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Comparison of the National Science Foundation's Scientists and Engineers Statistical Data System (SESTAT) with the Bureau of Labor Statistics' Current Population Survey (CPS)

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Introduction

The Division of Science Resources Statistics (SRS) of the National Science Foundation (NSF) initiated this report in response to requests from data users for information on scientists and engineers in the United States without a bachelor's or higher degree. Before making a decision to conduct a survey to collect this information, SRS reviewed existing data sources. During the review, the Current Population Survey (CPS) was identified as the most current data source with adequate coverage of the population of interest. CPS is a monthly labor force survey conducted by the U.S. Census Bureau and sponsored by the Bureau of Labor Statistics (BLS). This report provides the basis for understanding how CPS data may be used to satisfy the information needs of data users desiring information on the science and engineering (S&E) workforce without a bachelor's or higher degree. This information will complement the information on the S&E workforce[1] with education at the bachelor's level and higher that is provided by the NSF's Scientists and Engineers Statistical Data System (SESTAT).

SESTAT is a data system that includes the employment, educational, and demographic characteristics of a sample of scientists and engineers in the United States. SESTAT, which NSF maintains to provide data for policy analysis and general research, is usually updated every 2 years. SESTAT's definition of scientists and engineers is restricted to individuals age 75 or younger with a bachelor's or higher degree living in the United States. It includes two groups: (1) individuals with a bachelor's or higher degree in S&E and (2) individuals with a bachelor's or higher non-S&E degree who are working in S&E occupations.

CPS provides an alternative source of information about scientists and engineers. CPS can identify individuals with degrees by degree level; however, it does not collect data on field of degree and therefore cannot distinguish between S&E and non-S&E degrees. Because CPS collects data on occupation, it can identify

individuals working in S&E occupations. Thus, CPS and SESTAT can both provide estimates of individuals with at least a bachelor's degree who are working in S&E occupations.

Before endorsing the use of CPS data for estimates of the S&E workforce without a bachelor's or higher degree, SRS wanted to investigate the comparability of CPS data to SESTAT data where the coverage in the two survey systems overlaps. Therefore, the first purpose of this report is to compare SESTAT and CPS estimates of the S&E workforce with a bachelor's or higher degree and to try to account for any differences observed. Such differences may be attributed to the different coverage of the two survey systems, conceptual differences in the definitions used, nonresponse, and response effects. The comparisons between SESTAT and CPS estimates are presented in the section "Coverage Issues." The second purpose of this report is to provide estimates of the numbers of individuals without a bachelor's or higher degree who are working in S&E occupations. The results for this group are presented in the section "Comparison of Estimates." As background, the SESTAT and CPS designs are briefly reviewed in the sections "Overview of SESTAT Design" and "Overview of CPS Design."

Overview of SESTAT Design

The SESTAT target population includes individuals living in the United States who have a bachelor's or higher degree and were either educated in S&E or are working in an S&E occupation, with the exception of those individuals who are either institutionalized or age 76 and older. The broad degree and occupation categories considered as S&E include computer and mathematical science, life science, physical science, social science (including psychology), and engineering (see Kannankutty and Wilkinson 1999 for more information about the definition of S&E degree fields and S&E occupations).

The SESTAT data system is derived from three distinct survey components: the National Survey of College Graduates (NSCG), the National Survey of Recent College Graduates (NSRCG), and the Survey of Doctorate Recipients (SDR), which are explained below.

- The NSCG primarily covers "experienced" scientists and engineers who are not covered by the other two SESTAT surveys. The sample for the 1993 NSCG was selected from the 1990 decennial census and included any individuals living in the United States as of April 1990 with a bachelor's degree or higher in any field, not just S&E. The target population also included college degree holders who earned their degrees outside the United States but who were U.S. residents in 1990. In 1993, two selected groups from the NSCG were incorporated into the SESTAT data system: those with S&E degrees and those without such degrees who were working in S&E occupations; however, anyone who was already covered by the 1993 NSRCG or the 1993 SDR was excluded. Subsequent rounds of the NSCG comprised those NSCG cases incorporated into the 1993 SESTAT, augmented by samples of S&E graduates since 1990 obtained from the prior rounds of the NSRCG (see next bullet).
- The NSRCG covers those individuals who received an S&E bachelor's or master's degree from a U.S. educational institution in the 2 academic years before the survey reference date. The NSRCG cases are referred to the NSCG for follow-up.
- The SDR covers those individuals who received a doctorate in an S&E field from a U.S. educational institution since 1942.

- Information about SESTAT can be found at http://sestat.nsf.gov/. This report was written for an audience with a technical background and knowledge of SESTAT.

Overview of CPS Design

CPS is a monthly survey of about 50,000 households. It is based on a stratified, multistage area probability sample design and is the primary source of information on the labor force characteristics of the U.S. civilian noninstitutional population. In addition to information about employment status, earnings, hours of work, and other labor force characteristics, CPS collects educational attainment data and a variety of demographic characteristics such as age, sex, race/ethnicity, and marital status. Data are also available by occupation, industry, and class of worker. Since the inception of the survey, various changes have occurred in the design of the CPS sample. The survey is traditionally redesigned after each decennial census. The current sample design, introduced in January 1996, includes about 59,000 households from 754 sample areas. The number of eligible households in any given month is typically about 50,000; of these, about 93% respond to the survey. Data are generally collected for about 120,000 individuals of all ages from the responding households each month.

CPS uses a 4-8-4 rotation scheme in which each sampled household is interviewed for 4 consecutive months, then dropped out of the sample for the next 8 months, and finally brought back into the sample the following 4 months. A feature of the rotation scheme is that in any given month, about one-eighth of the households are first-time households and one-eighth are reactivated households after their 8-month resting period. The remaining households have been in the sample for 2 or more consecutive months. Thus, the household sample has roughly a 75% month-to-month overlap. Although accumulating the monthly CPS samples will increase the total sample size, the gains are limited because of the substantial overlap resulting from the 4-8-4 rotation scheme. The number of unique households in the CPS sample in a year is about three times the size of a typical monthly sample.[2]

A summary of key differences between the SESTAT and CPS designs is presented in the section "Summary and Conclusions."

Organization of the Report

The remainder of this report is organized as follows:

- "Data Collection and Processing Procedures" discusses the data collection and data processing procedures used by SESTAT and CPS.
- "Coverage Issues" explains the coverage issues and compares estimates of the S&E population derived from the two data sources.
- "Statistical Issues" briefly reviews other statistical issues that may affect comparisons of estimates between the two data sources.
- The main conclusions are summarized in "Summary and Conclusions."

Footnotes

[1] For the purposes of this report, the S&E workforce is defined as people working in SESTAT S&E occupations. SESTAT defines S&E occupations as computer and mathematical scientists, life scientists, physical scientists, social scientists (including psychologists), and engineers.

[2] For more information about the design and implementation of CPS, see U.S. Census Bureau 2000.

Data Collection and Processing Procedures

SESTAT and CPS use different procedures to collect and process data. A detailed comparison of the procedures used for the two survey systems appears in appendix A. This section presents highlights of the comparison, including both differences and similarities in the data collection procedures and data processing procedures, and in the collection of data on academic degree, employment status, occupation, and other respondent categories.

Data Collection Procedures

- All SESTAT sample members are asked to provide self-reports. CPS relies heavily on proxy reports; for example, a household respondent may provide information on each eligible household member. Interviewers are encouraged to ask individual household members to self-report on labor force participation. However, interviewers work under tight time constraints and are just as strongly encouraged to collect as much information as possible in one contact. Typically, just under one-half of the CPS data collected on labor force participation are provided by proxies.
- The two survey systems use different modes of data collection. SESTAT data are collected primarily by mail and telephone, with some follow-up by personal interview. In the 1997 SESTAT, 61% of responses were obtained by mail, 37% by telephone, and 2% by personal interview. Most CPS data are collected through personal interviews during the first and fifth months of participation and through telephone interviews during the other months of participation.
- SESTAT surveys collected by telephone and personal interviews use computer-assisted telephone and personal interviewing (CATI and CAPI). All CPS data are collected with computer-assisted interviewing. The CATI and CAPI systems used on both SESTAT and CPS conduct internal consistency checks during the survey administration. These computer-generated edit checks produce edit screens that ask the respondent to resolve or clarify discrepancies in the responses.
- CPS uses "dependent interviewing," in which responses to selected questions collected on each household member during a prior month are used during subsequent rounds of data collection. SESTAT does not use dependent interviewing.
- Both SESTAT and CPS require respondents to focus on a 1-week period of time (i.e., the reference week) as they answer the survey questions. In 1997, the SESTAT reference week was the week of 15 April 1997. The CPS reference week is always the week of the month that includes the 12th day of the month. This report used CPS data from the week of 12 April 1997.
- The length of the data collection periods scheduled for the two survey systems are different. CPS collects data for about 1 week after the reference week. SESTAT surveys last for several months after the reference week.
- Both survey systems have low-item nonresponse rates, especially for employment and occupation items. SESTAT has zero-item nonresponse rates for the questions on working during the reference week, looking for work during the reference week, and occupation because SESTAT defines these items as critical completes that must be answered to include the questionnaire responses in the final data system. The remaining SESTAT question used to determine labor force status, whether the respondent is on layoff from a job,

generally has an item nonresponse rate of 1% or less. The item nonresponse rates for January 1997 CPS data are 0.3% for labor force status and 1.7% for occupation.

- Both SESTAT and CPS include respondents whose primary language is not English. Most SESTAT respondents are graduates of U.S. colleges and therefore have some English language skills. By comparison, CPS includes some respondents with limited English skills and is likely to capture more individuals without U.S. degrees than SESTAT. Language problems in CPS are expected to be more of an issue for respondents without bachelor's degrees than for respondents with bachelor's or higher degrees. CPS uses interviewers who live in the geographic area in which they interview, and some of these interviewers collect data in languages other than English.
- Interviewers for both SESTAT and CPS receive extensive hands-on training on questionnaire administration, whereas respondents who self-administer the SESTAT questionnaire receive no training.

Data Processing Procedures

- SESTAT and CPS implement similar data processing procedures. Data from CATI and CAPI interviews are "examined" during the interviews through the use of programmed range checks and internal consistency checks. Both survey systems conduct postcollection editing using computerized systems.
- Although SESTAT and CPS follow many of the same steps in data processing, the techniques and rules for resolving problem cases vary. For example, SESTAT counts as a "noninterview" all cases that are missing one or more critical complete items (after attempted telephone follow-up), but CPS has no such rule. Furthermore, the two survey systems have important differences in the coding of occupation, as described in the section "Occupation Data."

Academic Degree Data

- To be eligible for SESTAT, a sample member must have completed a bachelor's or higher degree in any field. CPS includes respondents with and without bachelor's or higher degrees.
- CPS collects the highest level of school or highest degree completed but does not collect any other information about completed degrees, such as field of study. SESTAT collects the college/university, degree level, date, and field of study for degrees at the bachelor's or higher degree level. SESTAT also collects some information on associate's degrees as well as other educational activities.
- For degree level, both CPS and SESTAT use the same categories of bachelor's, master's, doctorate, and other professional degree, so these data are expected to be consistent across survey systems.

Employment Status Data

- Both survey systems gather data on workforce participation, including principal and secondary jobs, during the survey reference week. Although both survey systems ask similar questions about working for pay or profit during the survey reference week, the battery of questions used to determine labor force status are not the same on the two survey systems.

- The definition of "employed" is similar but not identical in the two survey systems. The main difference is that CPS specifically asks about work on a family business or farm and classifies the individual as employed if he or she is working 15 hours or more per week or receiving profits, whereas SESTAT instructs respondents to include self-employment without any limitation of number of hours worked.
- The two survey systems differ in the definition of "unemployed." For the SESTAT labor force variable, an individual who is not working is classified as unemployed if (1) the person is on layoff from a job or (2) the person was looking for work during the 4 weeks preceding the reference week. In CPS, an individual who is not working is classified as unemployed if (1) the person is on layoff from a job and has been given a date to return to work or has been given any indication of being recalled to work within the next 6 months or (2) the person has been trying to find work during the last 4 weeks and lists a job search method that could have brought him or her into contact with a potential employer.
- Both SESTAT and CPS collect information on full-time or part-time employment status during the survey reference week. In both survey systems, the full-time or part-time status can be determined for either principal job alone or all jobs combined.

Occupation Data

- In SESTAT surveys, the respondent is asked to provide both a verbatim description of the occupation and a self-selected occupation code. With CPS, the industry and occupation information are collected using open-ended questions and dependent interviewing.
- SESTAT occupation coders review the respondent's self-selected code and occupation description, along with many other questionnaire items related to the respondent's job and education, to assign the best code for the occupation. Coders are instructed not to change self-selected codes unless sufficient evidence exists to indicate that the respondent has made a mistake and the information provided allows the assignment of a better code. CPS coders do not have a respondent self-selected code; instead, they assign codes based on the occupation description, job duties, and industry.
- In the SESTAT survey system, occupation data are collected independently during each survey cycle without dependent interviewing. However, SESTAT coders on follow-up surveys are instructed to consider the best occupation code assigned in the previous cycle under certain conditions. In CPS, dependent interviewing for the industry and occupation questions is used for households that were included in the sample the previous month. Respondents who say they have the same employer and job duties as in the previous month are asked to verify the previous month's job description. If the job description is verified as correct, the previous month's occupation code is brought forward and no occupation coding is conducted. Another important difference is that in CPS the previous data collected are generally 1 month old and in SESTAT the previous data are 2 years old.
- Different occupational taxonomies are used in the two survey systems. Because both taxonomies were developed from the 1980 Standard Occupational Classification maintained by the Bureau of Labor Statistics, the two taxonomies are generally consistent. However, whereas the SESTAT system uses broad

categories for non-S&E jobs and more specific categories for S&E jobs, the CPS data are coded in both detailed and broad classifications for all jobs.

Other Respondent Classifications

- Respondent characteristics that can be used in analysis include sex, age, race, and ethnicity. SESTAT and CPS collect these data using slightly different methods. The main difference is that CPS collects data by proxy, whereas SESTAT does not use the proxy collection method.
- Both survey systems collect date of birth, which is coded as "age" for analysis. Both survey systems have procedures for resolving inconsistencies between information collected during the current survey cycle and information collected in previous cycles for date of birth.
- Both SESTAT and CPS ask about race and Hispanic origin in separate questions. The SESTAT data for race and ethnicity come from the sampling frames or the baseline surveys, which include the 1990 decennial census long form for NSCG cases sampled from the 1990 decennial census, the Survey of Earned Doctorates (SED) for the SDR cases (with verification of responses during the 1993 SDR), and the NSRCG survey each cycle. The questions used to collect race and ethnicity differ slightly between these surveys.
- The CPS race question is very similar to the NSRCG race question. CPS also collects the verbatim race responses provided by the respondents but edits any such responses back into the four main racial groups.
- The three SESTAT sources of Hispanic origin data (1990 decennial census, SED, and NSRCG) ask directly whether the respondent is of Hispanic origin (with slightly different wording). In CPS, respondents are asked to select their origin (or the origin of some other household member) from a "flash card" that lists 20 ethnic origins. Individuals of Hispanic origin are those who indicated that their origin was Mexican American, Chicano, Mexican (Mexicano), Puerto Rican, Cuban, Central or South American, or other Hispanic.

Conclusion

Differences between the SESTAT and CPS data collection procedures might influence the survey estimates, as discussed in detail in appendix A. However, the reinterview studies conducted on the SESTAT surveys did not find large differences between the initial interview and the second interview. Although this does not indicate that the respondent-reported information is correct, it does indicate consistency and can be used as a measure of data reliability.

SESTAT and CPS have similar data processing steps and procedures. However, the techniques and rules for resolving problem cases are different for the two survey systems. Some of the main differences are in the coding of occupation. Both CPS and SESTAT collect verbatim occupation descriptions using similar questions, and the coding taxonomies used in the two surveys are generally consistent with each other. However, the rest of the occupation coding process is different. These different processes could result in differences in the data for the two survey systems.

Coverage Issues

This section examines the areas of coverage and estimation. "SESTAT Coverage" discusses the coverage issues for SESTAT and provides SESTAT estimates of individuals in S&E occupations. "CPS Coverage" discusses the corresponding CPS coverage issues and how CPS can be used to provide estimates of individuals in S&E occupations that are comparable to SESTAT estimates. The CPS coverage also supports estimation of individuals in non-S&E occupations and individuals who do not have a bachelor's or higher degree (those who have an associate's degree or high school diploma as their highest degree level). Although not covered by SESTAT, there has been interest in examining the number and characteristics of individuals in S&E occupations who do not have a bachelor's or higher degree. "Comparison of Estimates" examines the compatibility of estimates between SESTAT and CPS and provides CPS estimates of individuals in S&E occupations that are not available in SESTAT. The estimates used data from the 1997 SESTAT[3] and the April 1997 CPS.[4] April 1997 was the reference month for both surveys.

Appendix B documents the SESTAT and CPS variables used in this report, the initial frequencies before recoding, and the method used to create derived variables for comparisons. Appendix B includes the following:

- Table B-1 lists the value codes prior to recoding of variables used to create derived variables for this report, including both CPS and SESTAT variables.
- Table B-2 describes the derived variables created for this report, including both CPS and SESTAT variables.
- Tables B-3 to B-5 give unweighted frequencies for SESTAT and CPS variables used to create the derived variables for the report. Table B-3 shows frequencies of the 1997 SESTAT sample employed in S&E occupations. Tables B-4 and B-5 show frequencies for the April 1997 CPS sample of persons 75 or younger with a bachelor's or higher degree who are employed in S&E and non-S&E occupations. Tables B-6 and B-7 show frequencies for the April 1997 CPS sample of persons 75 or younger with an associate's degree or high school diploma who are employed in S&E and non-S&E occupations.

SESTAT and CPS are both sample survey systems and are thus subject to sampling error. In this report, survey estimates are presented with the approximate standard error (SE) to indicate the precision of the estimates. The section "Sampling Errors" and appendix C discuss the methods used to compute standard errors of SESTAT and CPS estimates presented in this report. For example, the 1997 SESTAT estimate shows a total of 3,369,400 individuals working in S&E occupations. The SE of this estimate is 26,600 (appendix C, tables C-1 and C-3); the corresponding 95% confidence limits are obtained by adding and subtracting 1.96 times the SE from the survey estimate. This means that with 95% confidence, the "true" population is expected to lie between 3,317,300 and 3,421,500. The corresponding CPS estimate of persons with bachelor's or higher degrees employed in S&E occupations is 3,542,100. The SE of this estimate is 101,700 (appendix C, tables C-9 and C-11) and the 95% confidence interval is between 3,342,700 and 3,741,600.[5] The difference between these overall estimates is not statistically significant. However, the SESTAT and CPS estimates are significantly different for some groups and those differences that are significant at the 95% confidence level are indicated in appendix C, tables C-29 and C-31.

SESTAT Coverage

The SESTAT target population (see "Overview of SESTAT Design") includes people who meet all of the following conditions as of the survey reference period:

- Have a bachelor's or higher degree
- Have at least one S&E degree or do not have an S&E degree but were employed in an S&E occupation[6]
- Are age 75 or younger
- Do not live in an institution (e.g., nursing home, prison)
- Live in the United States as of the survey reference date

Table 1 summarizes estimates of the number of individuals in the SESTAT population by subset and year. The table also illustrates the magnitude of changes in the SESTAT population over time as well as coverage problems associated with certain subsets of the SESTAT population. As shown in the first row of the table, the population represented in the *total* SESTAT data system increased from 11,615,200 in 1993 to 12,530,700 in 1997. However, not all of the 12,530,700 individuals in the 1997 data system are scientists and engineers according to the SESTAT definition. About 276,600 individuals with no S&E degree in the 1997 SESTAT data system (subsets N, H, and J in table 1) were no longer working in S&E occupations in 1997 (but had been doing so in 1993). Figure 1 shows various subsets of the SESTAT population that correspond to the subsets in table 1.

TABLE 1. SESTAT estimated population counts, by subset: 1993, 1995, and 1997

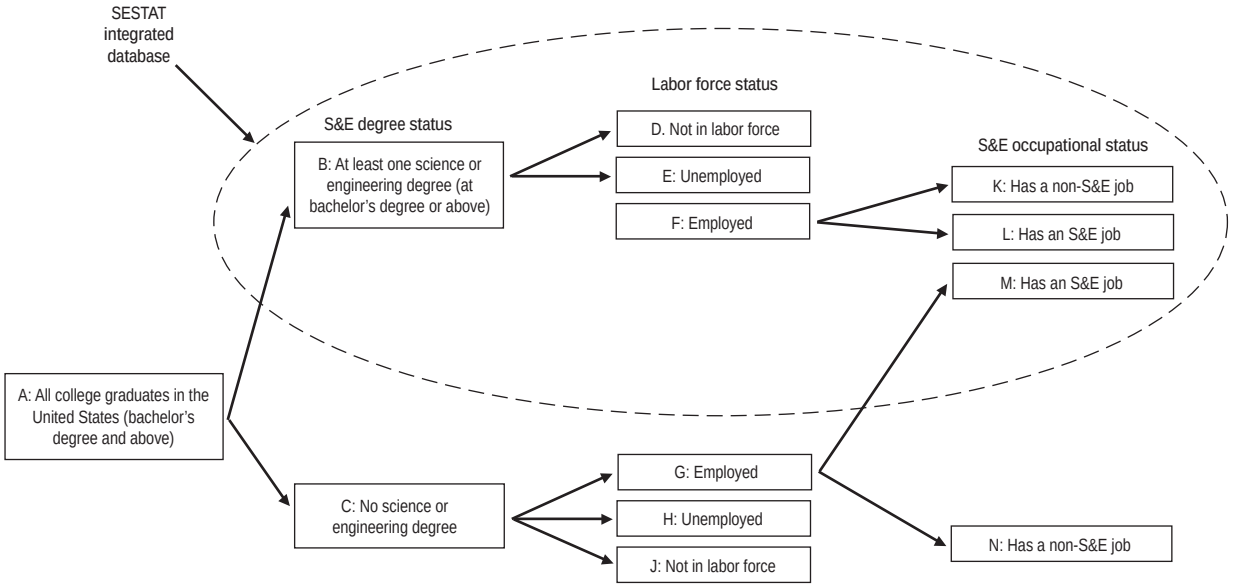
Subset	1993	1995	1997	S&E degree status	S&E occupational status	Labor force status
All populations	11,615,200	12,036,200	12,530,700	na	na	na
S&E population (D+E+K+L+M)	11,615,200	11,790,800	12,254,100	na	na	na
D	1,499,500	1,649,000	1,717,200	S&E	None	Not in labor force
E	322,200	237,700	187,300	S&E	None	Unemployed
K	6,490,100	6,718,600	6,980,100	S&E	Non-S&E	Employed
Employed in S&E occupation (L+M)	3,303,400	3,185,600	3,369,400	na	na	na
L	2,709,800	2,851,400	3,077,500	S&E	S&E	Employed
M	593,600	334,100	292,000	Non-S&E	S&E	Employed
Non-S&E population (G+H+J)	0	245,400	276,600	na	na	na
G	0	210,400	236,100	Non-S&E	Non-S&E	Employed
H	0	11,600	6,400	Non-S&E	None	Unemployed
J	0	23,400	34,100	Non-S&E	None	Not in labor force

na = not applicable.

NOTES: Age 75 or younger. See figure 1 for definition of subsets. Subsets G, H, and J included in SESTAT data system after 1993 but not originally part of SESTAT target population and represent individuals without an S&E degree who had S&E jobs in 1993 but later switched to non-S&E jobs.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1993, 1995, and 1997 Scientists and Engineers Statistical Data System (SESTAT).

FIGURE 1. SESTAT population: 1997



NOTES: After 1993 SESTAT surveys identified individuals for inclusion at point of earning an S&E degree from a U.S. institution, therefore two subpopulations of U.S. scientists and engineers are underrepresented in SESTAT integrated data system in 1995 and subsequent survey years: (1) new immigrants with degrees earned outside United States who entered the U.S. labor force after 1990, and (2) people with no S&E degrees in S&E occupations after 1993 (Box M in the diagram). Other individuals could be considered part of the population of scientists and engineers, e.g., individuals in technical occupations with 2-year degrees or other types of training. These individuals not included in SESTAT integrated data system, nor represented in this diagram.

SOURCE: N. Kannankutty and R. Wilkinson. SESTAT: A Tool for Studying Scientists and Engineers in the United States, Figure 1.3. National Science Foundation, Division of Science Resources Statistics (1999), http://www.nsf.gov/statistics/nsf99337/.

Under the current design used for the 1993, 1995, and 1997 SESTAT, certain groups that were originally intended to be in the target population are subject to undercoverage in SESTAT over the decade. One major group that is subject to undercoverage in SESTAT is a special group of immigrants. Immigrants who earned S&E degrees outside of the United States and who were residing in the country in April 1990 were included in the sampling frame for the 1993 NSCG. However, immigrants who earned S&E degrees outside of the United States and then entered the country after April 1990 are not covered in the SESTAT integrated data system unless they later earned an S&E degree from a U.S. institution. Immigrants who earned S&E degrees at a U.S. institution either before or after April 1990 are covered in the SESTAT integrated data system. Since it is not possible with the current SESTAT sampling frames to include foreign-trained individuals in SESTAT after April 1990 (unless they earn an S&E degree from a U.S. institution after entering the U.S.), the estimated population counts shown in table 1 understate the true numbers. Until provisions are made to supplement the SESTAT sample with foreign-trained scientists and engineers with no U.S. degree, the undercoverage of this subset will obviously increase over time. A rough estimate of the size of this omitted group is provided in the section "CPS Coverage."

The other major group subject to undercoverage in SESTAT includes individuals with a non-S&E degree who are employed in S&E occupations. This group would ordinarily be included in subset M of table 1. Starting with an estimated 593,600 individuals in the 1993 SESTAT, the numbers in subset M have decreased to 334,100

in 1995 and to 292,000 in 1997. This subset has diminished over time because the current SESTAT sampling frames do not allow any additions to the group. Specifically, the sample frames do not allow the identification of (1) individuals who earned non-S&E degrees after April 1990 and then obtained S&E jobs, (2) individuals who earned non-S&E degrees before April 1990 but then moved to S&E jobs after 1993, and (3) immigrants after April 1990 with only foreign-earned non-S&E degrees who entered S&E jobs in the United States. Even the estimated number of individuals with non-S&E degrees for 1993 is an understatement because individuals receiving non-S&E bachelor's or higher degrees between 1990 and 1993 who were working in S&E occupations in 1993 are not included in the 1993 SESTAT estimate.

Although it is not possible to estimate the extent of the undercoverage of the population with non-S&E degrees using the SESTAT data, differences in the number of individuals in subset M of table 1 over the three survey cycles may provide some indication. For example, assuming conservatively that the actual number of individuals with non-S&E degrees who are working in S&E remains at roughly the 1993 level (i.e., 593,600 individuals), at least 259,500 would be excluded from the 1995 SESTAT (the difference between the numbers in 1993 and 1995), and 301,600 would be excluded from the 1997 SESTAT (the difference between the numbers in 1993 and 1997). Although these numbers of excluded individuals are relatively small in comparison to the *total* S&E population in SESTAT, they represent a significant portion of the subset of individuals without S&E degrees who work in S&E occupations.

To summarize, the groups that are conceptually part of the target population but are subject to undercoverage after 1993 in SESTAT include the following:

- Individuals with a bachelor's or higher degree who were living abroad as of the 1990 decennial census (in April 1990), later came to live in the United States, and did not earn an S&E bachelor's or higher degree from a United States institution after 1 April 1990
- Individuals living in the United States as of the 1990 decennial census who did not have a bachelor's or higher degree but who earned an S&E degree after 1 April 1990, from a foreign institution only
- Individuals with a bachelor's or higher degree in a non-S&E field as of the 1990 decennial census who were not working in an S&E occupation in 1993 but who later moved into an S&E occupation (and did not receive an S&E degree from a U.S. institution)
- Individuals who did not have a bachelor's or higher degree in April 1990 but earned a non-S&E degree (in the United States or another country) after April 1990 and later moved into an S&E occupation in the United States

Analysts using the SESTAT data system may decide to restrict the S&E population to individuals with S&E degrees or, alternatively, to individuals currently working in S&E occupations. In doing so, the implications of the undercoverage will be different. For example, if the S&E population is restricted to include only individuals with S&E degrees, the undercoverage in SESTAT of individuals with non-S&E degrees who are working in S&E occupations is no longer a concern.

The S&E population in SESTAT includes active duty military personnel living in the United States. (Military personnel living outside the United States during the survey reference week are excluded from SESTAT, as are any individuals not residing in the United States.) Table 2 shows counts of the SESTAT population for civilians and military personnel in the United States. The total number of military personnel is 94,500, less than 1% of the 1997 SESTAT population.

TABLE 2. SESTAT estimated population counts, by subset and military status: 1997

Subset	All SESTAT	Civilian	Military	S&E degree status	S&E occupational status	Labor force status
All populations	12,530,700	12,436,200	94,500	na	na	na
S&E population (D+E+K+L+M)	12,254,100	12,161,300	92,800	na	na	na
D	1,717,200	1,717,200	0	S&E	None	Not in labor force
E	187,300	187,300	0	S&E	None	Unemployed
K	6,980,100	6,910,500	69,600	S&E	Non-S&E	Employed
Employed in S&E occupation (L+M)	3,369,400	3,346,200	23,200	na	na	na
L	3,077,500	3,056,000	21,400	S&E	S&E	Employed
M	292,000	290,200	1,800	Non-S&E	S&E	Employed
Non-S&E population (G+H+J)	276,600	274,900	1,700	na	na	na
G	236,100	234,400	1,700	Non-S&E	Non-S&E	Employed
H	6,400	6,400	0	Non-S&E	None	Unemployed
J	34,100	34,100	0	Non-S&E	None	Not in labor force

na = not applicable.

NOTES: Age 75 or younger. See figure 1 for definition of subsets. Subsets G, H, and J included in SESTAT data system after 1993 but not originally part of SESTAT target population and represent individuals without an S&E degree who had S&E jobs in 1993 but later switched to non-S&E jobs. Military includes individuals whose principal employer type was "U.S. military, active duty, or commissioned corps (e.g., U.S. Public Health Service, National Oceanic and Atmospheric Administration)."

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

CPS Coverage

The target population for CPS is the civilian noninstitutionalized population of the United States. Individuals residing in group quarters (e.g., college dormitories, retirement homes, and communes) are included in CPS if the group quarters are classified as civilian and noninstitutional. CPS includes only the "civilian" labor force. Active duty military personnel are generally excluded from CPS regardless of whether they are stationed in the United States or overseas. (An exception is the March CPS Supplement, for which military personnel residing in households with another adult civilian are eligible.)

See U.S. Census Bureau (2000)[7] for a discussion of CPS coverage issues. Although the goal of the CPS sample design is to give all U.S. residents a nonzero probability of selection for the survey, coverage of 100% is rarely achieved. Noncoverage results from errors in almost every phase of data collection from listing, sampling, and enumerating households to locating and interviewing respondents. Historically, the effect of these errors in CPS (like many other national surveys using area probability sampling designs) has been to understate the number of people in the United States.

An indication of the amount of undercoverage for a specific subgroup of the population is given by the "coverage ratio." The coverage ratio is defined as the ratio of the estimated number of individuals (as estimated from the sample) to the corresponding "known" population total derived from independent sources. For the 1996 CPS, the overall coverage ratio is estimated to be 93%. This can be interpreted to mean that about 7% of the U.S. population is not covered in the CPS data collection. The CPS coverage ratios also vary by race/ethnicity, age, and sex (see

U.S. Census Bureau 2000, table 16-1). Coverage ratios tend to be lower for blacks (84%) and Hispanics (83%) than for whites (94%) and are generally lower for males (92%) than for females (96%). The younger age groups (particularly individuals in their 20s and 30s and younger black males) have much lower coverage rates than older individuals.

CPS uses weighting adjustment and poststratification to independent population totals to compensate for undercoverage (see the section "Weighting and Estimation"). This procedure forces the aggregate count of individuals in the sample to agree with the independent totals. However, it does not guarantee that biases resulting from the undercoverage are adequately eliminated. For example, it is not known how the differential undercoverage will affect estimates of the number of individuals with S&E degrees or the number who are employed in S&E occupations.

A limitation of CPS relative to SESTAT is that CPS does not collect data about S&E degrees. Comparisons of SESTAT and CPS estimates are restricted to individuals in S&E occupations. Comparisons by S&E degree are not possible. For example, CPS cannot provide separate estimates of individuals with an associate's degree in S&E who are not working in S&E occupations. However, CPS can provide estimates of the number of individuals in S&E and non-S&E occupations and for individuals with an associate's degree who are employed in S&E occupations.

Table 3 shows CPS estimates of the number and percentage of individuals age 75 or younger in S&E and non-S&E occupations by highest degree attained, including degree levels above and below a bachelor's degree. An estimated 17% of individuals in S&E occupations have an associate's degree as their highest education level, and 5% have a high school diploma. The percentages of individuals in non-S&E occupations at these education levels are 33% and 39%, respectively. By employment status, 93% of individuals in S&E occupations are full-time workers, compared with 81% of individuals in non-S&E occupations.

TABLE 3. CPS number and percentage of individuals employed in S&E and non-S&E occupations, by highest degree attained and employment status: 1997 (April)

Highest degree/	Number			Percent	
employment status	All occupations	S&E	Non-S&E	S&E	Non-S&E
All individuals	101,664,600	4,539,700	97,124,900	100	100
Highest degree					
High school diploma	37,821,900	245,100	37,576,800	5	39
Associate's degree	32,608,600	752,500	31,856,200	17	33
Bachelor's degree	21,323,600	2,088,700	19,235,000	46	20
Master's degree	6,743,400	1,005,400	5,738,100	22	6
Doctorate	1,386,000	386,900	999,100	9	1
Professional	1,781,100	61,200	1,719,900	1	2
Employment status					
Full time	82,975,600	4,206,900	78,768,700	93	81
Part time	18,689,100	332,800	18,356,200	7	19

NOTE: Age 75 or younger.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Table 4 compares weighted counts of individuals in the April 1997 CPS who were age 75 or younger, had a bachelor's or higher degree, and were employed in an S&E occupation with the corresponding counts from the 1997 SESTAT. The SESTAT estimate of the number of civilian workers employed in S&E occupations is 3,346,200 (SE = 26,600). The corresponding CPS estimate is 3,542,100

(SE = 101,700). The difference between the two estimates is not statistically significant at the 95% confidence level.

TABLE 4. SESTAT and CPS individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment, and military status: 1997

Employment/	SESTAT				CPS (April)			
military status	All degrees	Bachelor's	Master's	Doctorate	All degrees	Bachelor's	Master's	Doctorate
All individuals	3,369,400	1,917,600	967,900	454,700	3,542,100	2,088,700	1,005,400	386,900
Civilian	3,346,200	1,904,700	959,800	453,000	3,542,100	2,088,700	1,005,400	386,900
Full time	3,082,200	1,783,000	855,700	417,200	3,284,700	1,981,400	891,300	352,800
Part time	264,100	121,700	104,100	35,800	257,400	107,300	114,000	34,100
Military	23,200	12,900	8,100	1,700	NA	NA	NA	NA

NA = not available because unweighted cell size is zero

NOTES: Age 75 or younger. "All degrees" includes individuals with professional degrees not listed separately by employment status.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Table 5 shows April 1997 CPS estimates of the number of bachelor's or higher degree recipients employed in S&E occupations by educational attainment and whether they entered the United States before 1990. Table 6 shows the corresponding estimates by S&E occupational group. Among the 3.54 million individuals in S&E occupations, about 210,200 (6%) entered the United States during or after 1990. This estimate of 210,200 (SE = 25,000) provides a crude upper boundary on the immigrant portion of the foreign-trained group that is excluded from SESTAT. The actual number of excluded immigrants is likely to be lower than 210,200 because individuals who received an S&E degree from a U.S. institution after April 1990 would be covered in SESTAT through the NSRCG or SDR. Those who entered the United States between January and April 1990 are also covered in SESTAT. The percentage of recent immigrants varies by educational level and by occupational groups. This percentage was higher among people with postgraduate degrees than among bachelor's degree recipients and higher among life scientists than other S&E occupations.

TABLE 5. CPS individuals with bachelor's or higher degree employed in S&E occupations, by entry year to United States and highest degree attained: 1997 (April)

Year entered U.S.	All degrees	Bachelor's	Master's	Doctorate	Professional
All years	3,542,100	2,088,700	1,005,400	386,900	61,200
1990 or earlier	3,332,000	2,017,000	920,100	338,800	56,100
1991 or later	210,200	71,700	85,300	48,100	5,100
1991 or later (%)	6	3	9	12	8

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE 6. CPS individuals with bachelor's or higher degree employed in S&E occupations, by entry year to United States and occupational group: 1997 (April)

Year entered U.S.	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All years	3,542,100	1,068,600	255,900	270,700	399,900	1,547,000
1990 or earlier	3,332,000	992,100	226,900	256,400	391,700	1,464,900
1991 or later	210,200	76,500	29,100	14,300	8,200	82,100
1991 or later (%)	6	0.07	11	5	2	5

SOURCE: U.S Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Table 7 shows the CPS estimates of the number of individuals in S&E occupations by highest degree attained (including associate's degree and high school diploma) and

occupational groups. The total count, including individuals whose highest educational level is an associate's degree or high school diploma, is about 4.54 million, which is 28% more than the total of 3.54 million individuals with bachelor's or higher degrees. About 752,500 individuals (SE = 47,300) in S&E occupations had an associate's degree, and another 245,100 (SE = 27,000) had a high school diploma (or equivalent). The inclusion of individuals without a college degree has the largest effect on estimates for computer and mathematical scientists and engineers, increasing the total counts by 37% and 32%, respectively. Appendix D lists the number of individuals in S&E occupations by educational level, S&E occupational group, and detailed occupational code.

TABLE 7. CPS individuals employed in S&E occupations, by highest degree attained and occupational group: 1997 (April)

Highest degree	All occupations	Computer and math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All degrees	4,539,700	1,462,700	299,300	293,700	449,400	2,034,600
Below bachelor's	997,600	394,100	43,400	23,000	49,500	487,600
High school diploma	245,100	98,700	18,700	4,700	16,400	106,600
Associate's	752,500	295,400	24,700	18,300	33,100	381,000
Bachelor's or higher	3,542,100	1,068,600	255,900	270,700	399,900	1,547,000
Bachelor's	2,088,700	667,700	112,800	120,200	104,900	1,083,100
Master's	1,005,400	310,700	50,000	85,600	169,200	389,900
Doctorate	386,900	81,300	73,200	55,300	115,500	61,600
Professional	61,200	8,800	19,900	9,700	10,400	12,400
Below bachelor's/ bachelor's or higher (%)	28	37	17	9	12	32

SOURCE: U.S Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Comparison of Estimates

This section provides comparisons of SESTAT and CPS estimates of individuals employed in S&E occupations with and without coverage adjustments. Three coverage differences are noted. First, SESTAT included individuals employed in military service, and CPS did not include this group. Second, SESTAT did not include new immigrants who entered the United States after April 1990 (and who did not receive a bachelor's or higher S&E degree from a U.S. institution after entry into the country), and CPS did include this group. Third, SESTAT did not include individuals in S&E occupations who did not have a bachelor's or higher degree, whereas CPS did.

Table 8 shows SESTAT and CPS estimates of the numbers of bachelor's or higher degree recipients in S&E occupations by highest degree attained, employment status, and S&E occupational group.[8] As mentioned earlier, the SESTAT estimate shows a total of 3.37 million graduates (civilian and military) in S&E occupations (SE= 26,600). The CPS estimate shows a total of 3.54 million civilians (SE = 101,700). The difference between these two overall estimates is not statistically significant at the 95% confidence level. By occupational group and degree attainment, some differences exist that are statistically significant at the 95% confidence level. By occupational group, the SESTAT estimate is significantly higher than the CPS estimate for the number of life scientists (126% of CPS estimate) and significantly lower for engineers (89% of CPS estimate). By degree attainment, the SESTAT estimate is significantly lower than the CPS estimate for bachelor's degree recipients (92% of CPS estimate) and significantly higher for doctorate recipients (118% of CPS estimate). One factor that could explain the differences in the doctorate estimates is better coverage of U.S. doctorate recipients that are included in SESTAT from the SDR component.[9]

TABLE 8. SESTAT and CPS individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997

Highest degree and employment status	All occupations	Computer and math scientists	Life scientists	Physical scientists	Social scientists	Engineers	SESTAT/ CPS (%)
All SESTAT	3,369,400	1,039,500	321,800	284,900	349,000	1,374,400	95
Bachelor's	1,917,600	675,400	125,200	131,700	68,500	916,900	92
Full time	1,795,600	639,200	111,400	118,200	47,200	879,700	91
Part time	122,000	36,200	13,800	13,500	21,300	37,200	114
Master's	967,900	301,600	70,300	69,100	151,100	375,900	96
Full time	863,800	277,400	61,700	61,800	106,500	356,300	97
Part time	104,100	24,200	8,500	7,300	44,600	19,500	91
Doctorate	454,700	59,000	111,800	83,700	120,800	79,400	118
Full time	418,900	54,500	105,500	79,200	103,600	76,100	119
Part time	35,800	4,500	6,300	4,500	17,200	3,300	105
All CPS (April)	3,542,100	1,068,600	255,900	270,700	399,900	1,547,000	na
Bachelor's	2,088,700	667,700	112,800	120,200	104,900	1,083,100	na
Full time	1,981,400	635,000	85,600	115,500	78,400	1,066,900	na
Part time	107,300	32,700	27,200	4,700	26,500	16,200	na
Master's	1,005,400	310,700	50,000	85,600	169,200	389,900	na
Full time	891,300	270,500	38,700	74,900	138,700	368,500	na
Part time	114,000	40,300	11,200	10,600	30,500	21,400	na
Doctorate	386,900	81,300	73,200	55,300	115,500	61,600	na
Full time	352,800	69,400	73,200	51,400	100,300	58,500	na
Part time	34,100	12,000	NA	3,900	15,200	3,100	na
SESTAT/CPS (%)	95	97	126	105	87	89	na

na = not applicable.

NA = not available, unweighted cell size is zero.

NOTE: Detail may not add to total because total includes individuals with professional degrees not shown separately by employment status.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Table 9 shows SESTAT and CPS estimates after "adjusting" for known differences between them. In this table, military personnel are excluded from SESTAT estimates and recent immigrants (individuals entering the United States in 1990 or later) are excluded from CPS estimates. These adjustments are imperfect because some of the excluded immigrants in CPS could have received an S&E bachelor's or higher degree in the United States after 1990 or could have entered the United States in 1990 by 15 April and would thus be included in SESTAT. In other words, to be comparable, the same set of recent immigrants should also be excluded from the SESTAT estimates; however, this is not possible with the collected data. Nonetheless, the results are interesting because they indicate the effect recent immigrants may have on the S&E population. For example, the CPS estimate for number of individuals with a bachelor's or higher degree employed in S&E occupations is 3,542,100 (SE = 101,700) overall and 3,332,000 (SE = 98,700) if those who entered the United States during or after 1990 are excluded.

TABLE 9. SESTAT and CPS individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment status, and occupational group after coverage adjustments: 1997

Highest degree and employment status	All occupations	Computer and math scientists	Life scientists	Physical scientists	Social scientists	Engineers	SESTAT/ CPS (%)
All SESTAT	3,346,200	1,035,200	319,800	282,200	347,900	1,361,200	100
Bachelor's	1,904,700	672,600	124,100	130,400	68,500	909,100	94
Full time	1,783,000	636,400	110,600	116,900	47,200	872,100	93
Part time	121,700	36,200	13,600	13,500	21,300	37,100	118
Master's	959,800	300,300	70,000	68,400	150,300	370,800	104
Full time	855,700	276,200	61,400	61,000	105,800	351,300	105
Part time	104,100	24,200	8,500	7,300	44,600	19,500	99
Doctorate	453,000	58,700	111,400	83,200	120,500	79,200	134
Full time	417,200	54,200	105,100	78,700	103,300	75,800	137
Part time	35,800	4,500	6,300	4,500	17,200	3,300	105
All CPS (April)	3,332,000	992,100	226,900	256,400	391,700	1,464,900	na
Bachelor's	2,017,000	637,600	112,800	119,800	100,400	1,046,300	na
Full time	1,913,500	604,900	85,600	115,500	75,900	1,031,500	na
Part time	103,500	32,700	27,200	4,300	24,500	14,800	na
Master's	920,100	273,200	43,900	76,900	166,100	360,000	na
Full time	814,600	234,600	36,700	69,000	135,600	338,600	na
Part time	105,500	38,600	7,200	7,800	30,500	21,400	na
Doctorate	338,800	73,400	52,000	52,500	114,800	46,100	na
Full time	304,700	61,500	52,000	48,700	99,600	43,000	na
Part time	34,100	12,000	NA	3,900	15,200	3,100	na
SESTAT/CPS (%)	100	104	141	110	89	93	na

na = not applicable.

NA = not available, unweighted cell size is zero.

NOTES: Estimates in table adjusted for coverage differences between surveys. SESTAT estimates exclude military, which are not covered at all in CPS; CPS estimates exclude immigrants who entered United States during or after 1990; SESTAT includes only those who entered United States before April 1990 (unless they later received S&E degree in United States). Details may not add to totals because totals include individuals with professional degrees not shown separately by employment status.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

The adjusted estimates in table 9 show that the number of individuals working in S&E occupations is roughly the same in both surveys. The SESTAT estimate is 3.35 million (SE= 26,600)and the CPS estimate is 3.33 million (SE = 98,700). The differences between the SESTAT and CPS estimates by occupational group and educational level are generally consistent with and without these coverage adjustments. However, two groups affected by these adjustments are life scientists and doctorate recipients. In both cases, the difference between the SESTAT estimate and CPS estimate increased.

Table 10 shows SESTAT and CPS estimates of the number of bachelor's or higher degree recipients in S&E occupations by sex, race/ethnicity, and age. The differences by sex and race/ethnicity are mostly small and insignificant. The differences in estimates for blacks, although large, are not statistically significant at the 95% confidence level. The differences by age, however, show significantly fewer individuals who are 29 years old and younger in SESTAT (61% of CPS estimate) but more individuals in the 50–59 and 60–75 age groups (142% and 130% of CPS estimates, respectively). A factor that may have contributed to this difference is the population weighting adjustment in CPS. As discussed in the section "CPS Coverage," the CPS estimates include an overall adjustment to reflect known population totals by race/ethnicity, age, and sex. These adjustments tend to be greatest for individuals in their 20s and 30s and are applied equally to individuals

with degrees and without degrees. Moreover, although the NSCG component of SESTAT included an initial poststratification adjustment to 1990 census counts, there has been no comparable adjustment in SESTAT.

TABLE 10. SESTAT and CPS individuals with bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997

Characteristic	All occupations	Computer and math scientists	Life scientists	Physical scientists	Social scientists	Engineers	SESTAT/ CPS (%)
All SESTAT	3,369,400	1,039,500	321,800	284,900	349,000	1,374,400	95
Sex							
Female	763,300	280,900	115,900	61,800	181,100	123,700	97
Male	2,606,100	758,600	205,900	223,100	167,900	1,250,700	94
Race/ethnicity							
Hispanic	103,500	26,200	8,000	7,200	14,400	47,700	89
White, non-Hispanic	2,791,900	839,400	272,400	240,200	302,600	1,137,300	97
Black, non-Hispanic	113,000	44,900	7,700	8,400	16,500	35,400	79
Asian/Pacific Islander	349,800	126,600	32,300	27,900	13,300	149,700	92
Other	11,300	2,500	1,400	1,200	2,100	4,200	57
Age							
≤29	472,700	137,200	46,700	44,500	58,000	186,300	61
30–39	1,089,400	382,800	88,800	83,800	72,300	461,600	90
40–49	996,900	331,000	103,600	81,300	104,700	376,200	101
50–59	594,500	159,800	59,900	51,300	82,500	240,900	142
60–75	213,100	28,500	22,700	23,700	30,500	107,700	130
All CPS (April)	3,542,100	1,068,600	255,900	270,700	399,900	1,547,000	na
Sex							
Female	783,800	311,200	96,600	53,400	156,800	165,800	na
Male	2,758,400	757,400	159,300	217,300	243,100	1,381,200	na
Race/ethnicity							
Hispanic	116,700	22,900	2,100	8,900	22,900	59,900	na
White, non-Hispanic	2,881,100	857,000	203,700	225,700	346,600	1,248,100	na
Black, non-Hispanic	143,400	63,300	6,700	4,900	14,300	54,200	na
Asian/Pacific Islander	381,200	117,000	39,600	30,800	16,200	177,700	na
Other	19,700	8,400	3,900	400	NA	7,000	na
Age							
≤29	770,600	268,700	65,300	75,600	68,600	292,400	na
30–39	1,204,500	360,900	67,000	86,900	90,300	599,400	na
40–49	983,700	309,900	72,900	68,700	139,900	392,300	na
50–59	418,900	107,700	23,600	31,000	69,500	187,100	na
60–75	164,500	21,400	27,200	8,600	31,500	75,700	na

na = not applicable.

NA = not available, unweighted cell size is zero.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Table 11 shows estimates from the two data sources after excluding from SESTAT persons in military service and excluding from CPS immigrants who entered the United States during or after 1990. The differences in estimates by age group are consistent with the differences without the adjustments. After coverage adjustments, the SESTAT estimates by sex are not significantly different than the CPS estimates. By race/ethnicity, the exclusion of new immigrants from CPS had a large effect on the estimated number of Asians (decreasing from 381,200 to 263,700).

TABLE 11. SESTAT and CPS individuals with bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group after coverage adjustment: 1997

Characteristic	All occupations	Computer and math scientists	Life scientists	Physical scientists	Social scientists	Engineers	SESTAT/ CPS (%)
All SESTAT	3,346,200	1,035,200	319,800	282,200	347,900	1,361,200	100
Sex							
Female	760,500	280,300	115,200	61,400	180,700	122,900	106
Male	2,585,800	754,900	204,600	220,800	167,200	1,238,300	99
Race/ethnicity							
Hispanic	102,400	25,900	7,900	7,200	14,200	47,300	90
White, non-Hispanic	2,773,000	836,300	270,600	237,800	301,700	1,126,500	99
Black, non-Hispanic	112,000	44,700	7,700	8,200	16,500	34,800	78
Asian/Pacific Islander	347,600	125,800	32,100	27,800	13,300	148,500	132
Other	11,200	2,500	1,400	1,200	2,000	4,100	83
Age							
≤29	466,300	136,000	46,100	43,900	57,900	182,300	70
30–39	1,079,300	380,800	87,900	82,400	71,700	456,500	96
40–49	992,300	330,100	103,300	80,900	104,400	373,600	103
50–59	593,100	159,800	59,800	51,200	82,500	239,800	143
60–75	212,400	28,400	22,600	23,600	30,500	107,300	131
All CPS (April)	3,332,000	992,100	226,900	256,400	391,700	1,464,900	na
Sex							
Female	720,000	287,900	85,700	46,900	153,700	145,800	na
Male	2,612,000	704,200	141,200	209,500	238,000	1,319,100	na
Race/ethnicity							
Hispanic	114,200	22,900	2,100	8,900	22,900	57,500	na
White, non-Hispanic	2,797,000	835,300	188,900	219,800	338,400	1,214,700	na
Black, non-Hispanic	143,400	63,300	6,700	4,900	14,300	54,200	na
Asian/Pacific Islander	263,700	68,000	25,300	22,800	16,200	131,500	na
Other	13,500	2,600	3,900	NA	NA	7,000	na
Age							
≤29	665,900	229,300	48,000	68,600	60,400	259,500	na
30–39	1,121,600	331,200	57,600	79,500	90,300	562,900	na
40–49	967,700	302,400	70,500	68,700	139,900	386,200	na
50–59	414,600	107,700	23,600	31,000	69,500	182,800	na
60–75	162,200	21,400	27,200	8,600	31,500	73,500	na

na = not applicable.

NA = not available, unweighted cell size is zero.

NOTES: Estimates adjusted for coverage differences between surveys. SESTAT estimates exclude military not covered at all in CPS; CPS estimates exclude immigrants who entered United States during 1990 or later; SESTAT includes only those who entered before April 1990 (unless they later received an S&E degree in United States).

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

One of the main coverage differences between SESTAT and CPS is that CPS includes individuals in S&E occupations who do not have a bachelor's or higher degree and SESTAT does not include this group. Table 12 shows the CPS estimates of this subgroup by sex, age, and race/ethnicity. Of the estimated 997,600 individuals in this subgroup (SE = 54,400), the majority have an associate's degree (see table 7) and most are employed in computer and mathematical sciences or engineering occupations. Compared with individuals who have a bachelor's or higher degree, somewhat greater proportions of individuals in S&E occupations who do not have a bachelor's or higher degree are female and age 40 or older. Additional detailed breakouts by occupation are given in appendix E, which shows that more than 78% of the 394,100 individuals who do not have a bachelor's degree but who are employed in

the broad computer and mathematical science category are computer systems analysts and scientists and the majority of the 487,600 engineers are employed either as electrical/electronic engineers or mechanical engineers.

TABLE 12. CPS individuals with high school diploma or associate's degree as highest education level employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997 (April)

Characteristic	All occupations	Computer and math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	997,600	394,100	43,400	23,000	49,500	487,600
Highest education level						
High school diploma	245,100	98,700	18,700	4,700	16,400	106,600
Associate's	752,500	295,400	24,700	18,300	33,100	381,000
Sex						
Female	272,800	179,300	5,400	4,700	30,500	52,900
Male	724,700	214,800	38,000	18,300	19,000	434,700
Race/ethnicity						
Hispanic	36,700	8,400	NA	2,800	NA	25,600
White, non-Hispanic	842,000	333,000	29,900	15,500	42,500	421,100
Black, non-Hispanic	69,800	30,700	6,600	4,800	6,900	20,800
Asian/Pacific Islander	33,000	14,900	3,100	NA	NA	15,000
Other	16,100	7,100	3,800	NA	NA	5,200
Age						
≤29	202,700	90,100	13,600	9,400	17,600	72,200
30–39	284,300	122,100	6,500	5,300	14,700	135,800
40–49	331,200	132,800	15,800	5,700	9,900	166,900
50–59	152,700	44,400	7,100	2,700	4,500	94,100
60–75	26,600	4,700	500	NA	2,800	18,600

NA = not available, unweighted cell size is zero.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Using CPS data, table 13 compares the characteristics of individuals in S&E occupations who have an associate's degree or high school diploma and the characteristics of individuals with the same degree attainment in non-S&E occupations. By sex and race/ethnicity, 73% of individuals in S&E occupations are male, 4% are Hispanic, and 7% are black. By employment status, a greater percentage of individuals in S&E occupations work full time than individuals in non-S&E occupations. This trend is consistent for all individuals in S&E occupations, including those both below and above the bachelor's degree level (see table 3).

TABLE 13. CPS number and percentage of individuals with high school diploma or associate's degree as highest education level employed in S&E and non-S&E occupations, by sex, race/ethnicity, age, and employment status: 1997 (April)

Characteristic	All occupations	Number		Percent	
		S&E	Non-S&E	S&E	Non-S&E
All individuals	70,430,500	997,600	69,432,900	100	100
Sex					
Female	34,420,000	272,800	34,147,200	27	49
Male	36,010,500	724,700	35,285,700	73	51
Race/ethnicity					
Hispanic	5,719,600	36,700	5,682,900	4	8
White, non-Hispanic	53,708,900	842,000	52,866,900	84	76
Black, non-Hispanic	8,544,800	69,800	8,475,000	7	12
Asian/Pacific Islander	1,912,200	33,000	1,879,300	3	3
Other	544,900	16,100	528,800	2	1
Age					
≤29	19,084,900	202,700	18,882,200	20	27
30–39	19,834,200	284,300	19,549,800	29	28
40–49	17,677,900	331,200	17,346,800	33	25
50–59	10,243,900	152,700	10,091,200	15	15
60–75	3,589,600	26,600	3,562,900	3	5
Employment status					
Full time	56,308,200	922,200	55,386,100	92	80
Part time	14,122,300	75,400	14,046,900	8	20

NOTE: Detail does not add to total due to rounding.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

In conclusion, to compare SESTAT and CPS estimates it is possible to adjust for some coverage differences. Three coverage differences are noted. First, SESTAT includes individuals employed in military service and CPS does not include this group. Second, SESTAT omits new immigrants who entered the United States after April 1990 (and who did not receive a bachelor's or higher S&E degree from a U.S. institution after entry into the country) and CPS does not omit this group. Third, SESTAT does not include individuals in S&E occupations who do not have a bachelor's or higher degree. The adjusted estimates for total number of individuals with a bachelor's or higher degree working in S&E occupations is roughly the same in both surveys when those in military service are excluded from SESTAT and immigrants who entered the United States during or after 1990 are excluded from CPS. The main differences in estimates from the two data sources among this adjusted group are by age and race/ethnicity and for life scientists and doctorate recipients.

CPS can provide estimates of the number of individuals in S&E occupations without a bachelor's or higher degree that are not available in SESTAT. In the April 1997 CPS sample, 431 individuals without a bachelor's or higher degree were working in S&E occupations (appendix C, table C-18). On a weighted basis, these 431 individuals from the sample represent about 997,600 individuals without bachelor's degrees who are working in S&E occupations (SE= 54,400; appendix C, table C-17). Almost 90% of these people were employed as computer/math scientists or engineers.

Footnotes

[3] 1999 SESTAT data were not available when this report was being written. The earlier cycles of SESTAT were not used because of time and resource limitations.

[4] As shown in appendix C, table C-32 and figure C-1, the number of people in S&E occupations as reported in CPS fluctuates by month. These appendix tables are intended simply to illustrate the month-to-month variation in the CPS S&E occupation numbers and to include all people age 16 or older in the civilian labor force who have a college degree and who are working or previously worked in an S&E occupation.

[5] The standard errors for CPS estimates tend to be higher than the corresponding standard errors for SESTAT estimates because the CPS sample includes a relatively small number of people in S&E occupations.

[6] Throughout this section, "degree" refers to bachelor's or higher degree.

[7] http://www.census.gov/prod/2000pubs/tp63.pdf

[8] The data in many of the tables in this section are based on derived variables created for both SESTAT and CPS data. See appendix B, table B-1, for a description of these derived variables.

[9] The sampling frame for the SDR is the Doctorate Records File, which is maintained by NSF and uses NSF's Survey of Earned Doctorates (SED) as its primary source. The SED is a census of all individuals receiving a research doctorate from a U.S. institution in each academic year. Institutional coordinators in graduate schools distribute survey forms to and collect them from individuals receiving research doctorates. Because of the high visibility and participation of doctorate-granting institutions, there is expected to be little, if any, coverage error in the first stage (inclusion of doctorate-granting graduate schools). Because the graduate schools collect the questionnaires from degree recipients at the time of doctoral completion, the second stage is also considered quite accurate. Comparisons of the number of research doctorates covered by the SED with the total number of doctorates (including nonresearch doctorates) reported by institutions to the National Center for Education Statistics confirm that coverage of research doctorates in the SED is excellent (http://www.nsf.gov/statistics/srvydoctorates/).

Statistical Issues

Sample Design

Both SESTAT and CPS are based on sample surveys that use complex probability sample designs. As such they are subject to various limitations. As described in the section "SESTAT Coverage," the main limitation of the SESTAT design is that over time it excludes an increasingly larger part of the target S&E population. In addition, SESTAT currently excludes individuals who do not have a bachelor's or higher degree. CPS, on the other hand, by definition excludes individuals in the military (a group covered in SESTAT). Because CPS is based on an area probability sample, it is also subject to undercoverage of certain subgroups of the civilian population (see the section "CPS Coverage"). Thus, an important distinction between the designs for the two studies is related to coverage issues. As long as these differences are recognized, the results from CPS and SESTAT can be analyzed and compared despite the fact that the SESTAT and CPS sample designs are different. Some additional factors that have a bearing on the ability to make comparisons across the studies follow. These factors include nonresponse and imputation, weighting and estimation, and sampling errors.

Nonresponse and Imputation

Nonresponse (both unit and item nonresponse) is a concern in both SESTAT and CPS because it can introduce biases of unknown magnitude in the survey estimates. Although weighting adjustments are made in both SESTAT and CPS to compensate for nonresponse, it is unlikely that the biases are completely eliminated. However, even if the characteristics of the nonrespondents are different from those of the respondents, the effect of nonresponse on the survey estimates will be minimal if nonresponse rates are relatively low and are not highly variable among demographic groups. In other words, the higher the nonresponse rate, the greater the potential for serious biases in the survey estimates.

Table 14 shows the unweighted unit response rate for SESTAT components in 1993, 1995, and 1997. For the NSCG, the response rates in 1995 and 1997 were conditional on prior respondent status in 1993. The 1993 NSCG response rate was 80%; only respondents of the 1993 NSCG were eligible for subsequent cycles. That is, there was no follow-up of nonrespondents from one cycle to the next. The conditional NSCG response rates for 1995 and 1997 were 95% and 94%, respectively. The unconditional response rate for the 1997 NSCG (i.e., the cumulative response rate for all three cycles) was approximately 71%. The response rates for the NSRCG and the SDR are unconditional response rates computed independently at each cycle. The unconditional response rates for the 1997 NSRCG and SDR were 82% and 84%, respectively.

TABLE 14. Percentage of unweighted response rates for SESTAT components: 1993, 1995, and 1997

Year	NSCG	NSRCG	SDR
1993	80	85	87
1995	95	83	77[a]
1997	94	82	84

CATI = computer-assisted telephone interviewing; NSCG = National Survey of College Graduates; NSRCG = National Survey of Recent College Graduates; SDR = Survey of Doctorate Recipients.

[a] Subsample of mail nonrespondents selected for CATI followup; 77% rate is unweighted response rate using total sample (including those subsampled out) as base.

NOTE: NSCG response rates in 1995 and in 1997 are high because the two cycles included only respondents in the 1993 NSCG.

SOURCE: National Science Foundation, 1999. SESTAT Design and Methodology, available at http://srsstats.sbe.nsf.gov/docs/techinfo.html.

The CPS unit response rates are generally higher than the SESTAT response rates, ranging from 91% to 94% per month (e.g., see U.S. Census Bureau 2000 and the CPS website[10]). The lower response rates in SESTAT raise the concern that the potential for bias resulting from unit nonresponse is greater for SESTAT than for CPS. However, SESTAT has fairly complete and rich data on demographics and degrees that are used for nonresponse adjustment to attenuate nonresponse biases. Because CPS nonresponse and poststratification adjustments are made without regard to degree status, the effect of the CPS adjustments for subsets of individuals with degrees is unknown.

Item nonresponse can also have adverse effects on survey data. The extent of item nonresponse is relatively minor for both SESTAT and CPS. In CPS, item nonresponse is generally low for demographic and labor force items (about 1% or less). In SESTAT, only those questionnaires that provide complete data for all "critical" items relating to degrees and occupation were considered to be completed questionnaires (i.e., respondents). Thus, by definition, there was no item nonresponse among respondents for the critical items. Any nonresponse in SESTAT is included in the unit response rates discussed above. For the noncritical items, item nonresponse rates are generally low. For example, the item nonresponse rates for variables included in this evaluation were approximately 1% or less. Both SESTAT and CPS use hotdeck methods to impute missing data items. SESTAT uses hotdeck imputation after some logical edit imputation is completed.

Weighting and Estimation

Both SESTAT and CPS require the use of weights to inflate the sample results to population levels. The purpose of the weights is to compensate for variable probabilities of selection, differential response rates, and undercoverage. All of the population estimates presented in this report are weighted estimates using person-level weights available in public-use files.

Although some aspects of weighting have varied from year to year, the main features of the weighting procedures used in SESTAT can be summarized as follows:

- In the 1993 NSCG, nonresponse adjustment was incorporated in the poststratification adjustment used to adjust the weights to match the population counts of the 1990 census. In 1995 and subsequent years, there was a separate adjustment for nonresponse. In addition, in 1995 an adjustment was made to account for the cases subsampled out after the CATI phase.

- In the 1993, 1995, and 1997 NSRCG, two separate adjustments were made. The first one was a poststratification adjustment that was applied to the (first-stage) institution weight. For this adjustment, a ratio was calculated using data from the Integrated Postsecondary Education Data System (IPEDS)[11] data in each of the 12 ratio-adjustment strata based on degree level and major field. For each ratio, the numerator was the sum of the number of degrees awarded over all institutions in the universe (i.e., in IPEDS), and the denominator was the weighted sum of degrees awarded in the sampled responding institutions as reported in IPEDS using the institution nonresponse-adjusted weight. The resulting (poststratified) institution weight was then used to develop an initial person-level weight, which was subsequently adjusted for survey nonresponse within designated weighting classes.
- In the 1993, 1995, and 1997 SDR, the base weights were adjusted for nonresponse within specified weighting classes. A nonresponse adjustment factor was calculated for each sampling cell; it was equal to the ratio of sample cases in the sampling cell to the number of usable responses in the sampling cell. If a nonresponse adjustment factor exceeded a prespecified ratio, collapsing procedures were used, i.e., the cell was combined with other cells with similar characteristics on the variables used for stratification. If this failed to provide adequate safeguards on the range of weights, the nonresponse adjustment weight was constrained to equal the maximum allowable rate. There was no additional poststratification of the nonresponse-adjusted weights.
- Each survey database (NSCG, NSRCG, and SDR) was designed to be combined with the other two surveys to capture the advantages of a larger sample size and greater coverage of the target population. However, combining the three databases meant that the issue of cross-survey multiplicity had to be addressed. That is, scientists and engineers in SESTAT could belong to the surveyed population of more than one component survey, depending on their degrees and when they were received. For example, someone with a bachelor's degree at the time of the 1990 census who went on to complete a master's degree in 1991 could be selected in the 1993 NSCG and the 1993 NSRCG. The following unique-linkage rule was devised to remove these multiple-selection opportunities: each member of SESTAT's target population is uniquely linked to one and only one component survey, and that individual is included in SESTAT only when he or she is selected for the linked survey. As a result, each person had only one chance of being selected into the combined SESTAT database. The priority for determining overlap used the hierarchy SDR, NSRCG, and NSCG. For individuals in SDR, their analysis weight was set equal to their SDR final weight. In NSRCG, the analysis weight was set to zero for individuals who had a chance of selection in SDR. In NSCG, the analysis weight was set to zero for individuals who had a chance of selection in either SDR or NSRCG. For the remaining individuals who did not have a chance of selection in the other components, their analysis weight was the same as their survey component final weight.

For analyses of the CPS data, weights have been developed that reflect probabilities of selection and include both nonresponse adjustments and poststratification adjustments to current population counts. As described in detail in U.S. Census Bureau (2000), chapter 10, the weights derived for analysis of CPS data include the following components:

- A base weight equal to the reciprocal of the probability of selecting a household for the sample. Individuals in a household use the same base weight. The base weight reflects adjustments for special sampling situations such as periodic sample reductions and in-field subsampling designed to control workload.
- An adjustment for nonresponse. This adjustment is made at the household level within cells defined by geography and metropolitan status.
- Ratio adjustment to known population distributions. This adjustment is done in two stages. In the first stage, weighted counts of the sampled noncertainty primary sampling units within each state are adjusted to agree with the corresponding statewide population totals by race. In the second stage, person-level weights are adjusted (poststratified) to independent population control totals by state; cross-classification by sex, age, and Hispanic origin; and cross-classification by sex, age, and race (black and other).

In conclusion, CPS adjusts weights by geographic area and demographic characteristics such as sex, age, race, and ethnicity. SESTAT adjusts weights by degree level and field as well as demographic characteristics such as sex, race/ethnicity, disability status, and citizenship.

Sampling Errors

All of the estimates cited in this report are based on sample data and are thus subject to sampling errors. Both SESTAT and CPS publish generalized variance functions (GVFs) that can be used to estimate the standard error of an estimated total. These GVFs have been used to obtain the standard errors of the estimates presented in this report. For example, table 15 shows the standard errors and the coefficients of variation (CV) of estimates of individuals working in S&E occupations by highest degree attained for SESTAT and CPS. CV is the standard error divided by the estimated total expressed as a percentage. As shown in the table, the standard errors for SESTAT estimates are considerably smaller than those for the corresponding CPS estimates. This is a reflection of the samples size for the two studies (see table 16). Thus, although CPS can provide useful information about the S&E population, detailed analyses are severely limited by the comparatively large sampling errors. In particular, analysis by subgroups, such as detailed occupation (e.g., economists) or demographic groups (e.g., women and minorities), is limited, even if several months of CPS data are accumulated. For additional information about the standard errors of the SESTAT and CPS estimates and corresponding subgroup sample sizes, see appendix C.

TABLE 15. SESTAT and CPS estimated totals, standard errors, and CVs for individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained: 1997

	SESTAT			CPS (April)		
Highest degree	Estimated totals	Standard errors	CV (%)	Estimated totals	Standard errors	CV (%)
All degrees	3,369,400	26,600	0.8	3,542,100	101,700	2.9
Bachelor's	1,917,600	22,000	1.1	2,088,700	78,500	3.8
Master's	967,900	15,600	1.6	1,005,400	54,600	5.4
Doctorate	454,700	5,200	1.1	386,900	33,900	8.8

CV = coefficient of variation.

NOTE: Details may not add to totals because totals include individuals with professional degrees not shown separately.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics, and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE 16. SESTAT and CPS unweighted counts (sample sizes) of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained and employment status: 1997

Highest degree/employment status	SESTAT	CPS (April)
All individuals	48,488	1,541
Bachelor's		
Full time	12,796	847
Part time	888	45
Master's		
Full time	9,067	399
Part time	1,045	50
Doctorate		
Full time	22,769	158
Part time	1,761	15
Professional		
Full time	144	26
Part time	18	1

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics, and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Footnotes

[10] http://www.bls.census.gov/cps/basic/perfmeas/typea.htm

[11] The National Center for Education Statistics has established IPEDS as its core postsecondary education data collection program. It is a single, comprehensive system that encompasses all identified institutions whose primary purpose is to provide postsecondary education. The IPEDS system is built around a series of interrelated surveys to collect institution-level data in areas such as enrollments, program completions, faculty, staff, and finances. The NSRCG poststratification adjustments used IPEDS data on number of bachelor's and master's degrees awarded by degree level and major field.

Summary and Conclusions

The two main purposes of this report are (1) to compare the SESTAT and CPS estimates of the S&E workforce with bachelor's or higher degrees and (2) to obtain estimates from CPS of the numbers of individuals in S&E occupations who do not have a bachelor's or higher degree. For the first purpose, comparisons between SESTAT and CPS were restricted to the subset of the S&E population with bachelor's or higher degrees who are working in S&E occupations. The remainder of the SESTAT population, people with S&E degrees who are not working in S&E occupations, cannot be identified using CPS data because CPS does not collect the data on degree fields needed to identify S&E degrees. Therefore, no comparisons between SESTAT and CPS could be made for this group. CPS was used for the second purpose because individuals without a bachelor's or higher degree are not included in SESTAT. The principal findings and conclusions of this study are summarized below.

1. SESTAT is a longitudinal data system that follows a large sample of individuals (about 100,000 in the 1997 cycle) with S&E bachelor's or higher degrees or S&E occupations over time. It is a rich data system for analyses of these individuals. CPS is a major survey that provides up-to-date information on the labor force and demographic characteristics of the general, civilian, noninstitutionalized U.S. population. SESTAT includes individuals with a bachelor's or higher degree and CPS includes these individuals along with those who have a degree below a bachelor's. This report points out differences in the two data sources and explores the possible use of the CPS data to provide limited information about individuals below a bachelor's degree who are employed in S&E occupations.
2. Differences exist in the mode in which SESTAT and CPS data are collected, which may affect nonsampling errors. In the 1997 SESTAT, 61% of responses were obtained by mail, 37% by CATI, and 2% by CAPI. CPS uses a combination of CAPI and CATI collection; CAPI is used during the first and fifth months of participation and CATI is used in the other months of participation. SESTAT and CPS also differ in the use of proxy respondents; all SESTAT sample members are asked to provide self-reports, whereas CPS relies heavily on proxy reports. However, it is unlikely that there is an appreciable mode effect for the items considered in this analysis.
3. Differences exist in the way information on educational attainment, occupation, and certain demographic data are collected and coded in the respective survey systems. Some of these differences are summarized as follows:
    - In the collection of data on degrees, the main difference between CPS and SESTAT is that CPS collects the highest level of school or degree completed and does not collect the field of degree, whereas SESTAT collects the school, degree level, date, and field for degrees at the bachelor's or higher level. SESTAT also collects some information on associate's degrees.
    - The occupation-coding process is different for the two survey systems. In CPS initial interviews, coders assign occupation codes using verbatim descriptions of the occupation, job duties, and industry. During follow-up months, dependent interviewing is used in CPS and data collected and coded during previous months may be used without coder review. In SESTAT, respondents provide verbatim responses and then select their own occupation codes, either from a printed list or through a series of

CATI screens. Coders review these verbatims and self-selected codes along with other survey data, but they change the respondent's code only when sufficient information exists to allow the assignment of a better code. Different occupational taxonomies are used in the two survey systems, but they were derived from the same source and are generally consistent with each other.

- Both SESTAT and CPS collect data on race in a similar manner, but the collection of data on ethnicity is different. The three SESTAT sources of Hispanic-origin data (1990 census, SED, NSRCG) ask directly whether the respondent is of Hispanic origin (with slightly different wording). In CPS, respondents are asked to select their origin (or the origin of some other household member) from a "flash card" listing 20 ethnic origins. Individuals of Hispanic origin are those who indicate their origin is Mexican American, Chicano, Mexican (Mexicano), Puerto Rican, Cuban, Central or South American, or other Hispanic. That is, Hispanic origin is self-reported in SESTAT and coded from origin data in CPS.

4. The total S&E population in the 1997 SESTAT includes more than 12 million individuals who (1) have a bachelor's or higher degree in an S&E field or (2) have a bachelor's or higher degree in a non-S&E field and had worked in an S&E occupation in the 1993 NSCG. The definition of the S&E population in SESTAT depends on both degree field(s) and occupation. CPS, which is based on a nationally representative sample of the civilian, noninstitutionalized population of the United States, provides an alternative source for studying the S&E population. However, CPS does not collect data on degree field. Thus, although CPS conceptually covers the same S&E population as SESTAT (with the exceptions noted below), it can only be used to study a subset of the S&E population, namely, the roughly 3 million individuals with bachelor's or higher degrees who are employed in S&E occupations. CPS can also be used to obtain estimates for the population working in S&E occupations without a bachelor's or higher degree.
5. The coverage of the S&E population in SESTAT and CPS differs in several ways:
    - SESTAT does not cover a portion of "foreign-trained" scientists and engineers, that is, U.S. residents who (1) were not eligible for inclusion in the 1993 NSCG who received an S&E bachelor's or higher degree from a non-U.S. institution only or (2) hold a non-S&E bachelor's or higher degree from a foreign institution and entered the United States after the 1990 census and later obtained an S&E job.
    - SESTAT excludes individuals currently working in S&E occupations who do not have a bachelor's or higher degree in an S&E field unless they were working in an S&E occupation in 1993.
    - With the exception of the March supplement, CPS excludes all active-duty military personnel. SESTAT, on the other hand, attempts to collect data from sample individuals in the military if they are living in the United States during the reference week.
6. The April 1997 CPS indicates that about 210,200 (6%) of the estimated 3.5 million individuals working in S&E occupations entered the United States during or after 1990 (table 5).[12] This estimate includes individuals who may have earned an S&E bachelor's or higher degree from a U.S. institution after April 1990 (and thus would be included in the NSRCG and/or SDR components

of SESTAT). It also includes those who entered the United States between January and April 1990 and thus would be covered in NSCG. Therefore, the estimated 210,200 recent immigrants (SE = 25,000) provide a rough upper boundary on the number of immigrants from 1990 or later who are excluded from SESTAT.

7. The SESTAT data system indicates that an estimated 594,000 individuals with non-S&E bachelor's or higher degrees were employed in S&E occupations in 1993 (table 1). The SESTAT estimate for this group decreased to 334,100 in 1995, and then to 292,000 in 1997. The drop-off reflects the fact that the SESTAT design does not include provisions for updating the original sample of those in S&E occupations who do not have a bachelor's or higher degree in an S&E field. Assuming that the actual number of such individuals has not decreased since 1993, an estimated 302,000 or more people may not have been covered in the 1997 SESTAT data system.
8. After accounting for the coverage differences noted earlier to the extent feasible, weighted estimates of the numbers of individuals with a bachelor's or higher degree who are employed in S&E occupations derived from the two data sources are roughly comparable for 1997: the SESTAT estimate is 3.35 million (SE = 26,600) and the CPS estimate is 3.33 million (SE= 98,700; table 9).
9. Individuals who do not have a bachelor's or higher degree who are working in S&E occupations are not included in SESTAT by definition. In the April 1997 CPS sample, only 431 individuals without 4-year college degrees were working in S&E occupations (appendix C, table C-18). On a weighted basis, these 431 sample individuals represent about 997,600 individuals without bachelor's degrees who are working in S&E occupations (SE= 54,400; table 12). The majority of these people were employed in computer/mathematics or engineering occupations.
10. The cumulative response rates in SESTAT are generally lower than the corresponding response rates in CPS. Thus, the SESTAT estimates may be subject to somewhat greater nonresponse biases than the CPS estimates. Because portions of SESTAT are panels that are followed over time, response rates in each SESTAT panel may decrease in each subsequent round of data collection. Although the weighting adjustments used in both survey systems are designed to minimize nonresponse biases, complete elimination of nonresponse biases is not certain and comparisons of estimates between the two survey systems may be affected. On the other hand, the large amount of information available for nonrespondents who were surveyed in the past is used to improve nonresponse adjustment techniques in SESTAT.
11. The sample sizes for CPS are considerably smaller than those for SESTAT for the population of interest. For example, in the April 1997 CPS sample, there are 1,541 individuals with bachelor's or higher degrees in S&E occupations, compared to 48,488 in the 1997 SESTAT (table 16). Thus, the CPS estimates are subject to much larger sampling errors than the corresponding SESTAT estimates. Even if several CPS samples are accumulated over time, the effective sample size will not increase appreciably because of the considerable overlap between successive monthly samples. The relatively small sample size of CPS limits the detail of analyses of the S&E population. However, CPS can provide useful information about individuals who do not have a bachelor's or higher degree, such as the number who are working in S&E occupations by occupation category. For example, combining the CPS information about individuals without a bachelor's or higher degree with an analysis of the SESTAT

population for those with at least a bachelor's degree may provide limited information for the study of S&E graduates as they make their transition into S&E occupations.

Footnotes

[12] Numbers are rounded to hundreds.

Appendix A. Detailed Comparison of SESTAT and CPS Procedures for Collecting and Processing Data

This appendix provides a detailed comparison of the SESTAT and CPS procedures for collecting and processing data, as summarized in "Data Collection and Processing Procedures." The two systems use different modes of data collection. SESTAT data are collected primarily by mail and telephone, with some follow-up by personal interview. Most CPS data are collected through personal interviews during the first and fifth months of participation and through telephone interviews during the other months of participation; all CPS data are collected using CATI or CAPI. In addition to these differences in data collection mode, other important differences include the following:

- Different strategies for asking questions (i.e., question wording and flow)
- Extent to which proxy reports are allowed
- Length of time between the survey reference week and data collection
- Different coding schema and definitions
- Different rules for imputing missing data

This appendix examines aspects of the SESTAT and CPS designs that could give rise to differences in the estimates from the two systems. The discussion is divided into six sections: (1) data collection procedures, (2) data processing procedures, (3) questions about academic degree, (4) questions about employment status, (5) questions about occupation, and (6) questions about other respondent classifications. In each section, a brief description of the SESTAT and CPS procedures is provided, followed by an explanation of how these procedures might affect the estimates.

Data Collection Procedures

The three surveys included in SESTAT use mail and telephone modes of data collection in different ways. NSCG and SDR were collected using self-administered questionnaires delivered by mail, with CATI telephone follow-up. For a small percentage of NSCG cases, field interviewers visited sample members and conducted a CAPI. Most NSCG and SDR data are collected by mail; in 1997, 79% of NSCG responses and 77% of SDR responses were completed by mail. NSRCG is primarily a CATI survey with some responses collected by mail. In the 1997 NSRCG, 97% of the responses were CATI.[1] For the 1997 SESTAT overall, 61% of responses were obtained by mail, 37% by CATI, and 2% by CAPI.

CPS relies on a combination of CAPI and CATI data collection. Sample households are surveyed eight times during a 16-month period. The design calls for each household to be surveyed monthly from month 1 through month 4, and again from month 13 through month 16. CAPI interviews are the primary mode of collection in month 1 and in month 13; telephone interviews (CATI) are conducted in the other 6 months.

CPS and SESTAT use computer-assisted technologies to differing degrees. Both the CPS and SESTAT CATI systems conduct internal consistency checks during the survey administration. These computer-generated edit checks produce edit screens that ask the respondent to resolve or clarify any discrepancies in the data. In addition, CPS programs use "dependent interviewing," in which responses to selected questions collected on each household member during a prior month are used during

subsequent rounds of data collection. The SESTAT system does not use dependent interviewing. A small number of cross-year edits are conducted using data collected in prior survey cycles, but they are generally conducted after data collection.

CPS and SESTAT also differ in the use of proxy respondents; all SESTAT sample members are asked to provide self-reports, whereas CPS relies heavily on proxy reports. The SESTAT mail surveys are addressed to the sample members, who provide the bulk of the survey responses. During telephone follow-up, SESTAT interviewers are allowed to complete the interviews with someone other than the sample member only in special limited situations.[2] Historically, these special situations have represented only a handful of respondents.

In CPS, a household respondent is identified at the beginning of each interview. These household respondents are asked to provide information about each eligible household member. Questions asked at the first month of interviewing (but not necessarily in every month) include the member's sex, race/ethnicity, date of birth and age, current military status, and highest level of education completed or highest degree received. Interviewers are encouraged to ask individual household members to self-report on labor force participation. However, interviewers are under tight time constraints and are just as strongly encouraged to collect as much information as possible in one contact (thereby minimizing callbacks). Typically, just under one-half of the data collected on labor force participation are provided by proxies.

Both SESTAT and CPS require respondents to focus on a 1-week period of time (i.e., the reference week) as they answer the survey questions. In 1997, SESTAT questionnaires asked respondents to focus on the week bounded by 13 April and 19 April. CPS always asks respondents to focus on the week of the month that includes the 12th; in April 1997, that week was bounded by 6 April and 12 April.

The length of the data collection periods scheduled for CPS and SESTAT are very different. CPS collects data for about 1 week after the reference week. SESTAT surveys, on the other hand, last for several months after the reference week. For example, the 1997 NSCG mailed the first questionnaires roughly 4 weeks after the reference week and closed CATI follow-up of nonrespondents 5 months after the reference week. The 1997 NSRCG began data collection roughly 4 weeks after the reference week and nonresponse follow-up continued into the 10th month after the reference week. The 1997 SDR mailed the first questionnaires about 6 weeks after the reference week. CATI collection was initiated 6 months after the reference week and nonresponse follow-up continued until the 11th month after the reference week.

The design features highlighted here could produce differences between estimates from the two survey systems. Although no investigation comparing the two designs has been conducted, methodological research indicates that variation in such design features can alter response patterns. For example, the self-administered paper-and-pencil questionnaires used in the SESTAT survey system give the respondent control over the order in which questions are presented and answered. In the SESTAT CATI component and in CPS, interviewers retain control of the order in which questions are presented. This difference can affect survey estimates by causing changes to the meaning of the survey questions. Dillman (2000) writes,

> Schwarz (1996) has detailed how, in the normal give-and-take of regular conversations, people tend to give answers that take into account things they have already said… Although the carryover is probably most extensive from questions that immediately follow one another, there is

> limited evidence that effects also occur when questions are widely separated. Consequently, it is important to recognize early on that a questionnaire cannot be viewed as a compilation of completely independent questions that have no effects on one another. Not only must each question be evaluated on the basis of its individual content, but also with regard to the larger context that often adds or subtracts meaning. (p. 91)

Differences between the SESTAT and CPS data collection procedures might influence the survey estimates in several other ways, which are explained below. Discussions of these issues can be found in Groves (1989), Biemer (1991), Fowler (1993, 1995), Mangione (1995), and Dillman (2000). However, it is also important to note that the reinterview studies conducted on the SESTAT surveys did not find large differences between the initial interview and the second interview. Although this does not indicate that the respondent-reported information is correct, it does indicate consistency and can be used as a measure of data reliability.

Recording Accuracy

Interviewers for both SESTAT and CPS receive extensive hands-on training in questionnaire administration, whereas sample members who are asked to self-administer the SESTAT questionnaires receive no training. This factor may lead to differences in reporting errors between the CPS and SESTAT surveys. However, as mentioned earlier, the reinterview studies have generally found consistent responses in the SESTAT data.

All CPS responses are collected using computer-assisted technology, whereas only 37% of the 1997 SESTAT responses were collected using this technology. These systems take advantage of built-in range checks and internal consistency checks. Out-of-scope and discrepant responses can be reviewed and resolved with the respondent during the interview. Although all SESTAT responses are subjected to editing once they are received, telephone follow-up to resolve discrepancies is conducted only for a small number of critical items. However, it is important to note that the primary variables used in this report, including degree level completed, working during the reference week, and occupation, are critical SESTAT items. Any editing problems with the critical items are resolved with the respondent during the initial interview or during data retrieval contacts. Additionally, in SESTAT, the critical items are divided into "critical completes" and "critical callbacks." Any cases for which critical complete items are not resolved with the respondent are considered incomplete and are not included in the final data system. Editing rules and imputation are used to resolve any items that are not considered "critical" in the SESTAT system.

Reliance on Self-Reports Versus Proxy Reports

Because CPS collects roughly one-half of the data (including labor force data) from household proxies, and any "knowledgeable adult" living in the household is eligible to serve as proxy, the possibility exists for the use of proxy reports to lead to some differences between SESTAT and CPS data.

Availability of Visual Aids

The self-administered SESTAT surveys and the CAPI-administered months of CPS (one-quarter of the April 1997 CPS respondent households) allow for the visual presentation of materials to the respondents. In the SESTAT mail questionnaires, respondents can read the question and all response options and can review the lists of

occupation and education codes. In the CAPI CPS, respondents can view response options (i.e., show cards) for at least some items. In the CATI surveys, respondents must rely entirely on auditory perception. However, rarely in CPS are CATI questions asked for which there were CAPI visual aids.

English Language Skills

Both SESTAT and CPS include respondents for whom English is not their primary language. Most SESTAT respondents are graduates of U.S. colleges and therefore have some English language skills.[3] By comparison, CPS includes some respondents with limited English skills and is likely to capture more individuals without U.S. degrees than SESTAT. Language problems are expected to be more of an issue for prebachelor's degree respondents than for postbachelor's respondents. Cases with language problems are also affected by the mode of data collection. Although the self-administering respondents can enlist the help of family or friends or refer to a dictionary if they need assistance with the survey, it is less likely that CATI respondents will do so. To the extent that this is true, the SESTAT CATI component and CPS will either count these individuals as nonrespondents or include the data they provide, which may have higher levels of response error than mail surveys. CPS relies on interviewers who live in the areas where they interview. These interviewers can collect data in some languages other than English.

Level of Detailed Responses to Open-Ended Questions

Both the SESTAT and CPS surveys include open-ended questions. Respondents to self-administered questionnaires often do not provide the same level of detailed responses to open-ended items as they do when interviewers administer the questionnaires because interviewers are trained on the intent of the question and on proper probing techniques. The extent to which coders must perform their task using respondents' answers that lack probing information will increase the likelihood of coding error. Occupation is the main data item used in the report that is collected (at least partially) with open-ended questions. The collection and coding of occupation is discussed in detail in the section "Occupation."

Social Desirability

Many studies have shown that survey respondents tend to report higher levels of socially undesirable behaviors, attitudes, and characteristics when they are allowed to respond without interviewer involvement. (This is not always the case, however. See Fowler [1993], p. 58.) In a study of mode effects on the 1993 NSCG conducted by the U.S. Census Bureau (Keathley, Riker, and Hicks 1995),[4] social desirability was cited as a possible reason for differences found in the reporting of labor force status between the mail and telephone groups. However, this was considered to be a small factor in the differences. Because few of the questions in SESTAT and CPS would be considered sensitive by most respondents, social desirability issues are expected to have only a small effect in both survey systems.

Relationship Between Reference Week and Survey Day

Memory decay is a problem in any survey that collects data on dynamic characteristics such as education, employment, and income. The more time that elapses between the reference week and the survey administration, the more likely it is that a response error will occur. As described earlier, SESTAT and CPS study designs are very different in this regard—SESTAT data collection periods continue for several months and the CPS data collection period is for only 1 week. However, it is important to note that the response variance study conducted by the U.S. Census

Bureau for the 1993 NSCG found that the NSCG displayed good reliability, with an index of inconsistency exceeding 50 for only one question and an index of 30 or more for one-quarter of the questions.

Record Checks

Self-administration typically gives respondents more time than telephone surveys to consult records that might improve response accuracy (see Fowler [1993], p. 58). On the other hand, the short time period between the interviewer-administered CPS survey and the reference week might minimize the need for record checks. However, the interviewer-administered SESTAT interviews, which might occur months after the reference week, might suffer from memory decay and record checks would probably be used infrequently. The SESTAT mail surveys, since they are self-administered, would benefit insofar as respondents consult their records. Although this is true in typical survey work, few variables other than salary would be affected by record check differences in SESTAT versus CPS comparisons.

Item Nonresponse

Paper-and-pencil questionnaire self-administration typically results in a larger amount of missing data than either CAPI or CATI administration. The 1993 NSCG mode effect study found that for the 12 characteristics included in the study, the mail group had significantly higher item nonresponse rates than the telephone group, with few exceptions. However, most of the questions had low nonresponse rates for both groups (less than 3%). Also, as discussed previously, the primary data items used in this report, including working during the reference week, looking for work during the reference week, and occupation, are critical complete items in SESTAT, meaning they have zero-item nonresponse. The additional SESTAT question used to determine labor force status, whether the respondent is on layoff from a job, generally has an item nonresponse rate of 1% or less. For CPS data, the item nonresponse for January 1997 data is 0.3% for labor force status and 1.7% for occupation. Methods used by SESTAT and CPS to handle item nonresponse are discussed in the section "Statistical Issues."

Data Processing Procedures

In many respects, SESTAT and CPS use similar data processing procedures. Data from CATI and CAPI interviews are examined during the interviews through the use of programmed range checks and internal consistency checks. SESTAT mail questionnaires are processed through a sophisticated computer editing system. Both survey systems conduct postcollection editing for range checks and skip error edits using computerized systems. In addition, the SESTAT computer editing system conducts additional checks, including mark-one edits for questions with more than one response marked, consistency edits, and cross-editing with previous cycle data for a small number of items. The SESTAT surveys also conduct computer-assisted backcoding of "other specify" responses.

SESTAT has additional rules for "best coding" for occupation and field of study to correct respondent recording errors, such as not making a code entry or not reviewing the entire list before making a selection. However, coders are not allowed to change the respondent's chosen code unless evidence exists—based on answers to other questions—that the recorded response is incorrect. SESTAT occupation and education codes are assigned using a computer-assisted system. CPS relies heavily on computerized range checks and internal consistency checks that are contained in the CAPI and CATI programs. However, textual responses to questions on industry and occupation are edited and coded by coders using a computer-assisted system. The

section "Occupation" contains additional information on the collection and processing of occupation data.

Although SESTAT and CPS follow many of the same steps in data processing, the techniques and rules for resolving problem cases vary. For example, SESTAT counts as a "noninterview" all cases that are missing one or more critical complete items (after attempted telephone follow-up), but CPS has no such rule. Other important differences in the coding of occupation are discussed in the section "Occupation."

Academic Degree

Unlike SESTAT, CPS includes respondents both with and without bachelor's or higher degrees (see "Coverage Issues"). Following is a discussion of the collection of education data in the two survey systems. Both CPS and SESTAT collect information on completed degrees, but SESTAT collects more detailed education data. CPS respondents are asked to report the highest level of education completed as follows:

CPS Education Items

What is the highest level of school (*name/you*) (*has/have*) completed or the highest degree (*name/you*) (*has/have*) received?[5]

(Previous education level entry displayed – after first month)

Less than 1st grade
1st, 2nd, 3rd, or 4th grade
5th or 6th grade
7th or 8th grade
9th grade
10th grade
11th grade
12th grade No Diploma
High school graduate, high school diploma, or equivalent (for example, GED)
Some college but no degree
Associate's degree in college occupational/vocational program
Associate's degree in college academic program
Bachelor's degree (for example, BA, AB, BS)
Master's degree (for example, MA, MS, MEng, MEd, MSW)
Professional school degree (for example, MD, DDS, DVM)
Doctorate degree (for example, PhD, EdD)

Two types of edit screens can be displayed for this item. First, if the respondent reports a lower level degree than reported in an earlier interview, the respondent is asked to resolve the discrepancy. Second, if a household member's age is less than expected for a reported degree level, then an edit screen is displayed. CPS collects no information about the field of degree or about the institution that awarded the degree.

To be eligible for SESTAT, a sample member must have completed a bachelor's or higher degree in any field. In the NSCG and NSRCG surveys, education history is collected during the baseline survey cycle and includes high school graduation year and state/country, whether an associate's degree was completed, and number of bachelor's and higher degrees received.[6] For bachelor's and higher degrees, detailed information on the most recent degree, second most recent degree, and first bachelor's degree is also collected during the baseline survey. This degree history

(including 2-year degrees) is updated with new degree information during the follow-up surveys. For the SDR, a complete degree history is collected with the Survey of Earned Doctorates (SED), which is used as the sampling frame for the SDR and updated with new degree information during each SDR survey cycle. In all three SESTAT surveys, data collected for bachelor's and higher degrees include the college/university that awarded the degree, month and year awarded, degree level, and the major field of study. In the follow-up surveys, data are also collected for postbaccalaureate and postmaster's certificates. The questions used to collect degree level in the baseline and follow-up surveys are as shown below.[7]

Baseline SESTAT Surveys

What type of degree did you receive?

Bachelor's
Master's (including MBA)
Doctorate (e.g., PhD, DSC, DSc, EdD)
Other professional degree (e.g., JD, LLB, ThD, MD, DDS) – specify
Other – specify

Follow-up Survey (as found on the 1997 SESTAT questionnaires)

If you were taking courses or enrolled in a college or university between April 1995 and April 1997, toward what degree or certificate, if any, were you (or are you) working?

Mark (X) this box if no specific degree or certificate and skip to (question number)

If more than one applies, mark the highest level

Bachelor's degree
Post baccalaureate certificate
Master's degree (including MBA)
Post master's certificate
Doctorate (e.g., PhD, DSC, DSc, EdD)
Other professional degree (e.g., JD, LLB, ThD, MD, DDS) – specify
Other – specify

Between April 1995 and April 1997, did you complete a degree or certificate?

Yes
No

(IF YES) What degree or certificate did you receive? Enter number of appropriate type of degree/certificate received from (question number) above.

Type of Degree/Certificate: _____

For degree level, both CPS and SESTAT use the same categories of bachelor's, master's, doctorate, and other professional degree; therefore, these data are expected to be consistent across survey systems. The main differences between CPS and SESTAT in the collection of degree information is that CPS collects the highest level of school or degree completed and does not collect the field of degree, whereas

SESTAT collects the school, level, date, and field for degrees at the bachelor's level and higher.

Employment Status

Both survey systems collect data on workforce participation, including principal and secondary jobs, during the survey reference week. Although both survey systems ask similar questions about working for pay or profit during the survey reference week, the battery of questions used to determine labor force status are not the same in the two survey systems. The questions and formulas used in each survey system are shown below.

CPS Labor Force Questions and Definition (from U.S. Census Bureau 2000: figure 5-1)

1. Does anyone in this household have a business or a farm?
2. LAST WEEK, did you do ANY work for (either) pay (or profit)?

   Parenthetical filled in if there is a business or farm in the household. If 1 is "yes" and 2 is "no," ask 3. If 1 is "no" and 2 is "no," ask 4.
3. LAST WEEK, did you do any unpaid work in the family business or farm?

   If 2 and 3 are both "no," ask 4.
4. LAST WEEK (in addition to the business), did you have a job, either full or part time? Include any job from which you were temporarily absent.

   Parenthetical filled in if there is a business or farm in the household.

   If 4 is "no," ask 5.
5. LAST WEEK, were you on layoff from a job?

   If 5 is "yes," ask 6. If 5 is "no," ask 8.
6. Has your employer given you a date to return to work?

   If "no," ask 7.
7. Have you been given any indication that you will be recalled to work within the next 6 months?

   If "no," ask 8.
8. Have you been doing anything to find work during the last 4 weeks?

   If "yes," ask 9.
9. What are all of the things you have done to find work during the last 4 weeks?

   Individuals are classified as employed if they say "yes" to questions

2, 3 (and work 15 hours or more in the reference week or receive profits from the business/farm), or 4.

Individuals who are available to work are classified as unemployed if they say "yes" to 5 and either 6 or 7, or if they say "yes" to 8 and provide a job search method that could have brought them into contact with a potential employer in 9.

SESTAT Labor Force Questions[8]

A1. Were you working for pay (or profit) during the week of April 15, 1997? This includes being self-employed or temporarily absent from a job (e.g., illness, vacation, or parental leave), even if unpaid.

STUDENTS: *Do NOT count financial aid awards with no work requirement*

Yes — *SKIP to A7*
No

A2. *(IF NO)* Did you look for work during the four weeks preceding April 15, 1997 (that is, anytime between March 19 and April 15, 1997)?

Yes
No

A3. What were your reasons for not working during the week of April 15?

Mark (X) all that apply

Retired
Year Retired
19 |__| |__|
On layoff from a job
Student
Family responsibilities
Chronic illness or permanent disability
Suitable job not available
Did not need or want to work
Other — *Specify*

SESTAT Labor Force Definition (from SESTAT website definition of LFSTAT variable)[9]**:**

Status	Definition
1 (Employed)	Working during reference week (A1 = Y)
2 (Unemployed)	Not working during reference week (A1 = N) and Not looking for work (A2 = N) and Reason for not working is layoff from job (A3(2) = Y)

2 (Unemployed)	Not working during reference week (A1 = N) and Looking for work (A2 = Y) and Reason for not working is not layoff from job (A3(2) = N)
2 (Unemployed)	Not working during reference week (A1 = N) and Looking for work (A2 = Y) and Reason for not working is layoff from job (A3(2) = Y)
3 (Not in Labor Force)	Not working during reference week (A1 = N) and Not looking for work (A2 = N) and Reason for not working is not layoff from job (A3(2) = N)

Despite these differences, the definition of "employed" is similar in the two survey systems. In CPS, an individual is classified as employed if during the reference week (1) the person did any work for pay or profit; (2) the person did unpaid work in a family business or farm and worked 15 hours or more per week or received profits; or (3) the person had a job, including any job from which he or she was temporarily absent. For the SESTAT labor force variable (LFSTAT), an individual is classified as employed if he or she was working for pay or profit during the reference week, including being self-employed or temporarily absent from a job, even if unpaid. The main difference is that CPS specifically asks about work on a family business or farm and classifies the individual as employed if working 15 hours or more per week or receiving profits, whereas SESTAT simply instructs the individual to include self-employment.

The two survey systems contain additional differences in how they define "unemployed." In CPS, an individual who is not working is classified as unemployed if (1) the person is on layoff from a job and has been given a date to return to work or has been given any indication of being recalled to work within the next 6 months or (2) the person has been trying to find work during the last 4 weeks and lists a job search method that could have brought him or her into contact with a potential employer. For the SESTAT labor force variable, an individual who is not working is classified as unemployed if (1) the person is on layoff from a job or (2) the person was looking for work during the 4 weeks preceding the reference week.

Both SESTAT and CPS collect information on full-time or part-time employment status during the survey reference week. In both survey systems, full-time or part-time status can be determined for either principal job alone or for all jobs combined. CPS collects the number of hours worked per week on the main job and the number of hours worked per week on all other jobs. SESTAT collects the number of hours worked per week on the main job and the full-time or part-time status for all jobs combined. In this report, full time is defined as working 35 or more hours per week for all jobs combined. The following questions are used to collect full-time and part-time employment data:

CPS Full-Time or Part-Time Employment Questions

How many hours per week (*do/does*) (*name/you*) USUALLY work at (*your/his/her*) (*job?/main job?*) By main job we mean the one at which (*you/he/she*) usually (*work/works*) the most hours.

How many hours per week (*do/does*) (*you/he/she*) USUALLY work at (*your/his/her*) other (*job/jobs*)?

SESTAT Full-Time or Part-Time Employment Questions (from the 1997 NSCG mail survey)[10]

A7. Counting *all* jobs held during the week of April 15, 1997, did you USUALLY work…

A total of 35 or more hours per week — *SKIP to A10*
Fewer than 35 hours per week

(The questionnaire section for collecting principal job information starts with the following statement: The next set of questions ask about your work on your principal job during the week of April 15, 1997.)

A39. During a typical week on this job, how many hours did you usually work?

Occupation

Data collection, code assignment, and coding schemes are used to compare occupation data for CPS and SESTAT. With CPS, the industry and occupation information are collected using open-ended questions and dependent interviewing. During the initial CPS interviews, this information is collected using the following open-ended questions:

What kind of business or industry is this?
READ IF NECESSARY: What do they make or do where (*you/he/she*) (*work/works/worked*)?

What kind of work (*do/does/did*) (*name/you*) do, that is, what (*is/was*) (*your/his/her*) occupation? (For example: plumber, typist, farmer)

What (*are/were*) (*your/his/her*) usual activities or duties at this job?

Dependent interviewing for the industry and occupation questions is used for households that were included in the sample the previous month. Respondents are provided with the name of the employer they provided in the previous month and asked if they still work for that employer. If the answer is "no," respondents are asked the independent questions on industry and occupation. If the answer is "yes," respondents are asked, "Have the usual activities and duties of your job changed since last month?" If the answer is "yes," the duties have changed, then the respondents are asked the independent questions on occupation and activities or duties. If the duties have not changed, then the respondents are asked to verify the previous month's description through the question, "Last month, you were reported as (*previous month's occupation or kind of work performed*) and your usual activities were (*previous month's duties*). Is this an accurate description of your current job?" If the answer is "yes," the previous month's occupation is brought forward and no coding is required. If the answer is "no," respondents are asked the independent questions on occupation activities and duties.

After collection, the new monthly CPS cases and cases in which the industry or occupation changed from the previous month are sent for coding by the industry/occupation coders. These specialized coders use a computer-assisted coding system and assign codes based primarily on the respondent-provided verbatim

occupation, industry sector, and job duties. Ten percent of each month's cases are selected to go through a quality assurance system to evaluate the work of each coder. The selected cases are verified by another coder after the monthly processing is completed. CPS coders have a short time to complete their work and are evaluated on speed. They may also be penalized for inconsistent coding identified during the quality assurance process.

In the SESTAT surveys, the respondent is asked to provide two types of occupation information: (1) a verbatim description of the occupation and (2) a self-selected occupation code. First, the respondent is asked to describe his or her occupation in an open-ended question format. In the mail questionnaire, the respondent is then asked to select a job code from a printed list of approximately 120 codes. These SESTAT codes are organized in categories listed in alphabetical order by major occupational group. The questions used on the mail survey to collect occupation are as follows:

> What kind of work were you doing on your principal job held during the week of April 15, (*survey year*) — that is, what was your occupation?
>
> *Please be as specific as possible, including any area of specialization.*
>
> *Example: High school teacher — Math (for NSCG and NSRCG)*
> *Example: College professor – Electrical Engineering (for SDR)*
>
> _____
> _____
> _____
> _____
>
> Using the JOB CODES (List B: pages *x-x*), choose the code that BEST describes the work you were doing on your principal job during the week of April 15, (*survey year*).
>
> *CODE* |___|___|___| NOTE: Job codes range from 010 to 500

In the SESTAT CATI survey, the respondents are first asked for the verbatim occupation description, as in the mail survey. The SESTAT interviewers are trained to collect as detailed a response as possible, including a job title. The CATI system then uses an occupation dictionary that was developed for the SESTAT system. Once the interviewer has finished collecting the occupation verbatim and description data, the CATI system compares the description to the occupation dictionary. This dictionary contains two sections, an autocoding section and a branching section. If the description matches an occupation in the autocoding section, CATI will automatically assign the appropriate three-digit SESTAT occupation code, and no additional occupation information is collected from the respondent. If the description matches an occupation in the branching section, CATI will display the appropriate screen that offers a reduced number of categories. The respondent will then be asked to select the category on that screen that best describes his or her occupation. Based on this selection, CATI assigns the appropriate three-digit code or proceeds through a sequence of additional occupation coding screens until a code can be assigned. If the occupation description does not match any of the dictionary items, then CATI will display the standard main heading screen. This screen offers the respondent a choice of eight main headings, such as "sales or marketing" or "scientific or engineering occupations," as well as an "other" option. The respondent will be asked to select a main heading. CATI will then continue to display occupation coding screens until a

three-digit code can be assigned. The code assigned through one of these processes is considered the respondent's self-selected occupation code.

After survey collection, both mail and CATI SESTAT surveys undergo a "best coding" process; the purpose is to verify the respondent's self-reported occupation code.[11] Trained occupation coders assign a "best code" to each occupation after considering the open-ended response and self-selected code provided by the respondent, as well as other relevant survey data such as employer type, number of people supervised, educational degrees, work activities, and salary. Coders receive detailed training and instructions, and at least 10% of their work is verified. SESTAT coders are encouraged to take the time needed to review and analyze all the available information and choose the best code. Coders are not penalized for choosing a different code than the one chosen during verification.

In the SESTAT surveys, occupation data are collected independently during each survey cycle. Unlike CPS, no dependent interviewing is used for SESTAT occupation data collection. However, SESTAT coders on follow-up surveys are instructed to consider the best occupation code assigned in the previous cycle under certain conditions: the respondent reports working for the same employer and in the same job as the previous cycle, the start date of the current job is before the reference date of the previous cycle, and the previous and current verbatim descriptions appear reasonably similar. The difference between CPS and SESTAT is that SESTAT coders are trained to consider the previous code, whereas CPS uses the previous code without review by a coder. Another important difference is that the previous CPS data are generally 1 month old, whereas the previous SESTAT data are 2 years old.

Different occupational taxonomies are used in CPS and SESTAT, but both taxonomies were developed from the 1980 Standard Occupational Classification (SOC) maintained by the Bureau of Labor Statistics.[12] Therefore, the two taxonomies are generally consistent. However, the SESTAT system uses broad categories for non-S&E jobs and more specific categories for S&E jobs. The CPS data are coded in both detailed and broad classifications for all jobs. Although the taxonomies are generally consistent, differences in training instructions and decision rules could result in differences in occupational classifications across the two survey systems. In particular, SESTAT occupation coders are trained to review the respondent's self-selected code and assign a new code only when it is more accurate; when it is not possible to determine a better code, the respondent's self-selected code should be maintained. Coders are instructed not to change responses unless sufficient evidence exists that the respondent has made a mistake and the information provided allows the assignment of a better code. In contrast, CPS coders do not have a self-selected code and instead assign codes based on the verbatim responses, duties, and industry sector.

In summary, both CPS and SESTAT collect verbatim occupation descriptions using similar questions. However, the rest of the occupation coding process is different for the two survey systems. In CPS, an additional open-ended question is asked to collect job activities and duties. The CPS occupation coders use the occupation description, duties, and industry to assign a code after collection. During follow-up months, CPS uses dependent interviewing. In SESTAT, respondents are asked to select their own occupation code, either from a printed list or through a series of CATI screens. SESTAT occupation coders review these codes along with the occupation descriptions, employer name, employer sector, work activities, supervisory responsibilities, salary, educational history, and information on the respondent's job during the previous survey round. These different collection and code assignment

processes could cause differences in the quality of occupation data for the two survey systems. In addition, differences in coder training, emphasis on coding speed, and coding decision rules could also result in differences in the data.

Other Respondent Classifications

Respondent characteristics that can be used in analysis include sex, age, and race/ethnicity. Again, SESTAT and CPS collect these data using slightly different methods. The main difference is that CPS collects data by proxy but SESTAT does not use this method. Recent studies have shown that people report ethnicity differently (for example, according to a person's age)

Sex

The way CPS and SESTAT collect data on sex differs slightly. SESTAT data come from the sampling frames or the baseline surveys. For NSCG cases sampled from the decennial census, the sex variable comes from the census long form and the information is carried forward into the SESTAT data system. For the SDR, the information is collected on the SED and carried over into the data system, but it was verified in 1993 because there had been a major redesign in the survey system and some cases were very old. For the NSRCG, the mail survey asks the respondent to choose male or female and the CATI survey instructs the interviewer to code without asking or to ask if necessary. For all SESTAT follow-up surveys, this item is asked periodically for sample person verification but the original value from the sampling frame or baseline survey is always carried forward in the data system. The CPS survey instructs the interviewer to code sex without asking unless the interviewer is unable to determine by voice or appearance.

Age

Both SESTAT and CPS determine age by collecting the respondent's birth date and resolving any discrepancies with birth date information collected in earlier survey cycles. The SESTAT interviews (both self-administered and interviewer administered) include the question, "What is your birth date?" Respondents are asked to provide the month, day, and year of their birth. This question is included in each survey cycle. During follow-up surveys, the birth date collection is used for sample person verification. If the respondent gives a birth date that is not consistent with a prior cycle, then editing and data retrieval procedures are conducted to resolve the discrepancy. These data are recoded into "age" for analysis.

CPS respondents are asked, "What is (*name's/your*) date of birth?" Again, interviewers record the month, day, and year and the data are recoded into "age" for analysis. The CPS survey provides the interviewer with data from previous interviews with the household. This information allows the interviewers to ask for clarification if the answers are discrepant. CPS also uses a scripted follow-up question after asking for the birth date, "As of last week, that would make (*name/you*) ((*age)/approximately (age)/less than 1/over 98*) (*years/year*) old. Is that correct?"[13]

Race and Ethnicity

The SESTAT data for race/ethnicity[14] come from the sampling frames or the baseline surveys. For NSCG cases sampled from the decennial census, race/ethnicity comes from the census long form and the information is carried forward into the SESTAT data system. For the SDR, the information is collected on the SED and carried over into the data system, but it was verified in the 1993 cycle. Race/ethnicity is collected in the NSRCG survey each cycle. In all of these surveys, Hispanic origin is collected in a separate question from race. The census form asks the race question

before the question on Hispanic origin, whereas SED and NSRCG ask Hispanic origin first. The Hispanic question has slight wording differences between the census long form, SED, and NSRCG. The census form includes subcategories of Hispanic as part of the same question, but SED and NSRCG collect this information in a separate question.

The race categories for NSRCG are white, black or African American, Asian or Pacific Islander, American Indian or Alaskan Native, and Other – specify. The responses to the "Other" category are backcoded into existing categories after data collection according to the SESTAT backcoding rules. The race categories for SED are the same with a slight wording difference, and there is no "Other" category. The 1990 census form contains categories similar to NSRCG except the census form uses the designation "Black or Negro," asks American Indians to record the tribe, lists Eskimo and Aleut as separate categories, and lists subcategories for Asian/Pacific Islander.

CPS asks respondents to select a race category from the same list of options used in the NSRCG surveys, with slight wording differences. CPS asks the race question before the ethnicity question. In addition, CPS collects the verbatim race responses provided by the respondents but edits any such responses back into the four main race groups. As described in the CPS Glossary of Subject Concepts, persons of Hispanic origin are determined on the basis of a question that asks for self-identification of the person's origin or descent. Respondents are asked to select their origin (or the origin of some other household member) from a "flash card" listing 20 ethnic origins. Persons of Hispanic origin are those who indicated that their origin was Mexican American, Chicano, Mexican (Mexicano), Puerto Rican, Cuban, Central or South American, or other Hispanic.[15]

Footnotes

[1] During the 1997 survey cycle, data for individuals originally sampled as part of the 1993 and 1995 NSRCG surveys were collected in the NSRCG panel survey. The survey instrument used to collect data was the same as the NSCG instrument, except it included some additional education questions. These data were analyzed as part of the NSCG component and are considered part of that component, but the data collection method was similar to NSRCG, with most responses collected by CATI. In the 1997 NSRCG panel survey, 96% of the responses were collected by CATI.

[2] The SESTAT guidelines include the following rules about the collection of proxy information from knowledgeable respondents, such as relatives or university officials: (1) proxy information may be used to determine eligibility for sample members who are living outside the United States, institutionalized, or deceased during the reference week; (2) a very limited set of proxy responses have been permitted for individuals who have extremely high positions and are too busy to respond otherwise; and (3) for a small number of cases involving language problems, respondents may ask another person to act as an interpreter for the questionnaire or CATI interview, but this is not considered a proxy situation.

[3] In the 1997 SESTAT, 96% of the eligible population had received their most recent degree from a U.S. institution.

[4] This report had some methodological issues that could affect the conclusions. It indicated the significance testing was performed assuming a design effect of 1. However, it was later determined that the correct design effect was 1.6, but the tests

were not performed again. The authors also indicated that some of the results that were originally found to be significant might not be significant. Therefore, it is possible that the social desirability issue was even smaller than originally thought by the authors.

[5] CPS also fields the school enrollment supplement every October, in which it asks about grades or year of school "attending."

[6] The NSCG baseline survey for the 1990 decade was the 1993 cycle. The NSRCG is a baseline survey every cycle.

[7] The baseline survey for the SDR is the SED survey, which uses a different format than the one shown.

[8] For a copy of the 1997 NSCG mail survey refer to http://sestat.nsf.gov/.

[9] Additional information on the LFSTAT variable is available at http://sestat.nsf.gov/docs/lfstat.html.

[10] For a copy of the 1997 NSCG mail survey refer to http://sestat.nsf.gov/

[11] In the SESTAT follow-up surveys, some cases are excluded from the best coding process. The exclusion rule on the 1999 NSCG is as follows: If the 1999 occupation self-code is not 055, 099, 254, 255, or 500, and the 1995 best code, 1997 self code, 1997 best code, and 1999 self-code all have the same code and are not blank, then set the 1999 best code = 1999 self-code and do not send the case to occupation best coding.

[12] CPS is scheduled to begin using the 2000 SOC system in 2003. SESTAT occupation coding is also expected to be based on the 2000 SOC codes starting in 2003.

[13] CPS caps the allowable range for age at 90—interviewers are instructed to code "90" for anyone age 90 or older. SESTAT excludes anyone age 76 or older from the survey system.

[14] The current Office of Management and Budget standards on questions about race and ethnicity were not in effect during 1997, the year on which this discussion is based. In evaluating the match between SESTAT and CPS data on race and ethnicity in future years, one would have to consider each survey system's schedule for incorporating the new standards.

[15] CPS Annual Demographic Survey Glossary of Subject Concepts, http://www.bls.census.gov/cps/ads/1996/sglosary.htm.

Appendix B. SESTAT and CPS Variables Used

Appendix B includes seven tables. Table B-1 lists the value codes prior to recoding of variables used to create derived variables for this report, including both CPS and SESTAT variables. Table B-2 describes the derived variables created for this report, including both CPS and SESTAT variables. Tables B-3 to B-5 give unweighted frequencies for SESTAT and CPS variables used to create the derived variables for the report. Table B-3 shows frequencies of the 1997 SESTAT sample employed in S&E occupations; Tables B-4 and B-5 show frequencies for the April 1997 CPS sample of persons 75 or younger with a bachelor's or higher degree who are employed in S&E and non-S&E occupations. Tables B-6 and B-7 show frequencies for the April 1997 CPS sample of persons 75 or younger with an associate's degree or high school diploma who are employed in S&E and non-S&E occupations.

Appendix B Tables

B-1 SESTAT and CPS variables and value codes: 1997

B-2 SESTAT and CPS derived variables used to create tables: 1997

B-3 Frequency of SESTAT variables before recoding, unweighted sample counts of individuals in S&E occupations: 1997

B-4 Frequencies of CPS variables before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed, by variable and occupation: 1997 (April)

B-5 Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

B-6 Frequencies of CPS variables before recoding for individuals 75 years or younger, with high school diploma or associate's degree, and employed, by variable and occupation: 1997 (April)

B-7 Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with high school diploma or associate’s degree, and employed: 1997 (April)

TABLE B-1. SESTAT and CPS variables and value codes: 1997

SESTAT variables and value codes

For LFSTAT-Labor force status (Labor_Force_Status_Codes)

1 Employed
2 Unemployed
3 Not in labor force
L Logical skip
M Missing
X Not on survey

For EMTP-Employer type (EMP_TYPE_CODE)

01 Elementary, middle, or secondary school
02 2-year college, junior college, or technical institute
03 4-year college or university
04 Medical school
05 University research institute
06 Other (educational institution)
07 Health-related (not medical)
08 Collapsed entries for 03, 04, and 05
09 Unknown/not applicable
10 Private-for-profit (non-educational institution)
11 Private-for-non-profit (non-educational institution)
12 Self-employed, not incorporated (non-educational institution)
13 Self-employed, incorporated (non-educational institution)
14 Local government (non-educational institution)
15 State government (non-educational institution)
16 U.S. military (non-educational institution)
17 U.S. government (non-educational institution)
18 Other (non-educational institution)
L Logical skip
M Missing
X Not on survey

For DGRDG-Degree level (DEGREE_CODES)

1 Bachelor's
2 Master's
3 Doctorate
4 Professional
5 Other
L Logical skip
M Missing
X Not on survey

For RACETH-Race ethnicity (ETHNICITY_CODES)

1 Hispanic
2 White, non-Hispanic
3 Black, non-Hispanic
4 Asian/Pacific Islander
5 American Indian/Alaskan Native
6 Other
L Logical skip
M Missing
X Not on survey

For GENDER – Sex (GENDER_CODES)

M Male
F Female

For OCPRMG-Occupation category (MAJOR_OCC_GROUP_CODES)

1 Computer and math scientists
2 Life and related scientists
3 Physical and related scientists
4 Social and related scientists
5 Engineers
6 Non-S&E occupations
7 Not on survey

8 Logical skip
9 Missing

For BAMEMG, D2MEMG, D3MEMG, D4MEMG, D5MEMG, DGRMEMG – Major field of degree (MAJOR_GROUP_CODES)
1 Computer and math sciences
2 Life and related sciences
3 Physical and related sciences
4 Social and related sciences
5 Engineering
6 Non-S&E degrees
7 Not on survey
8 Logical skip
9 Missing

For FPTIND-Employment status (FULL_PART_TIME_CODES)
1 Full-time
2 Part-time
3 No
9 Unknown/not reported
L Logical skip
M Missing

CPS April variables and value codes

For PEEDUCA – Highest level of school completed
31 Less than 1st grade
32 1st, 2nd, 3rd, or 4th grade
33 5th or 6th grade
34 7th or 8th grade
35 9th grade
36 10th grade
37 11th grade
38 12th grade-No diploma
39 High school graduate-Diploma or equivalent (GED)
40 Some college but no degree
41 Associate's degree-Occupational/vocational
42 Associate's degree-Academic program
43 Bachelor's degree (ex: BA, AB, BS)
44 Master's degree (ex: MA, MS, MEng, MEd, MSW)
45 Professional school degree (ex: MD, DDS, DVM)
46 Doctorate degree (ex: PhD, EdD)

For PRHSPNON–Hispanic origin
1 Hispanic
2 Non-Hispanic

For PERACE–Race
1 White
2 Black
3 American Indian, Aleut, Eskimo
4 Asian or Pacific Islander

For PTIO1OCD–CPS occupation code for primary job and SOC code in parenthesis
4 Chief executives and general administrators, public administration (112)
5 Administrators and officials, public administration (1132-1139)
6 Administrators, protective services (1131)
7 Financial managers (122)
8 Personnel and labor relations managers (123)
9 Purchasing managers (124)
13 Managers, marketing, advertising, and public relations (125)
14 Admininistrators, education and related fields (128)
15 Managers, medicine and health (131)
17 Managers, food serving and lodging establishments (1351)
18 Managers, properties and real estate (1353)
19 Funeral directors (part 1359)
21 Managers, service organizations, nec (127, 1352, 1354, part 1359)

22 Managers and administrators, nec (121, 126, 132-1343, 136-139)
23 Accountants and auditors (1412)
24 Underwriters (1414)
25 Other financial officers (1415, 1419)
26 Management analysts (142)
27 Personnel, training, and labor relations specialists (143)
28 Purchasing agents and buyers, farm products (1443)
29 Buyers, wholesale and retail trade except farm products (1442)
33 Purchacing agents and buyers, nec (1449)
34 Business and promotion agents (145)
35 Construction inspectors (1472)
36 Inspectors and compliance officers, except construction (1473)
37 Management related occupations, nec (149)
43 Architects (161)
44 Aerospace engineers (1622)
45 Metallurgical and materials engineers (1623)
46 Mining engineers (1624)
47 Petroleum engineers (1625)
48 Chemical engineers (1626)
49 Nuclear engineers (1627)
53 Civil engineers (1628)
54 Agricultural engineers (1632)
55 Engineers, electrical and electronic (1633, 1636)
56 Engineers, industrial (1634)
57 Engineers, mechanical (1635)
58 Marine and naval architects (1637)
59 Engineers, nec (1639)
63 Surveyors and mapping scientists (164)
64 Computer systems analysts and scientists (171)
65 Operations and systems researchers and analysts (172)
66 Actuaries (1732)
67 Statisticians (1733)
68 Mathematical scientists, nec (1739)
69 Physicists and astronomers (1842, 1843)
73 Chemists, except biochemists (1845)
74 Atmospheric and space scientists (1846)
75 Geologists and geodesists (1847)
76 Physical scientists, nec (1849)
77 Agricultural and food scientists (1853)
78 Biological and life scientists (1854)
79 Forestry and conservation scientists (1852)
83 Medical scientists (1855)
84 Physicians (261)
85 Dentists (262)
86 Veterinarians (27)
87 Optometrists (281)
88 Podiatrists (283)
89 Health diagnosing practitioners, nec (289)
95 Registered nurses (29)
96 Pharmacists (301)
97 Dietitians (302)
98 Respiratory therapists (3031)
99 Occupational therapists (3032)
103 Physical therapists (3033)
104 Speech therapists (3034)
105 Therapists, nec (3039)
106 Physicians' assistants (304)
113 Earth, environmental, and marine science teachers (2212)
114 Biological science teachers (2213)
115 Chemistry teachers (2214)

116 Physics teachers (2215)
117 Natural science teachers, nec (2216)
118 Psychology teachers (2217)
119 Economics teachers (2218)
123 History teachers (2222)
124 Political science teachers (2223)
125 Sociology teachers (2224)
126 Social science teachers, nec (2225)
127 Engineering teachers (2226)
128 Mathematical science teachers (2227)
129 Computer science teachers (2228)
133 Medical science teachers (2231)
134 Health specialties teachers (2232)
135 Business, commerce, and marketing teachers (2233)
136 Agriculture and forestry teachers (2234)
137 Art, drama, and music teachers (2235)
138 Physical education teachers (2236)
139 Education teachers (2237)
143 English teachers (2238)
144 Foreign language teachers (2242)
145 Law teachers (2243)
146 Social work teachers (2244)
147 Theology teachers (2245)
148 Trade and industrial teachers (2246)
149 Home economics teachers (2247)
153 Teachers, postsecondary, nec (2249)
154 Postsecondary teachers, subject not specified
155 Teachers, prekindergarten and kindergarten (231)
156 Teachers, elementary school (232)
157 Teachers, secondary school (233)
158 Teachers, special education (235)
159 Teachers, nec (236, 239)
163 Counselors, Educational and Vocational (24)
164 Librarians (251)
165 Archivists and curators (252)
166 Economists (1912)
167 Psychologists (1915)
168 Sociologists (1916)
169 Social scientists, nec (1913, 1914, 1919)
173 Urban planners (192)
174 Social workers (2032)
175 Recreation workers (2033)
176 Clergy (2042)
177 Religious workers, nec (2049)
178 Lawyers and judges (211, 212)
183 Authors (321)
184 Technical writers (398)
185 Designers (322)
186 Musicians and composers (323)
187 Actors and directors (324)
188 Painters, sculptors, craft-artists, and artist printmakers (325)
189 Photographers (326)
193 Dancers (327)
194 Artists, performers, and related workers, nec (328, 329)
195 Editors and reporters (331)
197 Public relations specialists (332)
198 Announcers (333)
199 Athletes (34)
203 Clinical laboratory technologists and technicians (362)
204 Dental hygienists (363)

205 Health record technologists and technicians (364)
206 Radiologic technicians (365)
207 Licensed practical nurses (366)
208 Health technologists and technicians, nec (369)
213 Electrical and electronic technicians (3711)
214 Industrial engineering technicians (3712)
215 Mechanical engineering technicians (3713)
216 Engineering technicians, nec (3719)
217 Drafting occupations (372)
218 Surveying and mapping technicians (373)
223 Biological technicians (382)
224 Chemical technicians (3831)
225 Science technicians, nec (3832, 3833, 384, 389)
226 Airplane pilots and navigators (825)
227 Air traffic controllers (392)
228 Broadcast equipment operators (393)
229 Computer programmers (3971, 3972)
233 Tool programmers, numerical control (3974)
234 Legal assistants (396)
235 Technicians, nec (399)
243 Supervisors and proprietors, sales occupations (40)
253 Insurance sales occupations (4122)
254 Real estate sales occupations (4123)
255 Securities and financial services sales occupations (4124)
256 Advertising and rel. sales occupations (4153)
257 Sales occupations, other business services (4152)
258 Sales engineers (421)
259 Sales representatives, mining, manufacturing, and wholesale (423, 424)
263 Sales workers, motor vehicles and boats (4342, 4344)
264 Sales workers, apparel (4346)
265 Sales workers, shoes (4351)
266 Sales workers, furniture and home furnishings (4348)
267 Sales workers, radio, TV, hi-fi, and appliances (4343, 4352)
268 Sales workers, hardware and building supplies (4353)
269 Sales workers, parts (4367)
274 Sales workers, other commodities (4345, 4347, 4354, 4356, 4359, 4362, 4369)
275 Sales counter clerks (4363)
276 Cashiers (4364)
277 Street and door-to-door sales workers (4366)
278 News vendors (4365)
283 Demonstrators, promoters and models, sales (445)
284 Auctioneers (447)
285 Sales support occupations, nec (444, 446, 449)
303 Supervisors, general office (4511, 4513, 4514, 4516, 4519, 4529)
304 Supervisors, computer equipment operators (4512)
305 Supervisors, financial records processing (4521)
306 Chief communications operators (4523)
307 Supervisors, distribution, scheduling, and adjusting clerks (4522, 4524-4528)
308 Computer operators (4612)
309 Peripheral equipment operators (4613)
313 Secretaries (4622)
314 Stenographers (4623)
315 Typists (4624)
316 Interviewers (4642)
317 Hotel clerks (4643)
318 Transportation ticket and reservation agents (4644)
319 Receptionists (4645)
323 Information clerks, nec (4649)
325 Classified-ad clerks (4662)
326 Correspondence clerks (4663)

327 Order clerks (4664)
328 Personnel clerks, except payroll and timekeeping (4692)
329 Library clerks (4694)
335 File clerks (4696)
336 Records clerks (4699)
337 Bookkeepers, accounting, and auditing clerks (4712)
338 Payroll and timekeeping clerks (4713)
339 Billing clerks (4715)
343 Cost and rate clerks (4716)
344 Billing, posting, and calculating machine operators (4718)
345 Duplicating machine operators (4722)
346 Mail preparing and paper handling machine operators (4723)
347 Office machinery operators, nec (4729)
348 Telephone operators (4732)
353 Communications equipment operators, nec (4733, 4739)
354 Postal clerks, except mail carriers (4742)
355 Mail carriers, postal service (4743)
356 Mail clerks, except postal service (4744)
357 Messengers (4745)
359 Dispatchers (4751)
363 Production coordinators (4752)
364 Traffic, shipping, and receiving clerks (4753)
365 Stock and inventory clerks (4754)
366 Meter readers (4755)
368 Weighers, measurers, checkers, and samplers (4756, 4757)
373 Expediters (4758)
374 Material recording, scheduling, and distributing clerks, nec (4759)
375 Insurance adjusters, examiners, and investigators (4782)
376 Investigators and adjusters, except insurance (4783)
377 Eligibility clerks, social welfare (4784)
378 Bill and account collectors (4786)
379 General office clerks (463)
383 Bank tellers (4791)
384 Proofreaders (4792)
385 Data-entry keyers (4793)
386 Statistical clerks (4794)
387 Teachers' aides (4795)
389 Administrative support occupations, nec (4787, 4799)
403 Launderers and ironers (503)
404 Cooks, private household (504)
405 Housekeepers and butlers (505)
406 Child care workers, private household (506)
407 Private household cleaners and servants (502, 507, 509)
413 Supervisors, firefighting and fire prevention occupations (5111)
414 Supervisors, police and detectives (5112)
415 Supervisors, guards (5113)
416 Fire inspection and fire prevention occupations (5122)
417 Firefighting occupations (5123)
418 Police and detectives, public service (5132)
423 Sheriffs, bailiffs, and other law enforcement officers (5134)
424 Correctional institution officers (5133)
425 Crossing guards (5142)
426 Guards and police, except public service (5144)
427 Protective service occupations, nec (5149)
433 Supervisors, food preparation and service occupations (5211)
434 Bartenders (5212)
435 Waiters and waitresses (5213)
436 Cooks (5214, 5215)
438 Food counter, fountain and related occupations (5216)
439 Kitchen workers, food preparation (5217)

443 Waiters'/waitresses' assistants (5218)
444 Miscellaneous food preparation occupations (5219)
445 Dental assistants (5232)
446 Health aides, except nursing (5233)
447 Nursing aides, orderlies, and attendants (5236)
448 Supervisors, cleaning and building service workers (5241)
449 Maids and housemen (5242, 5249)
453 Janitors and cleaners (5244)
454 Elevator operators (5245)
455 Pest control occupations (5246)
456 Supervisors, personal service occupations (5251)
457 Barbers (5252)
458 Hairdressers and cosmetologists (5253)
459 Attendants, amusement and recreation facilities (5254)
461 Guides (5255)
462 Ushers (5256)
463 Public transportation attendants (5257)
464 Baggage porters and bellhops (5262)
465 Welfare service aides (5263)
466 Family child care providers (part 5264)
467 Early childhood teacher's assistants (part 5264)
468 Child care workers, nec (part 5264)
469 Personal service occupations, nec (5258, 5269)
473 Farmers, except horticultural (5512-5514)
474 Horticultural specialty farmers (5515)
475 Managers, farms, except horticultural (5522-5524)
476 Managers, horticultural specialty farms (5525)
477 Supervisors, farm workers (5611)
479 Farm workers (5612-5617)
483 Marine life cultivation workers (5618)
484 Nursery workers (5619)
485 Supervisors, related agricultural occupations (5621)
486 Groundskeepers and gardeners, except farm (5622)
487 Animal caretakers, except farm (5624)
488 Grader and sorter, agricultural products (5625)
489 Inspectors, agricultural products (5627)
494 Supervisors, forestry and logging workers (571)
495 Forestry workers, except logging (572)
496 Timber cutting and logging occupations (573, 579)
497 Captains and other officers, fishing vessels (part 8241)
498 Fishers (583)
499 Hunters and trappers (584)
503 Supervisors, mechanics and repairers (60)
505 Automobile mechanics (part 6111)
506 Auto mechanic apprentices (part 6111)
507 Bus, truck, and stationary engine mechanics (6112)
508 Aircraft engine mechanics (6113)
509 Small engine repairers (6114)
514 Automobile body and related repairers (6115)
515 Aircraft mechanics, except engine (6116)
516 Heavy equipment mechanics (6117)
517 Farm equipment mechanics (6118)
518 Industrial machinery repairers (613)
519 Machinery maintenance occupations (614)
523 Electronic repairers, communications and industrial equipment (6151, 6153, 6155)
525 Data processing equipment repairers (6154)
526 Household appliance and power tool repairers (6156)
527 Telephone line installers and repairers (6157)
529 Telephone installers and repairers (6158)
533 Miscellaneous electrical and electronic equipment repairers (6152, 6159)

534 Heating, air conditioning, and refrigeration mechanics (616)
535 Camera, watch, and musical instrument repairers (6171, 6172)
536 Locksmiths and safe repairers (6173)
538 Office machine repairers (6174)
539 Mechanical controls and valve repairers (6175)
543 Elevator installers and repairers (6176)
544 Millwrights (6178)
547 Specified mechanics and repairers, nec (6177, 6179)
549 Not specified mechanics and repairers
553 Supervisors, brickmasons, stonemasons, and tile setters (6312)
554 Supervisors, carpenters and rel. workers (6313)
555 Supervisors, electricians and power transmission installers (6314)
556 Supervisors, painters, paperhangers, and plasterers (6315)
557 Supervisors, plumbers, pipefitters, and steamfitters (6316)
558 Supervisors, construction, nec (6311, 6318)
563 Brickmasons and stonemasons (part 6412, part 6413)
564 Brickmason and stonemason apprentices (part 6412, part 6413)
565 Tile setters, hard and soft (part 6414, part 6462)
566 Carpet installers (part 6462)
567 Carpenters (part 6422)
569 Carpenter apprentices (part 6422)
573 Drywall installers (6424)
575 Electricians (part 6432)
576 Electrician apprentices (part 6432)
577 Electrical power installers and repairers (6433)
579 Painters, construction and maintenance (6442)
583 Paperhangers (6443)
584 Plasterers (6444)
585 Plumbers, pipefitters, and steamfitters (part 645)
587 Plumber, pipefitter, and steamfitter apprentices (part 645)
588 Concrete and terrazzo finishers (6463)
589 Glaziers (6464)
593 Insulation workers (6465)
594 Paving, surfacing, and tamping equipment operators (6466)
595 Roofers (6468)
596 Sheetmetal duct installers (6472)
597 Structural metal workers (6473)
598 Drillers, earth (6474)
599 Construction trades, nec (6467, 6475, 6476, 6479)
613 Supervisors, extractive occupations (632)
614 Drillers, oil well (652)
615 Explosives workers (653)
616 Mining machine operators (654)
617 Mining occupations, nec (656)
628 Supervisors, production occupations (67, 71)
634 Tool and die makers (part 6811)
635 Tool and die maker apprentices (part 6811)
636 Precision assemblers, metal (6812)
637 Machinists (part 6813)
639 Machinist apprentices (part 6813)
643 Boilermakers (6814)
644 Precision grinders, filers, and tool sharpeners (6816)
645 Patternmakers and model makers, metal (6817)
646 Lay-out workers (6821)
647 Precious stones and metals workers (jewelers) (6822, 6866)
649 Engravers, metal (6823)
653 Sheet metal workers (part 6824)
654 Sheet metal worker apprentices (part 6824)
655 Miscellaneous precision metal workers (6829)
656 Patternmakers and model makers, wood (6831)

657 Cabinet makers and bench carpenters (6832)
658 Furniture and wood finishers (6835)
659 Miscellaneous precision woodworkers (6839)
666 Dressmakers (part 6852, part 7752)
667 Tailors (part 6852)
668 Upholsterers (6853)
669 Shoe repairers (6854)
674 Miscellaneous precision apparel and fabric workers (6856, 6859, part 7752)
675 Hand molders and shapers, except jewelers (6861)
676 Patternmakers, lay-out workers, and cutters (6862)
677 Optical goods workers (6864, part 7477, part 7677)
678 Dental laboratory and medical appliance technicians (6865)
679 Bookbinders (6844)
683 Electrical/electronic equipment assemblers (6867)
684 Miscellaneous precision workers, nec (6869)
686 Butchers and meat cutters (6871)
687 Bakers (6872)
688 Food batchmakers (6873, 6879)
689 Inspectors, testers, and graders (6881, 828)
693 Adjusters and calibrators (6882)
694 Water and sewage treatment plant operators (691)
695 Power plant operators (part 693)
696 Stationary engineers (part 693, 7668)
699 Miscellaneous plant and system operators (692, 694, 695, 696)
703 Set-up operators, lathe and turning machine (7312)
704 Operators, lathe and turning machine (7512)
705 Milling and planing machine operators (7313, 7513)
706 Punching and stamping press machine operators (7314, 7317, 7514, 7517)
707 Rolling machine operators (7316, 7516)
708 Drilling and boring machine operators (7318, 7518)
709 Grinding, abrading, buffing, and polishing machine operators (7322, 7324, 7522)
713 Forging machine operators (7319, 7519)
714 Numerical control machine operators (7326)
715 Miscellaneous metal, plastic, stone, and glass working machine operators (7329, 7529)
717 Fabricating machine operators, nec (7339, 7539)
719 Molding and casting machine operators (7315, 7342, 7515, 7524)
723 Metal plating machine operators (7343, 7543)
724 Heat treating equipment operators (7344, 7544)
725 Miscellaneous metal and plastic processing machine operators (7349, 7549)
726 Wood lathe, routing, and planing machine operators (7431, 7432, 7631, 7632)
727 Sawing machine operators (7433, 7633)
728 Shaping and joining machine operators (7435, 7635)
729 Nailing and tacking machine operators (7636)
733 Miscellaneous woodworking machine operators (7434, 7439, 7634, 7639)
734 Printing press operators (7443, 7643)
735 Photoengravers and lithographers (6842, 7444, 7644)
736 Typesetters and compositors (6841, 7642)
737 Miscellaneous printing machine operators (6849, 7449, 7649)
738 Winding and twisting machine operators (7451, 7651)
739 Knitting, looping, taping, and weaving machine operators (7452, 7652)
743 Textile cutting machine operators (7654)
744 Textile sewing machine operators (7655)
745 Shoe machine operators (7656)
747 Pressing machine operators (7657)
748 Laundering and dry cleaning machine operators (6855, 7658)
749 Miscellaneous textile machine operators (7459, 7659)
753 Cementing and gluing machine operators (7661)
754 Packaging and filling machine operators (7462, 7662)
755 Extruding and forming machine operators (7463, 7663)
756 Mixing and blending machine operators (7664)

757 Separating, filtering, and clarifying machine operators (7476, 7666, 7676)
758 Compressing and compacting machine operators (7467, 7667)
759 Painting and paint spraying machine operators (7669)
763 Roasting and baking machine operators, food (7472, 7672)
764 Washing, cleaning, and pickling machine operators (7673)
765 Folding machine operators (7474, 7674)
766 Furnace, kiln, and oven operators, except food (7675)
768 Crushing and grinding machine operators (part 7477, part 7677)
769 Slicing and cutting machine operators (7478, 7678)
773 Motion picture projectionists (part 7479)
774 Photographic process machine operators (6863, 6868, 7671)
777 Miscellaneous machine operators, nec (part 7479, 7665, 7679)
779 Machine operators, not specified
783 Welders and cutters (7332, 7532, 7714)
784 Solderers and brazers (7333, 7533, 7717)
785 Assemblers (772, 774)
786 Hand cutting and trimming occupations (7753)
787 Hand molding, casting, and forming occupations (7754, 7755)
789 Hand painting, coating, and decorating occupations (7756)
793 Hand engraving and printing occupations (7757)
795 Miscellaneous hand working occupations (7758, 7759)
796 Production inspectors, checkers, and examiners (782, 787)
797 Production testers (783)
798 Production samplers and weighers (784)
799 Graders and sorters, except agricultural (785)
803 Supervisors, motor vehicle operators (8111)
804 Truck drivers (8212-8214)
806 Driver-sales workers (8218)
808 Bus drivers (8215)
809 Taxicab drivers and chauffeurs (8216)
813 Parking lot attendants (874)
814 Motor transportation occupations, nec (8219)
823 Railroad conductors and yardmasters (8113)
824 Locomotive operating occupations (8232)
825 Railroad brake, signal, and switch operators (8233)
826 Rail vehicle operators, nec (8239)
828 Ship captains and mates, except fishing boats (part 8241, 8242)
829 Sailors and deckhands (8243)
833 Marine engineers (8244)
834 Bridge, lock, and lighthouse tenders (8245)
843 Supervisors, material moving equipment operators (812)
844 Operating engineers (8312)
845 Longshore equipment operators (8313)
848 Hoist and winch operators (8314)
849 Crane and tower operators (8315)
853 Excavating and loading machine operators (8316)
855 Grader, dozer, and scraper operators (8317)
856 Industrial truck and tractor equipment operators (8318)
859 Miscellaneous material moving equipment operators (8319)
864 Supervisors, handlers, equipment cleaners, and laborers, nec (85)
865 Helpers, mechanics, and repairers (863)
866 Helpers, construction trades (8641-8645, 8648)
867 Helpers, surveyor (8646)
868 Helpers, extractive occupations (865)
869 Construction laborers (871)
874 Production helpers (861, 862)
875 Garbage collectors (8722)
876 Stevedores (8723)
877 Stock handlers and baggers (8724)
878 Machine feeders and offbearers (8725)

TABLE B-1. SESTAT and CPS variables and value codes: 1997

883 Freight, stock, and material handlers, nec (8726)
885 Garage and service station related occupations (873)
887 Vehicle washers and equipment cleaners (875)
888 Hand packers and packagers (8761)
889 Laborers, except construction (8769)
905 Assigned to persons whose current labor force status is unemployed and last job was Armed Forces

For PESEX–Sex
1 Male
2 Female

For PRINUYER– Immigrant's year of entry to the U.S.
-1 Not In Universe (Born In U.S.)
0 Not Foreign Born
1 Before 1950
2 1950–1959
3 1960–1964
4 1965–1969
5 1970–1974
6 1975–1979
7 1980–1981
8 1982–1983
9 1984–1985
10 1986–1987
11 1988–1989
12 1990–1991
13 1992–1993
14 1994–1997

nec = not elsewhere classified.
SOC = standard occupational classification (1980).

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE B-2. SESTAT and CPS derived variables used to create tables: 1997

Variable	CPS (April)	SESTAT
LABFORCE	(Note that only CPS data for employed are included in report. S&E occupations are re-coded from PTIOIOCD).	If lfstat not equal 1 or 2 then labforce = 1 (not in labor force), if lfstat = 2 then labforce = 2 (unemployed), if full time or part time (FPTIND) and ocprmg is S&E then labforce = 3 (S&E Occupation), else labforce = 4 (not S&E Occupation)
FULL_PART_TIME	If pehruslt ≥35 then full time else if 0 < pehruslt < 35 then part time	FPTIND
DEGREE FIELD	(Not available)	has_se = 1 if any of the following (bamemg, d2memg, d3memg, d4memg, d5memg, dgrmemg) have values between 1 and 5 inclusive otherwise has_se = 0
DEGREE LEVEL	Recoded from peeduca, associate = 40, 41, 42	Dgrdg
MILITARY	(Excluded from CPS)	if emtp = 16 then military
AGE	Prtage ≤75	age
RACE	If prhspnon = 1 then Hispanic else perace	Raceth
OCC categories	Recoded from PTIO1OCD	Ocprmg
SEX	Pesex	Gender
ENTER90	If prinuyer = 12, 13, 14 then enter90 = 1 else enter90 = 0	(Not available)
Weight	PWSSWGT—second stage weight	WEIGHT

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE B-3. Frequency of SESTAT variables before recoding, unweighted sample counts of individuals in S&E occupations: 1997

Variables and codes	Frequency	Cumulative frequency
Full-time/part-time status during reference week (FPTIND)		
Full-time	44,776	44,776
Part-time	3,712	48,488
Labor force status (LFSTAT)		
Employed	48,488	48,488
Field of major for first bachelor's degree (broad group; BAMEMG)		
Computer and math sciences	4,643	4,643
Life and related sciences	7,269	11,912
Physical and related sciences	8,525	20,437
Social and related sciences	5,899	26,336
Engineering	16,416	42,752
Non-S&E Degrees	4,645	47,397
Frequency missing = 1,091		
Highest degree major field (broad group; DGRMEMG)		
Computer and math sciences	4,998	4,998
Life and related sciences	9,258	14,256
Physical and related sciences	7,436	21,692
Social and related sciences	7,241	28,933
Engineering	16,730	45,663
Non-S&E Degrees	2,825	48,488
Second highest degree major field (broad group; D2MEMG)		
Computer and math sciences	2,906	2,906
Life and related sciences	6,661	9,567
Physical and related sciences	6,746	16,313
Social and related sciences	5,702	22,015
Engineering	9,284	31,299
Non-S&E Degrees	3,486	34,785
Frequency missing = 13,703		
Third highest degree major field (broad group; D3MEMG)		
Computer and math sciences	1,566	1,566
Life and related sciences	3,406	4,972
Physical and related sciences	3,294	8,266
Social and related sciences	3,487	11,753
Engineering	4,196	15,949
Non-S&E Degrees	2,109	18,058
Frequency missing = 30,430		
Fourth highest degree major field (broad group; D4MEMG)		
Computer and math sciences	23	23
Life and related sciences	25	48
Physical and related sciences	47	95
Social and related sciences	46	141
Engineering	44	185
Non-S&E Degrees	59	244
Frequency missing = 48,244		
Fifth highest degree major field (broad group; D5MEMG)		
Life and related sciences	2	2
Physical and related sciences	1	3
Social and related sciences	2	5
Engineering	2	7
Non-S&E Degrees	2	9
Frequency missing = 48,479		
Employer type (EMTP)		
Elementary, middle, or secondary school	355	355
2-year college, junior college, or technical inst	766	1,121
4-year college or university	9,902	11,023
Medical school	2,629	13,652

TABLE B-3. Frequency of SESTAT variables before recoding, unweighted sample counts of individuals in S&E occupations: 1997

Variables and codes	Frequency	Cumulative frequency
University research institute	1,474	15,126
Other educational institution	204	15,330
Combined 4-year college, medical school, and university research institute	896	16,226
Private-for-profit (non-educational institution)	22,261	38,487
Private non-profit (non-educational inst)	1,606	40,093
Self-employed, not incorporated (non-educ inst)	1,425	41,518
Self-employed, incorporated (non-educ inst)	795	42,313
Local government (non-educational inst)	669	42,982
State government (non-educational inst)	1,305	44,287
U.S. military (non-educational inst)	336	44,623
U.S. government (non-educational inst)	3,477	48,100
Other (non-educational inst)	388	48,488
Highest degree, type of degree (DGRDG)		
Bachelor's	13,684	13,684
Master's	10,112	23,796
Doctorate	24,530	48,326
Professional	162	48,488
Age, calculated as survey year minus birth year (AGE)		
19	1	1
20	1	2
22	27	29
23	310	339
24	707	1,046
25	825	1,871
26	929	2,800
27	987	3,787
28	1,127	4,914
29	1,214	6,128
30	1,404	7,532
31	1,410	8,942
32	1,583	10,525
33	1,733	12,258
34	1,787	14,045
35	1,738	15,783
36	1,715	17,498
37	1,675	19,173
38	1,724	20,897
39	1,650	22,547
40	1,625	24,172
41	1,648	25,820
42	1,524	27,344
43	1,398	28,742
44	1,374	30,116
45	1,355	31,471
46	1,235	32,706
47	1,181	33,887
48	1,205	35,092
49	1,193	36,285
50	1,277	37,562
51	1,131	38,693
52	928	39,621
53	923	40,544
54	980	41,524
55	936	42,460
56	767	43,227

TABLE B-3. Frequency of SESTAT variables before recoding, unweighted sample counts of individuals in S&E occupations: 1997

Variables and codes	Frequency	Cumulative frequency
57	684	43,911
58	587	44,498
59	573	45,071
60	491	45,562
61	411	45,973
62	391	46,364
63	304	46,668
64	274	46,942
65	251	47,193
66	216	47,409
67	200	47,609
68	155	47,764
69	155	47,919
70	114	48,033
71	97	48,130
72	96	48,226
73	98	48,324
74	72	48,396
75	52	48,448
76	34	48,482
99 (Unknown)	6	48,488
Race/ethnicity (RACETH)		
Hispanic	2,399	2,399
White, non-Hispanic	36,088	38,487
Black, non-Hispanic	2,198	40,685
Asian/Pacific Islander	7,439	48,124
Other	364	48,488
Sex (GENDER)		
Female	12,180	12,180
Male	36,308	48,488
Occupation for principal job (broad group; OCPRMG)		
Computer and math scientists	9,561	9,561
Life and related scientists	9,047	18,608
Physical and related scientists	6,510	25,118
Social and related scientists	6,776	31,894
Engineers	16,594	48,488

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE B-4. Frequencies of CPS variables before recoding for individuals 75 years or younger, with bachelor's or higher degree, and employed, by variable and occupation: 1997 (April)

Variable	Cumulative frequency of occupations			Frequency of occupations	
	All	S&E	Non-S&E	S&E	Non-S&E
Hours worked at all jobs					
1–34	1,702	89	1,613	89	1,613
35+	14,251	1,541	12,710	1,452	11,097
Demographics-highest level of school completed					
Bachelor's degree (ex: BA, AB, BS)	9,660	892	8,768	892	8,768
Master's degree (ex: MA, MS, MEng, MEd, MSW)	12,785	1,341	11,444	449	2,676
Professional school degree (ex: MD, DDS, DVM)	13,602	1,368	12,234	27	790
Doctorate degree (ex: PhD, EdD)	14,251	1,541	12,710	173	476
Demographics-age					
19	3	0	3	0	3
20	6	0	6	0	3
21	21	0	21	0	15
22	112	9	103	9	82
23	331	29	302	20	199
24	621	64	557	35	255
25	965	113	852	49	295
26	1,348	157	1,191	44	339
27	1,764	211	1,553	54	362
28	2,185	269	1,916	58	363
29	2,614	325	2,289	56	373
30	3,013	381	2,632	56	343
31	3,395	431	2,964	50	332
32	3,815	484	3,331	53	367
33	4,225	534	3,691	50	360
34	4,613	585	4,028	51	337
35	5,021	634	4,387	49	359
36	5,439	690	4,749	56	362
37	5,855	742	5,113	52	364
38	6,292	795	5,497	53	384
39	6,702	836	5,866	41	369
40	7,190	887	6,303	51	437
41	7,631	929	6,702	42	399
42	8,059	972	7,087	43	385
43	8,513	1,016	7,497	44	410
44	8,957	1,072	7,885	56	388
45	9,421	1,115	8,306	43	421
46	9,845	1,151	8,694	36	388
47	10,239	1,183	9,056	32	362
48	10,658	1,221	9,437	38	381
49	11,096	1,271	9,825	50	388
50	11,515	1,302	10,213	31	388
51	11,826	1,325	10,501	23	288
52	12,091	1,344	10,747	19	246
53	12,371	1,369	11,002	25	255
54	12,657	1,400	11,257	31	255
55	12,867	1,420	11,447	20	190
56	13,059	1,435	11,624	15	177
57	13,209	1,447	11,762	12	138
58	13,352	1,460	11,892	13	130
59	13,478	1,468	12,010	8	118
60	13,598	1,477	12,121	9	111
61	13,702	1,488	12,214	11	93
62	13,792	1,500	12,292	12	78
63	13,881	1,508	12,373	8	81
64	13,947	1,513	12,434	5	61
65	13,999	1,518	12,481	5	47

TABLE B-4. Frequencies of CPS variables before recoding for individuals 75 years or younger, with bachelor's or higher degree, and employed, by variable and occupation: 1997 (April)

Variable	Cumulative frequency of occupations			Frequency of occupations	
	All	S&E	Non-S&E	S&E	Non-S&E
66	14,051	1,525	12,526	7	45
67	14,092	1,527	12,565	2	39
68	14,124	1,530	12,594	3	29
69	14,152	1,536	12,616	6	22
70	14,183	1,537	12,646	1	30
71	14,198	1,537	12,661	0	15
72	14,222	1,539	12,683	2	22
73	14,234	1,540	12,694	1	11
74	14,246	1,541	12,705	1	11
75	14,251	1,541	12,710	0	5
Demographics-Hispanic/non-Hispanic origin					
Hispanic	457	42	415	42	415
Non-Hispanic	14,251	1,541	12,710	1,499	12,295
Demographics-race of respondent					
White	12,562	1,317	11,245	1,317	11,245
Black	13,381	1,371	12,010	54	765
American Indian, Aleut, Eskimo	13,445	1,380	12,065	9	55
Asian or Pacific Islander	14,251	1,541	12,710	161	645
Demographics-sex					
Male	7,602	1,190	6,412	1,190	6,412
Female	14,251	1,541	12,710	351	6,298
Demographics-recoded immigrant's entry year to U.S.					
Not foreign born	12,593	1,260	11,333	1,260	11,333
Before 1950	12,629	1,263	11,366	3	33
1950–1959	12,732	1,274	11,458	11	92
1960–1964	12,824	1,287	11,537	13	79
1965–1969	12,956	1,311	11,645	24	108
1970–1974	13,125	1,331	11,794	20	149
1975–1979	13,359	1,368	11,991	37	197
1980–1981	13,479	1,388	12,091	20	100
1982–1983	13,574	1,403	12,171	15	80
1984–1985	13,667	1,418	12,249	15	78
1986–1987	13,759	1,423	12,336	5	87
1988–1989	13,886	1,447	12,439	24	103
1990–1991	13,979	1,460	12,519	13	80
1992–1993	14,076	1,482	12,594	22	75
1994–1997	14,251	1,541	12,710	59	116

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
Industry and occupation (main job) – occupation code for non-S&E occupations		
4	2	2
5	160	158
6	165	5
7	349	184
8	378	29
9	400	22
13	576	176
14	812	236
15	940	128
17	1,053	113
18	1,128	75
19	1,132	4
21	1,274	142
22	2,641	1,367
23	3,108	467
24	3,133	25
25	3,283	150
26	3,379	96
27	3,462	83
28	3,463	1
29	3,491	28
33	3,520	29
34	3,530	10
35	3,533	3
36	3,579	46
37	3,634	55
43	3,693	59
63	3,701	8
66	3,708	7
84	3,983	275
85	4,046	63
86	4,064	18
87	4,080	16
88	4,082	2
89	4,100	18
95	4,545	445
96	4,636	91
97	4,660	24
98	4,667	7
99	4,683	16
103	4,728	45
104	4,767	39
105	4,805	38
106	4,816	11
123	4,828	12
134	4,847	19
135	4,863	16
137	4,883	20
138	4,887	4
139	4,893	6
143	4,920	27
144	4,931	11
145	4,935	4
147	4,936	1

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
148	4,937	1
153	4,944	7
154	5,089	145
155	5,205	116
156	5,988	783
157	6,514	526
158	6,701	187
159	6,859	158
163	6,958	99
164	7,023	65
165	7,033	10
173	7,038	5
174	7,298	260
175	7,313	15
176	7,427	114
177	7,447	20
178	7,780	333
183	7,822	42
184	7,837	15
185	7,959	122
186	7,973	14
187	8,009	36
188	8,052	43
189	8,069	17
194	8,087	18
195	8,169	82
197	8,214	45
198	8,219	5
199	8,235	16
203	8,306	71
204	8,316	10
206	8,325	9
207	8,331	6
208	8,368	37
213	8,389	21
214	8,390	1
215	8,393	3
216	8,416	23
217	8,432	16
218	8,435	3
223	8,446	11
224	8,471	25
225	8,477	6
226	8,504	27
227	8,509	5
228	8,514	5
229	8,671	157
234	8,725	54
235	8,743	18
243	9,276	533
253	9,368	92
254	9,481	113
255	9,576	95
256	9,607	31
257	9,702	95

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
259	9,936	234
263	9,955	19
264	9,979	24
265	9,982	3
266	9,990	8
267	10,006	16
268	10,023	17
269	10,024	1
274	10,140	116
275	10,152	12
276	10,209	57
277	10,243	34
278	10,247	4
283	10,250	3
285	10,252	2
303	10,296	44
304	10,298	2
305	10,305	7
307	10,325	20
308	10,346	21
313	10,488	142
314	10,491	3
315	10,539	48
316	10,548	9
317	10,556	8
318	10,580	24
319	10,611	31
323	10,629	18
327	10,643	14
329	10,654	11
335	10,669	15
336	10,678	9
337	10,774	96
338	10,782	8
339	10,790	8
343	10,794	4
344	10,799	5
345	10,803	4
346	10,804	1
347	10,805	1
348	10,811	6
354	10,834	23
355	10,851	17
356	10,858	7
357	10,864	6
359	10,874	10
363	10,909	35
364	10,927	18
365	10,939	12
366	10,940	1
368	10,943	3
373	10,951	8
375	11,004	53
376	11,086	82
377	11,097	11

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
378	11,115	18
379	11,174	59
383	11,192	18
384	11,196	4
385	11,243	47
386	11,246	3
387	11,308	62
389	11,401	93
406	11,411	10
407	11,417	6
413	11,422	5
414	11,435	13
415	11,439	4
416	11,441	2
417	11,447	6
418	11,525	78
423	11,535	10
424	11,546	11
425	11,548	2
426	11,578	30
427	11,580	2
433	11,594	14
434	11,608	14
435	11,646	38
436	11,686	40
438	11,690	4
439	11,696	6
443	11,701	5
444	11,709	8
445	11,715	6
446	11,725	10
447	11,759	34
448	11,761	2
449	11,769	8
453	11,807	38
455	11,808	1
456	11,815	7
457	11,817	2
458	11,829	12
459	11,839	10
461	11,845	6
462	11,850	5
463	11,862	12
464	11,863	1
465	11,872	9
466	11,889	17
467	11,905	16
468	11,914	9
469	11,933	19
473	11,983	50
474	11,985	2
475	12,008	23
476	12,009	1
479	12,013	4
483	12,014	1

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
485	12,024	10
486	12,042	18
487	12,044	2
494	12,045	1
495	12,050	5
496	12,051	1
498	12,053	2
503	12,065	12
505	12,076	11
507	12,080	4
508	12,085	5
509	12,086	1
514	12,088	2
515	12,089	1
516	12,090	1
517	12,091	1
518	12,101	10
523	12,107	6
525	12,121	14
526	12,122	1
527	12,123	1
529	12,130	7
533	12,135	5
534	12,139	4
535	12,144	5
536	12,145	1
538	12,146	1
539	12,147	1
547	12,158	11
549	12,163	5
555	12,165	2
557	12,166	1
558	12,200	34
563	12,202	2
565	12,203	1
566	12,204	1
567	12,228	24
573	12,229	1
575	12,249	20
577	12,252	3
579	12,264	12
583	12,266	2
585	12,275	9
593	12,276	1
595	12,278	2
597	12,279	1
599	12,282	3
613	12,287	5
628	12,342	55
634	12,344	2
636	12,345	1
637	12,352	7
643	12,355	3
647	12,358	3
653	12,361	3

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
657	12,362	1
666	12,367	5
667	12,369	2
675	12,370	1
676	12,371	1
677	12,375	4
678	12,379	4
679	12,380	1
683	12,385	5
686	12,388	3
687	12,393	5
689	12,401	8
693	12,402	1
694	12,406	4
696	12,414	8
699	12,419	5
709	12,420	1
719	12,421	1
733	12,424	3
734	12,431	7
744	12,437	6
747	12,438	1
748	12,440	2
749	12,441	1
754	12,447	6
756	12,450	3
757	12,452	2
759	12,454	2
764	12,455	1
768	12,456	1
769	12,458	2
774	12,463	5
777	12,477	14
779	12,479	2
783	12,483	4
785	12,497	14
787	12,498	1
795	12,501	3
796	12,521	20
797	12,522	1
799	12,526	4
803	12,532	6
804	12,566	34
806	12,574	8
808	12,583	9
809	12,598	15
813	12,600	2
823	12,602	2
824	12,604	2
825	12,606	2
828	12,609	3
829	12,611	2
844	12,614	3
853	12,615	1
855	12,616	1

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
856	12,621	5
859	12,623	2
864	12,625	2
865	12,626	1
866	12,631	5
869	12,639	8
877	12,656	17
883	12,669	13
885	12,674	5
887	12,676	2
888	12,678	2
889	12,710	32
Industry and occupation (main job) – occupation code for S&E occupations		
44	32	32
45	40	8
46	45	5
47	53	8
48	92	39
49	97	5
53	197	100
55	394	197
56	448	54
57	560	112
58	562	2
59	647	85
64	991	344
65	1,044	53
67	1,055	11
68	1,057	2
69	1,065	8
73	1,116	51
74	1,122	6
75	1,152	30
76	1,170	18
77	1,183	13
78	1,232	49
79	1,249	17
83	1,273	24
113	1,277	4
114	1,286	9
115	1,293	7
116	1,298	5
118	1,306	8
119	1,312	6
124	1,315	3
125	1,318	3
126	1,323	5
127	1,335	12
128	1,353	18
129	1,361	8
133	1,367	6
136	1,370	3
166	1,422	52
167	1,525	103

TABLE B-5. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a bachelor's or higher degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
168	1,527	2
169	1,536	9
258[a]	1,541	5

[a] Code 258 (sales engineers) is under "sales occupations" heading in CPS but is included as S&E in this report.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE B-6. Frequencies of CPS variables before recoding for individuals 75 years or younger, with high school diploma or associate's degree, and employed, by variable and occupation: 1997 (April)

Variable	Cumulative frequency of occupations			Frequency of occupations	
	All	S&E	Non-S&E	S&E	Non-S&E
Hours worked at all jobs					
1–34	5,525	31	5,494	31	5,494
35+	31,716	431	31,285	400	25,791
Demographics-highest level of school completed					
High school graduate-Diploma or equivalent (GED)	17,041	110	16,931	110	16,931
Some college but no degree	27,401	290	27,111	180	10,180
Associate's degree-Occupational/vocational	29,743	351	29,392	61	2,281
Associate's degree-Academic program	31,716	431	31,285	80	1,893
Demographics-age					
15	2	0	2	0	2
16	5	0	5	0	3
17	34	0	34	0	29
18	289	1	288	1	254
19	921	5	916	4	628
20	1,640	7	1,633	2	717
21	2,392	15	2,377	8	744
22	3,127	24	3,103	9	726
23	3,771	30	3,741	6	638
24	4,462	37	4,425	7	684
25	5,185	47	5,138	10	713
26	5,958	55	5,903	8	765
27	6,686	65	6,621	10	718
28	7,405	71	7,334	6	713
29	8,147	84	8,063	13	729
30	8,944	97	8,847	13	784
31	9,730	107	9,623	10	776
32	10,555	115	10,440	8	817
33	11,370	130	11,240	15	800
34	12,221	149	12,072	19	832
35	13,115	163	12,952	14	880
36	14,065	172	13,893	9	941
37	15,027	182	14,845	10	952
38	16,011	196	15,815	14	970
39	16,955	211	16,744	15	929
40	17,894	228	17,666	17	922
41	18,857	248	18,609	20	943
42	19,703	259	19,444	11	835
43	20,573	269	20,304	10	860
44	21,428	283	21,145	14	841
45	22,224	302	21,922	19	777
46	22,948	314	22,634	12	712
47	23,688	323	23,365	9	731
48	24,399	336	24,063	13	698
49	25,128	352	24,776	16	713
50	25,854	364	25,490	12	714
51	26,417	367	26,050	3	560
52	26,942	378	26,564	11	514
53	27,462	385	27,077	7	513
54	28,005	393	27,612	8	535
55	28,502	395	28,107	2	495
56	28,944	401	28,543	6	436
57	29,286	409	28,877	8	334
58	29,641	414	29,227	5	350
59	29,952	416	29,536	2	309
60	30,244	420	29,824	4	288
61	30,531	421	30,110	1	286

TABLE B-6. Frequencies of CPS variables before recoding for individuals 75 years or younger, with high school diploma or associate's degree, and employed, by variable and occupation: 1997 (April)

Variable	Cumulative frequency of occupations			Frequency of occupations	
	All	S&E	Non-S&E	S&E	Non-S&E
62	30,770	424	30,346	3	236
63	30,938	425	30,513	1	167
64	31,069	426	30,643	1	130
65	31,178	427	30,751	1	108
66	31,286	429	30,857	2	106
67	31,363	430	30,933	1	76
68	31,426	430	30,996	0	63
69	31,490	430	31,060	0	64
70	31,541	431	31,110	1	50
71	31,573	431	31,142	0	32
72	31,625	431	31,194	0	52
73	31,663	431	31,232	0	38
74	31,690	431	31,259	0	27
75	31,716	431	31,285	0	26
Demographics-Hispanic/non-Hispanic origin					
Hispanic	2,114	14	2,100	14	2,100
Non-Hispanic	31,716	431	31,285	417	29,185
Demographics-race of respondent					
White	27,236	385	26,851	385	26,851
Black	30,404	411	29,993	26	3,142
American Indian, Aleut, Eskimo	30,795	417	30,378	6	385
Asian or Pacific Islander	31,716	431	31,285	14	907
Demographics-sex					
Male	15,786	312	15,474	312	15,474
Female	31,716	431	31,285	119	15,811
Demographics-recoded immigrant's year of coming to U.S.					
Not foreign born	29,058	399	28,659	399	28,659
Before 1950	29,105	399	28,706	0	47
1950–1959	29,285	403	28,882	4	176
1960–1964	29,427	408	29,019	5	137
1965–1969	29,653	410	29,243	2	224
1970–1974	29,950	413	29,537	3	294
1975–1979	30,338	417	29,921	4	384
1980–1981	30,569	420	30,149	3	228
1982–1983	30,703	422	30,281	2	132
1984–1985	30,883	424	30,459	2	178
1986–1987	31,059	424	30,635	0	176
1988–1989	31,216	426	30,790	2	155
1990–1991	31,368	428	30,940	2	150
1992–1993	31,509	429	31,080	1	140
1994–1997	31,716	431	31,285	2	205

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
Industry and occupation (main job) – occupation code for non-S&E occupations		
4	2	2
5	102	100
6	114	12
7	243	129
8	260	17
9	286	26
13	399	113
14	482	83
15	663	181
17	1,032	369
18	1,149	117
19	1,162	13
21	1,294	132
22	2,852	1,558
23	3,046	194
24	3,063	17
25	3,232	169
26	3,262	30
27	3,353	91
28	3,357	4
29	3,422	65
33	3,500	78
34	3,504	4
35	3,515	11
36	3,565	50
37	3,692	127
43	3,701	9
63	3,705	4
84	3,706	1
87	3,707	1
89	3,709	2
95	4,128	419
96	4,134	6
97	4,154	20
98	4,188	34
99	4,190	2
103	4,195	5
104	4,196	1
105	4,203	7
106	4,224	21
137	4,225	1
138	4,228	3
154	4,252	24
155	4,334	82
156	4,374	40
157	4,399	25
158	4,409	10
159	4,560	151
163	4,578	18
164	4,607	29
165	4,610	3
174	4,715	105
175	4,741	26

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
176	4,770	29
177	4,782	12
178	4,789	7
183	4,802	13
184	4,805	3
185	4,941	136
186	4,956	15
187	4,967	11
188	5,007	40
189	5,037	30
193	5,047	10
194	5,063	16
195	5,083	20
197	5,103	20
198	5,117	14
199	5,130	13
203	5,224	94
204	5,254	30
205	5,263	9
206	5,312	49
207	5,476	164
208	5,675	199
213	5,808	133
214	5,809	1
215	5,818	9
216	5,887	69
217	5,955	68
218	5,983	28
223	6,010	27
224	6,025	15
225	6,053	28
226	6,062	9
227	6,080	18
228	6,086	6
229	6,189	103
233	6,192	3
234	6,278	86
235	6,298	20
243	7,580	1,282
253	7,709	129
254	7,860	151
255	7,925	65
256	7,961	36
257	8,118	157
259	8,430	312
263	8,533	103
264	8,642	109
265	8,669	27
266	8,723	54
267	8,782	59
268	8,872	90
269	8,933	61
274	9,336	403
275	9,386	50
276	10,126	740

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
277	10,222	96
278	10,252	30
283	10,270	18
284	10,271	1
285	10,275	4
303	10,404	129
304	10,410	6
305	10,440	30
306	10,441	1
307	10,493	52
308	10,625	132
309	10,628	3
313	11,745	1,117
314	11,778	33
315	11,968	190
316	12,021	53
317	12,066	45
318	12,147	81
319	12,476	329
323	12,601	125
325	12,603	2
326	12,606	3
327	12,690	84
328	12,713	23
329	12,764	51
335	12,856	92
336	12,926	70
337	13,539	613
338	13,598	59
339	13,643	45
343	13,659	16
344	13,699	40
345	13,708	9
346	13,711	3
347	13,726	15
348	13,784	58
353	13,786	2
354	13,905	119
355	14,018	113
356	14,078	60
357	14,119	41
359	14,201	82
363	14,283	82
364	14,455	172
365	14,596	141
366	14,615	19
368	14,637	22
373	14,731	94
374	14,738	7
375	14,860	122
376	15,194	334
377	15,233	39
378	15,286	53
379	15,506	220
383	15,674	168

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
384	15,680	6
385	15,905	225
386	15,939	34
387	16,178	239
389	16,465	287
404	16,468	3
405	16,472	4
406	16,524	52
407	16,628	104
413	16,638	10
414	16,666	28
415	16,676	10
416	16,681	5
417	16,755	74
418	16,920	165
423	16,962	42
424	17,063	101
425	17,069	6
426	17,272	203
427	17,289	17
433	17,383	94
434	17,480	97
435	17,859	379
436	18,366	507
438	18,411	45
439	18,464	53
443	18,564	100
444	18,710	146
445	18,795	85
446	18,895	100
447	19,465	570
448	19,520	55
449	19,668	148
453	20,295	627
454	20,297	2
455	20,314	17
456	20,357	43
457	20,380	23
458	20,662	282
459	20,713	51
461	20,720	7
462	20,723	3
463	20,746	23
464	20,767	21
465	20,804	37
466	21,001	197
467	21,140	139
468	21,211	71
469	21,258	47
473	21,543	285
474	21,553	10
475	21,614	61
476	21,618	4
477	21,625	7
479	21,744	119

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
484	21,752	8
485	21,777	25
486	21,892	115
487	21,932	40
488	21,940	8
494	21,945	5
495	21,952	7
496	21,972	20
498	21,981	9
499	21,982	1
503	22,060	78
505	22,338	278
506	22,341	3
507	22,459	118
508	22,507	48
509	22,528	21
514	22,577	49
515	22,583	6
516	22,643	60
517	22,658	15
518	22,834	176
519	22,840	6
523	22,895	55
525	22,952	57
526	22,971	19
527	22,989	18
529	23,054	65
533	23,079	25
534	23,172	93
535	23,184	12
536	23,192	8
538	23,216	24
539	23,224	8
543	23,230	6
544	23,256	26
547	23,381	125
549	23,474	93
553	23,479	5
554	23,488	9
555	23,495	7
556	23,498	3
557	23,503	5
558	23,706	203
563	23,753	47
564	23,755	2
565	23,771	16
566	23,795	24
567	24,189	394
573	24,221	32
575	24,479	258
576	24,492	13
577	24,534	42
579	24,656	122
583	24,667	11
584	24,674	7

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
585	24,849	175
587	24,850	1
588	24,867	17
589	24,881	14
593	24,890	9
594	24,891	1
595	24,927	36
596	24,944	17
597	24,973	29
598	24,979	6
599	25,023	44
613	25,037	14
614	25,045	8
615	25,047	2
616	25,064	17
617	25,075	11
628	25,474	399
634	25,521	47
636	25,531	10
637	25,724	193
639	25,727	3
643	25,738	11
644	25,743	5
645	25,747	4
646	25,751	4
647	25,763	12
649	25,765	2
653	25,813	48
656	25,814	1
657	25,843	29
658	25,855	12
666	25,871	16
667	25,879	8
668	25,892	13
669	25,897	5
674	25,901	4
675	25,904	3
676	25,913	9
677	25,937	24
678	25,961	24
679	25,966	5
683	26,052	86
684	26,053	1
686	26,128	75
687	26,169	41
688	26,178	9
689	26,237	59
693	26,242	5
694	26,267	25
695	26,286	19
696	26,323	37
699	26,338	15
703	26,346	8
704	26,354	8
706	26,382	28

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
707	26,388	6
708	26,391	3
709	26,434	43
713	26,438	4
714	26,444	6
715	26,454	10
717	26,458	4
719	26,485	27
723	26,492	7
724	26,498	6
725	26,501	3
726	26,505	4
727	26,526	21
728	26,527	1
729	26,528	1
733	26,536	8
734	26,635	99
735	26,646	11
736	26,657	11
737	26,666	9
738	26,684	18
739	26,695	11
743	26,697	2
744	26,817	120
745	26,825	8
747	26,838	13
748	26,873	35
749	26,890	17
753	26,897	7
754	26,998	101
755	27,007	9
756	27,046	39
757	27,066	20
758	27,071	5
759	27,135	64
763	27,142	7
764	27,143	1
765	27,151	8
766	27,173	22
768	27,184	11
769	27,228	44
773	27,229	1
774	27,260	31
777	27,578	318
779	27,700	122
783	27,880	180
784	27,888	8
785	28,279	391
786	28,280	1
787	28,283	3
789	28,289	6
793	28,292	3
795	28,318	26
796	28,497	179
797	28,516	19

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
798	28,517	1
799	28,560	43
803	28,595	35
804	29,422	827
806	29,476	54
808	29,644	168
809	29,690	46
813	29,701	11
823	29,714	13
824	29,736	22
825	29,745	9
826	29,748	3
828	29,755	7
829	29,761	6
833	29,762	1
834	29,766	4
843	29,768	2
844	29,851	83
848	29,857	6
849	29,882	25
853	29,907	25
855	29,933	26
856	30,083	150
859	30,108	25
864	30,110	2
865	30,120	10
866	30,141	21
867	30,144	3
869	30,324	180
874	30,336	12
875	30,347	11
876	30,351	4
877	30,579	228
878	30,600	21
883	30,766	166
885	30,810	44
887	30,859	49
888	30,923	64
889	31,285	362
Industry and occupation (main job) – occupation code for S&E occupations		
44	6	6
45	9	3
46	10	1
47	12	2
48	16	4
53	33	17
55	110	77
56	147	37
57	181	34
58	182	1
59	204	22
64	331	127
65	363	32
67	366	3

TABLE B-7. Frequencies of CPS occupation codes before recoding for individuals 75 years or younger, with a high school diploma or associate's degree, and employed: 1997 (April)

Occupation code	Cumulative frequency	Frequency
73	371	5
75	372	1
76	373	1
77	381	8
78	384	3
79	390	6
114	391	1
115	393	2
116	395	2
127	396	1
128	400	4
129	401	1
133	402	1
166	419	17
167	425	6
169	426	1
258[a]	431	5

[a] Code 258 (sales engineers) is under "sales occupations" heading in CPS but is included as S&E in this report.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Appendix C. Standard Errors of SESTAT and CPS Estimates

Computational Procedures

The procedures used to compute the approximate variance of the SESTAT and CPS estimates presented in this report are based on procedures described in two technical reports: Cox et al. (2000) and U.S. Census Bureau (2000). In both reports, similar generalized variance function (GVF) models are used to approximate standard errors for estimates of characteristics of the target population. Using the GVF, the standard error (SE) of an estimated total can be obtained by inserting the value of the estimated total, $\hat{y}$, into the following formula:

$$SE(\hat{y}) = \sqrt{b_0 \hat{y}^2 + b_1 \hat{y}} \quad \text{(C.1)}$$

where b_0 and b_1 are appropriate constants.

The coefficient of variation (or relative standard error) of an estimated total is defined as the standard error of the estimate divided by the estimate, that is,

$$CV(\hat{y}) = \sqrt{b_0 + \frac{b_1}{\hat{y}}} \; . \quad \text{(C.2)}$$

Functions of the form (C.1) and (C.2) are referred to as GVFs and are derived empirically using standard errors computed for a large number of survey estimates. For the SESTAT data, GVFs have been developed for the overall population and for subgroups defined by sex, race/ethnicity, and occupation. To obtain approximate standard errors of estimates presented in this report, see Cox et al. (2000), appendix B, tables B-1 to B-4. To obtain the standard errors of the corresponding CPS estimates, the GVF provided in U.S. Department of Labor, Bureau of Labor Statistics (1997) is used.

Because the two survey systems are independent, the standard error of a difference between CPS and SESTAT estimates, $\hat{y}_{CPS} - \hat{y}_{SESTAT}$, can be computed as

$$SE(\hat{y}_{CPS} - \hat{y}_{SESTAT},) = \sqrt{SE^2(\hat{y}_{CPS}) + SE^2(\hat{y}_{SESTAT})} \; . \quad \text{(C.3)}$$

Standard Errors of Estimated Totals and Differences

The following tables summarize the estimates, standard errors, CVs, and corresponding sample sizes of the estimates presented in the section "Coverage Issues" of this report. Tables C-1 to C-8 correspond to SESTAT estimates, tables C-9 to C-28 correspond to CPS estimates, and tables C-29 to C-32 and figure C-1 correspond to differences between the SESTAT and CPS estimates.

Appendix C Tables

C-1 SESTAT estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997

C-2 SESTAT unweighted number of individuals for estimates, by highest degree attained, employment status, and occupational group: 1997

C-3 SESTAT standard error for estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997

C-4 SESTAT coefficient of variation of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997

C-5 SESTAT estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997

C-6 SESTAT unweighted number of individuals for estimates, by sex, race/ethnicity, age, and occupational group: 1997

C-7 SESTAT standard error of estimated number of individuals, by sex, race/ethnicity, age, and occupational group: 1997

C-8 SESTAT coefficient of variation of estimated number of individuals, by sex, race/ethnicity, age, and occupational group: 1997

C-9 CPS estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997 (April)

C-10 CPS unweighted number of individuals for estimates, by hightest degree attained, employment status, and occupational group: 1997 (April)

C-11 CPS standard error of estimated number of individuals, by highest degree attained and employment status: 1997 (April)

C-12 CPS coefficient of variation of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997 (April)

C-13 CPS estimated number of individuals with a bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997 (April)

C-14 CPS unweighted number of individuals for estimates, by sex, race/ethnicity, age, and occupational group: 1997 (April)

C-15 CPS standard error of estimated number of individuals for estimates, by sex, race/ethnicity, age, and occupational group: 1997 (April)

C-16 CPS coefficient of variation of estimated number of individuals, by sex, race/ethnicity, age, and occupational group: 1997 (April)

C-17 CPS estimated number of individuals with high school diploma or associate's degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997 (April)

C-18 CPS unweighted number of individuals for estimates, by highest degree attained, employment status, and occupational group: 1997 (April)

C-19 CPS standard error of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997 (April)

C-20 CPS coefficient of variation of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997 (April)

C-21 CPS estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by entry year to United States and highest degree attained: 1997 (April)

C-22 CPS unweighted number of individuals for estimates, by entry year to United States and highest degree attained: 1997 (April)

C-23 CPS standard error of estimated number of individuals, by entry year to United States and highest degree attained: 1997 (April)

C-24 CPS coefficient of variation of estimated number of individuals for estimates, by entry year to United States and highest degree attained: 1997 (April)

C-25 CPS individuals with bachelor's or higher degree employed in S&E occupations, by entry year to United States and occupational group: 1997 (April)

C-26 CPS unweighted number of individuals for estimates, by entry year to United States and occupational group: 1997 (April)

C-27 CPS standard error of estimated number of individuals for estimates, by entry year to United States and occupational group: 1997 (April)

C-28 CPS coefficient of variation of estimated number of individuals for estimates, by entry year to United States and occupational group: 1997 (April)

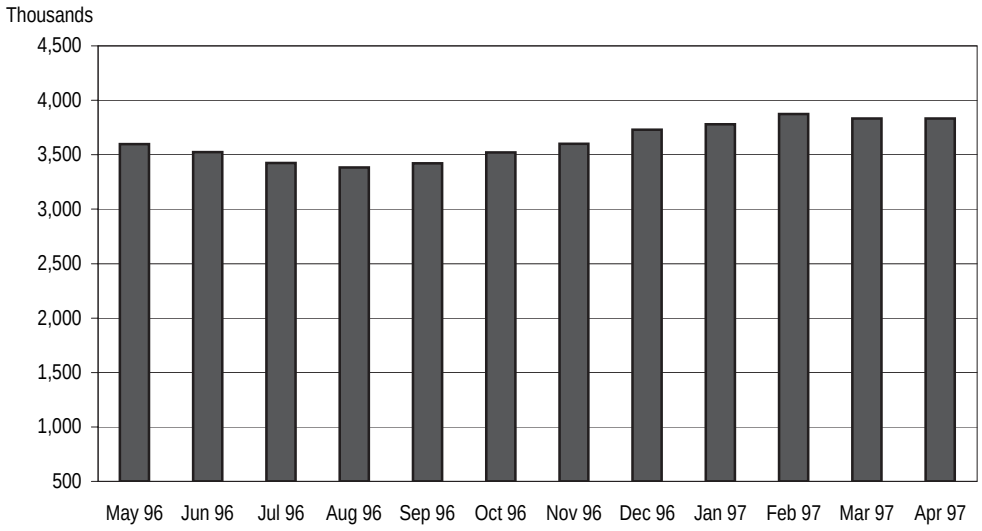
C-29 Estimated difference between SESTAT and CPS in number of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained and occupational group: 1997

C-30 SESTAT and CPS standard error of estimated difference, by highest degree attained, employment status, and occupational group: 1997

C-31 Estimated difference between SESTAT and CPS in number of individuals with a bachelor's or higher degree employed in S&E occupations by sex, race/ethnicity, age, and occupational group: 1997

C-32 Standard error of estimated difference between SESTAT and CPS, by sex, race/ethnicity, age, and occupational group: 1997

FIGURE C-1. CPS monthly estimates of individuals with bachelor's or higher degree in S&E occupations: May 1996–April 1997



NOTE: Includes both employed and unemployed individuals in labor force.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, May 1996–April 1997 Current Population Survey (CPS).

TABLE C-1. SESTAT estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	3,369,422	1,039,463	321,775	284,851	348,962	1,374,371
Civilian	3,346,245	NA	NA	NA	NA	NA
Bachelor's	1,917,646	675,426	125,182	131,676	68,486	916,877
Full time	1,795,642	639,221	111,412	118,177	47,151	879,682
Part time	122,004	36,205	13,770	13,499	21,335	37,195
Master's	967,882	301,556	70,278	69,145	151,053	375,850
Full time	863,755	277,402	61,738	61,799	106,485	356,332
Part time	104,127	24,154	8,540	7,346	44,568	19,519
Doctorate	454,694	58,953	111,825	83,682	120,793	79,439
Full time	418,915	54,473	105,545	79,180	103,620	76,095
Part time	35,779	4,480	6,280	4,502	17,173	3,343
Professional	29,202	3,528	14,490	348	8,630	2,205
Military	29,202	NA	NA	NA	NA	NA

NA = not available.

NOTE: Detail may not add to total because of rounding and because individuals with professional degrees are not shown separately by employment status.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-2. SESTAT unweighted number of individuals for estimates, by highest degree attained, employment status, and occupational group: 1997

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	48,488	9,561	9,047	6,510	6,776	16,594
Bachelor's	13,684	3,933	707	1,159	328	7,557
Full time	12,796	3,717	630	992	225	7,232
Part time	888	216	77	167	103	325
Master's	10,112	2,761	684	1,014	1,156	4,497
Full time	9,067	2,538	594	890	795	4,250
Part time	1,045	223	90	124	361	247
Doctorate	24,530	2,846	7,571	4,333	5,255	4,525
Full time	22,769	2,673	7,157	4,086	4,511	4,342
Part time	1,761	173	414	247	744	183
Professional	162	21	85	4	37	15

NOTE: Detail may not add to total because individuals with professional degrees are not shown separately by employment status.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-3. SESTAT standard error for estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	26,618	12,354	7,038	6,245	8,455	12,989
Civilian	26,551	NA	NA	NA	NA	NA
Bachelor's	21,976	11,740	4,719	4,870	4,021	10,504
Full time	21,372	11,495	4,546	4,632	3,506	10,381
Part time	5,943	3,013	1,816	1,614	2,490	2,525
Master's	15,615	6,413	3,587	3,004	6,186	6,538
Full time	14,781	6,237	3,384	2,820	5,186	6,392
Part time	5,209	2,088	1,309	921	3,348	1,598
Doctorate	5,225	1,664	1,568	1,446	2,418	1,648
Full time	5,071	1,614	1,554	1,431	2,244	1,614
Part time	1,644	506	485	425	923	345
Professional	2,793	854	1,572	214	1,245	594

NA = not available.

NOTES: Standard error estimated using generalized variant function method and parameter tables (Cox et al. 2000, appendix tables B1–4). Details may not add to totals because individuals with professional degrees not shown separately by employment status.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-4. SESTAT coefficient of variation of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997

(Percent)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	0.8	1.2	2.2	2.2	2.4	0.9
Bachelor's	1.1	1.7	3.8	3.7	5.9	1.1
Full time	1.2	1.8	4.1	3.9	7.4	1.2
Part time	4.9	8.3	13.2	12.0	11.7	6.8
Master's	1.6	2.1	5.1	4.3	4.1	1.7
Full time	1.7	2.2	5.5	4.6	4.9	1.8
Part time	5.0	8.6	15.3	12.5	7.5	8.2
Doctorate	1.1	2.8	1.4	1.7	2.0	2.1
Full time	1.2	3.0	1.5	1.8	2.2	2.1
Part time	4.6	11.3	7.7	9.4	5.4	10.3
Professional	9.6	24.2	10.8	61.4	14.4	26.9

NOTE: Detail may not add to total because individuals with professional degrees are not shown separately by employment status.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-5. SESTAT estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	3,369,422	1,039,463	321,775	284,851	348,962	1,374,371
Sex						
Female	763,302	280,882	115,900	61,768	181,079	123,673
Male	2,606,121	758,581	205,876	223,083	167,884	1,250,697
Race/ethnicity						
Hispanic	103,493	26,150	7,980	7,248	14,406	47,709
White, non-Hispanic	2,791,888	839,400	272,374	240,185	302,617	1,137,312
Black, non-Hispanic	112,962	44,879	7,742	8,374	16,523	35,444
Asian/Pacific Islander	349,795	126,560	32,305	27,888	13,330	149,712
Other	11,283	2,473	1,375	1,156	2,086	4,193
Age						
≤29	472,667	137,221	46,711	44,473	57,974	186,288
30-39	1,089,393	382,788	88,829	83,824	72,303	461,649
40-49	996,943	331,035	103,634	81,314	104,727	376,233
50-59	594,488	159,849	59,889	51,306	82,522	240,922
60-75	213,062	28,469	22,697	23,729	30,517	107,650

NOTES: Detail may not add to total because of rounding. SESTAT variable "age" calculated by subtracting birth year from survey reference year. Individuals who turned 76 between 16 April and 31 December of reference year have age equal 76 on file but are eligible for survey because they were 75 on 15 April. These individuals included in total but not listed separately by age; therefore, age detail may not add to total.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-6. SESTAT unweighted number of individuals for estimates, by sex, race/ethnicity, age, and occupational group: 1997

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	48,488	9,561	9,047	6,510	6,776	16,594
Sex						
Female	12,180	2,422	3,026	1,320	3,357	2,055
Male	36,308	7,139	6,021	5,190	3,419	14,539
Race/ethnicity						
Hispanic	2,399	430	382	293	453	841
White, non-Hispanic	36,088	6,646	6,981	5,019	5,241	12,201
Black, non-Hispanic	2,198	507	347	270	481	593
Asian/Pacific Islander	7,439	1,937	1,248	876	511	2,867
Other	364	41	89	52	90	92
Age						
≤29	6,128	1,446	528	756	502	2,896
30–39	16,419	3,545	2,996	2,064	1,678	6,136
40–49	13,738	2,681	2,996	1,806	2,140	4,115
50–59	8,786	1,543	1,776	1,316	1,757	2,394
60–75	3,377	344	749	562	689	1,033

NOTES: SESTAT variable “age” calculated by subtracting birth year from survey reference year. Individuals who turned 76 between 16 April and 31 December of reference year have age equal 76 on file but are eligible for survey because they were 75 on 15 April. These individuals included in total but not listed separately by age; therefore, age detail may not add to total.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-7. SESTAT standard error of estimated number of individuals, by sex, race/ethnicity, age, and occupational group: 1997

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	26,618	12,354	7,038	6,245	8,455	12,989
Sex						
Female	12,896	7,119	4,287	2,494	5,233	4,050
Male	23,031	9,237	5,719	6,030	5,211	12,294
Race/ethnicity						
Hispanic	3,551	1,692	812	803	1,287	2,088
White, non-Hispanic	25,735	13,573	7,205	5,923	8,033	12,342
Black, non-Hispanic	3,705	2,195	799	864	1,389	1,809
Asian/Pacific Islander	6,266	3,521	1,710	1,576	1,233	3,535
Other	1,190	527	332	321	466	630
Age						
≤29	11,076	5,228	2,808	2,424	3,260	5,371
30–39	16,471	8,413	3,846	3,338	3,651	8,249
40–49	15,806	7,887	4,144	3,287	4,423	7,505
50–59	12,371	5,624	3,173	2,605	3,909	6,079
60–75	7,499	2,419	1,965	1,768	2,352	4,111

NOTES: Standard error estimated using generalized variant function method and parameter tables (Cox et al. 2000, appendix tables B1–4). SESTAT variable "age" calculated by subtracting birth year from survey reference year. Individuals who turned 76 between 16 April and 31 December of reference year have age equal 76 on file but are eligible for survey because they were 75 on 15 April. These individuals included in total but not listed separately by age; therefore, age detail may not add to total.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-8. SESTAT coefficient of variation of estimated number of individuals, by sex, race/ethnicity, age, and occupational group: 1997

(Percent)

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	0.8	1.2	2.2	2.2	2.4	0.9
Sex						
Female	1.7	2.5	3.7	4.0	2.9	3.3
Male	0.9	1.2	2.8	2.7	3.1	1.0
Race/ethnicity						
Hispanic	3.4	6.5	10.2	11.1	8.9	4.4
White, non-Hispanic	0.9	1.6	2.6	2.5	2.7	1.1
Black, non-Hispanic	3.3	4.9	10.3	10.3	8.4	5.1
Asian/Pacific Islander	1.8	2.8	5.3	5.7	9.2	2.4
Other	10.5	21.3	24.2	27.8	22.3	15.0
Age						
≤29	2.3	3.8	6.0	5.5	5.6	2.9
30–39	1.5	2.2	4.3	4.0	5.1	1.8
40–49	1.6	2.4	4.0	4.0	4.2	2.0
50–59	2.1	3.5	5.3	5.1	4.7	2.5
60–75	3.5	8.5	8.7	7.4	7.7	3.8

NOTES: SESTAT variable “age” calculated by subtracting birth year from survey reference year. Individuals who turned 76 between 16 April and 31 December of reference year have age equal 76 on file but are eligible for survey because they were 75 on 15 April. These individuals included in total but not listed separately by age; therefore, age detail may not add to total.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT).

TABLE C-9. CPS estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997 (April)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	3,542,142	1,068,594	255,915	270,713	399,944	1,546,976
Bachelor's	2,088,662	667,679	112,843	120,227	104,850	1,083,063
Full time	1,981,380	635,023	85,617	115,534	78,350	1,066,856
Part time	107,282	32,656	27,226	4,693	26,500	16,207
Master's	1,005,350	310,738	49,964	85,583	169,190	389,875
Full time	891,301	270,459	38,749	74,946	138,656	368,491
Part time	114,049	40,279	11,215	10,637	30,534	21,384
Doctorate	386,905	81,349	73,184	55,253	115,507	61,612
Full time	352,770	69,393	73,184	51,403	100,319	58,471
Part time	34,135	11,956	NA	3,850	15,188	3,141
Professional	61,225	8,828	19,924	9,650	10,397	12,426

NA = not available because unweighted cell size is zero.

NOTE: Details may not add to totals because of rounding and individuals with professional degrees not shown separately by employment status.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-10. CPS unweighted number of individuals for estimates, by highest degree attained, employment status, and occupational group: 1997 (April)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	1,541	436	121	129	191	664
Bachelor's	892	272	52	54	52	462
Full time	847	258	44	52	38	455
Part time	45	14	8	2	14	7
Master's	449	126	30	43	79	171
Full time	399	110	25	39	64	161
Part time	50	16	5	4	15	10
Doctorate	173	34	31	27	55	26
Full time	158	28	31	26	48	25
Part time	15	6	NA	1	7	1
Professional	27	4	8	5	5	5

NA = not available because unweighted cell size is zero.

NOTE: Details may not add to totals because individuals with professional degrees not shown separately by employment status.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-11. CPS standard error of estimated number of individuals, by highest degree attained and employment status: 1997 (April)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	101,747	56,301	27,619	28,405	34,512	67,645
Bachelor's	78,473	44,557	18,348	18,938	17,686	56,679
Full time	76,456	43,458	15,983	18,565	15,290	56,256
Part time	17,890	9,873	9,015	3,743	8,894	6,955
Master's	54,620	30,429	12,211	15,980	22,463	34,076
Full time	51,446	28,392	10,754	14,954	20,337	33,131
Part time	18,445	10,964	5,786	5,635	9,546	7,989
Doctorate	33,947	15,580	14,778	12,841	18,563	13,560
Full time	32,418	14,390	14,778	12,386	17,300	13,209
Part time	10,094	5,974	NA	3,390	6,733	3,062
Professional	13,517	5,133	7,712	5,367	5,571	6,090

NA = not available because unweighted cell size is zero.

NOTES: Standard error estimated using generalized variant function method (U.S. Census Bureau 2000) and parameter tables (U.S. Department of Labor, Bureau of Labor Statistics, April 1997, table 1-F). Detail may not add to total because individuals with professional degrees are not listed separately by employment status.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-12. CPS coefficient of variation of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997 (April)

(Percent)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	2.9	5.3	10.8	10.5	8.6	4.4
Bachelor's	3.8	6.7	16.3	15.8	16.9	5.2
Full time	3.9	6.8	18.7	16.1	19.5	5.3
Part time	16.7	30.2	33.1	79.8	33.6	42.9
Master's	5.4	9.8	24.4	18.7	13.3	8.7
Full time	5.8	10.5	27.8	20.0	14.7	9.0
Part time	16.2	27.2	51.6	53.0	31.3	37.4
Doctorate	8.8	19.2	20.2	23.2	16.1	22.0
Full time	9.2	20.7	20.2	24.1	17.2	22.6
Part time	29.6	50.0	NA	88.1	44.3	97.5
Professional	22.1	58.1	38.7	55.6	53.6	49.0

NA = not available because unweighted cell size is zero.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-13. CPS estimated number of individuals with a bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997 (April)

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	3,542,142	1,068,594	255,915	270,713	399,944	1,546,976
Sex						
Female	783,762	311,153	96,596	53,448	156,802	165,763
Male	2,758,380	757,441	159,319	217,265	243,143	1,381,212
Race/ethnicity						
Hispanic	116,721	22,905	2,063	8,933	22,886	59,934
White, non-Hispanic	2,881,095	857,020	203,669	225,659	346,600	1,248,147
Black, non-Hispanic	143,432	63,299	6,718	4,940	14,292	54,183
Asian/Pacific Islander	381,237	116,963	39,600	30,764	16,167	177,743
Other	19,656	8,407	3,865	417	NA	6,967
Age						
≤29	770,593	268,678	65,346	75,556	68,610	292,403
30–39	1,204,475	360,859	66,955	86,887	90,347	599,427
40–49	983,705	309,946	72,857	68,674	139,944	392,284
50–59	418,915	107,706	23,557	31,024	69,496	187,132
60–75	164,453	21,404	27,200	8,573	31,547	75,729

NA = not available because unweighted cell size is zero.

NOTE: Detail may not add to total because of rounding.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-14. CPS unweighted number of individuals for estimates, by sex, race/ethnicity, age, and occupational group: 1997 (April)

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	1,541	436	121	129	191	664
Sex						
Female	351	130	42	24	84	71
Male	1,190	306	79	105	107	593
Race/ethnicity						
Hispanic	42	7	1	3	9	22
White, non-Hispanic	1,277	355	101	107	167	547
Black, non-Hispanic	53	22	2	3	9	17
Asian/Pacific Islander	160	49	16	15	6	74
Other	9	3	1	1	NA	4
Age						
≤29	325	106	27	28	34	130
30–39	511	144	32	42	47	246
40–49	435	126	41	37	63	168
50–59	197	51	11	17	31	87
60–75	73	9	10	5	16	33

NA = not available because unweighted cell size is zero.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-15. CPS standard error of estimated number of individuals for estimates, by sex, race/ethnicity, age, and occupational group: 1997 (April)

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	101,747	56,301	27,619	28,405	34,512	67,645
Sex						
Female	44,326	28,006	15,624	11,625	19,899	20,459
Male	85,878	45,550	20,965	24,474	25,887	61,280
Race/ethnicity						
Hispanic	21,258	9,440	2,835	5,898	9,437	15,256
White, non-Hispanic	91,831	50,431	24,639	25,933	32,126	60,780
Black, non-Hispanic	21,159	14,079	4,592	3,938	6,696	13,028
Asian/Pacific Islander	33,698	18,679	10,871	9,582	6,947	23,023
Other	7,660	5,010	3,397	1,116	NA	4,560
Age						
≤29	47,853	28,298	13,964	15,015	14,309	29,519
30–39	59,750	32,787	14,135	16,101	16,418	42,227
40–49	54,032	30,390	14,745	14,315	20,431	34,181
50–59	35,320	17,926	8,385	9,623	14,401	23,622
60–75	22,146	7,993	9,010	5,059	9,704	15,032

NA = not available because unweighted cell size is zero.

NOTE: Standard error estimated using generalized variant function method (U.S. Census Bureau 2000) and parameter tables (U.S. Department of Labor, Bureau of Labor Statistics, April 1997, table 1-F).

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-16. CPS coefficient of variation of estimated number of individuals, by sex, race/ethnicity, age, and occupational group: 1997 (April)

(Percent)

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	2.9	5.3	10.8	10.5	8.6	4.4
Sex						
Female	5.7	9.0	16.2	21.7	12.7	12.3
Male	3.1	6.0	13.2	11.3	10.6	4.4
Race/ethnicity						
Hispanic	18.2	41.2	137.4	66.0	41.2	25.5
White, non-Hispanic	3.2	5.9	12.1	11.5	9.3	4.9
Black, non-Hispanic	14.8	22.2	68.3	79.7	46.9	24.0
Asian/Pacific Islander	8.8	16.0	27.5	31.1	43.0	13.0
Other	39.0	59.6	87.9	267.6	NA	65.5
Age						
≤29	6.2	10.5	21.4	19.9	20.9	10.1
30–39	5.0	9.1	21.1	18.5	18.2	7.0
40–49	5.5	9.8	20.2	20.8	14.6	8.7
50–59	8.4	16.6	35.6	31.0	20.7	12.6
60–75	13.5	37.3	33.1	59.0	30.8	19.9

NA = not available because unweighted cell size is zero.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-17. CPS estimated number of individuals with high school diploma or associate's degree employed in S&E occupations, by highest degree attained, employment status, and occupational group: 1997 (April)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	997,552	394,063	43,404	22,997	49,471	487,617
High school diploma	245,100	98,699	18,680	4,712	16,378	106,631
Full time	235,533	96,540	18,680	4,712	13,865	101,736
Part time	9,567	2,159	NA	NA	2,513	4,895
Associate's	752,452	295,364	24,724	18,285	33,093	380,986
Full time	686,642	264,147	23,404	6,820	21,002	371,269
Part time	65,810	31,217	1,320	11,465	12,091	9,717

NA = not available because unweighted cell size is zero.

NOTE: Detail may not add to total because of rounding.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-18. CPS unweighted number of individuals for estimates, by highest degree attained, employment status, and occupational group: 1997 (April)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	431	167	19	11	24	210
High school diploma	110	42	7	2	8	51
Full time	105	41	7	2	6	49
Part time	5	1	NA	NA	2	2
Associate's	321	125	12	9	16	159
Full time	291	111	11	4	11	154
Part time	30	14	1	5	5	5

NA = not available because unweighted cell size is zero.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-19. CPS standard error of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997 (April)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	54,409	34,258	11,382	8,285	12,151	38,098
High school diploma	27,030	17,160	7,467	3,750	6,992	17,836
Full time	26,498	16,972	7,467	3,750	6,433	17,422
Part time	5,344	2,539	NA	NA	2,739	3,823
Associate's	47,289	29,668	8,591	7,388	9,938	33,686
Full time	45,183	28,059	8,358	4,512	7,918	33,255
Part time	14,014	9,653	1,985	5,850	6,008	5,386

NA = not available because unweighted cell size is zero.

NOTE: Standard error estimated using generalized variant function method (U.S. Census Bureau 2000) and parameter tables (U.S. Department of Labor, Bureau of Labor Statistics, April 1997, table 1-F).

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-20. CPS coefficient of variation of estimated number of individuals, by highest degree attained, employment status, and occupational group: 1997 (April)

(Percent)

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	5.5	8.7	26.2	36.0	24.6	7.8
High school diploma	11.0	17.4	40.0	79.6	42.7	16.7
Full time	11.3	17.6	40.0	79.6	46.4	17.1
Part time	55.9	117.6	NA	NA	109.0	78.1
Associate's	6.3	10.0	34.7	40.4	30.0	8.8
Full time	6.6	10.6	35.7	66.2	37.7	9.0
Part time	21.3	30.9	150.4	51.0	49.7	55.4

NA = not available because unweighted cell size is zero.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-21. CPS estimated number of individuals with bachelor's or higher degree employed in S&E occupations, by entry year to United States and highest degree attained: 1997 (April)

Year entered U.S.	All degrees	Bachelor's	Master's	Doctorate	Professional
All years	3,542,142	2,088,661	1,005,351	386,904	61,226
1990 or earlier	3,331,982	2,016,997	920,054	338,849	56,082
1991 or later	210,160	71,664	85,297	48,055	5,144
1991 or later (%)	5.9	3.4	8.5	12.4	8.4

NOTE: Detail may not add to total because of rounding.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-22. CPS unweighted number of individuals for estimates, by entry year to United States and highest degree attained: 1997 (April)

Year entered U.S.	All degrees	Bachelor's	Master's	Doctorate	Professional
All years	1,541	892	449	173	27
1990 or earlier	1,447	861	412	150	24
1991 or later	94	31	37	23	3
1991 or later (%)	6.1	3.5	8.2	13.3	11.1

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-23. CPS standard error of estimated number of individuals, by entry year to United States and highest degree attained: 1997 (April)

Year entered U.S.	All degrees	Bachelor's	Master's	Doctorate	Professional
All years	101,747	78,473	54,620	33,946	13,517
1990 or earlier	98,745	77,132	52,265	31,773	12,937
1991 or later	25,032	14,623	15,953	11,976	3,919

NOTE: Standard error estimated using generalized variant function method (U.S. Census Bureau 2000) and parameter tables (U.S. Department of Labor, Bureau of Labor Statistics, April 1997, table 1-F).

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-24. CPS coefficient of variation of estimated number of individuals for estimates, by entry year to United States and highest degree attained: 1997 (April)

(Percent)

Year entered U.S.	All degrees	Bachelor's	Master's	Doctorate	Professional
All years	3	4	5	9	22
1990 or earlier	3	4	6	9	23
1991 or later	12	20	19	25	76

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-25. CPS individuals with bachelor's or higher degree employed in S&E occupations, by entry year to United States and occupational group: 1997 (April)

Year entered U.S.	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All years	3,542,142	1,068,594	255,915	270,714	399,945	1,546,975
1990 or earlier	3,331,982	992,094	226,860	256,403	391,706	1,464,919
1991 or later	210,160	76,500	29,055	14,311	8,239	82,056
1991 or later (%)	5.9	7.2	11.4	5.3	2.1	5.3

NOTE: Detail may not add to total because of rounding.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-26. CPS unweighted number of individuals for estimates, by entry year to United States and occupational group: 1997 (April)

Year entered U.S.	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All years	1,541	436	121	129	191	664
1990 or earlier	1,447	401	106	123	185	632
1991 or later	94	35	15	6	6	32
1991 or later (%)	6.1	8	12.4	4.7	3.1	4.8

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-27. CPS standard error of estimated number of individuals for estimates, by entry year to United States and occupational group: 1997 (April)

Year entered U.S.	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All years	101,747	56,301	27,619	28,405	34,512	67,645
1990 or earlier	98,745	54,261	26,006	27,645	34,156	65,842
1991 or later	25,032	15,109	9,312	6,536	4,959	15,647

NOTE: Standard error estimated using generalized variant function method (U.S. Census Bureau 2000) and parameter tables (U.S. Department of Labor, Bureau of Labor Statistics, April 1997, table 1-F).

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-28. CPS coefficient of variation of estimated number of individuals for estimates, by entry year to United States and occupational group: 1997 (April)

(Percent)

Year entered U.S.	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All years	3	5	10	10	8	4
1990 or earlier	3	5	11	11	9	4
1991 or later	12	20	32	46	60	19

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-29. Estimated difference between SESTAT and CPS in number of individuals with bachelor's or higher degree employed in S&E occupations, by highest degree attained and occupational group: 1997

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	-172,720	-29,131	65,860*	14,138	-50,982	-172,605*
Civilian	-195,897	NA	NA	NA	NA	NA
Bachelor's	-171,016*	7,747	12,339	11,449	-36,364*	-166,186*
Full time	-185,738*	4,198	25,795	2,643	-31,199*	-187,174*
Part time	14,722	3,549	-13,456	8,806*	-5,165	20,988*
Master's	-37,468	-9,182	20,314	-16,438	-18,137	-14,024
Full time	-27,546	6,943	22,989*	-13,147	-32,171	-12,159
Part time	-9,922	-16,125	-2,675	-3,291	14,034	-1,865
Doctorate	67,789*	-22,396	38,642*	28,429*	5,287	17,826
Full time	66,145*	-14,920	32,361*	27,777*	3,301	17,624
Part time	1,644	-7,476	NA	652	1,985	202
Professional	-32,023*	-5,300	-5,434	-9,302	-1,767	-10,221

* = statistically significant at 95% level.

NA = not available.

NOTES: Differences between estimates in SESTAT (table C-1) and CPS (table C-9). Detail may not add to total because of rounding and individuals with professional degrees are not shown separately by employment group.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-30. SESTAT and CPS standard error of estimated difference, by highest degree attained, employment status, and occupational group: 1997

Highest degree/ employment status	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	105,171	57,641	28,502	29,084	35,533	68,881
Civilian	105,154	NA	NA	NA	NA	NA
Bachelor's	81,492	46,078	18,945	19,554	18,138	57,644
Full time	79,387	44,952	16,617	19,134	15,687	57,206
Part time	18,852	10,322	9,196	4,076	9,236	7,399
Master's	56,808	31,097	12,727	16,260	23,299	34,698
Full time	53,528	29,069	11,274	15,218	20,988	33,742
Part time	19,167	11,161	5,932	5,710	10,117	8,148
Doctorate	34,346	15,668	14,861	12,922	18,720	13,569
Full time	32,812	14,480	14,859	12,468	17,445	13,308
Part time	10,227	5,995	NA	3,417	6,796	3,081
Professional	13,802	5,204	7,870	5,371	5,708	6,119

NA = not available.

NOTE: Standard errors of SESTAT estimates shown in table C-3 and standard errors of corresponding CPS estimates shown in table C-11.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-31. Estimated difference between SESTAT and CPS in number of individuals with a bachelor's or higher degree employed in S&E occupations, by sex, race/ethnicity, age, and occupational group: 1997

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	-172,720	-29,131	65,860*	14,138	-50,982	-172,605*
Sex						
Female	-20,460	-30,271	19,304	8,320	24,277	-42,090*
Male	-152,259	1,140	46,557*	5,818	-75,259*	-130,515*
Race/ethnicity						
Hispanic	-13,228	3,245	5,917*	-1,685	-8,480	-12,225
White, non-Hispanic	-89,207	-17,620	68,705*	14,526	-43,983	-110,835
Black, non-Hispanic	-30,470	-18,420	1,024	3,434	2,231	-18,739
Asian/Pacific Islander	-31,442	9,597	-7,295	-2,876	-2,837	-28,031*
Other	-8,373	-5,934	-2,490	739	NA	-2,774
Age						
≤29	-297,926*	-131,457*	-18,635	-31,083	-10,636	-106,115*
30–39	-115,082	21,929	21,874	-3,063	-18,044	-137,778*
40–49	13,238	21,089	30,777*	12,640	-35,217	-16,051
50–59	175,573*	52,143*	36,332*	20,282*	13,026	53,790*
60–75	48,609*	7,065	-4,503	15,156*	-1,030	31,921*

* = statistically significant at 95% level.

NA = not available because CPS unweighted cell size is zero.

NOTES: Differences between estimates in SESTAT (table C-5) and CPS (table C-13). Detail may not add to total because of rounding. SESTAT variable "age" calculated by subtracting birth year from survey reference year. Individuals who turned 76 between 16 April and 31 December of reference year have age equal 76 on file but are eligible for survey because they were 75 on 15 April. These individuals included in total but not listed separately by age; therefore, age detail may not add to total.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

TABLE C-32. Standard error of estimated difference between SESTAT and CPS, by sex, race/ethnicity, age, and occupational group: 1997

Characteristic	All occupations	Computer/math scientists	Life scientists	Physical scientists	Social scientists	Engineers
All individuals	105,171	57,641	28,502	29,084	35,533	68,881
Sex						
Female	46,164	28,897	16,201	11,889	20,576	20,856
Male	88,912	46,477	21,731	25,206	26,406	62,501
Race/ethnicity						
Hispanic	21,553	9,591	2,949	5,952	9,524	15,398
White, non-Hispanic	95,369	52,225	25,670	26,618	33,115	62,020
Black, non-Hispanic	21,481	14,249	4,661	4,031	6,839	13,153
Asian/Pacific Islander	34,275	19,008	11,005	9,711	7,055	23,293
Other	7,752	5,037	3,413	1,161	NA	4,604
Age						
≤29	49,118	28,777	14,244	15,209	14,675	30,004
30–39	61,978	33,849	14,649	16,443	16,820	43,025
40–49	56,297	31,397	15,316	14,688	20,904	34,995
50–59	37,424	18,787	8,966	9,969	14,922	24,392
60–75		8,351	9,222	5,359	9,985	15,584

NA = not available because CPS unweighted cell size is zero.

NOTES: Standard errors of SESTAT estimates shown in table C-7 and standard errors of corresponding CPS estimates shown in table C-15. SESTAT variable "age" calculated by subtracting birth year from survey reference year. Individuals who turned 76 between 16 April and 31 December of reference year have age equal 76 on file but are eligible for survey because they were 75 on 15 April. These individuals included in total but not listed separately by age; therefore, age detail may not add to total.

SOURCES: National Science Foundation, Division of Science Resources Statistics, 1997 Scientists and Engineers Statistical Data System (SESTAT); and U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Appendix D. CPS Individuals in S&E Occupations, by Highest Degree Attained

Detail is provided by highest degree attained, occupational group, and detailed occupational code; occupational codes are from the 1980 Standard Occupational Classification (SOC).

Highest degree/occupational group/SOC code	Weighted estimate
High school diploma	
Computer and math scientists	
Computer systems analysts and scientists (171)	70,413
Operations and systems researchers and analysts (172)	25,476
Statisticians (1733)	2,810
Life scientists	
Agricultural and food scientists (1853)	11,189
Biological and life scientists (1854)	3,905
Forestry and conservation scientists (1852)	453
Medical science teachers (2231)	3,132
Physical scientists	
Chemists, except biochemists (1845)	4,712
Social scientists	
Economists (1912)	11,897
Psychologists (1915)	4,481
Engineers	
Metallurgical and materials (1623)	1,862
Mining (1624)	946
Petroleum (1625)	682
Chemical (1626)	540
Civil (1628)	14,158
Electrical and electronic (1633, 1636)	45,747
Industrial (1634)	19,807
Mechanical (1635)	16,430
Engineers, nec (1639)	4,557
Sales (421)	1,902
Associate's	
Computer and math scientists	
Computer systems analysts and scientists (171)	238,081
Operations and systems researchers and analysts (172)	43,288
Statisticians (1733)	3,378
Math science teachers (2227)	7,388
Computer science teachers (2228)	3,229
Life scientists	
Agricultural and food scientists (1853)	12,156
Biological and life scientists (1854)	2,957
Forestry and conservation scientists (1852)	8,291
Biological science teachers (2213)	1,320
Physical scientists	
Chemists, except biochemists (1845)	4,633
Geologists and geodesists (1847)	3,114
Physical scientists, nec (1849)	1,176
Chemistry teachers (2214)	5,199

Physics teachers (2215)	4,162
Social scientists	
Economists (1912)	21,484
Psychologists (1915)	8,260
Social scientists, nec (1913, 1914, 1919)	3,349
Engineers	
Aerospace (1622)	15,602
Metallurgical and materials (1623)	6,040
Chemical (1626)	8,843
Civil (1628)	30,714
Electrical and electronic (1633, 1636)	141,094
Industrial (1634)	59,745
Mechanical (1635)	66,876
Marine and naval architects (1637)	2,265
Engineers, nec (1639)	38,162
Engineering teachers (2226)	2,276
Sales (421)	9,369
Bachelor's	
Computer and math scientists	
Computer systems analysts and scientists (171)	586,408
Operations and systems researchers and analysts (172)	69,887
Statisticians (1733)	5,941
Mathematical scientists, nec (1739)	1,546
Computer science teachers (2228)	3,896
Life scientists	
Agricultural and food scientists (1853)	18,450
Biological and life scientists (1854)	45,969
Forestry and conservation scientists (1852)	29,355
Medical scientists (1855)	12,681
Biological science teachers (2213)	6,387
Physical scientists	
Physicists and astronomers (1842, 1843)	3,187
Chemists, except biochemists (1845)	63,154
Atmospheric and space scientists (1846)	4,470
Geologists and geodesists (1847)	23,872
Physical scientists, nec (1849)	21,267
Earth, environmental, and marine science teachers (2212)	4,276
Social scientists	
Psychology teachers (2217)	2,913
Economics teachers (2218)	6,264
Economists (1912)	57,989
Psychologists (1915)	30,080
Social scientists, nec (1913, 1914, 1919)	7,605
Engineers	
Aerospace (1622)	60,715
Metallurgical and materials (1623)	11,892
Mining (1624)	6,286
Petroleum (1625)	15,391
Chemical (1626)	56,179
Nuclear engineers (1627)	6,157
Civil (1628)	145,166

Electrical and electronic (1633, 1636)	339,845
Industrial (1634)	111,122
Mechanical (1635)	185,784
Marine and naval architects (1637)	4,928
Engineers, nec (1639)	125,826
Engineering teachers (2226)	3,754
Sales (421)	10,020
Master's	
Computer and math scientists	
Computer systems analysts and scientists (171)	219,488
Operations and systems researchers and analysts (172)	41,638
Statisticians (1733)	18,522
Math science teachers (2227)	28,865
Computer science teachers (2228)	2,226
Life scientists	
Agricultural and food scientists (1853)	5,853
Biological and life scientists (1854)	29,769
Forestry and conservation scientists (1852)	896
Medical scientists (1855)	8,485
Biological science teachers (2213)	4,556
Agriculture and forestry teachers (2234)	406
Physical scientists	
Physicists and astronomers (1842, 1843)	11,330
Chemists, except biochemists (1845)	20,741
Atmospheric and space scientists (1846)	5,733
Geologists and geodesists (1847)	30,043
Physical scientists, nec (1849)	14,853
Physics teachers (2215)	2,884
Social scientists	
Psychology teachers (2217)	4,880
Economics teachers (2218)	1,971
Economists (1912)	29,565
Psychologists (1915)	120,453
Sociologists (1916)	749
Social scientists, nec (1913, 1914, 1919)	11,573
Engineers	
Aerospace (1622)	18,389
Metallurgical and materials (1623)	3,300
Mining (1624)	521
Petroleum (1625)	3,145
Chemical (1626)	29,796
Nuclear engineers (1627)	3,843
Civil (1628)	60,412
Electrical and electronic (1633, 1636)	124,582
Industrial (1634)	26,389
Mechanical (1635)	60,805
Engineers, nec (1639)	52,057
Engineering teachers (2226)	5,881
Sales (421)	754

Doctorate	
Computer and math scientists	
Computer systems analysts and scientists (171)	32,857
Operations and systems researchers and analysts (172)	19,501
Statisticians (1733)	6,520
Mathematical scientists, nec (1739)	3,280
Math science teachers (2227)	11,195
Computer science teachers (2228)	7,995
Life scientists	
Biological and life scientists (1854)	24,207
Medical scientists (1855)	31,232
Biological science teachers (2213)	8,091
Medical science teachers (2231)	6,107
Agriculture and forestry teachers (2234)	3,547
Physical scientists	
Physicists and astronomers (1842, 1843)	562
Chemists, except biochemists (1845)	34,412
Atmospheric and space scientists (1846)	2,093
Geologists and geodesists (1847)	866
Earth, environmental, and marine science teachers (2212)	3,250
Chemistry teachers (2214)	9,483
Physics teachers (2215)	4,587
Social scientists	
Psychology teachers (2217)	5,951
Economics teachers (2218)	6,402
Political science teachers (2223)	3,645
Sociology teachers (2224)	5,909
Social science teachers, nec (2225)	10,895
Economists (1912)	16,709
Psychologists (1915)	63,064
Sociologists (1916)	443
Social scientists, nec (1913, 1914, 1919)	2,488
Engineers	
Metallurgical and materials (1623)	5,218
Electrical and electronic (1633, 1636)	12,334
Mechanical (1635)	8,855
Engineers, nec (1639)	19,569
Engineering teachers (2226)	15,635
Professional	
Computer and math scientists	
Computer systems analysts and scientists (171)	6,804
Operations and systems researchers and analysts (172)	2,024
Life scientists	
Biological and life scientists (1854)	4,476
Medical scientists (1855)	5,742
Biological science teachers (2213)	2,161
Medical science teachers (2231)	7,545
Physical scientists	
Chemists, except biochemists (1845)	1,958
Atmospheric and space scientists (1846)	2,472
Chemistry teachers (2214)	5,219

Social scientists	
Engineers	
Psychologists (1915)	8,716
Political science teachers (2223)	1,682
Civil (1628)	5,579
Electrical and electronic (1633, 1636)	2,215
Industrial (1634)	3,720
Engineering teachers (2226)	912

nec = not elsewhere classified.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

Appendix E. CPS Individuals With High School Diploma or Associate's Degree Employed in S&E Occupations, by Selected Characteristics

Detail is provided by sex, race/ethnicity, age, occupational group, and detailed occupational code; occupational codes are from the 1980 Standard Occupational Classification (SOC).

Characteristic/occupational group/SOC code	Weighted estimate
All occupations	
Computer and math scientists	
Computer systems analysts and scientists (171)	308,494
Operations and systems researchers and analysts (172)	68,764
Statisticians (1733)	6,188
Math science teachers (2227)	7,388
Computer science teachers (2228)	3,229
Life scientists	
Agricultural and food scientists (1853)	23,345
Biological and life scientists (1854)	6,862
Forestry and conservation scientists (1852)	8,744
Biological science teachers (2213)	1,320
Medical science teachers (2231)	3,132
Physical scientists	
Chemists, except biochemists (1845)	9,345
Geologists and geodesists (1847)	3,114
Physical scientists, nec (1849)	1,176
Chemistry teachers (2214)	5,199
Physics teachers (2215)	4,162
Social scientists	
Economists (1912)	33,382
Psychologists (1915)	12,741
Social scientists, nec (1913, 1914, 1919)	3,349
Engineers	
Aerospace (1622)	15,602
Metallurgical and materials (1623)	7,902
Mining (1624)	946
Petroleum (1625)	682
Chemical (1626)	9,383
Civil (1628)	44,872
Electrical and electronic (1633, 1636)	186,841
Industrial (1634)	79,552
Mechanical (1635)	83,306
Marine and naval architects (1637)	2,265
Engineers, nec (1639)	42,719
Engineering teachers (2226)	2,276
Sales (421)	11,271
Sex	
Male	
Computer and math scientists	
Computer systems analysts and scientists (171)	179,851
Operations and systems researchers and analysts (172)	29,541

Math science teachers (2227)	2,141
Computer science teachers (2228)	3,229
Life scientists	
Agricultural and food scientists (1853)	20,171
Biological and life scientists (1854)	5,919
Forestry and conservation scientists (1852)	8,744
Medical science teachers (2231)	3,132
Physical scientists	
Chemists, except biochemists (1845)	6,687
Geologists and geodesists (1847)	3,114
Physical scientists, nec (1849)	1,176
Chemistry teachers (2214)	3,121
Physics teachers (2215)	4,162
Social scientists	
Economists (1912)	10,709
Psychologists (1915)	8,296
Engineers	
Aerospace (1622)	15,602
Metallurgical and materials (1623)	7,902
Mining (1624)	946
Petroleum (1625)	682
Chemical (1626)	9,383
Civil (1628)	43,011
Electrical and electronic (1633, 1636)	166,140
Industrial (1634)	64,277
Mechanical (1635)	72,437
Marine and naval architects (1637)	2,265
Engineers, nec (1639)	38,557
Engineering teachers (2226)	2,276
Sales (421)	11,271
Female	
Computer and math scientists	
Computer systems analysts and scientists (171)	128,643
Operations and systems researchers and analysts (172)	39,222
Statisticians (1733)	6,188
Math science teachers (2227)	5,247
Life scientists	
Agricultural and food scientists (1853)	3,174
Biological and life scientists (1854)	943
Biological science teachers (2213)	1,320
Physical scientists	
Chemists, except biochemists (1845)	2,658
Chemistry teachers (2214)	2,078
Social scientists	
Economists (1912)	22,673
Psychologists (1915)	4,446
Social scientists, nec (1913, 1914, 1919)	3,349
Engineers	
Civil (1628)	1,861
Electrical and electronic (1633, 1636)	20,701
Industrial (1634)	15,276

Mechanical (1635)	10,869
Engineers, nec (1639)	4,163
Race/ethnicity	
White, non-Hispanic	
Computer and math scientists	
Computer systems analysts and scientists (171)	261,855
Operations and systems researchers and analysts (172)	59,593
Statisticians (1733)	6,188
Math science teachers (2227)	5,373
Life scientists	
Agricultural and food scientists (1853)	20,650
Biological and life scientists (1854)	2,957
Forestry and conservation scientists (1852)	4,967
Biological science teachers (2213)	1,320
Physical scientists	
Chemists, except biochemists (1845)	4,583
Geologists and geodesists (1847)	3,114
Physical scientists, nec (1849)	1,176
Chemistry teachers (2214)	5,199
Physics teachers (2215)	1,398
Social scientists	
Economists (1912)	30,880
Psychologists (1915)	8,296
Social scientists, nec (1913, 1914, 1919)	3,349
Engineers	
Aerospace (1622)	12,789
Metallurgical and materials (1623)	7,902
Mining (1624)	946
Petroleum (1625)	682
Chemical (1626)	6,988
Civil (1628)	32,455
Electrical and electronic (1633, 1636)	163,326
Industrial (1634)	71,402
Mechanical (1635)	74,751
Marine and naval architects (1637)	2,265
Engineers, nec (1639)	34,040
Engineering teachers (2226)	2,276
Sales (421)	11,271
Black, non-Hispanic	
Computer and math scientists	
Computer systems analysts and scientists (171)	27,788
Operations and systems researchers and analysts (172)	2,905
Life scientists	
Agricultural and food scientists (1853)	2,695
Biological and life scientists (1854)	3,905
Physical scientists	
Chemists, except biochemists (1845)	4,762
Social scientists	
Economists (1912)	2,501
Psychologists (1915)	4,446

Engineers	
Civil (1628)	6,287
Electrical and electronic (1633, 1636)	8,656
Mechanical (1635)	5,318
Engineers, nec (1639)	522
Other	
Computer and math scientists	
Computer systems analysts and scientists (171)	3,836
Operations and systems researchers and analysts (172)	3,261
Life scientists	
Forestry and conservation scientists (1852)	3,777
Engineers	
Electrical and electronic (1633, 1636)	5,209
Asian/Pacific Islander	
Computer and math scientists	
Computer systems analysts and scientists (171)	11,807
Operations and systems researchers and analysts (172)	1,038
Math science teachers (2227)	2,015
Life scientists	
Medical science teachers (2231)	3,132
Engineers	
Civil (1628)	3,521
Electrical and electronic (1633, 1636)	3,860
Industrial (1634)	5,404
Mechanical (1635)	2,173
Hispanic	
Computer and math scientists	
Computer systems analysts and scientists (171)	3,208
Operations and systems researchers and analysts (172)	1,967
Computer science teachers (2228)	3,229
Physical scientists	
Physics teachers (2215)	2,764
Engineers	
Aerospace (1622)	2,813
Chemical (1626)	2,395
Civil (1628)	2,608
Electrical and electronic (1633, 1636)	5,790
Industrial (1634)	2,746
Mechanical (1635)	1,064
Engineers, nec (1639)	8,158
Age	
<30	
Computer and math scientists	
Computer systems analysts and scientists (171)	72,756
Operations and systems researchers and analysts (172)	10,938
Math science teachers (2227)	3,148
Computer science teachers (2228)	3,229
Life scientists	
Agricultural and food scientists (1853)	8,308
Biological and life scientists (1854)	2,957
Forestry and conservation scientists (1852)	996

Biological science teachers (2213)	1,320
Physical scientists	
Chemistry teachers (2214)	5,199
Physics teachers (2215)	4,162
Social scientists	
Economists (1912)	12,874
Psychologists (1915)	1,342
Social scientists, nec (1913, 1914, 1919)	3,349
Engineers	
Aerospace (1622)	9,466
Metallurgical and materials (1623)	6,040
Chemical (1626)	8,843
Civil (1628)	1,472
Electrical and electronic (1633, 1636)	21,881
Industrial (1634)	5,716
Mechanical (1635)	14,056
Engineers, nec (1639)	2,404
Engineering teachers (2226)	2,276
30–39	
Computer and math scientists	
Computer systems analysts and scientists (171)	106,005
Operations and systems researchers and analysts (172)	13,987
Math science teachers (2227)	2,141
Life scientists	
Agricultural and food scientists (1853)	2,695
Forestry and conservation scientists (1852)	3,777
Physical scientists	
Chemists, except biochemists (1845)	4,121
Physical scientists, nec (1849)	1,176
Social scientists	
Economists (1912)	5,509
Psychologists (1915)	9,165
Engineers	
Metallurgical and materials (1623)	1,862
Petroleum (1625)	682
Civil (1628)	13,699
Electrical and electronic (1633, 1636)	51,695
Industrial (1634)	19,181
Mechanical (1635)	30,460
Engineers, nec (1639)	13,348
Sales (421)	4,834
40–49	
Computer and math scientists	
Computer systems analysts and scientists (171)	95,773
Operations and systems researchers and analysts (172)	32,151
Statisticians (1733)	2,810
Math science teachers (2227)	2,099
Life scientists	
Agricultural and food scientists (1853)	9,168
Forestry and conservation scientists (1852)	3,518
Medical science teachers (2231)	3,132

Physical scientists	
Chemists, except biochemists (1845)	2,566
Geologists and geodesists (1847)	3,114
Social scientists	
Economists (1912)	7,651
Psychologists (1915)	2,234
Engineers	
Aerospace (1622)	3,901
Mining (1624)	946
Chemical (1626)	540
Civil (1628)	17,479
Electrical and electronic (1633, 1636)	71,703
Industrial (1634)	36,431
Mechanical (1635)	10,156
Marine and naval architects (1637)	2,265
Engineers, nec (1639)	21,031
Sales (421)	2,485
50–59	
Computer and math scientists	
Computer systems analysts and scientists (171)	29,996
Operations and systems researchers and analysts (172)	11,687
Statisticians (1733)	2,671
Life scientists	
Agricultural and food scientists (1853)	3,174
Biological and life scientists (1854)	3,905
Physical scientists	
Chemists, except biochemists (1845)	2,658
Social scientists	
Economists (1912)	4,508
Engineers	
Aerospace (1622)	2,235
Civil (1628)	12,222
Electrical and electronic (1633, 1636)	39,297
Industrial (1634)	10,432
Mechanical (1635)	22,368
Engineers, nec (1639)	5,641
Sales (421)	1,920
60–75	
Computer and math scientists	
Computer systems analysts and scientists (171)	3,964
Statisticians (1733)	707
Life scientists	
Forestry and conservation scientists (1852)	453
Social scientists	
Economists (1912)	2,840
Engineers	
Electrical and electronic (1633, 1636)	2,264
Industrial (1634)	7,792
Mechanical (1635)	6,266

Engineers, nec (1639)	295
Sales (421)	2,031

nec = not elsewhere classified.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, April 1997 Current Population Survey (CPS).

References

Biemer PP. 1991. *Measurement Errors in Surveys.* New York: John Wiley & Sons, Inc.

Cox B, Jang D, Edson D, Rathbun K, Moonesinghe R. 2000. Sampling Errors for SESTAT: 1993/1995 and 1997. Unpublished manuscript, Washington, DC: Mathematica Policy Research, Inc.

Dillman DA. 2000. *Mail and Internet Surveys: The Tailored Design Method.* New York: John Wiley & Sons, Inc.

Fowler FJ Jr. 1993. *Survey Research Methods.* Newbury Park, CA: Sage Publications.

Fowler FJ Jr. 1995. *Improving Survey Questions: Design and Evaluation.* Thousand Oaks, CA: Sage Publications.

Groves RM. 1989. *Survey Errors and Survey Costs.* New York: John Wiley & Sons, Inc.

Kannankutty N, Wilkinson R. 1999. *SESTAT: A Tool for Studying Scientists and Engineers in the United States.* NSF 99-337. Arlington, VA: National Science Foundation. http://www.nsf.gov/statistics/nsf99337/start.htm.

Keathley D, Riker C, Hicks L. 1995. *Results of the 1993 National Survey of College Graduates Modal Study.* Washington, DC: U.S. Department of Commerce, U.S. Census Bureau.

Mangione TW. 1995. *Mail Surveys: Improving the Quality.* Thousand Oaks, CA: Sage Publications.

National Science Foundation. 1999. SESTAT Design and Methodology. http://srsstats.sbe.nsf.gov/docs/techinfo.html. Arlington, VA: National Science Foundation.

U.S. Census Bureau. 2000. *Current Population Survey: Design and Methodology.* Technical Paper 63. Washington, DC. http://www.census.gov/prod/2000pubs/tp63.pdf.

U.S. Department of Labor, Bureau of Labor Statistics. 1997. *Employment and Earnings April 1997.* Washington, DC: Government Printing Office.

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