A COMPARISON OF ESTIMATES IN THE NSRCG AND IPEDS

J. Michael Brick, Mary A. Collins, and Lucinda Gray

1. Introduction

The National Survey of Recent College Graduates (NSRCG) is a survey conducted by the National Science Foundation (NSF) as a part of its overall program to provide information on the resources devoted to science and technology in the United States. In particular, the NSRCG is a part of the Scientists and Engineers Statistical Data System (SESTAT) on the supply and utilization of scientists and engineers. The objective of the NSRCG is to estimate characteristics of new graduates in science and engineering (S&E).

To accomplish this objective, persons receiving a bachelor's or master's degree in selected S&E major fields of study are surveyed in the NSRCG. The graduates are sampled in a two-stage process. First, a sample of institutions offering these degrees is selected. Second, lists of graduates from the sampled institutions are obtained and graduates with eligible majors are sampled from these lists. The sampled graduates are interviewed and the results of the completed interviews are weighted to produce national estimates of all graduates in these S&E fields. The most recent cohorts of the NSRCG include graduates from 1991, 1992, 1993, and 1994 (a residual sample selected from spring 1990 is omitted from this discussion).

The National Center for Education Statistics (NCES) conducts an independent survey of the nation's postsecondary institutions, called the Integrated Postsecondary Education Data System (IPEDS). The IPEDS Completions Survey reports on the number of degrees awarded by all major fields of study, along with estimates by gender and race/ethnicity.

Since the NSRCG and the IPEDS produce estimates of the number of graduates and number of degree awards by race, it is natural to compare the estimates from the two surveys and to expect that differences between them would be small. Table 1 shows the estimated total number of graduates in S&E fields for 1991, 1992, 1993, and 1994 from the NSRCG and the comparable number of degree awards from IPEDS. The estimates show that the total number of graduates from the surveys differ by about 4 to 5 percent for bachelor's degrees and 10 to 15 percent for master's degrees across the years. In table 1, the IPEDS estimates are always greater than the NSRCG estimates.

These differences and the reasons for them are the subject of this report. The differences between the estimates can be explained to very large extent by a few important aspects of the design or reporting procedures in the two surveys. For example, the NSRCG excludes persons who obtained a degree but were living outside the US at the time of the survey while the IPEDS includes any degree awarded. Another example of the differences between the survey estimates is that the IPEDS does not report race and ethnicity at the level needed to determine if the degree awarded is in one of the S&E major fields eligible for NSRCG. These issues are discussed in more detail later in the report.

The report examines these and a number of other aspects of IPEDS and NSRCG that could give rise to differences in the estimates of totals and percentages from the two surveys. An attempt is made to quantify the amount of the difference that might be associated with each of these causes, where it is possible to estimate this from available data sources. This report is divided into the following sections:

- Section 2, Target Population: the target populations of the IPEDS and NSRCG are defined and differences between the two are examined.

- Section 3, Data Collection: the methods for collecting the data and the implications of these methods for the estimates are discussed.

- Section 4, Statistical Issues: this section covers sample design, weighting, nonresponse adjustments, and other statistical features of the surveys that might impact on the differences.

- Section 5, Summary: this final section is a summary of the all of the various aspects and an attempt to synthesize these to determine the amount of the difference that can be accounted for by these aspects of the surveys.

2. Target Population

Although both the NSRCG and IPEDS are surveys of postsecondary education and both report on completions from those institutions, there are important differences in the target populations for the two surveys that directly affect the estimates of the number of graduates. For example, the major fields of study covered by the two surveys are different. The reason for the different target populations is that the goals of the surveys are not the same. The IPEDS estimates of graduates are intended to measure the output of the educational system. The NSRCG estimates are intended to measure the supply and utilization of a portion of graduates in the years following their completion of a degree. These goals result in definitions of the target population that are not completely consistent for the two surveys. For example, the NSRCG study excludes graduates living outside of the US during the survey reference week because they are not part of the US labor force. The IPEDS counts degrees awarded regardless of whether the degree recipients intend to remain in the US following graduation.

Below, the major differences in the target populations that impact on the estimates of the number of graduates are discussed in detail. The first issue is the difference between the output of the educational system, a degree in a particular field being awarded, and a person who receives such as degree. The second issue is the award of the degree in a particular time period and that person being in the US population of interest one or two years later. A third issue involves the ability to use the two systems to produce comparable estimates by the specific major fields of study included in the NSRCG.

2.1 Degrees and Graduates

The IPEDS is a data collection system in which the institutions report the number of degrees that they award during a year by detailed major field of the degree. In addition, the institutions also report the number of the degrees awarded by race and ethnicity of the graduate for a less detailed breakdown of major field[1]. In the IPEDS, institutions are explicitly instructed to report the number of degrees awarded and not the number of graduates awarded degrees. For example, the graduate who receives a bachelor of science degree in mathematics and a bachelor of arts degree in sociology during the same academic year from the same institution. The institution is instructed to report this as two degrees in IPEDS, provided it meets the institutional requirements for degrees[2].

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[1] The detailed reporting of major field is the 6-digit Classification of Instructional Programs (CIP). Prior to 1995 the race and ethnicity of the graduates receiving the degree were reported only at the 2-digit CIP.

[2] The institution could decide that the person only should be awarded one degree but in more than one field. In this case, the IPEDS instructions are that the award be reported for the more specialized of the fields.

The NSRCG, on the other hand, is a survey of graduates rather than degrees awarded. A person who obtains any degree in the eligible S&E majors is eligible for the survey, if that person meets the other eligibility requirements for NSRCG discussed below. Thus, a person who receives two bachelor's in S&E fields is eligible, but only counted as one graduate, not two degrees[3]. Similarly, a person who receives one bachelor's in a S&E field and another in a non-S&E field is also eligible and counts equally.

Thus, the IPEDS estimates the number of degrees awarded while the NSRCG estimates the number of graduates who received at least one S&E degree in a school year. If IPEDS reports more than one award for the same graduate in the year, then differences should be expected between the systems with the IPEDS estimate of the number of degrees being larger than the NSRCG estimate of the number of graduates.

The data available for estimating the difference between the number of degrees awarded and the number of graduates who receive awards is very limited. We are not aware of any studies that have examined this issue for either the IPEDS or the NSRCG.

To roughly approximate the order of magnitude of the difference, data that are currently being processed for the 1997 cycle of the NSRCG (graduates from 1995 and 1996) were examined[4]. The data source is the set of 57 institutions that provided electronic lists of graduates for these years in a timely fashion. They are not a random sample of any well defined population, but may provide some inkling of the nature of the difference. In 32 of the 57 institutions, the lists contained multiple S&E degrees records for the graduate in the same institution and school year and degree level. In the 57 institutions, a total of 164,479 S&E records were reported. The number of times more than one record appears for the same graduate in S&E is 2,359. To estimate the percentage of graduates with multiple degrees divide the duplicated number of graduates by the number of graduates (164,479 - 2,359). The estimate is that 1.5 percent of all graduates have multiple awards defined in this manner on the NSRCG sampling lists.

The institutions providing lists for NSRCG were explicitly asked to list graduates and not degrees, while the IPEDS instructions requested that each degree be counted separately. Therefore, it is very likely that the 1.5 percent underestimates the actual difference between degrees and graduates and provides only a lower bound on the estimate. It is not possible to determine the exact relationship between the records reported on the NSRCG sampling lists and the counts reported to IPEDS without a great deal of investigation at the institution level. Since studying the quality of IPEDS data is outside the scope of this effort, we can only speculate on how these quantities might be reported and the types of errors that might exist in that survey.

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[3] A person could receive a bachelor's degree in 1991 and a master's degree in 1992, both in S&E fields. If the person is sampled for either degree, then all the degrees are obtained and used in the NSRCG estimates. Since the person has two chances of being sampled for the NSRCG in this case (once for each degree), the weights are adjusted to account for these multiple chances of selection. As a result, the estimates from the NSRCG can be used to produce approximately unbiased estimates of the number of persons receiving a degree in each year. This procedure does not result in a difference between the IPEDS and NSRCG when estimates by individual year are compared since both are measuring the number in the same academic year.

[4] The procedures used for the 1997 NSRCG cycle are somewhat different than from previous years in this regard. In the 1995 cycle (1993 and 1994 graduates) the institutions were asked to list graduates only once in the lists they provide for sampling and to report on the procedures they actually did use. This procedure seemed to work well, but a few institutions did list graduates more than once. As a result, a special effort has been undertaken in the 1997 cycle to eliminate graduates who are listed twice by the same institution for the same degree level and academic year prior to sampling. The impact of this should be to increase the difference between the IPEDS and NSRCG estimates. In the 1993 cycle, no specific instructions were given to the institutions with regard to how they should produce the lists for graduates with dual degrees.

2.2 Living Outside the US and Other Ineligible Graduates

Another difference in the target population relates to the time of the surveys. The IPEDS measures degrees awarded in a particular school year without regard to whether or not the graduate remains in the US and contributes to the US supply of scientists and engineers. In the NSRCG, the graduate sample must be eligible for the survey during the survey reference week.

A number of reasons exist for why a graduate may not be eligible for the NSRCG even though they did obtain a degree that is reported in IPEDS. Table 2 shows the number and percent of graduates sampled by the reasons for their ineligibility from the NSRCG. The 1991 and 1992 graduates are tabulated together and the 1993 and 1994 graduates are tabulated together because each of these groups were collected during the same survey cycle. No sampling weights were applied to these numbers so they are also only a rough approximation of the size of the difference.

The single biggest reason for being ineligible for the NSRCG is that the graduate lived outside the US during the reference week for the survey (April 1993 for the '91 and '92 graduates and April 1995 for the '93 and '94 graduates). Approximately 4 percent of the graduates (this includes both bachelor's and master's degree recipients) lived outside the US during the reference week. This probably understates the magnitude of the difference because some graduates who were not located for the survey may be living outside the US, but could not be classified into this category without confirmation. It is not possible to estimate whether the distribution is the same for all race and ethnicity categories from the data available.

The second largest percentage in the table is for graduates who reported that the degree they were awarded was not in an eligible S&E major field. This estimate is most likely a reflection of the sampling methods used in the NSRCG and not an indication of a real (reporting) difference. When the institution sampling list did not provide enough information to identify whether or not the graduate's major was in an eligible S&E field, the graduate was included as eligible for sampling and then discarded if they reported that they did not have an eligible degree when interviewed. For example, for some institutions, the sampling list was a graduation program that did not include major field of study. Graduates with unknown majors were eligible for sampling in NSRCG in order to avoid undercoverage of the S&E population. As a result, while there may be some graduates who have incorrectly reported degrees in either survey, these data do not shed much light on this problem other than suggesting differences between major field reporting in IPEDS and NSRCG are probably very small.

The next category of ineligible graduates is the graduates who reported that they were not awarded a degree in the specified time period (1991 & 1992 for the first group and 1993 & 1994 for the second group). For example, a student might apply for graduation in one academic year but actually graduate in the next academic year because of failing a course or submitting a paper late. About 1 to 2 percent of the graduates claimed they did not receive a degree in the specified period and were thus ineligible for the NSRCG. To the extent that the same administrative records used to generate the graduate lists for the NSRCG are also used to report degree awards to IPEDS, this may be a factor for IPEDS counts as well. Unfortunately, no information is currently available on this.

The last category is an amalgam of other reasons for ineligibility. For the most part it is comprised of graduates who were deceased by the reference week of the NSRCG. It also includes a very few graduates who were over 75 years old, did not attend the sampled institution, or were ineligible for another reason. The other category accounts for an extremely small percentage of the difference.

2.3 Major Field of Study

A third issue related to target population differences between the IPEDS and the NSRCG is the inclusion in the NSRCG of only specific S&E major fields of study while the IPEDS includes all fields. As discussed above, this is not an issue for comparing estimates of S&E graduates for totals or by field of study. The SESTAT system S&E codes used in the NSRCG study were designed to map directly to 6-digit Classification of Instructional Program (CIP) codes used in IPEDS. Therefore, IPEDS data that exactly match the SESTAT definition of S&E can be extracted using these 6-digit CIP codes. Tables of the number of graduates estimated from the NSRCG and the number of degrees awarded in the S&E majors by degree and major for 1991 through 1994 are included in the Appendix (tables A, B, C, and D). These estimates reveal that the NSRCG estimates are generally very close to the IPEDS numbers, especially given the other differences in the target population discussed above and the sampling error associated with the NSRCG estimates.

The issue does arise when estimates by race/ethnicity for the two surveys are compared. Prior to 1995, IPEDS collected race/ethnicity data only by broad 2-digit CIP code fields, not by the specific 6-digit CIP fields needed to identify the S&E fields as defined for the SESTAT system. Thus, it is not possible to obtain IPEDS race/ethnicity data that precisely match the S&E population as defined by SESTAT. For comparison purposes, a method is needed to use the 2-digit level IPEDS data to match as closely as possible to the target S&E population. The 2-digit level CIP codes included in this target S&E population are listed below. They are grouped by whether "all", "most," or "some" of the 2-digit CIP code field is part of the S&E population. For example, the 2-digit CIP code for Social Science and History includes both the S&E field of Social Science and the non-S&E field of History. Note that for this discussion "S&E" refers to the fields eligible for the SESTAT system.

All of 2-digit CIP code field is in S&E:

02 Agricultural Science
05 Area/Ethnic Studies
14 Engineering
26 Biological Science
27 Mathematics
40 Physical Science
42 Psychology

Most of 2-digit CIP code field is in S&E:

03 Conservation and Renewable Natural Resources
11 Computer Science
45 Social Science & History

Some of 2-digit CIP code field is in S&E (the eligible field is given in parenthesis):

01 Agricultural Business & Production (Agricultural Economics)
13 Education (Educational Psychology)
16 Foreign Language (Linguistics)
30 Multi/Interdisciplinary (Math & Computer Sci, Biological & Physical Sci, Systems Sci & Theory, Biopsychology, Peace & Conflict Studies, Gerontology, Sci, Tech, & Society)
44 Public Administration (Public Policy Analysis)

Two of the possible methods of using 2-digit CIP code data to approximate the target S&E population that corresponds to the NSRCG sampling frame will be discussed. For the first method, the 2-digit CIP codes that are all or mostly S&E are included in their entirety. The 2-digit CIP codes with only some S&E are excluded. This is the method used for NSF's publication *Science and Engineering*

Degrees, by Race/Ethnicity of Recipients. With this method, IPEDS race/ethnicity data by 2-digit CIP code are used without adjustment because 2-digit CIP codes are either included or excluded in their entirety. The disadvantage of this method is that non-S&E fields such as History are included in the estimates, and eligible S&E fields such as Agricultural Economics are left out. Table 3 contains IPEDS data for 1994 bachelor's degrees that can be used to examine the effect of this inclusion and exclusion by 2-digit CIP code. In this table, the "Number in eligible S&E fields" column was obtained by selecting IPEDS data using 6-digit CIP codes and matches the IPEDS estimates in Table 1 and Appendix B, which correspond to the SESTAT system S&E fields. As shown in the table, the total for S&E is 368,458 and the total obtained using method 1 is 395,380. This difference of 26,922 is caused by 32,601 non-S&E degrees being included and 5,679 S&E degrees being excluded.

The second method of approximating the target S&E population involves adjustments to the IPEDS 2-digit CIP code race/ethnicity data. This method utilizes the fact that while the 2-digit CIP code data cannot be separated into S&E and non-S&E by race/ethnicity, it can be for total degrees. Within each broad (2-digit CIP) field, the overall percent of degrees awarded in eligible S&E (6-digit) majors is calculated. This percent is then applied to each race/ethnicity category within that 2-digit CIP code. The advantage of this method is that all 2-digit CIP codes with at least some S&E are represented. The total obtained using this method matches the target S&E total.

Method 2 will result in accurate estimates if the percent S&E within a 2-digit CIP code does not vary significantly across race/ethnicity categories. Table 3 shows the overall percent S&E for each 2-digit CIP code used to calculate the method 2 adjustments for 1994 bachelor's recipients. Clearly, the adjustment with the most impact is for the Social Science and History category, which accounts for nearly one-third of all S&E majors, yet only about 80 percent of the degrees awarded in this category are in eligible fields. If the percent eligible in this category varies by race/ethnicity, then the estimates produced by this method will not be accurate.

To examine the consistency of the percent eligible across race/ethnicity categories, 1995 IPEDS data that is just now becoming publicly available can be used. This new dataset contains the race/ethnicity distribution at the 6-digit CIP level. Table 4 shows the distribution of the percent S&E by race/ethnicity for selected 2-digit CIP codes in the 1995 IPEDS. The estimates of the percent S&E for Social Science and History for black, non-Hispanic bachelor's recipients is 88 percent. While this differs somewhat from the 80 percent overall estimate for 1994, this variation is relatively minor and does not have a large impact on the estimates. Thus, the method 2 adjustment appears to be a reasonable approach for estimating the number of degrees awarded by race/ethnicity for the IPEDS data from 1992, 1993, and 1994.

Table 5 contains the IPEDS race/ethnicity estimates obtained using each method, along with the NSRCG estimates for comparison. It is worth noting that while the method 2 adjusted estimates should be roughly comparable for race/ethnicity estimates of degrees awarded in S&E fields, many analysts may not make these rather intricate adjustments. If the estimates from the two sources are compared without an adjustment, the difference between NSRCG and the IPEDS will obviously be artificially increased. For IPEDS data prior to 1995, the procedure for adjusting race/ethnicity counts to make them more comparable with the NSRCG population should always be done to obtain the most appropriate comparison. Fortunately, this approach will not be necessary in future years because IPEDS will support the estimation of the number of degrees awarded by race/ethnicity at the 6-digit CIP level.

3. Data Collection

Whenever data are collected in different surveys, there is the potential for the estimates to differ by nontrivial amounts. For example, the Current Population Survey (CPS) and the Survey of Income and Program Participation (SIPP) are two surveys conducted by the Census Bureau and both produce estimates of the number of persons living in poverty. The two estimates differ by more than sampling error because the methods used to measure poverty, most notably the questions asked, are different. The same type of measurement or nonsampling error is encountered in the IPEDS and NSRCG.

In this section, two aspects of nonsampling error related to data collection methods are examined to assess their potential impact on the estimates. The focus of this is primarily on the reporting of race and ethnicity characteristics of the graduates.

3.1 Institutional and Graduate Reporting

In the IPEDS, institutions report on the number of degrees awarded and the characteristics of the graduates who receive those degrees. Procedures for collecting the data are left to the discretion of the institution, although the IPEDS instructions encourage the institutions to use systematic methods for the data collection. The institutions may obtain the race and ethnicity of the graduates in a variety of ways and this is discussed more completely later in this section.

The race and ethnicity data for the NSRCG is obtained by interviewing the graduate and recording the graduate self-reported race and ethnicity. In section 3.2, the specific questions graduates are asked are presented and discussed. Since the data collection mechanisms are different, it is very possible that the data for the same graduate may not be the same in both surveys. In fact, it is possible that there may be incentives in the surveys to report in different ways.

No existing studies from IPEDS or NSRCG describe the differences between institution and graduate reporting of race and ethnicity. However, the institutions provided lists of graduates from 1993 and 1994 that often included the graduate's race and ethnicity for sampling purposes. By comparing the distributions of the institution-reported race/ethnicity categories on these lists to the graduate reported categories, it is possible to infer something about the difference. This assumes that the race data on the sampling lists is consistent with the race data in IPEDS, which seems reasonable but cannot be verified.

Table 6 is a cross-tabulation of the number of graduates by race and ethnicity as reported on graduate lists by sampled institutions in the NSRCG and by the graduates themselves in the NSRCG interview. This includes both bachelor's and master's degree recipients sampled for 1993 and 1994. It should be noted that the institution codes include categories for nonresident alien and unknown race, while the graduate self-reports from the NSRCG survey are in the standard OMB categories. The 4,475 graduates for whom the institutions did not report race/ethnicity on the NSRCG sampling lists are not included in the table.

The percentages of graduates with self-reported and institution-reported race/ethnicity in the same category can be computed as either row or column percentages. The base for the row percentage is the number of all the graduates reported by the institution in a particular race. The row percentages are: 62 percent of the institution-reported American Indians self-report as Native American, 95 percent for Asian/Pacific Islanders, 95 percent for black/non-Hispanics, 96 percent for Hispanic, and 98 percent for the white/non-Hispanics. The denominator for the column percentages is the number of all graduates who self-report in a particular race/ethnicity category. The column percentages are: 95 percent of all self-reported American Indians were reported as American Indians by the institutions, 69 percent for

Asian/Pacific Islanders, 97 percent for black/non-Hispanics, 86 percent for Hispanics, and 94 percent of white/non-Hispanics.

Looking at the total number reported as black by the institution and by the graduate, the numbers are very similar (1,433 institution reported and 1,403 self-reported). While these estimates are not weighted by the inverse of the probability of selection, it is fairly clear that the difference between the institution and self-reported race/ethnicity is relatively small for black graduates. However, it is worth noting that the reporting does make a difference for some of the other race categories. For the Asian/Pacific Islander category the large difference in the column percents is primarily explained by the large percentage of these students who are nonresident aliens. On the other hand, the percentage of graduates who are Hispanic is smaller from the institution-reports than from the self-reports in the NSRCG.

3.2 Questionnaire and Context Effects

As noted above, the NSRCG collects information on race directly from graduates, as we assume the institutions reporting to IPEDS do. In this section, we address differences in the data items themselves, and mode difference that may affect responses. We begin by presenting the items.

The NSRCG uses three questions to collect information from graduates on race and Hispanic origin. This follows the preferred OMB format of collecting Hispanic origin in a separate question from race. This method of asking about race and ethnicity is based on methodological research conducted by the Census Bureau; additional research on collecting race/ethnicity is currently underway. These items were asked using the same wording and in the same order in the 1993 and 1995 NSRCG data collections. Items on race and Hispanic origin were collected in the NSRCG near the end of the interview. Therefore, they follow the bulk of the substantive content of the NSRCG questionnaire.

Note that all graduates who reported their race as “other” in the NSRCG interview were recoded to an existing race category based on the text response collected in the SPECIFY field. This is consistent with the OMB directive to not include an “other” category for race. Persons who reported both white race and a minority race were coded to the minority race. Persons reporting multiple minority races were coded to the race first mentioned. If the SPECIFY field did not provide sufficient information to allow coding of the response, the value of race was set to missing and imputed. The item response rates for race and Hispanic origin were quite high -- 98 percent and 99 percent, respectively.

Are you of Hispanic origin or descent?

1 YES
2 NO

Which of the following categories best describes your Hispanic descent? Are you...
[IF MORE THAN ONE CATEGORY APPLIES, READ: Please select the one you consider the most important part of your background.]

1 Mexican, Mexican-American, Chicano
2 Puerto Rican,
3 Cuban, or
4 Some other Hispanic descent? (SPECIFY)

Are you....

1 White,
2 Black or African American,
3 Asian or Pacific Islander, or
4 American Indian or Alaskan Native (Eskimo, Aleut)?
91 OTHER (SPECIFY)

Institutions report race/ethnicity data to IPEDS using the five standard OMB racial/ethnic categories and separate categories for nonresident aliens and unreported race. In addition, the IPEDS data file contains a balance category (described below).

1 Nonresident Alien
2 Black, non-Hispanic
3 American Indian or Alaskan Native
4 Asian or Pacific Islander
5 Hispanic
6 White, non-Hispanic
7 Race/ethnicity unknown
8 Balance row (total minus sum of racial/ethnic backgrounds)

Thus, there are two categories in the IPEDS for which race is not specified, nonresident alien, and race/ethnicity unknown. Information from the NSRCG indicates that the majority of those classified as nonresident aliens by institutions reporting race were of Asian or Pacific Islander origin. The balance row is an arithmetic tool that is designed to make the total and the sum of race/ethnicity (or the 2-digit CIP and the sum of 6-digit CIP codes) match. It is added in the data preparation process and is not reported by the institution. In some cases, the balance row can be negative (for example, if the sum of the racial/ethnic numbers is greater than the total).

Institutions are instructed to have a systematic mechanism for the collection of race and ethnicity, and that the results of the approach used should be replicable using the same procedures. Instructions also indicate that institutions should undertake some form of verification to assess the accuracy of the system

they employ. NCES does not have quantitative information on the ways in which institutions collect information on race and ethnicity from their students, and does not know how many institutions collect the information using the same categories that are used to report to IPEDS. Based on common experience, it seems reasonable to expect that the vast majority of such information results from self-identification by students on written forms. The context in which the information is collected is unknown, but it is likely to occur in the process of collecting administrative information from students.

The available information on the collection of race and Hispanic origin in the NSRCG and in IPEDS points up three important methodological features that are known to have an effect on survey response -- question form, question context, and mode of administration. It is not possible to quantify the role of these three factors, either individually or in combination, in differences between the NSRCG and IPEDS estimates.

4. Statistical Issues

In the preceding sections, we described some of the definitional and operational aspects of the two surveys that could give rise to different estimates. In this section, attention is focused on statistical design and estimation issues that might also impact on the estimates. The topics included are the coverage of all the graduates in the population by the surveys, sample design and selection, estimation methods such as weighting and handling missing data, and sampling errors of the estimates.

4.1 Sampling Institutions and Graduates

One of the major differences between the IPEDS and the NSRCG is that the IPEDS is a census of postsecondary institutions and the characteristics are reported at the institution level while the NSRCG is a two-stage sample of institutions and graduates. The estimates from virtually every census and sample are subject to biases due to undercoverage, i.e., not including all eligible units in the study.

Undercoverage could occur in the IPEDS by not including some institutions that award degrees, especially S&E degrees for this comparison. However, any undercoverage of institutions in the IPEDS would be directly carried over to the NSRCG since it uses the IPEDS file of institutions for sampling. As a result, there should be no difference in the estimates due to differential undercoverage at this level.

The NSRCG is subject to undercoverage at the graduate level because the lists of graduates used in sampling may not include all the graduates who actually graduated with a degree in an eligible S&E major. No studies of the extent of this undercoverage have been done in NSRCG so it is not possible to quantify the potential impact of this type of undercoverage. While the IPEDS does not suffer from undercoverage in this sense because it is a census of institutions that report the numbers of degrees, it does suffer from incomplete responses. When the number of degrees awarded or the race of the graduate is missing in the IPEDS it is roughly equivalent to undercoverage. Rather than discuss this issue here, it is included below on methods of handling missing data.

Since the NSRCG is a sample, the sample design does play an important role in the ability to produce unbiased and precise estimates of the characteristics of graduates. During the implementation of the 1993 cycle, a problem was identified in establishing the exact probability of selection for the graduates. This problem was largely resolved, but some uncertainty about these probabilities still existed. No method was established to determine if this affected the estimates for 1991 and 1992 graduates. The sample design for the NSRCG was modified for the 1995 cycle, including a new sample of institutions and a different method of sampling graduates from the sampled institutions. The sample design for the

1995 cycle had some features to improve estimates of minorities, but the revised methods were implemented mainly to improve the precision of the estimates for blacks, Hispanics, and Native Americans.

Having a sample rather than a census also introduces sampling error in the estimates. Sampling error is due to the fact that the estimates vary depending on the particular sample that is selected. Two valid samples will not produce the exact same estimates. This is a particularly important issue when estimates are produced for subdomains that are a relatively small fraction of the total population. This issue is addressed later in this section for both estimates of the number of graduates by race and the number of black graduates in Historically Black Colleges and Universities (HBCUs).

4.2 Estimation

In all censuses and samples, procedures must be put into place to handle the inevitable failure to obtain complete responses from all the sampled units. The procedures used in the IPEDS and the NSRCG are different, but both attempt to compensate for missing data in the survey.

In the NSRCG, several stages of weighting were implemented to account for the varying probabilities of selection of the units and adjustments of the weights to account for unit nonresponse (failure to obtain institution cooperation or graduate cooperation). The procedure for calculating base weights was to develop a weight that was the inverse of the probability of selecting the graduate that included both the probability of selecting the institution and the graduate within the institution. The procedures described here are those used in the 1995 cycle, but the methods were very similar in the 1993 cycle.

At the institution level two adjustments were made to the base weights. First, a nonresponse adjustment was computed within categories defined by control (public and private) and number of graduates in the institution. Next, a first-stage ratio adjustment was used to reduce the error associated with sampling institutions. This adjustment was a ratio to the number of graduates reported in the IPEDS by 12 categories based on degree and major fields. The purpose of the ratio adjustment was to reduce the component of the sampling error due to only selecting a sample of institutions. The adjustment should be most effective for estimates of major fields.

At the graduate level, adjustments to the weights were done for graduates who failed to complete the interview. The adjustments were done by year of degree, degree level, and major field. A total of 43 nonresponse adjustment categories were created for each year. These adjustments are most likely to have the greatest benefit for estimates by year, degree, and major field. An additional adjustment was made to the weights to account for graduates who could have been sampled from more than one list. This adjustment is discussed in footnote 3 in section 2.1.

One final adjustment was made for the weights of Native Americans in 1993. The estimated number of Native American bachelor's was considerably greater than the number from any other year. Even though the number of Native Americans is very small and subject to a large sampling error, it was decided to adjust the weights of the Native American bachelor's for this year to be more in line with the IPEDS estimates and the estimates from the other years of the NSRCG. The weights of Native Americans that were very large were trimmed and then the weights of all Native American bachelor's in 1993 were poststratified to the number reported in the report *Science and Engineering Degrees, by Race/Ethnicity of Recipients* (NSF 95-330). This adjustment only affects the estimate for Native American bachelor's in 1993 and no other estimates.

As mentioned earlier, a very small percentage of graduates (less than 2 percent) did not report race or ethnicity. This resulted in item nonresponse. Hot-deck imputation procedures were used to impute these missing responses, where the cells for the hot-deck used data from the institution-reported race and ethnicity (where available) and responses were imputed from other respondents in the same institution when possible. Given the small percentage of missing data for race and ethnicity and the methods used to impute, item nonresponse probably has an extremely small impact on the NSRCG estimates.

For the IPEDS, both unit and item nonresponse were handled by imputation. The main method of imputing for unit nonresponse (institutions that did not report any data) was to replace missing data by the data from the previous year. If there were no data in the previous year for the institution, then imputation was based on either enrollment data from the institution or data on the level of awards from a different IPEDS survey. In this case, the race/ethnicity data were left missing.

For missing race/ethnicity data from institutions that did report other data in IPEDS, the distribution of race/ethnicity from the previous year was used to impute from the reported total number of degrees awarded. If the previous year's race/ethnicity data were also missing, the data were imputed based on institutions with similar characteristics.

No information was available in the IPEDS documentation that described the number and percent of imputed race/ethnicity data. However, this information may be available by accessing the public use files. Apparently, no studies on the bias associated with the imputations in IPEDS have been conducted.

In essence, the methods of handling incomplete data in both the NSRCG and the IPEDS seem to be reasonable and both should help to reduce the bias in estimates by race/ethnicity. However, no evidence is available to support this assumption and the impact of the procedures on the estimates has not be quantified.

4.3 Sampling Error

As discussed above, the estimates from the NSRCG are based on a sample and are subject to sampling error. Table 7 shows the estimated number of graduates and its estimated standard error for each year by race/ethnicity. Looking at the estimated number of black graduates, it may seem that the estimates are not very consistent across the years. However, the standard errors of the estimates are large relative to the difference between the estimates by year. Although a formal statistical test of the difference between the years has not been computed, it is very unlikely that the differences are statistical significant.[5] In general, the NSRCG sample size is not large enough to detect small changes in estimates of totals for these relatively rare subdomains. Of course, this situation is not unique to the NSRCG, but is an issue in virtually every sample survey when attempts are made to detect small changes in small groups.

Another example of an estimate that may be difficult to estimate from a sample survey like the NSRCG is the difference in characteristics between black bachelor's degree recipients from HBCUs and those from non-HBCU institutions. Table 8 gives the estimates and standard errors for this type of analysis for 1993 and 1994 graduates. Looking at the estimated totals, it is obvious the estimate of the

[5] The estimates of the number of graduates by race between two years are correlated because the same sample of institutions was used in some of the years. For example, the same sample of institutions was used to estimate the number of black/non-Hispanic graduates in 1993 and 1994. In order for the difference between these two years to be statistical significant at the 5 percent significance level, the correlation between the estimates would have to be about 0.9. Even assuming the component of variance from the sample of institutions is large, it is not likely that the correlation would be that large. For the other years, the correlations are lower because the same sample of institutions was not used so the estimates are clearly not significantly different.

number of black graduates from HBCUs has a large standard error (the 95 percent confidence interval is from 6,300 to 17,100). The standard error for this estimate is so large, even when compared to the estimate for black graduates from non-HBCUs, because the sample of the NSRCG[6] is not designed to measure this kind of statistic precisely. If these types of estimates need to be more precise, then it would be necessary to modify the design of the sample and select HBCUs at the first stage of the sample with certainty or at least with very large probabilities.

It should be noted that while NSRCG standard errors are relatively large for some totals, especially for relatively rare subdomains, they are lower for estimates of percent distributions. For example, the percent of 1994 bachelors who are black, non-Hispanic is 6 percent with a standard error of 0.58 (and an unweighted cell size of 577). The percent of 1994 bachelor's with degrees in Social Science is 50 percent with a standard error of 0.97 (and an unweighted cell size of 2,004).

This examination shows that differences that may appear to be important need to be evaluated taking the sampling errors of the estimates into consideration. Most of the differences in the estimated number of graduates by race/ethnicity from year-to-year appear to be within sampling error. In other words, the fluctuations in the estimates of these estimated totals are not unexpected, even if there were no real change in the population. When the other aspects of the sample, such as the differences in the target population, are taken into account, this suggests that it is inappropriate to be concerned that these differences are either a result of real changes in the population or errors in the estimates from either the IPEDS or the NSRCG.

5. Summary

In the foregoing sections, we have examined a number of features of the National Survey of Recent College Graduates (NSRCG) and the Integrated Postsecondary Education Data System (IPEDS) that could lead to differences in estimates between these two data sources. While it is possible to quantify some of the differences, many are not quantifiable. Briefly, the most significant areas of difference for the two data collections are;

- *Target population*: the target populations for the survey differ in that...
  - IPEDS reports on degrees awarded and NSRCG reports on graduates;
  - IPEDS reports on all degrees awarded but NSRCG excludes as ineligible those living outside the US during the survey reference period; and
  - IPEDS reports on all fields of study and NSRCG reports on eligible S&E degrees only.
- For the cohorts of interest, 1991 through 1994, IPEDS does not provide estimates of numbers of degrees by race at a detailed field of study level. As a result, no direct estimates of degrees awarded in eligible S&E fields by race are available for these years.
- *Data Collection*: The NSRCG and IPEDS have methods of collecting information on race that differ by mode, context, and wording.
- *Statistical Issues*: The NSRCG uses a two-stage sample of institutions and persons whereas IPEDS is a census of institutions. As a result, the estimates from the NSRCG are subject to sampling error but IPEDS estimates are not.

[6] The sample design for the survey is a clustered two-stage sample and any characteristic that is at the institution level, such as whether or not the college is an HBCU, implies all the graduates in the institution have the same characteristic. A cluster sample is not very efficient for estimating these types of statistics because of the very high intra-institution correlation.

As shown in the analysis, NSRCG estimates are quite similar to IPEDS estimates when appropriate adjustments are made for the specific eligible S&E fields. Some differences do remain, but differences should be expected because of the eligibility factors described above. Some of these expected differences can be estimated from available information and are summarized below. After accounting for these factors, the estimates from the two sources are generally within sampling error.

Factor	Estimated effect
Multiple degree awards at the same level in the same year	1.5 %
Living outside the US during the NSRCG reference week	4.0 %
Ineligible because the degree was not received in the NSRCG survey time period	1.0 %

Totals by major field of study for IPEDS and the NSRCG can be directly compared because it is possible to select eligible S&E fields from the IPEDS dataset. Comparisons by race/ethnicity are affected by the lack of detailed S&E fields by race in IPEDS, i.e., because race/ethnicity are reported only for the 2-digit CIP level and not at the 6-digit level that is needed to identify eligible fields. However, if proportional adjustments are made based on all awarded degrees at the two digit CIP level, the estimates from the NSRCG and IPEDS by race appear to be more comparable.

In conclusion, this investigation into differences between the NSRCG and IPEDS indicates that estimates from these two sources are comparable when appropriate adjustments are made for differences in definitions in target populations and the sampling errors of the NSRCG estimates are considered.

Table 1. Total number of degree recipients, by degree and year.

Cohort	Total number	
	NSRCG	IPEDS
1991 Bachelor's	308,500	326,100
1992 Bachelor's	330,900	343,518
1993 Bachelor's	348,900	361,518
1994 Bachelor's	349,700	368,458
1991 Master's	57,000	66,800
1992 Master's	58,600	68,777
1993 Master's	73,200	81,220
1994 Master's	73,400	86,064

NOTE: Details may not add to totals because of rounding.

SOURCE: For NSRCG data: National Science Foundation/SRS, National Survey of Recent College Graduates, 1993 and 1995.
For 1991 IPEDS data: National Center for Education Statistics, Digest of Education Statistics, 1994
For 1992-1994 IPEDS data: National Center for Education Statistics, IPEDS Completions file

Table 2. NSRCG Ineligible Graduates (Unweighted).

Case outcome	1991 & 1992 Cohorts		1993 & 1994 Cohorts	
	Number	Percent	Number	Percent
Total Sample	25,785	100.0%	21,000	100.0%
Total Ineligible	2,670	10.4%	1,630	7.8%
Living outside U.S in reference week	1,135	4.4%	780	3.7%
Ineligible major reported by graduate	841	3.3%	469	2.2%
No bachelors or masters in time frame	617	2.4%	319	1.5%
Duplicates	50	0.2%	35	0.2%
Deceased	26	0.1%	21	0.1%
Did not attend sampled school/campus	0	0.0%	2	0.0%
Over age 75 in April 1995	1	0.0%	1	0.0%
Other ineligible	0	0.0%	3	0.0%

SOURCE: National Science Foundation/SRS, National Survey of Recent College Graduates, 1993 and 1995

Table 3. IPEDS 1994 Bachelor's data for number and percent in eligible S&E fields, and counts for methods 1 and 2, by broad 2-digit CIP code field of study.

IPEDS Broad Fields by Two-digit CIP Codes	IPEDS 1994 Bachelor's Data				
	Total Number	Number in Eligible S&E Fields	Percent Eligible	Method 1 Estimates	Method 2 Estimates
Total	568,080	368,458	64.9%	395,380	368,458
All of broad field is in S&E					
02 Agricultural Science	6,486	6,486	100.0%	6,486	6,486
05 Area/Ethnic Studies	5,577	5,577	100.0%	5,577	5,577
14 Engineering	62,962	62,962	100.0%	62,962	62,962
26 Biological Science	52,213	52,213	100.0%	52,213	52,213
27 Mathematics	14,431	14,431	100.0%	14,431	14,431
40 Physical Science	18,525	18,525	100.0%	18,525	18,525
42 Psychology	69,768	69,768	100.0%	69,768	69,768
Most of broad field is in S&E					
03 Conservation	6,679	2,065	30.9%	6,679	2,065
11 Computer Science	24,458	23,998	98.1%	24,458	23,998
45 Social Sci & History	134,281	106,754	79.5%	134,281	106,754
Some of broad field is in S&E					
01 agricultural business	4,978	1,375	27.6%		1,375
13 Education	109,640	160	0.1%		160
16 Foreign Language	14,422	611	4.2%		611
30 Multi/Interdisciplinary	25,489	3,109	12.2%		3,109
44 Public Administration	18,171	424	2.3%		424

SOURCE: U.S. Department of Education, Integrated Postsecondary Education Data System, 1994

Table 4. Percent eligible S&E degrees awarded by 2-digit CIP and race/ethnicity based on 1995 IPEDS.

CIP Classification	Overall	Race/Ethnicity					
		Non-resident alien	Black, non-Hispanic	American Indian	Asian/ Pacific Islander	Hispanic	White, non-Hispanic
03 Conservation	35.1	46.8	38.5	17.8	39.9	52.6	34.8
11 Computer Science	98.1	98.1	98.6	100.0	99.1	96.9	98.0
45 Social Science & History	79.3	94.1	87.8	79.5	88.5	84.1	76.9

Source: U.S. Department of Education, Integrated Postsecondary Education Data System (IPEDS), 1995

Table 5. Comparison of race/ethnicity estimates from NSRCG and IPEDS estimates using method 1 and 2.

1991 Bachelor's	NSRCG	% NSRCG	IPEDS Method 1	% IPEDS Method 1	IPEDS Method 2	% IPEDS Method 2
Total	308,500		356,785			
Unknown race	0		8,637			
Total, race reported	308,500	100%	348,148	100%	--	--
White	247,800	80%	278,190	80%	--	--
Black	20,200	7%	19,987	6%	--	--
Asian	23,100	7%	20,552	6%	--	--
Hispanic	16,400	5%	15,351	4%	--	--
Native American	1,000	0%	1,344	0%	--	--
Nonresident alien	--		12,724	4%	--	--
1992 Bachelor's	**NSRCG**	**% NSRCG**	**IPEDS 1**	**% IPEDS 1**	**IPEDS 2**	**% IPEDS 2**
Total	330,900		376,933		343,518	
Unknown race	0		8,063		7,253	
Total, race reported	330,900	100%	368,870	100%	336,265	100%
White	266,900	81%	292,614	79%	266,113	79%
Black	23,900	7%	22,431	6%	20,206	6%
Asian	25,400	8%	22,635	6%	21,209	6%
Hispanic	13,800	4%	17,391	5%	15,879	5%
Native American	900	0%	1,561	0%	1,389	0%
Nonresident alien	--		12,238	3%	11,469	3%
1993 Bachelor's	**NSRCG**	**% NSRCG**	**IPEDS 1**	**% IPEDS 1**	**IPEDS 2**	**% IPEDS 2**
Total	348,900		388,435		361,518	
Unknown race	0		8,276		7,646	
Total, race reported	348,900	100%	380,159	100%	353,872	100%
White	282,600	81%	297,171	78%	275,591	78%
Black	19,800	6%	24,421	6%	22,680	6%
Asian	26,500	8%	24,504	6%	23,472	7%
Hispanic	18,200	5%	18,442	5%	17,390	5%
Native American	1,800	1%	1,819	0%	1,661	0%
Nonresident alien	--		13,802	4%	13,077	4%
1994 Bachelor's	**NSRCG**	**% NSRCG**	**IPEDS 1**	**% IPEDS 1**	**IPEDS 2**	**% IPEDS 2**
Total	349,700		395,380		368,458	
Unknown race	0		8,593		7,935	
Total, race reported	349,700	100%	386,787	100%	360,523	100%
White	274,900	79%	297,617	77%	276,418	77%
Black	21,700	6%	26,289	7%	24,467	7%
Asian	30,100	9%	26,420	7%	25,255	7%
Hispanic	21,400	6%	20,529	5%	19,323	5%
Native American	1,600	0%	2,004	1%	1,828	1%
Nonresident Alien	--		13,929	4%	13,232	4%

NOTES: NSRCG estimates are rounded to 100's.
Estimates from IPEDS method 1 include major fields not included in NSRCG.
IPEDS reports nonresident aliens as a separate category, while NSRCG reports them in the race categories (if they were living in the U.S. during the reference week).
The nonresident alien category is etimates to be about 75% Asian.

SOURCE: National Science Foundation/SRS, National Survey of Recent College Graduates; U.S. Department of Education, Integrated Postsecondary Education Data System.

Table 6. Institution and graduate reported race/ethnicity in the NSRCG: Number of graduates, 1993 and 1994.

	Graduate-Reported Race					
Institution-Reported Race	Total	American Indian	Asian/Pacific	Black, non-Hispanic	Hispanic	White, non-Hispanic
Total	12,084	719	1,049	1,403	1,284	7,629
American Indian	1,103	683	34	13	71	302
Asian or Pacific Islander	767	3	728	3	5	28
Black, non-Hispanic	1,433	9	7	1,365	29	23
Hispanic	1,155	2	8	2	1,110	33
Non-resident alien	299	1	230	7	14	47
White, non-Hispanic	7,327	21	42	13	55	7,196

Source: National Science Foundation/SRS, National Survey of Recent College Graduates, 1995

Table 7. Estimated number of bachelor's degree recipients by year and race/ethnicity.

	1991		1992		1993		1994	
Race/ethnicity	Number	s.e.	Number	s.e.	Number	s.e.	Number	s.e.
American Indian	1,000	400	900	300	1,800	200	1,600	300
Asian/Pacific Islander	23,100	2,000	25,400	2,200	26,500	1,800	30,100	1,600
Black, non-Hispanic	20,200	3,700	23,900	4,100	19,800	2,000	21,700	1,900
Hispanic	16,400	2,200	13,800	1,500	18,200	1,400	21,400	1,600
White, non-Hispanic	247,800	7,600	266,900	7,600	282,600	9,500	274,900	9,400

NOTE: s.e. is the standard error of the estimate.
Source: National Science Foundation/SRS, National Survey of Recent College Graduates, 1993 and 1995

Table 8. Status of 1993 and 1994 black science and engineering (S&E) bachelor's degree recipients from HBCU's and non-HBCU's after graduation: April 1995

Status in spring 1995	Blacks from HBCUs		Blacks from non-HBCUs	
	Estimate	Standard error	Estimate	Standard error
Total estimate	11,728	2700.95	29,750	1670.65
(Percentage distribution)				
Total percent	100%		100%	
Full-time student	21.7	2.78	23.3	1.86
Employed, not full-time student	72.3	3.62	68.9	2.08
In S&E occuption	13.5	2.07	12.5	1.18
In non-S&E occuption	58.7	3.86	56.4	2.33
Not employed, not full-time student	6.1	2.12	7.9	1.43
Unemployed[1]	0.8	0.77	0.4	0.18
Outside labor force	5.3	2.12	7.5	1.42

1 The unemployed are those who were not working on April 15 and who were seeking employment or who were on layoff from a job.

NOTE: Details may not add to totals because of rounding.

SOURCE: National Science Foundation/SRS, National Survey of Recent College Graduates, 1995

Table A. Number of science and engineering bachelor's degree recipients from NSRCG for 1991 and 1992, and from IPEDS Completions data for 1991 and 1992, by field of degree.

	1991				1992			
	NSRCG		IPEDS		NSRCG		IPEDS	
Major field	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All science and engineering fields	308,500	100%	326,100	100%	330,900	100%	343,518	100%
Major type								
Total science	247,900	80%	264,600	81%	273,100	83%	281,620	82%
Total engineering	60,600	20%	61,500	19%	57,700	17%	61,898	18%
Major field								
Computer and mathematical sciences, total	37,800	12%	39,600	12%	39,800	12%	39,296	11%
Computer science and information sciences	24,500	8%	24,300	7%	25,700	8%	24,121	7%
Mathematics and related sciences	13,200	4%	15,300	5%	14,100	4%	15,175	4%
Life and related sciences, total	47,600	15%	49,000	15%	52,100	16%	53,169	15%
Agricultural and food sciences	4,200	1%	5,500	2%	4,900	1%	5,843	2%
Biological sciences	40,000	13%	42,000	13%	43,300	13%	46,196	13%
Environmental life sciences including forestry sciences	3,400	1%	1,500	0%	3,900	1%	1,130	0%
Physical and related sciences, total	16,200	5%	16,300	5%	17,500	5%	17,076	5%
Chemistry, except biochemistry	7,300	2%	8,300	3%	8,600	3%	8,829	3%
Earth sciences, geology, and oceanography	3,800	1%	2,700	1%	3,800	1%	3,201	1%
Physics and astronomy	4,400	1%	4,400	1%	4,700	1%	4,245	1%
Other physical sciences	800	0%	800	0%	500	0%	801	0%
Social and related sciences, total	146,300	47%	159,800	49%	163,700	49%	172,079	50%
Economics	22,800	7%	25,200	8%	23,700	7%	24,976	7%
Political science and related sciences	32,800	11%	41,300	13%	41,800	13%	44,252	13%
Psychology	54,600	18%	58,200	18%	61,100	18%	63,795	19%
Sociology and anthropology	22,400	7%	21,700	7%	24,900	8%	24,304	7%
Other social sciences	13,700	4%	13,400	4%	12,200	4%	14,752	4%
Engineering, total	60,600	20%	61,500	19%	57,700	17%	61,898	18%
Aerospace and related engineering	3,500	1%	2,900	1%	3,800	1%	2,996	1%
Chemical engineering	3,300	1%	3,400	1%	3,400	1%	3,845	1%
Civil and architectural engineering	7,200	2%	7,800	2%	8,400	3%	8,706	3%
Electrical, electronic, computer and communications engineering	22,100	7%	21,700	7%	19,700	6%	20,589	6%
Industrial engineering	3,700	1%	3,700	1%	4,000	1%	3,800	1%
Mechanical engineering	12,900	4%	14,000	4%	12,200	4%	14,202	4%
Other engineering	7,900	3%	8,000	2%	6,200	2%	7,760	2%

KEY: S = Data are suppressed for reasons of respondent confidentiality and/or data reliability.

NOTE: Details may not add to totals because of rounding.

SOURCE: For NSRCG data: National Science Foundation/SRS, National Survey of Recent College Graduates, 1993 and 1995.
For 1991 IPEDS data: National Center for Education Statistics, Digest of Education Statistics, 1994
For 1992 IPEDS data: National Center for Education Statistics, IPEDS Completions file

Table B. Number of science and engineering bachelor's degree recipients from NSRCG for 1993 and 1994, and from IPEDS Completions data for 1993 and 1994, by field of degree.

	1991				1992			
	NSRCG		IPEDS		NSRCG		IPEDS	
Major field	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All science and engineering fields	348,900	100%	361,518	100%	349,700	100%	368,458	100%
Major type								
Total science	290,500	83%	298,848	83%	289,700	83%	305,496	83%
Total engineering	58,400	17%	62,670	17%	60,000	17%	62,962	17%
Major field								
Computer and mathematical sciences, total	35,200	10%	39,205	11%	34,000	10%	38,769	11%
Computer science and information sciences	18,700	5%	24,038	7%	20,000	6%	23,998	7%
Mathematics and related sciences	16,500	5%	15,167	4%	13,900	4%	14,770	4%
Life and related sciences, total	58,600	17%	57,741	16%	62,500	18%	63,214	17%
Agricultural and food sciences	62,000	18%	5,945	2%	6,300	2%	6,486	2%
Biological sciences	50,000	14%	50,137	14%	52,500	15%	54,663	15%
Environmental life sciences including forestry sciences	2,500	1%	1,659	0%	3,800	1%	2,065	1%
Physical and related sciences, total	16,500	5%	17,691	5%	16,700	5%	18,525	5%
Chemistry, except biochemistry	8,600	2%	9,109	3%	8,500	2%	9,641	3%
Earth sciences, geology, and oceanography	3,900	1%	3,503	1%	4,100	1%	3,868	1%
Physics and astronomy	3,900	1%	4,247	1%	4,000	1%	4,168	1%
Other physical sciences	0	0%	832	0%	0	0%	848	0%
Social and related sciences, total	180,200	52%	184,211	51%	176,500	50%	184,989	50%
Economics	21,800	6%	22,973	6%	17,500	5%	20,945	6%
Political science and related sciences	44,700	13%	44,819	12%	42,100	12%	42,533	12%
Psychology	65,300	19%	67,494	19%	67,900	19%	69,981	19%
Sociology and anthropology	28,600	8%	28,076	8%	30,900	9%	30,400	8%
Other social sciences	19,800	6%	20,849	6%	18,000	5%	21,130	6%
Engineering, total	58,400	17%	62,670	17%	60,000	17%	62,962	17%
Aerospace and related engineering	2,300	1%	2,735	1%	2,100	1%	2,330	1%
Chemical engineering	4,300	1%	4,598	1%	5,300	2%	5,286	1%
Civil and architectural engineering	8,600	2%	9,526	3%	9,500	3%	10,169	3%
Electrical, electronic, computer and communications engineering	20,000	6%	20,009	6%	18,600	5%	18,661	5%
Industrial engineering	3,300	1%	3,406	1%	3,100	1%	3,255	1%
Mechanical engineering	13,900	4%	14,574	4%	15,000	4%	15,169	4%
Other engineering	6,100	2%	7,822	2%	6,400	2%	8,092	2%

KEY: S = Data are suppressed for reasons of respondent confidentiality and/or data reliability.

NOTE: Details may not add to totals because of rounding.

SOURCE: National Science Foundation/SRS, National Survey of Recent College Graduates, 1995 and National Center for Education Statistics, Digest of Education Statistics, 1994 and 1995

Table C. Number of science and engineering master's degree recipients from NSRCG for 1991 and 1992, and from IPEDS Completions data for 1991 and 1992, by field of degree.

	1991				1992			
	NSRCG		IPEDS		NSRCG		IPEDS	
Major field	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All science and engineering fields	57,000	100%	66,800	100%	58,600	100%	68,777	100%
Major type								
Total science	36,900	65%	42,800	64%	37,700	64%	43,767	64%
Total engineering	20,100	35%	24,000	36%	20,900	36%	25,009	36%
Major field								
Computer and mathematical sciences, total	13,000	23%	13,200	20%	11,100	19%	13,410	19%
Computer science and information sciences	8,700	15%	9,100	14%	7,100	12%	9,383	14%
Mathematics and related sciences	4,300	8%	4,000	6%	3,900	7%	4,027	6%
Life and related sciences, total	6,900	12%	7,300	11%	6,300	11%	7,187	10%
Agricultural and food sciences	1,100	2%	1,600	2%	900	2%	1,602	2%
Biological sciences	5,300	9%	5,100	8%	4,800	8%	5,153	7%
Environmental life sciences including forestry sciences	500	1%	600	1%	500	1%	432	1%
Physical and related sciences, total	5,200	9%	5,300	8%	5,400	9%	5,352	8%
Chemistry, except biochemistry	1,500	3%	1,700	3%	1,500	3%	1,791	3%
Earth sciences, geology, and oceanography	1,900	3%	1,500	2%	1,600	3%	1,425	2%
Physics and astronomy	1,600	3%	1,800	3%	2,100	4%	1,947	3%
Other physical sciences	100	0%	300	0%	200	0%	189	0%
Social and related sciences, total	11,800	21%	17,200	26%	14,900	25%	17,818	26%
Economics	1,700	3%	2,400	4%	2,100	4%	2,564	4%
Political science and related sciences	1,500	3%	3,900	6%	3,200	5%	4,213	6%
Psychology	5,100	9%	6,100	9%	6,400	11%	6,083	9%
Sociology and anthropology	1,700	3%	2,100	3%	1,800	3%	2,243	3%
Other social sciences	1,900	3%	2,700	4%	1,400	2%	2,715	4%
Engineering, total	20,100	35%	24,000	36%	20,900	36%	25,009	36%
Aerospace and related engineering	1,000	2%	900	1%	1,000	2%	933	1%
Chemical engineering	700	1%	900	1%	900	2%	957	1%
Civil and architectural engineering	2,600	5%	3,000	4%	2,400	4%	3,150	5%
Electrical, electronic, computer and communications engineering	8,100	14%	8,200	12%	7,600	13%	8,615	13%
Industrial engineering	1,200	2%	2,000	3%	1,400	2%	2,012	3%
Mechanical engineering	3,100	5%	3,500	5%	3,300	6%	3,655	5%
Other engineering	3,500	6%	5,400	8%	4,400	8%	5,687	8%

KEY: S = Data are suppressed for reasons of respondent confidentiality and/or data reliability.

NOTE: Details may not add to totals because of rounding.

SOURCE: For NSRCG data: National Science Foundation/SRS, National Survey of Recent College Graduates, 1993 and 1995.
For 1991 IPEDS data: National Center for Education Statistics, Digest of Education Statistics, 1994
For 1992 IPEDS data: National Center for Education Statistics, IPEDS Completions file

Table D. Number of science and engineering master's degree recipients from NSRCG for 1993 and 1994, and from IPEDS Completions data for 1993 and 1994, by field of degree.

	1991				1992			
	NSRCG		IPEDS		NSRCG		IPEDS	
Major field	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All science and engineering fields	73,200	100%	81,220	100%	73,400	100%	86,064	100%
Major type								
Total science	50,200	69%	53,562	66%	49,800	68%	57,357	67%
Total engineering	23,000	31%	27,658	34%	23,600	32%	28,707	33%
Major field								
Computer and mathematical sciences, total	12,800	17%	14,184	17%	11,500	16%	14,519	17%
Computer science and information sciences	9,100	12%	10,090	12%	8,100	11%	10,398	12%
Mathematics and related sciences	3,700	5%	4,094	5%	3,400	5%	4,121	5%
Life and related sciences, total	7,600	10%	7,392	9%	7,400	10%	7,946	9%
Agricultural and food sciences	1,200	2%	1,593	2%	1,200	2%	1,614	2%
Biological sciences	5,500	8%	5,237	6%	5,300	7%	5,674	7%
Environmental life sciences including forestry sciences	800	1%	562	1%	900	1%	658	1%
Physical and related sciences, total	4,800	7%	5,365	7%	4,900	7%	5,688	7%
Chemistry, except biochemistry	1,700	2%	1,853	2%	1,700	2%	2,010	2%
Earth sciences, geology, and oceanography	1,300	2%	1,397	2%	1,400	2%	1,418	2%
Physics and astronomy	1,700	2%	1,916	2%	1,700	2%	2,081	2%
Other physical sciences	S	0%	199	0%	S	0%	179	0%
Social and related sciences, total	25,000	34%	26,621	33%	26,000	35%	29,204	34%
Economics	1,900	3%	2,725	3%	2,200	3%	2,989	3%
Political science and related sciences	4,400	6%	4,472	6%	3,800	5%	4,919	6%
Psychology	12,600	17%	12,584	15%	13,400	18%	13,820	16%
Sociology and anthropology	2,200	3%	2,534	3%	2,400	3%	2,730	3%
Other social sciences	3,800	5%	4,306	5%	4,200	6%	4,746	6%
Engineering, total	23,000	31%	27,658	34%	23,600	32%	28,707	33%
Aerospace and related engineering	800	1%	1,047	1%	900	1%	1,038	1%
Chemical engineering	900	1%	994	1%	800	1%	1,040	1%
Civil and architectural engineering	2,900	4%	3,655	5%	3,200	4%	3,933	5%
Electrical, electronic, computer and communications engineering	8,300	11%	9,231	11%	8,200	11%	9,274	11%
Industrial engineering	1,500	2%	2,065	3%	1,500	2%	2,109	2%
Mechanical engineering	3,900	5%	3,983	5%	3,600	5%	4,105	5%
Other engineering	4,700	6%	6,683	8%	5,400	7%	7,208	8%

KEY: S = Data are suppressed for reasons of respondent confidentiality and/or data reliability.

NOTE: Details may not add to totals because of rounding.

SOURCE: National Science Foundation/SRS, National Survey of Recent College Graduates, 1995 and National Center for Education Statistics, Digest of Education Statistics, 1994 and 1995