

Science, Engineering and Health Human Resources Data at the National Science Foundation

Introduction

The United States is unique among major industrialized nations in that it has directly invested in collecting detailed human resources data for the science and engineering enterprise. Most of these data sources evolved from administrative data collections to large-scale nationally representative datasets. Today, these resources are housed at the National Science Foundation's Division of Science Resources Statistics (SRS).

When the National Science Foundation (NSF) was founded as a federal agency in 1950, Congress mandated that NSF

“...provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources and to provide a source of information for policy formulation by other agencies of the Federal Government” (NSF Act of 1950, as amended; 42 U.S.C. 1862).

NSF/SRS has met this requirement by developing its own data sources, as well as providing access to data collected elsewhere in the federal government.

Human Resources Data Sources and History

If we consider the discrete stages of education and subsequent entrance to the workforce, the progress could be considered a continuum, as shown in Figure 1. Individuals generally progress through stages A through F, although not all stages may be completed. At each stage in this continuum, there are several major questions that the data are being used to address:

1. How many people are in this stage?
2. What are their demographic characteristics?
3. What are the short-term and long-trends at that stage?
4. How does performance at one stage relate to prior or subsequent stages?

In this article, we will describe the NSF/SRS data sources that can be used to study individuals in this continuum for stages C through F.

Undergraduate and Graduate Degrees—IPEDS Completions

The National Center for Education Statistics (NCES), through its Integrated Postsecondary Education Data System (IPEDS) is a major source of information on degree data in the U.S. The IPEDS system of surveys of postsecondary institutions in the United States requires them to periodically report to the federal government information on institutional characteristics, degree completions, enrollments, human resources, finances, financial aid and graduation rates.

The annually-collected IPEDS Completions data provide comprehensive, aggregate institutional data about stages C (undergraduate degrees) and E (graduate degrees) of the education and workforce continuum.

These data are available through NSF/SRS's WebCASPAR data tool at <http://webcaspar.nsf.gov>. IPEDS variables included in WebCASPAR include institution, control (public/private), degree level, state, gender, race/ethnicity and discipline. NSF uses these data to publish special tabulations of science, engineering and health (SEH) degrees awarded in the United States (see <http://www.nsf.gov/statistics/degrees> and <http://www.nsf.gov/statistics/degrecipients>).

Graduate Enrollment—Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS)

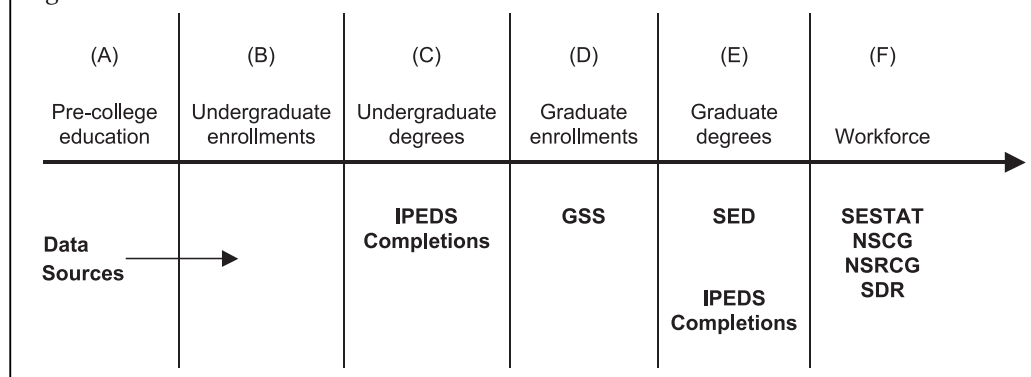
In 1962, the President's Science Advisory Committee urged that there be an increase in graduate degrees in engineering, mathematics and physical sciences. As a result, the National Science Foundation developed a traineeship program, which required institutions to submit a profile of their graduate students in the program disciplines. Over time, this grant program was phased out, but the demand for the graduate student profile still existed. SRS initiated the Survey of Graduate Students and Postdoctorates in Science and Engineering in 1972.

The GSS is currently administered annually on the number and characteristics of graduate students in science, engineering and health fields enrolled at U.S. institutions. Additionally, data are collected on postdoctorates at these

institutions, and summary information on non-faculty research personnel with doctorates. The GSS serves as the main resource for understanding stage D of the continuum.

These data are available through NSF/SRS's WebCASPAR data tool at <http://webcaspar.nsf.gov>. GSS variables included in WebCASPAR include institution, control (public/private), enrollment level and status, state, gender, race/ethnicity, discipline, and

Figure 1. Education and workforce continuum



sources and mechanisms of support. NSF regularly publishes this data in the report series “Graduate Students and Postdoctorates in Science and Engineering” (see <http://www.nsf.gov/statistics/gradpostdoc/>). A public-use file with more detailed information than in WebCASPAR can be found at

http://www.nsf.gov/statistics/srvygradpostdoc/pub_data.cfm.

For more information on this survey, see

<http://www.nsf.gov/statistics/srvygradpostdoc/>.

Doctoral Degrees—Survey of Earned Doctorates (SED)

While the IPEDS Completions survey collects institutional data on degree completions, including at the doctoral level, NSF (with sponsorship from five other federal agencies) collects individual level data on all research doctorates earned at U.S. institutions in the Survey of Earned Doctorates (SED).

The SED, started in 1957, is an annual census of all research doctorates awarded at U.S. institutions in the previous academic year. The cumulative data are stored in the Doctorate Records File (DRF). The DRF provides detailed information, gathered at the time of degree award, on educational histories, demographic characteristics and education/work plans immediately after completion of the doctorate.

These data are available through NSF/SRS’s WebCASPAR data tool at <http://webcaspar.nsf.gov>. SED variables included in WebCASPAR include doctoral and baccalaureate institution, control (public/private), state, gender, race/ethnicity, citizenship, and discipline. Additional data are available through a data license. NSF regularly publishes this data in the report series “S&E Doctorate Awards” (see <http://www.nsf.gov/statistics/doctorates/>). The interagency Summary Report which provides information on doctorate recipients in all fields can be found at <http://www.norc.org/projects/Survey+of+Earned+Doctorates.htm>. For more information on this survey, see <http://www.nsf.gov/statistics/srvydoctorates/>.

Science and Engineering Workforce—SESTAT

In 1952, NSF commissioned a study that would assist NSF in meeting its clearinghouse function in regard to human resources. The study indicated that while administrative planning was one use for information on scientific and technical manpower, statistical needs were also important in order to assess the national supply and demand for scientists and engineers.

Over time, a series of surveys were developed in order to

collect data on various subpopulations of scientists and engineers. In the early 1990s these surveys were combined into one integrated database and dissemination tool—the Scientists and Engineers Statistical Data System (SESTAT). SESTAT serves as the main resource for understanding stage F of the continuum.

The three surveys that make up SESTAT are:

1. Survey of Doctorate Recipients (SDR)—this survey, begun in 1973, covers U.S.-trained SEH doctorates. The sample for this survey is drawn from the Survey of Earned Doctorates. The SDR is a longitudinal survey, conducted every two years, which follows SEH Ph.D.s until age 76. See <http://www.nsf.gov/statistics/srvydoctoratework> for more information on this survey.

2) National Survey of College Graduates (NSCG)—this longitudinal survey covers all individuals in the U.S. who have at least a bachelor’s degree and have a degree and/or occupation in an SEH field. At the beginning of the last five decades (1960-2000), the NSCG sample was drawn from the long form of the Decennial Census and respondents were followed every two years for the remainder of the decade. Beginning in 2010, the NSCG sample will be drawn from the American Community Survey. See <http://www.nsf.gov/statistics/srvygrads> for more information on this survey.

3) National Survey of Recent College Graduates (NSRCG)—this cross-sectional survey, begun in 1976, covers the two most recent years of U.S.-trained SEH bachelor’s or master’s degree recipients. A sample of institutions is first selected, and then bachelor’s and master’s graduates in SEH fields from those institutions are sampled to be in the survey. See <http://www.nsf.gov/statistics/srvyrecentgrads> for more information on this survey.

These data are available through the SESTAT home page at <http://www.nsf.gov/statistics/sestat/>. The SESTAT database has over 1,000 variables on the employment, education and demographic characteristics of scientists and engineers. Public-use files for the integrated data and for the individual surveys in selected years are available for download, and there is also an online data tool which can be used to create tabulations. Additional data are available through a data license.

By Nirmala Kannankutty, Senior Analyst, Division of Science Resources Statistics, National Science Foundation

Nuts and Bolts of Professional Doctorates *continued from page 3*

DEST (Department of Education, Science, and Training). (2002). *Research Training in Doctoral Programs: What Can Be Learned from Professional Doctorates?* An executive summary of this report is available at:

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Note: A version of this article, and the matrix of individual professional doctorate administrative practices is available at: <http://www.gradschool.utah.edu/publications/professionaldocorate/>. Retrieved on February 21, 2009.

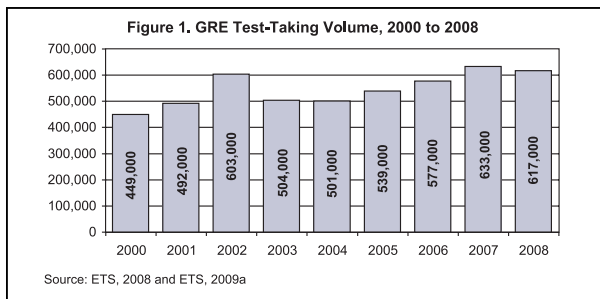
Data Sources: GRE and GMAT Test-Taking Trends

In December 2008, ETS announced that it expected GRE test-taking volume to fall in 2008, following three years of steady increases in the numbers of test-takers (ETS, 2008; Jaschik, 2008). Now, ETS has confirmed that its final numbers for 2008 show a decline to 617,000, down about 3% from 633,000 in 2007, and down 9% from ETS' initial projection of 675,000 at the start of 2008 (ETS, 2009a).

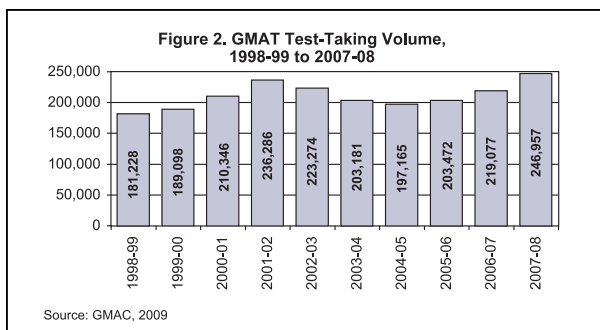
While the GRE is often required for admission to graduate school in the arts and sciences, business programs often require the GMAT (the Graduate Management Admission Test) rather than the GRE. In this article, we focus on recent trends in GRE and GMAT test-taking volumes and on the demographics of GRE and GMAT test-takers.

GRE and GMAT Test-Taking Trends

As shown in Figure 1, GRE test-taking volume reached a record high of 633,000 in calendar year 2007. The previous peak was in 2002, immediately following the last recession. Although test-taking volume dipped considerably in 2003, it grew steadily from 2005 to 2007. While test-taking volume declined slightly in 2008, the number of test-takers remains strong.



GMAT test-taking volume hit a record high of 246,957 in academic year 2007-08 (see Figure 2). Similar to the trend seen with the GRE, the previous peak was in 2001-02. Three years of declines from 2002-03 to 2004-05 were followed by three years of steady growth from 2005-06 to 2007-08.



Demographics of GRE and GMAT Test-Takers

Overall, GRE test-takers are more likely than GMAT test-takers to be women or U.S. citizens (see Table 1). Nearly six out of 10 GRE test-takers in 2006-07 were women, compared with only four out of ten GMAT test-takers. And, nearly three-quarters of the GRE test-takers in 2006-07 were U.S. citizens, compared with slightly more than half of the GMAT test-takers. Among U.S. citizens, the racial/ethnic distribution

of GRE and GMAT test-takers is similar, with one notable exception: Asian American students account for 6% of all GRE test-takers, but 11% of GMAT test-takers.

Table 1. Demographics of GRE and GMAT Test-Takers, 2006-07

	GRE	GMAT	Total Graduate Enrollment
Gender			
Male	41%	61%	41%
Female	59%	39%	59%
Citizenship			
U.S. Citizens	73%	54%	84%
Non-U.S. Citizens	27%	46%	16%
Race/Ethnicity *			
White	75%	73%	72%
African American	9%	9%	13%
Asian	6%	11%	6%
Native American	1%	1%	1%
Hispanic	6%	6%	8%
Other	4%	--	--

* U.S. citizens only.

Notes: Percents shown are for those for whom demographic data were available. Not all test-takers supplied demographic information. Graduate enrollment data are for Fall 2007.

Sources: ETS, 2009b; GMAC, 2009; and Bell, 2008

Not surprisingly, total graduate enrollment closely reflects the demographics of GRE test-takers (see Table 1), but the citizenship distribution does differ. Non-U.S. citizens comprise a larger percentage of GRE test-takers than they do total graduate enrollment. This is due in part to the higher representation of international students in programs and institution types that require the GRE for admission, but also reflects the interest of international students in studying in the United States and lower graduate school acceptance rates for non-U.S. citizens than U.S. citizens.

The difference in citizenship distribution is more pronounced when GMAT demographics are compared with the demographics of students in business programs (not shown in the table). Overall, 46% of GMAT test-takers in 2006-07 were non-U.S. citizens, yet only 18% of business students enrolled at the graduate level in Fall 2007 were non-U.S. citizens (Bell, 2008). Once again, this likely reflects lower graduate school acceptance rates for non-U.S. citizens and the international demand for U.S. graduate education.

Although the citizenship distributions of GMAT test-takers and business students vary considerably, the gender distributions do not. Women account for about 39% of all GMAT test-takers and 42% of all graduate students in business programs.

The age distributions of GRE and GMAT test-takers are similar, but different age groupings in the data prevent an exact comparison. For the GRE, 33% of test-takers in 2006-07 were under the age of 23, 48% were between 23 and 30 years old, 12% were 31 to 40, and 7% were over the age of 40. For the GMAT, 27% were under the age of 24, 53% were between 24 and 30 years old, 17% were 31 to 39, and 3% were 40 or older. The growth in the

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number of GMAT test-takers in 2006-07 was driven almost entirely by an increase in the number of test-takers under the age of 24, with a 31% increase in that age group that year, compared with a 4% increase in test-takers 24 to 30 years old, and slight declines in test-takers in the 31 to 39 and 40 and older categories.

Implications

GRE and GMAT test-taking volumes are important early indicators of first-year graduate enrollment. A sudden decrease in test-taking volume might indicate that first-year graduate enrollment could drop in the coming academic year. While the decline in GRE test-taking volume in 2008 might be seen by some as troubling, the drop follows a record high and was quite minimal at 3%. The one-year decline on its own is unlikely to significantly impact graduate enrollment in Fall 2009.

The increase in GMAT test-taking in 2007-08 is a sign that interest in graduate business programs remains strong, particularly among international students and younger applicants. When available, data for 2008-09 will shed light on whether that growth continued as the recession deepened.

Enrollment in graduate school typically increases during economic recessions, but it is still too early to know for sure what will happen in Fall 2009. During the last recession,

first-time graduate enrollment increased 5% in Fall 2001, and increased an additional 5% in Fall 2002, according to data from the *CGS/GRE Survey of Graduate Enrollment and Degrees*. Fall 2008 data from the survey, scheduled for release in early fall of this year, will provide the first national data on the affect of the current recession on graduate enrollment in 2008-09.

By Nathan E. Bell, Director, Research and Policy Analysis

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