Chapter 1

Summary of CBMS2000 Findings on Mathematical Sciences Enrollment, Bachelors Degrees, Faculty, and the Curriculum in Two- and Four-Year Colleges and Universities

A. What Do the CBMS Surveys Study?

Every CBMS survey continues longitudinal studies of fall term undergraduate enrollments in the mathematics programs of two-year colleges and in the mathematics and statistics departments of four-year colleges and universities. Every CBMS survey includes departments that offer associate, bachelors, masters, and doctoral degrees. Every CBMS survey also studies the demographics of the faculty in those programs and departments and examines the undergraduate curriculum to determine what is taught, who teaches it, and how it is taught. In addition, each CBMS survey selects a family of special topics for study.

Chapter 1 of this report, and particularly the data highlights section of Chapter 1, gives an executive summary of CBMS2000 findings on the various longitudinal issues studied since 1965, presented at a broad level of aggregation. Individual tables are discussed in more detail after the data highlights section. Chapter 2 presents CBMS2000 findings on the special topics chosen for the fall 2000 study. Subsequent chapters disaggregate Chapter 1 material. For example, Chapter 3 examines enrollment and curricular variations among four-year mathematics and statistics departments that offer bachelors, masters, or doctoral degrees as their highest degrees, and Chapter 5 contains data on individual first-year courses. Chapter 4 presents four-year faculty demographic data broken down by department type. Chapters 6 and 7 present detailed studies of curricular and personnel issues in two-year college mathematics programs.

As used in CBMS surveys, the phrase "mathematics department" is very broad and includes departments with names such as Applied Mathematics, Mathematics and Statistics, Mathematics and Computer Science, and Mathematical Sciences, as well as Mathematics. In almost all of these departments, one finds courses in mathematics and in statistics, and in some one also finds courses in operations research and computer science. In two-year colleges, the mathematics program usually offers courses in mathematics and statistics, and sometimes includes computer science courses as well. All of these course enrollments are counted as mathematical sciences enrollments and are included in the CBMS surveys, provided they are taught in a mathematics program or department. Statistics departments are included in the CBMS2000 study in separate strata, and enrollment data from statistics departments include only statistics courses. Courses taught in separate departments such as operations research, computer science, biostatistics, or developmental studies are not included in CBMS studies after 1990.

As explained in Appendix 2, the CBMS2000 survey used separate stratified random samples of three separate universes: mathematics programs in not-for-profit two-year colleges, mathematics departments in four-year colleges and universities, and statistics departments in four-year colleges and universities. Response rates were 60% for two-year college mathematics programs, 70% for four-year college mathematics departments, and 78% for statistics departments. Data collected was then used to make national projections for the entire population.

B. Fall Mathematical Sciences Enrollments Return to 1990 Level (SE.1 & SE.2)

Data from the National Center for Educational Statistics (NCES) show that between fall 1990 and fall 2000, the combined total undergraduate enrollment in the nation's two-year and four-year colleges and universities grew by about 9.4%. By contrast, the combined fall 2000 mathematical sciences enrollment in the nation's two-year college mathematics programs and in the mathematics and statistics departments of four-year colleges and universities was essentially unchanged from the level of fall 1990. (However, Section C below shows that academic year enrollment totals may have changed substantially.)

Fall term mathematics program enrollments in two-year colleges grew by about 7.5% between fall 1990 and fall 1995, reaching a high point of 1,498,000 in fall 1995. Between fall 1995 and fall 2000, mathematics program enrollments dropped back to just below their level in fall 1990. During the same ten-year period, NCES data show that overall two-year college enrollments grew by about 4.8% between fall 1990 and fall 1995, and by another 6.4% between fall

1995 and fall 2000, for a total growth of about 11.5% during the 1990–2000 decade. (See Tables SE.1 and TYR.4 for details.)

In four-year colleges and universities, the ten-year mathematical sciences enrollment trajectory was quite different. Combined mathematics and statistics department fall enrollments dropped by about 10% during the first five years of the decade and rebounded by about 11.5% during the second, ending the decade at 1,984,000, less than 1% above the level of fall 1990. (However, academic year mathematical sciences enrollments dropped below 1990 levels; see Section C below.) At the same time, total undergraduate enrollments in four-year colleges and universities grew by three tenths of one percent between fall 1990 and fall 1995, and then by about 7.3% between fall 1995 and fall 2000, for a ten-year growth of just over 7.6%. (See Table SE.1.)

Of particular interest was the decade-long growth of statistics enrollments. Fall undergraduate enrollments in statistics departments exceeded 1990 levels by 68%. Enrollments in statistics courses in two-year colleges were 37% higher than in fall 1990, as were statistics course enrollments in four-year mathematics departments.

One way to understand the relationship between CBMS data and NCES data appearing in Table SE.1 is to calculate the number of mathematics enrollments per student enrollment in a given fall term. For combined mathematics and statistics enrollments in four-year colleges and universities, the ratio gives the number of fall term enrollments in mathematics and statistics departments per student enrolled in four-year colleges or universities The ratios for fall 1990, 1995, and 2000 were, respectively, 0.293, 0.264, and 0.274. For two-year college mathematics programs, the corresponding ratios were 0.266, 0.273, and 0.237. Separate ratios for mathematics, statistics and computer science courses may be calculated from Table E.2 in Chapter 3 and NCES totals in Table SE.1 of this chapter. (The ratios for fall 2000 may need revision when firm NCES data for fall 2000 total enrollments become available.)

Where are undergraduate mathematical sciences courses taught? Once again, fall 2000 resembled fall 1990. At the beginning of the decade, two-year college mathematics programs taught about 41% of the nation's undergraduate enrollments in the mathematical sciences. By fall 1995, that percentage had risen to 46%, and between fall 1995 and fall 2000, the percentage returned to the 41% level.

C. Academic Year Totals Unchanged Since 1995–1996 and Down From 1990–1991

In making staffing decisions, colleges and universities tend to use academic year total enrollment rather than fall term enrollment. Therefore, it is important to know how fall term enrollments can be used to predict academic year totals, and recent CBMS surveys have studied that question.

The CBMS surveys of fall 1990, 1995, and 2000 asked departments to give their total enrollment for the entire preceding academic year, and for the fall term of that year. Thus, for example, CBMS2000 asked for the total 1999–2000 academic year enrollments, and for the fall 1999 enrollment in departmental undergraduate courses.

The CBMS surveys in 1990 and 1995 found that total academic year enrollment in the nation's four-year undergraduate mathematical sciences departments was almost exactly twice the fall term enrollment. The CBMS1995 report (pp. 4–5) explained the finding as follows:

"The lesser Spring semester enrollment in those institutions with a two-semester calendar is precisely balanced by those institutions on the term or quarter calendar, where the fall enrollment is substantially less than half of the academic year enrollment. Thus, a good estimate of the 1995–1996 academic year enrollment is obtained by doubling the 1995 fall totals."

The CBMS2000 survey detected a major shift in the academic-year-to-fall-term ratio. Rather than being essentially 2 as in 1990 and 1995, the ratio of combined mathematics and statistics department enrollments in academic year 1999–2000 to enrollments in fall 1999 was about 1.85. With high confidence, the ratio for 1999–2000 was different from the "almost exactly two" ratio found by previous CBMS surveys. (See the discussion of Table SE.1.) This change may be due to a large-scale shift toward the use of semester systems rather than quarter systems that can be seen in Table SE.2 of this chapter. Whatever its cause, it has ramifications for comparisons of academic year mathematical sciences enrollments in 2000–2001 with the same enrollments in 1990–1991 and in 1995–1996.

For example, under the natural assumption that the academic-year-to-fall-term ratio for 2000–2001 was not much different from what it was in 1999–2000, one sees that although undergraduate enrollments in mathematics and statistics departments of four-year colleges and universities were essentially the same in fall 2000 as they were in fall 1990, the total mathematical sciences enrollments for the 2000–2001 academic year were probably 7% lower than in the 1990–1991 academic year. Similarly, even though fall term 2000 enrollments in all mathematics and statistics departments of four-year colleges and universities were 11.5% larger than fall 1995 totals, the combined mathematics and statistics department enrollment for the 2000–2001 academic year was only about 3% larger than in academic year 1995–1996.

For mathematics departments of four-year colleges and universities considered alone, the academic-year-to-fall-term ratio was about 1.84 during the

1999–2000 academic year. Once again assuming that the academic-year-to-fall-term ratio for 2000–2001 was not much different from its 1999–2000 value, we see that 2000–2001 academic year enrollments for mathematics departments considered separately were up by about 3% from the 1995–1996 academic year, and down by about 9% from the 1990–1991 academic year.

For both statistics departments and for mathematics programs of two-year colleges, the academic-year-to-fall-term ratios were above 2. For more details about the academic-year-to-fall-term ratio, see the discussion of Table SE.1 of this chapter.

D. The Fine Structure of Fall Enrollment Changes (SE.3 & SE.5)

The overall percentage changes seen in Table SE.1 mask shifts in the types of mathematical sciences courses taken by undergraduates, and these shifts are important tools in tracking the development of the mathematical sciences curriculum.

Between 1995 and 2000, the declines in the two-year college mathematics program fall term enrollments were sharpest in mathematics and computer science courses, while statistics course enrollments actually grew. In four-year colleges and universities, mathematics course enrollments rose by about 10% between fall 1995 and fall 2000, but not uniformly. Calculus and advanced level course enrollments were up by about 6% each, while introductory level enrollments (which include Liberal Arts Mathematics as well as pre-calculus courses) were up by about 18%. Remedial level enrollments declined between 1995 and 2000, just as they had between 1990 and 1995. Fall term computer science enrollments in the mathematics departments of four-year colleges and universities rebounded from 1995 lows, but by fall 2000 had only reached 68% of their 1990 level.

Starting in 1990, statistics course fall term enrollments had a decade-long rise in two-year college mathematics programs, and in fall 2000 they were 37% higher than in fall 1990. In mathematics departments of four-year colleges and universities, total statistics enrollments were 37% higher than in fall 1990 and in statistics departments they climbed to 68% above their fall 1990 level.

Fall enrollment in the principal first-year Elementary Statistics course (having no calculus prerequisite) grew substantially between 1995 and 2000, as can be seen from the figures in Appendix I. The increase in mathematics departments was about 20% and the course enrolled about 115,000 students in fall 2000, roughly 60% as many students as enrolled in mainstream Calculus I. (See Appendix I and note that the figures in Table SE.3 for elementary-level statistics enrollments combine enrollments in several elementary courses.) Enrollment in the same Elementary Statistics course taught in statistics departments grew by about 14% between fall 1995 and fall 2000, reaching a total enrollment of about 40,000 students. Combined enrollments in the elementary statistics courses of two-year college mathematics programs stood at about 74,000 students in fall 2000, an increase of about 3% over the level of fall 1995.

Of special interest for predicting future advanced mathematics and statistics enrollment is the enrollment level in mainstream calculus courses, i.e., calculus courses that are prerequisites for upper division mathematics, statistics, and science courses. In four-year colleges and universities, fall enrollments in mainstream Calculus I declined by about 1% between 1995 and 2000. By contrast, fall enrollments in mainstream Calculus II rose by about 5%, and fall enrollments in later calculus courses increased by a surprising 18% during that five-year period (see Appendix I). In two-year colleges, enrollment in mainstream Calculus I declined by almost 9% from fall 1995 levels and stood at 53,000 in fall 2000. There were similar declines in mainstream Calculus II and III enrollments (see Table TYR.3 in Chapter 6).

Enrollments in various mathematics courses provide one way to study the nation's undergraduate mathematics curriculum. Another approach to such a study is to determine the percentage of departments that offer certain upper division courses in a given year, and Table SE.5 presents that data. Except in Number Theory, all course availability percentages in SE.5 were down from 1995 levels. Comparing Table SE.5 of this report to 1995 data suggests a growing disparity between the kind of mathematics major offered in departments with graduate programs and in departments that offer only bachelors degrees, at least in terms of the availability within a given academic year of pure mathematics courses such as Real Analysis, Geometry, and Topology.

E. Bachelors Degrees Awarded (SE.4)

CBMS surveys collect data on the number of bachelors degrees awarded during the previous twelve months (July 1 to June 30). The number of bachelors degrees awarded through the nation's mathematics and statistics departments continued its decade-long decline, dropping by about 1.2% between 1994–1995 and 1999–2000, and in 1999–2000 stood at about 92.5% of the level ten years before. But not all types of mathematical sciences bachelors degrees declined. For example, the number of mathematics education degrees rose by 55% between 1990 and 1995, and then by another 3% between 1995 and 2000. Between 1995 and 2000 there was a noticeable increase in the number of computer science degrees and the number of joint degrees in mathematics and computer science awarded through mathematics departments. In addition, the number of "other undergraduate degrees" awarded through mathematics departments rose

sharply, but the precise nature of these other mathematics degrees is unknown.

The percentage of women among all recipients of bachelors degrees awarded through mathematics and statistics departments rose to almost 43.5%, the highest percentage in the decade. Table E.1 in Chapter 3 provides details about components of that overall percentage, e.g., the percentage of women among recipients of degrees from statistics departments, and the percentage of women among mathematics education bachelors recipients.

F. Faculty Size — A Shift to Temporary Faculty (SF.6)

In two-year colleges, full-time faculty members are divided into those on the permanent staffing chart and those who are temporary. The size of the full-time mathematics program faculty grew by 2% between fall 1995 and fall 2000 even though mathematics program enrollments decreased during the same period. But there was a shift from permanent to temporary faculty: the number of permanent full-time faculty in two-year mathematics programs decreased by about 8% while the number of temporary full-time faculty increased almost six-fold.

Recent CBMS surveys have divided full-time faculty in four-year colleges and universities into tenured, tenure-eligible, and other full-time faculty. The latter category includes visitors, post-docs, and non-tenure-track instructors, for example. In four-year mathematics departments, between 1995 and 2000 the size of the total full-time and part-time faculty more or less kept pace with the growth of undergraduate fall enrollments (and probably outpaced the growth in academic year enrollments). As Table SF.6 shows, the size of the full-time faculty (including tenured, tenure-eligible, and other full-time) grew by about 4%. However, as Table F.2 of Chapter 5 shows, the composition of the national mathematics faculty changed markedly. The number of tenured faculty declined by about 3% between 1995 and 2000, and the number of tenure-eligible faculty declined by 6%. At the same time, the number of other full-time faculty increased by 65% and the number of part-time faculty rose by 35%. Clearly, a shift toward temporary faculty occurred in the mathematics departments of four-year colleges and universities.

As Table F.3 in Chapter 4 shows, a more serious situation developed in statistics departments. Between 1995 and 2000, the number of full-time faculty grew by 3% and the number of part-time faculty dropped by a third, so that the size of the faculty did not keep pace with the 14% fall enrollment increase between 1995 and 2000 (and certainly not with the even larger academic year enrollment increase in statistics departments). The 3% growth in the number of full-time faculty hid a 3% decline in the number of tenured statistics faculty and a 16% decline in the number of tenure-eligible statistics faculty, coupled with a more than doubling of the number of other full-time faculty. As in mathematics departments, there was a definite shift toward temporary faculty in statistics departments.

G. Gender and Ethnicity of the Mathematical Sciences Faculty (SF.8–SF.12)

In fall 2000, about 49% of permanent full-time faculty in two-year college mathematics programs were women, up nine percentage points between fall 1995 and fall 2000. Although precise comparison with 1995 results is not possible, it appears that the percentage of women among younger permanent faculty in two-year college mathematics programs dropped below the percentage of women among all permanent full-time faculty for the first time in ten years.

The percentage of women among the full-time faculty of mathematics departments in four-year colleges and universities rose continuously between 1980 and 2000 and reached 24.6% in fall 2000. That figure is approximately the same as the percentage of women (24.8%) among mathematics doctoral recipients during the five years between 1995 and 2000 found in Table SF.8 of this chapter. Among tenured mathematics department faculty, in fall 2000 the percentage of women stood at about 17%. The percentage of women among tenure-eligible faculty was 31%, down three percentage points from 1995 levels.

The percentage of women in statistics departments was considerably lower than in mathematics departments, standing at 18% in fall 2000. However, that percentage was up by seven percentage points between 1995 and 2000. In fall 2000, about 34% of tenure-eligible statistics faculty members were women.

Two-year college mathematics programs saw only marginal changes in the ethnic and racial composition of their permanent full-time faculty between fall 1995 and fall 2000, as Table TYR.27 in Chapter 7 shows. However, among faculty less than 40 years old, there was a slight decrease in the percentage of full-time permanent faculty who were white and non-Hispanic, but the comparison is complicated by a corresponding increase in the percentage of faculty whose race and ethnicity were unknown.

The CBMS2000 survey found some changes in the racial and ethnic composition of the full-time mathematical sciences faculty in four-year colleges and universities during the preceding five years. There were two point increases in the percentage of Asians and Hispanics in mathematics departments of four-year colleges and universities, and a six point decline in the percentage of white males, coupled with a three point increase in the percentage of white females. In statistics departments, the percentage of Hispanics

dropped markedly, and the percentage of white males among the full-time statistics faculty dropped by three points, while the percentage of white women grew from 8% to 13%.

H. Who Teaches Mathematical Science Courses? (SF.17, SFY.18, and SFY.19)

Following the pattern of CBMS1995, the CBMS2000 survey investigated the percentage of enrollment in various types of courses taught by tenured or tenure-eligible faculty, other full-time faculty, part-time faculty, and graduate teaching assistants. Also following the pattern of earlier CBMS reports, CBMS2000 made the assumption that all upper-level courses were taught by tenured and tenure-eligible faculty. As explained in the discussion of Table SF.17, the existence of an unknown instructor column in CBMS2000 data makes comparisons with CBMS1995 more difficult, but some conclusions are clear, and are consistent with the shift toward temporary faculty reported above.

In mathematics departments of four-year colleges and universities, there was an increase in the percentage of enrollments taught by part-time faculty and by other full-time faculty (i.e., those full-time faculty who are not tenured and not tenure-eligible). There was a substantial decrease in the percentage of enrollment taught by tenured and tenure-eligible faculty, and it is likely that there was also a drop in the percentage of enrollment taught by graduate students. The same pattern existed in statistics departments. In mathematics programs of two-year colleges, the percentage of sections (not of enrollments) taught by full-time faculty members decreased, with a corresponding increase in the percentage of sections taught by part-time faculty.

The mainstream calculus courses are of particular interest to four-year departments because of their gateway role for mathematics, statistics, and science majors. Even in these crucial courses, between fall 1995 and fall 2000 the percentage of enrollment taught by tenured and tenure-eligible faculty decreased. In addition, the percentage of enrollment in mainstream calculus taught by graduate teaching assistants remained essentially at 1995 levels. By contrast, in two-year colleges, 85% of mainstream Calculus I sections were taught by full-time faculty in fall 2000.

In mathematics departments of four-year colleges and universities, the percentage of enrollment in the Elementary Statistics course (no calculus prerequisite) taught by tenured and tenure-eligible faculty declined by between ten and twenty percentage points from 1995 levels, while in statistics departments the decline was between five and eleven percentage points. In fall 2000, at least 45% of elementary statistics course enrollments in mathematics departments were taught by tenured and tenure-eligible faculty, while in statistics departments the percentage was perhaps ten points lower.

Mathematics programs of two-year colleges also saw a shift toward teaching by temporary faculty. The percentage of sections taught by part-time faculty rose five percentage points to 46% in fall 2000. In addition, among full-time faculty in two-year college mathematics programs, there was an 8% decline in the number of permanent full-time faculty, coupled with a six-fold increase in temporary full-time faculty (see Table TYR.24).

I. The Spread of Calculus Reform Among First-Year Courses (SFY.20–SFY.25)

Tracking the spread of the calculus reform movement has become more difficult now that almost every textbook publisher advertises almost all calculus books as reflecting the best of calculus reform ideas. However, one can still study the spread of new pedagogies advocated by the reform movement. Five reform pedagogies were studied by CBMS2000: the use of graphing calculators, writing assignments, computer assignments, group projects, and meeting at least once per week in a context that required student computer use.

In fall 2000, two-year college mathematics programs were far more likely to use the first four of those reform pedagogies in teaching calculus than were four-year college and university mathematics departments. Among four-year mathematics departments, graphing calculators and computer assignments were very widely used in fall 2000, but in those same departments the use of writing assignments and group projects did not grow much between fall 1995 and fall 2000, and in some situations actually declined.

Calculus reform influenced the teaching of courses other than calculus. CBMS2000 examined the use of the same five reform pedagogies in the teaching of the first-year Elementary Statistics course (no calculus prerequisite). The CBMS1995 report gives data on the use of computer assignments in the Elementary Statistics course in fall 1995. CBMS2000 data show that by fall 2000, the use of computer assignments in the Elementary Statistics course declined in mathematics departments of four-year colleges and universities, remained unchanged in the mathematics programs of two-year colleges, and increased slightly from 1995 levels in statistics departments. No historical data exist on the use of the other four reform pedagogies in the Elementary Statistics course. However, CBMS2000 data allow comparisons between pedagogical practices in mathematics departments, mathematics programs, and statistics departments. The data show that faculty members in statistics departments were considerably more interested in using computer assignments and in weekly meetings

where students use computers than were their colleagues in mathematics departments or programs. On the other hand, mathematics departments tended to use writing assignments to a greater degree.

TABLES SE.1 and SE.2: ENROLLMENTS IN TWO-YEAR AND FOUR-YEAR MATHEMATICS AND STATISTICS PROGRAMS AND DEPARTMENTS

A. Overall Fall Undergraduate Enrollments Return to 1990 Levels

By fall 2000, combined enrollments in mathematics and statistics departments and mathematics programs in two- and four-year colleges and universities had rebounded from their 1995 low and ended the decade essentially where they started it. Viewed separately, both the mathematics programs in two-year colleges and the mathematics and statistics departments in four-year colleges and universities returned to 1990 enrollment levels by fall 2000, but by very different ten-year paths.

Two-year college mathematics program enrollment began the decade at 1,393,000 in fall 1990, rose by about 8% by fall 1995, and then declined. By fall 2000, mathematics program enrollment in two-year colleges was about one-half of one percent below its 1990 level. By contrast, fall enrollments in the mathematics and statistics departments of all four-year colleges and universities (i.e., including departments that give bachelors degrees as well as possibly higher degrees) began at 1,970,000 in fall 1990 and then declined by about 10% between 1990 and 1995. CBMS2000 found an increase from 1995 levels, and the estimated combined fall term enrollment in mathematics and statistics departments of all four-year schools was about seven-tenths of one percent higher than the fall 1990 level. (These enrollment figures include computer science courses provided they were taught by a mathematics or statistics department or program.)

In 1990, two-year college mathematics programs taught about 41% of all mathematical sciences enrollments in the U.S. By 1995, that percentage had risen to 46%, and between 1995 and 2000 the percentage returned to the 41% level seen ten years before.

B. Comparison to NCES Total Enrollment Figures

Enrollment changes in mathematics programs of two-year colleges and in mathematics and statistics departments of four-year colleges and universities must be viewed in the context of overall undergraduate enrollments. The National Center for Educational Statistics (NCES) is a federal agency that collects and publishes national educational statistics for the fall term of each academic year, and the bottom half of Table SE.1 presents NCES data taken from Table 5-1 of the NCES report *Condition of Education 2001* that can be located at the Internet address http://nces.ed.gov/programs/coe/2001/section1/tables/t05_1.html.

The NCES figures show that between 1990 and 1995 there was a 4.8% increase in two-year college fall enrollments, and at the same time CBMS1995 figures show that there was a 7.5% increase in enrollments in the mathematics programs of two-year colleges. Between fall 1995 and fall 2000, NCES projects that there was a 6.4% increase in total two-year college enrollments, while CBMS data show a decline of almost 7.5% in mathematics program enrollments.

In four-year colleges and universities, NCES data show an increase in fall undergraduate enrollments that was slightly less than three-tenths of one percent between fall 1990 and fall 1995. During that same period, CBMS data show a drop of almost 10% in mathematics and statistics department enrollments. Between fall 1995 and fall 2000, NCES projects an increase of 7.3% in total four-year college and university undergraduate enrollments, while CBMS data show an increase of about 11.5% in mathematics and statistics department enrollments.

Clearly, in both two-year colleges and in four-year colleges and universities, something other than the general enrollment level was driving enrollment changes in the mathematical sciences during the decade of the 1990s.

C. Separate Enrollment Trends in Undergraduate Mathematics, Statistics, and Computer Science Courses

Table SE.1 allows us to study undergraduate mathematics, statistics, and computer science enrollments separately. Recall that CBMS2000 considered only those computer science enrollments taught in mathematics programs of two-year colleges and in mathematics and statistics departments of four-year colleges and universities.

In two-year colleges, fall term mathematics course enrollments reached a high point in 1995 and fell by about 8% in the following five years. In fall 2000, they stood about 3% above the levels of 1990. Fall mathematics enrollments in four-year colleges and universities rose from their 1995 lows and in fall 2000 were 99.6% of their fall 1990 levels.

The CBMS surveys in 1990, 1995, and 2000 found growth in statistics enrollments in each five-year period and in each type of program or department surveyed. In two-year colleges, fall term statistics enrollments rose at a much slower pace between 1995 and 2000 than between 1990 and 1995, and by fall 2000 stood about 37% above their levels in 1990. Combined fall enrollments in statistics courses in the mathematics and statistics departments of four-year institutions grew steadily and in fall 2000 exceeded 1990 levels by about 45%. As Table E.2 in Chapter

3 shows, fall statistics enrollments in the nation's mathematics departments rose by almost 20% between 1995 and 2000, and statistics enrollments in statistics departments rose by about 14% during that same five-year period.

As noted above, recent CBMS surveys include certain computer science enrollments. The computer science enrollments in two-year colleges given in Table SE.1 are somewhat difficult to interpret. The estimates for 1990 (and before) include all computer science courses, whether or not they were taught within the mathematics program, but starting in 1995 only those computer science enrollments taught in the mathematics program were counted. That may be a partial explanation for the substantial computer science enrollment decrease between 1990 and 1995. Computer science enrollments in two-year college mathematics programs dropped even further between 1995 and 2000. This was probably due to the continued migration of computer science courses into their own programs, separate from the mathematics programs in two-year colleges.

Between 1990 and 1995, fall term computer science enrollments in four-year college and university mathematics departments dropped by about 45%. Between fall 1995 and fall 2000, there was a 24% increase, but computer science enrollments in mathematics departments remained more than 30% below the levels of fall 1990. The vast majority of these enrollments were in masters and bachelors schools.

TABLE SE.1 Enrollment (in 1000s) in undergraduate Mathematics, Statistics, and Computer Science courses taught in Mathematics Departments and Statistics Departments of four-year colleges and universities, and in Mathematics Programs of two-year colleges. Also NCES data on total Fall enrollments in two-year colleges and four-year colleges and universities: Fall 1980, 1985, 1990, 1995, and 2000.

	Four-Year College & University Mathematics & Statistics Departments							Two-Year College Mathematics Programs				
	Fall					2000 by Dept		Fall				
	1980	1985	1990	1995	2000	Math	Stat	1980	1985	1990	1995	2000
Mathematics	1525	1619	1621[1]	1471[1]	1614	1614	--	925	900	1241	1384	1273
Statistics	147	208	169	208	245	171	74	28	36	54	72	74
Computer Science	na	na	180	100	124	123	1	95[3]	98[3]	98[3]	43[3]	39[3]
Total	1672[2]	1827[2]	1970	1779	1984	1909	75	1048	1034	1393	1498	1386
NCES Total Fall Enrollment 2-yr								4526	4531	5240	5493	5847[4]
NCES Total Fall Enrollment 4-yr	5949	6066	6719	6739	7232[4]							
NCES Total Fall Enrollment 2-yr + 4-yr	10475	10597	11959	12232	13079[4]							

[1] These totals include approximately 2000 mathematics enrollments taught in Statistics Departments.

[2] 1980 and 1985 totals do not include Computer Science enrollments in Mathematics Departments.

[3] Computer Science totals in two-year colleges before 1995 include estimates of CS courses taught outside of the Mathematics Program. Starting with 1995, only those CS courses taught in the Mathematics Program are included.

[4] NCES Fall enrollment figures for Fall 2000 are projections "based on data through 1997 and middle alternative assumptions concerning the economy." Source: "Condition of Education 2001" report, Participation in Education Table 5-1 located at http://nces.ed.gov/programs/coe/2001/section1/tables/t05_1.html.

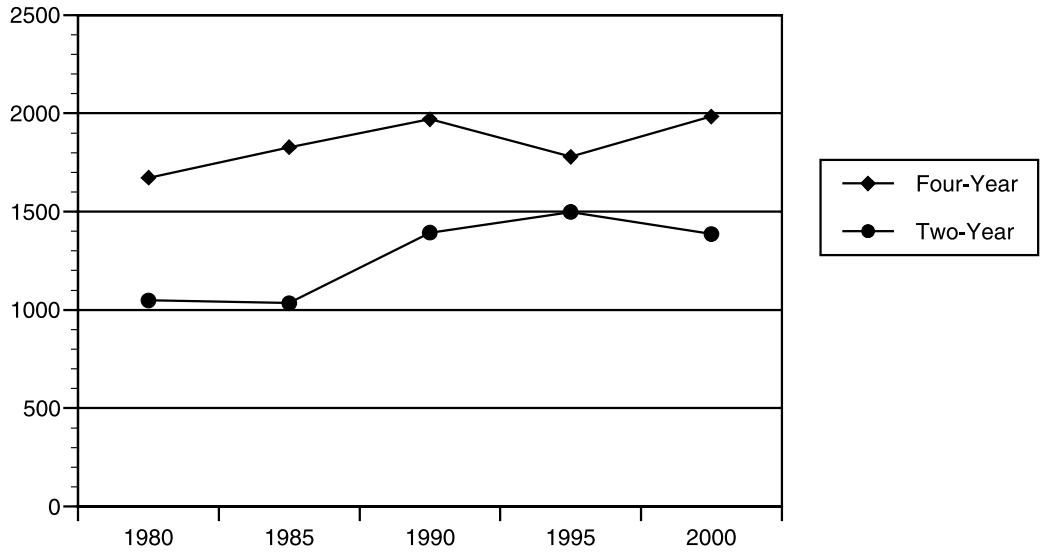

FIGURE SE.1.1 Combined enrollment (in 1000s) in undergraduate Mathematics, Statistics, and Computer Science courses at four-year colleges and universities in Mathematics Departments and Statistics Departments, and in Mathematics Programs of two-year colleges: Fall 1980[1], 1985[1], 1990, 1995[2], and 2000[2].

[1] 1980 and 1985 totals do not include Computer Science enrollments in Mathematics and Statistics Departments.
[2] Before 1995, two-year enrollments include Computer Science enrollments taught outside of the Mathematics Program.

D. Estimating Academic Year Enrollment Figures From Fall Enrollments

Since 1965, the CBMS surveys have studied enrollments in the fall term, thereby following the NCES pattern. Using fall figures to estimate total annual enrollments is tricky, because for some schools, fall semester is half of the academic year, while for others fall term is one third of the year.

Consequently, the 1990 and 1995 CBMS surveys included summary questions concerning total enrollments in all terms of the preceding academic year, in an effort to determine how to estimate total academic year enrollments from fall enrollments. In both 1990 and 1995, the surveys found that total undergraduate mathematical sciences enrollment in four-year colleges and universities (i.e., the combined enrollment in mathematics and statistics departments) for the entire academic year was almost exactly twice the total fall term enrollment.

The CBMS2000 survey repeated the study of annual v. fall term enrollments, asking about total mathematical sciences enrollments in the fall term of 1999 and in the entire 1999–2000 academic year. It found a substantial change, estimating the ratio of academic-year to fall-term enrollments (AY/FT) for four-year mathematics and statistics departments combined to be 1.85 (with standard error SE = 0.03) rather than 2. We do not have SE values for the combined mathematics and statistics department AY/FT ratio in 1994–1995, but if we make the reasonable assumption that the 1994–1995 AY/FT ratio had about the same SE value as the 1999–2000 figure, then there is little doubt that a real change in the AY/FT ratio occurred during the last five years of the decade.

For mathematics departments considered separately, the 1999–2000 AY/FT ratio is estimated to be 1.84 with SE = 0.03. (The ratio was 1.81, 1.91, and 1.81 for doctoral, masters, and bachelors departments respectively.) Statistics departments seem to have quite a different enrollment pattern during the academic year. Their AY/FT ratio for the 1999–2000 academic year was 2.18 with SE = 0.05. The marked

difference between the AY/FT ratios for four-year mathematics and statistics departments separately did not have much impact on the combined AY/FT ratio because four-year mathematics department enrollments were more than twenty times the size of statistics department enrollments.

No historical data exist on the AY/FT ratio for two-year college mathematics programs before CBMS2000. For future reference, the two-year college AY/FT ratio was 2.01 with SE = 0.04 in the 1999–2000 academic year.

Why was the AY/FT ratio almost exactly 2 in 1990 and 1995, and why did it change? The CBMS1995 report suggested that the AY/FT ratio was almost exactly 2 because second semester enrollment declines in semester system schools were almost exactly offset by the fact that in non-semester schools, the fall term had much less than half of the entire academic year enrollments. That explanation is consistent with the observed decrease in the AY/FT ratio found by CBMS2000 because Table SE.2 shows clearly that both two-year colleges and four-year colleges and universities moved steadily toward the use of a semester system between 1995 and 2000, with the result that we would expect the AY/FT ratio to decline.

The decreases in the AY/FT ratios have important ramifications for estimating academic year enrollments. Consider the combined mathematics and statistics department enrollments in four-year colleges and universities. In 1990 and 1995, that AY/FT ratio was almost exactly 2, and in 2000 the ratio was 1.85. Table SE.1 shows that the combined four-year mathematics and statistics department enrollment in fall 2000 was 11.5% higher than in fall 1995. If we make the reasonable assumption that the AY/FT ratio for 2000–2001 was very close to the ratio for 1999–2000, then the combined four-year mathematics and statistics department academic year enrollment in 2000–2001 probably was only 3% higher than the combined academic year enrollment in 1995–1996. Similarly, while Table SE.1 shows that combined four-year mathematics and statistics fall 2000 enrollments essentially returned to their fall 1990 level, the change in the AY/FT ratio means that the total academic year enrollments in 2000–2001 were actually about 7% lower than the total academic year enrollments in 1990–1991.

TABLE SE.2 Number and percentages of four-year and two-year schools with various types of academic calendars: Fall 1995 and 2000.

	Four-Year Colleges & Universities				Two-Year Colleges			
Type of calendar	Fall 1995		Fall 2000		Fall 1995		Fall 2000	
Semester	1072	(77%)	1329	(89%)	747	(73%)	981	(93%)
4-1-4	184	(13%)	75	(5%)	0	(0%)	0	(0%)
Trimester	4	(0%)	21	(1%)	0	(0%)	2	(0%)
Quarter	109	(8%)	53	(4%)	266	(26%)	66	(6%)
Other	27	(2%)	12	(1%)	10	(1%)	4	(0%)
Total	**1396**	**(100%)**	**1490**	**(100%)**	**1023**	**(100%)**	**1053**	**(100%)**

TABLE SE.3: HISTORY OF FALL UNDERGRADUATE ENROLLMENTS

A. Notes on the Table

Table SE.3 presents longitudinal data on enrollments in mathematics departments and statistics departments in four-year colleges and universities, and in mathematics programs of two-year colleges. As noted above, the term "mathematics department" is used broadly, to include departments with names such as Mathematical Sciences, Applied Mathematics, Mathematics and Computer Science, or Mathematics and Statistics, as well as Mathematics. Statistics departments that are organizationally distinct from mathematics departments were surveyed as a separate universe, as were two-year college mathematics programs. Separate computer science departments were not included in the CBMS2000 survey.

Statistics courses and computer science courses are often taught in mathematics departments of four-year colleges and universities, particularly in colleges and universities that do not have separate departments in these subjects. As with the CBMS1995 survey, CBMS2000 included these courses and enrollments as part of the curriculum of the mathematics department in which they were offered. Table SE.3 separately describes courses in mathematics, statistics, and computer science taught in mathematics and statistics departments.

Table SE.3 divides courses into levels, following the pattern of previous CBMS surveys. Because the curriculum differs so much between, say, two-year college mathematics programs and four-year college mathematics departments, the level called "remedial" does not mean the same thing in both types of departments. For a listing of the course names in each level in each type of department, see Appendix I (for four-year mathematics and statistics departments) and see Table TYR.3 in Chapter 6 for a listing of courses and levels in two-year colleges. Alternatively, see the three separate questionnaires that are reproduced in Appendices IV, V, and VI of this report.

B. Mathematics Course Enrollments: Two-Year Colleges Down, Four-Year Colleges Up

Between 1995 and 2000, fall term mathematics course enrollments in two-year college mathematics programs decreased by about 8%. That decrease was far from uniform. Enrollments in calculus level courses in two-year colleges dropped by almost 18%, while enrollments in remedial level courses declined by less than 5%. The category called "Other two-year mathematics courses" — which is a potpourri of courses such as Linear Algebra, Mathematics for Liberal Arts, Business Mathematics, and Technical Mathematics (but not including statistics) — dropped by almost 19%. However, compared to 1990, total fall 2000 mathematics course enrollments in two-year colleges were about 3% above their level a decade before.

Fall term mathematics course enrollments in four-year mathematics departments grew by almost 10% from 1995 to 2000 and came very close to matching the levels reached in 1990. Once again, the enrollment changes varied from one course level to another. Remedial level enrollments actually declined slightly. Introductory level enrollments, which include Liberal Arts Mathematics as well as pre-calculus courses, increased by almost 18% from 1995 levels, while calculus level and advanced level enrollments rose by about 6% each. When compared to enrollments in fall 1990, all levels except the introductory level were down substantially in fall 2000, while introductory level enrollments were up by 22%.

The fine structure of the changes in introductory level and calculus level enrollments may be important to understand. What CBMS2000 calls "introductory level mathematics courses" were called "pre-calculus level" in previous CBMS surveys, although the courses belonging to this category have not changed much over time. As can be seen from the course-by-course data in Appendix I, in fall 2000 only about 53% of introductory level enrollments were in courses designed to prepare students for calculus (namely College Algebra, Trigonometry, Algebra and Trigonometry, and Elementary Functions) while in fall 1995 the corresponding figure was 60%. Enrollment in these truly pre-calculus courses rose by about 5% from 1995 levels. By contrast, enrollment in the rest of the introductory level courses (which include Liberal Arts Mathematics, Finite Mathematics, Business Mathematics, and Mathematics for Elementary School Teachers) grew by about 37% between 1995 and 2000.

Calculus level enrollments include sophomore level courses such as Differential Equations, Discrete Mathematics, and Linear Algebra as well as mainstream calculus (i.e., those calculus courses that can serve as prerequisites for upper level mathematics courses) and non-mainstream calculus (all other calculus courses). The roughly 6% growth in calculus level enrollments between 1995 and 2000 was composed of a roughly 4% increase in mainstream calculus enrollments, a 3% increase in non-mainstream calculus, and a 12% increase in the other calculus level courses. It is also interesting to note that fall term mainstream Calculus I enrollments were unchanged between fall 1995 and fall 2000, while fall term mainstream Calculus II enrollments were up by 5% and fall term mainstream Calculus III and IV enrollments rose by 18% over fall 1995 levels. The surprising increases in mainstream Calculus II, III, and IV and in courses such as Linear Algebra, Discrete Mathematics, and Differential Equations may predict increases in upper division mathematics and statistics enrollments after 2000.

C. Statistics Enrollments Rise

Statistics course enrollments rose between fall 1995 and fall 2000, and rose markedly since fall 1990 in every type of institution surveyed. Two-year colleges saw the smallest increase after 1995 — only about 3% — while the mathematics and statistics departments of four-year colleges and universities both saw double-digit increases in their statistics course enrollments. Compared to 1990, fall 2000 statistics course enrollments in two-year colleges and in mathematics departments of colleges and universities rose by 37%, while the increase in statistics departments was 68%. These increases in statistics department enrollments make it harder to understand the marked decline in

TABLE SE.3 Enrollment (in 1000s) by course level in undergraduate Mathematics, Statistics, and Computer Science courses taught in Mathematics and Statistics Departments at four-year colleges and universities, and in Mathematics Programs at two-year colleges: Fall 1980, 1985, 1990, 1995, and 2000.

	Fall enrollment (in 1000s)												
	Four-Year College & University								Two-Year College Mathematics Programs				
	Mathematics Departments					Statistics Departments							
Course level	1980	1985	1990	1995	2000	1990	1995	2000	1980	1985	1990	1995	2000
Mathematics courses													
Remedial	242	251	261	222	219	--	--	--	441	482	724	800	763
Introductory (incl. Precalc)	602	593	592	613	723	--	--	--	180	188	245	295	274
Calculus	590	637	647	538	570	--	--	--	86	97	128	129	106
Advanced	91	138	119	96	102	--	--	--	0	0	0	0	0
Other (2-year)									218	133	144	160	130
Total Math courses	**1525**	**1619**	**1619**	**1469**	**1614**	**--**	**--**	**--**	**925**	**900**	**1241**	**1384**	**1273**
Statistics courses													
Elementary	na	na	87	115	136	30	49	54	28	36	54	72	74
Upper level	na	na	38	28	35	14	16	20	0	0	0	0	0
Total Stat courses	**na**	**na**	**125**	**143**	**171**	**44**	**65**	**74**	**28**	**36**	**54**	**72**	**74**
CS courses													
Lower level	na	na	134	74	90	0	1	1	95	98	98	43[1]	39[1]
Middle level	na	na	12	13	17	0	0	0	0	0	0	0	0
Upper level	na	na	34	12	16	0	0	0	0	0	0	0	0
Total CS courses	**na**	**na**	**180**	**99**	**123**	**0**	**1**	**1**	**95**	**98**	**98**	**43[1]**	**39[1]**
Grand Total	**na**	**na**	**1924**	**1711**	**1908**	**44[2]**	**66[2]**	**75**	**1048**	**1034**	**1393**	**1499**	**1386**

[1] Computer Science enrollment in 1995 and 2000 includes only courses taught in Mathematics programs. For earlier years it also includes estimates of Computer Science taught outside of the Mathematics program.

[2] These totals were adjusted to remove certain mathematics enrollments included in Statistics totals in 1990 and 1995.

the number of statistics department faculty between 1995 and 2000, as shown in Table F.3 of Chapter 4.

D. Computer Science Enrollments

Fall term computer science enrollments in two-year college mathematics programs dropped over 9% between 1995 and 2000. Because CBMS1990 figures include computer science enrollments taught outside of the mathematics program as well as within it, while later enrollment figures include only those computer science courses taught in mathematics, it is not meaningful to compare two-year college computer science enrollment figures from fall 2000 with the figures from fall 1990.

Table SE.3 shows that there were about 123,000 enrollments in computer science courses taught in the mathematics departments of four-year colleges and universities. These enrollments were primarily in bachelors and masters level departments as Table E.10 in Chapter 3 shows. Fall 2000 computer science enrollment grew substantially from 1995 levels, but reached only 68% of 1990 levels.

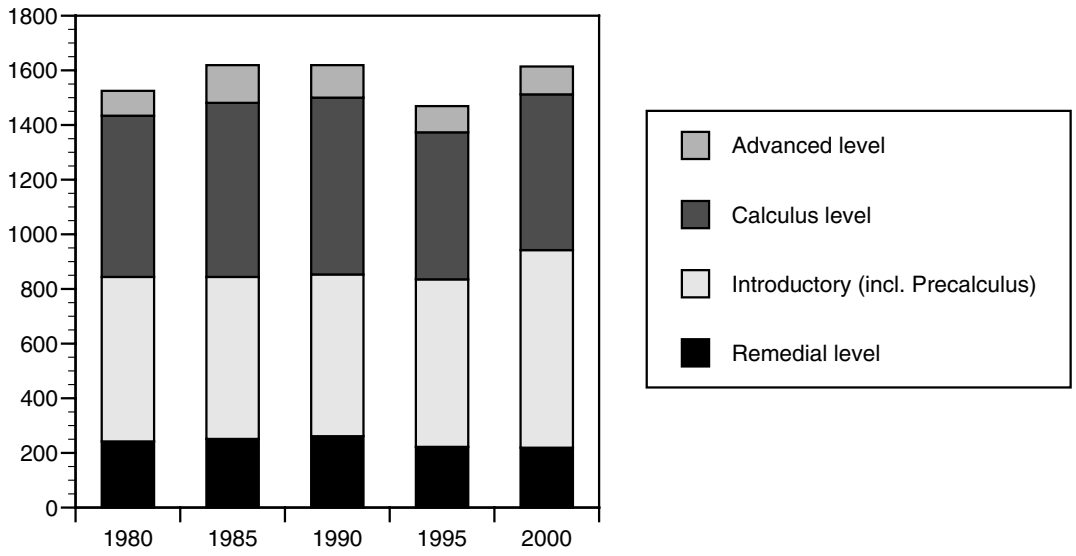

FIGURE SE.3.1 Enrollment (in 1000s) in undergraduate Mathematics courses in Mathematics Departments of four-year colleges and universities, by level of course: Fall 1980, 1985, 1990, 1995, and 2000.

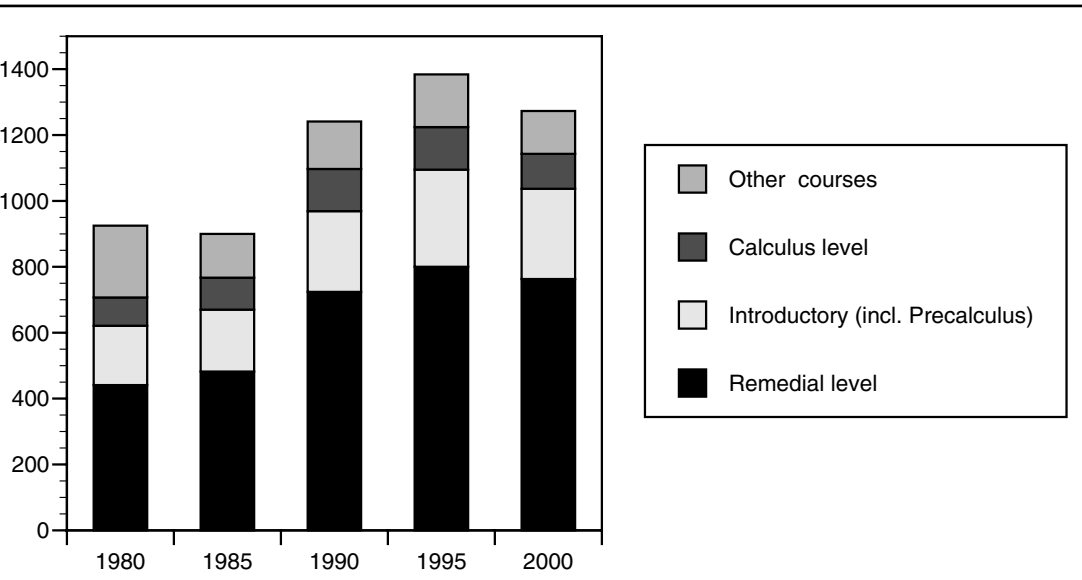

FIGURE SE.3.2 Enrollments (in 1000s) in Mathematics courses in two-year college Mathematics Programs by level of course: Fall 1980, 1985, 1990, 1995, and 2000.

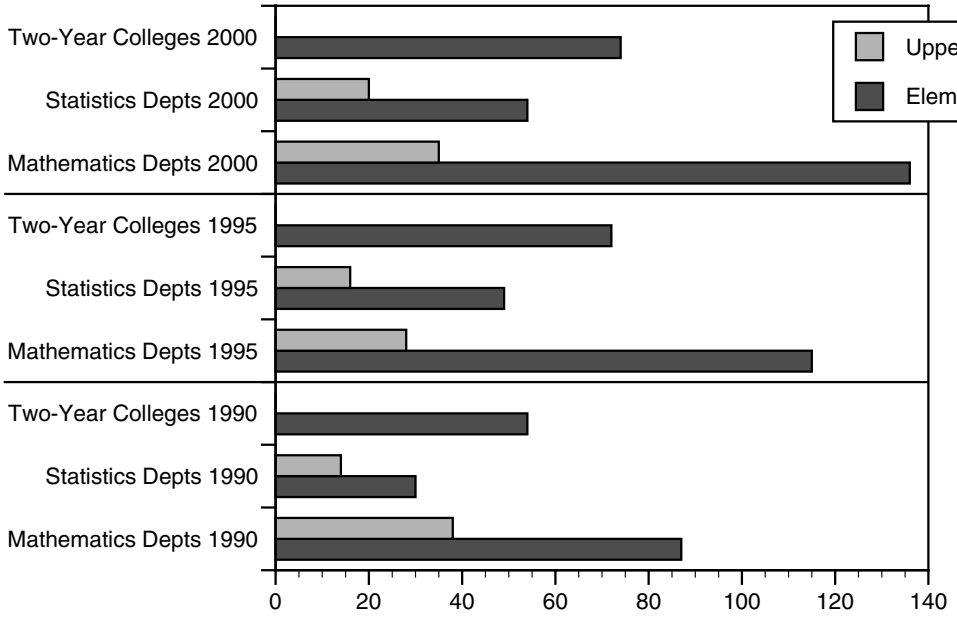

FIGURE SE.3.3 Enrollments (in 1000s) in Statistics courses in two year college Mathematics Programs, and in Mathematics Departments and Statistics Departments of four-year colleges and universities: Fall 1990, 1995, and 2000.

TABLE SE.4: BACHELORS DEGREES AWARDED

A. Trends in the Total Number of Bachelors Degrees Awarded

Following the pattern of previous CBMS surveys, the CBMS2000 survey asked about the number of bachelors degrees awarded by mathematics and statistics departments in colleges and universities during the preceding twelve months, in this case July 1, 1999 to June 30, 2000. The total number of bachelors degrees awarded by those departments continued its decline from the levels of 1989–1990, although the decline between 1994–1995 and 1999–2000 (about 1.2%) was smaller than the drop between 1989–1990 and 1994–1995 (over 6%). The overall number of bachelors degrees granted through mathematics and statistics departments in 1999–2000 stood at about 92.5% of its level ten years earlier.

The number of mathematics education degrees grew slightly from 1995 levels. The percentage of mathematics education degrees among all bachelors degrees granted by mathematics and statistics departments grew between 1990 and 2000, rising from about 13% of the total in 1989–1990 to 22% in 1999–2000. Almost all of that growth occurred during the first five years of the decade.

The number of bachelors degrees in computer science awarded through mathematics departments rose about 21% from its 1994–1995 level, but still remained substantially below the corresponding number awarded in 1989–1990.

Table SE.4 shows that between 1994–1995 and 1999–2000, there was a surprising increase in the number of mathematics bachelors degrees that departments classified as "Other tracks" in the department. It would be interesting to know details about these other degrees because in 1999–2000, almost 8% of all mathematics bachelors degrees belonged to that category.

B. Percentage of Degrees Awarded to Women

The percentage of women among all bachelors degree recipients in mathematics and statistics departments grew from 41.9% in 1994–1995 to 43.4% in 1999–2000, its highest level in the decade. Among recipients of computer science bachelors degrees awarded by mathematics departments, the percentage of women grew from about 19% in 1994–1995 to about 24% in 1999–2000. Comparing Table E.1 in Chapter 3 of this report with the corresponding table (in Chapter 2) in the 1995 report shows that the percentage of women among recipients of mathematics education bachelors degrees rose from 49% in 1994–1995 to 59% in 1999–2000.

TABLE SE.4 Number of bachelors degrees in Mathematics and Statistics Departments at four-year colleges and universities (combined) between July 1 and June 30 in 1979-80, 1984-85, 1989-90, 1994-95, and 1999-2000 by selected majors and by gender for totals in 1989-90, 1994-95, and 1999-2000.

Major	1979-80	1984-85	1989-90	1994-95	1999-2000
Mathematics (except as reported below)	11541	13171	13303	12456	10759
Mathematics Education	1752	2567	3116	4829	4991
Statistics (except Actuarial Science)	467	538	618	1031	502
Actuarial Mathematics & Statistics	146	na	245	620	425
Operations Research	na	312	220	75	43
Joint Mathematics & Computer Science	na	2519	960	453	876
Joint Mathematics & Statistics	na	121	124	188	196
Other	0	9	794	502	1507
Total Mathematics, Statistics & joint degrees	**13906**	**19237**	**19380**	**20154**	**19299**
Number of women	na	na	8847	9061	9017
Computer Science degrees	**na**	**8691**	**5075**	**2741**	**3315**
Number of women	na	na	1584	532	808
Total degrees	**na**	**27928**	**24455**	**22895**	**22614**
Number of women	**na**	**na**	**10431**	**9593**	**9825**

Note: For more detailed information about numbers of majors see Table E.1 in Chapter 3.

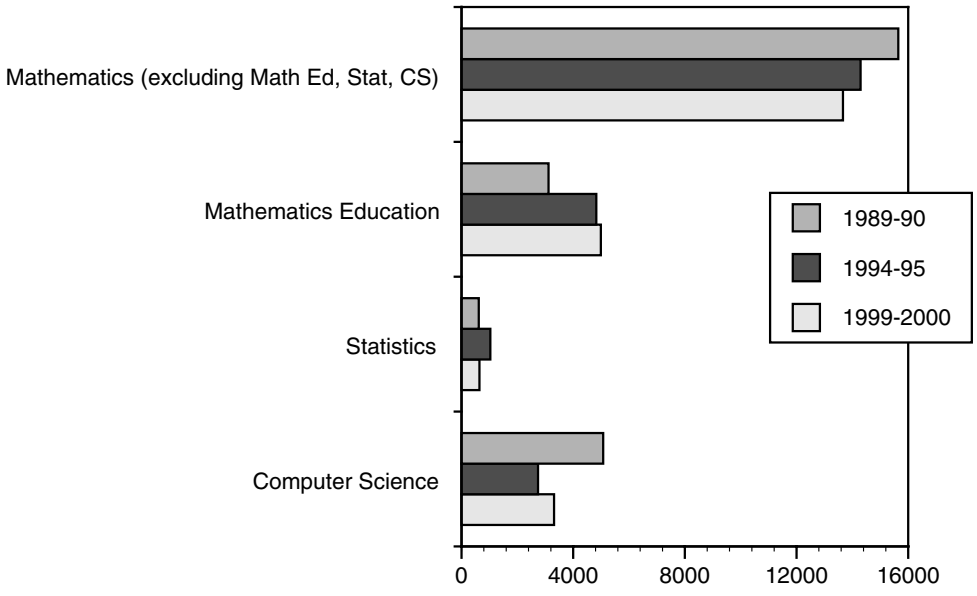

FIGURE SE.4.1 Number of bachelors degrees awarded by Mathematics Departments at four-year colleges and universities and by Statistics Departments at universities (combined) between July 1 and June 30 in 1989-90, 1994-95, and 1999-2000.

TABLE SE.5: AVAILABILITY OF ADVANCED COURSES

Table SE.5 shows the percentage of departments in four-year colleges and universities offering various advanced mathematics and statistics courses at least once in the 2000–2001 academic year. The percentage of departments offering a given course at least once in academic year 2000–2001 is one measure of the extent to which the course was a real part of the undergraduate mathematics or statistics major in the U.S. (Analysis of course availability in two-year colleges appears in Tables TYR.5 and TYR.6 in Chapter 6.)

The first two columns of Table SE.5 present overall course-availability percentages from 1995–1996 and 2000–2001. Comparison of 2000–2001 and 1995–1996 percentages provides one measure of how the actual curriculum for mathematics majors changed between 1995 and 2000. (Because no 1995 data exist on the statistics courses listed in Table SE.5, no such comparisons are possible for the statistics major.) With the exception of Number Theory, every mathematics course listed in Table SE.5 was less available in the 2000–2001 academic year than in 1995–1996. Modern Algebra courses were available at almost the same rate as they were five years earlier, while availability of Real Analysis and Geometry courses fell off noticeably. Why Analysis should decline so much more than Modern Algebra is not clear. Undergraduate Topology suffered the largest decline of all. It is somewhat surprising that Mathematics for Secondary Teachers also declined, given the continued rise in the number of mathematics education bachelors degrees awarded (see Table SE.4).

The third, fourth, and fifth columns of Table SE.5 show that during the 2000–2001 academic year, there was substantial variation in course availability based on the highest degree offered in a department. Undergraduates in doctoral departments had a wider array of undergraduate courses available to them than did the undergraduates in bachelors-only departments. But from the individual student's point of view, the difference might not have been as great as Table SE.5 suggests, given that students usually need two academic years to complete the upper division courses of their majors, and given that bachelors-only departments tend to offer some of their elective courses in alternate years.

Further information about the differences between mathematics majors in doctoral and bachelors departments comes from comparing Table SE.5 in the current report with SE.5 in the CBMS1995 report. Some of the shifts in course availability during the last five years of the 1990s were somewhat surprising. For example, in 1995–1996, undergraduate Topology was available in 63% of doctoral departments and in 52% of bachelors-only departments, while in 2000–2001 undergraduate Topology was available in 61% of doctoral departments and in 13% of bachelors-only departments. That was the most pronounced shift in relative course availability, but several other courses (e.g., Real Analysis, Geometry, and Combinatorics) experienced shifts in the same direction, albeit to a smaller degree. On the other hand, the availability of courses like Number Theory and Operations Research in bachelors-only departments became closer to the availability of those courses in doctoral departments. The relative availability of Modern Algebra did not change from 1995–1996 to 2000–2001; while the percentage of departments offering the course declined, the decline was about the same in doctoral and bachelors departments.

TABLE SE.5 Percentage of departments offering various undergraduate Mathematics and Statistics courses in 1995-96 and in 2000-01, by type of department in 2000-01.

		Academic Year 2000-01						
	All Math Depts 1995-96	All Math Depts 2000-01	PhD Math	MA Math	BA Math	All Stat Depts 2000-01	PhD Stat	MA Stat
Number of departments	1369	1430	187	233	1010	70	57	13
Upper level Mathematics								
Modern Algebra	77	71	87	88	63			
Adv Calculus/ Real Analysis	70	56	90	77	45			
Geometry	69	56	75	88	46			
Topology	50	22	61	32	13			
Number theory	27	33	63	57	23			
Combinatorics	24	18	48	24	11			
Applied Math/Modeling	35	24	51	51	13			
Intro to Operations Research	24	13	14	26	10			
Foundations/Logic	24	16	23	31	12			
Math for secondary teachers	53	42	39	64	37			
Math senior seminar/Ind study	77	58	57	62	58			
Upper level Statistics								
Mathematical Statistics	na	52	53	72	47	90	93	75
Probability	na	40	57	63	31	75	81	50
Stochastic processes	na	6	29	9	1	46	54	13
Applied statistical analysis	na	13	27	42	4	72	74	63
Experimental design	na	10	21	20	5	74	76	63
Regression & Correlation	na	9	22	24	3	82	86	63
Biostatistics	na	5	7	2	5	20	19	25
Nonparametric Statistics	na	4	14	7	1	45	43	50
Categorical data analysis	na	1	9	2	0	39	44	13
Sample survey design	na	3	10	11	0	52	50	63
Stat software & computing	na	5	21	13	1	48	45	63
Data management	na	1	4	2	0	13	16	0
Statistics senior sem/Ind study	na	5	15	14	2	34	36	25

Note: 0 means less than one half of 1%.

TABLE SF.6: SIZE OF THE FACULTY

This table presents data on the size of the full-time faculty (consisting of tenured, tenure-eligible, and other full-time faculty) in the mathematics departments and statistics departments of four-year colleges and universities, and on the size of the permanent and temporary full-time faculty in mathematics programs at two-year colleges. For more detailed faculty information separated by type of appointment and by type of department (highest degree offered), see Tables F1, F2, and F3 in Chapter 4. For more details on the two-year college faculty, see Table TYR.17 in Chapter 7.

A. Mathematics Departments: A Shift to Temporary Staff

As Table SE.3 shows, total undergraduate enrollments in mathematics departments (including all mathematics, statistics, and computer science courses taught in the nation's mathematics departments) increased by about 11.5% from fall 1995 to fall 2000. It is hard to tell whether there was a corresponding growth in faculty in mathematics departments. Table SF.6 shows that the number of full-time faculty in mathematics departments grew by just over 4%, from 18,248 to 19,007, during that same period. However, that is not the total story, because as Table SF.13 shows, during the same time period there was a roughly 35% growth in part-time faculty in mathematics departments with the result that the number of all faculty, both full-time and part-time, appears to have grown by about 11%. But because part-time faculty do not always teach the same number of courses per person as full-time faculty members, it is impossible to know whether that 11% increase represents an 11% growth in the "teaching power" of mathematics departments. In addition, as Tables F1 and F2 in Chapter 4 show, the 4% growth in total full-time faculty masked a decline of about 3% in the number of tenured faculty and a decline of about 6% in the number of tenure-eligible faculty, coupled with an increase of 65% in the number of other full-time faculty (i.e., full-time faculty who are neither tenured nor tenure-eligible) in mathematics departments. It is fair to say that in the period from fall 1995 to fall 2000 total faculty growth may have kept pace with fall enrollment growth, but there was a substantial shift away from staffing with tenured and tenure-eligible faculty members in the nation's mathematics departments.

B. Statistics Departments: Faculty Numbers Fall Behind Enrollment and Shift to Temporary Staff

Table SE.3 also reveals that undergraduate enrollments in the nation's statistics departments rose by almost 14% between fall 1995 and fall 2000. During the same period, as Table SF.6 reveals, the total full-time faculty in statistics departments grew by about 3%, from 988 to 1022. But in the case of statistics departments, at the same time there was a 34% drop in the number of part-time faculty. Clearly, then, the growth in "teaching power" of the nation's statistics departments did not come close to keeping pace with the growth in fall enrollment. Furthermore, Table F.3 of Chapter 4 shows that the number of tenured faculty members declined by about 3%, and the number of tenure-eligible faculty declined by about 16%, while the number of other full-time faculty more than doubled in statistics departments. In summary, in the nation's statistics departments, faculty growth did not keep up with enrollment growth, and at the same time there was a substantial shift away from tenured and tenure-eligible faculty.

C. Two-Year Colleges: Enrollment Declines While Faculty Enlarges, and Faculty Shifts Toward Temporary Staffing

Table SE.1 reveals a decline of about 7.5% in enrollments in two-year colleges from fall 1995 to fall 2000. During the same period, Table SF.6 reveals a roughly 2% increase in the number of full-time faculty in two-year colleges, from 7,742 in 1995 to 7,921 in 2000. At the same time, there was an increase of about 4% in the number of part-time faculty in two-year colleges. (Unlike the situation in four-year colleges and universities, the part-time faculty in two-year colleges vastly outnumber full-time faculty. In fall 2000 the ratio was almost 2 to 1, as can be seen in SF.13.) To understand the increase in full-time faculty mentioned above, recall that very few two-year colleges have a system of tenured and tenure-eligible faculty and instead divide their faculty into those on the "permanent staffing list" and "temporary full-time faculty." With that distinction in mind, Table F.6 in Chapter 4 reveals that the 2% overall growth in full-time faculty consists of a decrease of about 8% in the number of permanent full-time faculty and an almost six-fold increase in the number of temporary full-time faculty. In summary, the number of mathematics faculty in two-year colleges increased even though enrollments decreased between 1995 and 2000, and there was a noticeable shift away from staffing with permanent faculty.

D. The Degree Status of Four-Year Faculty

The percentage of four-year mathematics department faculty who hold doctoral degrees was 82% in fall 2000, down three percentage points from fall 1995. This may be due to the substantial increase in the number of faculty belonging to the "other full-time" category, only two fifths of whom hold doctoral degrees. Among tenured and tenure-eligible faculty in mathematics departments, 92% hold doctoral degrees, up two percentage points from 1995. Because it is almost certain that today's newly appointed tenure-eligible faculty either have, or soon receive, their doctoral degrees, the percentage of tenured and tenure-eligible faculty holding doctorates is likely to

rise as more senior tenured faculty retire and are replaced.

In statistics departments, 95% of the fall 2000 faculty had doctoral degrees, up from 89% in 1995, and 99% of the tenured and tenure-eligible faculty had doctoral degrees, up from 91% five years earlier.

E. Faculty on Leave

When departments reported the data on tenured and tenure-eligible faculty used in Table SF.6, they were asked to report both the number of faculty members who are on leave in fall 2000, and the number teaching in the department in fall 2000. This was also the case in previous CBMS surveys and is necessary to insure that the survey gets an accurate picture of the nation's permanent mathematics faculty.

Because faculty members on leave from one department might be teaching as visitors in another, Table SF.6 may involve some double counting in the total number of the nation's mathematics faculty. However, any double-counted faculty members almost surely would be counted as permanent in their home department and temporary in their host department. Therefore the double counting will not affect the count of tenured faculty in four-year colleges and universities or the count of permanent faculty in two-year colleges.

In addition, the percentages of faculty on leave are relatively small. In fall 2000, about 7% of tenured and tenure-eligible mathematics faculty members were reported as on leave, with percentages ranging from about 10% in doctoral departments to about 5.5% in both masters and bachelors departments. In statistics departments, the overall percentage was about 7.6%, with 8% of faculty in doctoral departments and about 5% in masters level departments being on leave. For comparison, in fall 1995 the percentages were about 7% in mathematics departments and 6% in statistics departments.

TABLE SF.6 Number of tenured/tenure-eligible and other full-time faculty in Mathematics Departments at four-year colleges and universities and in Statistics Departments at universities by highest degree, and in 2000 by tenured and tenure-eligible and other full-time status. Also full-time permanent and full-time temporary faculty in two-year college Mathematics Programs: Fall 1980, 1985, 1990, 1995, and 2000.

						2000	
Four-Year College & University	1980	1985	1990	1995	2000	Tenured/ tenure-eligible	Other full-time
Mathematics Departments							
Total full-time faculty	**16022**	**17849**	**19411**	**18248**	**19007**	**15471**	**3536**
	(100%)	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**
Having doctoral degree	12497	13208	14963	15428	15643	14275	1368
	(78%)	(74%)	(77%)	(85%)	(82%)	(92%)	(39%)
Having other degree	3525	4641	4448	2820	3364	1196	2168
	(22%)	(26%)	(23%)	(15%)	(18%)	(8%)	(61%)
Statistics Departments							
Total full-time faculty	**610**	**740**	**735**	**988**	**1022**	**871**	**151**
	(100%)	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**
Having doctoral degree	587	718	706	880	972	858	114
	(96%)	(97%)	(96%)	(89%)	(95%)	(99%)	(75%)
Having other degree	23	22	29	108	50	13	37
	(4%)	(3%)	(4%)	(11%)	(5%)	(1%)	(25%)
Total Math & Stat Depts	**16,632**	**18,589**	**20,146**	**19,236**	**20,029**	**16,342**	**3,687**
Two-Year College Mathematics Programs						Full-time permanent	Full-time temporary
Total full-time faculty	**5,623**	**6,277**	**7,222**	**7,742**	**7,921**	**6,960**	**961**
Grand total	**22,255**	**24,866**	**27,368**	**26,978**	**27,950**	**23,302**	**4,648**

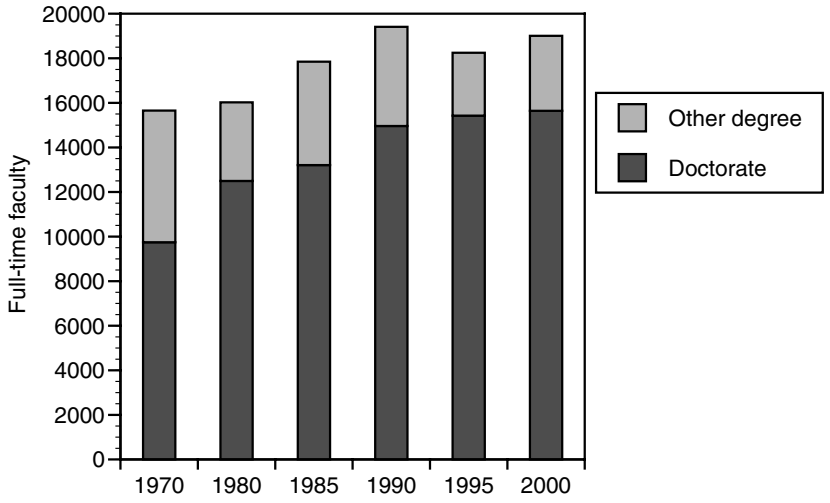

FIGURE SF.6.1 Number of full-time faculty by doctorate or other degree in Mathematics Departments at four-year colleges and universities: Fall 1970, 1980, 1985, 1990, 1995, and 2000.

TABLE SF.7: DEGREE STATUS OF PERMANENT MATHEMATICS FACULTY IN TWO-YEAR COLLEGES

Table SF.7 studies the academic background of permanent faculty members in the mathematics programs of two-year colleges. The masters degree is the highest degree held by over 80% of permanent two-year college mathematics faculty. The percentage of mathematics program faculty holding doctorates appears to have dropped between 1995 and 2000, and the percentage holding bachelors degrees as their highest degree seems to have risen. All three percentages are consistent with historical levels.

TABLE SF.7 Percentage of full-time permanent faculty in Mathematics Programs at two-year colleges by highest degree: Fall 1975, 1980, 1985, 1990, 1995, and 2000.

	Percentage of full-time permanent faculty					
Highest degree	1975	1980	1985	1990	1995	2000
Doctorate	11	15	13	17	17	16
Masters	82	80	82	79	82	81
Bachelors	7	5	5	4	1	3
	100%	100%	100%	100%	100%	100%
Number of full-time permanent faculty	**5944**	**5623**	**6277**	**7222**	**7578**	**6960**

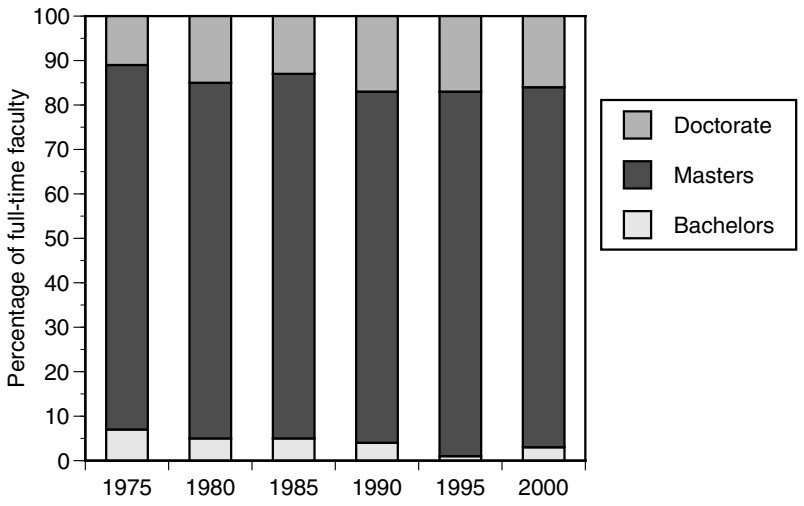

FIGURE SF.7.1 Percentage of full-time permanent faculty in Mathematics Programs at two-year colleges by highest degree: Fall 1975, 1980, 1985, 1990, 1995, and 2000.

TABLE SF.8: PERCENTAGE OF WOMEN AMONG THE FULL-TIME MATHEMATICS AND STATISTICS FACULTY

Table SF.8 reports overall figures on the gender distribution among full-time faculty in mathematics and statistics departments of four-year colleges and universities, and among the full-time mathematics program faculty in two-year colleges. The table also presents data on the number of doctorates granted (taken from annual reports of the Joint AMS-ASA-IMS-MAA Data Committee) and on masters degrees awarded (from the National Center for Educational Statistics). This information about doctoral and masters degrees can be used to estimate the gender distribution in the pools from which new full-time faculty are typically hired. For additional information on gender in the faculty of four-year colleges and universities, see Tables F.2 and F.3 in Chapter 4. See Tables TYR.24 and TYR.25 in Chapter 7 for more details about the gender composition of two-year college faculty.

Each CBMS survey between 1980 and 2000 detected an increase in the percentage of women in mathematics departments of four-year colleges and universities, and in fall 2000 the percentage of women faculty in mathematics departments approximated the percentage of women in recent Ph.D. graduating classes. The percentage of women among tenured and other full-time faculty rose by three and five percentage points respectively between 1995 and 2000, but the percentage of women among tenure-eligible mathematics department faculty dropped from 34% to 31% during that same period.

The percentage of women among the full-time faculty of statistics departments rose from 11% in 1995 to almost 18% in 2000, and the 18% figure was the highest up to that time. Among tenured statistics faculty, the percentage of women rose from 5% in 1995 to 9% in fall 2000, and among tenure-eligible faculty the percentage grew from 20% in 1995 to almost 34% in fall 2000.

The percentage of women among the full-time faculty of mathematics programs in two-year colleges has always been higher than the corresponding percentage in four-year schools, and in fall 2000 stood at 49%, up from 40% in 1995 and 34% in 1990. Since 1990, CBMS surveys have also gathered data about the gender composition of the "younger faculty" in two-year college mathematics programs. In 1990 and 1995, the term "younger faculty" was defined to mean faculty members of age less than 35, and in the CBMS2000 survey the definition was shifted to "age less than 40" (see Table SF.8). While this shift muddies comparisons, it is still interesting to observe that in 1990 and 1995 the percentage of women among the younger faculty was higher than the percentage of women among the overall two-year college mathematics faculty (51% v. 34% in 1990 and 46% v. 40% in 1995) while in 2000 the percentage of women in the (re-defined) younger faculty category was less than the overall percentage of women among the two-year college mathematics program faculty by four percentage points.

TABLE SF.8 Gender among full-time faculty in Mathematics Departments at four-year colleges and universities and in Statistics Departments at universities by type of appointment, and among permanent full-time faculty in two-year college Mathematics Programs: Fall 2000. Also gender among new PhDs from U.S. Mathematics Departments and Statistics Departments: 1980-2000. Historical data is also presented for Fall 1980, 1985, 1990 and 1995.

Four-Year College & University	1980	1985	1990	1995	2000	Tenured 2000	Tenure-eligible 2000	Other full-time 2000
Mathematics Departments								
Number of full-time faculty	16022	17849	19411	18248	19007	12335	3136	3536
Number of women	2243	2677	3843	3880	4673	2042	958	1673
	(14%)	(15%)	(20%)	(21%)	(25%)	(17%)	(31%)	(47%)
Statistics Departments								
Number of full-time faculty	na	740	735	988	1022	710	161	151
Number of women	na	74	105	107	179	66	54	59
		(10%)	(14%)	(11%)	(18%)	(9%)	(34%)	(39%)
Number of PhDs from U.S. Math & Stat Depts[1]				July 1, 1980-June 30, 2000: 19654			July 1, 1995-June 30, 2000: 5779	
Number of women among new PhDs[1]				4095 (21%)			1453 (25%)	

Two-Year College Mathematics Programs	1980	1985	1990	All full-time 1995	Full-time age<35 1995	All full-time 2000	Full-time age<40 2000
Number of full-time faculty	5623	6277	7222	7578	938	6960	1392
Number of women	1406	1946	2455	3031	431	3423	626
	(25%)	(31%)	(34%)	(40%)	(46%)	(49%)	(45%)
Master's Degrees in Mathematics granted in the U.S. in 1997-98[2]					3643		
Number of women among new Masters[2]					1494 (41%)		

[1] First Annual Reports of the AMS-ASA-IMS-MAA Data Committee, Table 3-A, AMS Notices 1980-2000.
[2] 2000 Digest of Education Statistics, National Center for Education Statistics.

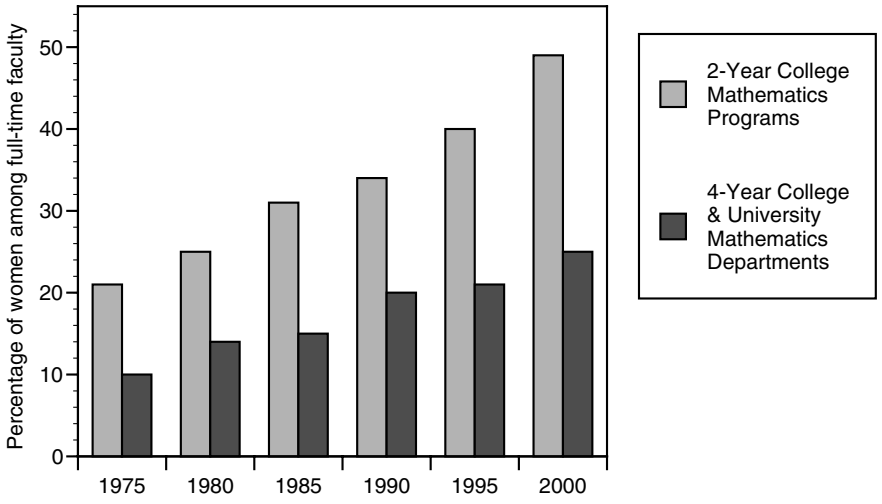

FIGURE SF.8.1 Percentage of women among full-time faculty in Mathematics Departments at four-year colleges and universities and in Mathematics Programs at two-year colleges: Fall 1975, 1980, 1985, 1990, 1995, and 2000.

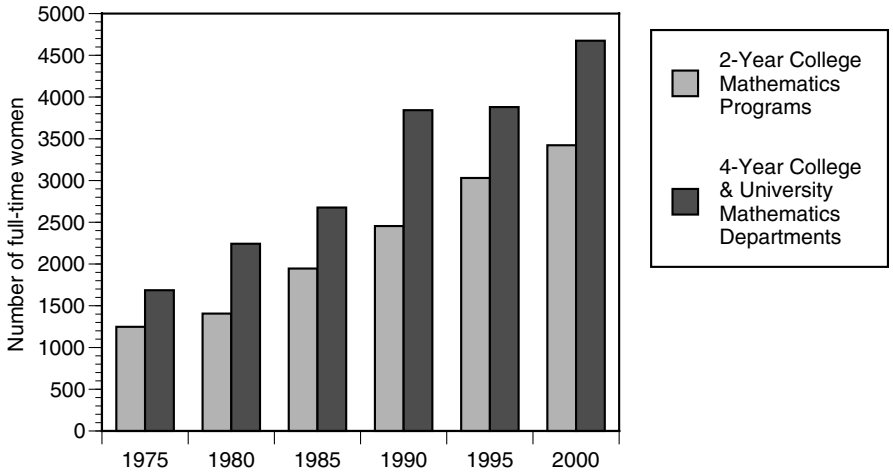

FIGURE SF.8.2 Number of women among full-time faculty in Mathematics Departments at four-year colleges and universities and in Mathematics Programs at two-year colleges: Fall 1975, 1980, 1985, 1990, 1995, and 2000.

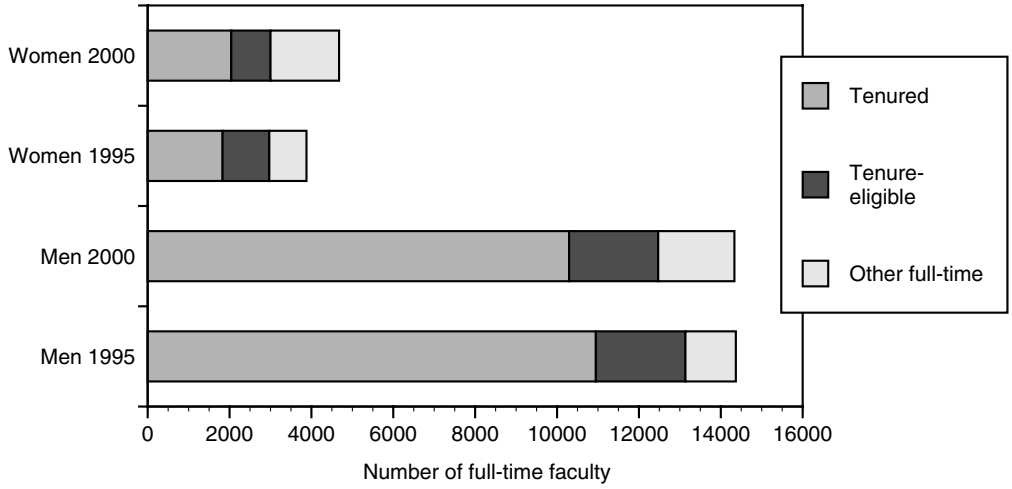

FIGURE SF.8.3 Number of tenured, tenure-eligible, and other full-time faculty by gender in Mathematics Departments at four-year colleges and universities: Fall 2000.

TABLES SF.9 AND SF.10: MATHEMATICS & STATISTICS FACULTY AGE DISTRIBUTION

These tables are not completely comparable with Tables SF.9 and SF.10 in the CBMS1995 report because the age categories were shifted slightly (e.g., 31–35 became 30–34) in the 2000 survey to make them consistent with age ranges used elsewhere. In Fall 2000, the median age for tenured and tenure-eligible mathematics faculty in four-year colleges and universities was about 51 while the median age for permanent faculty in the mathematics programs of two-year colleges was roughly 48. Between 1995 and 2000, the average (or mean) age declined slightly in mathematics departments and increased slightly in two-year college mathematics programs. The median age of tenured and tenure-eligible faculty in university statistics departments was about 48, and the mean age in statistics departments declined slightly between 1995 and 2000.

For more detailed information about faculty age distributions in four-year mathematics and statistics departments of various kinds, see Tables F.4 and F.5 in Chapter 4. More detailed information about faculty ages in two-year colleges appears in Tables TYR.32 and TYR.34 of Chapter 7.

TABLE SF.9 Percentage age distribution of tenured and tenure-eligible faculty in Mathematics Departments at four-year colleges and universities by gender. Percentage full-time permanent faculty in Mathematics Programs at two-year colleges. Also average ages: Fall 2000.

Four-Year College & University	Percentage of tenured/tenure-eligible faculty										**Total tenured/ tenure-eligible faculty**	Average age 2000
	<30	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	>69		
Mathematics Departments												
Tenured men	0	1	4	8	11	11	15	11	3	2		52.4
Tenured women	0	1	1	2	3	2	2	1	0	0	**100%**	49.6
Tenure-eligible men	1	5	5	2	0	0	0	0	0	0	**15471**[1]	36.6
Tenure-eligible women	1	2	1	1	0	1	0	0	0	0		37.8
Total tenured & tenure-eligible faculty	**2**	**9**	**12**	**13**	**14**	**15**	**18**	**12**	**3**	**2**	**100% 15471**	**49.0**

Two-Year College Mathematics Programs	Percentage of permanent full-time faculty								**Total**	Average age		
	<30	30-34	35-39	40-44	45-49	50-54	55-59	>59		1990	1995	2000
Full-time permanent faculty	4	9	13	11	15	20	16	11	**100% 6960**	45.4	47.2	47.6

Note: 0 means less than half of 1%. As a result, some marginal totals appear inaccurate.

[1] Total for all 4 rows in this block.

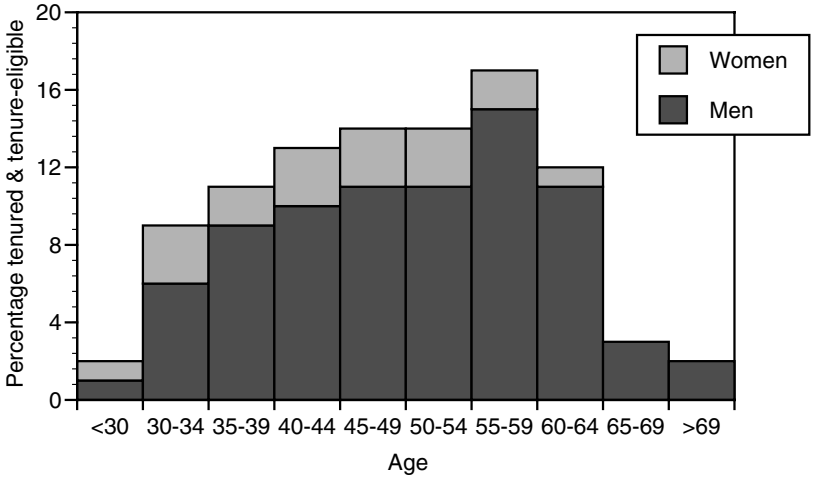

FIGURE SF.9.1 Percentage age distribution of tenured/tenure-eligible faculty in Mathematics Departments at four-year colleges and universities by gender: Fall 2000.

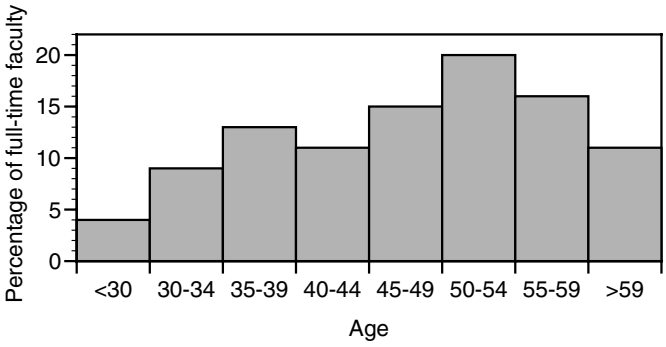

FIGURE SF.9.2 Percentage age distribution of full-time permanent faculty in Mathematics Programs at two-year colleges: Fall 2000.

TABLE SF.10 Percentage age distribution of tenured and tenure-eligible faculty in Statistics Departments at universities by gender. Also average ages: Fall 2000.

Statistics Departments	Percentage of tenured/tenure-eligible faculty										**Total tenured/ tenure-eligible faculty**	Average age
	<30	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	>69		
Tenured men	0	1	5	10	14	13	16	10	3	3		52.3
Tenured women	0	0	1	2	2	1	0	1	0	0	**100%**	44.7
Tenure-eligible men	3	6	3	0	0	0	0	0	0	0	**871**[1]	32.9
Tenure-eligible women	1	3	1	1	0	0	0	0	0	0		34.5
Total tenured & tenure-eligible faculty	**4**	**10**	**10**	**13**	**16**	**14**	**16**	**11**	**3**	**3**	**100% 871**	**48.2**

Note: 0 means less than half of 1%. As a result, some marginal totals may appear inaccurate.

[1] Total for all four rows in box.

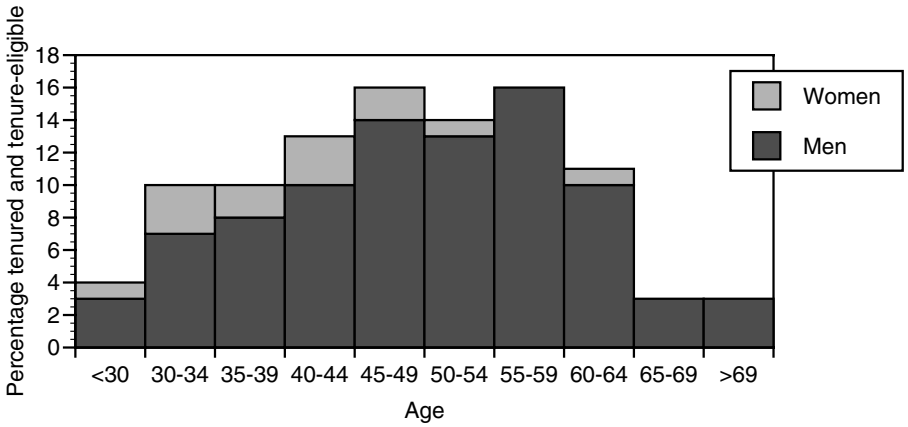

FIGURE SF.10.1 Percentage age distribution of tenured/tenure-eligible faculty in Statistics Departments at universities by gender: Fall 2000.

TABLES SF.11 AND SF.12: ETHNICITY AND GENDER IN MATHEMATICS AND STATISTICS DEPARTMENTS

Tables SF.11 and SF.12 describe the ethnic and gender composition of mathematics and statistics departments in four-year colleges and universities. Detailed information about mathematics and statistics departments in four-year colleges and universities, by type of department, appears in Tables F.6 and F.7 of Chapter 4. Detailed information about the ethnic composition of mathematics program faculty in two-year colleges can be found in Tables TYR.26 through TYR.34 in Chapter 7 of this report.

The CBMS1995 report found that there was little change between 1990 and 1995 in the ethnicity percentages reported in Tables SF.11 and SF.12. CBMS2000, on the other hand, detected some changes from 1995. For example, the percentage of Asians in the full-time mathematics faculty rose from 8% to 10% and the percentage of Hispanics rose from 1% to 3%. Perhaps the largest change was that the percentage of white males among the full-time faculty declined from 69% in 1995 to 63% in 2000, while the percentage of white women grew from 18% to 21%.

In statistics departments there were also changes in ethnic composition. Between 1995 and 2000, the percentage of Hispanics declined from 5% to 1%, the percentage of white males dropped from 66% to 63% and the percentage of white women grew from 8% to 13%.

TABLE SF.11 Percentage of gender and of racial/ethnic groups among tenured, tenure-eligible, and other full-time faculty in Mathematics Departments at four-year colleges and universities: Fall 2000.

	Percentage of faculty						
Mathematics Departments	American Indian/ Alaskan	Asian/ Pacific Islander	Black, not Hispanic	Mexican American/ Puerto Rican/ other Hispanic	White, not Hispanic	Not known	**Number of full-time faculty**
Tenured men	0	6	1	1	45	0	
Tenured women	0	1	0	0	9	0	
Tenure-eligible men	0	2	0	1	9	0	**100%**
Tenure-eligible women	0	0	0	0	4	0	**19007**[1]
Other full-time men	0	1	0	0	9	0	
Other full-time women	0	0	0	0	8	0	
Total full-time men	**0**	**8**	**2**	**2**	**63**	**1**	**100%**
Total full-time women	**0**	**2**	**0**	**1**	**21**	**0**	**19007**[2]

Note: 0 means less than half of 1% and this causes apparent column sum inconsistencies.
[1] Total for all six rows in this block.
[2] Total for both rows in this block.

TABLE SF.12 Percentage of gender and of racial/ethnic groups among tenured, tenure-eligible, and other full-time faculty in Statistics Departments at universities: Fall 2000.

	Percentage of faculty						
Statistics Departments	American Indian/ Alaskan	Asian/ Pacific Islander	Black, not Hispanic	Mexican American/ Puerto Rican/ other Hispanic	White, not Hispanic	Not known	**Number of full-time faculty**
Tenured men	0	10	0	1	50	3	
Tenured women	0	1	0	0	5	0	
Tenure-eligible men	0	4	0	0	6	1	**100%**
Tenure-eligible women	0	2	0	0	3	0	**1022**[1]
Other full-time men	0	2	0	0	6	0	
Other full-time women	0	1	0	0	5	0	
Total full-time men	**0**	**15**	**0**	**1**	**63**	**4**	**100%**
Total full-time women	**0**	**4**	**0**	**0**	**13**	**0**	**1022**[2]

Note: 0 means less than half of 1% and this causes apparent column sum inconsistencies.
[1] Total for all six rows in this block.
[2] Total for both rows in this block.

TABLE SF.13: RATIOS OF PART-TIME AND FULL-TIME FACULTY MEMBERS

Table SF.13 gives longitudinal data on the extent to which departments and programs relied on part-time rather than full-time faculty between fall 1980 and fall 2000 by displaying the ratio "number of part-time faculty per 100 full-time faculty."

This table also corrects an error in the SF.13 figures reported for mathematics program faculty in two-year colleges in the CBMS1995 report. CBMS1995 gave 7,578 as the number of all full-time faculty members. That figure was the number of *permanent* full-time faculty and, as can be seen from Table SF.6 of the 1995 report, the total of all permanent and temporary full-time faculty was really 7,742.

The number of part-time faculty rose in both two-year mathematics programs and four-year mathematics departments much faster than the number of full-time faculty. This is reflected in a noticeable increase in the ratio mentioned above in both two-year and four-year mathematics departments and programs. In statistics departments, by contrast, the ratio declined noticeably because the number of part-time faculty dropped to 66% of its 1995 level, while the number of full-time faculty increased.

Further elaborations on these data may be found in Tables F.2 and F.3 of Chapter 4. Detailed analysis of part-time and full-time faculty in two-year college mathematics programs appears in Tables TYR.17, TYR.19, and TYR.25 of Chapter 7.

TABLE SF.13 Number of full-time and part-time faculty in Mathematics Departments at four-year colleges and universities, in Statistics Departments at universities, and in Mathematics Programs at two-year colleges. Number of part-time faculty per 100 full-time faculty is also given: Fall 1980, 1985, 1990, 1995, and 2000.

Four-Year College & Universities	1980	1985	1990	1995	2000
Mathematics Departments					
Full-time faculty	16022	17849	19411	18248	19007
Part-time faculty	5456	7087	6786	5289	7161
Number of part-time per 100 full-time faculty	34	40	35	29	38
Statistics Departments					
Full-time faculty	610	740	735	988	1022
Part-time faculty	132	118	90	136	90
Number of part-time per 100 full-time faculty	22	16	12	14	9
Two-Year College Mathematics Programs					
Full-time faculty	5623	6277	7222	7742	7921
Part-time faculty	6661	7433	13680	14266	14887[1]
Number of part-time per 100 full-time faculty	118	118	189	184	188

[1] Paid by two-year colleges. In Fall 2000, there were an additional 776 part-time faculty in two year colleges who were paid by a third party, e.g., a school district, in a dual credit course.

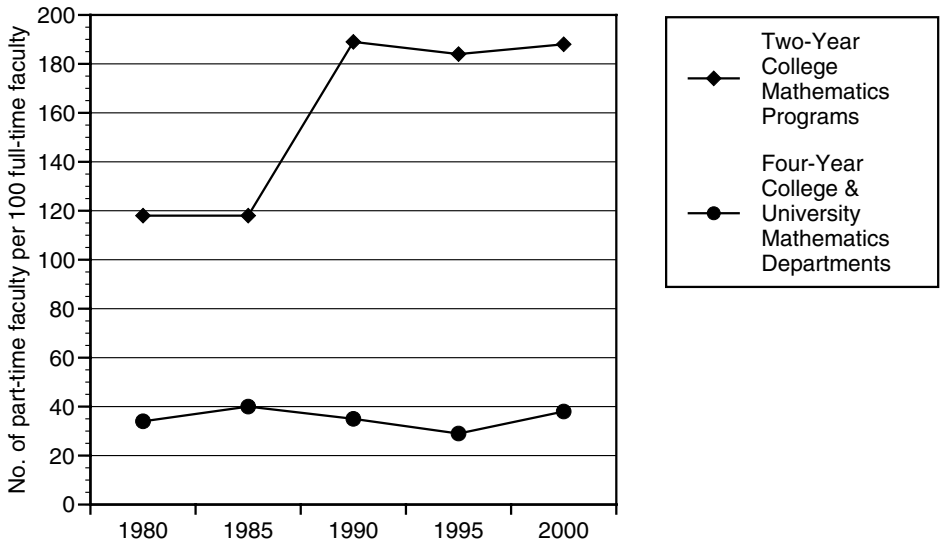

FIGURE SF.13.1 Number of part-time faculty per 100 full-time faculty in Mathematics Departments at four-year colleges and universities and in Mathematics Programs at two-year colleges: Fall 1980, 1985, 1990, 1995, and 2000.

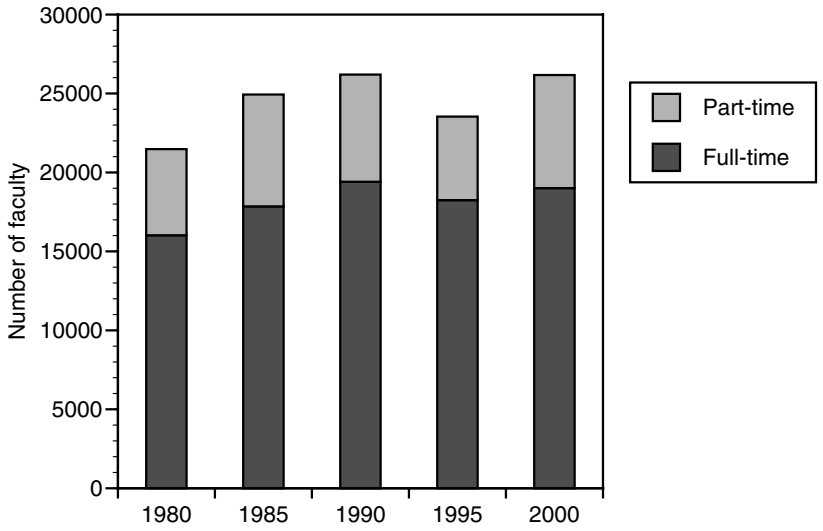

FIGURE SF.13.2 Number of full-time and part-time faculty in Mathematics Departments at four-year colleges and universities: Fall 1980, 1985, 1990, 1995, and 2000.

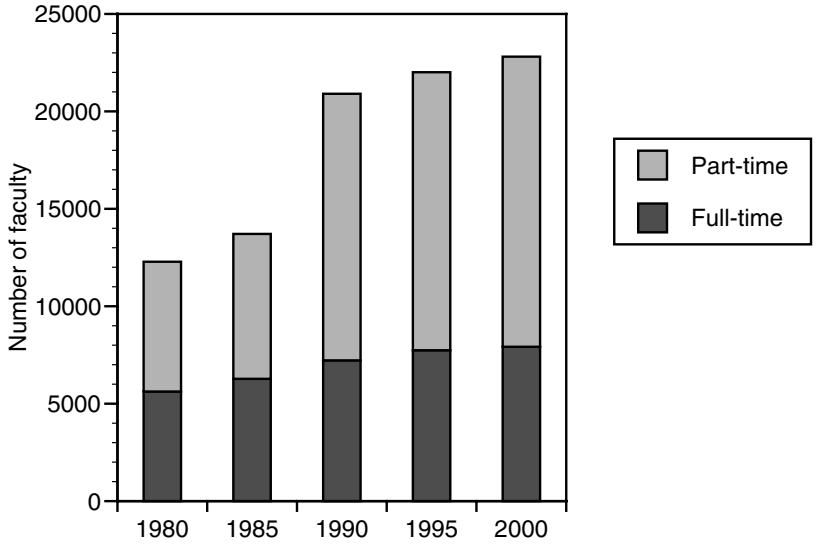

FIGURE SF.13.3 Number of full-time and part-time faculty in Mathematics Programs at two-year colleges: Fall 1980, 1985, 1990, 1995, and 2000.

TABLE SF.14: ETHNICITY AND GENDER AMONG PART-TIME FACULTY

Table SF.14 presents data on the ethnic and gender composition of the part-time faculty in four-year college and university mathematics and statistics departments and in two year college mathematics programs. Table F.8 in Chapter 4 provides more details. Information on the ethnic and gender composition of part-time faculty in two-year college mathematics programs appears in TYR.25, TYR.30, and TYR.31 of Chapter 7.

In four-year mathematics departments, the number of part-time faculty increased markedly, from 5,289 in fall 1995 to 7,161 in fall 2000. During those five years, there was a two point increase in the percentage of white males among the part-time faculty, and a four point increase in the percentage of white women. In statistics departments, which suffered serious declines in the overall number of part-time faculty between 1995 and 2000, the percentage of Asians increased while the percentage of black faculty dropped from 7% to less than half of one percent. At the same time, the percentage of white men among the statistics part-time faculty dropped from 51% to 48%, while the percentage of white women rose from 18% to 27%.

TABLE SF.14 Percentage of gender and of racial/ethnic groups among part-time faculty in Mathematics Departments and Statistics Departments at four-year colleges and universities and in Mathematics Programs at two-year colleges: Fall 2000.

	Percentage of part-time faculty						
	American Indian/ Alaskan %	Asian/ Pacific Islander %	Black, not Hispanic %	Mexican American/ Puerto Rican/ other Hispanic %	White, not Hispanic %	Not known %	**Total number of part-time faculty**
Mathematics Departments							
Part-time faculty, men	0	2	2	2	53	1	**7161**
Part-time faculty, women	0	1	1	1	37	1	
Statistics Departments							
Part-time faculty, men	0	17	0	2	48	0	**90**
Part-time faculty, women	0	6	0	2	27	0	
Two-Year Colleges							
Part-time faculty, total	0	4	6	3	82	5	**14887**

Note: 0 means less than half of 1%. Round-off causes blocks to add to more than 100%.

TABLE SF.15: DEATHS AND RETIREMENTS AMONG MATHEMATICS AND STATISTICS FACULTY, AND NEW FACULTY POSITIONS IN 1999–2000

Table SF.15 reports the number of deaths and retirements among tenured and tenure-eligible faculty in mathematics and statistics departments of four-year colleges and universities, and the number of deaths and retirements among permanent faculty in mathematics programs of two-year colleges, in the 1999–2000 academic year. In 1999–2000, about 3% of tenured and tenure-eligible faculty members left college and university mathematics departments through death or retirement. In statistics departments, and in the mathematics programs of two-year colleges, the percentage was closer to 2%.

The CBMS2000 percentage figures for deaths and retirements in four-year college and university mathematics and statistics departments are consistent with the results of an independent survey conducted by the Joint Data Committee of the AMS, ASA, IMS, and MAA [*Notices Amer. Math. Soc.* **48** (2001), p. 820].

The number of deaths and retirements from the four-year college and university faculty in 1999–2000 was far lower that the number of new Ph.D.s awarded — the Joint Data Committee survey showed that there were 1,127 new Ph.D. degrees awarded in the U.S. in 1999–2000 [*Notices Amer. Math. Soc.* **48** (2001), p. 710]. However, there still seemed to be an adequate number of new positions for the new doctoral recipients. There were 1,854 advertised searches for doctoral faculty in 1999–2000, with 1,134 being tenured and tenure-track positions for which new Ph.D. recipients were eligible to apply [*Notices Amer. Math. Soc.* **48** (2001), p. 821].

TABLE SF.15 Number of deaths and retirements of tenured/tenure-eligible faculty from Mathematics Departments and from Statistics Departments by type of school, and of full-time permanent faculty from Mathematics Programs at two-year colleges between September 1, 1999 and August 31, 2000. Historical data is included when available.

Four-Year College & University	1979-80	1984-85	1989-90	1994-95	1999-2000	Number of tenured/tenure-eligible faculty 2000
Mathematics Departments						
Univ(PhD)	na	na	135	172	174	5521
Univ(MA)	na	na	68	132	165	3932
Coll(BA)	na	na	119	137	123	6018
Total deaths and retirements in all Mathematics Departments	156	220	322	441	462	15471
Total deaths and retirements in all Statistics Departments	na	na	17	33	16	871
Two-Year College Mathematics Programs						Number of full-time permanent faculty 2000
Total deaths and retirements in all Mathematics Programs	na	na	na	274	163	6960

TABLE SF.16: AVERAGE TEACHING ASSIGNMENTS IN MATHEMATICS AND STATISTICS DEPARTMENTS OF FOUR-YEAR COLLEGES AND UNIVERSITIES

Table SF.16 presents data on the average teaching assignment (in contact hours) in mathematics and statistics departments of four-year colleges and universities for tenured and tenure-eligible faculty, by type of department, in fall 2000. Table TYR.18 in Chapter 7 presents analogous data for mathematics programs of two-year colleges.

In about 87% of doctoral mathematics departments, a teaching assignment of at most eight contact hours was typical in fall 2000. This is roughly the same conclusion that one would draw from the CBMS1995 data. Among masters-level departments, 90% had typical fall 2000 teaching assignments between nine and twelve contact hours per week, higher than the corresponding percentage in 1995. In fall 2000, a twelve contact hour assignment was very typical in bachelors-only mathematics departments. Comparisons to 1995 data suggest that bachelors-level mathematics departments were substantially more likely to have twelve contact hour assignments in fall 2000 than in fall 1995.

Ninety-seven percent of doctoral statistics departments had teaching assignments of six or fewer contact hours per week in fall 2000. This is quite different from the situation in 1995, when 32% of doctoral statistics departments reported typical teaching assignments of 7 to 12 contact hours per week. The number of masters-level statistics departments is quite low, and the percentages reported for those departments in Table SF.16 are hard to interpret.

As Table TYR.18 in Chapter 6 shows, in fall 2000 the average teaching assignment in the mathematics programs of two-year colleges was slightly less than 15 contact hours per week. This average was down by one hour per week from the average in fall 1995.

TABLE SF.16 Percentage of departments having various weekly teaching assignments in classroom contact hours for tenured/tenure-eligible faculty in Mathematics Departments and Statistics Departments by type of school: Fall 2000.

	Percentage of departments having various levels of typical teaching assignments (in contact hours)						
	< 6 hrs %	6 hrs %	7–8 hrs %	9–11 hrs %	12 hrs %	>12 hrs %	Number of schools
Mathematics Departments							
Univ (PhD)	14	56	17	6	6	2	187
Univ (MA)	2	0	6	44	46	2	233
College (BA)	0	1	3	23	63	10	1010
Statistics Departments							
Univ (PhD)	34	63	2	0	0	0	57
Univ (MA)	14	57	0	0	29	0	13

Note: 0 means less than half of 1%. Round-off causes blocks to add to more than 100%.

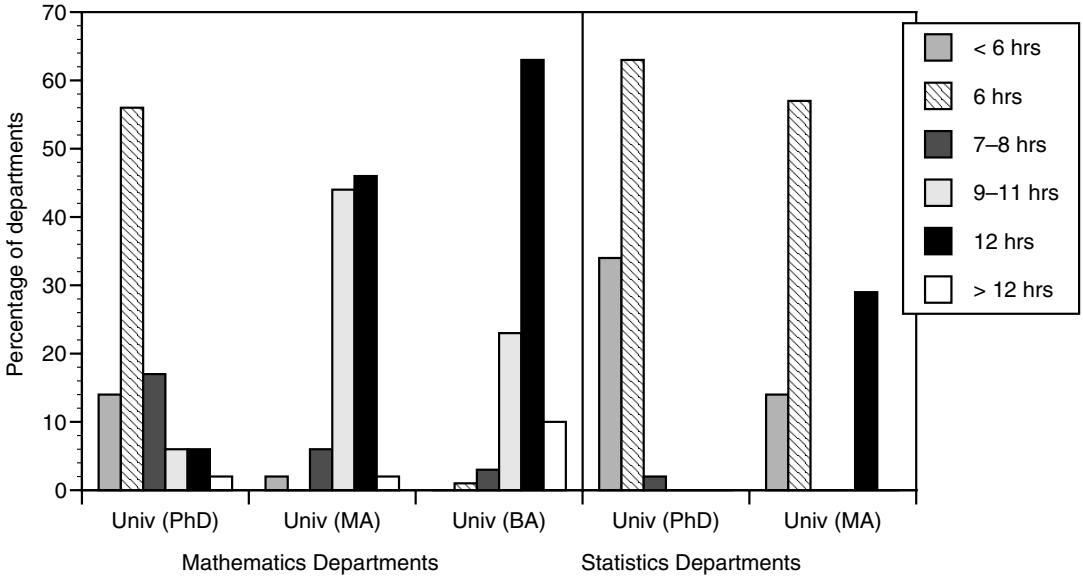

FIGURE SF.16.1 Percentage of Mathematics Departments and Statistics Departments in four-year colleges and universities having various weekly teaching assignments in classroom contact hours for tenured and tenure-eligible faculty by type of school: Fall 2000.

TABLE SF.17: WHO TEACHES VARIOUS TYPES OF COURSES?

Table SF.17 is a new table for the CBMS surveys. It corresponds to part of Table SFY.17 in the CBMS1995 report and shows the percentage of enrollments taught by various types of instructors (tenured and tenure-eligible, other full-time, part-time, and graduate teaching assistants) in college and university mathematics and statistics departments. In addition, for two-year colleges, Table SF.17 shows the percentage of sections (rather than of enrollment) taught by full-time faculty (both permanent and temporary) and by part-time faculty.

As was the case with previous CBMS surveys, we made the assumption that all advanced level courses in four-year colleges and universities were taught by tenured and tenure-eligible faculty. For other courses, departments responding to the CBMS2000 were asked to classify the instructors of each of their course sections. Because some departments that responded to the survey did not identify the instructors for all of their sections, Table SF.17 contains an "unknown instructor" column. Part, but not all, of this unknown instructor category is due to course sections that were taught by distance learning (see Chapter 2). The existence of the unknown instructor column makes comparisons with 1995 data somewhat difficult.

A. Staffing Trends in Mathematics Departments

If we ignore the problems associated with the unknown instructor column, several conclusions are evident from Table SF.17. First, in every course category, we see substantial declines in the percentage of enrollment taught by tenured and tenure-eligible faculty, and declines in the percentage of enrollment taught by graduate teaching assistants, between fall 1995 and fall 2000. In each course category within mathematics departments, the percentage of enrollment taught by other full-time and part-time faculty increased by between three and seven points.

Even if we take the unknown instructor column into account, we can say that there were increases in the percentage of students taught by other full-time and part-time faculty, and those increases might be quite large. For example, if it happened that all unknown instructors in the "Mathematics Courses 2000" row actually belonged to the other-full-time category, then the increase in teaching by other full-time faculty would be ten percentage points rather than four. Furthermore, even if all of the unknown instructors in a given course category were tenured and tenure-eligible faculty members, we would still conclude that the percentage of enrollment taught by tenured and tenure-eligible faculty decreased between fall 1995 and fall 2000. However, whether there was a decrease in the percentage of mathematics department enrollment taught by graduate teaching assistants depends upon how many of the unknown instructors were actually graduate students.

B. Staffing Trends in Statistics Departments

If one ignores the unknown instructor column, Table SF.17 leads to the conclusion that between 1995 and 2000, statistics departments saw the same staffing trends as did mathematics departments, namely, smaller proportions of students being taught by tenured and tenure-eligible faculty and by graduate teaching assistants, with a corresponding increase in

the percentage of students taught by other full-time and part-time faculty members. Even if one takes the unknown instructor column into consideration, one sees that there was no increase in the percentage of teaching by tenured and tenure-eligible faculty, coupled with a decrease in teaching by graduate students, and possible near doublings in the percentage of students taught by other full-time and part-time faculty.

C. Staffing Trends in Two-Year Colleges

Two-year colleges typically do not have a tenure track and instead divide faculty into full-time (both permanent and temporary) and part-time. Note that the two-year college data in SF.17 shows percentage of *sections* rather than percentage of *enrollments*. The percentage of sections taught by full-time faculty declined between 1995 and 2000, and there was a corresponding increase in sections taught by part-time faculty.

TABLE SF.17 Percentage of enrollment in various types of courses taught by different types of instructors in Mathematics and Statistics Departments of four-year colleges and universities, and percentage of sections taught by full-time and part-time faculty in Mathematics Programs of two-year colleges: Fall 1995 and Fall 2000. Also total enrollments (in 1000s).

	Percentage taught by					
Four-Year College & University	Tenured/ tenure-eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Unknown %	Total enrollment in 1000s
Mathematics Departments[1]						
Mathematics courses 2000	44	18	22	10	6	1614
Mathematics courses 1995	51	14	19	17	--	1469
Statistics courses 2000	56	13	19	5	7	171
Statistics courses 1995	70	6	15	7	--	143
Computer Science courses 2000	47	20	22	0	11	123
Computer Science Courses 1995	67	14	18	0	--	99
All Mathematics Department courses 2000	45	18	22	9	6	1909
All Mathematics Department courses 1995	54	13	15[2] 19	13[2] 15	--	1711
Statistics Departments[1]						
All Statistics Department courses 2000	51	13	13	18	5	74
All Statistics Department courses 1995	56	9	7	29	--	65
Two-Year College Mathematics Programs	Full-time %		Part-time %			Enrollment in 1000s
All Mathematics Programs courses 2000	54[3]		46[3]			1386
All Mathematics Programs courses 1995	62[3]		38[3]			1498

[1] We assume that all upper level and advanced courses are taught by tenured and tenure-eligible faculty.
[2] These figures correct typographical errors in CBMS 1995 Table SF.17.
[3] Percentage of sections taught by full-time and part-time faculty.

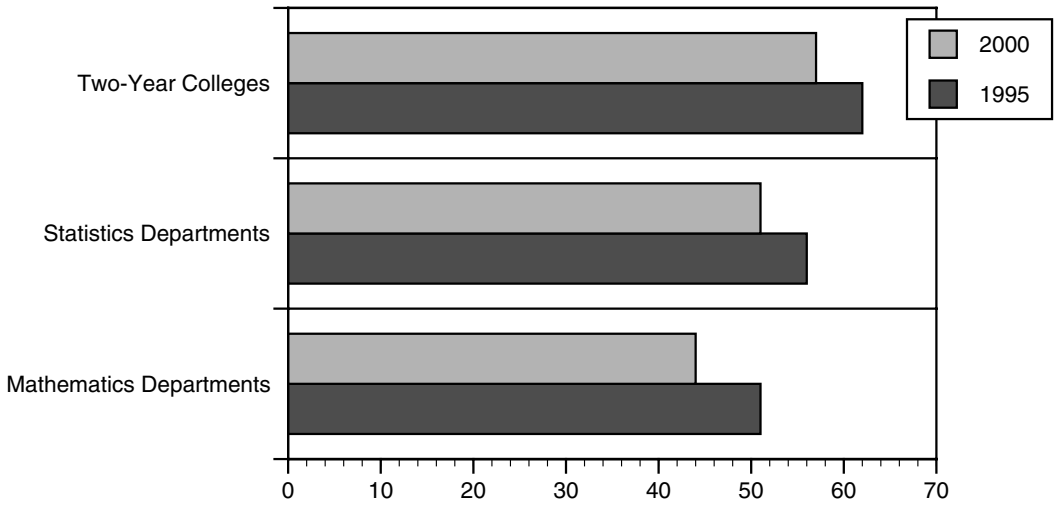

FIGURE SF.17.1 Percentage of enrollment taught by tenured/tenure-eligible faculty in Mathematics and Statistics Departments in colleges and universities, and percentage of sections taught by full-time faculty (permanent and temporary) in two-year college Mathematics Programs: Fall 1995 and Fall 2000.

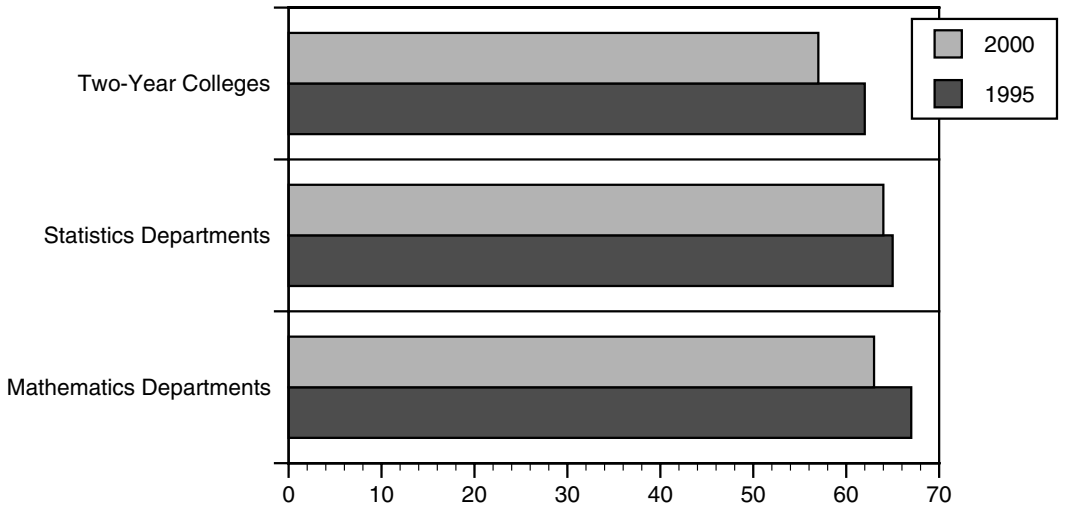

FIGURE SF.17.2 Percentage of enrollments taught by full time faculty (tenured, tenure-eligible, and other full time) in Mathematics and Statistics Departments of colleges and universities, and percentage of sections taught by full-time faculty (permanent and temporary) in two-year colleges: Fall 1995 and Fall 2000.

TABLE SFY.18: WHO TEACHES FIRST-YEAR COURSES?

Table SFY.18 presents a summary of who taught the nation's *first-year* mathematical sciences courses in two-year college mathematics programs and in the mathematics and statistics departments of four-year colleges and universities, giving corresponding data for fall 1995 and fall 2000. Table SFY.18 presents data on the percentages of enrollments in first-year courses taught by tenured and tenure-eligible faculty, other full-time faculty, part-time faculty, and graduate teaching assistants. In addition, because departments did not report the teachers of some of their sections in the CBMS2000 survey, there is a column corresponding to unknown instructors. Part, but far from all, of the unknown instructors column is accounted for by sections of courses taught by distance education (see Chapter 2). The size of the unknown instructor column makes comparisons between data from CBMS2000 and CBMS1995 problematic in some cases.

A. First-Year Courses in Four-Year Mathematics Departments

If one ignores the unknown instructor column and makes an entry-by-entry comparison between Table SFY.18 in the current report and the corresponding table (Table SFY.17) in the CBMS1995 report, one sees very clear trends in the data. One concludes that in four-year mathematics departments, between fall 1995 and fall 2000 there was a substantial decline in the percentage of undergraduate enrollments taught by tenured and tenure-eligible faculty in first-year mathematics, statistics, and computer science courses, except in remedial level mathematics courses where there was a slight increase. For example, in both the introductory and calculus levels, the percentage of enrollment taught by tenured and tenure-eligible faculty dropped by ten percentage points, and in elementary level statistics courses and lower-level computer science courses the percentage dropped by almost twenty percentage points. In addition, there were increases in every course category in the percentage of enrollments taught by other full-time faculty, and (except in remedial mathematics courses) there was an increase in percentage of enrollments taught by part-time faculty. Finally in every course category other than computer science courses, the percentage of enrollments taught by graduate teaching assistants decreased. In the remedial and introductory levels, the declines in teaching by graduate students were at approximately the ten percentage point level.

Even after one takes account of the unknown instructor column in the CBMS2000 report, some conclusions remain unavoidable. For example, in every course category listed in SFY.18 except for remedial courses, the percentage of enrollment taught by part-time faculty increased. The only question was the amount of the increase. For introductory level courses, the increase was somewhere between 6% and 13% and for calculus level courses, the increase was somewhere between 3% and 6%. Next, even if all unknown instructors were actually tenured and tenure-eligible, in every course category listed in SFY.18 except remedial courses, there was a decrease in the percentage of enrollment taught by tenured and tenure-eligible faculty between fall 1995 and fall 2000. Finally, even if all unknown instructors were graduate teaching assistants, there was a decline in the percentage of remedial level and introductory level students taught by graduate teaching assistants. The only possible increase in teaching by graduate students was in calculus level courses, under the assumption that all unknown instructors were graduate teaching assistants, and in that case, the increase would be at most one percentage point.

Further information about who teaches first-year calculus and elementary-level statistics courses in mathematics departments can be found in Tables FY.1, FY.3, and FY.5 in Chapter 5.

B. First-Year Courses in Statistics Departments

An entry-by-entry comparison of teaching percentages from fall 1995 and fall 2000 would lead to the conclusion that the percentage of enrollment in first-year elementary-level statistics courses (no calculus prerequisite) taught by tenured and tenure-eligible faculty members decreased by eight percentage points, and the percentage of enrollment taught by graduate students dropped by thirteen points. The percentage of enrollment taught by other full-time faculty rose substantially, and the percentage taught by part-time faculty doubled.

Some of those conclusions remain valid even when the unknown instructor column is considered in the most conservative way. Even if all unknown instructors were tenured or tenure-eligible, there was still a decline in the percentage of enrollment in statistics departments' elementary courses taught by tenured and tenure-eligible faculty. Even if all unknown instructors were graduate students, there was still a seven point decrease in graduate student teaching. Furthermore, no matter who the unknown instructors were, there was still a substantial increase in the percentage of enrollment taught by other full-time and part-time faculty, and the increase may have been quite large.

Further details on who teaches elementary-level statistics courses in statistics departments can be found in Table FY.6 of Chapter 5.

C. Two-Year College Mathematics Programs

CBMS2000 data on two-year colleges show percentages of sections, not percentages of enrollments, and do not have unknown instructor problems. Recall that two-year colleges typically do not have a tenure track

but instead divide their full-time faculty into permanent and temporary faculty (see Table SF.6 in this chapter).

As in four-year colleges, there was a decline in the percentage of sections taught by full-time faculty. In fall 1995, full-time faculty members taught 62% of all two-year college mathematics program sections. By fall 2000, that percentage had declined to 54%, with a corresponding increase in sections taught by part-time faculty. For more detailed information about who teaches various kinds of two-year college courses, see Table TYR.9 in Chapter 6.

TABLE SFY.18 Percentage of enrollment in lower division courses of various types in Mathematics and Statistics Departments of colleges and universities, by type of instructor, and percentage of sections taught by full-time and part-time faculty in Mathematics Programs of two-year colleges: Fall 1995 and 2000. Also total enrollments (in 1000s).

	Percentage taught by					
Four-Year College & University	Tenured/ tenure-eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Unknown %	Total enrollment in 1000s
Mathematics Department courses						
Mathematics courses						
Remedial level 2000	15	18	45	12	10	219
Remedial level 1995	14	14	46	26	--	222
Introductory level 2000	30	23	27	13	7	723
Introductory level 1995	40	18	21	22	--	613
Calculus level 2000	61	16	12	8	3	570
Calculus level 1995	71	11	9	10	--	538
Statistics courses						
Elementary level 2000	45	16	24	7	8	136
Elementary level 1995	63	7	19	11	--	115
Computer Science courses						
Lower level 2000	39	24	26	1	10	90
Lower level 1995	60	16	24	1	--	74
Statistics Department Courses						
Elementary level 2000	33	18	18	25	6	54
Elementary level 1995	41	12	9	38	--	49
Two-Year College Mathematics Programs						
All courses 2000	54[1]		46[1]			1386
All courses 1995	62[1]		38[1]			1498

[1] Percentage of sections taught by full-time (permanent and temporary) and part-time faculty.

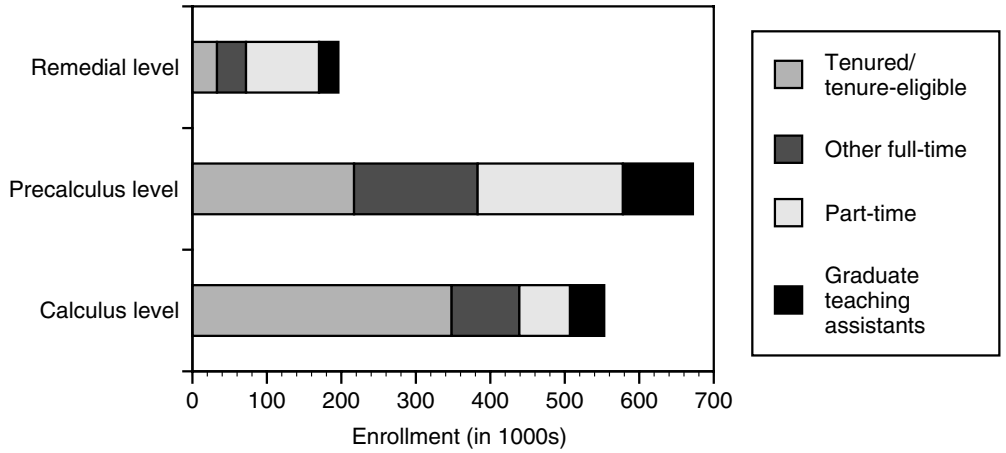

FIGURE SFY.18.1 Enrollment (in 1000s) in lower division undergraduate Mathematics courses in Mathematics Departments at four-year colleges and universities by level of course and type of instructor: Fall 2000.

TABLE SFY.19: WHO TEACHES MAINSTREAM CALCULUS IN TWO- AND FOUR-YEAR COLLEGES AND UNIVERSITIES?

Table SFY.19 presents data on the percentage of enrollments in mainstream Calculus I and II taught by various types of faculty (tenured and tenure-eligible, other full-time, part-time, and graduate teaching assistants) in mathematics departments of four-year colleges and universities, and by full-time or part-time faculty in two-year college mathematics programs. This table corresponds to Table SFY.18 in the CBMS1995 report. For further elaborations of this data, see Table FY.1 in Chapter 5 for four-year colleges and universities, and Tables TYR.8 and TYR.9 in Chapter 6 for two-year colleges.

A. Enrollment Trends in Mainstream Calculus Courses

In four-year colleges and universities, enrollments in mainstream Calculus I declined by about 1% between fall 1995 and fall 2000, and mainstream Calculus II enrollments rose by about 5%. Although not a part of this table, it may be worth noting that enrollments in later mainstream calculus courses grew by almost 18%, to 73,000 (see Appendix I). By contrast, two-year college enrollments in mainstream Calculus I and II declined by 9% and 13% respectively from 1995 levels.

B. Staffing Trends in Mainstream Calculus Courses

As in Tables SF.17 and SFY.18, the existence of the unknown faculty column makes comparisons between fall 2000 and fall 1995 data more difficult. However, some conclusions remain possible. Even if every unknown instructor in the course total rows belonged to the tenured and tenure-eligible category, it would still be true that the data from fall 2000 show a decline in the percentage of mainstream calculus enrollment taught by tenured and tenure-eligible faculty. The percentage of teaching by other full-time and part-time faculty increased no matter who the unknown instructors were. Whether graduate student teaching in mainstream calculus was unchanged or actually rose between fall 1995 and fall 2000 depends upon the composition of the unknown instructor column. If one ignores the unknown instructors, one would say that the percentage of enrollment taught by graduate teaching assistants remained unchanged in both mainstream calculus courses. But if it happened that all unknown instructors were actually graduate students, then one would conclude that the percentage of mainstream calculus teaching by graduate teaching assistants rose between fall 1995 and fall 2000.

In two-year colleges, the percentage of sections (not enrollments) of mainstream Calculus I taught by full-time faculty (both permanent and temporary) did not change between 1995 and 2000, and the percentage of sections of mainstream Calculus II taught by full-time faculty rose by six percentage points.

TABLE SFY.19 Percentage of enrollment in Mainstream Calculus I and II taught by tenured/tenure-eligible, other full-time, part-time faculty, graduate teaching assistants, and unknown in Mathematics Departments at four-year colleges and universities by size of sections, and percentage of sections taught by full-time and part-time faculty in Mathematics Programs at two-year colleges: Fall 2000. Also total enrollments (in 1000s) and average section sizes.

	Percentage of enrollment taught by						
Four-Year College & Universities	Tenured/ tenure-eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Unknown %	Enrollment in 1000s	Average section size
Mainstream Calculus I							
Large lecture/recitation	62	18	9	8	3	68	47
Regular section <36	63	16	11	5	5	91	24
Regular section >35	50	22	15	11	2	31	40
Course total 2000	60	18	11	7	4	190	32
Course total 1995	73	12	8	7	--	192	33
Mainstream Calculus II							
Large lecture/recitation	63	18	7	5	7	28	50
Regular section <36	69	11	12	6	2	46	25
Regular section >35	61	13	9	16	1	13	42
Course total 2000	66	13	10	7	4	87	32
Course total 1995	74	12	5	10	--	83	30
Total Mnstrm Calculus I & II 2000	62	16	11	7	4	277	32
Total Mnstrm Calculus I & II 1995	73	12	7	8	--	275	32

	Percentage of sections taught by			
Two-Year College Mathematics Programs	Full-time %	Part-time %	Enrollment in 1000s	Average section size
Mainstream Calculus I 2000	84	16	53	23
Mainstream Calculus I 1995	84	16	58	25
Mainstream Calculus II 2000	87	13	20	20
Mainstream Calculus II 1995	81	19	23	23
Total Mnstrm Calculus I & II 2000	85	15	73	22
Total Mnstrm Calculus I & II 1995	83	17	81	24

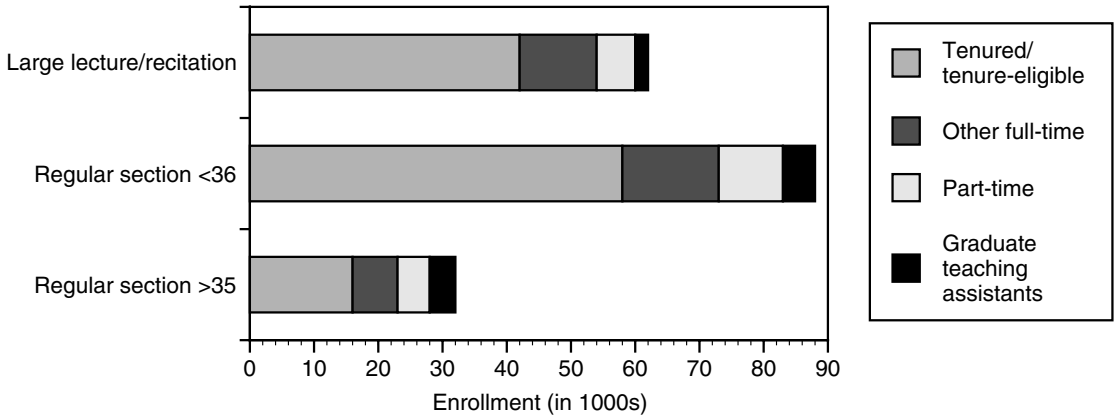

FIGURE SFY.19.1 Enrollment (in 1000s) in Mainstream Calculus I taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Mathematics Departments at four-year colleges and universities by size of sections: Fall 2000.

TABLE SFY.20: HOW IS MAINSTREAM CALCULUS TAUGHT?

Table SFY.20 presents data on the percentage of enrollment in mainstream Calculus I and II in fall 2000 that was taught using various reform pedagogies in four-year colleges and universities, and on the percentage of sections taught using reform pedagogies in the mathematics programs of two-year colleges. Four of the pedagogical options studied — graphing calculators, writing assignments, computer assignments, and group projects — were also studied in earlier CBMS surveys. The fifth option in CBMS2000 was "meeting at least once a week in a setting that requires student computer use" which is abbreviated to "weekly computer lab" in the heading of the table. The computer lab option replaced a question in the CBMS1995 survey about the percentage of sections that were "taught using a reform text." The reform text question was dropped because by fall 2000 the term "reform text" was no longer well defined, with almost every textbook publisher claiming to use aspects of calculus reform in almost every calculus textbook.

Comparison of CBMS2000 data with the findings of previous CBMS surveys makes it clear that the use of graphing calculators and computer assignments rose substantially between fall 1995 and fall 2000 in mainstream Calculus I and II in both two- and four-year colleges and universities. In two-year colleges, graphing calculator use in mainstream calculus courses reached almost 80% in fall 2000, while in mathematics departments of four-year colleges and universities, the percentage was closer to 50%. Between fall 1995 and fall 2000, the use of writing assignments and group projects increased in both Calculus I and II in two-year colleges. However, in four-year colleges and universities, the use of group projects as a teaching tool declined in the same five year period, and while the use of writing assignments rose in mainstream Calculus I, it fell in mainstream Calculus II. It is apparent that in fall 2000 most reform pedagogies were used to a much greater extent in two-year colleges than in four-year colleges and universities. The only exception to that statement is in the area of computer lab use: in all kinds of departments and programs, in fall 2000 about one in six mainstream calculus students had class at least once each week in a situation requiring student computer use.

For a study of the use of reform pedagogies in bachelors, masters, and doctoral departments, see Table FY.2 in Chapter 5. For more information about the use of reform methods in the entire spectrum of two-year college mathematics, statistics, and computer science courses, see Table TYR.10 in Chapter 6.

TABLE SFY.20 Percentage of enrollment in Mainstream Calculus I and II taught using various reform methods in Mathematics Departments of four-year colleges and universities by size of sections, and percentage of sections taught using various reform methods in two-year college Mathematics Programs: Fall 2000 (Figures in parentheses show percentages from 1990 and 1995). Also total enrollments (in 1000s) and average section sizes.

	Percentage taught using						
Four-Year Colleges & Universities	Graphing calculators %	Writing assignments %	Computer assignments %	Group projects %	Weekly computer lab %	Enrollment in 1000s	Average section size
Mainstream Calculus I							
Large lecture/recitation	40	23	20	14	17	68	47
Regular section <36	61	29	34	21	17	91	24
Regular section >35	50	31	46	24	13	31	40
Course total	51	27	31	19	17	190	32
(1990,1995) data	(3,37)	(10,22)	(9,18)	(3,23)	na	192	33
Mainstream Calculus II							
Large lecture/recitation	45	17	22	14	19	28	50
Regular section <36	53	18	25	17	12	46	25
Regular section >35	33	20	40	11	13	13	42
Course total	48	18	27	15	14	87	32
(1990,1995) data	(2,29)	(9,24)	(7,17)	(2,20)	na	83	30
Total Mnstrm Calculus I & II	50	24	30	18	16	277	32
1995 data	35	23	18	22	na	275	32
Two-Year Colleges							
Mainstream Calculus I	78	31	35	27	17	53	23
1995 data	65	20	23	22	na	58	25
Mainstream Calculus II	74	25	37	25	16	20	20
1995 data	63	13	16[1]	18[1]	na	23	23
Total Mainstream Calculus I & II	76	28	35	27	17	73	22
1995 data	65	18	24	22	na	81	24

[1] These entries correct typographical errors in CBMS 1995 Table SFY.20.

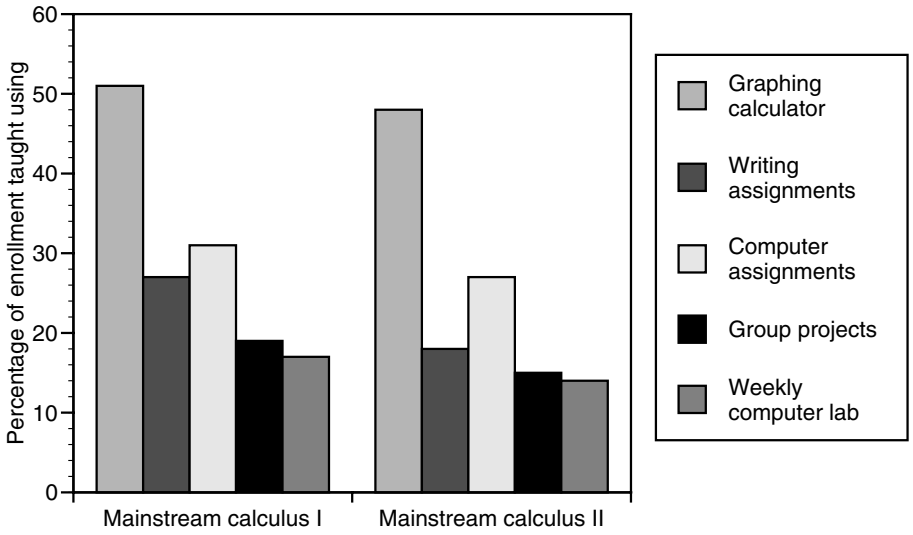

FIGURE SFY.20.1 Percentage of enrollment in Mainstream Calculus I and Mainstream Calculus II taught using various reform methods in Mathematics Departments at four-year colleges and universities: Fall 2000.

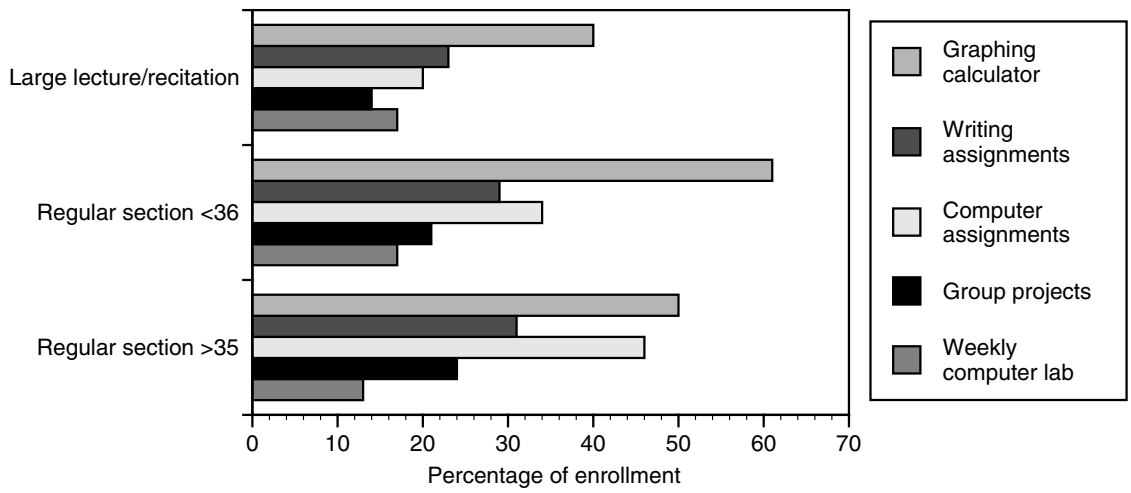

FIGURE SFY.20.2 Percentage of enrollment in Mainstream Calculus I taught using various reform methods in Mathematics Departments at four-year colleges and universities by size of sections: Fall 2000.

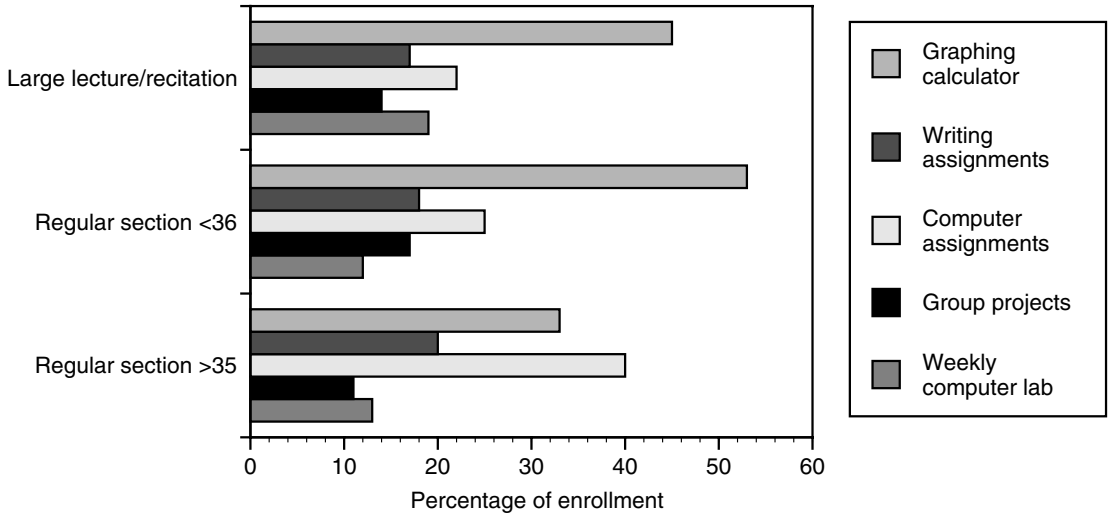

FIGURE SFY.20.3 Percentage of enrollment in Mainstream Calculus II taught using various reform methods in Mathematics Departments at four-year colleges and universities by size of sections: Fall 2000.

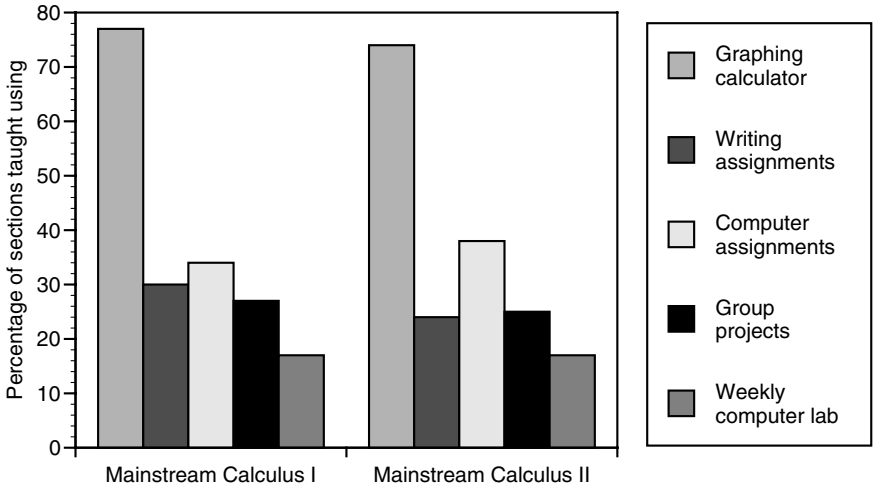

FIGURE SFY.20.4 Percentage of sections in Mainstream Calculus I and Mainstream Calculus II taught using various reform methods in Mathematics Programs at two-year colleges: Fall 2000.

TABLE SFY.21 AND SFY.22: NON-MAINSTREAM CALCULUS

A. Who Teaches Non-mainstream Calculus?

Table SFY.21 presents data on the percentage of enrollments in non-mainstream Calculus I and II taught by various types of instructors in three different instructional formats in four-year colleges and universities, and on the percentage of sections taught by full-time and part-time instructors in two-year college mathematics programs. (Recall that a calculus course is described as "non-mainstream" if it does not lead to upper division mathematics courses.) Like Tables SFY.18, and SFY.19, Table SFY.21 has an unknown instructor column that makes historical comparisons more difficult.

As with almost all other course categories studied so far, the percentage of non-mainstream Calculus I enrollment taught by tenured and tenure-eligible faculty in four-year colleges and universities declined between fall 1995 and fall 2000. Even in the unlikely event that all unknown instructors were in the tenured and tenure-eligible category, the total percentage of enrollment taught by tenured and tenure-eligible faculty dropped by at least nine percentage points from its 1995 level. Non-mainstream Calculus II provided a contrast: in that course the percentage of enrollment taught by tenured and tenure-eligible faculty rose, perhaps by as much as ten percentage points. In addition, as with most other courses studied, teaching by graduate students either declined or was unchanged from fall 1995 levels, depending upon how many of the unknown instructors were graduate students.

Two-year colleges saw the same pattern in non-mainstream calculus courses. The percentage of sections taught by full-time faculty declined in non-mainstream Calculus I, and rose substantially in non-mainstream Calculus II. However, as the enrollment data in Table SFY.21 show, the latter course is very small nationally.

Although still considerably smaller than mainstream Calculus I, the non-mainstream version of the course grew more rapidly in four-year colleges and universities, increasing by more than 8% between fall 1995 and fall 2000, while mainstream Calculus I decreased by about 1% during the same period. By contrast, in two-year colleges, non-mainstream Calculus I enrollment declined substantially between 1995 and 2000. Also, as was the case in 1995, average section sizes in non-mainstream Calculus I were larger than in mainstream Calculus I in each type of section. Comparing Table SFY.21 with the corresponding table (SFY.20) in the CBMS1995 report, one sees that the large lectures used in non-mainstream Calculus I got smaller, shrinking from an average of 106 students in 1995 to about 81 students in fall 2000.

B. How is Non-mainstream Calculus I Taught?

Table SFY.22 presents data on the extent to which various reform pedagogies have changed the way that non-mainstream Calculus I is taught. In four-year colleges and universities, the use of graphing calculators, writing assignments, computer assignments, and group projects in non-mainstream Calculus I increased between fall 1995 and fall 2000, with substantial growth in the use of graphing calculators and much less growth in the use of group projects. In two-year colleges, use of the first three reform pedagogies grew, while the use of group projects held steady at 20% of sections. The increase in graphing calculator use, from 44% of sections in 1995 to 72% in fall 2000, was particularly noteworthy. About one in sixteen students in non-mainstream Calculus I encountered the fifth teaching method — where students meet at least once each week in a situation that requires student computer use (abbreviated "weekly computer lab" in Table SFY.22). As can be seen by comparing Tables SFY.20 and SFY.22, the five reform pedagogies are more widely used in mainstream calculus than in non-mainstream calculus courses.

TABLE SFY.21 Percentage of enrollment in Non-Mainstream Calculus I and II taught by tenured/tenure-eligible, other full-time, part-time faculty, graduate teaching assistants, and unknown in Mathematics Departments at four-year colleges and universities by size of sections, and percentage of sections taught by full-time and part-time faculty in Mathematics Programs at two-year colleges: Fall 2000. Also total enrollments (in 1000s) and average section sizes.

	Percentage of enrollment taught by						
Four-Year Colleges & Universities	Tenured/ tenure-eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Unknown %	Enrollment in 1000s	Average section size
Non-Mainstream Calculus I							
Large lecture/recitation	61	14	10	13	2	22	81
Regular section <36	39	19	23	15	4	44	27
Regular section >35	39	28	20	8	5	39	56
Course total 2000	44	21	19	12	4	105	40
Course total 1995	57	10	18	15	--	97	39
Non-Mainstream Calculus II							
Course total 2000	53	10	22	15	1	10	40
Course total 1995	44	11	18	26	--	14	35
Total Non-Mnstrm Calculus I & II 2000	44	20	19	12	5	115	40
Total Non-Mnstrm Calculus I & II 1995	55	10	18	16	--	111	38

	Percentage of sections taught by			
Two-Year Colleges	Full-time %	Part-time %		
Non-Mainstream Calculus I 2000	74	26	16	22
Non-Mainstream Calculus I 1995	77	23	26	26
Non-Mainstream Calculus II 2000	92	8	1	20
Non-Mainstream Calculus II 1995	63	37	1	19
Total Non-Mnstrm Calculus I & II 2000	76	24	17	22
Total Non-Mnstrm Calculus I & II 1995	76	24	27	26

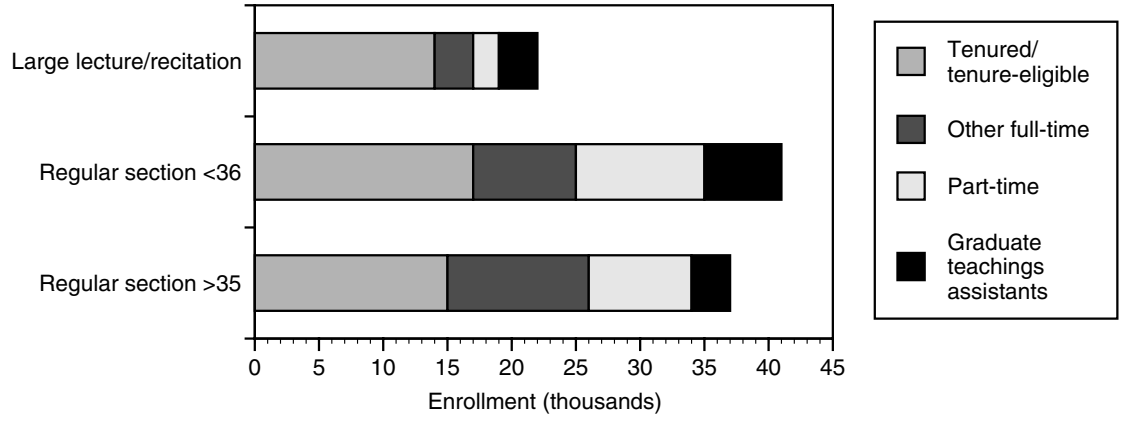

FIGURE SFY.21.1 Enrollment in Non-Mainstream Calculus I taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Mathematics Departments at four-year colleges and universities by size of sections: Fall 2000.

TABLE SFY.22 Percentage of enrollment in Non-Mainstream Calculus I taught using various reform methods in Mathematics Departments at four-year colleges and universities by size of sections, and percentage of sections taught using various reform methods in Mathematics Programs at two-year colleges: Fall 2000. Also total enrollments (in 1000s) and average section sizes.

	Percentage of enrollment taught using						
Four-Year Colleges & Universities	Graphing calculators %	Writing assignments %	Computer assignments %	Group projects %	Weekly computer lab %	Enrollment in 1000s	Average section size
Non-Mainstream Calculus I							
Large lecture/recitation	27	12	7	5	1	22	81
Regular section <36	53	12	9	3	6	44	27
Regular section >35	46	17	22	16	0	39	56
Course total	45	14	13	9	3	105	40
1995 data	26	7	6	7	na	97	39
Two-Year Colleges	Percentage of sections						
Non-Mainstream Calculus I	72	20	15	20	6	16	22
1995 data	44	17	8	20	na	26	26

Note: 0 means less than one-half of 1%.

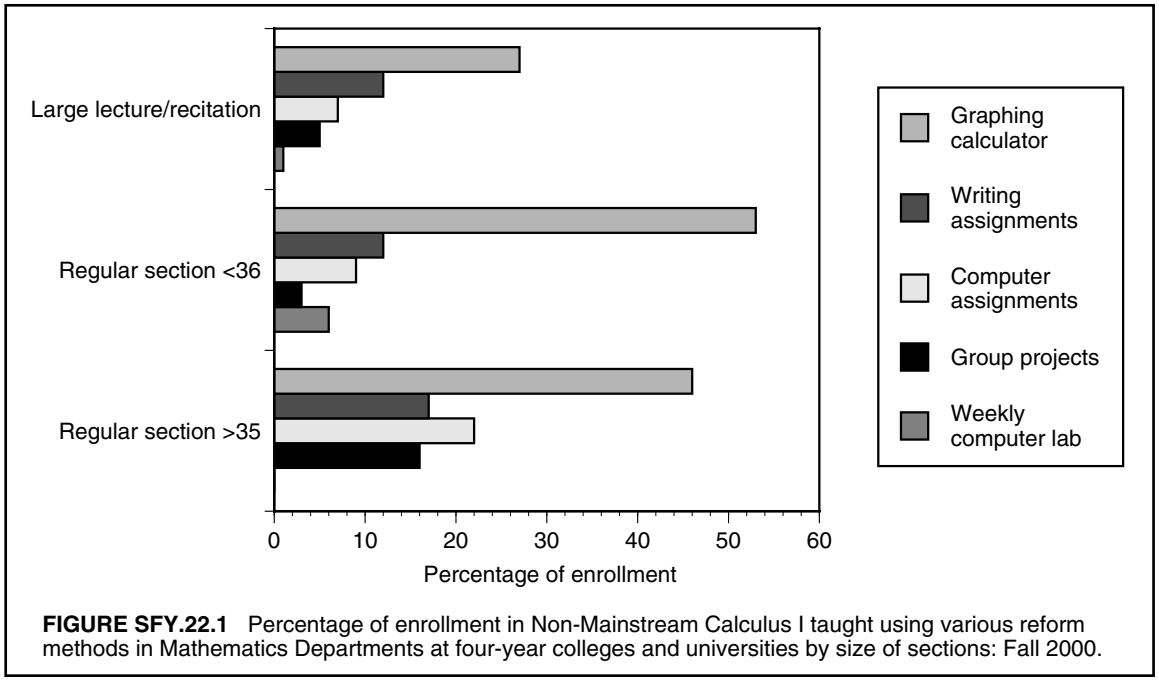

FIGURE SFY.22.1 Percentage of enrollment in Non-Mainstream Calculus I taught using various reform methods in Mathematics Departments at four-year colleges and universities by size of sections: Fall 2000.

TABLES SFY.23, SFY.24, AND SFY.25: TWO ELEMENTARY STATISTICS COURSES

These three tables present data on two first-year courses — Elementary Statistics, and Probability and Statistics, both with no calculus prerequisite. In addition to displaying enrollment and average section size figures for the courses, they answer the questions "Who teaches the courses?" and "How are the courses taught?" In comparing the figures in these three tables with, say, Table SE.3, it is important to realize the courses studied in these three tables are but two of the courses in the broader category that earlier tables called "elementary level statistics" in four-year colleges and universities. For a listing of courses within that broader category, see Appendix I or see the four-year mathematics and statistics questionnaires reproduced in Appendices IV and VI. In addition, Table SFY.25 is devoted entirely to the single Elementary Statistics course listed as course C1 in the four-year mathematics questionnaire, and as course B-1 in the four-year statistics questionnaire. For further study of these tables, see Tables FY.5 through FY.8 in Chapter 5. The corresponding tables in the CBMS1995 report are SFY.22 and SFY.23.

A. Enrollment and Section-Size Trends

In four-year colleges and universities, enrollments in the first-year course "Elementary Statistics" grew by about 18% between fall 1995 and 2000, and accounted for nearly all of the enrollments in the elementary statistics category (see Table SE.3). As shown in Tables SFY.23 and SFY.24, fall 2000 enrollments in the first-year course "Probability and Statistics" dropped by about 28% from fall 1995 levels in mathematics departments, and that second course is quite small compared to the first.

Table SFY.23 corrects an addition error in the corresponding table (SFY.22) from the 1995 report appearing in the Enrollment Total column for the Elementary Statistics course, and for the combination of the two courses studied in the table.

Table SFY.24 shows that in statistics departments, enrollments in the first-year Elementary Statistics course also grew between 1995 and 2000, but at a slower rate than in mathematics departments, and that enrollments in the first-year Probability and Statistics course dropped to half of their already relatively small 1995 level.

In two-year colleges, enrollment in Elementary Statistics (with or without Probability) grew by about 3% between fall 1995 and fall 2000.

Average section sizes in the Elementary Statistics course grew by about 27% between 1995 and 2000 in both mathematics and statistics departments, with average section sizes in statistics departments continuing to be substantially larger than in mathematics departments. Average section sizes in two-year colleges declined during the same period.

B. Who Teaches the Two Courses?

Tables SFY.23 and SFY.24 describe the percentage of fall 2000 enrollments in four-year colleges and universities that were taught by various types of instructors, and the percentage of *sections* in two-year colleges that were taught by full-time (permanent and temporary) and part-time instructors.

If one ignores the unknown instructor column, one sees a substantial drop in the percentage of enrollment in the Elementary Statistics course in mathematics departments that was taught by tenured and tenure-eligible faculty. Indeed, there was a fourteen point decrease in the percentage of Elementary Statistics course enrollment taught by full-time faculty of any type (tenured, tenure-eligible, or other full-time faculty) in mathematics departments. The same general trend was found in statistics departments — for example, there was a nine percentage point drop between fall 1995 and fall 2000 in the percentage of enrollment in the Elementary Statistics course that was taught by full-time faculty of any kind. In two-year college mathematics programs, there was also a decline in the percentage of sections taught by full-time faculty, but it was much smaller. In the Elementary Statistics course in four-year colleges and universities, the percentage of enrollment taught by graduate teaching assistants declined. In mathematics departments, the change was marginal, and in statistics departments the decline was large. In both kinds of departments, the percentages taught by other full-time and part-time faculty rose.

If one takes the unknown instructor percentages into account, the picture becomes murkier. Even if all unknown instructors were tenured or tenure-eligible, the percentage of enrollments taught by tenured and tenure-eligible instructors still declined, but by a lesser amount than mentioned above. The percentage of enrollment taught by other full-time and part-time instructors rose, no matter who the unknown instructors were, and might have risen sharply. In statistics departments, the percentage of enrollment in the Elementary Statistics course taught by graduate students declined somewhat. In mathematics departments, taking the unknown instructor percentages into consideration makes it unclear whether the level of teaching by graduate students in the Elementary Statistics course rose or fell between fall 1995 and fall 2000.

C. How is the Elementary Statistics Course Taught?

Table SFY.25 focuses on the extent to which the five calculus reform pedagogies studied in Tables SFY.20 and SFY.22 have influenced the teaching of the first-year Elementary Statistics course in mathematics and

statistics departments of four-year colleges and universities, and in mathematics programs of two-year colleges. It has no antecedent in the CBMS1995 report, although that report did present information about the use of computer assignments in 1995 Tables SFY.22 and SFY.23. For more detailed information, see tables FY.6 and FY.8 in Chapter 5 of this report.

The use of computer assignments in teaching the Elementary Statistics course declined slightly in four-year mathematics departments and in two-year mathematics programs between 1995 and 2000, and increased slightly in four-year statistics departments. Table SFY.25 makes it clear that statistics department faculty saw computer assignments and "meeting at least once each week in a setting that requires student computer use" (abbreviated "weekly computer lab" in Table SFY.25) as being considerably more important in the Elementary Statistics course than did their colleagues in mathematics departments. Three other reform pedagogies — graphing calculators, writing assignments, and group projects — were more frequently used in mathematics departments. Two-year college mathematics programs generally agreed more with four-year mathematics departments than with statistics departments when it came to the use of reform pedagogies. Of all three types of departments, two-year mathematics programs were the most likely to use graphing calculators, writing assignments, and group projects.

TABLE SFY.23 Percentage of enrollment in Elementary Statistics (no Calculus prerequisite) and Probability and Statistics (no Calculus prerequisite) taught by tenured/tenure-eligible, other full-time, part-time, graduate teaching assistants, and unknown in Mathematics Departments at four-year colleges and universities by size of sections, and percentage of sections in Elementary Statistics (with or without Probability) taught by full-time and part-time faculty in Mathematics Programs at two-year colleges: Fall 2000. Also total enrollments (in 1000s) and average section sizes.

	Percentage of enrollment taught by						
Mathematics Departments	Tenured/ tenure-eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Unknown %	Enrollment in 1000s	Average section size
Elementary Statistics (no calculus prerequisite)							
Large lecture/recitation	47	9	17	14	13	25	41
Regular section <36	47	15	29	3	6	63	27
Regular section >35	40	19	19	10	12	26	47
Course total 2000	45	13	24	7	11	114	42
Course total 1995	65	7	19	8	--	97	33
Probability & Statistics (no calculus prerequisite)							
Course total 2000	50	28	23	0	0	13	25
Course total 1995	61	6	15	19	--	18	31
Total Elem. Probability & Statistics courses	46	14	24	6	10	127	25
Two course total 1995	64	7	18	10	--	115	33

	Percentage of sections taught by			
Two-Year Colleges	Full-time %	Part-time %	Enrollment in 1000s	Average section size
Elementary Statistics (with or without probability)	66	34	71	25
Course total 1995	69	31	69	28

Note: 0 means less than one half of 1%.

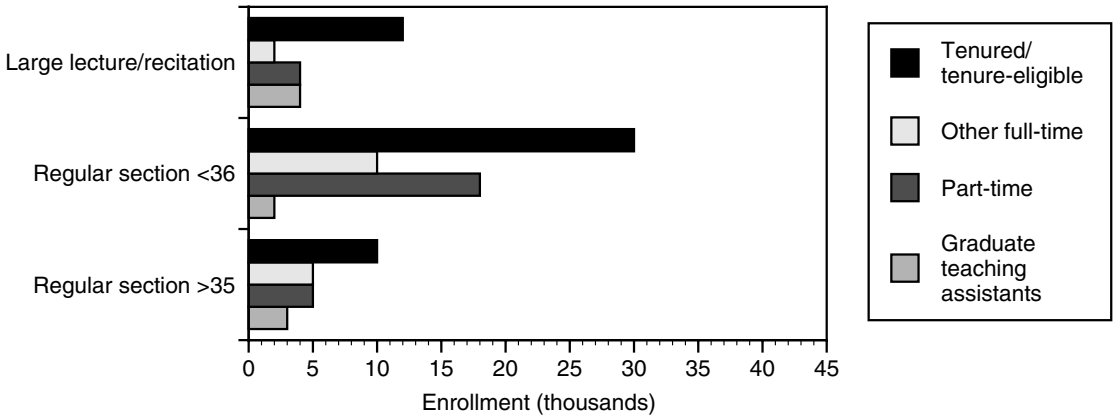

FIGURE SFY.23.1 Enrollment in Elementary Statistics (no Calculus prerequisite) taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Mathematics Departments at four-year colleges and universities by size of sections: Fall 2000.

TABLE SFY.24 Percentage of enrollment in Elementary Statistics (no Calculus prerequisite) and Probability and Statistics (no Calculus prerequisite) taught by tenured/tenure-eligible, other full-time, part-time faculty, graduate teaching assistants, and unknown in Statistics Departments at four-year colleges and universities by size of sections: Fall 2000. Also total enrollments (in 1000s) and average section sizes.

	Percentage of enrollment taught by						
Statistics Departments	Tenured/ tenure-eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Unknown %	Enrollment in 1000s	Average section size
Elementary Statistics (no calculus prerequisite)							
Large lecture/recitation	38	19	24	15	4	31	65
Regular section <36	50	6	9	30	5	1	28
Regular section >35	23	8	16	36	17	7	47
Course total 2000	36	17	22	19	6	40	65
Course total 1995	47	15	10	29	--	35	51
Probability & Statistics (no calculus prerequisite)							
Course total 2000	18	12	13	32	25	4	55
Course total 1995	32	4	2	61	--	8	48
Total Elem. Probability & Statistics courses 2000	34	17	21	21	7	44	58
Two course total 1995	44	13	9	35	--	43	50

Note: 0 means less than one half of 1%.

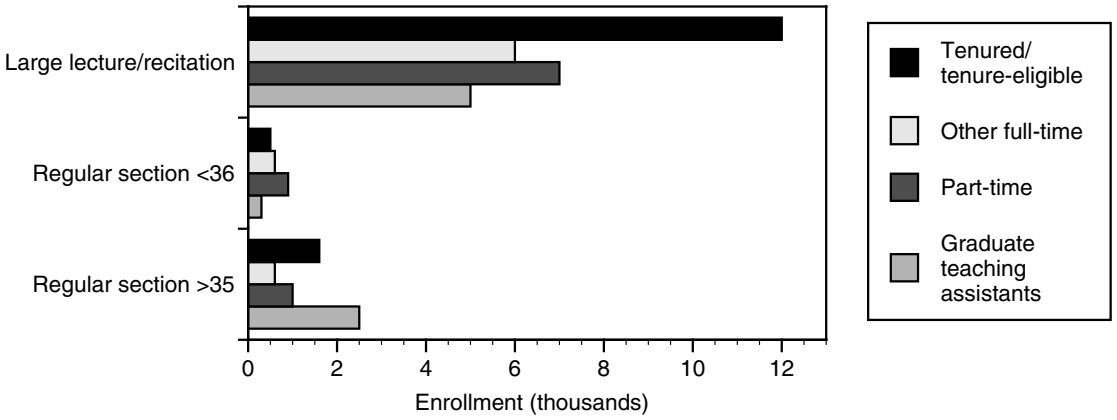

FIGURE SFY.24.1 Enrollment in Elementary Statistics (no Calculus prerequisite) taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Statistics Departments at four-year colleges and universities by size of sections: Fall 2000.

TABLE SFY.25 Percentage of enrollment in Elementary Statistics (no Calculus prerequisite) taught using various reform methods in Mathematics Departments and Statistics Departments in four-year colleges and universities, and percentage of sections in Mathematics Programs at two-year colleges taught using various reform methods: Fall 2000. Also total enrollment (in 1000s) and average section sizes.

	Percentage of enrollment taught using						
Elementary Statistics	Graphing calculators %	Writing assignments %	Computer assignments %	Group projects %	Weekly computer lab %	Enrollment in 1000s	Average section size
Mathematics Departments							
Large lecture/recitation	40	47	61	27	42	25	41
Regular section <36	48	42	54	25	20	63	27
Regular section >35	52	22	23	10	13	26	47
Course total 2000	47	39	48	22	23	114	42
Course total 1995	na	na	51	na	na	95	33
Statistics Departments							
Large lecture/recitation	14	22	62	16	47	31	65
Regular section <36	4	24	54	13	19	1	27
Regular section >35	12	26	74	17	32	7	47
Course total 2000	13	23	63	16	43	40	65
Course total 1995	na	na	59	na	na	35	51
Two-year colleges							
Course total 2000	59	50	46	35	28	71	25
Course total 1995	na	na	46	na	na	69	28

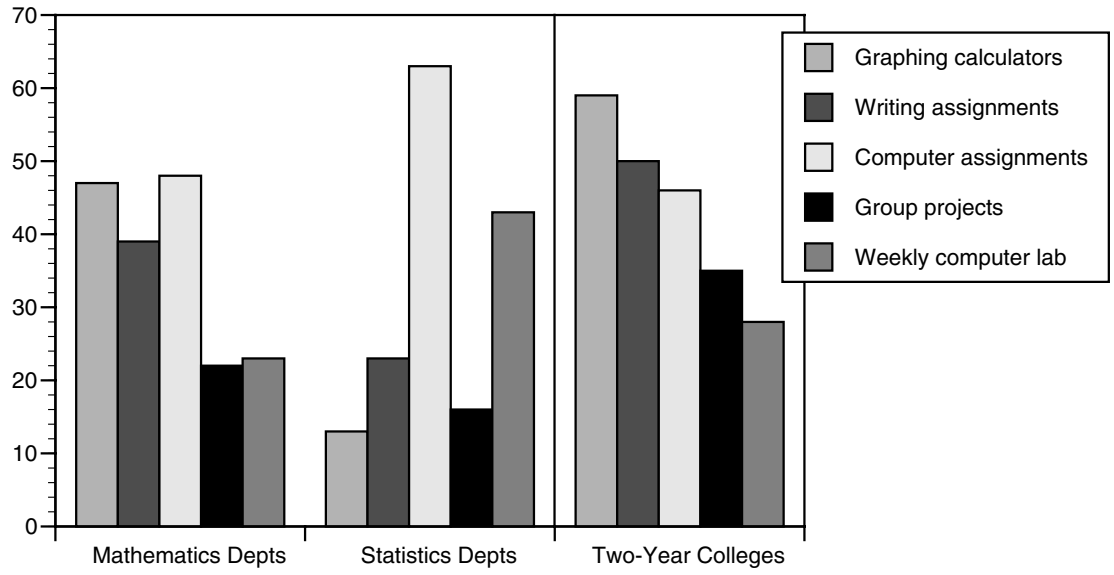

FIGURE SFY.25.1 Percentage of enrollments in four-year colleges and universities, and percentage of sections in two-year colleges, in Elementary Statistics (no Calculus prerequisite) taught using various reform methods: Fall 2000.