The State of Undergraduate Education in Statistics: A Report from the CBMS 2000

Richard L. SCHEAFFER and Elizabeth A. STASNY

Every five years since 1965 the Conference Board of the Mathematical Sciences (CBMS), with the support of the National Science Foundation, has conducted a national survey of undergraduate education in the mathematical sciences in the United States. The survey collects information on undergraduate enrollments in courses in the mathematical sciences and on the demographics of faculty members. It also asks about the undergraduate curriculum to determine what is taught, who teaches it, and how it is taught. The 2000 CBMS survey, for the first time, sampled departments of statistics separately and asked questions about the educational backgrounds of those teaching statistics in departments of mathematics. This article presents a summary of the 2000 CBMS survey results of particular interest to statisticians.

KEY WORDS: Bachelor's degrees; CBMS survey results; Instructional practices; Undergraduate statistics enrollment; Statistics faculty.

1. INTRODUCTION

The Conference Board of the Mathematical Sciences (CBMS) consists of 16 member organizations, including the American Statistical Association and the Institute of Mathematical Statistics. Every five years since 1965 the CBMS has received support from the National Science Foundation to conduct a national survey of undergraduate education in the mathematical sciences in the United States. The purpose of the survey is to track enrollment trends in undergraduate mathematical sciences courses, but additional information on faculty and instructional practices is collected as well. CBMS does not make recommendations on mathematical sciences education based on this survey. 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. The CBMS surveys include departments that offer associate, bachelor's, master's, 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 includes a set of questions on special topics of current interest. As members of the steering committee, we proposed that CBMS 2000 investigate two special statistics topics: the educational background of faculty members teaching statistics courses in fall 2000, and the impact of the new Advanced Placement (AP) Statistics program on university statistics departments.

A detailed report on the CBMS 2000 survey was published by the American Mathematical Society (see Lutzer, Maxwell, and Rodi 2002). In the following we present summaries of the CBMS 2000 results that are of particular interest to statisticians. Throughout, we make comparisons with previous CBMS surveys. (See, e.g., Loftsgaarden, Rung, and Watkins 1997; Loftsgaarden and Watkins 1998.) We note that previous CBMS results are presented without estimates of uncertainty because no such estimates were obtained before the CBMS 2000.

In this section we provide information on the survey methods for the CBMS 2000. Section 2 presents information related to the undergraduate student population enrolled in statistics courses, showing the increasing trends in those enrollments as well as how they compare to calculus enrollments. We include findings related to the new AP statistics courses and the effects of those courses on undergraduate statistics education. Section 3 gives results relating to the faculty teaching undergraduate statistics, showing that much of the teaching load is shifting from tenured or tenure-accruing faculty to other full-time faculty rather than part-time faculty. Section 4 describes teaching practices in undergraduate statistics courses, documenting the increasing use of computers. Section 5 presents conclusions.

1.1 CBMS 2000 Methods

The Survey Research Unit of the University of North Carolina was hired to help design and carry out the survey and to conduct statistical analyses of the responses. This is the first time in the history of the CBMS that a statistical group was involved in the design and implementation of the survey. The CBMS 2000 survey used stratified simple random samples of three separate populations: mathematics programs in not-for-profit two-year colleges ($N = 1{,}007$, $n = 300$), mathematics departments in four-year colleges and universities ($N = 1{,}430$, $n = 240$), and statistics departments in four-year colleges and universities ($N = 70$, $n = 60$). Surveys were mailed to sampled departments in September 2000 and data collection was completed in

Richard L. Scheaffer is Professor Emeritus, Department of Statistics, University of Florida, Gainesville, FL 32603 (E-mail: Scheaffe@stat.ufl.edu). Elizabeth A. Stasny is Professor, Department of Statistics, Ohio State University, Columbus, OH 43210 (E-mail: eas@stat.ohio-state.edu). The authors are particularly grateful to our colleagues in the 45 statistics departments who responded to the CBMS 2000.

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Table 1. Estimates of Fall Enrollment in Statistics Courses by Level of Course, Year, and Type of Unit Offering the Course

	Four-year colleges and universities								Two-year colleges			
	Mathematics departments				Statistics departments				Mathematics programs			
	1990	1995	2000	Change from 1990	1990	1995	2000	Change from 1990	1990	1995	2000	Change from 1990
Elementary courses	87	115	136 (12)	56%	30	49	54 (3)	80%	54	72	74 (5)	37%
Upper level Courses	38	28	35 (3)	−8%	14	16	20 (2)	43%	0	0	0	—

NOTE: Enrollment is in 1000s of students. Standard errors are given in parentheses below the enrollment estimates for 2000; standard errors were not calculated in previous years. Percent change is from 1990 to 2000.

February 2001. The response rates were 60% for two-year college mathematics programs, 70% for four-year college mathematics departments, and 75% for statistics departments. Because stratified random sampling without replacement was used for choosing the samples within each of the three populations, the stratification also had to be taken into account in calculating summary measures and their standard errors. National estimates and their standard errors were obtained using SUDAAN survey software. (See, e.g., Research Triangle Institute 2002.)

Statistics departments were divided into five strata for sampling and analysis: four included departments granting Ph.D.s grouped by institutional enrollment (0–14,999; 15,000–24,999; 25,000–34,999; and 35,000+) and the fifth included all other departments offering master's and/or bachelor's degrees. After accounting for the fact that there would be some nonresponse, it was determined that of the 70 statistics programs at four-year colleges and universities, 60 should be sampled for the CBMS. The 45 institutions responding to the survey (distributed as 6, 14, 6, 11, and 8 across the respective strata above) are listed in the Appendix. Note that biostatistics departments were not included in CBMS 2000 because none of them taught classes for undergraduates.

Advance letters were mailed on September 1, 2000, informing sampled departments that they would be receiving the questionnaire. All questionnaires were mailed on September 11, 2000.

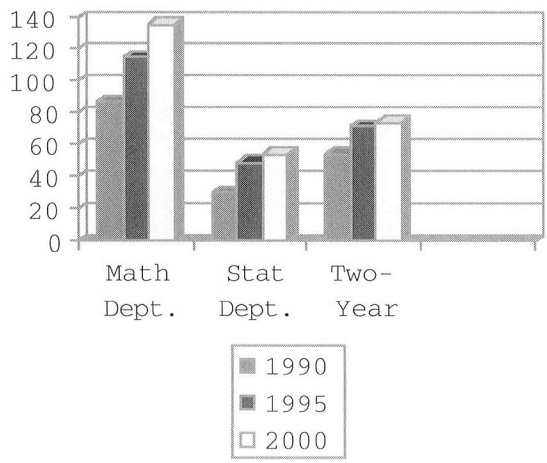

Figure 1. Estimated Enrollment (in thousands of students) in Elementary Statistics Courses by Year and Type of Unit Offering the Course.

Postcard reminders were mailed on October 9 and a second questionnaire was mailed to nonrespondents on October 23. Members of the CBMS steering committee contacted nonresponding departments to encourage them to complete the survey. Responses were accepted until February 28, 2001. A copy of the 20-page statistics questionnaire was given by Lutzer, Maxwell, and Rodi (2002).

In the following we make a number of comparisons of results from CBMS 2000 with previous CBMS survey results. Thus, it is important to note the difference in sampling methods used for previous surveys. CBMS 2000 was the first time that a separate sample of statistics departments was selected. Previous surveys sampled mathematics departments at four-year institutions and then included any statistics departments at sampled institutions. Differences in estimates over time are, therefore, confounded with potential biases from the sampling design used previously.

2. UNDERGRADUATE STUDENTS ENROLLED IN STATISTICS

2.1 Enrollment Estimates

Starting in 1990, elementary statistics course fall term enrollments had a decade-long rise (see Table 1 and Figure 1). In mathematics departments of four-year colleges and universities, elementary statistics enrollments were about 56% higher in 2000 than in fall 1990 and in statistics departments they climbed to 80% above their fall 1990 level. In two-year college mathematics programs, enrollments in statistics courses in fall 2000 were 37% higher than in fall 1990. Comparing 2000 enrollments to those of 1995, two-year colleges saw an increase of 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.

Using the full CBMS 2000 report (Lutzer, Maxwell, and Rodi 2002), we may compare the estimated enrollments in elementary statistics courses to those in introductory calculus courses. Among four-year colleges and universities, mainstream calculus I for 1990, 1995, and 2000 had enrollments (in thousands of students) of 201, 192, and 192, respectively, while enrollments in nonmainstream calculus I courses were 148, 95, and 105 for the same three years. Thus, in 2000, enrollment in elementary statistics offered in mathematics departments was about 71% of enrollment in introductory mainstream calculus I. Among

Table 2. Estimated Numbers of Bachelor's Degrees in Mathematics and Statistics Departments at Four-Year Colleges and Universities

Major	1989–1990	1994–1995	1999–2000
Mathematics (except in majors shown below)	13,303	12,456	10,759 (992)
Mathematics education	3,116	4,829	4,991 (1,334)
Statistics	618	1,031	502 (68)
Actuarial mathematics and statistics	245	620	425 (90)
Mathematics and statistics	124	188	196 (101)

NOTE: Standard errors are given in parentheses below the enrollment estimates for 2000; standard errors were not calculated in previous years. Concerning the high standard error for the estimated number of mathematics and statistics degrees, we note that most institutions report zero in this category, but there are a few responses as high as 5 to 10.

two-year colleges, comparable enrollments now appear to have passed those for calculus I in the mathematics departments of these institutions.

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. Between fall 1995 and fall 2000, NCES reported an increase of 7.4% in total enrollment in all degree-granting institutions (see Gerald and Hussar 2002, table 10), while CBMS data show an increase of about 10.7% in enrollments in all mathematics and statistics department courses.

We note that enrollments in statistics courses beyond the elementary level are relatively small and have had less dramatic increases, or even decreases, since 1990. This should alert the statistics profession that there is much work to do to improve undergraduate statistics education for the many students who should have a strong background in statistics for their chosen fields of endeavor. [See the Bryce, Gould, Notz, and Peck (2001) article on the ASA guidelines on undergraduate degrees in statistical science for more on this issue.]

2.2 Degrees and Demographics of Undergraduate Statistics Students

The number of bachelor's degrees granted in statistics (Table 2) appears to have risen in the middle of the decade and then settled back to near 1990 levels by 2000. About half of these degrees are joint with some aspect of mathematics, with actuarial mathematics remaining a popular choice. (The large decrease in the estimated number of bachelor's degrees granted in statistics between 1995 and 2000 may be surprising, but we note that the 1995 estimate is from a nonprobability sample for which no measure of error was calculated and the estimated error for 2000 is quite large. Amstat Online data suggest that slightly more than 1,000 bachelor's degrees in statistics were awarded in 1999–2000, but these are self-reported data that include a variety of departments that do not fit into any of the populations of the CBMS study.) Over the same 10-year period, the numbers of mathematics majors dropped steadily, and there was an increase in the numbers of mathematics education majors.

The percentages of degrees awarded to women by statistics departments increased steadily from 38% to 43% over the decade, while the increase was from 32% to 59% for degrees in statistics awarded by mathematics departments. Table 3 shows the estimated numbers of bachelor's degrees in mathematics and statistics awarded between July 1, 1999, and June 30, 2000. The percentages of women receiving bachelor's degrees in statistics are higher in mathematics departments than in statistics departments, but they are substantial in all types of statistics and mathematics departments. Overall, an estimated 49% of bachelor's degrees in statistics were awarded to women compared to 42% of bachelor's degrees in mathematics. These estimates suggest that there is a good-sized pool of potential female graduate students in statistics and, eventually, of female faculty members.

Table 3. Estimated Numbers of Bachelor's Degrees in Mathematics and Statistics in 1999–2000 by Gender and Highest Degree Awarded by the School (standard errors in parentheses)

	Mathematics departments			Statistics departments	
	Ph.D.	Master's	Bachelor's	Ph.D.	Master's
Statistics majors					
Males	36 (17)	43 (17)	24 (15)	161 (22)	62 (26)
Females	48 (15)	65 (38)	34 (34)	139 (17)	32 (9)
Percent females	57%	60%	59%	46%	34%
Mathematics majors					
Males	2,851 (273)	1,340 (144)	3,742 (524)		
Females	1,703 (159)	886 (119)	3,142 (591)		
Percent females	37%	40%	46%		

NOTE: There are no departments of statistics in universities for which the highest degree awarded is a bachelor's.

2.3 Impact of the Statistics Advanced Placement Examination

As mentioned above, one set of special topics questions on the statistics questionnaire asked about changes in enrollments, curriculum, and the number of statistics majors in statistics departments that might have resulted from the relatively new AP statistics program. Although the numbers of high school students taking the AP statistics examination are large (7,667 in 1997, 15,486 in 1998, 25,240 in 1999, and 34,118 in 2000) the impact of this program was not expected to be extensive because the examination was first offered in 1997. The resulting data, however, can serve as a baseline for future studies. We do expect the impact of AP statistics offerings to grow as the number of students enrolled in those courses continues to grow; about 58,000 students took the AP Statistics examination in 2003.

For fall 2000, it is estimated that 1,012 (SE 230) students nationally received statistics department credit for an elementary level statistics course based on their AP statistics examination performance. That figure was slightly less than 2% of the total of all fall 2000 elementary level statistics enrollments in statistics departments. (The 1,012 figure may look low compared to the nearly 18,000 students who received grades of 3, 4, or 5 on the AP exam in the spring of 2000, but there are fewer than 100 statistics departments in the U.S. and almost 1,400 mathematics departments. Thus, the numbers reported by statistics departments do not include the students receiving credit for statistics in the vast majority of institutions.)

The survey found that in fall 2000 no statistics department reported creating new courses because of AP statistics, but some statistics departments did report an increase in statistics majors since the 1997 inception of the program. In fall 2000, about 80% (SE 3.7) of statistics departments offered a bachelor's degree in statistics. Of those departments offering a bachelor's degree, about 32% (SE 5.7) reported an increase in the number of majors between 1997 and 2000; further breakdown of this figure reveals that 36% of doctoral statistics departments and 17% of master's level statistics departments reported an increase in undergraduate majors.

It is too early to see an impact of the AP program on bachelor's degrees granted. Furthermore, because the AP Statistics examination allows students to earn credit only for the noncalculus elementary statistics course, the linkage between that program and the number of majors in statistics departments is somewhat indirect. It is possible, however, that the enthusiasm for statistics generated by students' early exposure to the subject might lead to growth in the number of undergraduate majors. Reports of increases in the numbers of statistics majors by some departments may be noteworthy given what appears to be a general decline in the number of statistics majors (in both statistics and mathematics departments) between 1995 and 2000.

Table 4. Estimated Numbers of Faculty Members in Statistics Departments by Type of Position and Gender

	Tenured	Tenure-eligible	Other full-time	Part-time	Total
2000					
Men	644	107	92	62	905
Women	66	54	59	28	207
Total	710	161	151	90	1,112
	(27)	(10)	(15)	(10)	(37)
1995					
Men	690	153	38	106	987
Women	40	38	29	30	137
Total	730	191	67	136	1,124

NOTE: Standard errors are given in parentheses below the enrollment estimates for 2000; standard errors were not calculated in previous years.

3. FACULTY MEMBERS TEACHING UNDERGRADUATE STATISTICS

3.1 Estimates of Faculty Size

Table 4 shows the estimated numbers of faculty members in statistics departments classified by type of position and gender. Even though the undergraduate enrollments in the nation's statistics departments rose by almost 14% between fall 1995 and fall 2000, during the same period the total full-time faculty in statistics departments only grew by about 3%, from 988 to 1,022. At the same time there was a 34% drop in the number of part-time faculty. Furthermore, Table 4 shows that the numbers of both tenured and tenure-eligible faculty members declined, 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 toward other full-time faculty, just as there was in mathematics departments (see Lutzer, Maxwell, and Rodi 2002). Interpretation of these data should take into account the standard errors associated with the 2000 figures, and the fact that there are no standard errors available for the 1995 data.

Between 1995 and 2000, statistics departments saw the same staffing trends as did mathematics departments (Lutzer, Maxwell, and Rodi 2002), 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 (Table 5). Even taking the unknown instructor column into consideration, we see that there was little or 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.

Looking at the elementary statistics course (no calculus prerequisite) by itself, comparison of estimated teaching percentages from fall 1995 and fall 2000 leads to the conclusion that the percentage of enrollment taught by tenured and tenure-eligible faculty members decreased, as did the percentage of enrollment taught by graduate students. The percentage of enrollment taught by other full-time faculty or by part-time faculty rose substantially.

The overall average number of students per section, including large-lecture classes with recitation (discussion) sections, is about 60; this increases to 64 for just those classes with recitation sections and decreases to 52 for classes without recitation sections. The average class size for an elementary statistics course with no calculus prerequisite was estimated at about 58 students, up from about 50 in 1995.

Table 5. Estimated Percentages of Enrollments in Statistics Departments by Type of Instructor

	Percentage taught by				
	Tenured/ tenure-eligible	Other full-time	Graduate Part-time	Teaching assistants	Unknown
All courses					
2000	51	13	13	18	5
1995	56	9	7	29	0
Elementary					
2000	34	17	21	21	7
1995	44	13	9	35	0

3.2 Demographics of Statistics Faculty Members

The estimated 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 is the highest up to that time (Table 6). Among tenured statistics faculty, the estimated percentage of women rose from 5% in 1995 to 9% in fall 2000, and among tenure-eligible faculty the estimated percentage grew from 20% in 1995 to almost 34% in fall 2000 (Tables 4 and 6). The estimated percentage of women in statistics departments was considerably lower than in mathematics departments, standing at 18% in fall 2000 as compared to 25% in mathematics. That percentage for statistics, however, was up by seven percentage points from 1995 to 2000. Among tenure-eligible faculty, who are likely to be the most recent hires, the percentage of women is about the same for both mathematics and statistics departments.

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

3.3 Statistics Degrees of Those Teaching Statistics

A way to understand the educational backgrounds of faculty teaching statistics courses is to ask about the major fields of study for their highest earned degree. CBMS 2000 phrased the question in those terms to take into account that a person might receive a doctoral degree from a mathematics department even though the person's dissertation was in statistics. Table 7 presents the estimated proportions of instructors teaching statistics by highest degree earned.

By far the majority of instructors within statistics departments have at least a master's degree in statistics or biostatistics (about 89% for doctoral departments and about 79% for master's departments). In doctoral mathematics departments, however, only about 58% of statistics course instructors had at least a master's degree in statistics or biostatistics as their highest degree earned. In master's-level mathematics departments, the corresponding percentage was near 44%, and in bachelor's-level departments only 19% of statistics course instructors had at least a master's degree in statistics or biostatistics as their highest degree earned. As we expected, a large majority of instructors in statistics departments (83% for doctoral departments and 62% for master's departments) held doctoral degrees in either statistics or biostatistics. The comparable percentages for instructors of statistics in mathematics departments were about 52% and 38%.

Taken together, we estimate that fewer than 50% of the faculty teaching statistics courses in mathematics departments have

Table 6. Estimated Numbers of Full-Time Faculty Members in Statistics and Mathematics Departments at Four-Year Institutions by Gender, Year, and Tenure Status

	1985	1990	1995	2000	Tenured 2000	Tenure-Eligible 2000	Other 2000
Statistics departments							
Number of faculty members	740	735	988	1,022 (32)	710 (27)	161 (10)	151 (15)
Number of faculty women	74	105	107	179 (11)	66 (7)	54 (6)	59 (7)
Percent of faculty women	10%	14%	11%	18%	9%	34%	39%
Mathematics departments							
Number of faculty members	17,849	19,411	18,248	19,007 (622)	12,335 (519)	3,136 (234)	3,536 (250)
Number of faculty women	2,677	3,843	3,880	4,673 (279)	2,042 (208)	958 (113)	1,673 (148)
Percent of faculty women	15%	20%	21%	25%	17%	31%	47%

NOTE: Standard errors are given in parentheses below the estimates of number of faculty for 2000; standard errors were not calculated in previous years.

Table 7. Fall 2000 Estimated Percentage of Faculty Teaching Statistics Courses with Various Major Fields for Highest Degree Earned, by Highest Degree Offered in Department (standard errors in parentheses)

	Mathematics departments			Statistics departments	
Field of highest degree	Ph.D.	Master's	Bachelor's	Ph.D.	Master's
Statistics Ph.D.	50 (4)	36 (7)	11 (2)	82 (2)	56 (9)
Statistics master's	6 (1)	6 (2)	7 (2)	5 (1)	15 (2)
Biostatistics Ph.D.	2 (1)	2 (1)	0 (0)	1 (.4)	6 (3)
Biostatistics master's	0 (0)	0 (0)	1 (1)	1 (.3)	2 (1.3)
Mathematics Ph.D.	22 (4)	28 (4)	31 (4)	6 (1)	10 (5)
Mathematics master's	6 (2)	12 (3)	18 (3)	0 (.4)	2 (1.3)
Other Ph.D.	7 (3)	10 (5)	16 (4)	2 (1.1)	4 (2)
Other master's	3 (1.1)	3 (1.7)	11 (4)	0 (.1)	2 (1.7)

at least a master's degree in statistics, a situation that is much worse in two-year colleges. This could have negative effects on the quality of undergraduate statistics education and on the prospects of pursuing graduate work in statistics among those undergraduates who might be interested in the field. In turn, this may compound the problem of an under supply of statisticians in the labor market.

4. INSTRUCTIONAL PRACTICES

CBMS 2000 examined the use of several "reform pedagogies" in the teaching of the first-year elementary statistics course, in particular the use of graphing calculators, writing assignments, computer assignments, group projects, and meeting at least once a week in a context that required computer use. Some of the results related to these reforms are shown in Table 8. The CBMS 1995 report gives data on the use of computer assignments in the elementary statistics course in fall 1995, but the other pedagogies have no historical data. By fall 2000, the use of computer assignments in the elementary statistics course had increased in departments granting Ph.D. and master's degrees, but had decreased in mathematics departments granting bachelor's degrees at four-year colleges and universities.

Comparisons between pedagogical practices in mathematics departments and statistics departments show that faculty members in statistics departments were considerably more interested in using computer assignments and in weekly computer labs than were their colleagues in mathematics departments or programs. On the other hand, mathematics departments tended to use writing assignments to a slightly greater degree.

5. CONCLUSIONS

Enrollments in undergraduate statistics increased steadily between 1990 and 2000 in both mathematics and statistics departments. Of the 319,000 enrollments in the fall of 2000, nearly 54% were in departments of mathematics, while statistics departments and mathematics departments in two-year colleges share the remainder approximately equally. (No accounting has been made for the enrollments in statistics courses taught outside of the mathematical sciences.)

The number of faculty members teaching statistics has not kept pace with the enrollment increases, especially at the tenured and tenure-eligible ranks. There was a substantial increase in

Table 8. Estimated Percentages of Enrollment in Elementary Statistics with Various Teaching Practices (by type of department)

	Writing assignments			Computer assignments			Weekly computer lab		
	Ph.D.	Master's	Bachelor's	Ph.D.	Master's	Bachelor's	Ph.D.	Master's	Bachelor's
Mathematics									
2000	22	33	52	48	55	44	23	22	24
1995	na	na	na	42	30	64	na	na	na
Statistics									
2000	25	11	na	61	85	na	38	85	na
1995	na	na	na	61	25	na	na	na	na

the percentage of enrollment taught by full-time faculty other than those tenured or tenure-eligible and part-time faculty. Both statistics and mathematics departments appear to be shifting much of their undergraduate teaching to nontenure-eligible full-time instructors.

The percentages of women holding tenured and tenure-eligible faculty positions in statistics departments increased over the decade, but are still low compared to the percentages for mathematics departments. The percentages of women receiving bachelor's degrees in mathematics or statistics increased over the decade, suggesting that the pool of potential faculty members should also be increasing.

In this time of great emphasis on teacher education and the proliferation of statistics topics within the K–12 curriculum, it is interesting to note that, among colleges and universities offering K–8 teacher certification programs, only 4% of the statistics departments offer a special course for prospective teachers. About 68% of statistics departments say that prospective teachers are likely to take a standard elementary statistics course. Given that most state standards call for an emphasis on data analysis throughout the K–12 mathematics curriculum and many high schools have a significant amount of statistics in their curricula below the AP level, this appears to be an inadequate response to current efforts in the mathematics education community to improve the skills of future teachers.

In the use of writing assignments and group projects, mathematics doctoral departments and statistics doctoral departments were roughly comparable. In the use of required computer assignments and weekly computer labs, doctoral statistics departments were substantially ahead of doctoral mathematics departments.

APPENDIX: SCHOOLS WITH STATISTICS DEPARTMENT RESPONDENTS IN THE CBMS 2000

Bowling Green State University
Brigham Young University
California State University, Hayward
Carnegie Mellon University
Colorado State University
Cornell University
Florida State University
George Mason University
Iowa State University
Kansas State University
Louisiana State University
Michigan State University
North Dakota State University
Ohio State University
Oklahoma State University
Oregon State University
Pennsylvania State University
Purdue University
St. Cloud State University
Stanford University
New York University, Stern School of Business
Texas A& M University
George Washington University
University of California, Santa Barbara
University of California, Davis
University of California, Riverside
University of Central Florida
University of Chicago
University of Connecticut
University of Florida
University of Illinois
University of Iowa
University of Michigan
University of Minnesota
University of Missouri, Columbia
University of North Carolina
University of Pennsylvania
University of Pittsburgh
University of South Carolina
University of Tennessee
University of Virginia
University of Wisconsin
University of Wyoming
Virginia Polytechnic Institute and State University
West Virginia University

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REFERENCES

Bryce, G. R., Gould, R., Notz, W. I., and Peck, R. L. (2001), "Curriculum Guidelines for Bachelor of Science Degrees in Statistical Science," *The American Statistician*, 55, 7–13.

Gerald, D. E., and Hussar, W. J. (2002), *Projections of Education Statistics to 2012*, National Center for Education Statistics, NCES #2002030.

Loftsgaarden, D. O., Rung, D. C., and Watkins, A. E. (1997), *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States: Fall 1995 CBMS Survey*, MAA Reports Number 2, Washington, DC: The Mathematical Association of America.

Loftsgaarden, D. O., and Watkins, A. E. (1998), "Statistics Teaching in Colleges and Universities: Courses, Instructors, and Degrees in Fall 1995," *The American Statistician*, 52, 308–314.

Lutzer, D. J., Maxwell, J. W., and Rodi, S. B. (2002), *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States: Fall 2000 CBMS Survey*, Providence, RI: The American Mathematical Society.

Research Triangle Institute (2002), SUDAAN (Release 8.0) [Computer Software], Research Triangle Park, NC: Research Triangle Institute.