

ASA Caucus of Academic Representatives Report on the 2009 Survey of Departments of Statistics and Biostatistics

This survey was conducted by Keith Crank, ASA liaison, and the report was prepared by Keith Crank, with guidance and approval of the Caucus Board's Executive Committee, which consisted of Douglas Simpson (Chair), Dalene Stangl, Jim Albert, Françoise Seillier-Moiseiwitsch, and Don Edwards.

Introduction:

On April 2, 2009, 94 departments of statistics and biostatistics at US institutions were sent links to an online survey form. The goal was to obtain information about Ph.D. granting departments that would be useful to Chairs and Heads when dealing with their upper level administration and with their faculty. The information would also be useful to ASA in understanding the current state of graduate level statistics education. This was the second such survey conducted by ASA. The first survey was conducted in 2008. The department survey is expected to be an annual event.

The e-mails were sent to the Chair or Head of the department, and they were asked to complete the form by the end of April. Reminders were sent in the middle of April and again about a week before the survey deadline.

Forty-one departments responded to the survey. Of these 41 surveys summarized in this report, 29 were from statistics departments and 12 were from biostatistics departments. This is an increase of five statistics departments and two biostatistics departments, when compared to the 2008 survey. Of the 29 statistics departments that reported in 2009, 15 also provided data in 2008. Of the 12 biostatistics departments that reported in 2009, 7 also provided data in 2008.

Degrees Offered:

Of the 29 Ph.D. granting statistics departments that responded to the survey, 22 offer a Bachelor's degree, all offer a Master's degree, three also offer a Ph.D. in biostatistics, and four offer a Master's in biostatistics. For the 12 Ph.D. granting biostatistics departments, none offer a Bachelor's degree, but 11 offer a Master's degree. (Note: Departments that offer degrees in both statistics and biostatistics were grouped with statistics departments for summary purposes.)

Faculty:

The number of full-time faculty is higher in biostatistics departments than in statistics departments, on average. Although the average number of Full Professors is higher in statistics departments, the average number of faculty in all other categories is higher in biostatistics departments. However, in the Associate and Assistant Professor categories the difference is primarily in the number of Research Only appointments. (See Table 1.)

Biostatistics departments appear to be slightly more diverse than statistics departments. (See Table 2.) However, Table 3 shows that some departments are more diverse than others. (As a point of comparison it is worth noting that in 2007, 56% of the Ph.D.s in biometry and biostatistics went to women, while only 41% of the Ph.D.s in statistics went to women. (This data comes from the IPEDS database at the National Center for Education Statistics.))

Undergraduate Students:

Since none of the biostatistics departments offer a Bachelor's degree, this section deals only with statistics departments. Although 22 of the responding departments indicated they offer a Bachelor's degree in statistics, there was a problem with data from one of the departments and it was not used in compiling summary statistics.

For the 21 departments that are summarized in Table 4, there was an average of 10.8 degrees awarded and an average of 41.3 undergraduate statistics majors. Of the degrees awarded, 81% went to U.S. citizens and 40% went to women. The survey forms identified 6% of the degree recipients as underrepresented minority (URM). No information was collected on what happened to the students upon graduation.

Graduate Students:

Graduate programs in statistics and biostatistics tend to be larger than undergraduate programs in statistics. The number of students in graduate statistics and biostatistics programs averages between 50 and 60 compared to an average of about 40 undergraduate statistics majors. Most of the graduate students are Ph.D. students, but because of the longer time needed to complete a Ph.D. there are 2-3 times as many Master's degrees awarded as Ph.D.s. (See tables 5 and 7.)

Not surprisingly, given recent trends, the percentage of degrees going to U.S. citizens decreases as one progresses from Bachelor's to Master's to Ph.D. On the other hand, this is not happening with degrees awarded to women. A higher percentage of graduate degrees go to women than do undergraduate degrees.

There were very few underrepresented minorities (URMs) in any of the graduate programs. At the Master's level, about 4.5% of the statistics degrees and 9% of the biostatistics degrees went to URMs. At the Ph.D. level these percentages were 5% and 6%, respectively.

Upon receiving their Master's degree, about 31% of biostatistics students and 43% of statistics students continue on for a Ph.D. (Many of these may already be in a Ph.D. program, but receive a Master's degree along the way.) Of these, about a third go into a Ph.D. degree program other than statistics or biostatistics. However, there are many Master's degree recipients who are in a status unknown to the department. (Statistics departments seem to do better at following their Master's students after graduation than do biostatistics departments.) (See Table 6.)

For biostatistics Ph.D. graduates, 20% went to tenure track positions, while 33% of statistics Ph.D. graduates went to tenure track positions. The percentages of both groups going to postdoctoral positions were very similar (around 15%). The percentages of Ph.D.s going to nonacademic positions were about the same for the two types of departments.

Only one of the 224 Ph.D. recipients was reported as being unemployed. But 17 were listed as in an unknown status, so the total unemployment could be around 8%. We did not collect unemployment information for those with a Master's degree.

Additional Student Information:

For the 2009 survey, we asked about credit for AP statistics. Twenty-six of the twenty-nine statistics departments that responded indicated that their university gave credit for a sufficiently high score on the AP statistics exam. (The remaining three departments gave answers of "no," "don't know," and "NA.") Of the 26 that gave credit for AP statistics, 3 required a score of 5 on the exam, 9 required a score of 4 or higher, and 9 required a score of 3 or higher. (The remaining 5 didn't know what score was required, or didn't answer that part of the question.)

We also asked about applications for graduate school. The average number of applications for graduate school was about 70 for a statistics Master's program, 115 for a statistics Ph.D. program, 35 for a biostatistics Master's program, and 45 for a biostatistics Ph.D. program. Most statistics departments indicated that the number of applications increased from the previous year for both the Master's and Ph.D. programs. Biostatistics departments indicated that the number of applications increased for their Ph.D. programs, but decreased for their Master's programs.

Although the number of applications for graduate programs generally increased, the number of expected students did not. Most departments (both statistics and

biostatistics) expected the number of new graduate students to be at or below the number for 2008 (at both the Master's and Ph.D. levels).

Finally, we asked about assistantships available for graduate students. All of the statistics departments have teaching assistantships, and all but two have research assistantships. Almost all of the assistantships are available to both Master's and Ph.D. students.

Comparisons with 2008:

The summary data for 2009 shows little change from 2008. But, in 2008 the average number of faculty was almost identical for statistics and biostatistics departments, while this year biostatistics departments appear to be larger. When comparisons are made between the two years for only those departments that reported in both years, there are no changes in total faculty between 2008 and 2009. However, there is some evidence that the full-time faculty in biostatistics departments increased, while part-time/adjunct faculty decreased by a corresponding amount.

Looking at the data from the departments that responded both years, I found that the year to year variation in responding departments actually masked a possible trend in student information. Although the number of undergraduate statistics majors appears to have remained constant (based on Table 4 in both the 2008 report and this report), the data from departments that responded both years shows a substantial increase from 2008 to 2009. For these departments the average number of statistics majors went up from 38 in 2008 to 46.5 in 2009 (with a standard error of 4.4 based on paired differences).

This suggested looking at a few more variables. Tables 9 and 10 give some of the overall student and faculty information for 2008 and 2009, as well as a regression estimate for 2009. The regression estimator is a double-sampling estimator, as described in Cochran's Sampling Techniques (1977, Third Edition). I used a constant slope of 1.0 across all of the variables, as well as an r-squared of 0.75 in estimating the variance. And instead of trying to get optimal weights for the unmatched and matched estimators, I used the sample sizes to get the weights. (For the unmatched estimator, I used the size of the unmatched portion of the 2009 sample. For the matched estimator, I used a number slightly higher than the average of the number of the matched portion and the total 2008 sample.) Although the sample sizes are large compared to the population of Ph.D. granting statistics and biostatistics departments, I ignored the finite population correction factor in estimating the standard errors.

For most of the variables, the regression estimate falls between the 2008 mean and the 2009 mean. However, for the number of bachelor's students and the number of statistics Ph.D. students, the regression estimate is larger than either of the two means. This is most interesting for the bachelor's students, since the

2009 mean was substantially (though not significantly) lower than the 2008 mean.

Comparisons with other Information:

For most of the data collected in this survey, there is no other place to find the information. (Of course, that's why the survey was conducted.) But, for number of Ph.D. degrees, there are other sources of information.

For Ph.D. degrees, the American Mathematical Society (AMS) conducts a yearly survey of math, statistics, and biostatistics departments. Their February 2009 report shows 215 Ph.D.s awarded by statistics departments and 76 Ph.D.s awarded by biostatistics departments for the same time period as this survey. (Note that these are simple counts of the number of Ph.D.s awarded by those departments that responded to their survey. It is not an estimate of total Ph.D.s awarded by statistics and biostatistics departments.) Separately, the National Center for Education Statistics collects data on Ph.D. degrees awarded by discipline (IPEDS data). For 2007, they provide a figure of 314 Ph.D.s in statistics and 129 Ph.D.s in biostatistics and biometry. (I believe the NCEs data is for the calendar year. Both this survey and the AMS survey asked for degrees awarded between July 1, 2007, and June 30, 2008.)

From the data collected in this survey, we can estimate the total number of Ph.D.s awarded by statistics departments (N=59) and biostatistics departments (N=35). The estimates are 354 (s.e.=46) for statistics and 146 (s.e.=46) for biostatistics. Both of these estimates look reasonable.

Final Comments:

This report documents the results of the second of what should be regular surveys of statistics and biostatistics departments. It contains few surprises. But it does begin to provide information based on survey data that, over time, will have much more validity about things we "know" than do our individual guesses and anecdotal information.

The survey only included statistics and biostatistics departments that offer a Ph.D. in statistics or biostatistics. Many Bachelor's and Master's degrees (and a few Ph.D.s) come from departments that include other disciplines (generally mathematics) or that don't offer a Ph.D. In the future it would be good to sample some of these other departments, but the logistics of this are not simple and would require a large time commitment.

Another survey that could provide valuable information is a survey of our students and alumnae. What induces a student to major in statistics? What happens to our students when they graduate? What are their career paths? How

can we continue to provide resources that they would find useful? This, also, would be more complicated than what we are currently doing and would require a large time commitment.

Tables

	Full Professor (Research Only)	Associate Professor (Research Only)	Assistant Professor (Research Only)	Other Full Time	Adjunct or Part Time	Total Faculty
Statistics (29):						
Mean	7.6 (.03)	3.2 (.03)	4.5 (.07)	2.3	2.1	19.9
Median	7 (0)	3 (0)	3 (0)	2	1	18
Range	3 – 18	1 – 10	0 – 18	0 – 9	0 – 8	8 – 53
Biostatistics (12):						
Mean	6.0 (.2)	4.5 (.8)	6.9 (2.1)	1.8	5.2	24.4
Median	5 (0)	4 (0)	4 (1.5)	0.5	2.5	22
Range	1 – 13	1 – 8	2 – 18	0 – 17	0 – 35	7 – 63

Table 1. Faculty at Ph.D. granting departments of statistics and biostatistics. Numbers in parentheses after type of department are for number of responses. Numbers in parentheses within table are for research only appointments.

	Total Faculty	Female (% of total)	Hispanic (% of total)	URM (% of total)
Statistics (29):				
Mean	19.9	4.7 (24%)	0.2 (1%)	0.5 (3%)
Median	18	4	0	0
Range	8 – 53	0 – 18	0 – 2	0 – 5
Biostatistics (12):				
Mean	24.4	7.4 (30%)	0.5 (2%)	0.9 (4%)
Median	22	6	0	1
Range	7 – 63	3 – 18	0 – 2	0 – 3

Table 2. Female and Minority faculty at Ph.D. granting departments of statistics and biostatistics. Numbers in parentheses after type of department are for number of responses. URM is underrepresented minority. It includes Hispanics, African-Americans, and Native Americans and Pacific Islanders (but not Asians).

	0%	0-10%	10-20%	20-30%	30-40%	40-50%	>50%
Statistics (29):							
Female	1	5	6	8	8	1	0
Hispanic	25	3	1	0	0	0	0
URM	22	4	3	0	0	0	0
Biostatistics (12):							
Female	0	0	4	2	4	1	1
Hispanic	7	4	1	0	0	0	0
URM	4	7	0	1	0	0	0

Table 3. Frequency counts for percentages of department faculty who are female, Hispanic, or URM. Columns include the upper end of the range, but not the lower end (i.e., if a department has exactly 20% of its faculty female, it is counted in the column 10-20%).

	Undergraduate Statistics Majors	Bachelor's Degrees Awarded	U.S. Citizens	Female
Statistics (21):				
Mean	41.3	10.8	8.7 (81%)	4.5 (40%)
Median	49	9	8	4
Range	3 – 107	0 – 42	0 – 21	0 – 10

Table 4. Undergraduate students and Bachelor's degrees awarded by Ph.D. granting statistics departments. (The column for U.S. citizens includes permanent residents.) The final two columns are a subset of degrees awarded (not all undergraduate majors).

	Master's Students	Master's Degrees Awarded	U.S. Citizens	Female
Statistics (29):				
Mean	22.8	16.4	6.8 (42%)	7.7 (48%)
Median	22	14	4	6
Range	0 – 62	2 – 58	2 – 22	0 – 31
Biostatistics (11):				
Mean	20.0	8.5	4.6 (55%)	3.9 (46%)
Median	15	5	3	2
Range	3 – 49	2 – 32	0 – 20	1 – 16

Table 5. Master's students and Master's degrees awarded by Ph.D. granting statistics and biostatistics departments. (The column for U.S. citizens includes permanent residents.) The final two columns are a subset of degrees awarded (not all Master's students).

	Ph.D. Program Statistics	Ph.D. Program Other	Employed Business & Industry	Employed Government	Employed Academia	Other or Unknown
Statistics (29):						
Mean	4.4	2.7	5.5	0.4	0.8	2.7
Median	3	1	4	0	0	1
Range	0 – 15	0 – 20	0 – 25	0 – 4	0 – 4	0 – 14
Biostatistics (11):						
Mean	2.1	0.6	0.6	0.0	1.7	3.5
Median	1	0	0	0	1	2
Range	0 – 9	0 – 3	0 – 3	0 – 0	0 – 5	0 – 19

Table 6. Placement of Master's degree statistics and biostatistics graduates. (Ph.D. Program Statistics refers to either statistics or biostatistics.)

	Ph.D. Statistics Students	Ph.D. Degrees Awarded	U.S. Citizens	Female
Statistics (29):				
Mean	32.4	6.0	1.7 (27%)	2.7 (44%)
Median	25	7	1	2
Range	9 – 122	0 – 20	0 – 7	0 – 15
Biostatistics (12):				
Mean	25.1	4.2	1.5 (36%)	2.6 (62%)
Median	21	3	1	1.5
Range	1 – 68	0 – 15	0 - 7	0 – 10

Table 7. Ph.D. students and Ph.D. degrees awarded by statistics and biostatistics departments. (The column for U.S. citizens includes permanent residents.) The final two columns are a subset of degrees awarded (not all Ph.D. students).

	Tenure- Track	Postdoc	Nonacademic	Unemployed, Other, or Unknown
Statistics (19):				
Mean	2.0	1.0	2.6	0.4
Median	2	0	1	0
Range	0 – 5	0 – 5	0 – 9	0 – 3
Biostatistics (6):				
Mean	0.8	0.7	1.6	1.2
Median	0	0	0.5	0
Range	0 – 3	0 – 5	0 – 6	0 – 6

Table 8. Placement of Ph.D. statistics and biostatistics graduates.

	Teaching	Research
Statistics:	23.7	8.5
Master's Only	0.8	0.1
Ph.D. Only	4.4	4.3
Either	18.5	4.1
Biostatistics:	5.7*	14.2
Master's Only	0.0	0.0
Ph.D. Only	1.4*	5.3
Either	4.3*	8.8

Table 9. Average number of Teaching and Research Assistantships available.
 * These averages are for those departments that offer teaching assistantships.

	< \$15,000	\$15,000 - \$17,500	\$17,500 - \$20,000	\$20,000 or more
Statistics:				
Teaching	7	13	3	6
Research	4	10	4	9
Biostatistics:				
Teaching	0	1	0	6
Research	0	0	0	10

Table 10. Distribution of stipends for teaching and research assistantships.

Variable	2008 Mean (s.e)	2009 Mean (s.e)	Regression Estimator (s.e.)
Full-Time Faculty	19.2 (2.0)	17.6 (1.7)	17.8 (1.6)
Bachelor's Degrees	15.2 (3.6)	10.8 (2.1)	13.0 (1.9)
Bachelor's Students	44.8 (8.0)	41.3 (6.5)	46.2 (5.9)
Master's Degrees	23.1 (4.3)	16.4 (2.4)	20.5 (2.2)
Master's Students	29.7 (6.6)	22.8 (3.0)	26.9 (2.7)
Ph.D. Degrees	6.5 (0.8)	6.0 (0.8)	6.2 (0.7)
Ph.D. Students	31.7 (4.4)	32.4 (4.4)	33.7 (4.0)

Table 11. 2008-2009 Comparisons for Statistics Departments

Variable	2008 Mean	2009 Mean	Regression Estimator
Full-Time Faculty	15.7 (2.4)	19.2 (2.2)	18.6 (2.0)
Master's Degrees	9.0 (1.9)	8.5 (2.6)	8.8 (2.4)
Master's Students	17.2 (3.3)	20.0 (4.3)	18.3 (3.9)
Ph.D. Degrees	3.1 (1.1)	4.2 (1.3)	4.1 (1.2)
Ph.D. Students	24.0 (6.6)	25.1 (6.3)	25.2 (5.8)

Table 12. 2008-2009 Comparisons for Biostatistics Departments