ASA Caucus of Academic Representatives
Report on the 2011 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 Kathryn Chaloner (Chair), Jim Albert, Karen Bandeen-Roche, Arny Stromberg, and Don Edwards.

Introduction:

On April 20, 2011, 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 fourth such survey conducted by ASA. The first survey was conducted in 2008. The department survey is 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 middle of May. A Word document with the same questions was also sent to them, as well as to Administrative Assistants who had completed the survey in the past. They had a choice of completing the Word document or the online survey. Reminders were sent weekly prior to the survey deadline.

Sixty-five departments responded to the survey. (Fifteen of the 65 respondents sent their answers via e-mail, rather than through the online survey.) Of the 65 surveys summarized in this report, 47 were from statistics departments and 18 were from biostatistics departments. This is an increase of seven statistics departments and a decrease of five biostatistics departments, when compared to the 2010 survey. Of the 47 statistics departments that reported in 2011, 34 also provided data in 2010. Of the 18 biostatistics departments that reported in 2011, 17 also provided data in 2010.

Degrees Offered:

Of the 47 Ph.D. granting statistics departments that responded to the survey, 38 offer a Bachelor's degree, all offer a Master's degree, seven also offer a Ph.D. in biostatistics, and six offer a Master's in biostatistics. For the 18 Ph.D. granting biostatistics departments, one offers a Bachelor's degree, while 17 offer a Master's degree. One also offers a Master's in statistics and its Ph.D. is in statistics rather than biostatistics.

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This year we asked about Professional Master's degrees for the first time. Five of the statistics departments offer a Professional Master's degree. For the biostatistics departments, one offers a Professional Master's degree in statistics, while 12 offer a Master's of Public Health in biostatistics.

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 essentially the same in both sets of departments, the average number of faculty in most other categories is higher in biostatistics departments. Biostatistics departments have a larger number of research-only faculty, but that only explains part of the difference at the Associate and Assistant professor level. Biostatistics departments also have a larger number of adjunct or part-time faculty. (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 2009, 57% of the Ph.D.s in biometry and biostatistics went to women, while only 43% of the Ph.D.s in statistics went to women. (This data comes from the IPEDS database at the National Center for Education Statistics.))

Since 2008, when these surveys began, the size of statistics departments has remained fairly constant, while biostatistics departments have grown in size. (See Table 4.)

Undergraduate Students:

Since only one of the biostatistics departments offers a Bachelor's degree, this section deals only with statistics departments. Thirty-eight of these departments indicated that they offered a Bachelor's degree in statistics.

For the 38 departments that are summarized in Table 5, there was an average of 15.2 degrees awarded and an average of 69.7 undergraduate statistics majors. Of the degrees awarded, 80% went to U.S. citizens and 37% went to women. The survey forms identified 7% of the degree recipients as underrepresented minority (URM). No information was collected on what happened to the students upon graduation.

The size of the undergraduate statistics population appears to be increasing, especially in the last two years. (See Table 6.) The number of Bachelor's

degrees is still fairly small, but there is an expected delay between the increase in students and the corresponding increase in degrees awarded.

Graduate Students:

Graduate programs in statistics and biostatistics tend to be larger than undergraduate programs in statistics. But, the big jump in the number of undergraduate statistics majors this year suggests that undergraduate programs are catching up quickly. In biostatistics most of the graduate students are Ph.D. students, but in statistics departments the split between master's students and Ph.D. students is fairly even. (See tables 5, 7, and 10.)

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% of the statistics degrees and 7% of the biostatistics degrees went to URMs. At the Ph.D. level these percentages were 3% and 6%, respectively.

Upon receiving their Master's degree, about 31% of biostatistics students and 36% of statistics students continue on for a Ph.D. (These figures include students already in a Ph.D. program who receive a Master's degree along the way.) Of the MS graduates from statistics departments who continue for a PhD, about a 30% go into a Ph.D. degree program other than statistics or biostatistics. For MS graduates from biostatistics departments this number is around 10%. However, there are many Master's degree recipients who are in a status unknown to the department. (See Table 8.)

For biostatistics Ph.D. graduates, 29% went to tenure track positions, while 22% of statistics Ph.D. graduates went to tenure track positions. The percentages of both groups going to postdoctoral positions were very similar (around 17%). The percentage of Ph.D.s going to nonacademic positions was higher for statistics Ph.D.s (47%) than for biostatistics Ph.D.s (17%). (See Table 11.)

Three of the 348 Ph.D. recipients were reported as being unemployed. But 51 were listed as in an unknown status, so the total unemployment could be as high as 15% (though that seems unlikely). We did not collect unemployment information for those with a Master's degree.

In Tables 9 and 12, we present data on graduate degrees and students by year. At the Ph.D. level, the numbers have remained fairly constant over the past 2-3 years, though the number of students in biostatistics departments appears to be increasing. At the master's level, the estimates bounce around more, making it difficult to identify possible trends.

Graduate School Applications:

In 2009, we began asking about applications for graduate school. At the master's level there has been a steady increase in applications for both statistics and biostatistics programs. At the Ph.D. level there has also been an increase, but it shows up as a step function, rather than a steady year-to-year increase. The increase in applications has not led to similar increases in the expected size of the graduate programs. (See Table 13.)

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. (See Table 14.)

For Ph.D. degrees, the American Mathematical Society (AMS) conducts a yearly survey of math, statistics, and biostatistics departments. Their February 2011 report shows 294 Ph.D.s awarded by statistics departments and 128 Ph.D.s awarded by biostatistics departments for the same time period as this survey (July 1, 2009, - June 30, 2010). (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.) Based on our data, we would estimate a total of 360 Ph.D.s in statistics and 150 Ph.D.s in biostatistics from these departments between July 1, 2009, and June 30, 2010, if nonresponding departments are similar to the departments that responded to our survey.

Separately, the National Center for Education Statistics (NCES) collects data on Ph.D. degrees awarded by discipline (IPEDS data). For 2009, they provide a figure of 210 Ph.D.s in statistics and 84 Ph.D.s in biostatistics and biometry. This corresponds to the data we collected in 2010. Our estimates of the number of statistics and biostatistics Ph.D.s just from statistics and biostatistics departments was 372 and 150. (AMS for this time period had corresponding numbers of 245 and 107.)

Finally, the National Science Foundation collects data from their Survey of Earned Doctorates (SED), which is similar to the NCES data. For 2009, their numbers are 353 Ph.D.s in statistics and 115 Ph.D.s in biostatistics and biometry.

The ASA estimates in Table 14 are consistently higher than any of the other numbers. (Note that the other numbers are not estimates. The IPEDS and SED are censuses, and the AMS does not adjust for nonresponse.) The higher

numbers suggest that the respondents to the ASA survey are ones that are likely to have larger Ph.D. programs.

Final Comments:

The estimates in Tables 4, 6, 9, 12, and 13 are not the means of the yearly survey responses. Because the same group of departments is contacted each year, many of the responses can be matched from year to year. This allows a ratio or regression estimator to be used, which reduces the standard error of the estimates.

However, it is the estimates from the early survey years that are most highly variable, because response rates have been increasing. For this reason, a ratio estimator was used in the reverse direction, as well as the forward direction. In fact, this procedure was repeatedly run backward and forward until the estimates converged. This should make the estimates from the early years more precise than the original survey means were.

The associated standard errors in those tables are (most likely) over estimates. They were calculated as if the procedure was only run once, and they do not include any corrections for the number of departments being a finite population.

Tables

	Full Professor (Research Only)	Associate Professor (Research Only)	Assistant Professor (Research Only)	Other Full Time	Total Full Time Faculty	Adjunct or Part Time
Statistics (47):						
Mean	**8.2** (0.3)	**3.7** (0.1)	**4.0** (0.3)	2.1	**18.0**	2.6
Median	8 (0)	4 (0)	3 (0)	1	18	0
Range	1 – 19	0 – 12	1 – 12	0 – 13	8 – 45	0 – 32
Biostatistics (18):						
Mean	**8.6** (0.7)	**5.3** (1.1)	**7.4** (2.0)	2.6	**23.7**	7.6
Median	6.5 (0)	4.5 (0)	6 (1.5)	0	24.5	2.5
Range	1 – 29	1 – 10	1 – 18	0 – 14	7 – 45	0 – 41

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 Full Time Faculty	Female (% of total)	Hispanic (% of total)	URM (% of total)
Statistics (47):				
Mean	**18.0**	**4.5** (25%)	**0.3** (1%)	**0.5** (3%)
Median	18	4	0	0
Range	8 – 45	1 – 16	0 – 2	0 – 3
Biostatistics (18):				
Mean	**23.7**	**9.3** (30%)	**0.7** (2%)	**1.3** (4%)
Median	24.5	7	1	1
Range	7 – 45	2 – 29	0 – 2	0 – 6

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 (47):							
Female	0	6	15	15	8	3	0
Hispanic	36	6	2	0	0	0	0
URM	28	12	4	0	0	0	0
Biostatistics (18):							
Female	0	1	5	4	3	3	2
Hispanic	8	10	0	0	0	0	0
URM	5	11	2	0	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%).

Variable	2008 (s.e)	2009 (s.e.)	2010 (s.e)	2011 (s.e.)
Statistics:				
Full-Time Faculty	19.0 (1.8)	17.7 (1.5)	18.2 (1.3)	18.3 (1.0)
Biostatistics:				
Full-Time Faculty	18.5 (2.4)	20.5 (2.0)	23.3 (2.2)	24.4 (2.8)

Table 4: Faculty size over time. **Note:** The values for 2011 do not agree with the values in Tables 1 & 2, because the estimates in this table are ratio-type estimators that use data from previous surveys to improve the estimates. The values in Tables 1 & 2 use only the data from the current survey.

	Undergraduate Statistics Majors	Bachelor's Degrees Awarded	U.S. Citizens	Female
Statistics (38):				
Mean	69.7	15.2	11.7 (80%)	5.7 (37%)
Median	51	10	8	4
Range	4 – 391	0 – 73	0 – 62	0 – 20

Table 5. 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). Degrees awarded cover the period from July 1, 2009 through June 30, 2010.

Variable	2008 (s.e)	2009 (s.e.)	2010 (s.e)	2011 (s.e.)
Bachelor's Degrees	12.5 (3.2)	11.0 (1.8)	13.3 (1.9)	15.0 (2.3)
Bachelor's Students	41.3 (5.7)	42.9 (5.8)	49.5 (5.8)	70.5 (10.6)

Table 6: Statistics bachelor's degrees and undergraduate majors over time.
Note: The values for 2011 do not agree with the values in Table 5, because the estimates in this table are ratio-type estimators that use data from previous surveys to improve the estimates. The values in Table 5 use only the data from the current survey.

	Master's Students	Master's Degrees Awarded	U.S. Citizens	Female
Statistics (47):				
Mean	33.1	18.1	7.3 (41%)	6.9 (38%)
Median	27	12	5	5
Range	0 – 205	1 – 134	0 – 44	0 – 30
Biostatistics (17):				
Mean	23.8	8.8	5.4 (61%)	5.5 (63%)
Median	17	7	5	5
Range	1 – 73	2 – 28	0 – 17	1 – 18

Table 7: 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). Degrees awarded cover the period from July 1, 2009 through June 30, 2010. This table does not include Professional Master's or Master's of Public Health.

	Ph.D. Program Statistics	Ph.D. Program Other	Employed Business & Industry	Employed Government	Employed Academia	Other or Unknown
Statistics (43):						
Mean	3.4	1.5	4.0	0.3	0.4	3.9
Median	3	0	2	0	0	2
Range	0 – 9	0 – 9	0 – 33	0 – 4	0 – 3	0 – 19
Biostatistics (17):						
Mean	2.4	0.3	0.9	0.2	1.1	3.9
Median	2	0	0	0	0	1
Range	0 – 8	0 – 2	0 – 5	0 – 1	0 – 7	0 – 25

Table 8: Placement of Master's degree statistics and biostatistics graduates. (Ph.D. Program Statistics refers to either statistics or biostatistics.) This does not include Professional Master's or Master's of Public Health. **Note:** The mean placement numbers for statistics graduates do not add to the mean number of degrees awarded (in Table 7), because the item nonresponse for this question tended to come from departments with larger numbers of degrees awarded.

Variable	2008 (s.e)	2009 (s.e.)	2010 (s.e)	2011 (s.e.)
Statistics:				
Master's Degrees	22.4 (4.0)	18.2 (2.2)	17.5 (2.4)	18.7 (2.9)
Master's Students	33.3 (6.3)	28.0 (2.7)	34.5 (4.7)	36.5 (4.6)
Biostatistics:				
Master's Degrees	4.9 (1.7)	6.1 (2.3)	10.6 (2.5)	6.0 (1.8)
Master's Students	16.1 (2.9)	17.8 (3.8)	20.6 (3.3)	21.7 (4.8)

Table 9: Master's degrees and students over time (average per department). **Note:** The values for 2011 do not agree with the values in Table 7, because the estimates in this table are ratio-type estimators that use data from previous surveys to improve the estimates. The values in Table 7 use only the data from the current survey.

	Ph.D. Statistics Students	Ph.D. Degrees Awarded	U.S. Citizens	Female
Statistics (47):				
Mean	34.9	5.9	2.0 (35%)	2.6 (44%)
Median	30	5	2	2
Range	7 – 115	0 – 22	0 – 6	0 – 14
Biostatistics (18):				
Mean	32.8	4.0	1.9 (47%)	2.3 (57%)
Median	23.5	3	2	2
Range	5 – 116	0 – 9	0 - 5	0 – 8

Table 10: 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). Degrees awarded cover the period from July 1, 2009 through June 30, 2010.

	Tenure-Track	Postdoc	Nonacademic	Unemployed, Other, or Unknown
Statistics (47):				
Mean	1.3	1.1	2.8	0.7
Median	1	1	2	0
Range	0 – 8	0 – 4	0 – 8	0 – 15
Biostatistics (18):				
Mean	1.2	0.7	0.7	1.5
Median	0	0	0.5	0
Range	0 – 6	0 – 4	0 – 3	0 – 9

Table 11: Placement of Ph.D. statistics and biostatistics graduates.

Variable	2008 (s.e)	2009 (s.e.)	2010 (s.e)	2011 (s.e.)
Statistics:				
Ph.D. Degrees	6.7 (0.8)	6.1 (0.7)	6.2 (0.6)	6.0 (0.6)
Ph.D. Students	34.6 (4.1)	35.2 (3.8)	36.0 (3.4)	37.3 (3.0)
Biostatistics:				
Ph.D. Degrees	3.8 (1.0)	4.7 (1.2)	4.4 (0.6)	4.4 (0.7)
Ph.D. Students	26.1 (5.9)	26.2 (5.5)	30.1 (4.4)	33.8 (6.6)

Table 12: Ph.D. degrees and students over time (average per department). **Note:** The values for 2011 do not agree with the values in Table 10, because the estimates in this table are ratio-type estimators that use data from previous surveys to improve the estimates. The values in Table 10 use only the data from the current survey.

	Master's			Ph.D.		
	2009	2010	2011	2009	2010	2011
Statistics:						
Applications	96.7	128.5	175.8	124.0	126.2	146.0
	(9.4)	(15.9)	(15.5)	(16.5)	(13.6)	(14.5)
Expected to Enter	11.5	17.0	18.7	8.1	9.8	8.9
	(1.4)	(2.9)	(3.4)	(1.1)	(1.1)	(0.8)
Biostatistics:						
Applications	38.2	44.7	57.9	39.6	62.8	62.8
	(10.6)	(6.9)	(10.9)	(13.7)	(10.0)	(14.0)
Expected to Enter	10.2	9.6	12.5	7.7	7.1	10.2
	(2.2)	(1.8)	(3.4)	(1.5)	(0.9)	(2.2)

Table 13: Applications for graduate programs and expected number of entering students over time.

	2007 (s.e)	2008 (s.e.)	2009 (s.e.)	2010 (s.e)
Statistics:				
ASA Survey	402 (48)	366 (42)	372 (36)	360 (36)
AMS Survey	247	223	296	294
Department of Education	305	213	210	NA
National Science Foundation	359	303	353	NA
Biostatistics:				
ASA Survey	129 (34)	160 (41)	150 (20)	150 (24)
AMS Survey	106	81	138	128
Department of Education	129	105	84	NA
National Science Foundation	121	121	115	NA

Table 14: Total Ph.D. degrees and students over time. The ASA survey rows come from Table 12. The AMS survey rows come from their annual survey report that appears in the February issue of the Notices of the American Mathematical Society. The Department of Education rows come from the Integrated Postsecondary Education Data System (IPEDS). The National Science Foundation rows come from the Survey of Earned Doctorates.