

## **ASA Caucus of Academic Representatives (Draft) Report on the 2012 Survey of Departments of Statistics and Biostatistics**

### **Introduction:**

In September, 2012, 95 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. The department survey has been conducted since 2008.

E-mail with a link to the survey was sent to the chair or head of the department and to administrative assistants (in many instances), asking for completion of the survey within a specified time period. 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. Multiple follow up messages were sent.

Forty-four departments responded to the survey. Of the 44 surveys summarized in this report, 31 were from statistics departments and 13 were from biostatistics departments. This is an decrease of sixteen statistics departments and a decrease of five biostatistics departments, when compared to the 2011 survey. All of the 31 statistics departments that reported in 2012 also provided data in 2011. Of the 13 biostatistics departments that reported in 2012, 11 also provided data in 2011.

### **Degrees Offered:**

Of the 31 Ph.D. granting statistics departments that responded to the survey, 23 offer a Bachelor's degree, 30 offer a Master's degree, and 29 offer a Ph.D. in statistics. Also, 1 of them offers a Bachelor's degree in biostatistics, 2 offer a Master's degree in biostatistics, 2 offer a Ph.D. in biostatistics, and 5 of them offer a Professional Master's degree in statistics.

For the 13 Ph.D. granting biostatistics departments, 10 offer a Master's degree and 12 offer a Ph.D. in biostatistics. None of them offer a Bachelor's degree in biostatistics but 1 of them offers a Bachelor's degree in statistics. In addition, 6 of them offer a Master's of Public Health in biostatistics and 4 offer other academic Master's degrees in biostatistics.

### **Faculty:**

The number of full-time faculty is higher in biostatistics departments than in statistics departments, on average. Actually, the average numbers of Full Professors, Associate Professors and Assistant Professors are all higher in biostatistics departments than in statistics 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.

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. Twenty-six of these departments indicated that they offered a Bachelor's degree in statistics.

For the 26 departments that are summarized in Table 5, there was an average of 17.8 degrees awarded and an average of 62.4 undergraduate statistics majors. Of the degrees awarded, 86% went to U.S. citizens and 39% went to women. The survey forms identified 2% 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 have increased from 2008 to 2011 but have decreased in 2012. (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:**

The size of the graduate statistics population appears to be increasing, especially in the last two years. In biostatistics most of the graduate students were Ph.D. students before 2012, but the big jump in the number of Master's students this year suggests that graduate programs accepted more Master's students than Ph. D. students. In statistics departments the split between master's students and Ph.D. students is fairly even, but Ph.D. groups have grown more this year. (See tables 7, 9, 10 and 12.)

The percentage of degrees going to U.S. citizens increases as one progress from Bachelor's to Master's to Ph.D. There were very few Hispanic and underrepresented minorities (URMs) in any of the graduate programs. At the Master's level, about 1% of the statistics degrees and 2% of the biostatistics degrees went to Hispanic. At the Ph.D. level these percentages were 1% and 0%, respectively. At the Master's level, about 1% of the statistics degrees and 1% of the biostatistics degrees went to URMs. At the Ph.D. level these percentages were 3% and 0%, respectively.

Upon receiving their Master's degree, about 27% of biostatistics students and 24% 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 32% go into a Ph.D. degree program other than statistics or biostatistics. For MS graduates from biostatistics departments this number is around 19%. 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, 22% went to tenure track positions, while 27% of statistics Ph.D. graduates went to tenure track positions. The percentage of Ph.D. going to postdoctoral positions was higher for biostatistics Ph.D.s (22%) than for statistics Ph.D.s (15%). Also, 40% of statistics Ph.D. graduates went to nonacademic positions, while 41% of biostatistics Ph.D. graduates went to nonacademic positions. (See Table 11.)

Two of the 148 Ph.D. recipients were reported as being unemployed while 8 were listed as in an unknown status. 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 statistics departments appears to be increasing. At the master's level, the numbers in statistics departments have decreased compared with those in the early years, but the estimates in biostatistics departments 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 but a slight decrease this year. At the Ph.D. level there has also been an increase. The increase in applications has not led to similar increases in the expected size of the graduate programs. (See Table 13.)

### **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

	<b>Full Professor</b> (Research Only)	<b>Associate Professor</b> (Research Only)	<b>Assistant Professor</b> (Research Only)	Other Full Time	<b>Total Full Time Faculty</b>	Adjunct Or Part Time
<b>Statistics(31):</b>						
Mean	<b>7.1(0.5)</b>	<b>3.2(0.1)</b>	<b>3.2(0.5)</b>	2.5	<b>16.1</b>	3.1
Median	6(0)	3(0)	3(0)	2	14.3	2
Range	0-16	0-10	0-10	0-10	7-46	0-17
<b>Biostatistics (13):</b>						
Mean	<b>8.4(0.8)</b>	<b>5.8(1.4)</b>	<b>6.7(1.5)</b>	2.1	<b>23</b>	9.8
Median	7(0)	4(1)	6(2)	0	21	3
Range	1-28	2-11	3-11	0-17	9-43	0-46

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.

	<b>Total Full Time Faculty</b>	<b>Female (% of total)</b>	<b>Hispanic (% of total)</b>	<b>Black (% of total)</b>	<b>URM (% of total)</b>
<b>Statistics(31):</b>					
Mean	<b>16.1</b>	<b>4.4(26%)</b>	<b>0.2(1%)</b>	<b>0.3(1%)</b>	<b>0.1(1%)</b>
Median	14.3	4	0	0	0
Range	7-46	0-16	0-2	0-2	0-1
<b>Biostatistics (13):</b>					
Mean	<b>23</b>	<b>9.5(39%)</b>	<b>0.5(2%)</b>	<b>0.5(2%)</b>	<b>0.1(0.2%)</b>
Median	21	6	0	0	0
Range	9-43	3-19	0-2	0-3	0-1

Table 2. Female and Minority faculty at Ph.D. granting departments of statistics and biostatistics. Number in parentheses after type of department are for number of response. URM is underrepresented minority. It includes Native American and Pacific Islander (but not Asian).

	0%	0-10%	10-20%	20-30%	30-40%	40-50%	>50%
<b>Statistics(31):</b>							
Female	1	2	6	9	8	3	1
Hispanic	26	3	2	0	0	0	0
Black	23	7	0	0	0	0	0
URM	29	1	1	0	0	0	0
<b>Biostatistics (13):</b>							
Female	0	0	1	3	2	5	2
Hispanic	8	5	0	0	0	0	0
Black	8	5	0	0	0	0	0
URM	12	1	0	0	0	0	0

Table 3. Frequency counts for percentages of department faculty who are female, Hispanic, black 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)	2012 (s.e)
<b>Statistics:</b>					
Full-Time Faculty	18.7 (1.8)	17.5 (1.5)	18.2 (1.3)	18.2 (1.0)	18.9 (1.0)
<b>Biostatistics:</b>					
Full-Time Faculty	17.5 (2.4)	20.0 (2.0)	23.1 (2.2)	24.1 (2.8)	23.1 (2.6)

Table 4. Faculty size over time. **Note:** The value for 2012 do not agree with the values in Tables 1 & 2, because the estimates in the 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
<b>Statistics (26):</b>				
Mean	62.4	17.8	11.4(86%)	6.1(39%)
Median	48	8.5	8	4.5
Range	0-400	0-129	0-37	0-28

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, 2010 through June 30, 2011.

Variable	2008 (s.e)	2009 (s.e)	2010 (s.e)	2011 (s.e)	2012 (s.e)
Bachelor's Degrees	15.0 (3.2)	12.1 (1.8)	13.9 (1.9)	15.4 (2.3)	12.2 (2.3)
Bachelor's Students	42.6 (5.7)	43.5 (5.8)	49.8 (5.8)	70.8 (10.6)	58.9 (10.4)

Table 6: Statistics bachelor's degrees and undergraduate majors over time. **Note:** The values for 2012 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	Hispanic
<b>Statistics (31):</b>				
Mean	19.3	21.8	6.1 (29%)	0.3 (1%)
Median	5.5	16	5	0
Range	0 - 225	2 - 125	0 - 28	0 - 2
<b>Biostatistics (13):</b>				
Mean	6.7	10.8	5 (46%)	0.2 (2%)
Median	1.5	8	5	0
Range	0 - 26	0 - 49	0 - 13	0 - 1

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, 2010 through June 30, 2011.

	Ph. D. Program Statistics	Ph. D. Program Other	Employed Business & Industry	Employed Government	Employed Academic	Other or Unknown
<b>Statistics (31):</b>						
Mean	3.6	1.7	6.3	0.7	0.6	3.2
Median	3	0	2.5	0	0	2
Range	0 - 10	0 - 19	0 - 40	0 - 4	0 - 4	0 - 13
<b>Biostatistics (13):</b>						
Mean	2.2	0.5	1.3	1	2.3	1.3

Median	1	0	0.5	0	1	0.5
Range	0 - 9	0 - 2	0 - 8	0 - 6	0 - 10	0 - 7

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)	2012 (s.e)
<b>Statistics:</b>					
Master's Degrees	24.5 (4.0)	19.2 (2.2)	18.2 (2.4)	19.2 (2.9)	16.8 (2.8)
Master's Students	24.0 (6.3)	23.1 (2.7)	31.2 (4.7)	34.2 (4.6)	39.7 (4.5)
<b>Biostatistics:</b>					
Master's Degrees	6.2 (1.7)	6.8 (2.3)	11.0 (2.5)	6.3 (1.8)	7.6 (1.7)
Master's Students	10.0 (2.9)	14.4 (3.8)	19.1 (3.3)	20.2 (4.8)	30.5 (4.8)

Table 9: Master's degrees and students over time (average per department). **Note:** The values for 2012 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	Hispanic
<b>Statistics (31):</b>				
Mean	17.4	4.8	2.1 (43%)	0.0 (1%)
Median	14	3	2	0
Range	0 - 72	0 - 16	0 - 6	0 - 1
<b>Biostatistics (13):</b>				
Mean	15.4	3.7	1.5 (42%)	0 (0%)
Median	9	3	1	0
Range	0 - 61	0 - 12	0 - 5	0 - 0

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, 2010 through June 30, 2011.



	Tenure-Track	Postdoc	Nonacademic	Unemployed, Other, or Unknown
<b>Statistics (31):</b>				
Mean	1.3	0.7	1.9	0.3
Median	0.5	0	1	0
Range	0 - 13	0 - 4	0 - 10	0 - 2
<b>Biostatistics (13):</b>				
Mean	0.8	0.8	1.5	0.3
Median	0	0	0	0
Range	0 - 3	0 - 4	0 - 8	0 - 2

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

Variable	2008 (s.e)	2009 (s.e)	2010 (s.e)	2011 (s.e)	2012 (s.e)
<b>Statistics:</b>					
Ph.D. Degrees	6.4 (0.8)	5.9 (0.7)	6.1 (0.6)	5.9 (0.6)	6.6 (0.6)
Ph.D. Students	28.3 (4.1)	31.9 (3.8)	33.9 (3.4)	35.7 (3.0)	44.2 (3.1)
<b>Biostatistics:</b>					
Ph.D. Degrees	3.4 (1.0)	4.4 (1.2)	4.2 (0.6)	4.3 (0.7)	4.0 (0.7)
Ph.D. Students	17.2 (5.9)	21.0 (5.5)	27.6 (4.4)	31.5 (6.6)	39.2 (6.5)

Table 12: Ph.D. degrees and students over time (average per department). **Note:** The values for 2012 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	2012	2009	2010	2011	2012
<b>Statistics:</b>								
Applications	180.3 (9.4)	161.5 (15.9)	243.0 (15.5)	203.0 (15.3)	166.1 (16.5)	154.9 (13.6)	181.9 (14.5)	196.8 (15.0)
Expected to Enter	17.0 (1.4)	18.9 (2.9)	21.6 (3.4)	18.5 (3.2)	8.2 (1.1)	10.2 (1.1)	8.7 (0.8)	8.1 (0.8)
<b>Biostatistics:</b>								
Applications	60.2 (10.6)	49.0 (6.9)	76.1 (10.9)	65.5 (9.7)	41.1 (13.7)	71.8 (10.0)	60.1 (14.0)	61.3 (12.6)

Expected to Enter	12.4 (2.2)	10.0 (1.8)	14.5 (3.4)	14.8 (3.4)	4.7 (1.5)	7.0 (0.9)	7.6 (2.2)	10.3 (2.1)
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Table 13: Applications for graduate programs and expected number of entering students over time.