Report on the 2017–2018 New Doctorate Recipients

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This report presents a statistical profile of recipients of doctoral degrees awarded by departments in the mathematical sciences at universities in the United States during the period July 1, 2017 through June 30, 2018. Information in this report was provided by 293 of the 324 doctorate-granting departments surveyed, with additional information provided by the individual degree recipients.

The *Report on the 2017–2018 Employment Experiences of the New Doctoral Recipients* immediately following this report provides an analysis of the fall 2018 employment plans of the 390 PhD recipients who responded to this survey, as well as a summary of their demographic characteristics.

The document containing these two reports along with the tables on which they are based is referenced here by [1], and it is available on the AMS website at `www.ams .org/annual-survey`.

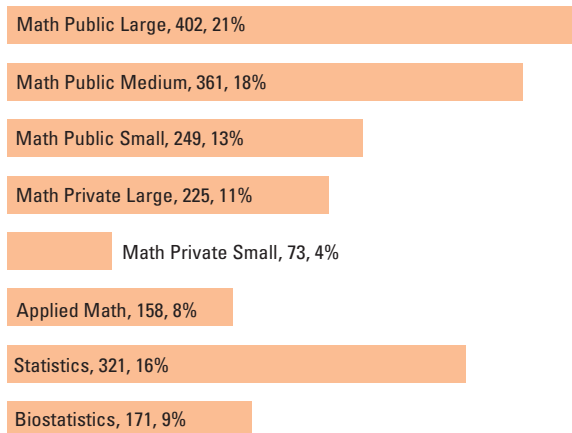## Overall Characteristics of the 2017–2018 Cohort

In mathematical and statistical sciences, 1,960 PhDs were awarded by the responding departments (293); 20 of these departments awarded no doctorates. Figure A.1 gives a breakdown of degree counts by department grouping. This overall count is essentially unchanged from that for the 2016–17 cohort, and the percentages are the same as well. Figure A.2 shows a breakdown of PhD production by mathematical and statistical sciences groups over the years from 2003–04 to 2017–18. Compared, for instance, with the 2007–08 cohort, the combined number of PhDs in 2017–18 is about 42% higher, which translates to an approximate 3.6% year-over-year increase on average.

Dissertation titles are identified by the Mathematics Subject Classification System [2] and then grouped into one of thirteen broad categories (Algebra and Number Theory; Real, Complex, Functional, and Harmonic Analysis; Geometry and Topology; Discrete Mathematics, Combinatorics, Logic, and Computer Science; Probability; Statistics; Biostatistics; Applied Mathematics; Numerical Analysis and Approximation; Linear and Nonlinear Optimization and Control; Differential, Integral, and Difference Equations; Mathematics Education; Other/Unknown). The highest percentage, 32% (622), of the new PhDs had a dissertation in either Statistics or Biostatistics, followed by Algebra and Number Theory with 14% (269) and Applied Mathematics with 14% (265). Further details can be found in Table A.1 in [1].

**Figure A.1.** Number and Percentage of Degrees Awarded by Department Grouping*
Total Degrees Awarded: 1,960

Math Public Large, 402, 21%
Math Public Medium, 361, 18%
Math Public Small, 249, 13%
Math Private Large, 225, 11%
Math Private Small, 73, 4%
Applied Math, 158, 8%
Statistics, 321, 16%
Biostatistics, 171, 9%

*See page 1206 for a description of the department groupings.

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Figure A.2. New PhDs Awarded by Group
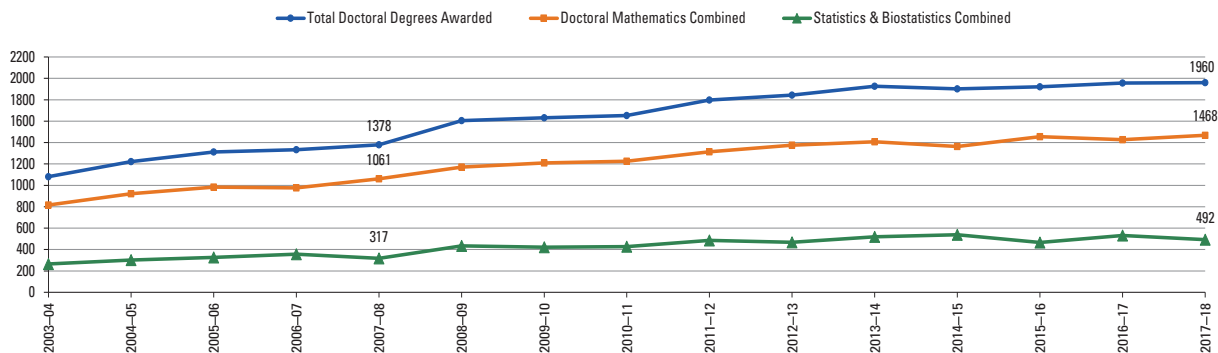
Employment

The employment status as of late 2018 was known for 1,696 of the 1,960 doctoral recipients. Figure E.1 gives a percentage breakdown by employment locale and seeking status. Figure E.2 shows the overall percentages of these PhDs reporting employment in various job sectors, and Figure E.3 provides a breakdown of the same information by citizenship.

Of the US citizens whose employment status is known, 86% (714) are employed in the US, and of these:

- 31% are employed in PhD-granting departments.
- 36% are employed in all other academic categories.
- 33% are employed in government, business and industry.

About 30% of the 2017–18 PhDs were in postdoc positions, which marks a decrease of about 3 percentage points from 2016–17. Most were in doctorate-granting departments, and their distribution is shown in Figure E.4. The counts of postdocs in various job sectors are shown in Figure E.5, broken down by citizenship. Of the PhDs in US academic jobs, 51% were postdocs.

Figure E.6 tracks the overall and women's unemployment of new PhDs over a ten-year period. These rates have tended to parallel each other; in all but two of these years, the unemployment rate has been slightly lower for women. The highest unemployment rate in 2017–18 was reported in the Math Private Small (11%) group, and the lowest was about 3% in the Statistics group.

Full details regarding employment outcomes are contained in Tables F.1–F.3 and E.1–E.11 in [1].

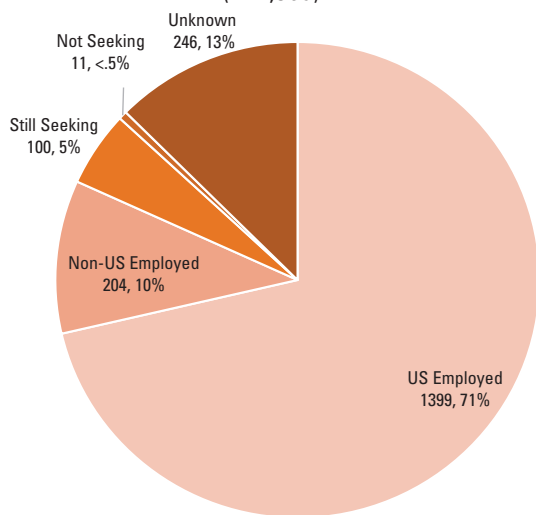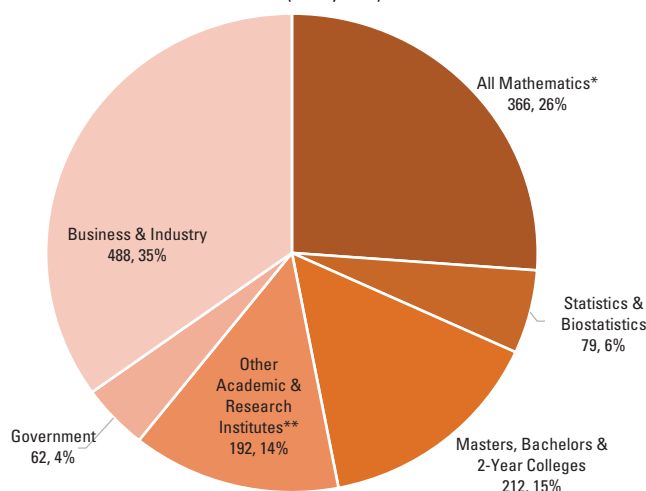**Figure E.1.** Employment Status (n=1,960)

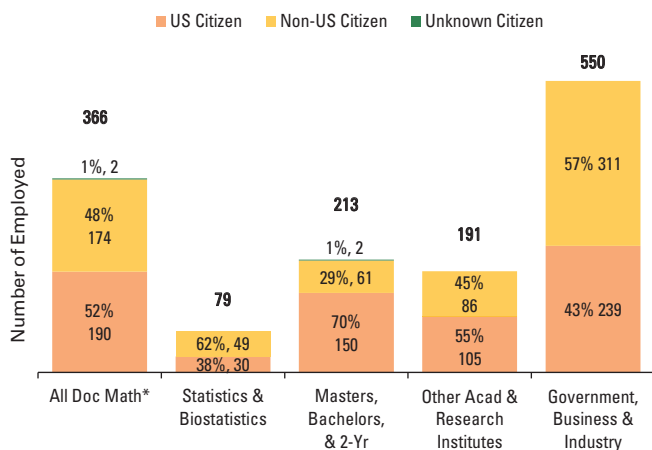**Figure E.2.** US Employed by Type of Employer (n=1,399)

* Includes all Math Public, Math Private, and Applied Math departments.
** Other Academic consists of departments outside the mathematical sciences including numerous medical-related units.

Figure E.3. Employment in the US by Type of Employer and Citizenship (n=1,399)

■ US Citizen ■ Non-US Citizen ■ Unknown Citizen

*Includes all Math Public, Math Private, and Applied Math departments.

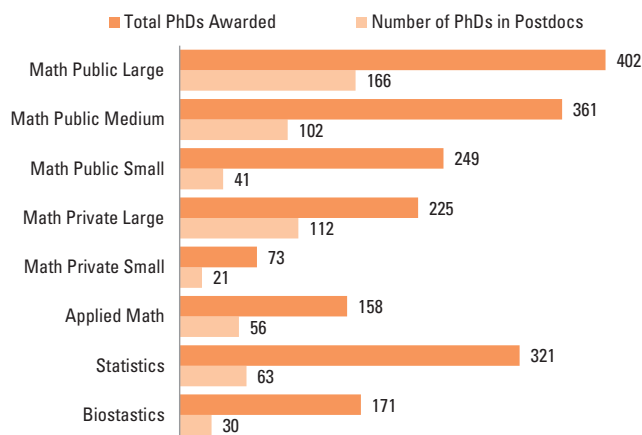**Figure E.4.** PhDs Employed in Postdocs by Degree-Granting Department Group (n=1,960)
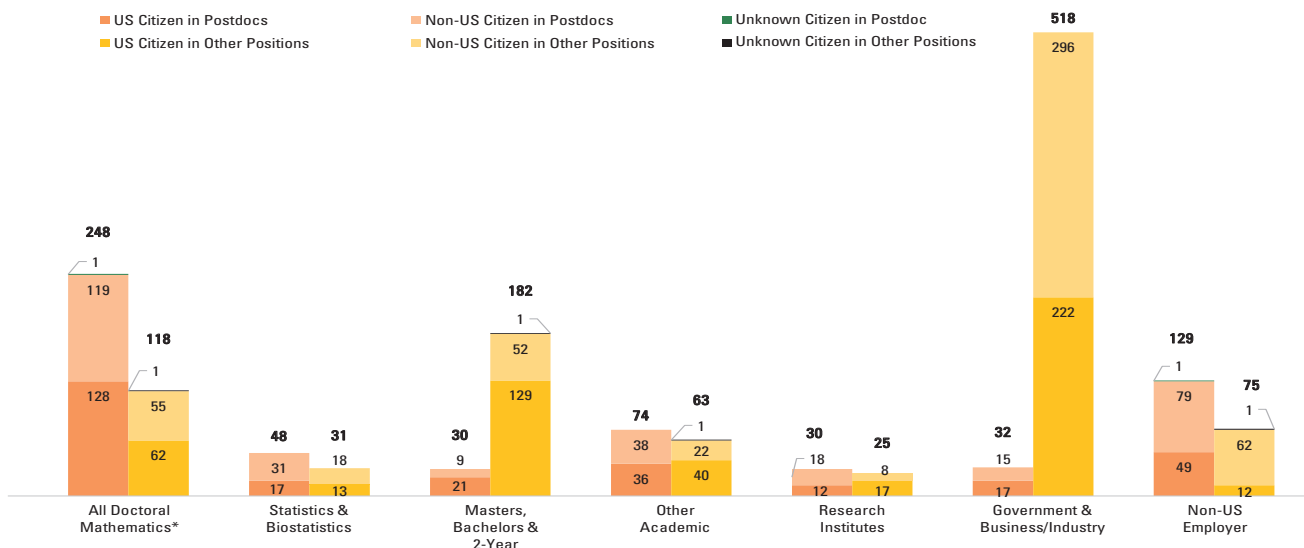
■ Total PhDs Awarded ■ Number of PhDs in Postdocs

Figure E.5. New PhDs Employment by Citizenship, Type of Position, and Type of Employer (n=1,603)

■ US Citizen in Postdocs ■ Non-US Citizen in Postdocs ■ Unknown Citizen in Postdoc
■ US Citizen in Other Positions ■ Non-US Citizen in Other Positions ■ Unknown Citizen in Other Positions

* Includes all Math Public, Math Private, and Applied Math departments.

Demographics

Gender and citizenship were known for all 1,960 new PhDs reported for 2017–18. Figure D.1 gives a breakdown by departmental grouping of the recipients' gender, and Figure D.2 provides the same categorical breakdown by citizenship. Overall, 48% (935) of recipients were US citizens, 29% (567) were women, and 8% (79) were members of underrepresented minority groups. Figure D.3 shows the gender breakdown of the US citizens, and Figure D.4 shows the overall size of the PhD cohort and citizenship breakdown for 2017–18 and the preceding five years.

Here are a few other features of the 2017–18 data:

- In all math groups except Math Private Large and Applied Math, more than half of the PhD recipients were US citizens.
- In the Statistics groups, 35% of the new PhDs were US citizens.
- 50% of those identifying as men and 42% of those identifying as women were US citizens.
- Among the US citizens earning PhDs, 6 were American Indian or Alaska Native, 81 were Asian, 27 were Black or African American, 34 were Hispanic or Latino, 2 were Native Hawaiian or Other Pacific Islander, 754 were White, and 31 were of unknown race/ethnicity.

Further details on the overall demographics of the 2017–18 cohort are in Tables D.1–D.4 in [1].

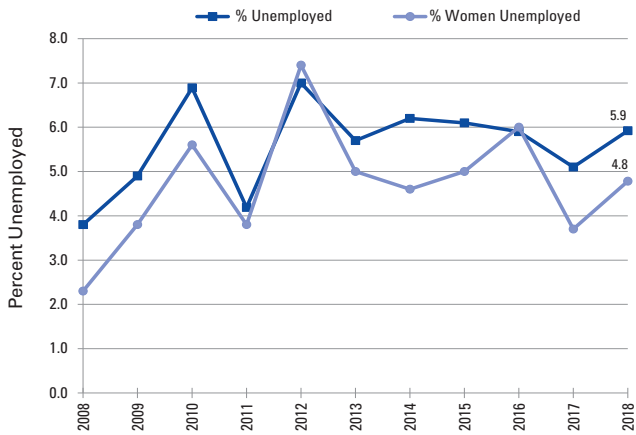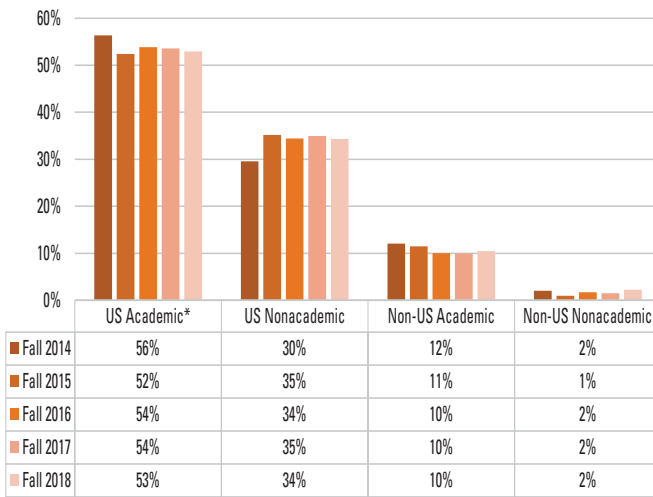**Figure E.6.** Percentage of New Doctoral Recipients Unemployed 2008–17

Figure D.2. Citizenship of Doctoral Recipients by Degree-Granting Grouping (n=1,960)

Figure E.7. Percentage of New PhDs Known to be Employed by Type of Employer

	US Academic*	US Nonacademic	Non-US Academic	Non-US Nonacademic
Fall 2014	56%	30%	12%	2%
Fall 2015	52%	35%	11%	1%
Fall 2016	54%	34%	10%	2%
Fall 2017	54%	35%	10%	2%
Fall 2018	53%	34%	10%	2%

* Includes other academic departments and research institutes/other non-profits.

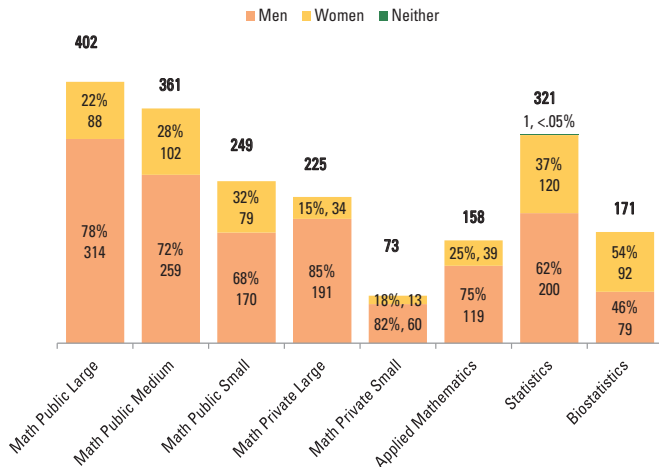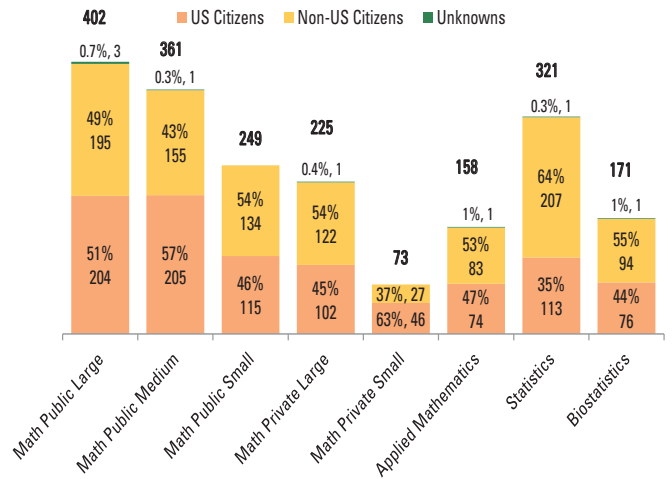**Figure D.1.** Gender of Doctoral Recipients by Degree-Granting Grouping (n=1,960)

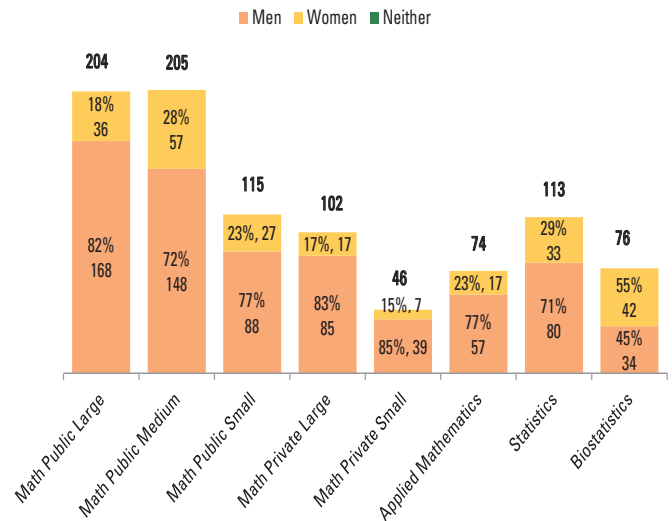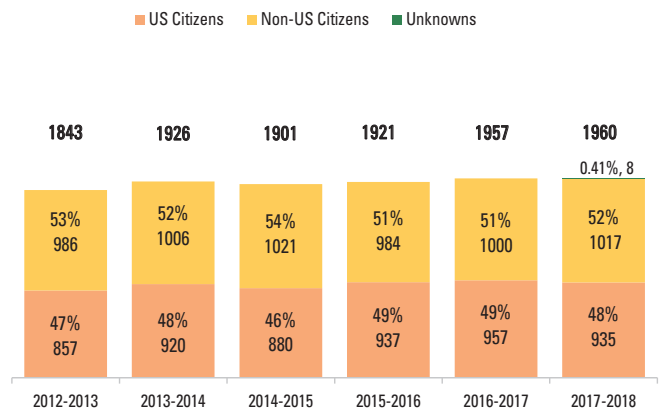**Figure D.3.** Gender of US Citizen Doctoral Recipients by Degree-Granting Grouping (n=935)

Figure D.4. Citizenship of New PhD Recipients, 2012–18

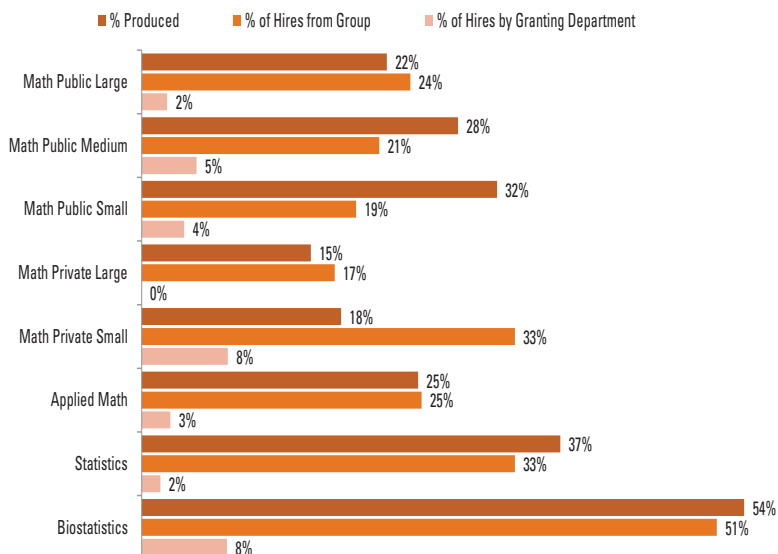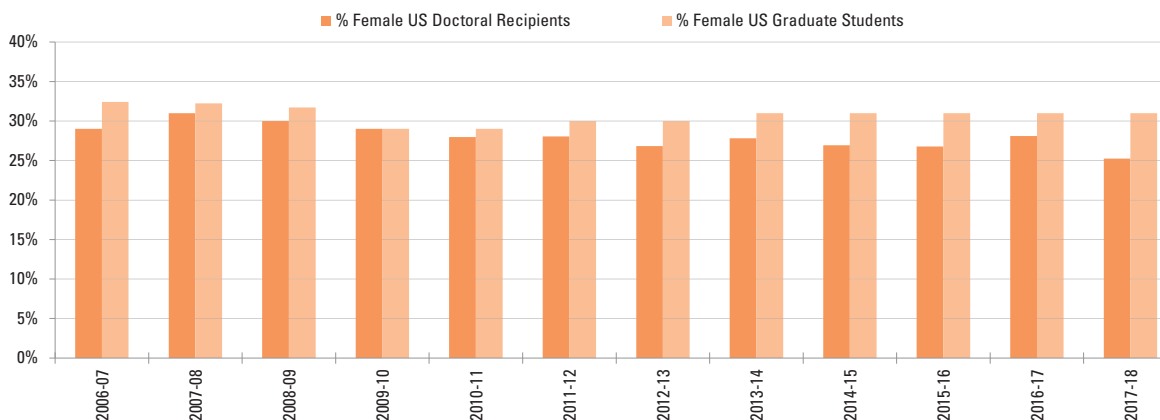**Figure F.1.** Women as a Percentage of Doctorate Recipients Produced by and Hired by Department Grouping

Table F.1. Number of Women Doctorates Produced by and Hired by Department Groupings

Department Grouping	Women		
	Produced	Total Hired	# Hired by Granting Dept.
Math Public Large	88	30	2
Math Public Medium	102	14	5
Math Public Small	79	9	3
Math Private Large	34	15	0
Math Private Small	13	7	1
Applied Math	39	5	1
Statistics	120	14	2
Biostatistics	92	19	7
Total	567	113	21

Figure F.2. Women as a Percentage of US Citizen Doctoral Recipients and Graduate Students

Women Doctorates

Overall, 29% of doctorate recipients were women, the same as for 2016–17. Of the 1,017 PhDs taking academic jobs, 28% (284) were women. Both of these percentages have decreased from their common high of 32% in 2014.

Figure F.1 gives some insight into which groups tend to hire their own women graduates. For example, the graph shows that in Math Public Small departments, women constituted 32% of PhDs produced, 19% of faculty hired in this group were women from this group, and overall 4% of women produced by this group were hired in this group.

Figure F.2 focuses on the percentage, over time, of US-citizen PhDs and graduate students who are women. It is notable that the percentage of women graduate students (tracked in the Departmental Profile reports of the Annual Survey) in the seven years leading up to 2017–18 has been steady at about 30%, whereas the percent of US citizen PhD recipients who are women has generally declined in this period.

Tables D.1, D.3, and F.1 in [1] provide further details.

Statistics/Biostatistics Doctorates

Eighty-nine departments in the Statistics groups (50 of 60 Statistics and 39 of 46 Biostatistics) responded to this survey. They produced 492 doctorates, most of whom had dissertations in statistics or biostatistics (a few were in such areas as probability and applied math), 75 fewer than in 2016–17. Figures S.1 through S.5 give breakdowns of these numbers by gender, citizenship, and employment status. In addition, departments in the Mathematics groups produced 141 PhDs with dissertations in statistics or biostatistics.

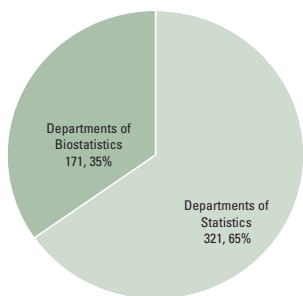**Figure S.1.** PhDs Awarded by Statistics/Biostatistics Departments (n=492)

Departments of Biostatistics
171, 35%

Departments of Statistics
321, 65%

Figure S.2. Gender of PhD Recipients from Statistics/Biostatistics Departments (n=492)

Neither, 1, <.5%

Women
212, 43%

Men
279, 57%
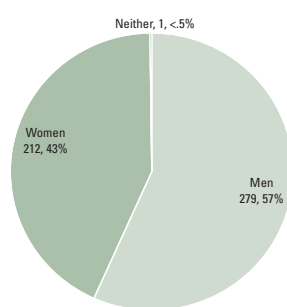
Figure S.3. Citizenship of PhD Recipients from Statistics/Biostatistics Departments (n=492)

Unknown Citizen
2, <.5%

US Citizen
189, 39%

Non-US Citizen
301, 61%
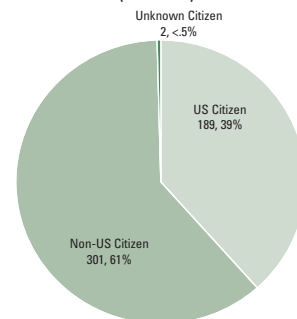
Figure S.4. Employment Status of PhD Recipients from Statistics/Biostatistics Departments (n=492)

Still Seeking (in the US)
12, 2%

Unknown
53, 11%

Non-US Employed
20, 4%

US Employed
407, 83%

So the overall number of PhDs specializing in statistical sciences for 2017–18, across all types of departments, was 622, or 32% of the total. Table A.1 in [1] provides details.

Here are some attributes of the 2017–18 PhDs produced by departments in the Statistics groups:

- These doctorates constituted 25% of all those in mathematical sciences.
- 37% of those in Statistics and 54% in Biostatistics were women.
- 40% of the US citizens were women.
- The unemployment rate of 2.7% is about half the corresponding percentage among Math PhDs.
- 42% of those hired by Stat/Biostat departments were women.

Tables A.1, D.1–D.5, F.1–F.3, and E.1–E.11 in [1] include more details about PhDs in the Statistics groups.

References

[1] A. Golbeck, T. Barr, and C. Rose, *Report on the 2017–2018 New Doctorate Recipients, with Tables*, www.ams.org/annual-survey/2018Survey-NewDoctorates-Report.pdf.
[2] MSC2020–Mathematics Subject Classification System, http://mathscinet.ams.org/msnhtml/msc2020.pdf

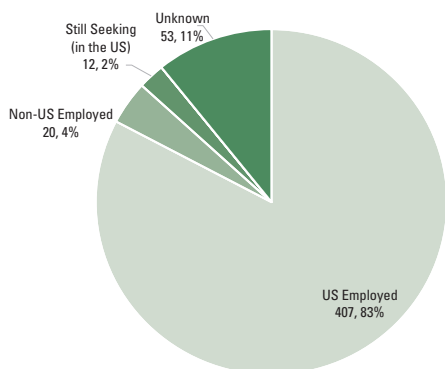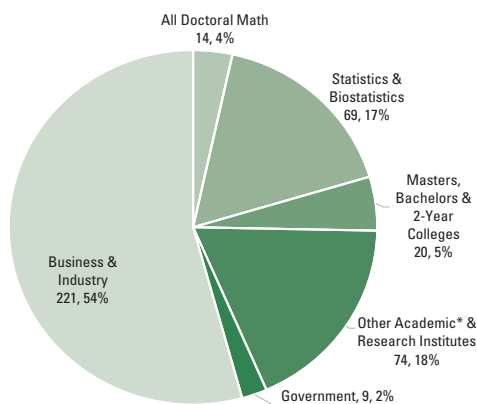**Figure S.5.** US-Employed PhD Recipients from Statistics/Biostatistics Departments by Type of Employer (n=407)

All Doctoral Math
14, 4%

Statistics & Biostatistics
69, 17%

Masters, Bachelors & 2-Year Colleges
20, 5%

Other Academic* & Research Institutes
74, 18%

Government, 9, 2%

Business & Industry
221, 54%

*Other Academic consists of departments outside the mathematical sciences including numerous medical-related units.

Departmental Groupings

In this report, *Mathematical and Statistical Sciences* departments are those in four-year institutions in the US that refer to themselves with a name that incorporates (with a few exceptions) "Mathematics" or "Statistics" in some form. For instance, the term includes, but is not limited to, departments of "Mathematics," "Mathematical Sciences," "Mathematics and Statistics," "Mathematics and Computer Science," "Applied Mathematics," "Statistics," and "Biostatistics." Also, *Mathematics (Math)* refers to departments that (with exceptions) have "Mathematics" in the name; *Stat/Biostat* refers to departments that incorporate (again, with exceptions) "Statistics" or "Biostatistics" in the name but do not use "Mathematics."

Listings of the actual departments that comprise these groups are available on the AMS website at `www.ams.org/annual-survey/groupings`.

A department is in Group...	...when its subject area, highest degree offered, and PhD production rate *p*
Math Public Large	Math PhD, $7.0 \leq p$
Math Public Medium	Math PhD, $3.9 \leq p < 7.0$
Math Public Small	Math PhD, $p < 3.9$
Math Private Large	Math PhD, $3.9 \leq p$
Math Private Small	Math PhD, $p < 3.9$
Applied Math	Applied mathematics, PhD
Statistics	Statistics, PhD
Biostatistics	Biostatistics, PhD
Masters	Math, masters
Bachelors	Math, bachelors
Doctoral Math	Math Public, Math Private, & Applied Math
Stat/Biostat or Stats	Statistics & Biostatistics
Math	All groups except Statistics & Biostatistics

Department Response Rates by Grouping

Group	Received
Math Public Large:	26 of 26 including 0 with no degrees
Math Public Medium:	39 of 40 including 0 with no degrees
Math Public Small:	62 of 70 including 9 with no degrees
Math Private Large:	24 of 24 including 0 with no degrees
Math Private Small:	24 of 28 including 2 with no degrees
Applied Math:	28 of 30 including 2 with no degrees
Statistics:	51 of 60 including 1 with no degrees
Biostatistics:	39 of 46 including 6 with no degrees
Total:	293 of 324 including 20 with no degrees

As of press time for this issue of *Notices*, the following departments had not responded to the survey. Therefore, any PhDs which may have been awarded by these departments are not included in this report.

Mathematics Departments
Clarkson University
Dartmouth College
Illinois State University
Jackson State University
Mississippi State University
Montclair State University
University of Alabama at Birmingham
University of California, Santa Cruz
University of Denver
University of Missouri–Kansas City
University of Oklahoma
University of Pennsylvania
University of Puerto Rico, Mayaguez
Wright State University, Dayton
Yeshiva University

Statistics Departments
George Washington University
Harvard University
Michigan State University
North Dakota State University, Fargo
Southern Methodist University
University of Alabama–Tuscaloosa
University of Arizona
University of California, Irvine
University of Virginia

Biostatistics Departments
Case Western Reserve University
Saint Louis University College for Public Health & Social Justice
University of Arizona, Mel & Enid Zuckerman College of Public Health
University of Cincinnati, Medical College
University of Illinois at Chicago
University of South Carolina
University of Texas–School of Public Health

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