

Johns Hopkins University
Bloomberg School of Public Health

Report on Johns Hopkins University
School of Medicine Faculty Salary Analysis, 2003-2004
With Additional Comments

April 13, 2005

Objectives:

- Describe the distribution of total salaries for School of Medicine faculty
- Determine the difference in average total salary between females and males who are from the same department and similar in terms of rank, degree and years in rank.

Data:

Information on 1444 School of Medicine faculty members was provided by Mary Foy and Phil Goertz. The data include

- Department⁺
- Rank (Professor, Associate Professor, or Assistant Professor)
- Gender (Male vs. Female)
- Degree* (MD vs. Non-MD)
- Years in current rank
- 2003-2004 salary (current FTE salary and total salary which includes bonuses)

NOTE: Originally, the data contained 33 department groups.

- The following departments were combined to form Basic Science: Biophysics, Cell Biology, Anatomy, Biomedical Engineering, Comparative Medicine, Molecular Biology and Genetics, Pharmacology, Biological Chemistry, Physiology and Neuroscience.
- Oncology and Radiation Oncology were combined to form the Oncology group.
- Surgery, Otolaryngology, Orthopaedic surgery, Neurosurgery and Urology were combined to form the Surgery group.
- The Academic Administration department only included one male faculty and was removed from the analysis.

NOTE: An MD is defined to be someone who has at least one of the following degrees: MD, DMD, MBBCh, MBBS, MBChB

Methods:

Cross-tabulations were used to describe the relationship among the discrete predictor variables: department, rank, gender and degree. Summary statistics were calculated for years in rank and salary by degree, rank and gender. Boxplots (a.k.a. box-whiskers plots) were used to assess the relationship between salary and each of the discrete predictors. The “box” portion of the boxplot gives the 25th, 50th (median) and 75th percentiles of the salary. The “whiskers” portion of the boxplot indicates the range of the data above or the 25th and 75th percentiles. Any values indicated by “o” below or above the “whiskers” are

considered to be extreme observations relative to the majority of the salaries. Scatterplots were used to assess the relationship between the years in rank and salary.

A series of linear regression models were used to describe log salary as a function of: gender, department group, rank, degree, and years in rank (natural spline with 3 degrees of freedom) effects. The log transformation of the salary protects against a few very large salaries having high influence on the results of the regression models and allows a simple interpretation of the regression coefficients. Take for example the regression coefficient for gender. This coefficient represents roughly the percentage difference between the median salary for female faculty compared to otherwise similar male faculty. Therefore, an estimated regression coefficient of -0.02 would indicate that women earn on average 2% less than men, and an estimated regression coefficient of 0.02 would indicate that women earn on average 2% more than men, everything else being equal.

With our first model, we estimated an overall gender difference with adjustments for department group and department group-specific rank, degree and years in rank. Second, we estimated a separate gender difference for each department group adjusting for department group-specific rank, degree and years in rank. Because the gender differences were highly uncertain given the large number of departments and small sample sizes for some departments, we combined all departments with fewer than 20 female faculty into an “Other” department group and obtained department group-specific gender differences for: Basic Science, OBGYN, Neurology, Medicine, Ophthalmology, Pathology, Pediatrics, Psychiatry, Surgery, Radiology, Oncology, Anesthesiology and Other. The gender difference for the Medicine department was estimated with and without the inclusion of the Cardiology and GI specialties.

Additional Note: The model with department-specific gender effects was refit after removing a subset of faculty who influenced the results of the regression analysis significantly. Twenty-one faculty and twenty-three faculty were removed from the analysis for total salary and full-time equivalent salary, respectively. In general, these faculty have large years in rank and higher/lower than usual salaries. A listing of these faculty can be provided.

Additional Note: Predicted total and full-time equivalent salaries were obtained by fitting the regression models described above to the data for male faculty only. Using the results of these regression models, predicted salaries were obtained for both female and male faculty. Male faculty who influenced the results of the regression analysis significantly were removed from the analysis (15 and 18 for the total salary and full-time equivalent salary, respectively); however predicted values for these faculty were obtained none the less. An Excel spreadsheet is provided which contains the social security number, department, rank, degree, gender and years in rank of all faculty (excluding the Cardiology and GI specialties) with the observed salaries and predicted salaries. In addition, the spreadsheet contains the percent difference in predicted versus observed salaries, an indicator of whether this difference is greater than 25 percent, and an indicator for the male faculty whom were removed from the prediction models due to high influence.

Results:

Tables 1 through 3 display the number of faculty by gender, rank and degree in each department. Of the 1444 faculty, 30 percent are female, 26 percent are full professors and 26 percent are associate professors. Seventy-three (73) percent of the faculty are MDs. Tables 4 and 5 display the cross-tabulation of gender and degree with rank. Thirty-one (31) percent of the male and 15 percent of the female faculty are full professors. The proportion of full professors is roughly the same across the Non-MDs and MDs (28 vs. 26 percent, respectively). Tables 6 through 8 contain summary statistics for years in rank and salary (in \$1000) by degree, rank and gender. Male professors have spent an average of 9 years in that rank whereas female professors have spent approximately 5 years. There appears to be little differences in years in rank comparing the Non-MDs to the MDs of the same gender. Among Non-MDs, the average salary among female faculty is approximately \$10,000 less than the males, regardless of rank. The differences in mean salary between genders are greater among the MDs at each rank. The appendix further summarizes salaries within the 13 department groups used in this analysis.

We estimate that the average current FTE salary for female faculty is 4 percent less than otherwise similar male faculty (95% CI: 1 to 6 percent less). The corresponding difference for total salary is estimated to be 6 percent less (95% CI: 3 to 9 percent less). Table 8 and Figures 8 and 9 display the estimated gender difference described above for each department group and for the entire school.

We tested the assumption that the gender difference is the same for all department groups. For FTE salary, we failed to reject this assumption (Wald test with 13 df, p-value = 0.12); for total salary, the gender differences were found to be statistically significantly different across department groups (Wald test with 13 df, p-value = 0.02). We also find that the estimate of the gender difference in the department of Medicine is sensitive to the inclusion of the Cardiology and GI specialties. Specifically, we estimate that female faculty from the department of Medicine have average total salaries which are 5 percent less than otherwise similar male faculty and that this difference reduces to 3 percent when Cardiology and GI faculty are excluded from the analysis.

Note: The overall estimates of the gender differences are not sensitive to the exclusion of the identified influential faculty. The estimates for OB/GYN, pediatrics, radiology, anesthesiology and the Other department are sensitive to the exclusion of the faculty whom were identified to be influential in the analysis (comparing the estimates from Table 9 to Table 9b). The estimated gender differences change by 2 to 6 percent however, the qualitative association (statistical significance does not change).

Table 1: Numbers of School of Medicine faculty by department and gender.

Department	Male	Female	Total
Basic Science	82	24	106
Art Applied to Med.	3	1	4
Gynecology/Obstetrics	16	23	39
History of Medicine	4	1	5
Oral Surgery/Dentistry	2	0	2
Neurology	52	20	72
Dermatology	14	6	20
Medicine	228	93	321
Ophthalmology	56	28	84
Pathology	61	27	88
Pediatrics	49	50	99
Psychiatry	70	43	113
Surgery	148	22	170
Radiology	62	20	82
Physical Medicine/Rehab	6	6	12
Oncology	74	28	102
Emergency Medicine	20	4	24
Anesthesiology	58	22	80
Genetic Medicine	11	9	20
Academic Administration	1	0	1
Total	1016	428	1444

Table 2: Numbers of School of Medicine faculty by department and rank.

Department	Professor	Associate Professor	Assistant Professor	Total
Basic Science	59	24	23	106
Art Applied to Med.	0	2	2	4
Gynecology/Obstetrics	5	11	23	39
History of Medicine	1	4	0	5
Oral Surgery/Dentistry	1	0	1	2
Neurology	20	15	37	72
Dermatology	3	8	9	20
Medicine	86	89	146	321
Ophthalmology	26	15	43	84
Pathology	25	32	31	88
Pediatrics	19	32	48	99
Psychiatry	21	27	65	113
Surgery	49	43	78	170
Radiology	15	24	43	82
Physical Medicine/Rehab	1	3	8	12
Oncology	33	24	45	102
Emergency Medicine	1	3	20	24
Anesthesiology	10	22	48	80
Genetic Medicine	4	5	11	20
Academic Administration	0	0	1	1
Total	379	383	682	1444

Table 3: Numbers of School of Medicine faculty by department and Non-MD vs. MD.

Department	Non-MD	MD	Total
Basic Science	92	14	106
Art Applied to Med.	4	0	4
Gynecology/Obstetrics	8	31	39
History of Medicine	5	0	5
Oral Surgery/Dentistry	2	0	2
Neurology	13	59	72
Dermatology	4	16	20
Medicine	49	272	321
Ophthalmology	26	58	84
Pathology	21	67	88
Pediatrics	15	84	99
Psychiatry	45	68	113
Surgery	26	144	170
Radiology	26	56	82
Physical Medicine/Rehab	6	6	12
Oncology	29	73	102
Emergency Medicine	1	23	24
Anesthesiology	5	75	80
Genetic Medicine	9	11	20
Academic Administration	1	0	1
Total	387	1057	1444

Table 4: Numbers of School of Medicine faculty by gender and rank.

Gender	Professor	Associate Professor	Assistant Professor	Total
Male	316	285	415	1016
Female	63	98	267	428
Total	379	383	682	1444

Table 5: Numbers of School of Medicine faculty by degree and rank.

Degree	Professor	Associate Professor	Assistant Professor	Total
Non-MD	108	116	163	387
MD	271	267	519	1057
Total	379	383	682	1444

Table 6: Mean, (standard deviation) and [range] of years in rank by degree, rank and gender.

Non-MD		
Rank	Male	Female
Professor	9.0 (6.9) [0, 35]	5.4 (5.4) [0, 19]
Associate Professor	5.3 (5.3) [0, 25]	5.2 (3.9) [0, 18]
Assistant Professor	2.7 (2.9) [0, 19]	3.8 (3.1) [0, 12]
MD		
Rank	Male	Female
Professor	9.0 (7.8) [0, 35]	5.1 (5.2) [1, 25]
Associate Professor	5.9 (5.6) [0, 31]	5.0 (4.9) [0, 28]
Assistant Professor	3.9 (3.8) [0, 27]	3.9 (3.4) [0, 24]

Table 7: Mean, (standard deviation) and [range] of current FTE salary (in \$1,000s) by degree, rank and gender.

Non-MD		
Rank	Male	Female
Professor	141 (26) [93, 215]	134 (23) [97, 220]
Associate Professor	98 (18) [63, 154]	87 (12) [56, 110]
Assistant Professor	77 (21) [50, 204]	69 (10) [49, 105]
MD		
Rank	Male	Female
Professor	203 (51) [66, 392]	179 (25) [116, 240]
Associate Professor	173 (46) [81, 384]	152 (33) [95, 243]
Assistant Professor	133 (45) [45, 253]	126 (35) [54, 250]

Table 8: Mean, (standard deviation) and [range] of total salary (in \$1,000s) by degree, rank and gender.

Non-MD		
Rank	Male	Female
Professor	144 (28) [93, 240]	136 (24) [98, 223]
Associate Professor	99 (18) [63, 154]	89 (13) [56, 110]
Assistant Professor	79 (26) [50, 252]	70 (11) [50, 106]
MD		
Rank	Male	Female
Professor	236 (101) [67, 683]	188 (34) [116, 281]
Associate Professor	200 (79) [81, 642]	162 (43) [102, 297]
Assistant Professor	149 (66) [45, 434]	134 (44) [54, 277]

Table 9. Estimated percent difference in mean salary comparing females to otherwise similar males. The coefficients (%diff) and standard errors (SE) from regressions of log salary allowing for an overall gender difference or a department-specific gender difference after adjusting for department-specific rank, degree, and years in rank.

Department	Current FTE Salary		Total Salary	
	%diff	SE	%diff	SE
Overall	-3.8	1.3	-6.3	1.5
Basic Science	-2.5	4.9	-3.5	6.0
OB/GYN	-19.7	8.2	-24.0	10.0
Neurology	-2.6	5.7	-5.1	6.9
Medicine	-3.3	2.6	-5.0	3.2
Medicine*	-1.6	2.9	-2.8	3.6
Ophthalmology	-7.1	5.1	-6.9	6.2
Pathology	-1.3	5.1	-5.2	6.2
Pediatrics	-5.4	4.4	-4.7	5.4
Psychiatry	0.4	4.2	0.9	5.6
Surgery	0.7	4.9	-7.3	5.9
Radiology	-2.4	5.4	-10.4	6.6
Oncology	-3.0	4.8	-2.8	5.9
Anesthesiology	-9.8	5.6	-14.0	6.8
Other	-6.2	4.8	-11.8	6.0

* Estimated gender difference after removing the Cardiology and GI specialties.

Table 9b. Estimated percent difference in mean salary comparing females to otherwise similar males. The coefficients (%diff) and standard errors (SE) from regressions of log salary allowing for an overall gender difference or a department-specific gender difference after adjusting for department-specific rank, degree, and years in rank. The data removes faculty identified to have high influence and the Medicine estimate excludes the Cardiology and GI specialties.

Department	Current FTE Salary		Total Salary	
	%diff	SE	%diff	SE
Overall	-4.0	1.2	-6.5	1.5
Basic Science	-2.3	4.3	-3.3	5.4
OB/GYN	-17.6	7.8	-18.4	9.8
Neurology	-2.6	5.0	-5.1	6.2
Medicine	-1.7	2.7	-2.9	3.3
Ophthalmology	-6.7	4.5	-5.4	5.6
Pathology	-1.3	4.5	-5.2	5.6
Pediatrics	-2.3	4.0	-1.4	4.9
Psychiatry	0.4	3.7	0.9	4.7
Surgery	-0.3	4.3	-8.4	5.4
Radiology	-5.4	4.8	-13.7	6.0
Oncology	-3.0	4.3	-2.8	5.3
Anesthesiology	-14.1	5.0	-18.4	6.3
Other	-9.4	4.5	-16.2	5.5

Figure 1: Boxplots of salary (in \$1000) by gender.

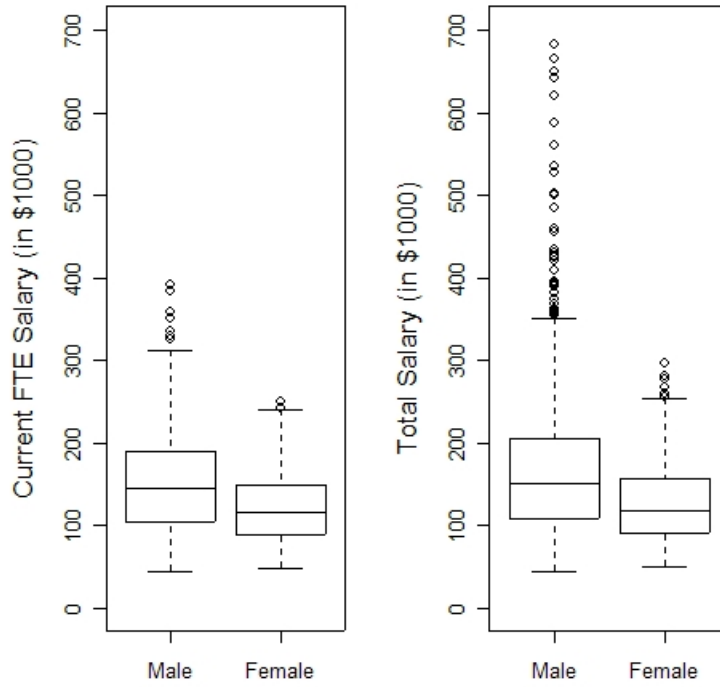


Figure 2: Boxplots of salary (in \$1000) by degree.

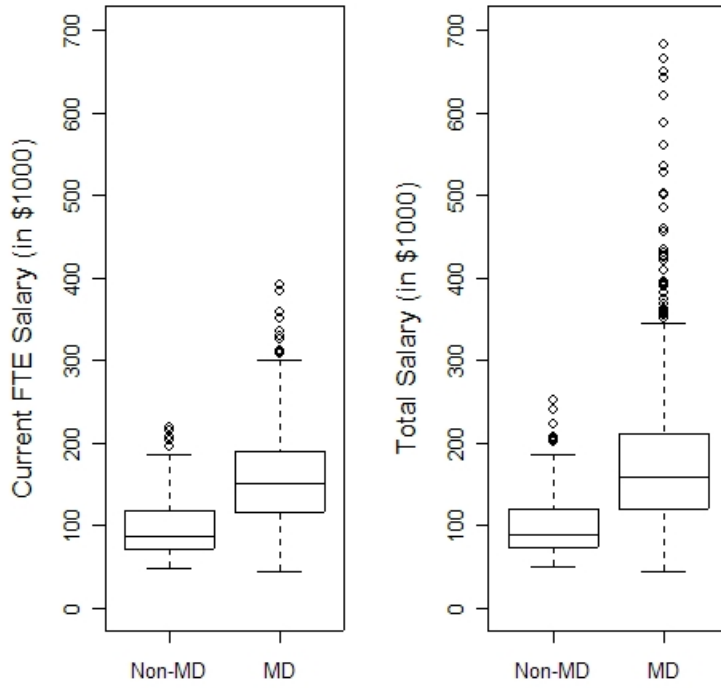


Figure 3. Boxplots of salary (in \$1000) by rank (P – Professor, AsP – Associate Professor and AP – Assistant Professor).

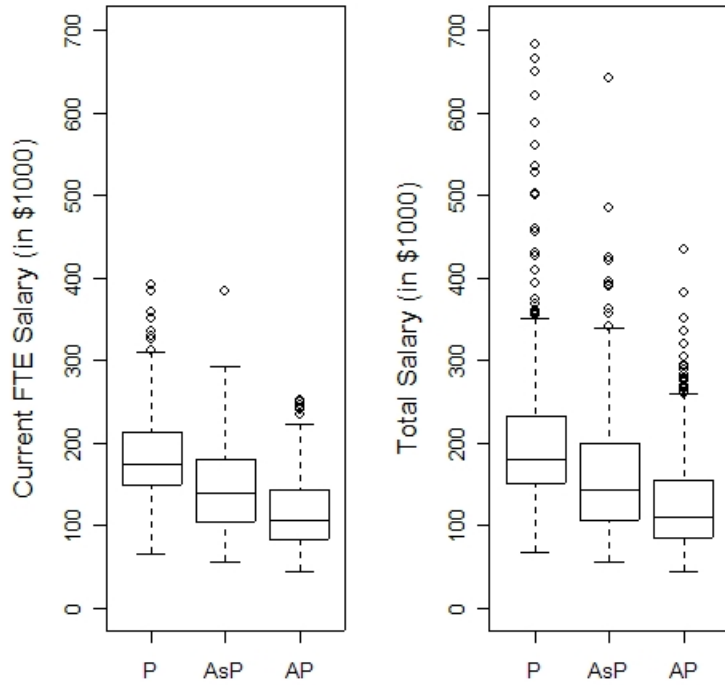


Figure 4. Boxplots of salary (in \$1000) by degree and gender.

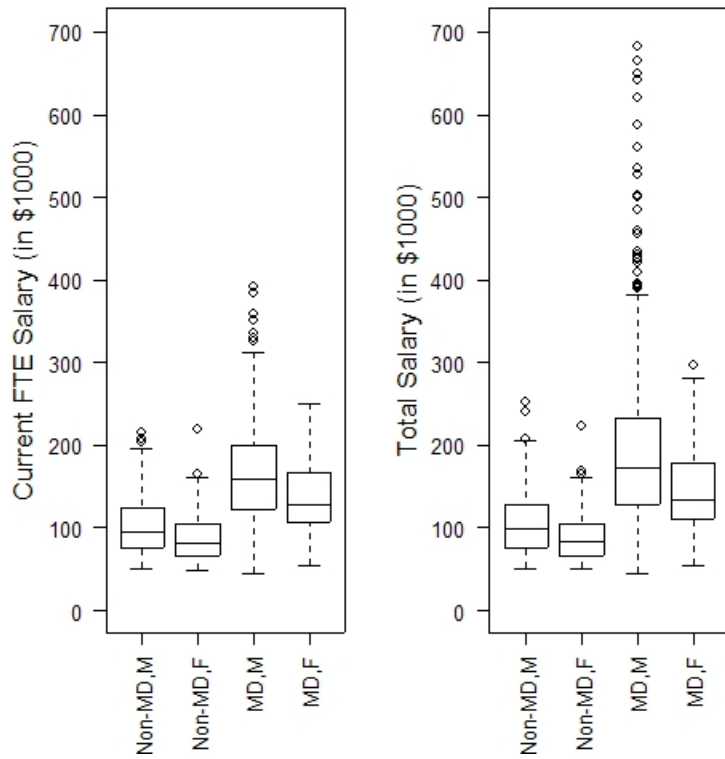


Figure 5. Boxplots of salary (in \$1000) by rank and gender (P – Professor, AsP – Associate Professor and AP – Assistant Professor)

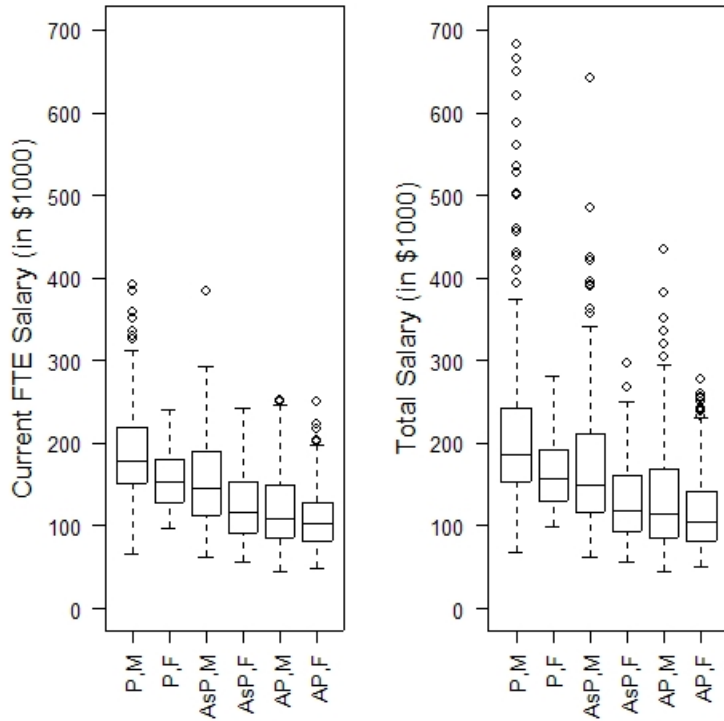


Figure 6. Scatterplot of salary (in \$1000) by years in rank. The solid line on the figure estimates the mean salary as a function of years in rank.

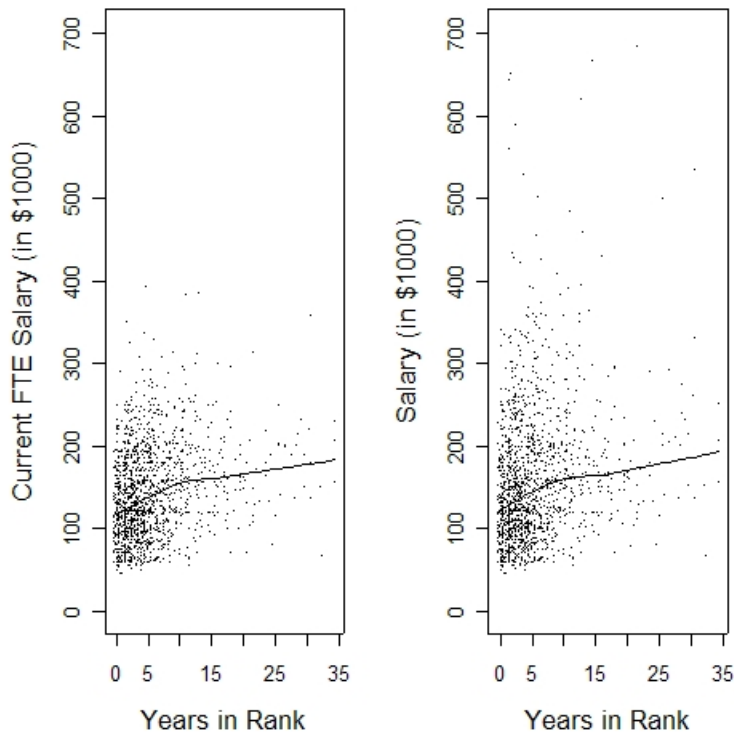


Figure 7. Scatterplot of salary (in \$1000) by years in rank and gender. The lines on the figure estimate the mean salary as a function of years in rank for each gender (dashed line are the males and solid line are the females).

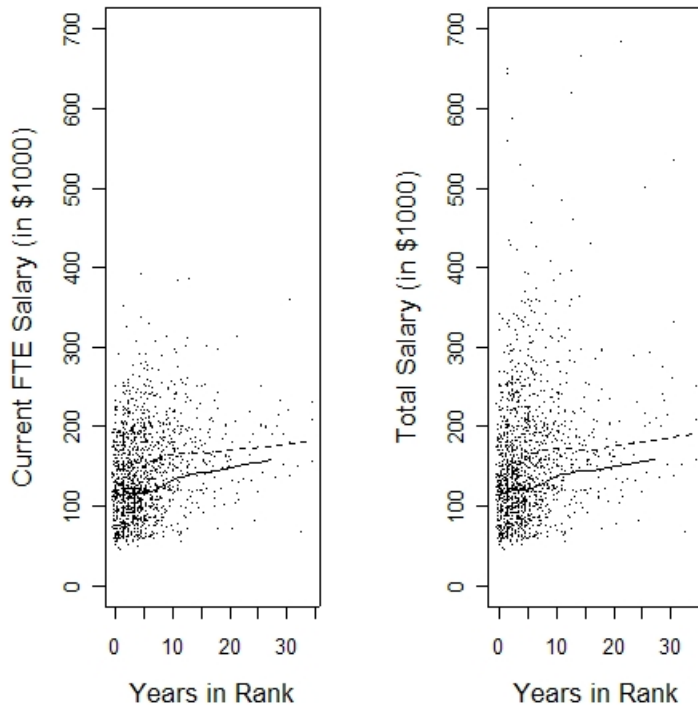


Figure 8. Estimated percent difference in average current FTE salary comparing females to otherwise similar males with 95% confidence intervals. The overall percent difference is displayed in addition to the department-specific estimates. The second estimate (*) from the Medicine department excludes the Cardiology and GI specialties.

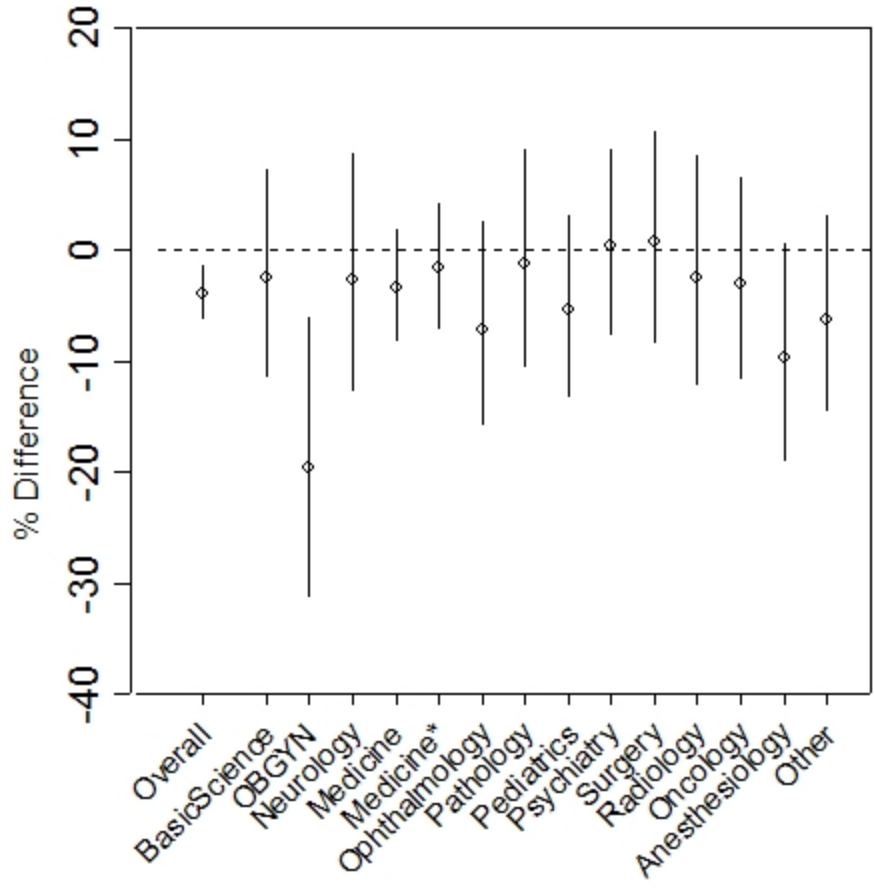


Figure 9. Estimated percent difference in average total salary comparing females to otherwise similar males with 95% confidence intervals. The overall percent difference is displayed in addition to the department-specific estimates. The second estimate (*) from the Medicine department excludes the Cardiology and GI specialties.

