

Johns Hopkins University  
Bloomberg School of Public Health

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

November 29, 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<sup>+</sup>
- 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 25<sup>th</sup>, 50<sup>th</sup> (median) and 75<sup>th</sup> percentiles of the salary. The “whiskers” portion of the boxplot indicates the range of the data above or the 25<sup>th</sup> and 75<sup>th</sup> 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 and OBGYN into an “Other” department group and obtained department group-specific gender differences for: Basic Science, 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. Fifteen faculty and eighteen 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.

#### Results:

Tables 1 through 3 display the number of faculty by gender, rank and degree in each department. Of the 1440 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 approximately 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 (Likelihood ratio test with 11 df, p-value = 0.38); for total salary, we also failed to reject this assumption (Likelihood ratio test with 11 df, p-value = 0.14). 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 pediatrics, radiology, anesthesiology, ophthalmology 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           | 55   | 25     | 80    |
| 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                   | 1011 | 425    | 1440  |

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           | 27        | 15                  | 38                  | 80    |
| 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                   | 378       | 383                 | 679                 | 1440  |

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           | 24     | 56   | 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                   | 385    | 1055 | 1440  |

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

| Gender | Professor | Associate Professor | Assistant Professor | Total |
|--------|-----------|---------------------|---------------------|-------|
| Male   | 317       | 284                 | 414                 | 1015  |
| Female | 63        | 99                  | 263                 | 425   |
| Total  | 380       | 383                 | 677                 | 1440  |

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

| Degree | Professor | Associate Professor | Assistant Professor | Total |
|--------|-----------|---------------------|---------------------|-------|
| Non-MD | 108       | 116                 | 161                 | 385   |
| MD     | 272       | 267                 | 516                 | 1055  |
| Total  | 380       | 383                 | 677                 | 1440  |

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         |
| <b>Overall</b> | <b>-3.6</b>        | <b>1.3</b> | <b>-6.1</b>  | <b>1.5</b> |
| Basic Science  | -2.5               | 4.9        | -3.5         | 6.0        |
| 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  | -3.3               | 5.2        | -2.8         | 6.4        |
| 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          | -6.9               | 3.8        | -12.5        | 4.7        |

\* 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         |
| <b>Overall</b> | <b>-3.7</b>        | <b>1.2</b> | <b>-6.3</b>  | <b>1.5</b> |
| Basic Science  | -2.3               | 4.3        | -3.3         | 5.4        |
| Neurology      | -2.6               | 5.0        | -5.1         | 6.2        |
| Medicine       | -1.7               | 2.7        | -2.9         | 3.3        |
| Ophthalmology  | -7.5               | 4.7        | -6.7         | 6.0        |
| 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          | -9.6               | 3.5        | -12.5        | 4.3        |

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

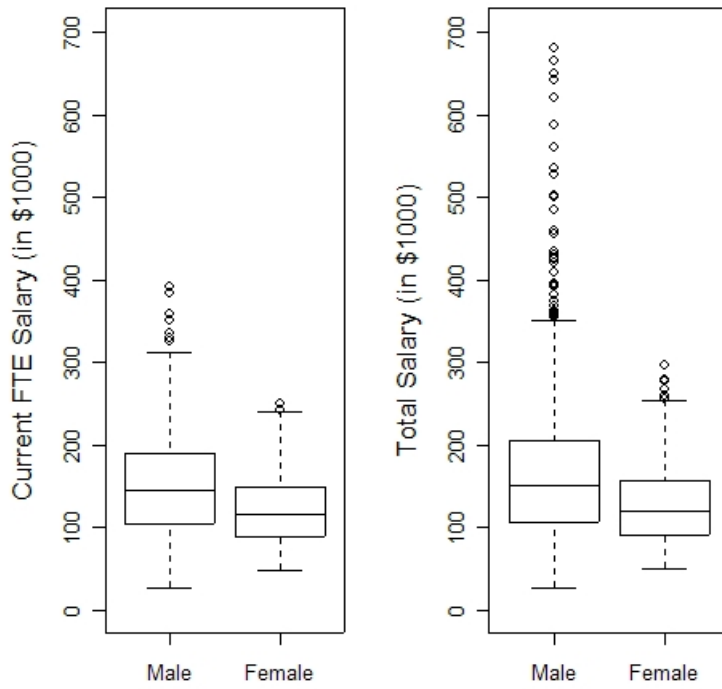


Figure 2: Boxplots of salary (in \$1000) by degree.

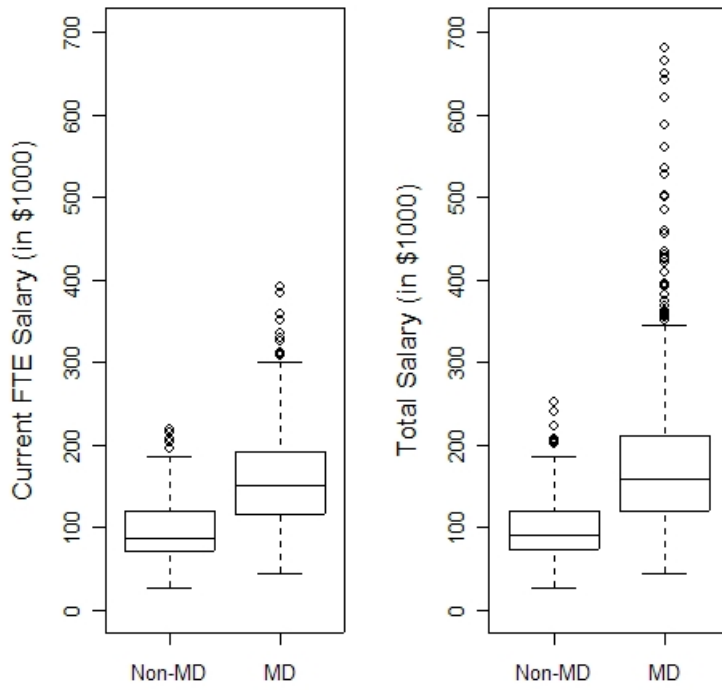


Figure 3. Boxplots of salary (in \$1000) by rank (P – Professor, AsP – Associate Professor and AP – Assistant Professor).

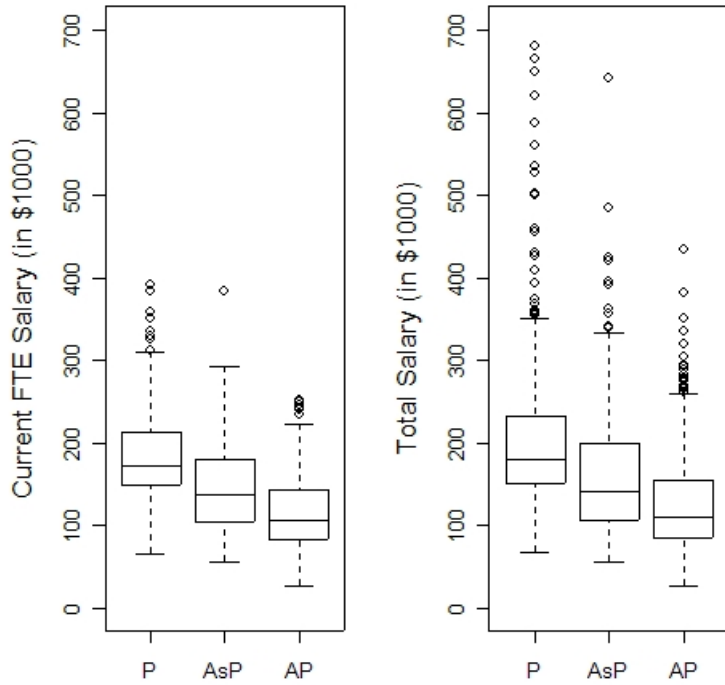


Figure 4. Boxplots of salary (in \$1000) by degree and gender.

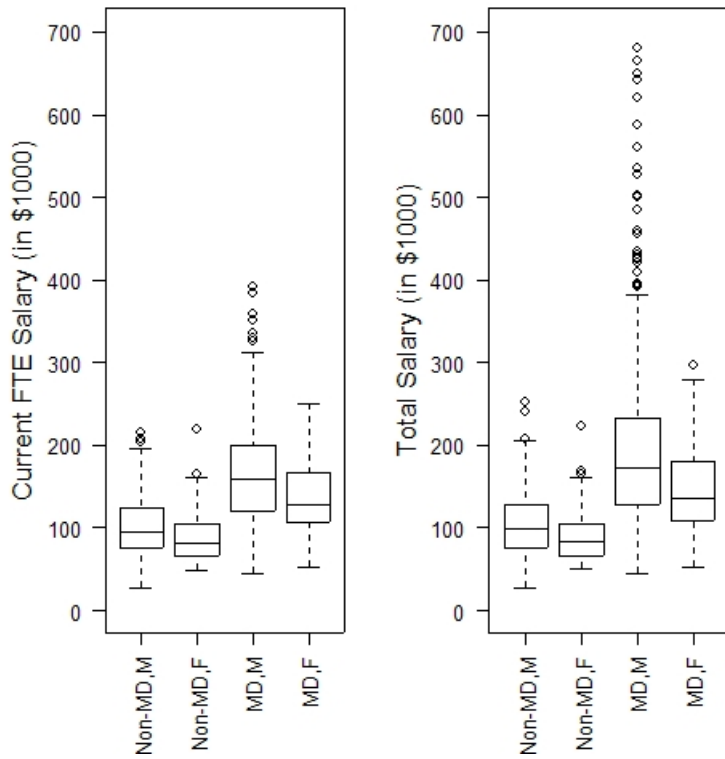


Figure 5. Boxplots of salary (in \$1000) by rank and gender (P – Professor, AsP – Associate Professor and AP – Assistant Professor)

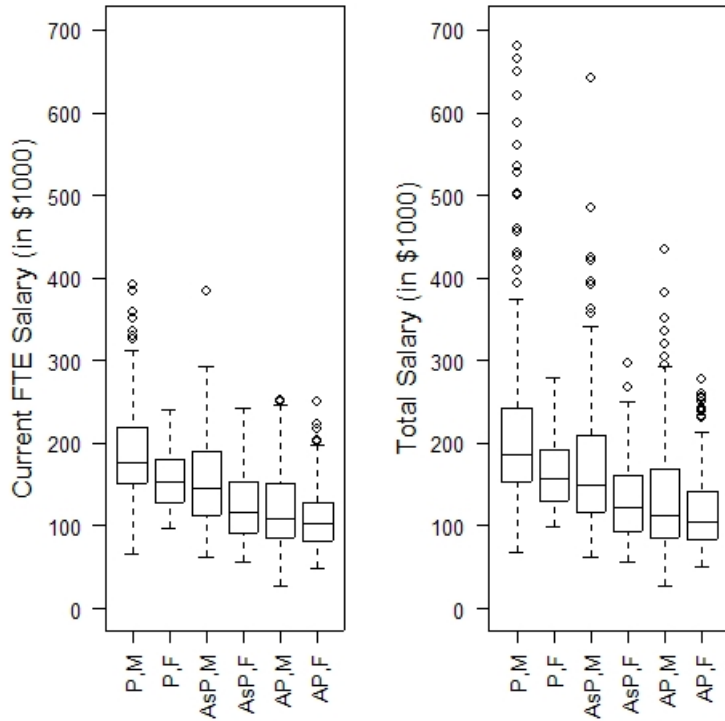


Figure 6. Scatterplot of salary (in \$1000) by years in rank. The solid line on the figure estimates the mean salary as a function of years in rank.

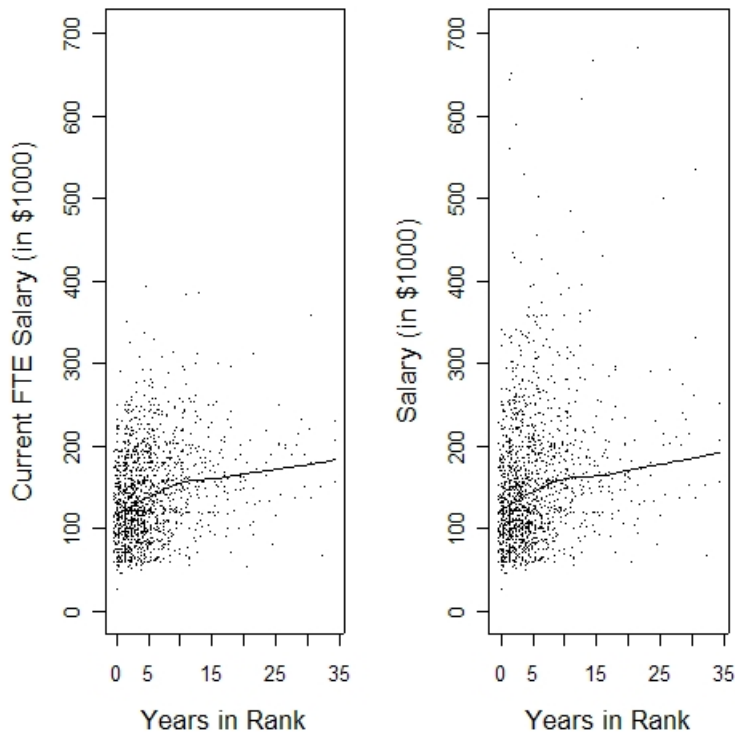


Figure 7. Scatterplot of salary (in \$1000) by years in rank and gender. The lines on the figure estimate the mean salary as a function of years in rank for each gender (dashed line are the males and solid line are the females).

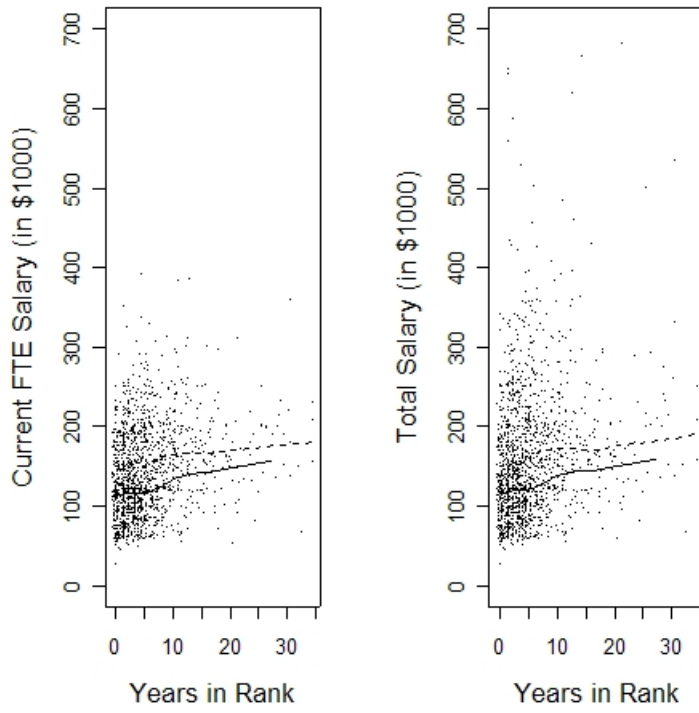


Figure 8. Estimated percent difference in average current FTE salary comparing females to otherwise similar males with 95% confidence intervals. The overall percent difference is displayed in addition to the department-specific estimates. The second estimate (\*) from the Medicine department excludes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

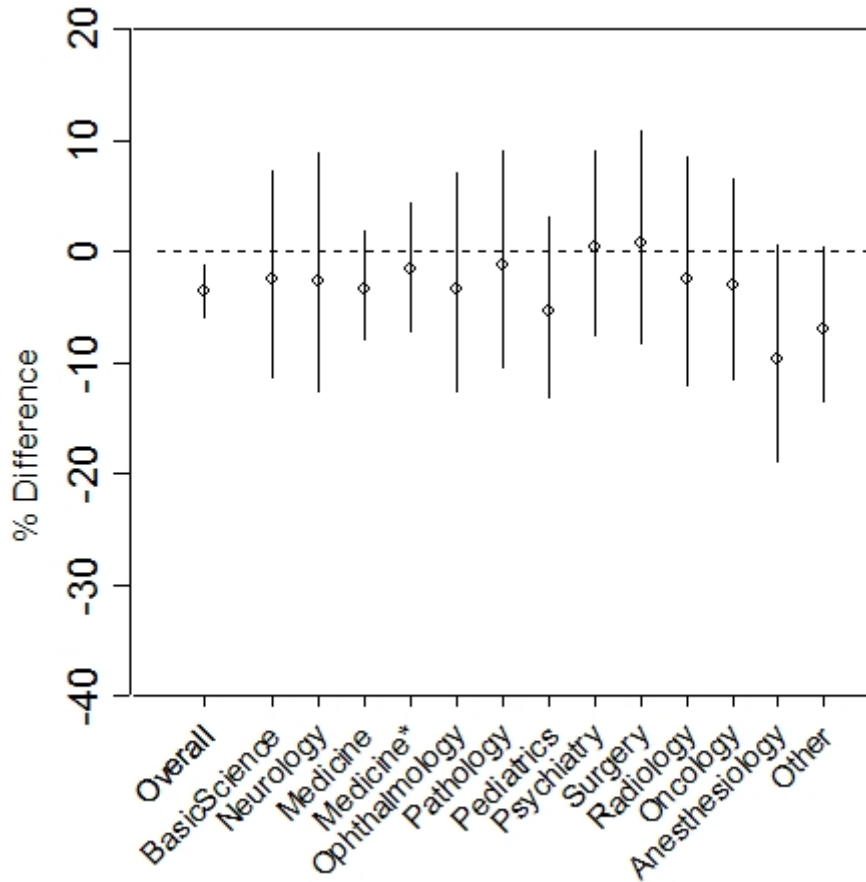


Figure 9. Estimated percent difference in average total salary comparing females to otherwise similar males with 95% confidence intervals. The overall percent difference is displayed in addition to the department-specific estimates. The second estimate (\*) from the Medicine department excludes the Cardiology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

