

SEX DISCRIMINATION PROBLEM

5. Summarizing Relevant Variables

- 5.1 The summary statistics for male and female starting salaries.
- 5.2 The basic summary statistics for starting salary, number of years of education, and number of years of prior experience for males and females.
- 5.3 The summary statistics of starting salary for each gender group over the three-year period.
- 5.4 Are the one-variable graphical and numerical tools useful to support or reject the sex discrimination claim?

- 5.1 Obtain the summary statistics for male and female starting salaries. In particular, obtain the mean, median, quartiles, standard deviation, minimum, and maximum.

The following is a part of the output produced by *Explore*. See the details in *Computing Instructions*.

Beginning Salaries By Gender							
Males							
Valid cases:	32.0	Missing cases:	.0	Percent missing:	.0		
Mean	5956.875	Std Err	122.1056	Min	4620.000	Skewness	.7674
Median	6000.000	Variance	477112.5	Max	8100.000	S E Skew	.4145
5% Trim	5928.333	Std Dev	690.7333	Range	3480.000	Kurtosis	1.7728
95% CI for Mean (5707.839, 6205.911)			IQR	825.0000	S E Kurt	.8094	
Females							
Valid cases:	61.0	Missing cases:	.0	Percent missing:	.0		
Mean	5138.852	Std Err	69.1234	Min	3900.000	Skewness	-.0780
Median	5220.000	Variance	291460.3	Max	6300.000	S E Skew	.3063
5% Trim	5136.995	Std Dev	539.8707	Range	2400.000	Kurtosis	-.2863
95% CI for Mean (5000.585, 5277.120)			IQR	600.0000	S E Kurt	.6038	

Now we will obtain similar outputs for other variables and summarize our results in the form of a table.

- 5.2 Obtain the mean, median, standard deviation, minimum, maximum for starting salary, number of years of education, and number of years of prior experience for males and females.

The *Explore* procedure in SPSS produces the following summaries:

	Gender	Number	Mean	Median	St. Deviation	Min	Max
Starting Salary (dollars)	Males	32	5956.87	6000	690.73	4620	8100
	Females	61	5138.85	5220	539.87	3900	6300
Education (years)	Males	32	13.53	15	1.87	8	16
	Females	61	11.97	12	2.31	8	16
Experience (months)	Males	32	103.05	56	102.10	7	359
	Females	61	99.82	82	85.40	0	381

As you can see, the mean beginning salaries for women were lower than those for men, but the men had higher mean years of education and months of experience. This is consistent with the conclusions we obtained by analyzing the graphical displays for the variables. Notice that although the average number of months of prior experience is higher for men, the median is larger for women as we noticed while examining the side-by-side boxplots of starting salaries for males and females. The distribution of number of months of experience is highly skewed for men.

The histograms and side-by-side boxplots of starting salaries for males and females obtained before indicate that females tend to receive lower starting salaries than males. However, the data refers to employees hired in a three-year period, between 1969 and 1971. The starting salaries in 1969 and 1971 are incomparable unless we take into account the effects of inflation and labour market situation. We expect that starting salaries are higher in 1971 than in 1969. Thus, if more males were hired proportionally than females at the end of the study period our results might be skewed favourably towards the gender group.

- 5.3 Obtain the basic descriptive statistics (mean, median, standard deviation, minimum, and maximum) of the beginning salary for each of the three years considered in the case study. More precisely, obtain the statistics for the seniority variable in each of the following 12-month periods: 65-76, 77-88, and 89-100, regardless of gender. Then obtain the statistics in each of the three time periods for each gender.

SPSS produces the following statistics:

STARTING SALARIES				
Seniority (months)	Number	Mean	Median	St. Deviation
65-76	28	5611.071	5400	743.9302
77-88	39	5484.615	5400	558.917
89-100	26	5118.462	5100	799.018

As you can see beginning salaries increase with time of hire, reflecting changes in mean starting salary over the three-year period.

On the other hand, the gender structure of the new hires has also changed over the time. Out of 28 employees hired in the last year of the study, only 6 were men. If we calculate the difference between average male and female salaries over the three year period, this difference in fact underestimates the true disparity in salaries between males and females because the salaries in the last year of the study are generally higher, females are overrepresented, and the fraction of employees hired in each of the three years is similar.

The descriptive statistics of beginning salary for each gender are given in the following table:

STARTING SALARIES BY GENDER								
Seniority (months)	Number		Mean		Median		St. Deviation	
	Males	Females	Males	Females	Males	Females	Males	Females
65-76	6	22	6600	5341.36	6300	5400	827.04	439.40
77-88	16	23	5790	5272.17	6000	5280	548.16	468.72
89-100	10	16	5838	4668.75	5850	4470	649.33	500.18

The above statistics confirm our earlier conclusions about the differences in starting salaries between males and females. Notice that the standard deviation for female salaries is much smaller than the standard deviation for male salaries over the three-year period.

5.4 Does all the above graphical displays and numerical summaries support the claim of discrimination? Did the females tend to receive lower starting salaries than *similarly* qualified and experienced males? In fact, the males generally did have more years of education than the females, and this, not sex, may have been responsible for the disparity in starting salaries. Is that so?

You are not able to answer the question of sex discrimination using one-variable graphical tools such as boxplots or histograms. We need two-variable graphical displays such as scatterplots to compare the starting salaries of males and females with similar measures of qualification.