

Marriage Ages

A student investigated whether people tend to marry spouses of similar ages and whether husbands tend to be older than their wives. He gathered data on the ages of 24 couples, taken from marriage licenses filed in Cumberland County, Pennsylvania, in June and July of 1993 (Data is found on our class Google doc under Data: MarriageAges):

Couple	Husband	Wife	Difference	Couple	Husband	Wife	Difference
1	25	22	3	13	25	24	1
2	25	32	-7	14	23	22	1
3	51	50	1	15	19	16	3
4	25	25	0	16	71	73	-2
5	38	33	5	17	26	27	-1
6	30	27	3	18	31	36	-5
7	60	45	15	19	26	24	2
8	54	47	7	20	62	60	2
9	31	30	1	21	29	26	3
10	54	44	10	22	31	23	8
11	23	23	0	23	29	28	1
12	34	39	-5	24	35	36	-1

- a) Using technology, calculate the median and mean age for each group (husbands/wives). Which spouse tends to be older and by how many years on average?

With 24 people in each group, the median ages are the average of the 12th and 13th ordered values. For husbands, the median is $(30 + 31)/2$ or 30.5 years. For wives, the median is $(28 + 30)/2$ or 29 years. For husbands, the mean age is 35.7 years and for wives, the mean age is 33.8 years. Husbands tend to be a little less than two years older than their wives.

- b) Using technology, calculate the IQR and standard deviation of ages for each group. Does one group of spouses have more variability in their ages than the other group?

The lower quartile is the median of the bottom 12 ordered values, so the average of the 6th and 7th values. For husbands, the lower quartile is $(25 + 25)/2$ or 25 years and the upper quartile is $(51 + 38)/2$ or 44.5 years. The IQR is, therefore, $44.5 - 25$ or 19.5 years. You can see this by examining the sorted ages for

husbands: 19 23 23 25 25 25 25 26 26 29 29 30 31 31 31 34 35 38 51 54 54 60 62 71

For wives, the lower quartile is $(24 + 24)/2$ or 24 years and the upper quartile is $(39 + 44)/2$ or 41.5 years, so the IQR is $41.5 - 24$ or 17.5 years. The standard deviations are 14.6 and 13.6 years for husbands and wives, respectively. These calculations indicate that the middle 50% of husbands'

ages cover a slightly greater distance than the wives' ages by 2 years and that the husbands' ages typically lie slightly farther from the mean, by approximately 1 year on average.

- c) Comment on how the age distributions compare, citing numerical summaries for support.
The age distributions are quite similar for husbands and wives. Both are skewed to the right, centered around the low 30s or so, with considerable variability from the upper teens through low 70s. The husbands are a bit older on average, and their ages are a bit more spread out than the wives' ages.
- d) Notice that the table also reports the difference in ages, subtracting the wife's age from the husband's age, for each couple. Calculate the mean and median of these age differences for the two groups. Do you notice anything about how these compare to the means and medians of the husbands and wives individually?

The ordered differences in couples' ages are

-7, -5, -5, -2, -1, -1, 0, 0, 1, 1, 1, 1, 1, 2, 2, 3, 3, 3, 3, 5, 7, 8, 10, 15

The median is the average of the 12th and 13th ordered values: $(1+1)/2$ or 1 year.

The mean is the sum of these differences divided by 24, which turns out to be $45/24$ or 1.9 years.

Notice that the mean of the age differences is equal to the difference in mean ages between husbands and wives: $1.9 = 35.7 - 33.8$. But this property does not quite hold for the median.

- e) Calculate the IQR and standard deviation of these age differences. Compare these values to the IQR and standard deviation of the ages themselves in part b.

The quartiles are -0.5 and 3, so the IQR is 3.5 years. The standard deviation of these age differences is 4.8 years. The IQR of the differences and the standard deviation of the differences calculated here are less than the individual IQRs (19.5 and 17.5) and the individual standard deviations (14.56 and 13.56) calculated in part b.

- f) Determine how many and what proportion of the age differences fall within one standard deviation of the mean. Is this close to the percentage that the empirical rule predicts?

To be within one standard deviation of the mean is to be within 1.9 ± 4.8 years, which means between -2.9 and 6.7 years. Seventeen of the age differences fall within this interval, which is a proportion of $17/24$ or .708, or 70.8%. This percentage is quite close to 68%, which is what the empirical rule predicts. Because the distribution of the age differences does look fairly symmetric and mound-shaped, this outcome is not surprising.

- g) What do these calculations reveal about whether people tend to marry spouses of similar ages? Explain.
The mean and median indicate that, on average, people marry someone within a couple years of their own age. More importantly, the measures of spread are fairly small for the differences, much smaller than for individual ages. This result suggests that there is not much variability in the differences, which suggests that people do tend to marry people of similar ages.

- h) Based on the context, explain why the age differences have much less variability than the individual ages.
The differences have less variability because even though people get married from their teens to seventies (and beyond), they tend to marry people within a few years of their own age.

