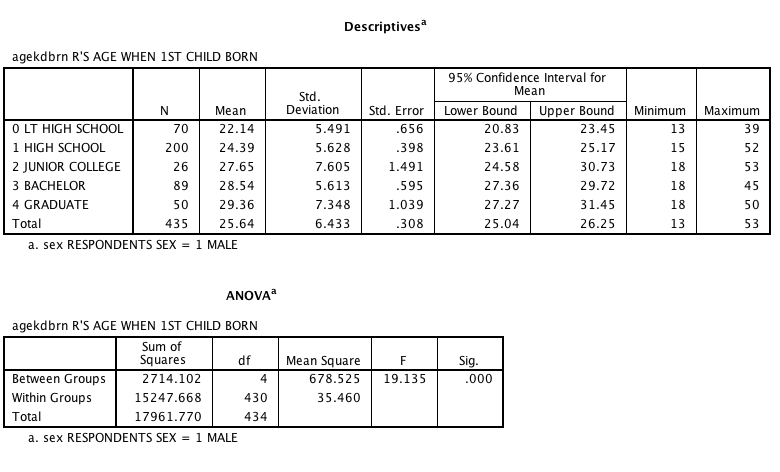
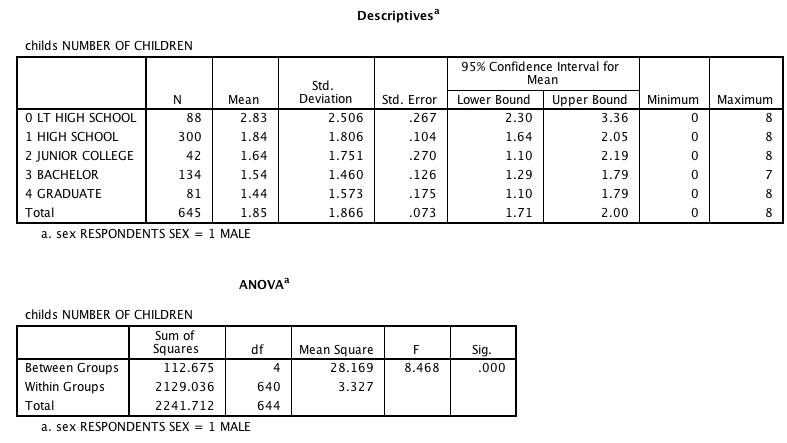
**Chapter 10 Analysis of Variance**

**SPSS Solutions**

1. b. F – obtained is 19.135, significant at the .000 level. We reject the null hypothesis and conclude that one of the means is significantly different. For men (as it was for women in the SPSS Demonstration), as educational attainment increases, so does the age when one’s first child is born. The oldest first-time fathers are those with a graduate degree (29.36), followed by men with a bachelor’s degree (28.54). The youngest first-time fathers were those with a high school degree (22.14).

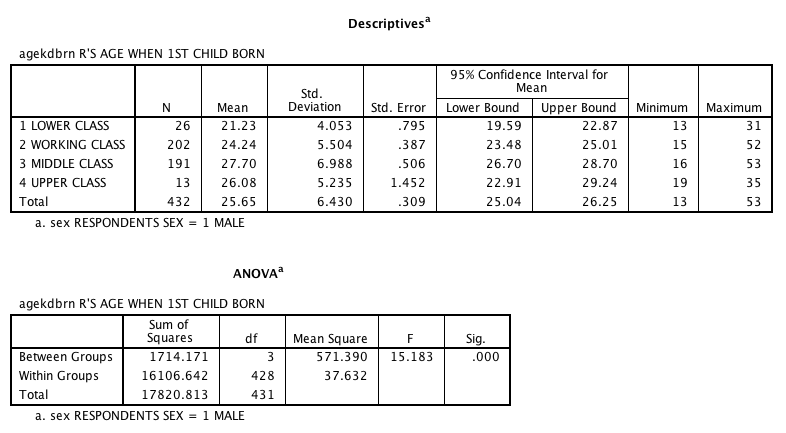
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c. For men only. F obtained of 8.468 is significant at the .000 level. We reject the null hypothesis at the .05 level and conclude that one of the means is significantly different. The output indicates that the educational group with the largest families are those with less than a high school degree (2.83 children) and those with a high school degree (1.84 children). Those with a graduate degree had the lowest average number of children, 1.44 children.



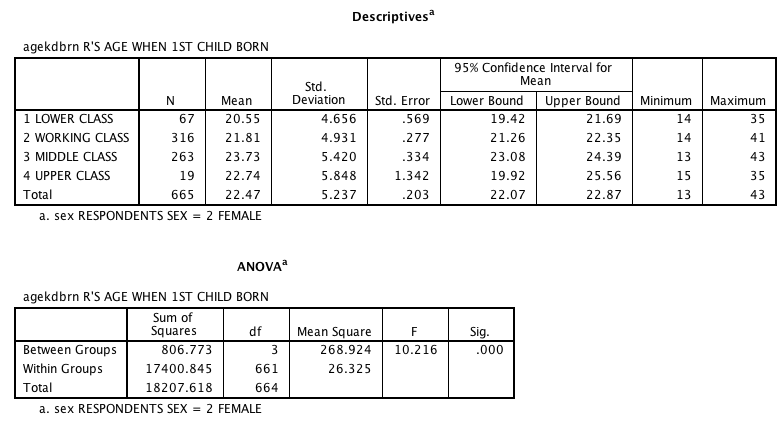
2.

The model for men only: The F obtained is 15.183 (p=.000). We would reject the null hypothesis and note that as social class increases, so does the age when first child was born. The youngest average age was 21.23 for lower class men; the oldest average age was 27.70 for middle class men.

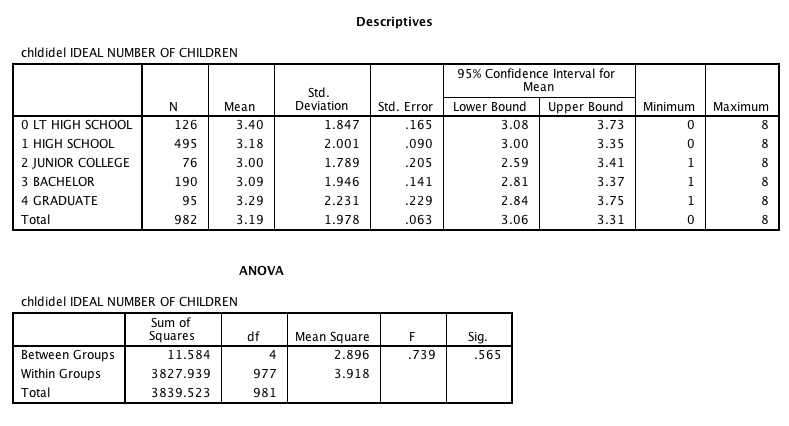


The model for women only: F obtained is 10.216 (p=.000). We would reject the null hypothesis and conclude that one of the means is significantly different. Based on the Descriptives table, we know that the same pattern exists for women as it does for men – as social class increases, so does the age when respondent’s first child was born.

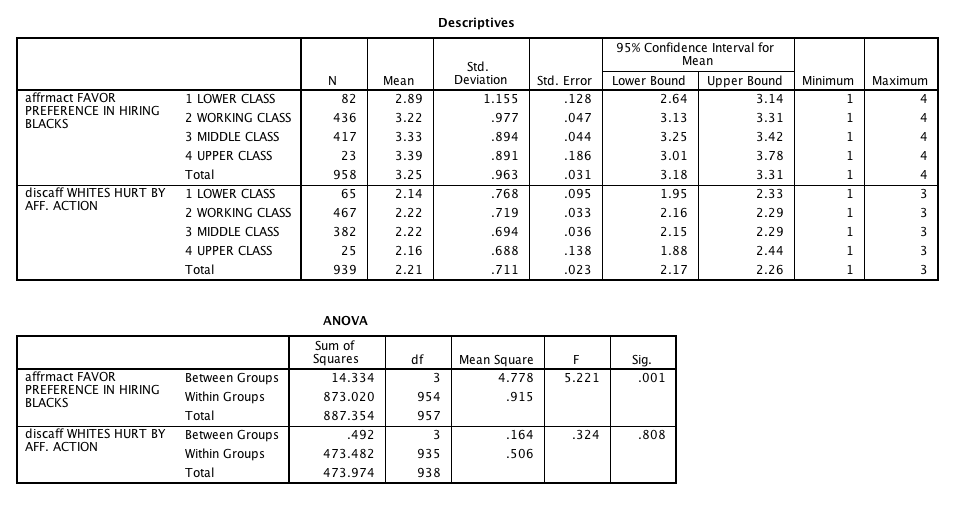
Comparing men and women, we can see that across all social classes, women are younger than men when their first child is born. For women, the average age when a first child is born is 22.47 years; for men, the average age is 25.65 years.



3. For all respondents: F obtained is .739 (p=.565). Since p is smaller than alpha = .05, we would fail to reject the null hypothesis that there is no difference between the means.



4.



The model for AFFRMACT is significant at the .001 level. As social class increases, the level of opposition increases (average scores are higher). The highest scores are for those in upper class category, 3.39 on a 4-point scale.

**Chapter 10 – Answers to Exercises**

1.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 = | 2.875 | 2 = | 2.250 | 3 = | 2.00 | 4 = | 1.375 |
| ΣY1 = | 23 | ΣY2 = | 18 | ΣY3 = | 16 | ΣY4 = | 11 |
| ΣY12 = | 71 | ΣY22 = | 44 | ΣY32 = | 38 | ΣY42 = | 17 |
| n1 = | 8 | n2 = | 8 | n3 = | 8 | n4  = | 8 |
| = 2.125 | | | | | | | |
| N = 32 | | | | | | | |

SSB = 8(2.875 – 2.125)2 + 8(2.250 – 2.125)2 + 8(2.00 – 2.125)2 +

8(1.375 – 2.125)2

= 8(0.5625) + 8(.015625) + 8(.015625) + 8(.5625)

= 4.5 + .125 + .125 + 4.5

# SSB = 9.25

dfb = 4 – 1

**dfb** = **3**

**Mean square between = 9.25/3 = 3.08**

SSW = (71 + 44 + 38 + 17) – [(232/8) + (182/8) + (162/8) + (112/8)]

= 170 – (66.125 + 40.5 + 32 + 15.125)

= 170 – 153.75

**SSW** = **16.25**

dfw = 32 – 4

**dfw** = **28**

**Mean square within = 16.25/28 = 0.58**

F = 3.08/0.58

**F** = **5.31**

**Decision:** If we set alpha at 0.05, F critical would be 2.95 (df1 = 3 and df2 = 28). Based on our F obtained of 5.31, we would reject the null hypothesis and conclude that at least one of the means is significantly different than the others. Upper class respondents rate their health the highest (1.375), followed by middle and working class respondents (2.00 and 2.25 respectively) and lower class respondents (2.875) on a scale where 1 = excellent, 4 = poor.

2.

a. Respondent’s race is the independent variable.

b. F obtained is 7.23. We would reject the null hypothesis of no difference and conclude that at least one of the mean number of friends who smoke cigarettes is different among these three groups. The lowest mean score is for black students, 2.17 (between a few and some friends). The highest mean score is for white students, 4.33 (between most and all response categories).

3.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 = | 1.6 | 2 = | 1.4 | 3 = | 0.6 |
| ΣY1 = | 16 | ΣY2 = | 14 | ΣY3 = | 6 |
| ΣY12 = | 30 | ΣY22 = | 24 | ΣY32 = | 8 |
| n1 = | 10 | n2 = | 10 | n3 = | 10 |
| = 1.2 | | | | | |
| N = 30 | | | | | |

SSB = 10(1.6 – 1.2)2 + 10(1.4 – 1.2)2 + 10(0.6 – 1.2)2

= 10(0.16) + 10(0.04) + 10(0.36)

= 1.6 + 0.4 + 3.6

# SSB = 5.6

dfb = 3 – 1

**dfb** = **2**

**Mean square between = 5.6/2 = 2.8**

SSW = (30 + 24 + 8) – [(162/10) + (142/10) + (62/10)

= 62 – (25.6 + 19.6 + 3.6)

= 62 – 48.8

**SSW** = **13.2**

dfw = 30 – 3

**dfw** = **27**

**Mean square within =13.2/27 = 0.488889**

F = 2.8/0.49

**F** = **5.71**

**Decision:** If we set alpha at 0.05, F critical would be 3.35 (df1 = 2 and df2 = 27). Based on our F obtained of 5.71, we would reject the null hypothesis and conclude that at least one of the means is significantly different than the others. Respondents with no degree rate their church attendance highest (1.6), followed by respondents with a secondary degree (1.4) and then respondents with a university degree (0.6).

b. *If we set alpha to .01, we would still reject the null hypothesis. F critical would be 5.49, less than F obtained of 5.71.*

4. a. From the ANOVA table, we know that the *F* ratio is 4.757. The *p* value is .001. Since SPSS reports the exact *p* value, we are able to say that the relationship between education and worry about financial dependence is significant at the .001 level (less than our alpha level of .01). As education increases, respondents are more likely to disagree to the statement.

b. Eta-squared is .06 or 6% for this model.

5. The calculated F-ratio is .070, significant at .991 level. We would fail to reject the null hypothesis of no difference between the group means.

6.

a. We would reject the null hypothesis of equal means. The F-obtained is 6.746, significant at the .000 level (and less than our alpha of .05). As educational attainment increases, disagreement to the statement about immigrants taking jobs away increases

Mean scores are highest for those with a graduate degree (3.42) and lowest for those with only a high school degree 2.63).

b. If alpha were set at .01, we would still reject the null hypothesis.

7.

a.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
| *n*1 = 7 | *n*2 = 7 | *n*3 = 7 |
|  | | |
| *N* = 21 | | |

SSB = 7(4.29 - 3.24)2 + 7(2.29 - 3.24)2 + 7(3.14 - 3.24)2

= 7(1.10) + 7(0.90) + 7(0.01)

= 7.70 + 6.30 + 0.07

*SSB* = 14.07

*df*b = 3  1

*df*b = 2

Mean square between = 14.07/2 = 7.035

*SSW* = (134 + 44 + 84)  [(302/7) + (162/7) + (222/7)]

= 262  (128.57 + 36.57 + 69.14)

= 262  234.28

*SSW* = 27.72

*df*w= 21  3

*df*w = 18

Mean square within = 27.72/18 = 1.54

*F* = 7.035/1.54

*F* = 4.57

*Decision.* If we set alpha at .05, *F* critical would be 3.55 (*df*1 = 2 and *df*2 = 18). Based on our *F* obtained of 4.57, we would reject the null hypothesis and conclude that at least one of the means is significantly different from the others. On average, white respondents have the highest number of school days missed in the past 4 weeks (4.29), followed by Hispanic respondents (3.14), and then black respondents (2.29).

b. If alpha were changed to .01, *F* critical would be 6.01. We would fail to reject the null hypothesis at this alpha level.

8.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| *Y*1 = 4 | *Y*2 = 7 | *Y*3 = 16 |
|  |  |  |
| *n*1 = 5 | *n*2 = 4 | *n*3 = 5 |
|  | | |
| *N* = 14 | | |

*SSB* = 5(.8  1.93)2 + 4(1.75  1.93)2 + 5(3.20 – 1.93)2

= 5(1.2769) + 4(.0324) + 5(1.6129)

= 6.3845 + 0.1296 + 8.0645

SSB = 14.58

*df*b = 3  1

*df*b = 2

Mean square between = 14.58/2 = 7.29

*SSW* = (6 + 15 + 54)  [(42/5) + (72/4) + (162/5)]

= 75  (3.2 + 12.25 + 51.2)

= 75  66.65

*SSW* = 8.35

*df*w = 14  3

*df*w = 11

Mean square within = 8.35 /11 = 0.76

*F* = 7.29/0.76

*F* = 9.59

*Decision.* If we set alpha at .05, *F* critical would be 3.98 (*df*1 = 2 and *df*2 = 11). Based on our *F* obtained of 9.59, we would reject the null hypothesis and conclude that at least one of the means is significantly different from the others. The average number of moving violations is the highest for large city respondents (3.2); medium sized city residents are next (1.75), followed last by small town respondents (0.8).

9. For each sociocultural resource we would reject the null hypothesis. For social support, the obtained F-ratio is 12.17, p < .001. Whites report the highest level of social support (2.85) while Non-Cuban Hispanics have the lowest (2.58). For religious attendance, the obtained F-ratio is 56.43, p < .001. Church attendance is highest for African Americans and Non-Cuban Hispanics in the sample (3.94 and 3.37 on the five point scale).

10. The means reported in the Descriptives table indicate that as education increases, so does the average internet hours per week. However, the F-obtained is 2.150, significant at .075. The level of significance is greater than our alpha of .05. We fail to reject the null hypothesis.

11. Based upon the F-obtained of 7.318, we reject the null hypothesis of no difference and conclude that there is a significant difference in GPA between these three student groups. High school GPA is highest for white students, followed by Hispanic and black students.