1a. That there is a significant relationship between brain size and intelligence, and that controlling for covariates only increases significance.

1b. Coefficients in model two suggest that gender and weight are inversely related to intelligence. However, these coefficients may be falsely attributed this effect, due to omission of other more relevant variables, such as nutrition.

1c. The point is to have a more comprehensive model, where potential confounds, and explanatory variables are controlled for. Thus, by including more controls, we do not misattribute an independent variable’s effects on the outcome and are better able to assess the strength of a relationship.

1d.

t-stat for height=-2.767/1.447=-1.91

[Since we only have t table for positive values of t statistic, we use the absolute value of the t statistic.

With df=36, the two values that |t stat|=1.91 falls between= (1.6888, 2.028). ]

Therefore, this range of critical values corresponds to a range of p-values=(0.050, 0.1000).

This finding is confirmed by Stata calculation, where p-value = 0.0577, and falls in the above range.

1e.

The regression of IQ scores on brain size yields vastly different estimates of the constant when including controls.

In the first instance of a simple bivariate regression, the constant= .119 indicates that for a brain size of 0, IQ scores are at 5.167.

In the second model, after we control for height, gender, and weight, we find that the constant captures individual fixed effects. In other words, it tells us how much of an IQ score individual ‘i‘ is likely to start out with, absent increases in brain size. The constant indicates the baseline IQ when including controls.

Model 2: IQ = 134.383 + 0.2BrainSize – 2.599Gender – 2.767Height – 0.075Weight + error

So, the constant in second model means for a male with 0 height, 0 weight, and 0 brain size.

2a.



The values of the two b coefficients are b\_poor=0.9091, and b\_divorce=0.6041.

The value of the intercept, a=-6.4839.

We are looking at the effects of poverty, and divorce, on homicide rates.

From the coefficients, we can infer that for each percentage increase in number of families below the poverty line, the number of homicides per 100,000 goes up by 0.90 individuals.

Similarly, for every additional divorce per 1,000 individuals, aged 15-59, the number of homicides increases by roughly 0.60 per 100,000 people.

The constant indicates that when families below the poverty line, and divorces, are down to zero, the number of homicides falls below zero. In other words, as the number of divorces, and families living in poverty, increases so does the homicide rate.

Here, only the coefficient for the poverty is significant, while the coefficient for divorces and the constant do not pass significance tests, using either t-statistic or p-value.

The coefficient for poverty passes both significance tests:

t statistic=2.47>1.96=>significance at 95% confidence level.

p-value=0.024<0.05=>significance at 95% confidence level.

2b.

The R^2 for this equation is 0.33

Meanwhile, the adjusted R^2 is 0.22, a dramatic shift.

This tells us that adding extra independent variables led stata to output a higher R^2 than the true value, where divorce rates do not even impact the outcome significantly.

Thus, when 1 of 2 independent variables is found to have little effect, the R^2 adjusted downwards to reflect a weaker effect (than the falsely shown R^2=0.33).

The R^2=0.33 showed a weak relationship to begin with. The adjusted R^2 showed an even weaker effect.

This must mean that variation in homicide rates is better explained by including other factors.

The F-test for this equation tells us that at the 95% confidence level, it is significant. At least one of our

variables has a significant effect on the outcome, therefore the model passes the F-test.

This means our model has some predictive power, even if the R^2 is low.

2c.



The standardized values of the coefficients are:



b\*\_poor=0.4865

b\*\_divorce=0.2460

We can interpret these standardized values as follows:

For every standard deviation increase in the percentage of poor families, there is a corresponding 0.4865 standard deviation increase in the homicide rate.

For every standard deviation increase in the divorce rate, there is a corresponding 0.2460 standard deviation increase in the homicide rate.

When comparing standardized coefficients of variables within a sample, the percentage of families living in poverty clearly has a greater impact on the poverty rate than the divorce rate does.