BUS 735: Business Decision Making and Research
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Take Home Exam 1

The following questions use the dataset `health.sav` that collected data from college students on their pulse at rest, after moderate exercise, and after vigorous exercise. Along with these measures are other measures of health including weight and reflex speed, and a number of variables that may influence people's health including their gender, participation in sports, whether they had smoked in the past, etc. Click on **Variable View** in SPSS to view all the variables along with a description.

Whenever you conduct a hypothesis test, specify which test you are running. Copy and past *only the relevant tables* from your SPSS output to support your answers. Remember to completely follow all steps for hypothesis testing.

1. Develop a model that predicts students' weight based on their gender, age, height, the number of hours they watch TV, their participation in sports, and whether they used to be a smoker.

   (a) What variables, if any, lead to statistically significant increases in weight? Report the relevant statistics and p-values.

   (b) What variables, if any, lead to statistically significant decreases in weight? Report the relevant statistics and p-values.

   (c) Cite a statistic and report its value that gives information on how well the independent variables explain weight. Do you think your model explains the data well?

   (d) Suppose someone is 28 years old, is male, is 180 centimeters tall, watches TV 10 hours per week, does not participate in sports and has smoked in the past. What is his predicted weight?

   (e) What is the marginal predicted impact on weight when the person in the problem above becomes one year older?

   (f) Accounting for all the other variables in the model, what is the predicted difference in weight between men and women?

2. Create a new variable called 'BMI' (Body Mass Index) according to the following formula: BMI = (Weight in Kg)/(Height in Meters). People with a BMI over 35 are considered overweight. Create another variable called 'OVERWEIGHT' that is equal to 1 if BMI is over 35 and 0 otherwise. Develop a model that predicts whether or not someone is overweight based on the same explanatory variables as in #1.

   (a) How many people in your sample are overweight?

(b) What variables, if any, lead to statistically significant increases in the probability of being overweight? Report the relevant statistics and p-values.

(c) What variables, if any, lead to statistically significant decreases in the probability of being overweight? Report the relevant statistics and p-values.

(d) How do your answers to questions (b) and (c) compare to your answers in #1(b) and #1(c)?

(e) Cite statistics that report how well your independent variables explain whether or not someone is overweight. Do you think your model explains the data well?

(f) Suppose someone is 28 years old, is male, is 180 centimeters tall, watches TV 10 hours per week, does not participate in sports and has smoked in the past. What is the probability he is overweight?

(g) What is the marginal predicted impact on the probability of being overweight when the person in the problem above becomes one year older?

(h) Suppose there is another person identical to the person in part (f) except she is female. Is she more or less likely to be overweight than the gentleman in problem (f)? How much more or less?

3. Develop a model that predicts average pulse while at rest, after moderate exercise, and after vigorous exercise while taking into account whether someone was a past smoker or not?

   (a) Using this model, is there statistical evidence that pulse rate is different while at rest, after moderate exercise, and after vigorous exercise?

   (b) Using this model, is there evidence that being a past smoker influences pulse rate?

   (c) Using this model, is there evidence of an interaction effect between type of exercise and whether or someone smoked in the past?

4. Create a new variable called 'WEIGHTCAT' (for weight category) that is equal to 1 if $BMI \leq 35$ (normal weight), 2 if $35 < BMI \leq 40$ (overweight), and 3 if $BMI > 40$ (obese). Develop a model that predicts average pulse while at rest taking into account gender and weight category.

   (a) Is there evidence that males and females have a different average pulse? If so, which gender has a higher pulse?

   (b) Is there evidence that weight category influences average pulse? If so, conduct post-hoc tests to indicate which weight levels lead to higher pulse rates.

   (c) Is there evidence for an interaction between gender and weight category? If so, examine the means (no hypothesis testing) and comment on the relationship between gender and weight.