**Reading achievement and motivation in Switzerland**

The Swiss government has done an intervention study in the State of Fribourg in Switzerland about reading achievement and reading motivation of 4th graders. The goal was to investigate an intervention to increase reading achievement. The intervention consisted of training teachers and parents. Teachers learned methods that make reading more fun and parents learned how to support their children in their reading homework.

This is a real study and now we assume that the Swiss government has some additional questions for you.

They provided you with a part of the dataset from the study (***Swiss\_Literacy\_Exam1.sav***). There are only 4th graders in this dataset.

The dataset has a lot of information in it. You will only have to use some of these variables.

The study measured the students reading skills with a test at the beginning of the school year before the intervention (t1) and at the end of the school year after the intervention (t2).

Explanation of some variables

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| *Variable name* | *Explanation of variable label* |
| GROUP | Designates if student is in the control or intervention group  1 = Intervention parents and school  2 = Control group |
| SEX | The gender of the student: girl or boy  1 = Girls  2 = Boys |
| T1\_READTEST | Reading test score (ELFE test) before the intervention at start of school year  On a scale from 1-120points |
| T2\_READTEST | Reading test score (ELFE test) after the intervention at end of school year  On a scale from 1-120points |
| T1\_READMOT | Reading motivation before the intervention at start of school year  On a scale from 1-4 (1=really low reading motivation; 4=really high reading motivation) |
| T2\_READMOT | Reading motivation after the intervention at end of school year  On a scale from 1-4 (1=really low reading motivation; 4=really high reading motivation) |

**FIRST TOPIC – Initial comparison of total sample to population**

The Swiss government would like to generalize the findings from this study to the average Swiss 4th grader. They have checked if the average social background and the percentage of immigrants in the sample are representative for the Swiss population of 4th graders. The sample is indeed representative in those regards. But in addition to that they would like you to check if the children in your sample are similar to the Swiss national average for 4th graders in regards to reading achievement.

In the public records you find the information in the list below about the reading achievement test (called ELFE) that the study used. The records report the Mean (M) and the Standard Deviation (SD) of different populations at the beginning of the 4th grade:

European average in the ELFE reading test: M= 62 points, SD = 16

German average in the ELFE reading test: M= 70 points, SD = 12

Swiss average in the ELFE reading test: M= 68 points, SD = 10

State of Fribourg average in the ELFE reading test: M= 66 points, SD = 13

1. Formulate the alternative hypothesis for the question for the first topic: Is the sample of 4th graders that participated in the study initially different from the Swiss national average in reading achievement, as measured by the ELFE reading test?
2. Which statistical test would you use to answer the question for the first topic?
3. How are you going to test this hypothesis for the first topic; one-tailed or two-tailed?
4. What is the mean for reading achievement t1 (before the intervention)?
5. What is the standard deviation for reading achievement t1 (before the intervention)?
6. How many 4th graders are in your total sample?
7. What is the mean difference between the sample and the population?
8. What is the *t*-value of the test you conducted to answer the question for the first topic?
9. What is the relevant *p*-value for the test you conducted to answer the question for the first topic?
10. Do you reject the null hypothesis for the first topic, and why?
11. For your goal to generalize to the broader population of Swiss 4th graders is this result desirable?

**Second TOPIC – Comparison of total sample in reading achievement from beginning to end of school year**

The next question is: Did the total sample of students increase in their reading scores from the beginning of the school year to the end? From experience we expect that the 4th graders learn during the school year and improve their reading scores. Anything else would be worrisome, right?

1. What is the alternative hypothesis for our assumption?
2. Which statistical test would you use to answer the question for the second topic?
3. How are you going to test this hypothesis for the second topic; one-tailed or two-tailed?
4. What is the mean for reading achievement at time1 (for everybody)?
5. What is the mean for reading achievement at time2 (for everybody)?
6. What is the mean difference in reading scores?
7. What is the *t*-value of the test you conducted for the second topic?
8. What is the *p*-value?
9. Do you reject the null hypothesis for the second topic, and why?
10. Is this result desirable in regards the goal of schools to improve students reading abilities?

**Third TOPIC – Comparison of reading achievement of the intervention group and control group at the end of school year**

For the study two groups were created.

1 – The intervention group (called Intervention parents and school) includes the students who participated in the intervention.

2 - The control group (called Control group) includes the students who did not participate in the intervention.

Now the question of the whole study was about is this: At the end of the year, just looking at the reading achievement scores t2: Do the students in the intervention group have higher reading scores than the students in the control group? We did our best to develop a beneficial intervention for reading achievement, so we assume that the intervention had a positive effect and result in higher reading achievement.

1. What is your alternative hypothesis for the question if the 4th graders in the intervention group had higher reading achievement scores (test 2) than the 4th graders in the control group?
2. Which statistical test would you use to answer the question for the third topic?
3. How are you going to test this hypothesis for the third topic; one-tailed or two-tailed?
4. What is the mean for reading achievement at time2 for the intervention group?
5. What is the mean for reading achievement at time2 for the control group?
6. What is the mean difference between the intervention group and the control group?
7. What is the *t*-value of the test you conducted for the third topic?
8. What is the relevant *p*-value of the test you conducted for the third topic?
9. Do you reject the null hypothesis for the third topic, and why?
10. You are writing your report to the Swiss government. Would you recommend this intervention in regards to the impact on reading achievement?