Homework_1

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1.8 Smoking habits of UK residents.

(a) What does each row of the data matrix represent? Answer (a)

Each row represents the responses of each individual respondants who answered the survey questions.

(b) How many participants were included in the survey?

```
smoking <-
read.csv(url("https://raw.githubusercontent.com/jbryer/DATA606Spring2019/master/data/os3_data/Ch%201%20Exercise%20Data/smoking.csv"), header = FALSE)
nrow(smoking)
```

```
## [1] 1692
```

Answer (b)

1691 participants

(c) Indicate whether each variable in the study is numerical or categorical. If numerical, identify as continuous or discrete. If categorical, indicate if the variable is ordinal.

Answer (c)

gender - categorical
age - numerical (discrete) maritalStatus - categorical highestQualification - categorical(ordinal) nationality - categorical ethnicity - categorical grossincome - categorical (ordinal) region - categorical smoke - categorical
amtWeekends - numerical (discrete) AmtWeekdays - numerical (discrete) type - categorical

1.10 Cheaters, scope of inference.

(a) Identify the population of interest and the sample in this study.

Answer (a)

The population of interest are childern, the sample is 160 children aged between 5 and 15

(b) Comment on whether or not the results of the study can be generalized to the population, and if the findings of the study can be used to establish causal relationships

Answer (b)

The results of the study cannot be generalised since it's not sure whether the population of analysis were chosen based on certain criteria or based on certain factors. The findings of the study are based on experimental analysis, therefore it cannot be used to build casual relationships.

1.28 Reading the paper

Answer (a) according to the data given: pack-a-day 37% more likely two-pack-a-day 44% more likely more -than-two twice the risks Therefore, by these observations , we can conclude that smoking causes dimentia later in life and risks are likely to increase with increase in smoking rate.

Answer (b) Sleep disorders maynot lead to bullying in children. A child can be a bully based on various other factors, like, various family issues that disturbs the mental well being of a child, bullying child might have gone through same bullying experiance , child abuse, etc. Therefore, corelating sleep disorder only with bullying in children is not justified.

1.36 Exercise and mental health.

(a) What type of study is this? Answer (a)

it is a randomized study

(b) What are the treatment and control groups in this study? Answer (b)

treatment group: the group which is told to exercise twice a week control group: the group who is told not to exercise.(half the subject)

(c) Does this study make use of blocking? If so, what is the blocking variable? Answer (c)

Yes, this study makes use of age groups as a blocking variable.

(d) Does this study make use of blinding? Answer (d)

No blinding is used. both the respondants and researchers are aware of the group who are exercising and not exercising.

(e) Comment on whether or not the results of the study can be used to establish a causal relationship between exercise and mental health, and indicate whether or not the conclusions can be generalized to the population at large. Answer (e)

There was random sampling of the population and also each group were assigned tasks to do, therefore the results of the study can be used to establish a causal relationship between exercise and mental health.

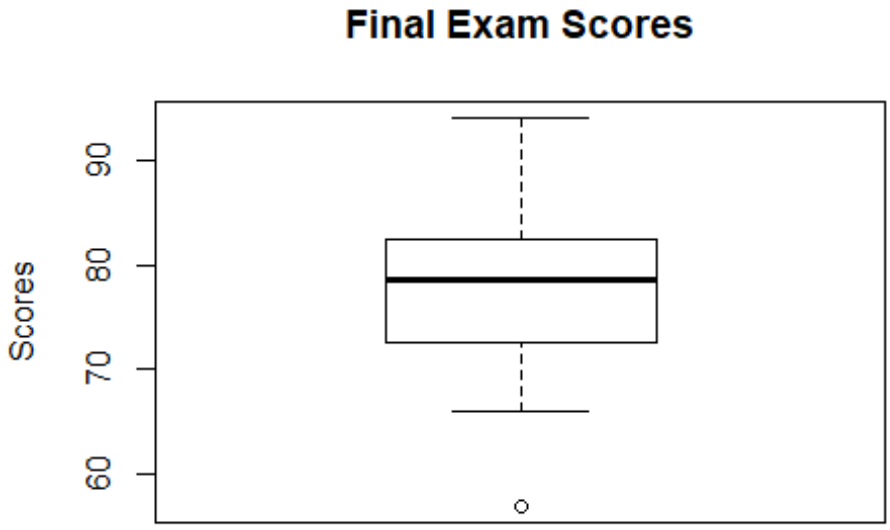
Conclusion can be generalised to the population , since this is a randomized experiment.

(f) Suppose you are given the task of determining if this proposed study should get funding. Would you have any reservations about the study proposal? Answer (f)

No,I would not have any restrictions on the study proposal, since the analysis is done based on factors which are analytically strong ,like, randomized sample, blocking age groups, compairing results, clear instructions given for the experiment.

1.48 Stats scores.

```
scores <- (c(57, 66, 69, 71, 72, 73, 74, 77, 78, 78, 79, 79, 81, 81, 82, 83,
83,              88, 89, 94))
boxplot(scores, main = "Final Exam Scores", ylab = "Scores")
```



1.50 Mix-and-match.

histogram (A) matches box plot (2) : it is symmetrical, unimodal and uniformly distributed

histogram (B) matches with box plot (3): it is symmetrical, multimodal and a rough uniform distribution

histogram (C) matches with box plot (1): it is right skewed distribution, unimodal

1.56 Distributions and appropriate statistics, Part II .

(a) Distribution will be left skewed: the 3rd quartile is less densely populated than the first two quartiles.

Median would best represent this typical observation in the data: it will lessen the effect of extreme values

variability of observations would be best represented by IQR, because SD can be sensitive to extreme values.

(b)Distribution seems to be symmetric. There are only few expensive houses, which would not skew the data much and the quartile ranges are similar

Median would best represent this typical observation in the data: it will lessen the effect of extreme values

variability of observations would be best represented by IQR, because SD can be sensitive to extreme values.

(c) It will be left-skewed distribution since most of the students will be at the minimum value of zero(non-drinkers) and since very few drink excessively.

The median would best represent the typical observation since it will lessen the effects of the all the non-drinkers and the excessive drinkers.

The variability would be best represented by the IQR because the SD would be sensitive to all the non-drinkers and the excessive drinkers.

(d) It will be a symetrical distribution.

The median would best represent the typical observation since it will lessen the effect of the extreme values of the high-level executives.

The variability would be best represented by the IQR because the SD would be sensitive to the extreme values of the high-level executives.

1.70 Heart transplants.

```
heartTr<-
read.csv(url("https://raw.githubusercontent.com/jbryer/DATA606Spring2019/master/data/os3_data/Ch%201%20Exercise%20Data/heart_transplant.csv"))
heartTr
```

```
##      id acceptyear age survived survtime prior transplant wait
## 1    15         68  53     dead        1    no    control   NA
## 2    43         70  43     dead        2    no    control   NA
## 3    61         71  52     dead        2    no    control   NA
## 4    75         72  52     dead        2    no    control   NA
## 5     6         68  54     dead        3    no    control   NA
## 6    42         70  36     dead        3    no    control   NA
## 7    54         71  47     dead        3    no    control   NA
## 8    38         70  41     dead        5    no  treatment    5
## 9    85         73  47     dead        5    no    control   NA
## 10    2         68  51     dead        6    no    control   NA
## 11  103         67  39     dead        6    no    control   NA
## 12   12         68  53     dead        8    no    control   NA
## 13   48         71  56     dead        9    no    control   NA
## 14  102         74  40    alive       11    no    control   NA
## 15   35         70  43     dead       12    no    control   NA
```

```
## 16   95         73  40     dead       16    no  treatment    2
## 17   31         69  54     dead       16    no    control   NA
## 18    3         68  54     dead       16    no  treatment    1
## 19   74         72  29     dead       17    no  treatment    5
## 20    5         68  20     dead       18    no    control   NA
## 21   77         72  41     dead       21    no    control   NA
## 22   99         73  49     dead       21    no    control   NA
## 23   20         69  55     dead       28    no  treatment    1
## 24   70         72  52     dead       30    no  treatment    5
## 25  101         74  49    alive       31    no    control   NA
## 26   66         72  53     dead       32    no    control   NA
## 27   29         69  50     dead       35    no    control   NA
## 28   17         68  20     dead       36    no    control   NA
## 29   19         68  59     dead       37    no    control   NA
## 30    4         68  40     dead       39    no  treatment   36
## 31  100         74  35    alive       39   yes  treatment   38
## 32    8         68  45     dead       40    no    control   NA
## 33   44         70  42     dead       40    no    control   NA
## 34   16         68  56     dead       43    no  treatment   20
## 35   45         71  36     dead       45    no  treatment    1
## 36    1         67  30     dead       50    no    control   NA
## 37   22         69  42     dead       51    no  treatment   12
## 38   39         70  50     dead       53    no  treatment    2
## 39   10         68  42     dead       58    no  treatment   12
## 40   35         71  52     dead       61    no  treatment   10
## 41   37         70  61     dead       66    no  treatment   19
## 42   68         72  45     dead       68    no  treatment    3
## 43   60         71  49     dead       68    no  treatment    3
## 44   62         71  39     dead       69    no    control   NA
## 45   28         69  53     dead       72    no  treatment   71
## 46   47         71  47     dead       72    no  treatment   21
## 47   32         69  64     dead       77    no  treatment   17
## 48   65         72  51     dead       78    no  treatment   12
## 49   83         73  53     dead       80    no  treatment   32
## 50   13         68  54     dead       81    no  treatment   17
## 51    9         68  47     dead       85    no    control   NA
## 52   73         72  56     dead       90    no  treatment   27
## 53   79         72  53     dead       96    no  treatment   67
## 54   36         70  48     dead      100    no  treatment   46
## 55   32         71  41     dead      102    no    control   NA
## 56   98         73  28    alive      109    no  treatment   96
## 57   87         73  46     dead      110    no  treatment   60
## 58   97         73  23    alive      131    no  treatment   21
## 59   37         71  41     dead      149    no    control   NA
## 60   11         68  47     dead      153    no  treatment   26
## 61   94         73  43     dead      165   yes  treatment    4
## 62   96         73  26    alive      180    no  treatment   13
## 63   90         73  52     dead      186   yes  treatment  160
## 64   53         71  47     dead      188    no  treatment   41
## 65   89         73  51     dead      207    no  treatment  139
```

```
## 66   24          69  51     dead      219    no  treatment   83
## 67   27          69   8     dead      263    no    control   NA
## 68   93          73  47    alive      265    no  treatment   28
## 69   51          71  48     dead      285    no  treatment   32
## 70   67          73  19     dead      285    no  treatment   57
## 71   16          68  49     dead      308    no  treatment   28
## 72   84          73  42     dead      334    no  treatment   37
## 73   91          73  47     dead      340    no    control   NA
## 74   92          73  44    alive      340    no  treatment  310
## 75   58          71  47     dead      342   yes  treatment   21
## 76   88          73  54    alive      370    no  treatment   31
## 77   86          73  48    alive      397    no  treatment    8
## 78   82          71  29    alive      427    no    control   NA
## 79   81          73  52    alive      445    no  treatment    6
## 80   80          72  46    alive      482   yes  treatment   26
## 81   78          72  48    alive      515    no  treatment  210
## 82   76          72  52    alive      545   yes  treatment   46
## 83   64          72  48     dead      583   yes  treatment   32
## 84   72          72  26    alive      596    no  treatment    4
## 85   71          72  47    alive      630    no  treatment   31
## 86   69          72  47    alive      670    no  treatment   10
## 87    7          68  50     dead      675    no  treatment   51
## 88   23          69  58     dead      733    no  treatment    3
## 89   63          71  32    alive      841    no  treatment   27
## 90   30          69  44     dead      852    no  treatment   16
## 91   59          71  41    alive      915    no  treatment   78
## 92   56          71  38    alive      941    no  treatment   67
## 93   50          71  45     dead      979   yes  treatment   83
## 94   46          71  48     dead      995   yes  treatment    2
## 95   21          69  43     dead     1032    no  treatment    8
## 96   49          71  36    alive     1141   yes  treatment   36
## 97   41          70  45    alive     1321   yes  treatment   58
## 98   14          68  53     dead     1386    no  treatment   37
## 99   26          69  30    alive     1400    no    control   NA
## 100  40          70  48    alive     1407   yes  treatment   41
## 101  34          69  40    alive     1571    no  treatment   23
## 102  33          69  48    alive     1586    no  treatment   51
## 103  25          69  33    alive     1799    no  treatment   25
```

(a) As per the mosaic plot, the survival is not independent since the expectancy of life is bigger for the patients who got the heart transplant.

(b) The box plot shows that that the heart transplant is effective for increase of life expectancy.

```
patientcont_dead <- nrow(subset(heartTr, heartTr$transplant ==
    "control" & heartTr$survived == "dead"))
patientcont <- nrow(subset(heartTr, heartTr$transplant ==
    "control"))
patienttreat_dead <- nrow(subset(heartTr, heartTr$transplant ==
```

```
    "treatment" & heartTr$survived == "dead"))
patienttreat <- nrow(subset(heartTr, heartTr$transplant ==
    "treatment"))
patientcont_deadratio <- patientcont_dead/patientcont
patienttreat_deadratio <- patienttreat_dead/patienttreat
patientcont_deadratio

## [1] 0.8823529

patienttreat_deadratio

## [1] 0.6521739
```

88.23% of the patients in the control group died by the end of the study and 65.22% of the patients in the treatment group died by the end of the study.

1. The claim being tested is whether or not a heart transplant will increase a patient's lifespan.

```
alive <- sum(heartTr$survived == "alive")
alive

## [1] 28

dead <- sum(heartTr$survived == "dead")
dead

## [1] 75

patienttreat

## [1] 69

patientcont

## [1] 34

patienttreat_deadratio - patientcont_deadratio

## [1] -0.230179
```

28 75 69 34 -0.230179 at least as extreme or greater.

It seems that a difference of at least -23.02% due to chance alone would only happen about 2% of the time according to the figure. Such a low probability indicates a rare event.