N741: Homework 5

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# Homework 5 - DUE March 15, 2017

For this homework, we'll work with the "Wong" dataset built in to the car package. The "Wong" data frame has 331 row and 7 columns. The observations are longitudinal data on recovery of IQ after comas of varying duration for 200 subjects. The data are from Wong, Monette, and Weiner (2001) and are for 200 patients who sustained traumatic brain injuries resulting in comas of varying duration. After awakening from their comas, patients were periodically administered a standard IQ test, but the average number of measurements per patient is small (331/200 = 1.7). *To get more info type ??Wong.*

The 7 variables in the dataset are:

* id
  + patient ID number.
* days
  + number of days post coma at which IQs were measured.
* duration
  + duration of the coma in days.
* sex
  + a factor with levels Female and Male.
* age
  + in years at the time of injury.
* piq
  + performance (i.e., mathematical) IQ.
* viq
  + verbal IQ.

## Load dataset in from car package

library(car)

## Warning: package 'car' was built under R version 3.3.3

## Warning: replacing previous import 'lme4::sigma' by 'stats::sigma' when  
## loading 'pbkrtest'

data(Wong)  
  
library(dplyr)

##   
## Attaching package: 'dplyr'

## The following object is masked from 'package:car':  
##   
## recode

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

# add an age group variable  
Wong$agegrp <- case\_when(  
 (Wong$age > 0 & Wong$age <= 10) ~ 1,  
 (Wong$age > 10 & Wong$age <= 20) ~ 2,  
 (Wong$age > 20 & Wong$age <= 30) ~ 3,  
 (Wong$age > 30 & Wong$age <= 40) ~ 4,  
 (Wong$age > 40 & Wong$age <= 50) ~ 5,  
 (Wong$age > 50 & Wong$age <= 60) ~ 6,  
 (Wong$age > 60 & Wong$age <= 70) ~ 7,  
 (Wong$age > 70 & Wong$age <= 100) ~ 8)  
  
# convert to factor, add code levels and labels  
Wong$agegrp <- factor(Wong$agegrp,  
 levels = c(1,2,3,4,5,6,7,8),  
 labels = c("Ages 1-10",  
 "Ages 11-10",  
 "Ages 21-10",  
 "Ages 31-10",  
 "Ages 41-10",  
 "Ages 51-10",  
 "Ages 61-70",  
 "Ages 71-100"))

Using this dataset, and today's demos complete the following tasks:

1. Make a table of non-parametric statistics (median and IQR) for the number of days and duration grouped by sex. You'll be using summarise() from the dplyr package. For a given variable x you'll use median(x, na.rm=TRUE), quantile(x, 0.25, na.rm=TRUE), and quantile(x, 0.75, na.rm=TRUE). Give the table a title using the caption= option and update the column names with something nice using the col.names= option in the knitr::kable() command.

**ANSWER KEY**

t1 <- Wong %>%  
 group\_by(sex) %>%  
 summarise(durmed = median(duration, na.rm=TRUE),  
 dur25 = quantile(duration, 0.25, na.rm=TRUE),  
 dur75 = quantile(duration, 0.75, na.rm=TRUE),  
 daymed = median(days, na.rm=TRUE),  
 day25 = quantile(days, 0.25, na.rm=TRUE),  
 day75 = quantile(days, 0.75, na.rm=TRUE))  
  
knitr::kable(t1,  
 col.names=c("Sex",  
 "Median Duration",  
 "Q1 Duration",  
 "Q3 Duration",  
 "Median Days",  
 "Q1 Days",  
 "Q3 Days"),  
 caption="Non-parametric Summary By Sex - Days and Duration")

Non-parametric Summary By Sex - Days and Duration

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sex | Median Duration | Q1 Duration | Q3 Duration | Median Days | Q1 Days | Q3 Days |
| Female | 4 | 1 | 11 | 135 | 58.50 | 361.00 |
| Male | 7 | 1 | 18 | 163 | 59.75 | 431.25 |

1. Make a table of parametric statistics (mean and SD) for the performance outcomes piq and viq grouped by sex. Like the table above, you'll be using summarise() from the dplyr package. Now you'll use mean(x, na.rm=TRUE) and sd(x, na.rm=TRUE). Give the table a title using the caption= option and update the column names with something nice using the col.names= option in the knitr::kable() command.

**ANSWER KEY**

t1 <- Wong %>%  
 group\_by(sex) %>%  
 summarise(piqmean = mean(piq, na.rm=TRUE),  
 piqsd = sd(piq, na.rm=TRUE),  
 viqmean = mean(viq, na.rm=TRUE),  
 viqsd = sd(viq, na.rm=TRUE))  
  
knitr::kable(t1,  
 col.names=c("Sex",  
 "Mean PIQ",  
 "SD PIQ",  
 "Mean VIQ",  
 "SD VIQ"),  
 caption="Parametric Summary By Sex - PQI and VIQ")

Parametric Summary By Sex - PQI and VIQ

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Mean PIQ | SD PIQ | Mean VIQ | SD VIQ |
| Female | 89.18310 | 17.99866 | 94.35211 | 14.24690 |
| Male | 87.11154 | 14.25658 | 95.13077 | 14.02281 |

1. Make a table containing the frequencies and relative percentages for agegrp. Use the example we did in class to help guide you.

**ANSWER KEY**

# find the sample size or number of rows in dataset  
ss <- length(Wong$agegrp)  
  
# group by each level of agegrp  
# find the raw counts using n()  
# then compute the relative % by dividing by ss  
t2 <- Wong %>%  
 group\_by(agegrp) %>%  
 summarise(freq = n(),  
 pct = n()\*100/ss)  
  
# make a summary table  
knitr::kable(t2,  
 col.names = c("Age Group",  
 "Frequency",  
 "Percent"),  
 caption="Frequency Table for Age Group")

Frequency Table for Age Group

|  |  |  |
| --- | --- | --- |
| Age Group | Frequency | Percent |
| Ages 1-10 | 1 | 0.3021148 |
| Ages 11-10 | 53 | 16.0120846 |
| Ages 21-10 | 144 | 43.5045317 |
| Ages 31-10 | 48 | 14.5015106 |
| Ages 41-10 | 42 | 12.6888218 |
| Ages 51-10 | 27 | 8.1570997 |
| Ages 61-70 | 14 | 4.2296073 |
| Ages 71-100 | 2 | 0.6042296 |

1. Make a regression model (Model 1) for the performance IQ (piq) using age and sex. Put the regression model results into a table.

**ANSWER KEY**

m1 <- lm(piq~sex+age, data=Wong)  
sm1 <- summary(m1)  
knitr::kable(sm1$coefficients,  
 caption="Model 1")

Model 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t value | Pr(>|t|) |
| (Intercept) | 86.8868114 | 2.5796740 | 33.681314 | 0.0000000 |
| sexMale | -2.1651531 | 2.0258169 | -1.068780 | 0.2859546 |
| age | 0.0743977 | 0.0600527 | 1.238874 | 0.2162781 |

1. Make a second regression model (Model 2) for performance IQ (piq) using age and sex plus days and duration. Put the regression model results into a table.

**ANSWER KEY**

m2 <- lm(piq~sex+age+days+duration, data=Wong)  
sm2 <- summary(m2)  
knitr::kable(sm2$coefficients,  
 caption="Model 2")

Model 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t value | Pr(>|t|) |
| (Intercept) | 88.0961373 | 2.6462149 | 33.2913764 | 0.0000000 |
| sexMale | -1.7252891 | 2.0152576 | -0.8561135 | 0.3925638 |
| age | 0.0542142 | 0.0604989 | 0.8961181 | 0.3708509 |
| days | 0.0011534 | 0.0007457 | 1.5468461 | 0.1228705 |
| duration | -0.1026657 | 0.0328189 | -3.1282468 | 0.0019172 |

1. Finally, make a table showing the results from the anova() command comparing Model 1 and Model 2 you made above using the example we did in class as a guide.

**ANSWER KEY**

m1m2 <- anova(m1,m2)  
row.names(m1m2) <- c("Model 1","Model 2")  
knitr::kable(m1m2,  
 caption = "Compare M1 and M2")

Compare M1 and M2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Res.Df | RSS | Df | Sum of Sq | F | Pr(>F) |
| Model 1 | 328 | 74967.59 | NA | NA | NA | NA |
| Model 2 | 326 | 72585.66 | 2 | 2381.933 | 5.348922 | 0.0051796 |

1. STUDENT CHOICE - pick either a htmlwidget from <http://gallery.htmlwidgets.org/> or do a "flexdashboard" using the templates at <http://rmarkdown.rstudio.com/flexdashboard/> as a guide.

**ANSWER KEY - answers will vary by student**

### References

Wong, P. P., Monette, G., and Weiner, N. I. (2001) Mathematical models of cognitive recovery. Brain Injury, 15, 519–530.

Fox, J. (2016) Applied Regression Analysis and Generalized Linear Models, Third Edition. Sage.