

Regression analysis with imputed education

Martin Tušl

2/19/2021

```
### Data upload
df <- read.csv("~/Desktop/R/Projects/Covid-19 (Wave 4)/data/Wave4_edu_na.csv", header=TRUE)

### Packages
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.0 --

## v ggplot2 3.3.3      v purrr  0.3.4
## v tibble  3.0.6      v dplyr  1.0.4
## v tidyr   1.1.2      v stringr 1.4.0
## v readr   1.4.0      v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

library(mice)

##
## Attaching package: 'mice'

## The following object is masked from 'package:stats':
##
##   filter

## The following objects are masked from 'package:base':
##
##   cbind, rbind

library(VIM)

## Loading required package: colorspace

## Loading required package: grid

## VIM is ready to use.
```

```
## Suggestions and bug-reports can be submitted at: https://github.com/statistikat/VIM/issues
```

```
##
```

```
## Attaching package: 'VIM'
```

```
## The following object is masked from 'package:datasets':
```

```
##
```

```
##     sleep
```

```
library(epiDisplay)
```

```
## Loading required package: foreign
```

```
## Loading required package: survival
```

```
## Loading required package: MASS
```

```
##
```

```
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
```

```
##
```

```
##     select
```

```
## Loading required package: nnet
```

```
##
```

```
## Attaching package: 'epiDisplay'
```

```
## The following objects are masked from 'package:mice':
```

```
##
```

```
##     cc, cci
```

```
## The following object is masked from 'package:ggplot2':
```

```
##
```

```
##     alpha
```

```
library(corrplot)
```

```
## corrplot 0.84 loaded
```

```
library(Hmisc)
```

```
## Loading required package: lattice
```

```
##
```

```
## Attaching package: 'lattice'
```

```
## The following object is masked from 'package:epiDisplay':
##
##     dotplot

## Loading required package: Formula

##
## Attaching package: 'Hmisc'

## The following objects are masked from 'package:dplyr':
##
##     src, summarize

## The following objects are masked from 'package:base':
##
##     format.pval, units
```

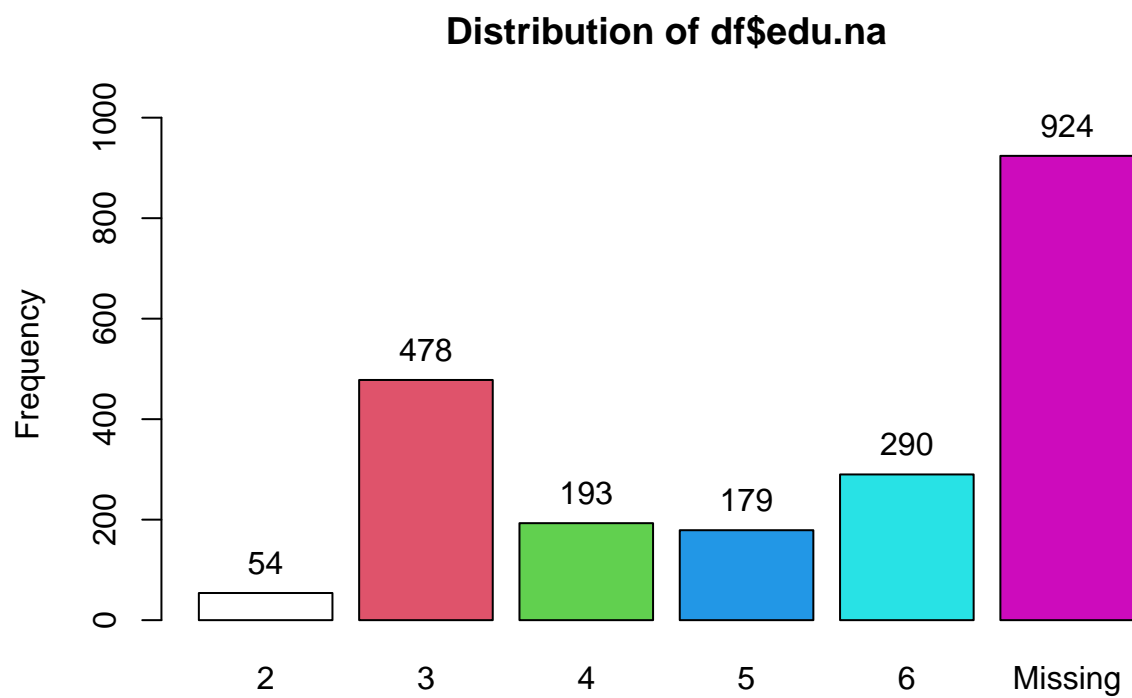
```
library(MASS)
```

1) Data preparation

```
## Recoding
df <- df %>%
  mutate_if(is.character, as.factor)
df <- df %>%
  mutate_at(vars(Work.wors, Work.imp, Privat.wors, Privat.imp, mwb.cat, srh), as.ordered)
df <- df %>%
  mutate_at(vars(Gender, Country, Liv.situation, Contract.change, Ovrl_HO, Work.wors.3, Work.imp.3, Pri
df$Contract.change <- factor(df$Contract.change, levels = c("1", "2", "3", "4"),
                           labels = c("No change", "Short-time reduced", "Short-time 0", "Job loss"))
df$Ovrl_HO <- factor(df$Ovrl_HO, levels = c("1", "2", "3"),
                   labels = c("None", "Experienced", "New"))
```

2) Data imputation (education)

```
## Distribution of education with n = 924 NAs
tab1(df$edu.na)
```



```
## df$edu.na :
##      Frequency  %(NA+)  %(NA-)
## 2           54     2.5     4.5
## 3          478    22.6    40.0
## 4          193     9.1    16.2
## 5          179     8.5    15.0
## 6          290    13.7    24.3
## <NA>         924    43.6     0.0
## Total       2118   100.0   100.0
```

```
## Imputing missing data for Education
md.pattern(df)
```

ID.2	ID.3	Gender	Liv.situation	Work.wors	Work.imp	Privat.wors	Privat.imp	Contract.change	Work.quant	Care.quant	Free.quant	mwb.cat	Ovrl_HO	Work_time	Caring_duties	Freetime	Age.cat	srh	Country	Age.num	Work.wors.3	Work.imp.3	Privat.wors.3	Privat.imp.3	edu.na
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

```
##      X.1 X ID.2 ID.3 Gender Liv.situation Work.wors Work.imp Privat.wors
## 1194  1 1   1   1     1           1           1           1           1
## 924   1 1   1   1     1           1           1           1           1
##      0 0   0   0     0           0           0           0           0
##      Privat.imp Contract.change Work.quant Care.quant Free.quant mwb.cat
## 1194      1           1           1           1           1           1
## 924      1           1           1           1           1           1
##      0           0           0           0           0           0
##      Ovrl_HO Work_time Caring_duties Freetime Age.cat srh Country Age.num
## 1194      1           1           1           1           1           1           1
## 924      1           1           1           1           1           1           1
##      0           0           0           0           0           0           0
##      Work.wors.3 Work.imp.3 Privat.wors.3 Privat.imp.3 edu.na
## 1194      1           1           1           1           1           0
## 924      1           1           1           1           0           1
##      0           0           0           0           0           924 924
```

```
df1 <- df %>%
  dplyr::select(-c(X, X.1, ID.2, ID.3, Age.cat, Work_time, Freetime, Caring_duties, Work.wors.3, Work.i

impute <- mice(df1, m = 5, maxit = 50, meth='pmm', seed = 500)
```

```
##
## iter imp variable
## 1 1 edu.na
```

##	1	2	edu.na
##	1	3	edu.na
##	1	4	edu.na
##	1	5	edu.na
##	2	1	edu.na
##	2	2	edu.na
##	2	3	edu.na
##	2	4	edu.na
##	2	5	edu.na
##	3	1	edu.na
##	3	2	edu.na
##	3	3	edu.na
##	3	4	edu.na
##	3	5	edu.na
##	4	1	edu.na
##	4	2	edu.na
##	4	3	edu.na
##	4	4	edu.na
##	4	5	edu.na
##	5	1	edu.na
##	5	2	edu.na
##	5	3	edu.na
##	5	4	edu.na
##	5	5	edu.na
##	6	1	edu.na
##	6	2	edu.na
##	6	3	edu.na
##	6	4	edu.na
##	6	5	edu.na
##	7	1	edu.na
##	7	2	edu.na
##	7	3	edu.na
##	7	4	edu.na
##	7	5	edu.na
##	8	1	edu.na
##	8	2	edu.na
##	8	3	edu.na
##	8	4	edu.na
##	8	5	edu.na
##	9	1	edu.na
##	9	2	edu.na
##	9	3	edu.na
##	9	4	edu.na
##	9	5	edu.na
##	10	1	edu.na
##	10	2	edu.na
##	10	3	edu.na
##	10	4	edu.na
##	10	5	edu.na
##	11	1	edu.na
##	11	2	edu.na
##	11	3	edu.na
##	11	4	edu.na
##	11	5	edu.na

##	12	1	edu.na
##	12	2	edu.na
##	12	3	edu.na
##	12	4	edu.na
##	12	5	edu.na
##	13	1	edu.na
##	13	2	edu.na
##	13	3	edu.na
##	13	4	edu.na
##	13	5	edu.na
##	14	1	edu.na
##	14	2	edu.na
##	14	3	edu.na
##	14	4	edu.na
##	14	5	edu.na
##	15	1	edu.na
##	15	2	edu.na
##	15	3	edu.na
##	15	4	edu.na
##	15	5	edu.na
##	16	1	edu.na
##	16	2	edu.na
##	16	3	edu.na
##	16	4	edu.na
##	16	5	edu.na
##	17	1	edu.na
##	17	2	edu.na
##	17	3	edu.na
##	17	4	edu.na
##	17	5	edu.na
##	18	1	edu.na
##	18	2	edu.na
##	18	3	edu.na
##	18	4	edu.na
##	18	5	edu.na
##	19	1	edu.na
##	19	2	edu.na
##	19	3	edu.na
##	19	4	edu.na
##	19	5	edu.na
##	20	1	edu.na
##	20	2	edu.na
##	20	3	edu.na
##	20	4	edu.na
##	20	5	edu.na
##	21	1	edu.na
##	21	2	edu.na
##	21	3	edu.na
##	21	4	edu.na
##	21	5	edu.na
##	22	1	edu.na
##	22	2	edu.na
##	22	3	edu.na
##	22	4	edu.na

##	22	5	edu.na
##	23	1	edu.na
##	23	2	edu.na
##	23	3	edu.na
##	23	4	edu.na
##	23	5	edu.na
##	24	1	edu.na
##	24	2	edu.na
##	24	3	edu.na
##	24	4	edu.na
##	24	5	edu.na
##	25	1	edu.na
##	25	2	edu.na
##	25	3	edu.na
##	25	4	edu.na
##	25	5	edu.na
##	26	1	edu.na
##	26	2	edu.na
##	26	3	edu.na
##	26	4	edu.na
##	26	5	edu.na
##	27	1	edu.na
##	27	2	edu.na
##	27	3	edu.na
##	27	4	edu.na
##	27	5	edu.na
##	28	1	edu.na
##	28	2	edu.na
##	28	3	edu.na
##	28	4	edu.na
##	28	5	edu.na
##	29	1	edu.na
##	29	2	edu.na
##	29	3	edu.na
##	29	4	edu.na
##	29	5	edu.na
##	30	1	edu.na
##	30	2	edu.na
##	30	3	edu.na
##	30	4	edu.na
##	30	5	edu.na
##	31	1	edu.na
##	31	2	edu.na
##	31	3	edu.na
##	31	4	edu.na
##	31	5	edu.na
##	32	1	edu.na
##	32	2	edu.na
##	32	3	edu.na
##	32	4	edu.na
##	32	5	edu.na
##	33	1	edu.na
##	33	2	edu.na
##	33	3	edu.na

##	33	4	edu.na
##	33	5	edu.na
##	34	1	edu.na
##	34	2	edu.na
##	34	3	edu.na
##	34	4	edu.na
##	34	5	edu.na
##	35	1	edu.na
##	35	2	edu.na
##	35	3	edu.na
##	35	4	edu.na
##	35	5	edu.na
##	36	1	edu.na
##	36	2	edu.na
##	36	3	edu.na
##	36	4	edu.na
##	36	5	edu.na
##	37	1	edu.na
##	37	2	edu.na
##	37	3	edu.na
##	37	4	edu.na
##	37	5	edu.na
##	38	1	edu.na
##	38	2	edu.na
##	38	3	edu.na
##	38	4	edu.na
##	38	5	edu.na
##	39	1	edu.na
##	39	2	edu.na
##	39	3	edu.na
##	39	4	edu.na
##	39	5	edu.na
##	40	1	edu.na
##	40	2	edu.na
##	40	3	edu.na
##	40	4	edu.na
##	40	5	edu.na
##	41	1	edu.na
##	41	2	edu.na
##	41	3	edu.na
##	41	4	edu.na
##	41	5	edu.na
##	42	1	edu.na
##	42	2	edu.na
##	42	3	edu.na
##	42	4	edu.na
##	42	5	edu.na
##	43	1	edu.na
##	43	2	edu.na
##	43	3	edu.na
##	43	4	edu.na
##	43	5	edu.na
##	44	1	edu.na
##	44	2	edu.na

```
## 44 3 edu.na
## 44 4 edu.na
## 44 5 edu.na
## 45 1 edu.na
## 45 2 edu.na
## 45 3 edu.na
## 45 4 edu.na
## 45 5 edu.na
## 46 1 edu.na
## 46 2 edu.na
## 46 3 edu.na
## 46 4 edu.na
## 46 5 edu.na
## 47 1 edu.na
## 47 2 edu.na
## 47 3 edu.na
## 47 4 edu.na
## 47 5 edu.na
## 48 1 edu.na
## 48 2 edu.na
## 48 3 edu.na
## 48 4 edu.na
## 48 5 edu.na
## 49 1 edu.na
## 49 2 edu.na
## 49 3 edu.na
## 49 4 edu.na
## 49 5 edu.na
## 50 1 edu.na
## 50 2 edu.na
## 50 3 edu.na
## 50 4 edu.na
## 50 5 edu.na
```

```
new_df <- complete(impute, 1)
```

2) Correlation matrix with imputed education

```
## Wave 4 analysis with imputed education data
```

```
new_df2 <- new_df
```

```
new_df2[,] = lapply(new_df2[,], as.numeric)
```

```
colnames(new_df2) <- c("Gender", "Living situation", "Work worsened", "Work improved", "Private worsened", "Private improved", "Contract change", "Work time change")
```

```
col_order <- c("Gender", "Age", "Country", "Education", "Living situation", "Contract change", "Work time change")
```

```
new_df2 <- new_df2[, col_order]
```

```
mat2 <- rcorr(as.matrix(new_df2))
```

```
mat2
```

```
##           Gender   Age Country Education Living situation
## Gender           1.00  0.05  -0.03      0.00             0.03
## Age              0.05  1.00  -0.10     -0.01             0.00
## Country         -0.03 -0.10   1.00     -0.01            -0.01
```

## Education	0.00	-0.01	-0.01	1.00	-0.03
## Living situation	0.03	0.00	-0.01	-0.03	1.00
## Contract change	-0.03	-0.01	0.05	0.03	0.01
## Work time	0.03	-0.04	-0.03	-0.01	0.02
## Leisure time	0.03	0.03	0.02	0.00	-0.04
## Caring duties	-0.01	-0.10	0.04	0.02	0.15
## Home-office	0.04	-0.12	0.04	0.02	0.02
## Work worsened	-0.05	0.02	0.02	0.00	0.00
## Work improved	-0.02	-0.14	0.05	0.05	0.03
## Private worsened	-0.02	-0.08	-0.02	-0.01	-0.19
## Private improved	-0.03	-0.07	0.06	0.04	0.15
## MWB	0.03	0.13	-0.02	0.00	0.06
## SRH	-0.06	-0.16	0.12	-0.01	0.04
##	Contract change	Work time	Leisure time	Caring duties	
## Gender	-0.03	0.03	0.03	-0.01	
## Age	-0.01	-0.04	0.03	-0.10	
## Country	0.05	-0.03	0.02	0.04	
## Education	0.03	-0.01	0.00	0.02	
## Living situation	0.01	0.02	-0.04	0.15	
## Contract change	1.00	-0.60	0.25	-0.05	
## Work time	-0.60	1.00	-0.40	0.05	
## Leisure time	0.25	-0.40	1.00	-0.03	
## Caring duties	-0.05	0.05	-0.03	1.00	
## Home-office	-0.08	0.02	0.04	0.10	
## Work worsened	0.49	-0.40	0.11	0.04	
## Work improved	-0.14	0.14	0.07	0.05	
## Private worsened	0.04	0.02	-0.15	0.00	
## Private improved	0.13	-0.12	0.21	0.05	
## MWB	-0.09	0.03	0.10	-0.02	
## SRH	-0.08	0.04	0.09	0.04	
##	Home-office	Work worsened	Work improved	Private worsened	
## Gender	0.04	-0.05	-0.02	-0.02	
## Age	-0.12	0.02	-0.14	-0.08	
## Country	0.04	0.02	0.05	-0.02	
## Education	0.02	0.00	0.05	-0.01	
## Living situation	0.02	0.00	0.03	-0.19	
## Contract change	-0.08	0.49	-0.14	0.04	
## Work time	0.02	-0.40	0.14	0.02	
## Leisure time	0.04	0.11	0.07	-0.15	
## Caring duties	0.10	0.04	0.05	0.00	
## Home-office	1.00	0.01	0.25	0.02	
## Work worsened	0.01	1.00	-0.17	0.26	
## Work improved	0.25	-0.17	1.00	-0.02	
## Private worsened	0.02	0.26	-0.02	1.00	
## Private improved	0.11	0.12	0.39	-0.20	
## MWB	0.03	-0.16	0.03	-0.20	
## SRH	0.05	-0.09	0.04	-0.12	
##	Private improved	MWB	SRH		
## Gender	-0.03	0.03	-0.06		
## Age	-0.07	0.13	-0.16		
## Country	0.06	-0.02	0.12		
## Education	0.04	0.00	-0.01		
## Living situation	0.15	0.06	0.04		
## Contract change	0.13	-0.09	-0.08		

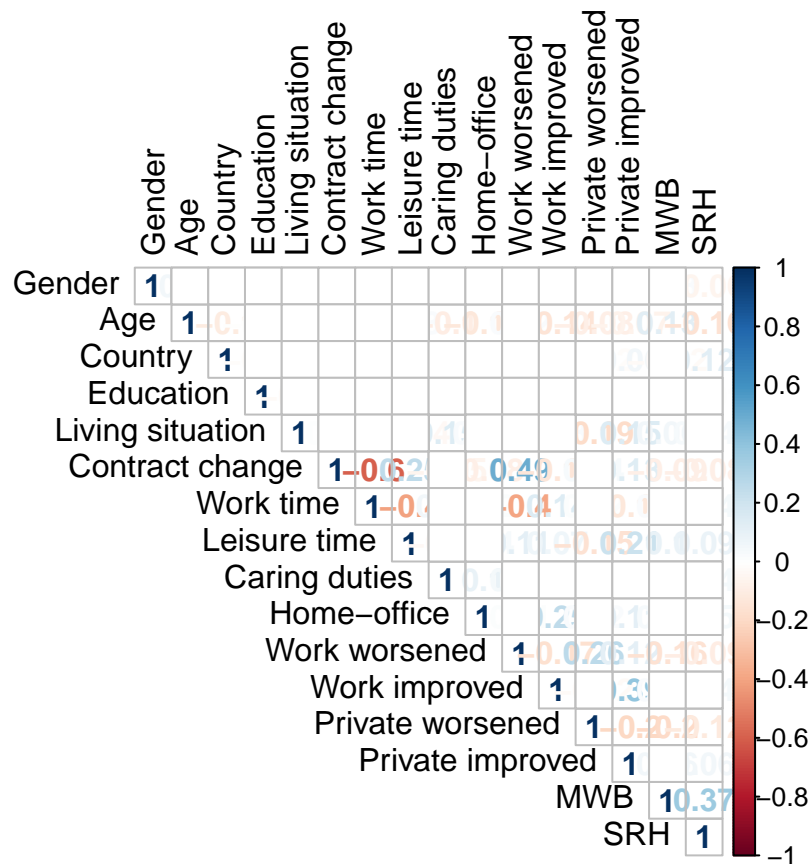
```

## Work time          -0.12  0.03  0.04
## Leisure time       0.21  0.10  0.09
## Caring duties      0.05 -0.02  0.04
## Home-office        0.11  0.03  0.05
## Work worsened      0.12 -0.16 -0.09
## Work improved      0.39  0.03  0.04
## Private worsened   -0.20 -0.20 -0.12
## Private improved    1.00  0.06  0.06
## MWB                0.06  1.00  0.37
## SRH                0.06  0.37  1.00
##
## n= 2118
##
##
## P
##      Gender Age      Country Education Living situation
## Gender          0.0160 0.1843  0.9431  0.1078
## Age             0.0160          0.0000 0.7122  0.8816
## Country         0.1843 0.0000          0.5426 0.7757
## Education       0.9431 0.7122 0.5426          0.1764
## Living situation 0.1078 0.8816 0.7757 0.1764
## Contract change 0.1713 0.5126 0.0375 0.1686  0.7747
## Work time       0.1864 0.0445 0.1703 0.6038  0.3017
## Leisure time    0.1354 0.1686 0.3132 0.9926  0.0817
## Caring duties   0.7494 0.0000 0.0591 0.4210  0.0000
## Home-office     0.0391 0.0000 0.0815 0.4550  0.2605
## Work worsened   0.0211 0.3010 0.4275 0.9924  0.9215
## Work improved   0.4770 0.0000 0.0166 0.0120  0.1754
## Private worsened 0.2947 0.0001 0.4044 0.5000  0.0000
## Private improved 0.1265 0.0014 0.0064 0.0980  0.0000
## MWB             0.2426 0.0000 0.2536 0.9305  0.0062
## SRH             0.0084 0.0000 0.0000 0.6629  0.0802
##
##      Contract change Work time Leisure time Caring duties
## Gender          0.1713          0.1864  0.1354  0.7494
## Age             0.5126          0.0445  0.1686  0.0000
## Country         0.0375          0.1703  0.3132  0.0591
## Education       0.1686          0.6038  0.9926  0.4210
## Living situation 0.7747          0.3017  0.0817  0.0000
## Contract change          0.0000  0.0000  0.0191
## Work time       0.0000          0.0000  0.0189
## Leisure time    0.0000          0.0000  0.1470
## Caring duties   0.0191          0.0189  0.1470
## Home-office     0.0001          0.4245  0.0886  0.0000
## Work worsened   0.0000          0.0000  0.0000  0.0514
## Work improved   0.0000          0.0000  0.0020  0.0139
## Private worsened 0.0941          0.4100  0.0000  0.9291
## Private improved 0.0000          0.0000  0.0000  0.0340
## MWB             0.0000          0.1769  0.0000  0.3538
## SRH             0.0001          0.0396  0.0000  0.0504
##
##      Home-office Work worsened Work improved Private worsened
## Gender          0.0391  0.0211  0.4770  0.2947
## Age             0.0000  0.3010  0.0000  0.0001
## Country         0.0815  0.4275  0.0166  0.4044
## Education       0.4550  0.9924  0.0120  0.5000

```

## Living situation	0.2605	0.9215	0.1754	0.0000
## Contract change	0.0001	0.0000	0.0000	0.0941
## Work time	0.4245	0.0000	0.0000	0.4100
## Leisure time	0.0886	0.0000	0.0020	0.0000
## Caring duties	0.0000	0.0514	0.0139	0.9291
## Home-office		0.6258	0.0000	0.3031
## Work worsened	0.6258		0.0000	0.0000
## Work improved	0.0000	0.0000		0.2528
## Private worsened	0.3031	0.0000	0.2528	
## Private improved	0.0000	0.0000	0.0000	0.0000
## MWB	0.1219	0.0000	0.2107	0.0000
## SRH	0.0275	0.0000	0.0469	0.0000
##	Private	improved	MWB	SRH
## Gender	0.1265		0.2426	0.0084
## Age	0.0014		0.0000	0.0000
## Country	0.0064		0.2536	0.0000
## Education	0.0980		0.9305	0.6629
## Living situation	0.0000		0.0062	0.0802
## Contract change	0.0000		0.0000	0.0001
## Work time	0.0000		0.1769	0.0396
## Leisure time	0.0000		0.0000	0.0000
## Caring duties	0.0340		0.3538	0.0504
## Home-office	0.0000		0.1219	0.0275
## Work worsened	0.0000		0.0000	0.0000
## Work improved	0.0000		0.2107	0.0469
## Private worsened	0.0000		0.0000	0.0000
## Private improved			0.0112	0.0096
## MWB	0.0112			0.0000
## SRH	0.0096		0.0000	

```
corrplot(mat2$r, method = "number", type = "upper", tl.col = "black",
         p.mat = mat2$P, sig.level = 0.01, insig = "blank")
```



3) Ordinal regression with imputed education

```
## Ordinal regression + education
df$edu.b <- new_df$edu.na
df$edu_cat.b <- df$edu.b
df$edu_cat.b <- recode(df$edu_cat.b, "2" = 1, "3" = 2, "4" = 2, "5" = 3, "6" = 3)

df$edu_cat.b <- factor(df$edu_cat.b, levels = c("1", "2", "3"),
  labels = c("Primary", "Secondary", "Tertiary"))

# Work life worsened
ord1 <- polr(Work.wors ~ Gender + Country + Age.cat + edu_cat.b + relevel(Contract.change, ref = "No change"),
  exp(coefficients(ord1))
```

```
##          GenderMale
##          0.9121626
##          CountrySwitzerland
##          0.8705041
##          Age.cat31-40
##          0.9305751
##          Age.cat41-50
##          1.0759641
##          Age.cat51-60
##          1.2298337
```

```

##                               Age.cat61-65
##                               1.5552640
##                               edu_cat.bSecondary
##                               1.0909186
##                               edu_cat.bTertiary
##                               1.0098348
## relevel(Contract.change, ref = "No change")Short-time reduced
##                               3.4641261
##       relevel(Contract.change, ref = "No change")Short-time 0
##                               9.7639277
##       relevel(Contract.change, ref = "No change")Job loss
##                               35.9233312
##       Liv.situationPartner/Family/Flatshare
##                               0.8881331
##       relevel(Ovrl_H0, ref = "None")Experienced
##                               1.1805547
##       relevel(Ovrl_H0, ref = "None")New
##                               1.2114104
##       relevel(Work_time, ref = "Unchanged")Decreased
##                               2.9459462
##       relevel(Work_time, ref = "Unchanged")Increased
##                               2.0581031
##       relevel(Freetime, ref = "Unchanged")Decreased
##                               1.6231534
##       relevel(Freetime, ref = "Unchanged")Increased
##                               1.2702152
##       relevel(Caring_duties, ref = "Unchanged")Decreased
##                               1.1256348
##       relevel(Caring_duties, ref = "Unchanged")Increased
##                               1.5817016

```

```
exp(confint(ord1))
```

```
## Waiting for profiling to be done...
```

```

##                               2.5 %
## GenderMale                    0.7805245
## CountrySwitzerland            0.7218580
## Age.cat31-40                  0.6899679
## Age.cat41-50                  0.8008077
## Age.cat51-60                  0.9220021
## Age.cat61-65                  1.0948978
## edu_cat.bSecondary            0.7400180
## edu_cat.bTertiary             0.6807666
## relevel(Contract.change, ref = "No change")Short-time reduced 2.6752336
## relevel(Contract.change, ref = "No change")Short-time 0      6.8783274
## relevel(Contract.change, ref = "No change")Job loss          15.2507314
## Liv.situationPartner/Family/Flatshare                        0.7415359
## relevel(Ovrl_H0, ref = "None")Experienced                    0.9836641
## relevel(Ovrl_H0, ref = "None")New                            0.9807631
## relevel(Work_time, ref = "Unchanged")Decreased              2.3289897
## relevel(Work_time, ref = "Unchanged")Increased              1.5519796
## relevel(Freetime, ref = "Unchanged")Decreased               1.2935647

```

```
## relevel(Freetime, ref = "Unchanged")Increased 1.0357888
## relevel(Caring_duties, ref = "Unchanged")Decreased 0.8049886
## relevel(Caring_duties, ref = "Unchanged")Increased 1.2736398
## 97.5 %
## GenderMale 1.068738
## CountrySwitzerland 1.049161
## Age.cat31-40 1.255797
## Age.cat41-50 1.446681
## Age.cat51-60 1.641901
## Age.cat61-65 2.210616
## edu_cat.bSecondary 1.611288
## edu_cat.bTertiary 1.500408
## relevel(Contract.change, ref = "No change")Short-time reduced 4.491975
## relevel(Contract.change, ref = "No change")Short-time 0 13.929541
## relevel(Contract.change, ref = "No change")Job loss 92.198574
## Liv.situationPartner/Family/Flatshare 1.063780
## relevel(Ovrl_H0, ref = "None")Experienced 1.417012
## relevel(Ovrl_H0, ref = "None")New 1.496180
## relevel(Work_time, ref = "Unchanged")Decreased 3.730254
## relevel(Work_time, ref = "Unchanged")Increased 2.730828
## relevel(Freetime, ref = "Unchanged")Decreased 2.037337
## relevel(Freetime, ref = "Unchanged")Increased 1.557323
## relevel(Caring_duties, ref = "Unchanged")Decreased 1.573180
## relevel(Caring_duties, ref = "Unchanged")Increased 1.965002
```

Work life improved

```
ord2 <- polr(Work.imp ~ Gender + Country + Age.cat + edu_cat.b + relevel(Contract.change, ref = "No change"),
exp(coefficients(ord2))
```

```
## GenderMale
## 0.9291832
## CountrySwitzerland
## 1.1543297
## Age.cat31-40
## 1.0384390
## Age.cat41-50
## 0.9602569
## Age.cat51-60
## 0.7080231
## Age.cat61-65
## 0.5030176
## edu_cat.bSecondary
## 1.0755465
## edu_cat.bTertiary
## 1.2970654
## relevel(Contract.change, ref = "No change")Short-time reduced
## 0.6753045
## relevel(Contract.change, ref = "No change")Short-time 0
## 0.5283738
## relevel(Contract.change, ref = "No change")Job loss
## 0.3861149
## Liv.situationPartner/Family/Flatshare
## 1.0904322
## relevel(Ovrl_H0, ref = "None")Experienced
```



```
##                                2.5804120
##                                relevel(Ovrl_H0, ref = "None")New
##                                2.7617703
##                                relevel(Freetime, ref = "Unchanged")Decreased
##                                0.9586698
##                                relevel(Freetime, ref = "Unchanged")Increased
##                                1.9230185
##                                relevel(Work_time, ref = "Unchanged")Decreased
##                                0.6140584
##                                relevel(Work_time, ref = "Unchanged")Increased
##                                1.3255582
##                                relevel(Caring_duties, ref = "Unchanged")Decreased
##                                1.1052265
##                                relevel(Caring_duties, ref = "Unchanged")Increased
##                                0.9591047
```

```
exp(confint(ord2))
```

```
## Waiting for profiling to be done...
```

```
##                                2.5 %
## GenderMale                                0.7866735
## CountrySwitzerland                        0.9484231
## Age.cat31-40                              0.7636080
## Age.cat41-50                              0.7089614
## Age.cat51-60                              0.5258178
## Age.cat61-65                              0.3446781
## edu_cat.bSecondary                        0.7209361
## edu_cat.bTertiary                         0.8640537
## relevel(Contract.change, ref = "No change")Short-time reduced 0.5131386
## relevel(Contract.change, ref = "No change")Short-time 0      0.3642592
## relevel(Contract.change, ref = "No change")Job loss          0.1543427
## Liv.situationPartner/Family/Flatshare    0.9023431
## relevel(Ovrl_H0, ref = "None")Experienced 2.1290723
## relevel(Ovrl_H0, ref = "None")New         2.2126082
## relevel(Freetime, ref = "Unchanged")Decreased 0.7534824
## relevel(Freetime, ref = "Unchanged")Increased 1.5492102
## relevel(Work_time, ref = "Unchanged")Decreased 0.4791954
## relevel(Work_time, ref = "Unchanged")Increased 0.9964536
## relevel(Caring_duties, ref = "Unchanged")Decreased 0.7781939
## relevel(Caring_duties, ref = "Unchanged")Increased 0.7629009
##                                97.5 %
## GenderMale                                1.0975995
## CountrySwitzerland                        1.4034582
## Age.cat31-40                              1.4143308
## Age.cat41-50                              1.3028667
## Age.cat51-60                              0.9548649
## Age.cat61-65                              0.7319491
## edu_cat.bSecondary                        1.6229578
## edu_cat.bTertiary                         1.9688689
## relevel(Contract.change, ref = "No change")Short-time reduced 0.8872501
## relevel(Contract.change, ref = "No change")Short-time 0      0.7599407
## relevel(Contract.change, ref = "No change")Job loss          0.8782200
```

```
## Liv.situationPartner/Family/Flatshare 1.3190580
## relevel(Ovrl_H0, ref = "None")Experienced 3.1296884
## relevel(Ovrl_H0, ref = "None")New 3.4484880
## relevel(Freetime, ref = "Unchanged")Decreased 1.2182123
## relevel(Freetime, ref = "Unchanged")Increased 2.3893308
## relevel(Work_time, ref = "Unchanged")Decreased 0.7855556
## relevel(Work_time, ref = "Unchanged")Increased 1.7610726
## relevel(Caring_duties, ref = "Unchanged")Decreased 1.5595642
## relevel(Caring_duties, ref = "Unchanged")Increased 1.2041471
```

Private life worsened

```
ord3 <- polr(Privat.wors ~ Gender + Country + Age.cat + edu_cat.b + relevel(Contract.change, ref = "No change"),
exp(coefficients(ord3))
```

```
## GenderMale
## 1.0464516
## CountrySwitzerland
## 0.8570772
## Age.cat31-40
## 0.7559187
## Age.cat41-50
## 0.7671323
## Age.cat51-60
## 0.7525384
## Age.cat61-65
## 0.5805638
## edu_cat.bSecondary
## 0.8538884
## edu_cat.bTertiary
## 0.8003800
## relevel(Contract.change, ref = "No change")Short-time reduced
## 1.2256702
## relevel(Contract.change, ref = "No change")Short-time 0
## 1.0697473
## relevel(Contract.change, ref = "No change")Job loss
## 1.2225458
## Liv.situationPartner/Family/Flatshare
## 0.4049530
## relevel(Ovrl_H0, ref = "None")Experienced
## 1.0169192
## relevel(Ovrl_H0, ref = "None")New
## 1.0760396
## relevel(Freetime, ref = "Unchanged")Decreased
## 2.6196984
## relevel(Freetime, ref = "Unchanged")Increased
## 1.2918654
## relevel(Work_time, ref = "Unchanged")Decreased
## 0.8975688
## relevel(Work_time, ref = "Unchanged")Increased
## 1.1296106
## relevel(Caring_duties, ref = "Unchanged")Decreased
## 1.6278207
## relevel(Caring_duties, ref = "Unchanged")Increased
## 1.3980635
```

```
exp(confint(ord3))
```

```
## Waiting for profiling to be done...
```

```
##                                     2.5 %
## GenderMale                        0.8958557
## CountrySwitzerland                0.7124980
## Age.cat31-40                      0.5625655
## Age.cat41-50                      0.5716604
## Age.cat51-60                      0.5660324
## Age.cat61-65                      0.4098833
## edu_cat.bSecondary                 0.5852277
## edu_cat.bTertiary                 0.5450699
## relevel(Contract.change, ref = "No change")Short-time reduced 0.9532162
## relevel(Contract.change, ref = "No change")Short-time 0      0.7814879
## relevel(Contract.change, ref = "No change")Job loss          0.6055486
## Liv.situationPartner/Family/Flatshare 0.3379501
## relevel(Ovrl_H0, ref = "None")Experienced 0.8504493
## relevel(Ovrl_H0, ref = "None")New        0.8742659
## relevel(Freetime, ref = "Unchanged")Decreased 2.0948398
## relevel(Freetime, ref = "Unchanged")Increased 1.0536565
## relevel(Work_time, ref = "Unchanged")Decreased 0.7121896
## relevel(Work_time, ref = "Unchanged")Increased 0.8616550
## relevel(Caring_duties, ref = "Unchanged")Decreased 1.1912255
## relevel(Caring_duties, ref = "Unchanged")Increased 1.1290296
##                                     97.5 %
## GenderMale                        1.2224963
## CountrySwitzerland                1.0305484
## Age.cat31-40                      1.0154471
## Age.cat41-50                      1.0291983
## Age.cat51-60                      1.0003049
## Age.cat61-65                      0.8214443
## edu_cat.bSecondary                 1.2463090
## edu_cat.bTertiary                 1.1755607
## relevel(Contract.change, ref = "No change")Short-time reduced 1.5764976
## relevel(Contract.change, ref = "No change")Short-time 0      1.4635893
## relevel(Contract.change, ref = "No change")Job loss          2.4608851
## Liv.situationPartner/Family/Flatshare 0.4848444
## relevel(Ovrl_H0, ref = "None")Experienced 1.2158407
## relevel(Ovrl_H0, ref = "None")New        1.3241866
## relevel(Freetime, ref = "Unchanged")Decreased 3.2789601
## relevel(Freetime, ref = "Unchanged")Increased 1.5843214
## relevel(Work_time, ref = "Unchanged")Decreased 1.1306784
## relevel(Work_time, ref = "Unchanged")Increased 1.4806077
## relevel(Caring_duties, ref = "Unchanged")Decreased 2.2251122
## relevel(Caring_duties, ref = "Unchanged")Increased 1.7313719
```

```
# Private life improved
```

```
ord4 <- polr(Privat.imp ~ Gender + Country + Age.cat + edu_cat.b + relevel(Contract.change, ref = "No change"),
exp(coefficients(ord4))
```

```
##                                     GenderMale
```

```

##                                0.8671534
##                                CountrySwitzerland
##                                1.1343789
##                                Age.cat31-40
##                                0.9326995
##                                Age.cat41-50
##                                0.8817253
##                                Age.cat51-60
##                                0.7956288
##                                Age.cat61-65
##                                0.7620480
##                                edu_cat.bSecondary
##                                1.0233009
##                                edu_cat.bTertiary
##                                1.1383543
## relevel(Contract.change, ref = "No change")Short-time reduced
##                                1.3194003
##      relevel(Contract.change, ref = "No change")Short-time 0
##                                1.5646007
##      relevel(Contract.change, ref = "No change")Job loss
##                                1.6478062
##      Liv.situationPartner/Family/Flatshare
##                                1.7493973
##      relevel(Ovrl_H0, ref = "None")Experienced
##                                1.7191369
##      relevel(Ovrl_H0, ref = "None")New
##                                1.4134217
##      relevel(Freetime, ref = "Unchanged")Decreased
##                                0.8520655
##      relevel(Freetime, ref = "Unchanged")Increased
##                                2.2639044
##      relevel(Work_time, ref = "Unchanged")Decreased
##                                0.8896387
##      relevel(Work_time, ref = "Unchanged")Increased
##                                1.0828423
##      relevel(Caring_duties, ref = "Unchanged")Decreased
##                                1.3445981
##      relevel(Caring_duties, ref = "Unchanged")Increased
##                                1.3318738

```

```
exp(confint(ord4))
```

```
## Waiting for profiling to be done...
```

```

##                                2.5 %
## GenderMale                                0.7365729
## CountrySwitzerland                        0.9349385
## Age.cat31-40                              0.6881372
## Age.cat41-50                              0.6520268
## Age.cat51-60                              0.5927505
## Age.cat61-65                              0.5291626
## edu_cat.bSecondary                        0.6903785
## edu_cat.bTertiary                         0.7636191

```

```
## relevel(Contract.change, ref = "No change")Short-time reduced 1.0112060
## relevel(Contract.change, ref = "No change")Short-time 0      1.1245166
## relevel(Contract.change, ref = "No change")Job loss          0.7561445
## Liv.situationPartner/Family/Flatshare                       1.4469275
## relevel(Ovrl_H0, ref = "None")Experienced                   1.4249222
## relevel(Ovrl_H0, ref = "None")New                           1.1369290
## relevel(Freetime, ref = "Unchanged")Decreased              0.6711321
## relevel(Freetime, ref = "Unchanged")Increased              1.8314358
## relevel(Work_time, ref = "Unchanged")Decreased             0.6965138
## relevel(Work_time, ref = "Unchanged")Increased             0.8113823
## relevel(Caring_duties, ref = "Unchanged")Decreased         0.9566308
## relevel(Caring_duties, ref = "Unchanged")Increased         1.0666475
##                                                                97.5 %
## GenderMale                                                  1.020856
## CountrySwitzerland                                         1.375090
## Age.cat31-40                                                1.266076
## Age.cat41-50                                                1.194267
## Age.cat51-60                                                1.069775
## Age.cat61-65                                                1.096195
## edu_cat.bSecondary                                          1.529633
## edu_cat.bTertiary                                           1.711065
## relevel(Contract.change, ref = "No change")Short-time reduced 1.720909
## relevel(Contract.change, ref = "No change")Short-time 0    2.175794
## relevel(Contract.change, ref = "No change")Job loss        3.520267
## Liv.situationPartner/Family/Flatshare                     2.118688
## relevel(Ovrl_H0, ref = "None")Experienced                 2.074597
## relevel(Ovrl_H0, ref = "None")New                         1.756053
## relevel(Freetime, ref = "Unchanged")Decreased             1.080052
## relevel(Freetime, ref = "Unchanged")Increased             2.800705
## relevel(Work_time, ref = "Unchanged")Decreased            1.134914
## relevel(Work_time, ref = "Unchanged")Increased            1.441473
## relevel(Caring_duties, ref = "Unchanged")Decreased        1.883259
## relevel(Caring_duties, ref = "Unchanged")Increased        1.662360
```

Mental well-being

```
ord5 <- polr(mwb.cat ~ Gender + Country + Age.cat + edu_cat.b + relevel(Contract.change, ref = "No change"),
exp(coefficients(ord5))
```

```
##                                                                GenderMale
##                                                                1.0422960
##                                                                CountrySwitzerland
##                                                                0.9164552
##                                                                Age.cat31-40
##                                                                1.0653308
##                                                                Age.cat41-50
##                                                                1.2537878
##                                                                Age.cat51-60
##                                                                1.5476030
##                                                                Age.cat61-65
##                                                                2.2396450
##                                                                edu_cat.bSecondary
##                                                                1.1792041
##                                                                edu_cat.bTertiary
##                                                                1.1265758
```

```

## relevel(Contract.change, ref = "No change")Short-time reduced
##                                0.9537203
##      relevel(Contract.change, ref = "No change")Short-time 0
##                                0.5706529
##      relevel(Contract.change, ref = "No change")Job loss
##                                0.7282156
##      Liv.situationPartner/Family/Flatshare
##                                1.1537617
##      relevel(Ovrl_H0, ref = "None")Experienced
##                                1.0522501
##      relevel(Ovrl_H0, ref = "None")New
##                                1.1364849
##      relevel(Freetime, ref = "Unchanged")Decreased
##                                0.8121531
##      relevel(Freetime, ref = "Unchanged")Increased
##                                1.2339215
##      relevel(Work_time, ref = "Unchanged")Decreased
##                                1.1395597
##      relevel(Work_time, ref = "Unchanged")Increased
##                                1.1973091
##      relevel(Caring_duties, ref = "Unchanged")Decreased
##                                1.0623248
##      relevel(Caring_duties, ref = "Unchanged")Increased
##                                0.9965195
##      Work.wors.32
##                                0.7108598
##      Work.wors.33
##                                0.6068512
##      Work.imp.32
##                                0.8961589
##      Work.imp.33
##                                1.0713671
##      Privat.wors.32
##                                0.8011573
##      Privat.wors.33
##                                0.6148731
##      Privat.imp.32
##                                1.0358630
##      Privat.imp.33
##                                1.3974512

```

```
exp(confint(ord5))
```

```
## Waiting for profiling to be done...
```

```

##                                2.5 %
## GenderMale                                0.8933734
## CountrySwitzerland                        0.7642798
## Age.cat31-40                              0.7930525
## Age.cat41-50                              0.9374500
## Age.cat51-60                              1.1646286
## Age.cat61-65                              1.5865040
## edu_cat.bSecondary                        0.8165072

```

```

## edu_cat.bTertiary 0.7748589
## relevel(Contract.change, ref = "No change")Short-time reduced 0.7342298
## relevel(Contract.change, ref = "No change")Short-time 0 0.4106128
## relevel(Contract.change, ref = "No change")Job loss 0.3516185
## Liv.situationPartner/Family/Flatshare 0.9628089
## relevel(Ovrl_H0, ref = "None")Experienced 0.8776672
## relevel(Ovrl_H0, ref = "None")New 0.9214433
## relevel(Freetime, ref = "Unchanged")Decreased 0.6458778
## relevel(Freetime, ref = "Unchanged")Increased 1.0061520
## relevel(Work_time, ref = "Unchanged")Decreased 0.9018131
## relevel(Work_time, ref = "Unchanged")Increased 0.9066082
## relevel(Caring_duties, ref = "Unchanged")Decreased 0.7691518
## relevel(Caring_duties, ref = "Unchanged")Increased 0.8019717
## Work.wors.32 0.5766147
## Work.wors.33 0.4853344
## Work.imp.32 0.7128568
## Work.imp.33 0.8141640
## Privat.wors.32 0.6509710
## Privat.wors.33 0.5044965
## Privat.imp.32 0.8334670
## Privat.imp.33 1.0839741
## 97.5 %
## GenderMale 1.2160398
## CountrySwitzerland 1.0989264
## Age.cat31-40 1.4314371
## Age.cat41-50 1.6775426
## Age.cat51-60 2.0577855
## Age.cat61-65 3.1648248
## edu_cat.bSecondary 1.7042264
## edu_cat.bTertiary 1.6393123
## relevel(Contract.change, ref = "No change")Short-time reduced 1.2388921
## relevel(Contract.change, ref = "No change")Short-time 0 0.7927167
## relevel(Contract.change, ref = "No change")Job loss 1.5150878
## Liv.situationPartner/Family/Flatshare 1.3826983
## relevel(Ovrl_H0, ref = "None")Experienced 1.2616664
## relevel(Ovrl_H0, ref = "None")New 1.4018632
## relevel(Freetime, ref = "Unchanged")Decreased 1.0209663
## relevel(Freetime, ref = "Unchanged")Increased 1.5135677
## relevel(Work_time, ref = "Unchanged")Decreased 1.4400585
## relevel(Work_time, ref = "Unchanged")Increased 1.5820923
## relevel(Caring_duties, ref = "Unchanged")Decreased 1.4676497
## relevel(Caring_duties, ref = "Unchanged")Increased 1.2381870
## Work.wors.32 0.8759811
## Work.wors.33 0.7584924
## Work.imp.32 1.1263951
## Work.imp.33 1.4099394
## Privat.wors.32 0.9858660
## Privat.wors.33 0.7491296
## Privat.imp.32 1.2873816
## Privat.imp.33 1.8020891

```

```
# Self-rated health
```

```
ord6 <- polr(srh ~ Gender + Country + Age.cat + edu_cat.b + relevel(Contract.change, ref = "No change")
exp(coefficients(ord6))
```

```

##                               GenderMale
##                               0.8441806
##                               CountrySwitzerland
##                               1.6231260
##                               Age.cat31-40
##                               0.8436521
##                               Age.cat41-50
##                               0.6039255
##                               Age.cat51-60
##                               0.4634165
##                               Age.cat61-65
##                               0.4645842
##                               edu_cat.bSecondary
##                               0.9084084
##                               edu_cat.bTertiary
##                               0.8348948
## relevel(Contract.change, ref = "No change")Short-time reduced
##                               0.8976240
##       relevel(Contract.change, ref = "No change")Short-time 0
##                               0.4964601
##       relevel(Contract.change, ref = "No change")Job loss
##                               0.7932151
##       Liv.situationPartner/Family/Flatshare
##                               1.1412855
##       relevel(Ovrl_H0, ref = "None")Experienced
##                               0.9850409
##       relevel(Ovrl_H0, ref = "None")New
##                               1.0665283
##       relevel(Freetime, ref = "Unchanged")Decreased
##                               0.9219813
##       relevel(Freetime, ref = "Unchanged")Increased
##                               1.4513966
##       relevel(Work_time, ref = "Unchanged")Decreased
##                               1.0197447
##       relevel(Work_time, ref = "Unchanged")Increased
##                               1.1677709
##       relevel(Caring_duties, ref = "Unchanged")Decreased
##                               0.8217287
##       relevel(Caring_duties, ref = "Unchanged")Increased
##                               1.0595499
##                               Work.wors.32
##                               0.9060982
##                               Work.wors.33
##                               0.7633037
##                               Work.imp.32
##                               0.8460000
##                               Work.imp.33
##                               0.9433892
##                               Privat.wors.32
##                               0.6660763
##                               Privat.wors.33
##                               0.6684191
##                               Privat.imp.32
##                               1.0424613

```



```
## Privat.imp.33
## 1.1023334
```

```
exp(confint(ord6))
```

```
## Waiting for profiling to be done...
```

```
## 2.5 %
## GenderMale 0.7142735
## CountrySwitzerland 1.3291918
## Age.cat31-40 0.6098276
## Age.cat41-50 0.4380922
## Age.cat51-60 0.3383799
## Age.cat61-65 0.3189227
## edu_cat.bSecondary 0.6070786
## edu_cat.bTertiary 0.5547337
## relevel(Contract.change, ref = "No change")Short-time reduced 0.6771458
## relevel(Contract.change, ref = "No change")Short-time 0 0.3487418
## relevel(Contract.change, ref = "No change")Job loss 0.3464258
## Liv.situationPartner/Family/Flatshare 0.9394769
## relevel(Ovrl_H0, ref = "None")Experienced 0.8084441
## relevel(Ovrl_H0, ref = "None")New 0.8523149
## relevel(Freetime, ref = "Unchanged")Decreased 0.7233300
## relevel(Freetime, ref = "Unchanged")Increased 1.1597479
## relevel(Work_time, ref = "Unchanged")Decreased 0.7895261
## relevel(Work_time, ref = "Unchanged")Increased 0.8661947
## relevel(Caring_duties, ref = "Unchanged")Decreased 0.5772042
## relevel(Caring_duties, ref = "Unchanged")Increased 0.8395948
## Work.wors.32 0.7217468
## Work.wors.33 0.5997132
## Work.imp.32 0.6602527
## Work.imp.33 0.7009573
## Privat.wors.32 0.5333800
## Privat.wors.33 0.5393232
## Privat.imp.32 0.8249087
## Privat.imp.33 0.8324221
## 97.5 %
## GenderMale 0.9974545
## CountrySwitzerland 1.9839477
## Age.cat31-40 1.1662384
## Age.cat41-50 0.8314914
## Age.cat51-60 0.6335726
## Age.cat61-65 0.6760396
## edu_cat.bSecondary 1.3559181
## edu_cat.bTertiary 1.2534151
## relevel(Contract.change, ref = "No change")Short-time reduced 1.1896894
## relevel(Contract.change, ref = "No change")Short-time 0 0.7064855
## relevel(Contract.change, ref = "No change")Job loss 1.8267224
## Liv.situationPartner/Family/Flatshare 1.3863481
## relevel(Ovrl_H0, ref = "None")Experienced 1.2004046
## relevel(Ovrl_H0, ref = "None")New 1.3349981
## relevel(Freetime, ref = "Unchanged")Decreased 1.1753194
## relevel(Freetime, ref = "Unchanged")Increased 1.8174655
```

## relevel(Work_time, ref = "Unchanged")Decreased	1.3174620
## relevel(Work_time, ref = "Unchanged")Increased	1.5762685
## relevel(Caring_duties, ref = "Unchanged")Decreased	1.1709026
## relevel(Caring_duties, ref = "Unchanged")Increased	1.3376298
## Work.wors.32	1.1375376
## Work.wors.33	0.9714374
## Work.imp.32	1.0839799
## Work.imp.33	1.2704581
## Privat.wors.32	0.8314925
## Privat.wors.33	0.8280767
## Privat.imp.32	1.3178055
## Privat.imp.33	1.4608616