stat_analysis

Ryan Wei

2024-03-19

```
source(knitr::purl("./data_manipulation.Rmd", quiet=TRUE))
source(knitr::purl("./EDA.Rmd", quiet=TRUE))
```

```
data.baseline <- data.comp %>% filter(day == 0)
```

Complete case GEE

```
library(gee)
library(geepack)
library(glmtoolbox)
library(gtsummary)
library(tidyverse)
data.comp.lag <-
  data.comp %>%
  group_by(subject_id) %>%
  mutate(mem_comp_lag = lag(mem_comp), observed_lag = lag(observed)) %>%
  ungroup() %>%
  filter(observed_lag != 0) %>%
  mutate(drop = ifelse(observed == 0 & observed_lag == 1, 1, 0)) %>%
  dplyr::select(subject_id, day, day_fct, age, gender, treatment_group, mem_comp_lag, drop) %>%
  mutate(day_fct = factor(day, levels = c(5,19,90)))


model.complete.1 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_
model.complete.2 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_
model.complete.3 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_

#tbl_regression(model.complete.1)
#tbl_regression(model.complete.2)
#tbl_regression(model.complete.3)

tbl_merge(
  list(tbl_regression(model.complete.1), tbl_regression(model.complete.2), tbl_regression(model.complet
)
```

Characteristic

Beta

95% CI

p-value

Beta

95% CI

p-value

Beta

95% CI

p-value

day_fct

0

—

—

—

—

—

—

5

-0.10

-0.34, 0.15

0.4

-0.10

-0.34, 0.15

0.4

-0.10

-0.34, 0.15

0.4

19

-0.28

-0.65, 0.08

0.13

-0.24

-0.58, 0.10

0.2

-0.22

-0.53, 0.10

0.2

90

-0.30

-0.73, 0.13

0.2

-0.13

-0.50, 0.25

0.5

-0.16

-0.50, 0.19

0.4

treatment_group

A

—

—

—

—

—

—

B

-0.08

-0.73, 0.57

0.8

-0.10

-0.76, 0.56

0.8

-0.09

-0.75, 0.57

0.8

C

-0.19

-0.72, 0.34

0.5

-0.18

-0.71, 0.36

0.5

-0.19

-0.72, 0.35

0.5
age
-0.02
-0.05, 0.02
0.4
-0.02
-0.05, 0.02
0.3
-0.02
-0.05, 0.01
0.2
gender
M
—
—
—
—
—
—
F
-0.06
-0.61, 0.50
0.8
0.02
-0.51, 0.55
>0.9
-0.03
-0.59, 0.53
>0.9
day_fct * treatment_group
5 * B
-0.06
-0.53, 0.42
0.8
-0.05
-0.51, 0.40

0.8

-0.06

-0.52, 0.40

0.8

19 * B

0.22

-0.35, 0.79

0.4

0.24

-0.22, 0.69

0.3

0.18

-0.23, 0.60

0.4

90 * B

0.25

-0.37, 0.88

0.4

0.29

-0.18, 0.75

0.2

0.23

-0.23, 0.69

0.3

5 * C

0.35

0.00, 0.70

0.053

0.37

0.03, 0.72

0.032

0.38

0.04, 0.73

0.031

19 * C

0.71

0.21, 1.2

0.005

0.68

0.23, 1.1

0.003

0.66

0.22, 1.1

0.003

90 * C

0.39

-0.17, 0.95

0.2

0.32

-0.20, 0.85

0.2

0.31

-0.17, 0.79

0.2

Testing MCAR

```
model.drop <-
  geeglm(drop ~ day_fct + treatment_group + age + gender + mem_comp_lag, data = data.comp.lag, family =

tbl_regression(model.drop, exponentiate = F)
```

Characteristic

log(OR)

95% CI

p-value

day_fct

5

—

—

19

2.0

0.41, 3.7

0.014

90

2.3

0.61, 4.1

0.008

treatment_group

A

—

—

B

0.06

-1.2, 1.3

>0.9

C

-0.25

-1.3, 0.84

0.6

age

-0.02

-0.06, 0.03

0.4

gender

M

—

—

F

0.70

-0.25, 1.7

0.2

mem_comp_lag

0.24

-0.35, 0.83

0.4

No significant evidence of violating MCAR. . .

Linear mixed effect models

```
library(lme4)
library(nlme)
library(lattice)
library(knitr)
library(kableExtra)

model.lmer = lmer(
  mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_fct + (1 |subject_id), da
)

tbl_regression(model.lmer)
```

Characteristic

Beta

95% CI

day_fct

0

—

—

5

-0.10

-0.37, 0.18

19

-0.21

-0.51, 0.08

90

-0.16

-0.47, 0.16

treatment_group

A

—

—

B

-0.09

-0.77, 0.59

C

-0.19

-0.84, 0.46

age

-0.02

-0.05, 0.01

gender

M

—

—

F

-0.03

-0.56, 0.50

day_fct * treatment_group

5 * B

-0.06

-0.47, 0.35

19 * B

0.18

-0.28, 0.64

90 * B

0.23

-0.23, 0.69

5 * C

0.38

-0.01, 0.78

19 * C

0.66

0.23, 1.1

90 * C

0.31

-0.15, 0.77

IPW GEE

```
# propensity score models, using logistic regression and coxph model
model.prob.drop <-
  geeglm(dropped ~ day_fct + treatment_group + age + gender, data = data.surv %>% mutate(day_fct = facto

model.prob.drop.coxph <- coxph(Surv(start, stop, dropped) ~ treatment_group + age + gender, data = data

tbl_regression(model.prob.drop, exponentiate = F)
```

Characteristic

log(OR)

95% CI

p-value

day_fct

5

—

—

19

2.1

0.56, 3.6

0.007

90

2.5

0.84, 4.2

0.003

treatment_group

A

—

—

B

0.27

-0.86, 1.4

0.6

C

0.10

-0.98, 1.2

0.9

age

-0.03

-0.07, 0.01

0.2

gender

M

—

—

F

0.48

-0.45, 1.4

0.3

```
tbl_regression(model.prob.drop.coxph, exponentiate = F)
```

Characteristic

log(HR)

95% CI

p-value

treatment_group

A

—

—

B

0.20

-0.69, 1.1

0.7

C

0.09

-0.79, 0.97

0.8

age

-0.03

-0.07, 0.02

0.2

gender

M

—

—

F

0.38

-0.36, 1.1

0.3

```
tbl_merge(
  list(tbl_regression(model.prob.drop, exponentiate = F),tbl_regression(model.prob.drop.coxph, exponenti
)
```

Characteristic

log(OR)

95% CI

p-value

log(HR)

95% CI

p-value

day_fct

5

—

—

19

2.1

0.56, 3.6

0.007

90

2.5

0.84, 4.2

0.003

treatment_group

A

—

—

—

—

B

0.27

-0.86, 1.4

0.6

0.20

-0.69, 1.1

0.7

C

0.10

-0.98, 1.2

0.9

0.09

-0.79, 0.97

0.8

age

-0.03

-0.07, 0.01

0.2

-0.03

-0.07, 0.02

0.2

gender

M

—

—

—

—

F

0.48

-0.45, 1.4

0.3

0.38

-0.36, 1.1

0.3

```
predict.prob.drop <- predict(model.prob.drop, newdata = data.surv, type = "response")
predict.prob.drop.coxph <- predict(model.prob.drop.coxph, newdata = data.surv, type = "survival")

data.surv$prob.stay <- 1 - predict.prob.drop
data.surv$prob.stay.coxph <- predict.prob.drop.coxph

data.comp <- left_join(data.comp, data.surv %>% dplyr::select(subject_id,day_fct,treatment_group,prob.s
data.comp <-
  data.comp %>%
  mutate(
    prob.stay = ifelse(day_fct==0, 1, prob.stay),
    prob.stay.coxph = ifelse(day_fct==0, 1, prob.stay.coxph)
  )
```

```
model.ipw.1 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_fct, 
model.ipw.2 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_fct, 
model.ipw.3 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day_fct, 
```

```
tbl_merge(
  list(tbl_regression(model.ipw.1), tbl_regression(model.ipw.2), tbl_regression(model.ipw.3))
)
```

Characteristic

Beta

95% CI

p-value

Beta

95% CI

p-value

Beta

95% CI

p-value

day_fct

0

—

—

—

—

—

—

5

-0.10

-0.35, 0.15

0.4

-0.10

-0.35, 0.15

0.4

-0.10

-0.34, 0.15

0.4

19

-0.29

-0.66, 0.07

0.12

-0.24

-0.59, 0.10

0.2

-0.22

-0.54, 0.09

0.2

90

-0.32

-0.75, 0.11

0.14

-0.14

-0.51, 0.23

0.5

-0.19

-0.53, 0.15

0.3

treatment_group

A

—

—

—

—

—

—

B

-0.07

-0.72, 0.58

0.8

-0.10

-0.75, 0.55

0.8

-0.11

-0.76, 0.54

0.7

C

-0.18

-0.71, 0.35

0.5
-0.17
-0.70, 0.35
0.5
-0.22
-0.74, 0.31
0.4
age
-0.01
-0.05, 0.02
0.5
-0.01
-0.05, 0.02
0.4
-0.02
-0.06, 0.02
0.4
gender
M
—
—
—
—
—
—
F
-0.05
-0.61, 0.52
0.9
0.06
-0.47, 0.60
0.8
-0.01
-0.61, 0.59
>0.9
day_fct * treatment_group

5 * B

-0.05

-0.53, 0.43

0.8

-0.05

-0.50, 0.41

0.8

-0.05

-0.51, 0.41

0.8

19 * B

0.22

-0.36, 0.80

0.4

0.25

-0.21, 0.70

0.3

0.19

-0.23, 0.60

0.4

90 * B

0.25

-0.39, 0.89

0.4

0.26

-0.21, 0.73

0.3

0.23

-0.24, 0.70

0.3

5 * C

0.36

0.00, 0.71

0.050

0.38

0.03, 0.72

0.031

0.39

0.04, 0.74

0.027

19 * C

0.74

0.25, 1.2

0.003

0.70

0.25, 1.1

0.002

0.68

0.25, 1.1

0.002

90 * C

0.40

-0.19, 0.99

0.2

0.31

-0.24, 0.85

0.3

0.32

-0.18, 0.81

0.2

```
model.ipw.coxph.1 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day
model.ipw.coxph.2 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day
model.ipw.coxph.3 <- geeglm(mem_comp ~ day_fct + treatment_group + age + gender + treatment_group * day



tbl_merge(
  list(tbl_regression(model.ipw.coxph.1), tbl_regression(model.ipw.coxph.2), tbl_regression(model.ipw.c
)
```

Characteristic

Beta

95% CI

p-value

Beta

95% CI

p-value

Beta

95% CI

p-value

day_fct

0

—

—

—

—

—

—

5

-0.10

-0.35, 0.15

0.4

-0.10

-0.34, 0.15

0.4

-0.10

-0.34, 0.15

0.4

19

-0.29

-0.66, 0.07

0.12

-0.24

-0.59, 0.10

0.2

-0.22

-0.54, 0.09

0.2

90

-0.32

-0.75, 0.11

0.14

-0.14

-0.51, 0.23

0.5

-0.19

-0.53, 0.15

0.3

treatment_group

A

—

—

—

—

—

—

B

-0.07

-0.72, 0.58

0.8

-0.11

-0.76, 0.54

0.7

-0.12

-0.76, 0.53

0.7

C

-0.18

-0.71, 0.35

0.5

-0.18

-0.70, 0.35

0.5

-0.22

-0.75, 0.31

0.4

age

-0.01

-0.05, 0.02

0.5

-0.01

-0.05, 0.02

0.4

-0.02

-0.06, 0.02

0.4

gender

M

—

—

—

—

—

—

F

-0.05

-0.61, 0.52

0.9

0.06

-0.48, 0.60

0.8

-0.01

-0.61, 0.59

>0.9

day_fct * treatment_group

5 * B

-0.05

-0.53, 0.43

0.8

-0.05

-0.50, 0.41

0.8

-0.05

-0.51, 0.41

0.8

19 * B

0.22

-0.36, 0.80

0.5

0.24

-0.21, 0.70

0.3

0.19

-0.22, 0.60

0.4

90 * B

0.25

-0.40, 0.89

0.5

0.26

-0.21, 0.73

0.3

0.23

-0.24, 0.69

0.3

5 * C

0.35

0.00, 0.71

0.050

0.38

0.03, 0.72

0.031

0.39

0.04, 0.74

0.027

19 * C

0.74

0.25, 1.2

0.003

0.69

0.25, 1.1

0.002

0.68

0.25, 1.1

0.002

90 * C

0.40

-0.19, 0.99

0.2

0.30

-0.24, 0.85

0.3

0.32

-0.18, 0.81

0.2