

Supplemental Codes S1: R-codes.

R codes for RMANCOVA and GRMANCOVA model are provided. Codes for the other two models are similar.

```
# RMANCOVA
```

```
library(lme4)
```

```
library(car)
```

```
library(dplyr)
```

```
mod_c <- lmer(y ~ week + SBPBASE + DBPBASE + (1|ID), REML=F, data=df)
```

```
## calculate AIC
```

```
AIC(mod_c)
```

```
## Type III ANOVA table
```

```
Anova(mod_c, type = "III")
```

```
smry_c <- summary(mod_c)
```

```
## between subject
```

```
sig_alpha_sq <- smry_c$varcor$ID[1]
```

```
## random error
```

```
sig_sq <- smry_c$sigma^2
```

```
ICC_c <- sig_alpha_sq / (sig_alpha_sq + sig_sq)
```

```
# GRMANCOVA
```

```
mod_b <- glmer(y ~ week + SBPBASE + DBPBASE + (1|ID), family = binomial(link = "logit"),  
              data=df, control=glmerControl(optimizer="bobyqa", optCtrl=list(maxfun=2e4)))
```

```
smry_b <- summary(mod_b)
```

```
AIC(mod_b)
```

```
## coefficients
```

```
coef_b <- smry_b$coefficients[,1]
```

```
## variance estimate
```

```
var_b <- smry_b$varcor$ID[1]
```

```
## design matrix
```

```
xmat <- model.matrix(~1+week + SBPBASE + DBPBASE, df)
```

```
## linear predictor
```

```
xb <- data.frame(xb=xmat %*% coef_b)
```

```
post <- df %>% bind_cols(xb2)
```

```

# integrand of variance for week j
sigmaj <- function(x) {
  pj=0
  for (i in 1:n) {
    pj=pj+ 1/(1+exp(-xb[i]-x)) / n
  }
  f=pj*(1-pj)*(1/sqrt(2*pi*sig) )*exp(-0.5*x^2 /sig)
  return(f)
}

# integrand of first part in  $\sigma_{\tau}^2$ 
sumpj1 <- function(x) {
  pj=0
  for (j in 1:12) {
    data_sub <- post %>% filter(week==j)
    # n: number of observations in jth week
    n <- data_sub$n1[1]
    xb <- data_sub$xb
    sig <- var_b
    for (i in 1:n) {
      pj=pj+ 1/(1+exp(-xb[i]-x)) / n
    }
  }
  f=pj^2 * (1/sqrt(2*pi*sig))*exp(-0.5*x^2 /sig)
  return(f)
}

# integrand of second part in  $\sigma_{\tau}^2$ 
sumpj2 <- function(x) {
  pj=0
  for (j in 1:12) {
    data_sub <- post %>% filter(week==j)
    n <- data_sub$n1[1]
    xb <- data_sub$xb
    sig <- var_b
    for (i in 1:n) {

```

```

    pj=pj+ 1/(1+exp(-xb[i]-x)) / n
  }
}
f=pj * (1/sqrt(2*pi*sig))*exp(-0.5*x^2 /sig)
return(f)
}
a <- integrate(sumpj1, -Inf, Inf)$value
b <- integrate(sumpj2, -Inf, Inf)$value
sig_tau_sq <- a-b^2

# J needs to be assigned with a value
sig <- vector()
for (j in 1:J) {
  data_sub <- post %>% filter(week==j)
  n <- data_sub$n1[1]
  xb <- data_sub$xb
  sig <- var_b
  sig[j] = integrate(sigmaj, -Inf, Inf)$value
}
sig_e_sq <- sum(sig)
icc_b <- sig_tau_sq/(sig_tau_sq+sig_e_sq)

```