

Supplementary R Codes

Surrounding greenness is associated with lower risk and burden of low birth weight in Iran

Siqi Luo, Yaqi Wang, Fatemeh Mayvaneh, Helder Relvas, Mohammad Baaghideh, Kai Wang, Yang Yuan, Zhouxin Yin, Yunquan Zhang

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1. Codes for the regression models in the main text

```
##Codes are not utilized for running, but to aid interpretation of the statistical models used in
the study.
## load the packages
library(xlsx);library(dplyr)
##load the analyzed data
load("data_iran.rdata")
## Construct a function to extract the result
ect <- function(model){
  beta <- summary(model)$coef[2,"Estimate"]
  low <- (summary(model)$coef[2,"Estimate"] - 1.96*summary(model)$coef[2, "Std. Error"])
  high <- (summary(model)$coef[2,"Estimate"] + 1.96*summary(model)$coef[2, "Std.
Error"])
  p <- summary(model)$coef[2,"Pr(>|z|)"]
  table <- cbind(beta,low,high,p)
  return(table)}
outcomes<-list(data$lbw,data$tlbw)
exposures<-list(data$NDVI500,data$NDVI1000,data$NDVI2000,
                data$NDVI3000,data$EVI500,data$EVI1000,
                data$EVI2000,data$EVI3000)
#####
##### model 1 #####
#####
mod1<-lapply(outcomes,function(y){
  a<-lapply(exposures,function(x){
    model <- glm(y~x,
                 family=binomial(link = "logit"),
                 data=data)
    d<-ect(model)
    return(d)
  })
})
rbind(mod1[[1]],mod1[[2]]) %>%
do.call("rbind",.) %>%
as.data.frame() %>%
mutate(ci=paste0(round(exp(beta)^0.1,3),
                 ["",round(exp(low)^0.1,3)," to ", round(exp(high)^0.1,3),"]")) %>%
mutate(ci0=paste(ci,cut(p,c(-0.1,0.001,0.01,0.05,1),c("****", "***", "**", "")),sep=" "),
        exposure=rep(c("NDVI500","NDVI1000","NDVI2000","NDVI3000",
                        "EVI500","EVI1000","EVI2000","EVI3000"),each=2),
        outcome=c(rep(c("lbw","tlbw"),8)),
        mod="Model 1")->model1
```

```

#####
##### model 2 #####
#####
mod2<-lapply(outcomes,function(y){
  a<-lapply(exposures,function(x){
    model <- glm(y~x+age+Sex+gw,
                 family=binomial(link = "logit"),
                 data=data)

    d<-ect(model)
    return(d)
  })
})
rbind(mod2[[1]],mod2[[2]]) %>%
  do.call("rbind",.) %>%
  as.data.frame() %>%
  mutate(ci=paste0(round(exp(beta)^0.1,3),
                    ["",round(exp(low)^0.1,3)," to ", round(exp(high)^0.1,3),"]")) %>%
  mutate(ci0=paste(ci,cut(p,c(-0.1,0.001,0.01,0.05,1),c("****", "***", "**", "")),sep=" "),
          exposure=rep(c("NDVI500","NDVI1000","NDVI2000","NDVI3000",
                          "EVI500","EVI1000","EVI2000","EVI3000"),each=2),
          outcome=c(rep(c("lbw","tlbw"),8)),
          mod="Model 2")->model2
#####
##### model 3 #####
#####
mod3<-lapply(outcomes,function(y){
  a<-lapply(exposures,function(x){
    model <- glm(y~x+age+
                 Sex+order_cat+parity_cat+
                 season+nationality+residence+
                 deli_type+education+gw+hospital,
                 family=binomial(link = "logit"),
                 data=data)

    d<-ect(model)
    return(d)
  })
})
rbind(mod3[[1]],mod3[[2]]) %>%
  do.call("rbind",.) %>%
  as.data.frame() %>%
  mutate(ci=paste0(round(exp(beta)^0.1,3),
                    ["",round(exp(low)^0.1,3)," to ", round(exp(high)^0.1,3),"]")) %>%

```

```

mutate(ci0=paste(ci,cut(p,c(-0.1,0.001,0.01,0.05,1),c("****","**","*","")),sep=" "),
      exposure=rep(c("NDVI500","NDVI1000","NDVI2000","NDVI3000",
                    "EVI500","EVI1000","EVI2000","EVI3000"),each=2),
      outcome=c(rep(c("lbw","tlbw"),8)),
      mod="Model 3")->model3
#####
##### model 4 #####
#####
mod4<-lapply(outcomes,function(y){
  a<-lapply(exposures,function(x){
    model <- glm(y~x+pm_preg+age+
                splines::ns(tmean_preg,df=3)+
                splines::ns(rh_preg,3)+
                Sex+order_cat+parity_cat+
                season+nationality+residence+
                deli_type+education+gw+hospital,
                family=binomial(link = "logit"),
                data=data)

    d<-ect(model)
    return(d)
  })
})
rbind(mod4[[1]],mod4[[2]]) %>%
  do.call("rbind",.) %>%
  as.data.frame() %>%
  mutate(ci=paste0(round(exp(beta)^0.1,3),
                  ["",round(exp(low)^0.1,3)," to ", round(exp(high)^0.1,3),"]")) %>%
  mutate(ci0=paste(ci,cut(p,c(-0.1,0.001,0.01,0.05,1),c("****","**","*","")),sep=" "),
        exposure=rep(c("NDVI500","NDVI1000","NDVI2000","NDVI3000",
                    "EVI500","EVI1000","EVI2000","EVI3000"),each=2),
        outcome=c(rep(c("lbw","tlbw"),8)),
        mod="Model 4")->model4

```

2. Codes for Figure 2

```

##load packages
library(xlsx); library(ggplot2)
## read data
mr_res<-read.xlsx("Results.xlsx",sheetIndex = 1)
mr_res$ci<-paste0(format(round(exp(mr_res$beta*0.1),3),3),
                  ("",format(round(exp(mr_res$low*0.1),3),3),
                  "-",format(round(exp(mr_res$high*0.1),3),3),"))

```

```

mytheme<-theme(axis.text.x=element_text(size=14,color="black"),
              axis.text.y=element_text(size=14,color="black",hjust = 0),
              legend.text=element_text(size=14,color="black"),
              legend.title=element_text(size=14,color="black"),
              plot.title = element_text(size = 16,color = "black",face = "bold"),
              panel.background=element_blank(),
              panel.grid.minor=element_blank(),
              panel.grid.major=element_blank(),
              panel.border=element_blank(),
              axis.line=element_blank(),
              axis.ticks=element_blank(),
              legend.position="top",
              legend.direction = "horizontal",
              legend.key.height = unit(0.6,"cm"),
              legend.key.width = unit(1.8,"cm"),
              plot.margin = margin(-0.1,0,-0.2,0,unit = "cm"))
p1<-ggplot(data=subset(mr_res,outcome=="lbw"),aes(mod,exposure,fill=or))+
  geom_tile(color="#BD3C29",size=0.4)+
  scale_x_discrete(limits=c("Model 1","Model 2",
                            "Model 3","Model 4"),
                  labels=c("Model 1","Model 2",
                            "Model 3","Model 4"))+
  scale_y_discrete(limits=c("EVI3000","EVI2000","EVI1000","EVI500",
                            "NDVI3000","NDVI2000","NDVI1000","NDVI500"),
                  labels=c(expression(EVI["-3000m"]),
                            expression(EVI["-2000m"]),
                            expression(EVI["-1000m"]),
                            expression(EVI["-500m"]),
                            expression(NDVI["-3000m"]),
                            expression(NDVI["-2000m"]),
                            expression(NDVI["-1000m"]),
                            expression(NDVI["-500m"])))
  scale_fill_gradient2(limits=c(0.845,0.935),name="OR",
                      breaks=c(0.85,0.87,0.89,0.91,0.93),
                      labels=c(0.85,0.87,0.89,0.91,0.93),
                      low = "#2c7bb6",mid="#ffffbf",high="#d7191c",midpoint = 0.89)+
  labs(x="",y="",title = "a")+
  geom_text(aes(label=ci),size=5,hjust=0.5)+mytheme+
  theme(axis.text.x = element_blank())
p2<-ggplot(data=subset(mr_res,outcome=="tlbw"),aes(mod,exposure,fill=or))+
  geom_tile(color="#BD3C29",size=0.4)+

```

```

scale_x_discrete(limits=c("Model 1","Model 2",
                          "Model 3","Model 4"),
                labels=c("Model 1","Model 2",
                          "Model 3","Model 4"))+
scale_y_discrete(limits=c("EVI3000","EVI2000","EVI1000","EVI500",
                          "NDVI3000","NDVI2000","NDVI1000","NDVI500"),
                labels=c(expression(EVI["-3000m"]),
                          expression(EVI["-2000m"]),
                          expression(EVI["-1000m"]),
                          expression(EVI["-500m"]),
                          expression(NDVI["-3000m"]),
                          expression(NDVI["-2000m"]),
                          expression(NDVI["-1000m"]),
                          expression(NDVI["-500m"])))
scale_fill_gradient2(limits=c(0.845,0.935),name="OR",
                    breaks=c(0.85,0.87,0.89,0.91,0.93),
                    labels=c(0.85,0.87,0.89,0.91,0.93),
                    low = "#2c7bb6",mid="#ffffbf",high="#d7191c",midpoint = 0.89)+
labs(x="",y="",title = "b")+
geom_text(aes(label=ci),size=5,hjust=0.5)+mytheme
library(ggpubr)
p<-ggarrange(p1,p2,nrow = 2,align = "h",
            common.legend = T,legend = "top")
cairo_pdf("figure2.pdf",width=10,height=8,family = "Calibri")
p
dev.off()

```

3. Codes for Figure 3

```

##load and read data
load("data_iran.rdata")
cr<-read.xlsx("Results.xlsx",sheetIndex = 2)
library(ggplot2)
theme0<-theme(panel.grid.major = element_blank(),
              panel.grid.minor = element_blank(),
              panel.background = element_blank(),
              axis.text.x = element_text(size = 10),
              axis.text.y = element_text(size = 8),
              axis.title = element_text(size = 12),
              strip.text.x = element_text(size = 12),
              strip.text.y = element_text(),
              strip.background = element_rect(fill="white",colour = "black"))

```

```

#####NDVI+LBW
ggplot(data = subset(cr,exposure=="NDVI"&outcome=="LBW"))+
  geom_ribbon(aes(x=x,y=y,ymin=ylow,ymax=yhigh),
             fill="#002C5B",alpha=0.4)+
  geom_line(aes(x=x,y=y),colour="#002C5B88",size=0.5)+
  facet_grid(~outcome,scales = "free",
            labeller = labeller(exposure=label_parsed))+
  annotate("text",x=0.2,y=0.85,size=4,color="grey20",hjust=0,
         label=expression("Nonlinear " *italic(P)*" < 0.001"))+
  scale_x_continuous(breaks = seq(0,0.8,0.2),
                    labels = seq(0,0.8,0.2))+
  scale_y_continuous(breaks=seq(0.5,1,by=0.1),
                    labels=sprintf("%.1f",seq(0.5,1,0.1)))+
  labs(title = "a",y="OR (95% CI)",x="")+
  theme_classic()+theme0+
  theme(axis.text.x = element_blank(),
        strip.background.x = element_rect(color = "white",
                                           fill = "#002C5B40"),
        plot.margin = margin(b=-0.2,t=0.2,r=0.2,l=0.2,
                             unit = "cm"))->p1

ggplot()+
  geom_boxplot(aes(x=data$NDVI3000,y=-0.2),width=0.24,
              fill="#002C5B44",color="#002C5B88",
              outlier.shape = NA)+
  geom_density(aes(x=data$NDVI3000),fill="#002C5B66",
              color="white",show.legend = F)+
  scale_x_continuous(breaks = seq(0,0.8,0.2),
                    labels = seq(0,0.8,0.2))+
  labs(x=expression("NDVI"["-3000m"]),y="Kernel density (%)")+
  theme_classic()+theme0+
  theme(plot.margin = margin(t=-0.35,b=0,l=0.2,r=0.2,
                             unit = "cm"))->p2

#####NDVI+TLBW
ggplot(data = subset(cr,exposure=="NDVI"&outcome=="TLBW"))+
  geom_ribbon(aes(x=x,y=y,ymin=ylow,ymax=yhigh),
             fill="#B30839",alpha=0.4)+
  geom_line(aes(x=x,y=y),colour="#B3083988",size=0.5)+
  facet_grid(~outcome,scales = "free",
            labeller = labeller(exposure=label_parsed))+
  annotate("text",x=0.2,y=0.85,size=4,color="grey20",hjust=0,
         label=expression("Nonlinear " *italic(P)*" < 0.001"))+
  scale_x_continuous(breaks = seq(0,0.8,0.2), labels = seq(0,0.8,0.2))+

```

```

scale_y_continuous(breaks=seq(0.5,1,by=0.1),
                   labels=sprintf("%.1f",seq(0.5,1,0.1)))+
labs(title = "",y=NULL,x="")+
theme_classic()+theme0+
theme(axis.text.x = element_blank(),
      strip.background.x = element_rect(color = "white",
                                         fill = "#B3083940"),
      plot.margin = margin(b=-0.2,t=0.2,r=0.2,l=0.2,
                           unit = "cm"))->p3
ggplot()+
geom_boxplot(aes(x=data$NDVI3000,y=-0.2),width=0.24,
             fill="#B3083944",color="#B3083988",
             outlier.shape = NA)+
geom_density(aes(x=data$NDVI3000),fill="#B3083966",
             color="white",show.legend = F)+
scale_x_continuous(breaks = seq(0,0.8,0.2),
                  labels = seq(0,0.8,0.2))+
labs(x=expression("NDVI"["-3000m"]),y=NULL)+
theme_classic()+theme0+
theme(plot.margin = margin(t=-0.35,b=0,l=0.2,r=0.2,
                           unit = "cm"))->p4

#####EVI+LBW
ggplot(data = subset(cr,exposure=="EVI"&outcome=="LBW"))+
geom_ribbon(aes(x=x,y=y,ymin=ylow,ymax=yhigh),
          fill="#002C5B",alpha=0.4)+
geom_line(aes(x=x,y=y),colour="#002C5B88",size=0.5)+
facet_grid(~outcome,scales = "free",
          labeller = labeller(exposure=label_parsed))+
annotate("text",x=0.2,y=0.85,size=4,color="grey20",hjust=0,
        label=expression("Nonlinear " *italic(P)*" < 0.001"))+
scale_x_continuous(breaks = seq(0.1,0.7,0.2),
                  labels = seq(0.1,0.7,0.2))+
scale_y_continuous(breaks=seq(0.5,1,by=0.1),
                  labels=sprintf("%.1f",seq(0.5,1,0.1)))+
labs(title = "b",y="OR (95% CI)",x="")+
theme_classic()+theme0+
theme(axis.text.x = element_blank(),
      strip.background.x = element_rect(color = "white",
                                         fill = "#002C5B40"),
      plot.margin = margin(b=-0.2,t=0.2,r=0.2,l=0.2,
                           unit = "cm"))->p5

```



```

ggplot()+
  geom_boxplot(aes(x=data$EVI3000,y=-0.28),width=0.32,
              fill="#002C5B44",color="#002C5B88",
              outlier.shape = NA)+
  geom_density(aes(x=data$EVI3000),fill="#002C5B66",
              color="white",show.legend = F)+
  scale_x_continuous(breaks = seq(0.1,0.7,0.2),
                    labels = seq(0.1,0.7,0.2))+
  scale_y_continuous(breaks = seq(0,4,1),
                    labels = seq(0,4,1))+
  labs(x=expression("EVI"["-3000m"]),
       y="Kernel density (%)")+
  theme_classic()+theme0+
  theme(plot.margin = margin(t=-0.35,b=0,l=0.2,r=0.2,
                             unit = "cm"))->p6

#####EVI+TLBW
ggplot(data = subset(cr,exposure=="EVI"&outcome=="TLBW"))+
  geom_ribbon(aes(x=x,y=y,ymin=ylow,ymax=yhigh),
            fill="#B30839",alpha=0.4)+
  geom_line(aes(x=x,y=y),colour="#B3083988",size=0.5)+
  facet_grid(~outcome,scales = "free",
            labeller = labeller(exposure=label_parsed))+
  annotate("text",x=0.2,y=0.85,size=4,color="grey20",hjust=0,
         label=expression("Nonlinear " *italic(P)*" < 0.001"))+
  scale_x_continuous(breaks = seq(0.1,0.7,0.2),
                    labels = seq(0.1,0.7,0.2))+
  scale_y_continuous(breaks=seq(0.5,1,by=0.1),
                    labels=sprintf("%.1f",seq(0.5,1,0.1)))+
  labs(title = "",y=NULL,x="")+
  theme_classic()+theme0+
  theme(axis.text.x = element_blank(),
        strip.background.x = element_rect(color = "white",
                                           fill = "#B3083940"),
        plot.margin = margin(b=-0.2,t=0.2,r=0.2,l=0.2,
                             unit = "cm"))->p7

ggplot()+
  geom_boxplot(aes(x=data$EVI3000,y=-0.28),width=0.32,
              fill="#B3083944",color="#B3083988",
              outlier.shape = NA)+
  geom_density(aes(x=data$EVI3000),fill="#B3083966",
              color="white",show.legend = F)+
  scale_x_continuous(breaks = seq(0.1,0.7,0.2),
                    labels = seq(0.1,0.7,0.2))+

```

```

scale_y_continuous(breaks = seq(0,4,1),
                   labels = seq(0,4,1))+
labs(x=expression("EVI"["-3000m"]),y=NULL)+
theme_classic()+theme0+
theme(plot.margin = margin(t=-0.35,b=0,l=0.2,r=0.2,
                           unit = "cm"))->p8

#####
library(ggpubr)
aa<-ggarrange(p1,p2,ncol = 1,align = "v",heights = c(2,1))
bb<-ggarrange(p3,p4,ncol = 1,align = "v",heights = c(2,1))
cc<-ggarrange(p5,p6,ncol = 1,align = "v",heights = c(2,1))
dd<-ggarrange(p7,p8,ncol = 1,align = "v",heights = c(2,1))
p<-ggarrange(aa,bb,cc,dd,
             nrow = 1,ncol = 4,align = "v")
cairo_pdf("figure3.pdf",width = 11,height = 4,family = "Calibri")
p
dev.off()

```

4. Codes for Figure 4

```

library(xlsx);library(dplyr);library(ggsci);library(ggplot2)
sub<-read.xlsx("Results.xlsx",sheetIndex = 3)
#####
sub$outcome <- factor(sub$outcome,levels = c("LBW", "TLBW"),
                    labels=c("LBW", "TLBW"))
mutate(sub,y=round(exp(beta)^0.1,3),
       ylow=round(exp(low)^0.1,3),
       yhigh=round(exp(high)^0.1,3))>sub
sub$exposure <- factor(sub$exposure,levels = c("NDVI", "EVI"),
                    labels=c(expression("NDVI"["-3000m"]),expression("EVI"["-3000m"])))
sub$group <- c(rep(c("<=25", "(25, 35]", ">35"),4),
              rep(c("Below high school", "High school",
                    "College or above"),4),
              rep(c("City", "Village"),4))
sub$group <- factor(sub$group,levels = c("<=25", "(25, 35]", ">35", "Below high school",
                                         "High school", "College or above", "City", "Village"))
color1 <- c(rep(c('#b5e1f7', '#fd8a09', '#ca2c32'),4),
            rep(c('#b5e1f7', '#fd8a09', '#ca2c32'),4),
            rep(c('#b5e1f7', '#fd8a09'),4))
p <- ggplot()+geom_pointrange(data=sub,size=0.45,
                             aes(x=group,y=y, ymin = as.numeric(ylow),
                                 ymax = as.numeric(yhigh)),shape=15,width=1.5)+

```

```

geom_errorbar(data=sub,size=0.45,
              aes(x=group,y=y,
                  ymin = as.numeric(ylow),
                  ymax = as.numeric(yhigh)),width=0.15)+
geom_point(data = sub,size=3,
           aes(x=group,y=y),shape=21,colour="black",fill=color1)+
facet_grid(exposure~outcome,scales="free",labeller="label_parsed")+
geom_vline(xintercept = "High school",lwd=49,col="grey50",alpha=0.1)+
geom_vline(xintercept = 7.55,lwd=33,col="black",alpha=0.1)+
#geom_hline(yintercept = )
scale_fill_npg()+
ylab("OR (95% CI)")+
theme_test()+
theme(panel.spacing.x = unit(0.2,"cm"),
      panel.spacing.y = unit(0.1, "cm"),
      axis.title = element_blank(),
      axis.text = element_text(color="black"),
      axis.text.x=element_text(size=12,angle = 45,vjust=1,hjust=1),
      axis.ticks.x=element_blank(),
      axis.text.y = element_text(size = 12),
      axis.title.y.left=element_text(size=14,color="black"),
      legend.text = element_text(color="black",size=9),
      legend.title=element_blank(),
      legend.spacing.x=unit(0.1,'cm'),
      legend.key=element_blank(),
      legend.key.width=unit(0.4,'cm'),
      legend.key.height=unit(0.4,'cm'),
      legend.position = "top",
      strip.background = element_rect(fill = "white",colour = "black",size=0.3),#3182bd
      #fill =gray(0.85),colour = gray(0.3),
      strip.text.y=element_text(size=14,face = "bold"),
      strip.text.x=element_text(size=14,face = "bold"),
      plot.margin=unit(c(0.3,0.3,0.3,0.3),units="cm"))
cairo_pdf("figure4.pdf",width=9,height=8,family = "Calibri")
p
dev.off()

```

5. Codes for Figure 5

```

library(xlsx);library(ggplot2);library(ggthemes)
data<-read.xlsx("Results.xlsx",sheetIndex = 4)
p1 <- ggplot(data,aes(x=exposure,y=af*100,fill=outcome))+
  geom_bar(stat = 'identity',position = position_dodge(0.75), width=0.75,color="black")+

```

```

geom_text(aes(label=round(af*100,1)),size=4,vjust=3,
          position = position_dodge(0.75),color="black")+
geom_vline(xintercept = 6.6,lwd=142,col="grey50",alpha=0.1)+
geom_errorbar(aes(x=exposure,ymin=aflow*100, ymax=afhigh*100),
              stat = 'identity', position=position_dodge(.75), width=.2) +
scale_fill_manual(values = c("#b3cde3","#fbb4ae"))+
scale_y_continuous(limits = c(0,8),breaks = seq(0,8,2), labels = seq(0,8,2))+
scale_x_discrete(limits=c(paste0("NDVI",c(500,1000,2000,3000)),
                          paste0("EVI",c(500,1000,2000,3000))),
                 labels=c(expression(NDVI["-500m"]),expression(NDVI["-1000m"]),
                           expression(NDVI["-2000m"]),expression(NDVI["-3000m"]),
                           expression(EVI["-500m"]),expression(EVI["-1000m"]),
                           expression(EVI["-2000m"]),expression(EVI["-3000m"])))
labs(title = "a",y="Attributable fractions (%)",x=NULL)+
theme_calc(base_size = 12,base_family = "Calibri")+
theme(axis.text.x = element_text(size = 12),
      axis.text.y = element_text(size = 12),
      axis.title.y = element_text(size = 14),
      legend.position = c(0.1,0.89),
      legend.direction = "horizontal",
      legend.background = element_blank(),
      legend.title = element_blank(),
      plot.title = element_text(size = 16,face = "bold"),
      plot.background = element_blank()
)
##
p2 <- ggplot(data,aes(x=exposure,y=an/1000,fill=outcome))+
geom_bar(stat = 'identity',position = position_dodge(0.75),width=0.75,color="black")+
geom_text(aes(label=format(round(an,0),0)),size=4,vjust=3,
          position = position_dodge(0.75),color="black")+
geom_vline(xintercept = 6.6,lwd=142,col="grey50",alpha=0.1)+
geom_errorbar(aes(x=exposure,ymin=low, ymax=high),
              stat = 'identity',
              position=position_dodge(.8), width=.2) +
scale_fill_manual(values = c("#b3cde3","#fbb4ae"))+
scale_y_continuous(limits = c(0,6000),breaks = seq(0,6000,2000),
                  labels = seq(0,6000,2000))+
scale_x_discrete(limits=c(paste0("NDVI",c(500,1000,2000,3000)),
                          paste0("EVI",c(500,1000,2000,3000))),
                 labels=c(expression(NDVI["-500m"]),expression(NDVI["-1000m"]),
                           expression(NDVI["-2000m"]),expression(NDVI["-3000m"]),
                           expression(EVI["-500m"]),expression(EVI["-1000m"]),
                           expression(EVI["-2000m"]),expression(EVI["-3000m"])))

```

```
labs(title = "b",y= "Avoidable number",x=NULL)+
theme_calc(base_size = 12,base_family = "Calibri")+
theme(axis.text.x = element_text(size = 12),
      axis.text.y = element_text(size = 12),
      axis.title.y = element_text(size = 14),
      legend.position = c(0.1,0.89),
      legend.direction = "horizontal",
      legend.background = element_blank(),
      legend.title = element_blank(),
      plot.title = element_text(size = 16,face = "bold"),
      plot.background = element_blank())

##
library(ggpubr)
p<-ggarrange(p1,p2,ncol = 1,align = "v")
cairo_pdf("figure/figure5.pdf",width = 9,height = 8,family = "Calibri")
p
dev.off()
```