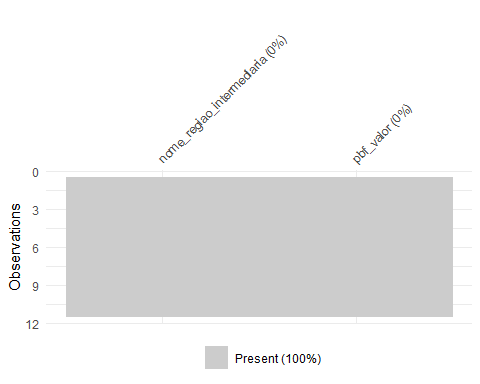
multivariada04

Panosso AR & Oliveira JA

2023-07-14

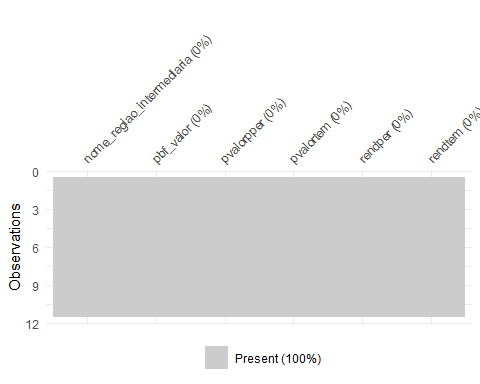
### Base de dados - “im”

# Carregando a base de dados  
im <- read\_rds("data/im.rds") %>%   
 select(nome,id\_municipio:valor\_pago\_pbf)  
  
im <- left\_join(im,  
 df\_nomes %>%   
 select(nome, nome\_regiao\_intermediaria),  
 by = "nome") %>%   
 relocate(nome, nome\_regiao\_intermediaria)  
  
  
tab\_im <- im %>% filter(ano >= 2010) %>%   
 group\_by(nome\_regiao\_intermediaria, nome, ano) %>%   
 summarise(  
 familias\_beneficiarias\_pbf = mean(familias\_beneficiarias\_pbf,na.rm=TRUE),  
 pessoas\_beneficiarias\_pbf = mean(pessoas\_beneficiarias\_pbf,na.rm=TRUE),  
 valor\_pago\_pbf = mean(valor\_pago\_pbf,na.rm=TRUE)  
 ) %>%   
 group\_by(ano, nome\_regiao\_intermediaria) %>% filter(ano >=2010, ano < 2020) %>%   
 summarise(  
 nfamilias = sum(familias\_beneficiarias\_pbf, na.rm=TRUE),  
 npessoa = sum(pessoas\_beneficiarias\_pbf, na.rm=TRUE),  
 valorpago = sum(valor\_pago\_pbf, na.rm=TRUE),  
 )  
  
base\_multivariada <- tab\_im %>%   
 filter(ano>= 2015, ano < 2020) %>%   
 group\_by(nome\_regiao\_intermediaria) %>%   
 summarise(  
 pbf\_valor = sum(valorpago, na.rm=TRUE)  
 )  
visdat::vis\_miss(base\_multivariada)



### Base de dados “lavouras”

lavoura\_permanente <- read\_rds("data/permanente.rds")   
lavoura\_temporaria <- read\_rds("data/temporaria.rds")  
lavouras <- rbind(lavoura\_permanente %>%   
 mutate(tipo = "permanente"),  
 lavoura\_temporaria %>%   
 mutate(tipo = "temporaria")  
)  
lavouras$na <- apply(  
 lavouras[5:12],  
 1,   
 function(x) sum(is.na(x))  
)  
  
lavouras <- lavouras %>%   
 filter(na != 8, ano >= 2010,  
 produto != "Café (em grão) Arábica",  
 produto != "Café (em grão) Canephora") %>%   
 select(-na)  
  
lavouras <- lavouras %>%   
 group\_by(tipo, ano, nome) %>%   
 summarise(  
 n\_produtos = n(),  
 area\_plantada = sum(area\_plantada,na.rm=TRUE),  
 rendimento\_medio = mean(rendimento\_medio,na.rm=TRUE),  
 prop\_area\_colhida = mean(prop\_area\_colhida,na.rm=TRUE) ,  
 prop\_valor\_producao = mean(prop\_valor\_producao,na.rm=TRUE)  
 ) %>%   
 pivot\_wider(names\_from = tipo,  
 values\_from = n\_produtos:prop\_valor\_producao)  
  
  
lavouras <- left\_join(lavouras, df\_nomes %>%   
 select(nome, nome\_regiao\_intermediaria),  
 by = "nome") %>%   
 relocate(ano, nome, nome\_regiao\_intermediaria)  
  
lavouras\_resu <- lavouras %>%   
 group\_by(nome\_regiao\_intermediaria) %>%   
 summarize(  
 npper = mean(n\_produtos\_permanente,na.rm=TRUE),   
 nptem = mean(n\_produtos\_temporaria,na.rm=TRUE),   
 areapper = mean(area\_plantada\_permanente,na.rm=TRUE),   
 areapltem = mean(area\_plantada\_temporaria,na.rm=TRUE),   
 rendper = mean(rendimento\_medio\_permanente,na.rm=TRUE),   
 rendtem = mean(rendimento\_medio\_temporaria,na.rm=TRUE),   
 pacolhidaper = mean(prop\_area\_colhida\_permanente,na.rm=TRUE),   
 pacolhidatem = mean(prop\_area\_colhida\_temporaria,na.rm=TRUE),   
 pvalorpper = mean(prop\_valor\_producao\_permanente,na.rm=TRUE),   
 pvalortem = mean(prop\_valor\_producao\_temporaria,na.rm=TRUE)   
 )  
  
base\_multivariada <- left\_join(base\_multivariada,  
 lavouras\_resu %>%   
 select(nome\_regiao\_intermediaria,  
 pvalorpper,  
 pvalortem,  
 rendper,  
 rendtem),  
 by = "nome\_regiao\_intermediaria")  
  
visdat::vis\_miss(base\_multivariada)

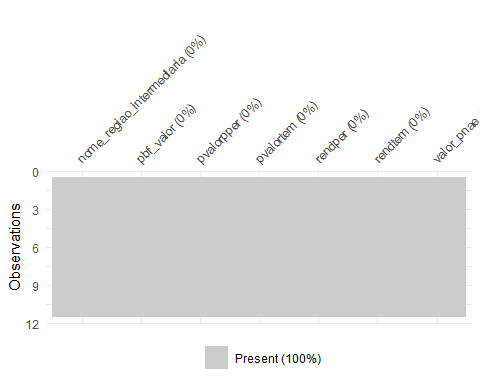


### Base de dados - “pnae”

pnae\_alunos <- read\_rds("data/pnae\_alunos\_atendidos.rds")  
lista\_etapas <- pnae\_alunos$etapa\_ensino %>% unique()  
pnae\_recurso <- read\_rds("data/pnae\_recurso.rds")   
pnae\_recurso <- pnae\_recurso %>%   
 mutate(  
 modalidade\_ensino = ifelse(modalidade\_ensino == "EJA",  
 "EDUCAÇÃO DE JOVENS E ADULTOS (EJA)",  
 modalidade\_ensino)  
 )

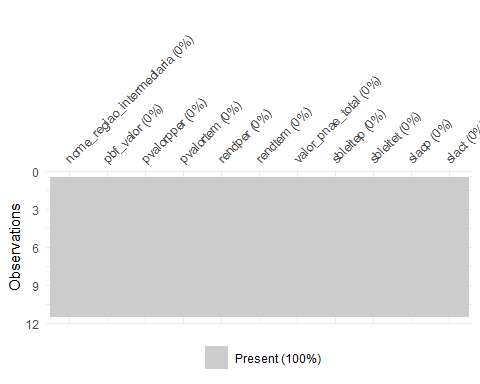
pnae\_recurso <- pnae\_recurso %>%   
 group\_by(nome, ano, esfera\_governo, modalidade\_ensino) %>%   
 summarise(vl\_total\_escolas = mean(vl\_total\_escolas)) %>%   
 rename(etapa\_ensino = modalidade\_ensino) %>%   
 filter(etapa\_ensino %in% lista\_etapas)  
  
pnae <- left\_join(pnae\_alunos %>% filter(esfera\_governo == "MUNICIPAL") %>%  
 select(ano:qt\_alunos\_pnae,nome),  
 pnae\_recurso,  
 by =c("nome","ano","esfera\_governo","etapa\_ensino"))  
  
pnae <- left\_join(pnae, df\_nomes %>%   
 select(nome, nome\_regiao\_intermediaria),  
 by = "nome")

pnae\_resumo <- pnae %>%   
 # filter(ano >= 2010, ano <= 2020) %>%   
 # drop\_na() %>%   
 group\_by(ano, nome\_regiao\_intermediaria, etapa\_ensino) %>%   
 summarise(  
 qt\_alunos\_pnae = sum(qt\_alunos\_pnae,na.rm=TRUE),  
 vl\_total\_escolas = sum(vl\_total\_escolas,na.rm=TRUE)  
 ) %>%   
 pivot\_wider(  
 names\_from = etapa\_ensino,  
 values\_from = c(qt\_alunos\_pnae,vl\_total\_escolas)) %>%   
 group\_by(nome\_regiao\_intermediaria) %>%   
 mutate(  
 across(qt\_alunos\_pnae\_CRECHE:`vl\_total\_escolas\_ATENDIMENTO EDUCACIONAL ESPECIALIZADO (AEE)`, function(x) mean(x,na.rm=TRUE))) %>%   
 janitor::clean\_names() %>%   
 filter(ano == 2007) %>%   
 select(-ano)  
  
pnae\_resumo <- pnae\_resumo %>%   
 select(-qt\_alunos\_pnae\_ensino\_medio,  
 -qt\_alunos\_pnae\_indigena,  
 -qt\_alunos\_pnae\_quilombola,  
 -vl\_total\_escolas\_ensino\_medio,  
 -vl\_total\_escolas\_indigena,  
 -vl\_total\_escolas\_quilombola  
 )  
nomes\_antigos <- names(pnae\_resumo)  
nomes\_novos <- c(  
 "nome", "qt\_creche", "qt\_eja", "qt\_fundamental",   
 "qt\_pre\_escola", "qt\_aee", "vl\_creche", "vl\_eja",   
 "vl\_fundamental", "vl\_pre\_escola", "vl\_aee")  
pnae\_resumo <- pnae\_resumo %>%   
 rename\_at(vars(nomes\_antigos),~nomes\_novos)  
  
pnae\_resumo$valor\_pnae\_total <- pnae\_resumo %>%   
 rename(nome\_regiao\_intermediaria = nome) %>%   
 ungroup() %>%   
 select(starts\_with("vl\_")) %>% apply(.,1,sum)  
  
base\_multivariada<-left\_join(base\_multivariada,  
 pnae\_resumo %>%   
 rename(nome\_regiao\_intermediaria = nome) %>%   
 ungroup() %>%   
 select(nome\_regiao\_intermediaria,valor\_pnae\_total),  
 by = "nome\_regiao\_intermediaria")  
visdat::vis\_miss(base\_multivariada)

 ### Base de dados - “sisvan”

sisvan\_estab <- read\_rds("data/sisvan\_estab.rds")  
sisvan <- sisvan\_estab %>%   
 group\_by(municipio, ano) %>%   
 summarise(  
 servico\_nutricao\_proprio =   
 sum(indicador\_servico\_nutricao\_proprio),  
 servico\_nutricao\_terceirizado =   
 sum(indicador\_servico\_nutricao\_terceirizado),  
 servico\_lactario\_proprio =   
 sum(indicador\_servico\_lactario\_proprio), servico\_lactario\_terceirizado =   
 sum(indicador\_servico\_lactario\_terceirizado), servico\_banco\_leite\_proprio =   
 sum(indicador\_servico\_banco\_leite\_proprio), servico\_banco\_leite\_terceirizado=  
 sum(indicador\_servico\_banco\_leite\_terceirizado),  
 # total = trunc(n()/12)  
 ) %>% mutate(nome = municipio)  
  
sisvan\_estab <- left\_join(sisvan\_estab %>%   
 mutate(nome = municipio),   
 df\_nomes %>%  
 select(nome, nome\_regiao\_intermediaria),  
 by = "nome")

sisvan <- left\_join(sisvan,  
 df\_nomes %>%   
 select(nome, nome\_regiao\_intermediaria),  
 by = "nome")  
  
  
sisvan\_resumo <- sisvan %>%   
 group\_by(nome\_regiao\_intermediaria, nome) %>%   
 summarise(  
 snutrip = mean(servico\_nutricao\_proprio,na.rm=TRUE),  
 snutrit = mean(servico\_nutricao\_terceirizado,na.rm=TRUE),   
 slacp = mean(servico\_lactario\_proprio,na.rm=TRUE),  
 slact = mean(servico\_lactario\_terceirizado,na.rm=TRUE),   
 sbleitep = mean(servico\_banco\_leite\_proprio,na.rm=TRUE),  
 sbleitet = mean(servico\_banco\_leite\_terceirizado,na.rm=TRUE),  
 ) %>%   
 group\_by(nome\_regiao\_intermediaria) %>%  
 summarise(  
 snutrip = sum(snutrip,na.rm=TRUE),  
 snutrit = sum(snutrit,na.rm=TRUE),   
 slacp = sum(slacp,na.rm=TRUE),  
 slact = sum(slact,na.rm=TRUE),   
 sbleitep = sum(sbleitep,na.rm=TRUE),  
 sbleitet = sum(sbleitet,na.rm=TRUE),  
 )   
  
base\_multivariada <- left\_join(base\_multivariada,  
 sisvan\_resumo %>%   
 select(nome\_regiao\_intermediaria,  
 sbleitep,sbleitet,slacp,slact),  
 by = "nome\_regiao\_intermediaria")  
visdat::vis\_miss(base\_multivariada)

 ### Base de Dados “Estado Nutricional”

estado\_nutricional <- read\_rds("data/df\_final.rds") %>%   
 group\_by(ano,fase\_da\_vida,idade,indice,municipio) %>%   
 mutate(valor\_p = valor/sum(valor)\*100) %>%   
 ungroup()

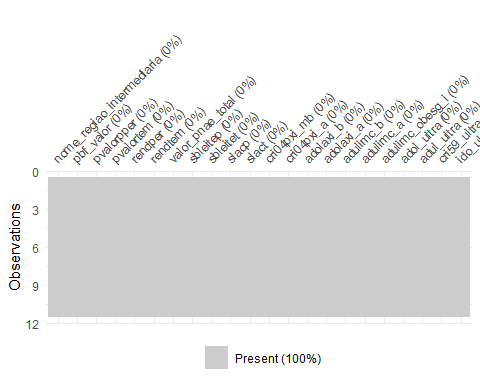
estado\_nutricional <- left\_join(estado\_nutricional,   
 df\_nomes %>% select(nome, id\_municipio\_6,nome\_regiao\_intermediaria) %>%   
 rename(id\_municipio = id\_municipio\_6),  
 by = c("id\_municipio")) %>%   
 select(-regiao,-uf,-codigo\_uf,-id\_municipio,-municipio,-indice\_cri,  
 -indice\_ado,-valor) %>% relocate(ano,nome,nome\_regiao\_intermediaria) %>%   
 pivot\_wider(names\_from = c(fase\_da\_vida, idade, indice, classe),  
 values\_from = c(valor\_p)) %>%   
 janitor::clean\_names()

estado\_nutri\_resumo <- estado\_nutricional %>%   
 group\_by(nome) %>%   
 mutate(across(crianca\_0\_4\_peso\_x\_idade\_muito\_baixo:idoso\_imc\_sobrepeso,mean)) %>%   
 filter(ano == 2017) %>%   
 select(-ano)

# estado\_nutri\_resumo %>% names  
nomes\_antigos <- names(estado\_nutri\_resumo)  
estado\_nutri\_resumo <- estado\_nutri\_resumo %>%   
 rename\_at(vars(nomes\_antigos), ~novos\_nomes)

consumo <- read\_rds("data/consumo/consumo.rds")  
consumo <- left\_join(consumo, df\_nomes %>% select(nome, id\_municipio\_6, nome\_regiao\_intermediaria) %>%   
 rename(codigo\_ibge = id\_municipio\_6) %>%  
 mutate(codigo\_ibge = as.numeric(codigo\_ibge)),  
 by = c("codigo\_ibge"))  
#consumo$tipo\_relatorio %>% unique()  
  
tipos\_relat <- c("CONS\_ULTRA","CONS\_EMBUT")  
  
consumo <- consumo %>% select(-faixa\_etaria, -codigo\_ibge, -municipio,  
 -uf, -total, -monitorados) %>%   
 filter(tipo\_relatorio %in% tipos\_relat,  
 fase\_da\_vida != "entre-6-meses-23-meses")  
  
consumo <- consumo %>%   
 pivot\_wider(names\_from = c(fase\_da\_vida,tipo\_relatorio),  
 values\_from = percent) %>%   
 janitor::clean\_names()

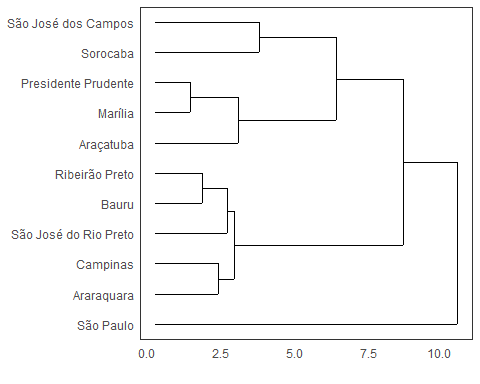
consumo\_estado\_nutricional <- left\_join(consumo, estado\_nutricional,  
 by=c("ano","nome","nome\_regiao\_intermediaria"))  
  
consumo\_resumo <- consumo %>%   
 group\_by(nome\_regiao\_intermediaria, nome) %>%   
 summarise(  
 adol\_embut = mean(adolecentes\_cons\_embut,na.rm=TRUE),   
 adol\_ultra = mean(adolecentes\_cons\_ultra,na.rm=TRUE),   
 adul\_embut = mean(adultos\_cons\_embut,na.rm=TRUE),   
 adul\_ultra = mean(adultos\_cons\_ultra,na.rm=TRUE),   
 cri24\_embut = mean(criancas\_2\_4\_cons\_embut,na.rm=TRUE),  
 cri24\_ultra = mean(criancas\_2\_4\_cons\_ultra,na.rm=TRUE),   
 cri59\_embut = mean(criancas\_5\_9\_cons\_embut,na.rm=TRUE),  
 cri59\_ultra = mean(criancas\_5\_9\_cons\_ultra,na.rm=TRUE),  
 ido\_embut = mean(idosos\_cons\_embut,na.rm=TRUE),   
 ido\_ultra = mean(idosos\_cons\_ultra,na.rm=TRUE)   
 )  
  
consumo\_estado\_nutricional\_resumo <- left\_join(estado\_nutri\_resumo, consumo\_resumo,  
 by = c("nome","nome\_regiao\_intermediaria"))   
  
consumo\_estado\_nutricional\_resumo <- consumo\_estado\_nutricional\_resumo %>%  
 group\_by(nome\_regiao\_intermediaria) %>%   
 mutate(across(where(is.numeric), function(x) {  
 mean(x,na.rm=TRUE)  
 })) %>% select(-nome) %>%   
 distinct() %>% ungroup()  
  
base\_multivariada\_final<-left\_join(base\_multivariada,  
 consumo\_estado\_nutricional\_resumo %>%   
 select(nome\_regiao\_intermediaria, cri04pxi\_mb,cri04pxi\_a,adolaxi\_b,adolaxi\_a,adulimc\_b,adulimc\_a,adulimc\_obesg\_i,adol\_ultra,adul\_ultra,cri59\_ultra,ido\_ultra),  
 by = "nome\_regiao\_intermediaria")  
  
visdat::vis\_miss(base\_multivariada\_final)



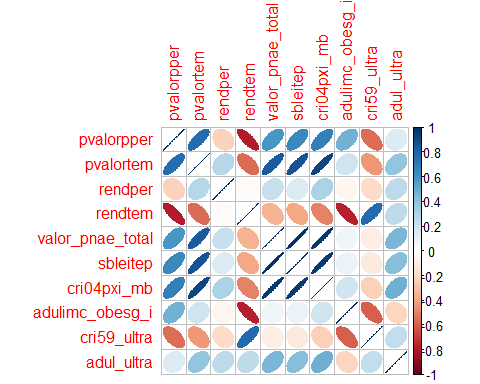
glimpse(base\_multivariada\_final)  
#> Rows: 11  
#> Columns: 22  
#> $ nome\_regiao\_intermediaria <chr> "Araraquara", "Araçatuba", "Bauru", "Campina~  
#> $ pbf\_valor <dbl> 23331002, 17252236, 32368805, 143901391, 290~  
#> $ pvalorpper <dbl> 32.06938, 43.04411, 33.30764, 26.32069, 41.4~  
#> $ pvalortem <dbl> 22.34074, 20.91238, 26.60732, 24.27895, 19.4~  
#> $ rendper <dbl> 16118.90, 10013.23, 17154.66, 18374.05, 1267~  
#> $ rendtem <dbl> 26331.24, 24557.14, 27976.21, 27036.19, 2076~  
#> $ valor\_pnae\_total <dbl> 33960039, 23549775, 49789042, 213697145, 317~  
#> $ sbleitep <dbl> 49.23529, 35.70588, 54.29412, 146.58824, 69.~  
#> $ sbleitet <dbl> 18.58824, 20.00000, 27.52941, 104.00000, 51.~  
#> $ slacp <dbl> 176.5294, 143.4118, 312.2941, 834.4706, 254.~  
#> $ slact <dbl> 32.529412, 19.294118, 10.647059, 71.000000, ~  
#> $ cri04pxi\_mb <dbl> 1.5726608, 1.0598679, 1.1731888, 2.1430115, ~  
#> $ cri04pxi\_a <dbl> 80.05143, 83.28411, 82.46787, 70.45003, 83.9~  
#> $ adolaxi\_b <dbl> 8.573601, 5.688026, 6.839120, 12.251156, 6.3~  
#> $ adolaxi\_a <dbl> 86.49727, 91.10615, 90.18920, 82.50369, 90.4~  
#> $ adulimc\_b <dbl> 3.744068, 3.146034, 4.017444, 4.224828, 3.05~  
#> $ adulimc\_a <dbl> 30.27549, 30.22648, 30.38484, 29.65036, 30.7~  
#> $ adulimc\_obesg\_i <dbl> 19.50858, 20.61756, 19.43634, 19.69363, 20.1~  
#> $ adol\_ultra <dbl> 0.8911780, 0.8750348, 0.9090685, 0.8947255, ~  
#> $ adul\_ultra <dbl> 0.7723664, 0.7612397, 0.7705733, 0.8201318, ~  
#> $ cri59\_ultra <dbl> 0.9431682, 0.8915440, 0.8804550, 0.8959593, ~  
#> $ ido\_ultra <dbl> 0.7198289, 0.6004985, 0.6235637, 0.6749000, ~

# Análise Multivariada

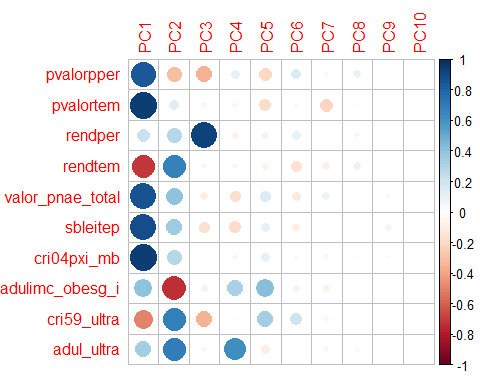
da <- base\_multivariada\_final %>%   
 select(pbf\_valor:valor\_pnae\_total,sbleitep,cri04pxi\_mb,adulimc\_obesg\_i,  
 cri59\_ultra,adul\_ultra)  
  
da\_pad <- decostand(da[-1] ,   
 method = "standardize",  
 na.rm=TRUE)  
row.names(da\_pad) <- base\_multivariada\_final$nome\_regiao\_intermediaria  
da\_pad\_euc<-vegdist(da\_pad,"euclidean",na.rm=TRUE)   
da\_pad\_euc\_ward<-hclust(da\_pad\_euc, method="ward.D")  
grupo<-cutree(da\_pad\_euc\_ward,4)  
n\_grupo <- length(unique(grupo))  
ggdendrogram(da\_pad\_euc\_ward, rotate = TRUE, size = 2)



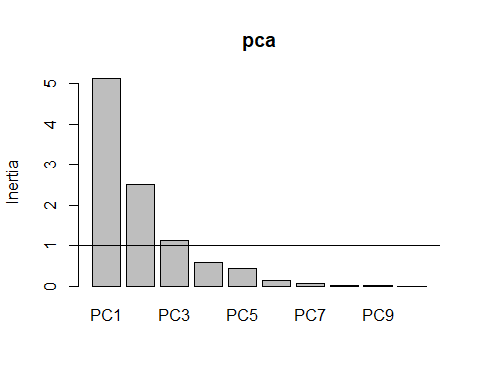
cor\_matrix <- cor(da\_pad,use = "na.or.complete")  
corrplot(cor\_matrix, method="ellipse")



pca <- prcomp(da\_pad,  
 scale=T)  
df<- da\_pad  
# Autovalores  
eig<-pca$sdev^2  
print(round(eig,3))  
#> [1] 5.122 2.506 1.137 0.572 0.437 0.126 0.074 0.020 0.006 0.000  
ve<-eig/sum(eig)  
print(round(ve,4))  
#> [1] 0.5122 0.2506 0.1137 0.0572 0.0437 0.0126 0.0074 0.0020 0.0006 0.0000  
print(round(cumsum(ve),4)\*100)  
#> [1] 51.22 76.28 87.65 93.37 97.74 99.01 99.74 99.94 100.00 100.00  
mcor<-cor(df,pca$x)  
corrplot(mcor)

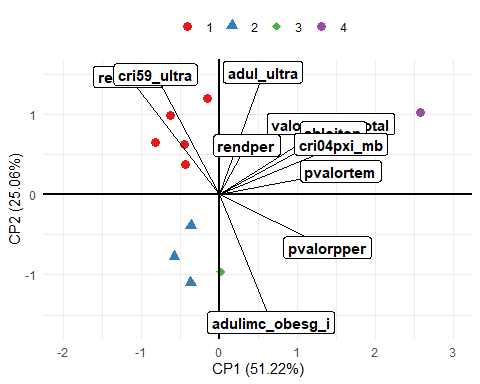


screeplot(pca)  
abline(h=1)



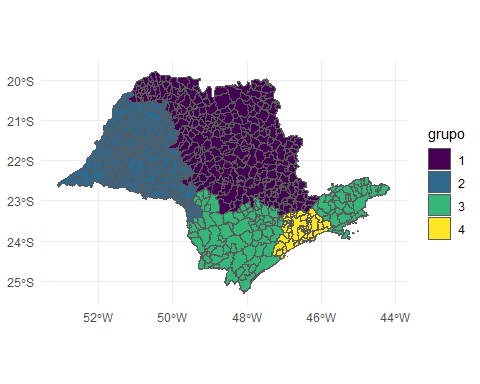
pc1V<-cor(df,pca$x)[,1]/sd(cor(df,pca$x)[,1])  
pc2V<-cor(df,pca$x)[,2]/sd(cor(df,pca$x)[,2])  
pc3V<-cor(df,pca$x)[,3]/sd(cor(df,pca$x)[,3])  
pc1c<-pca$x[,1]/sd(pca$x[,1])  
pc2c<-pca$x[,2]/sd(pca$x[,2])  
pc3c<-pca$x[,3]/sd(pca$x[,3])  
nv<-ncol(df)

bip<-data.frame(pc1c,pc2c,pc3c,grupo=as.factor(grupo))  
texto <- data.frame(x = pc1V, y = pc2V,z = pc3V,label = names(df)  
)  
  
bip %>%   
 ggplot(aes(x=pc1c, y=pc2c))+  
 geom\_point() +  
 geom\_point(aes(shape = grupo, color = grupo), size = 3) + theme\_minimal()+  
 scale\_shape\_manual(values=16:(15+n\_grupo)) +  
 scale\_colour\_brewer(palette = "Set1") +  
 geom\_vline(aes(xintercept=0),  
 color="black", size=1) +  
 geom\_hline(aes(yintercept=0),  
 color="black", size=1) +  
 annotate(geom="segment",  
 x=rep(0,length(df)),  
 xend=texto$x,  
 y=rep(0,length(df)),  
 yend=texto$y,color="black",lwd=.5) +  
 geom\_label(data=texto,aes(x=x,y=y,label=label),  
 color="black",angle=0,fontface="bold",size=4,fill="white") +  
 labs(x=paste("CP1 (",round(100\*ve[1],2),"%)",sep=""),  
 y=paste("CP2 (",round(100\*ve[2],2),"%)",sep=""),  
 color="",shape="") +  
 theme(legend.position = "top") +  
 coord\_cartesian(xlim=c(-2,3))



ck<-sum(pca$sdev^2>=1)  
tabelapca<-vector()  
for( l in 1:ck) tabelapca<-cbind(tabelapca,mcor[,l])  
colnames(tabelapca)<-paste(rep(c("PC"),ck),1:ck,sep="")  
pcat<-round(tabelapca,3)  
tabelapca<-tabelapca[order(abs(tabelapca[,1])),]  
print(tabelapca)  
#> PC1 PC2 PC3  
#> rendper 0.2158033 0.2802054 0.92424102  
#> adul\_ultra 0.3411916 0.6995227 0.04709929  
#> adulimc\_obesg\_i 0.4047664 -0.7309575 0.06129459  
#> cri59\_ultra -0.4924350 0.6857273 -0.34756946  
#> rendtem -0.7074623 0.6730011 -0.04365758  
#> pvalorpper 0.8420740 -0.3030017 -0.34011618  
#> valor\_pnae\_total 0.8694759 0.4029872 -0.09220292  
#> sbleitep 0.8896779 0.3544741 -0.16337256  
#> pvalortem 0.9464886 0.1340522 0.05544224  
#> cri04pxi\_mb 0.9486441 0.2878224 0.01799318

df\_grupo <- data.frame(nome\_regiao\_intermediaria = row.names(da\_pad), grupo)  
  
df\_grupo <- left\_join(df\_nomes %>%   
 select(id\_municipio, nome, nome\_regiao\_intermediaria),  
 df\_grupo,  
 by ="nome\_regiao\_intermediaria")  
  
d\_sf\_municipio <- st\_read("shp/35MUE250GC\_SIR.shp", quiet = TRUE)  
  
d\_sf\_municipio <- d\_sf\_municipio %>%  
 rename(id\_municipio = CD\_GEOCMU) %>%  
 inner\_join(df\_grupo %>%  
 relocate(id\_municipio), "id\_municipio") %>%   
 mutate(grupo = as.factor(grupo))  
  
ggplot(d\_sf\_municipio) +  
 geom\_sf(aes(fill = grupo))+  
 theme\_minimal() +  
 scale\_fill\_viridis\_d()



n\_grupo <- length(unique(grupo))  
nome <- row.names(da\_pad)  
for(i in 1:n\_grupo){  
 print("===============")  
 print(paste0("Grupo ",i,""))  
 print("===============")  
 print(paste(nome[grupo == i],collapse = "; "))  
 cat("\n")  
}  
#> [1] "==============="  
#> [1] "Grupo 1"  
#> [1] "==============="  
#> [1] "Araraquara; Bauru; Campinas; Ribeirão Preto; São José do Rio Preto"  
#>   
#> [1] "==============="  
#> [1] "Grupo 2"  
#> [1] "==============="  
#> [1] "Araçatuba; Marília; Presidente Prudente"  
#>   
#> [1] "==============="  
#> [1] "Grupo 3"  
#> [1] "==============="  
#> [1] "Sorocaba; São José dos Campos"  
#>   
#> [1] "==============="  
#> [1] "Grupo 4"  
#> [1] "==============="  
#> [1] "São Paulo"