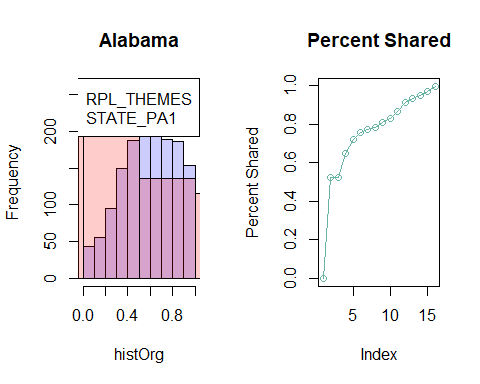
Data Analysis

Eric Cavanna

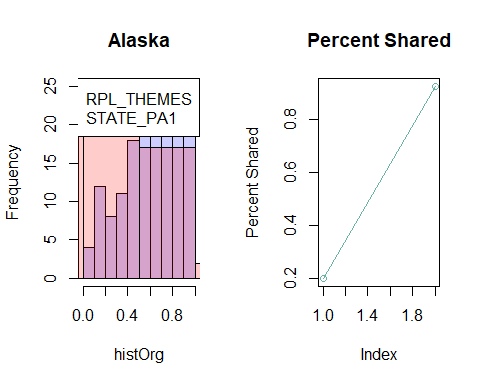
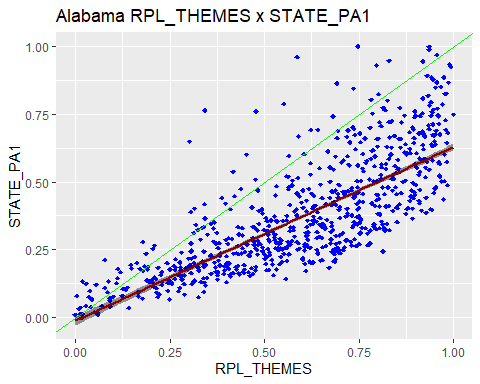
2023-03-26

#does analysis stratified and adds it onto the end of the dataframe  
strat <- "STATE" #sets strata  
byLine <- FA\_By\_Component(cdcUnik, strat,5:21) #does analysis  
withStrata <- left\_join(cdcFAtract, byLine$Strat\_FA, by="FIPS") #adds FA to big dataframe  
#adds name of strata to the last column  
names(withStrata)[length(names(withStrata))] <- paste(strat,"PA1",sep = "\_")

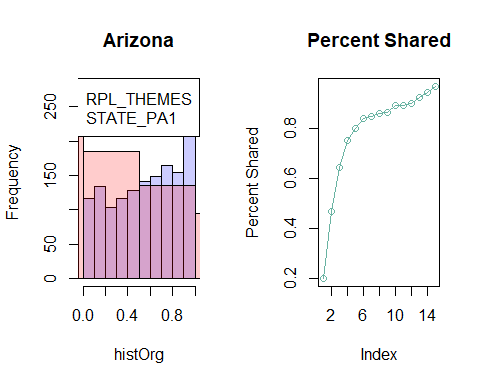
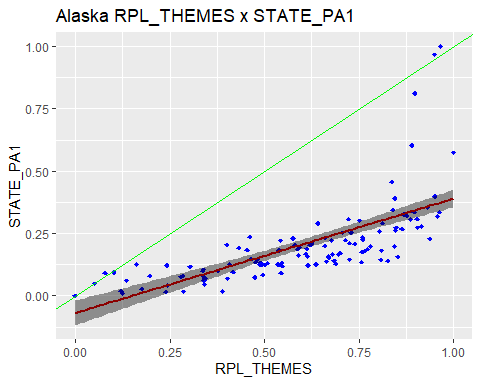
# makes pretty pictures for each strata identified  
#Histo\_By\_Strat(withStrata,"STATE","FULL\_PA1","STATE\_PA1") #compares state to country FA  
  
Histo\_By\_Strat(withStrata, "STATE", "RPL\_THEMES", "STATE\_PA1") #compares state FA to CDC country wide



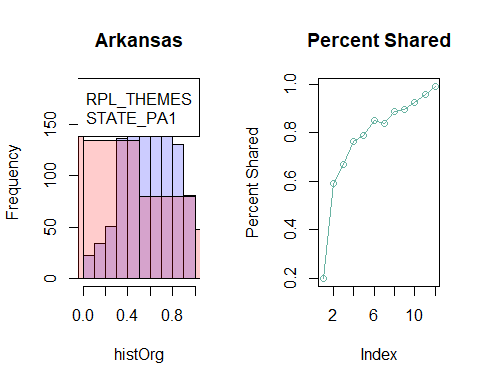
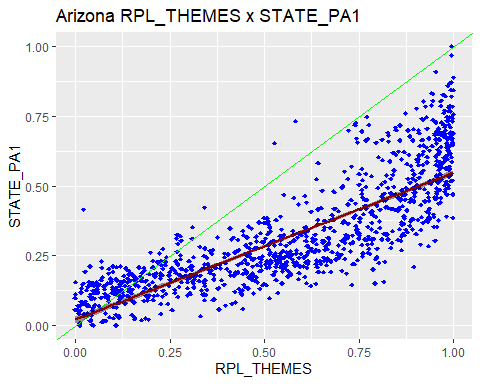
## `geom\_smooth()` using formula = 'y ~ x'



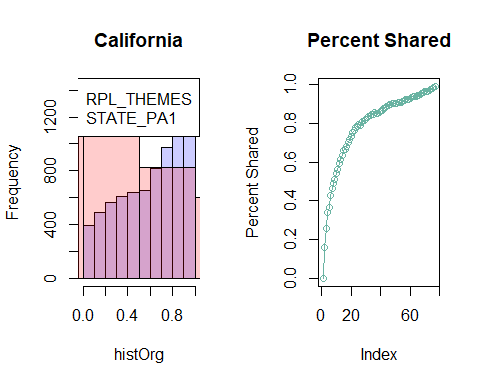
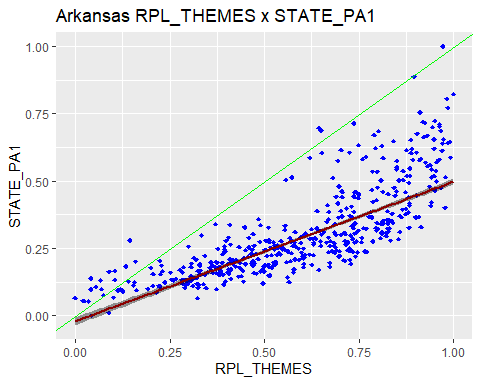
## `geom\_smooth()` using formula = 'y ~ x'



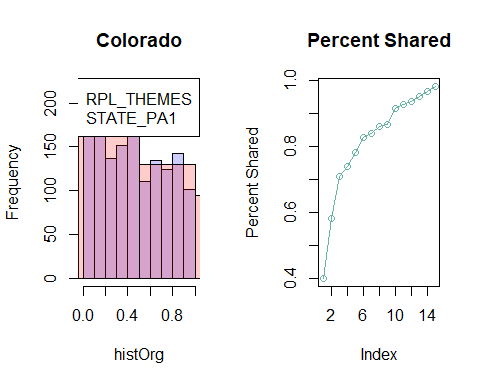
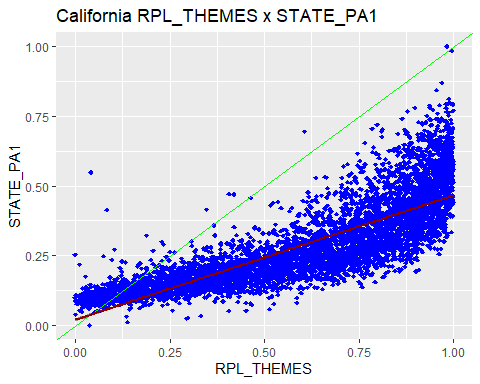
## `geom\_smooth()` using formula = 'y ~ x'



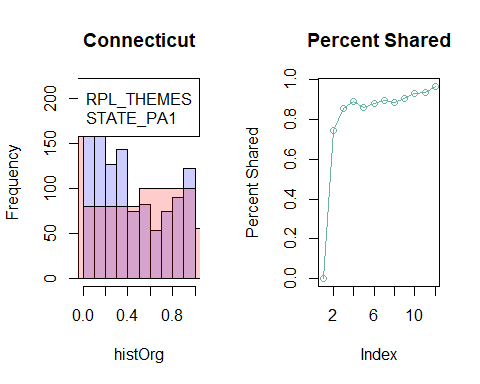
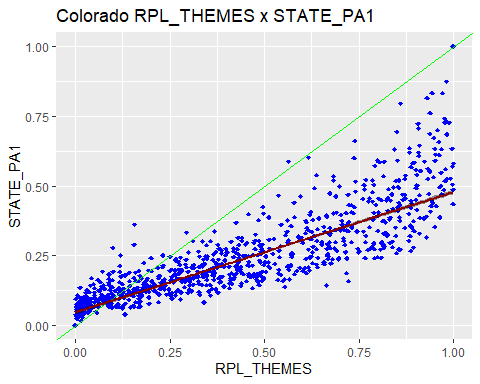
## `geom\_smooth()` using formula = 'y ~ x'



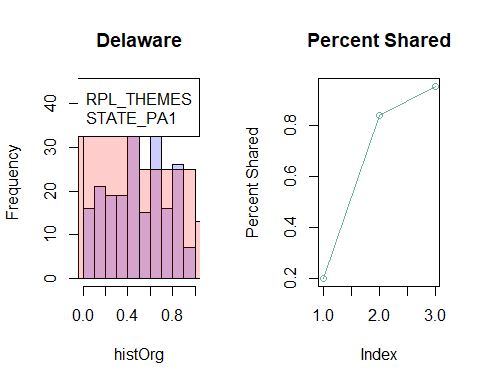
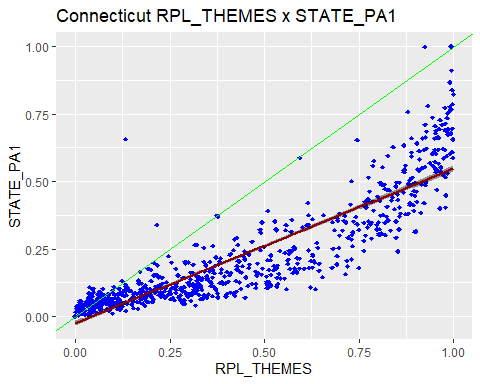
## `geom\_smooth()` using formula = 'y ~ x'



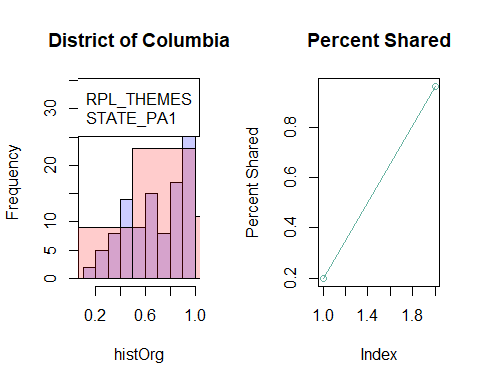
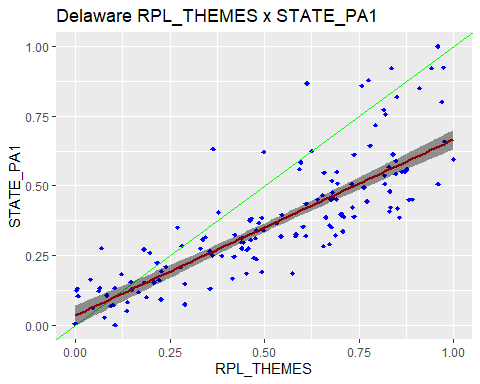
## `geom\_smooth()` using formula = 'y ~ x'



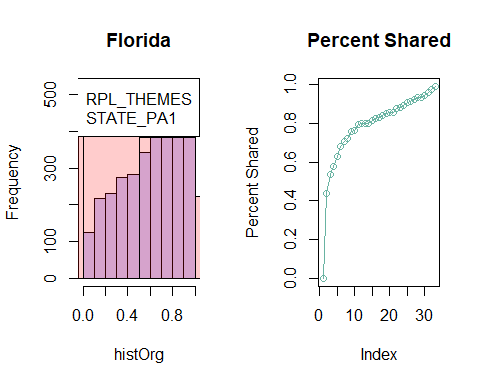
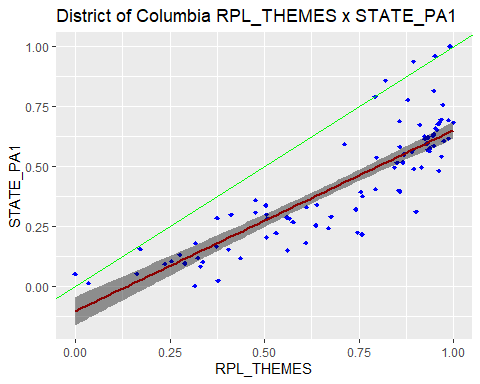
## `geom\_smooth()` using formula = 'y ~ x'



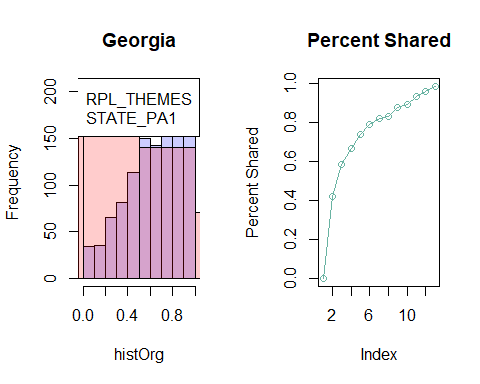
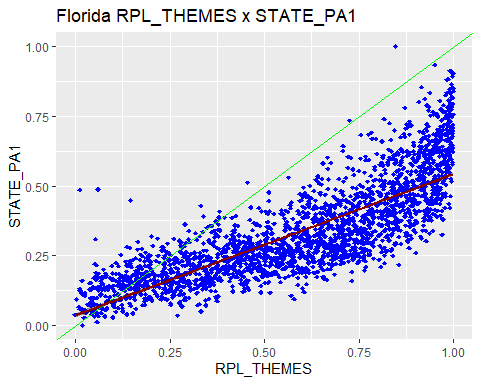
## `geom\_smooth()` using formula = 'y ~ x'



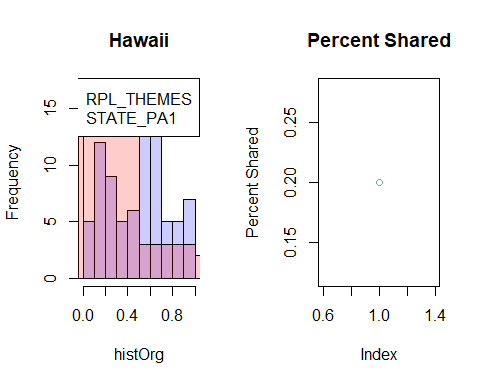
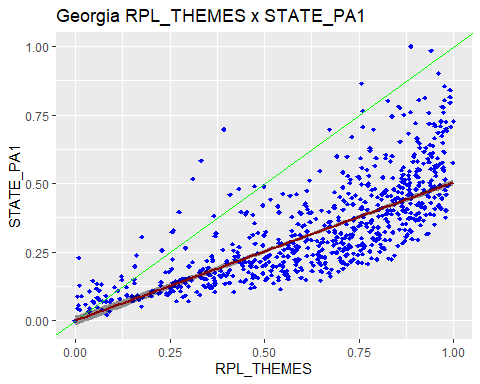
## `geom\_smooth()` using formula = 'y ~ x'



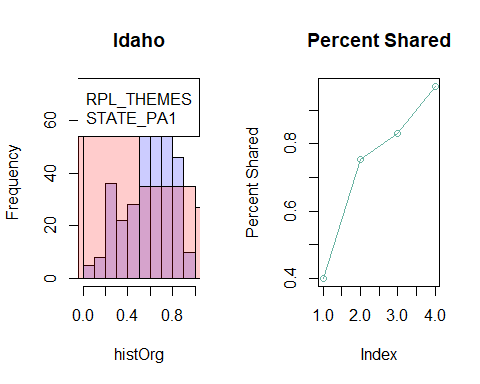
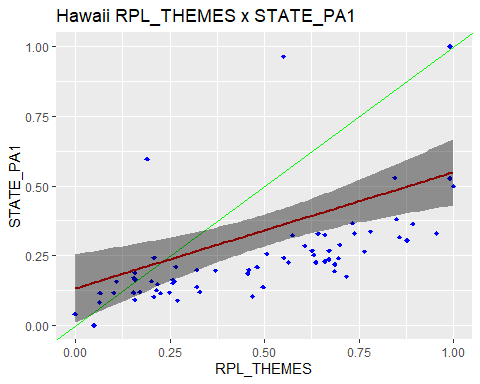
## `geom\_smooth()` using formula = 'y ~ x'



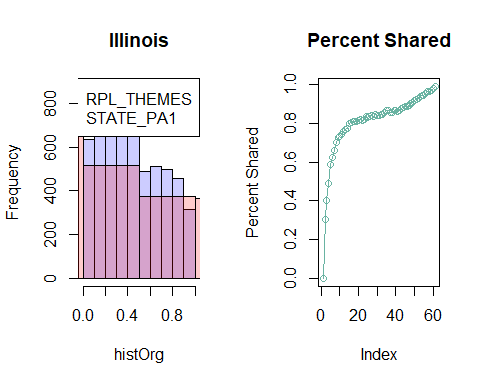
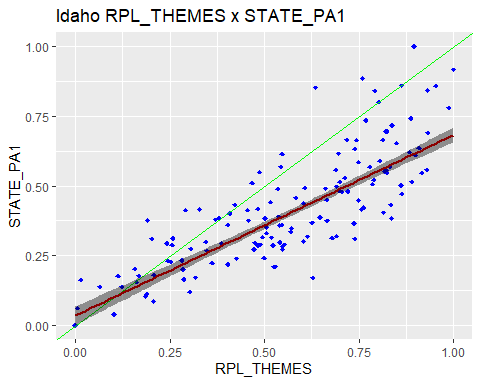
## `geom\_smooth()` using formula = 'y ~ x'



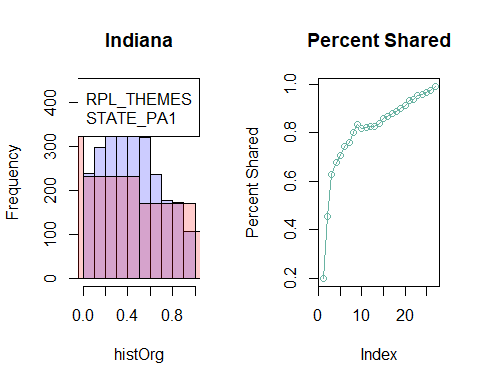
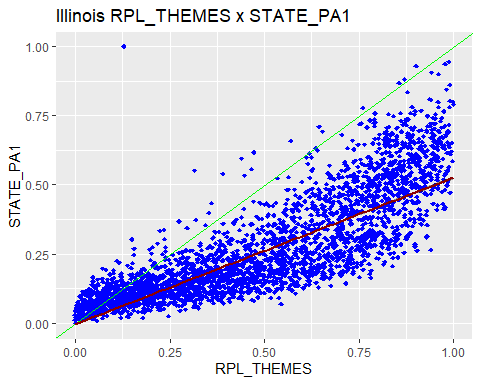
## `geom\_smooth()` using formula = 'y ~ x'



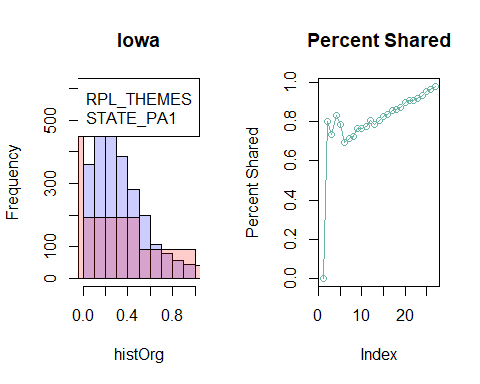
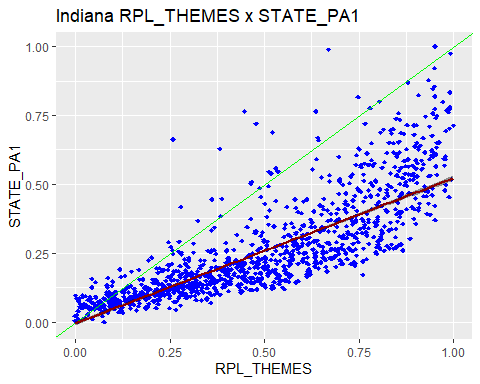
## `geom\_smooth()` using formula = 'y ~ x'



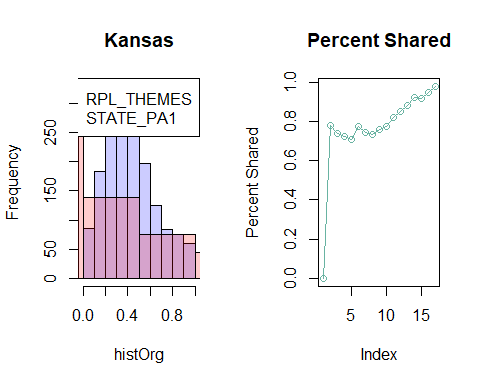
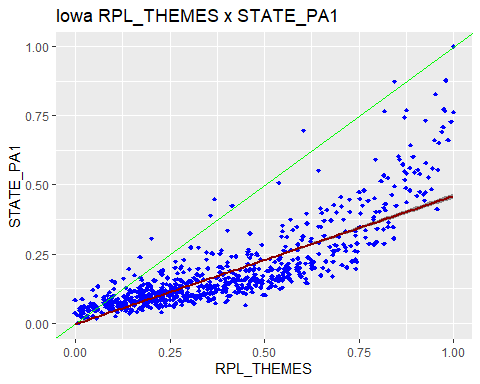
## `geom\_smooth()` using formula = 'y ~ x'



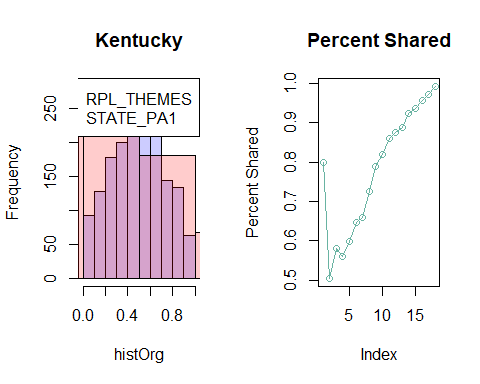
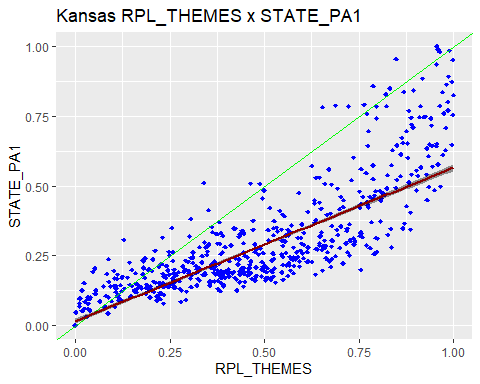
## `geom\_smooth()` using formula = 'y ~ x'



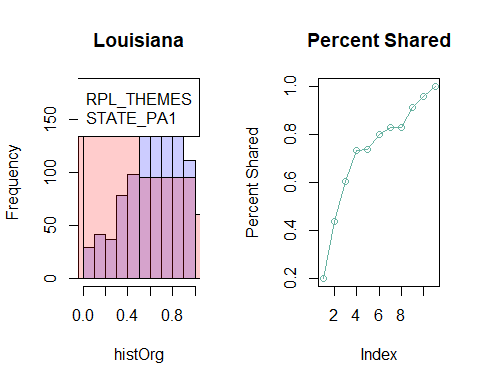
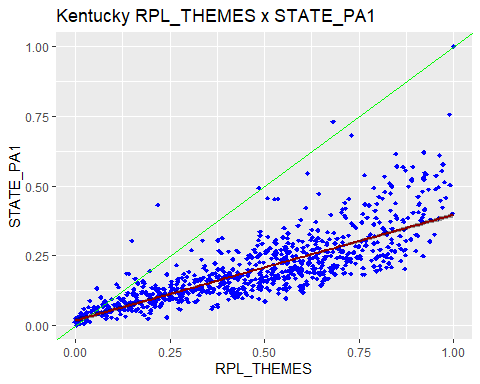
## `geom\_smooth()` using formula = 'y ~ x'



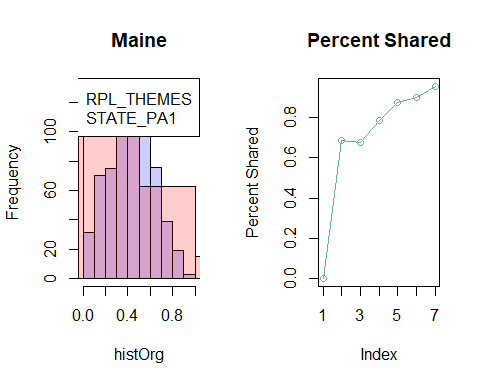
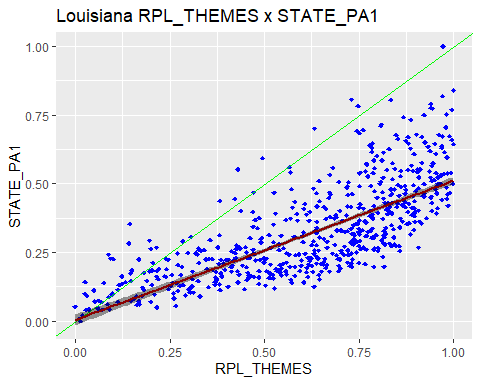
## `geom\_smooth()` using formula = 'y ~ x'



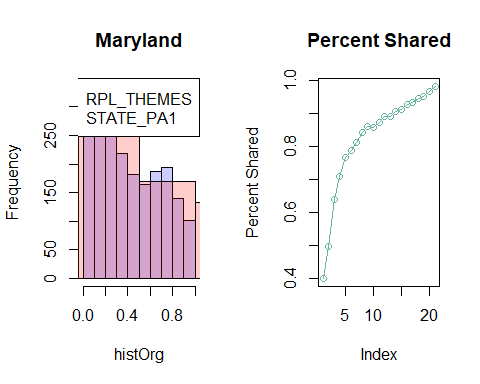
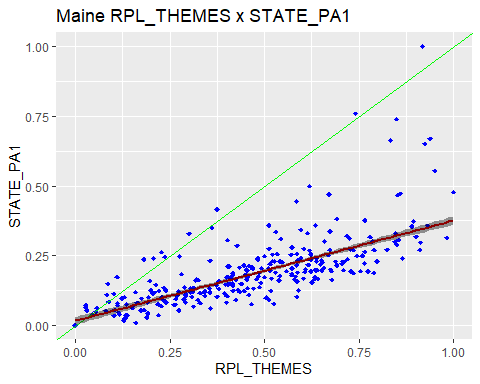
## `geom\_smooth()` using formula = 'y ~ x'



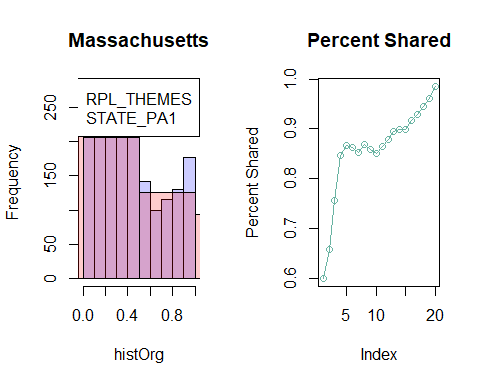
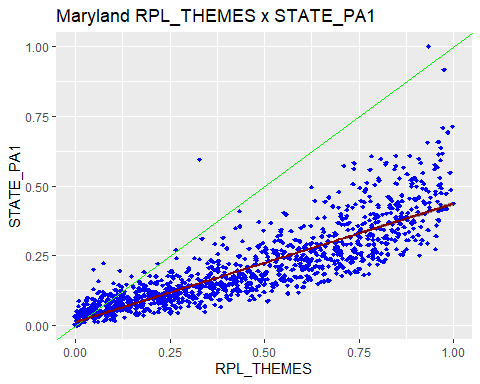
## `geom\_smooth()` using formula = 'y ~ x'



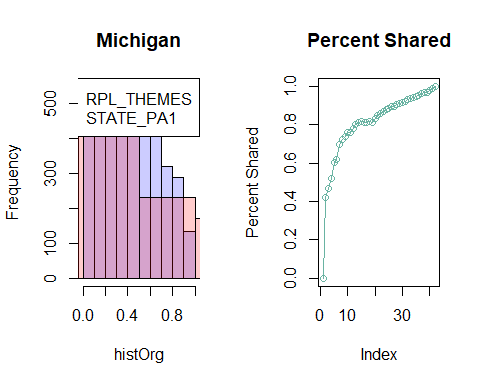
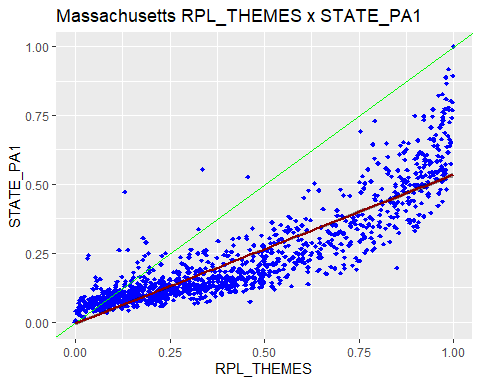
## `geom\_smooth()` using formula = 'y ~ x'



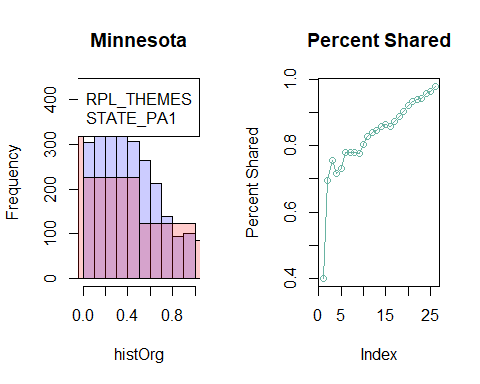
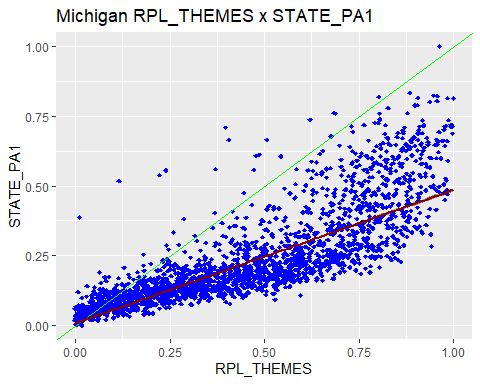
## `geom\_smooth()` using formula = 'y ~ x'



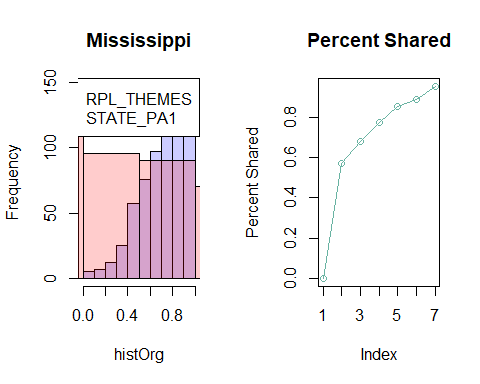
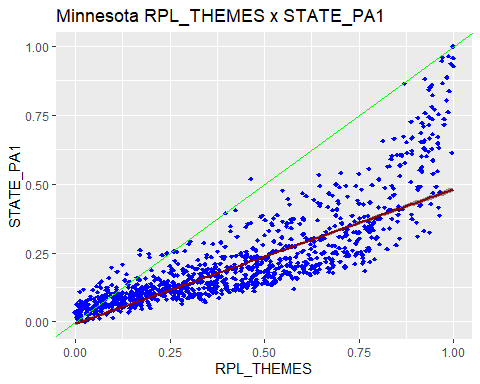
## `geom\_smooth()` using formula = 'y ~ x'



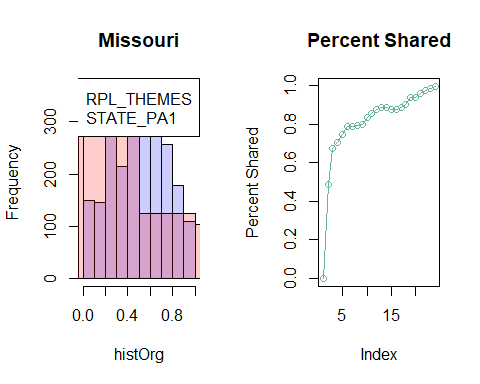
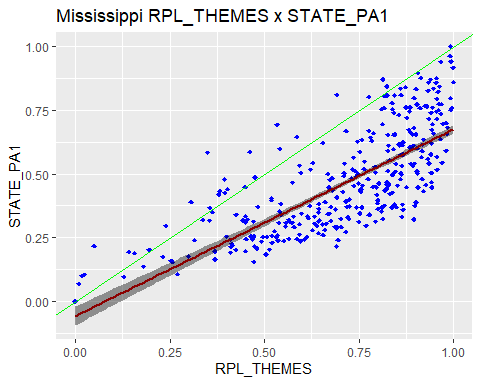
## `geom\_smooth()` using formula = 'y ~ x'



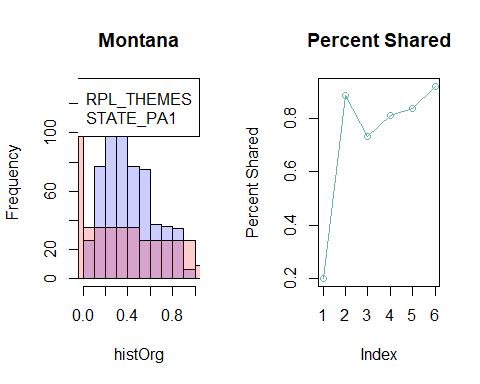
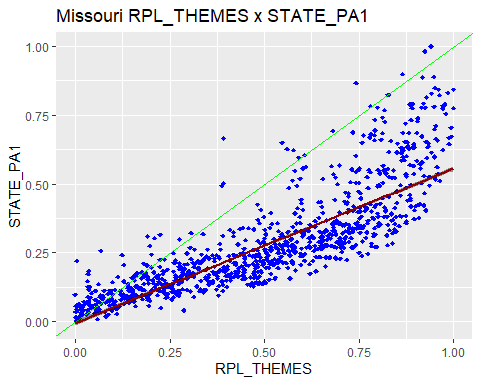
## `geom\_smooth()` using formula = 'y ~ x'



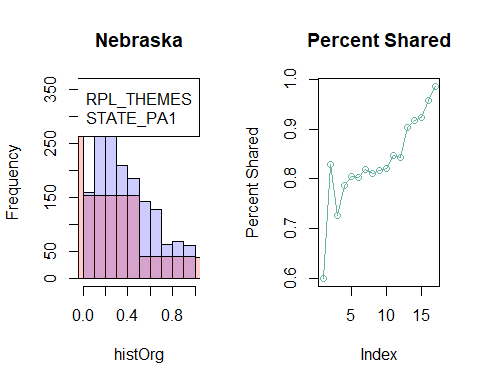
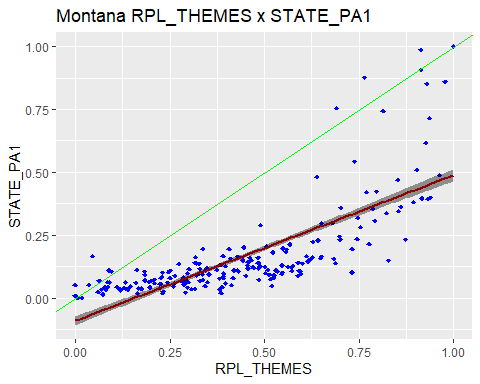
## `geom\_smooth()` using formula = 'y ~ x'



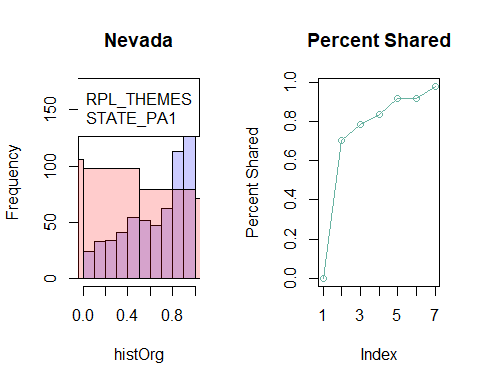
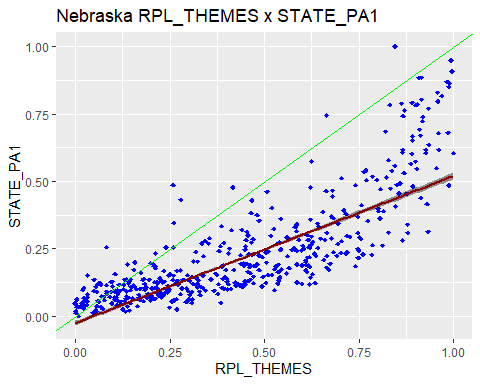
## `geom\_smooth()` using formula = 'y ~ x'



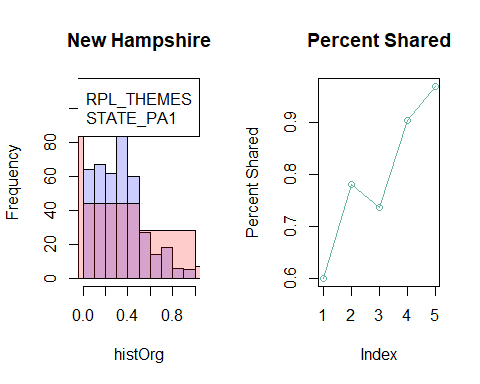
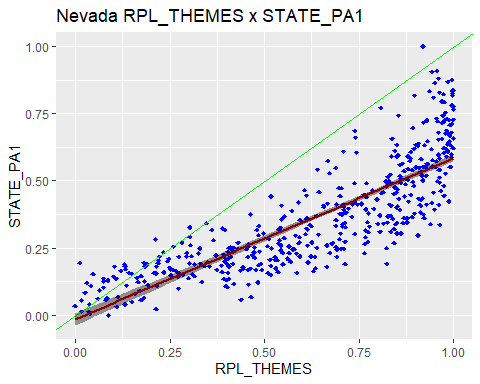
## `geom\_smooth()` using formula = 'y ~ x'



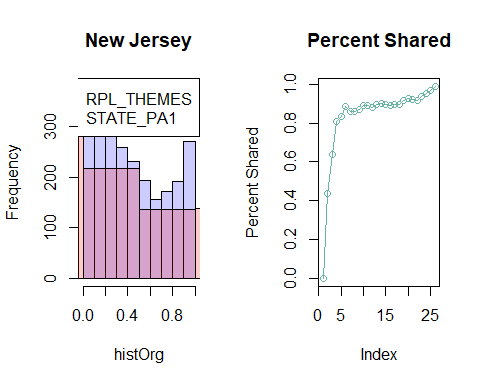
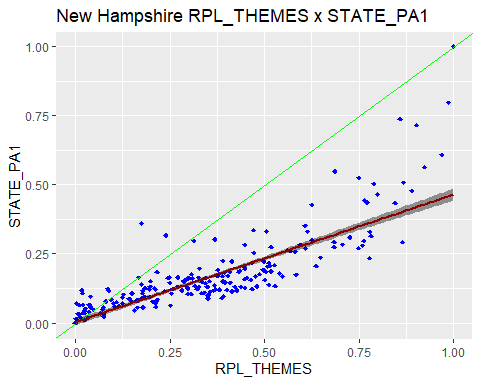
## `geom\_smooth()` using formula = 'y ~ x'



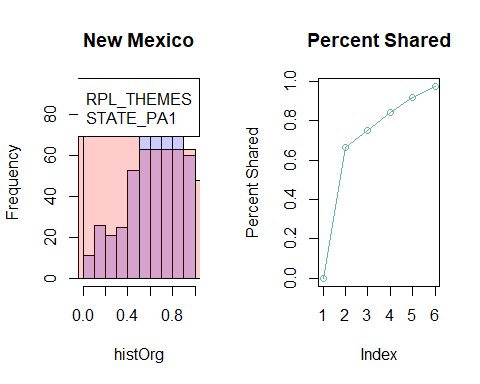
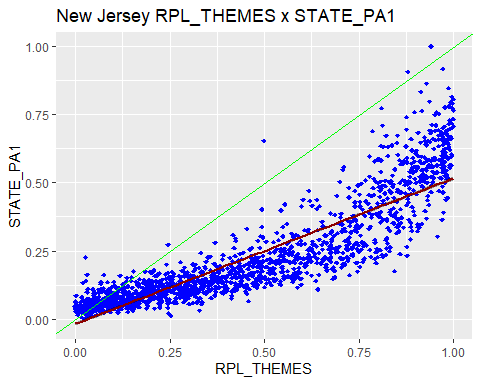
## `geom\_smooth()` using formula = 'y ~ x'



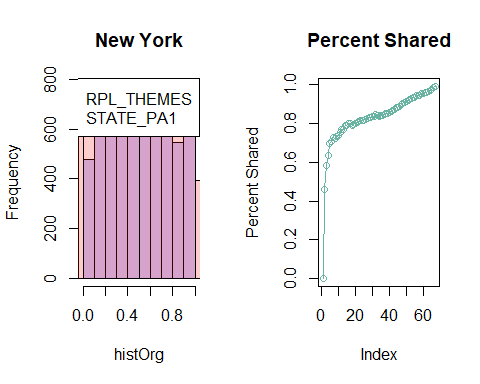
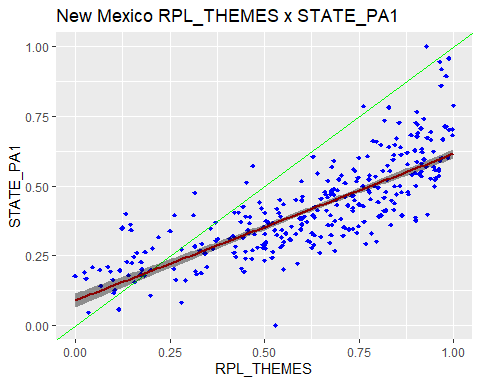
## `geom\_smooth()` using formula = 'y ~ x'



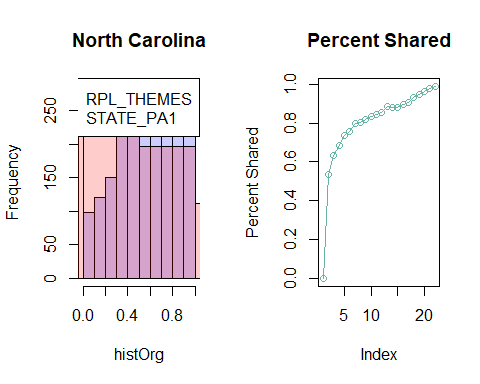
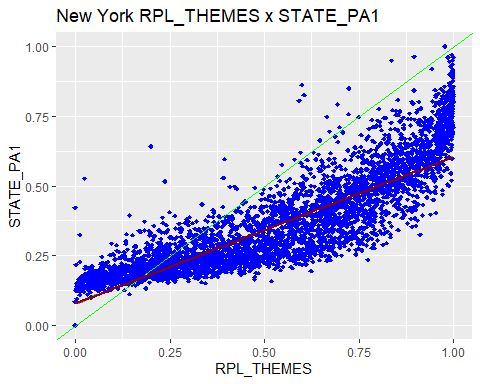
## `geom\_smooth()` using formula = 'y ~ x'



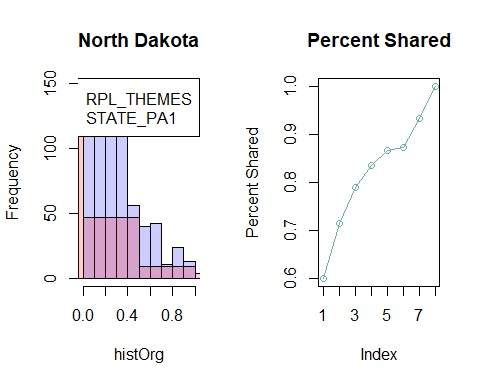
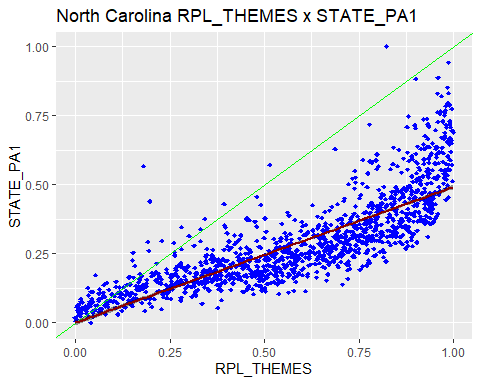
## `geom\_smooth()` using formula = 'y ~ x'



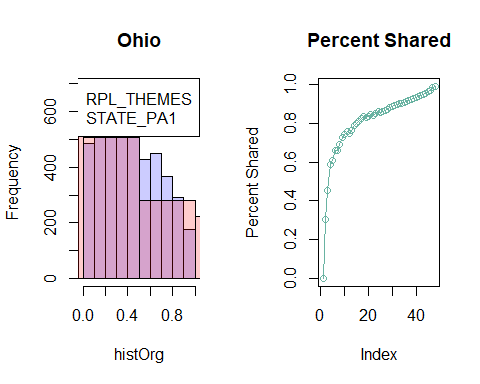
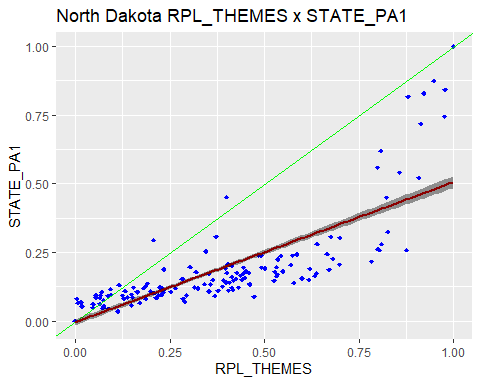
## `geom\_smooth()` using formula = 'y ~ x'



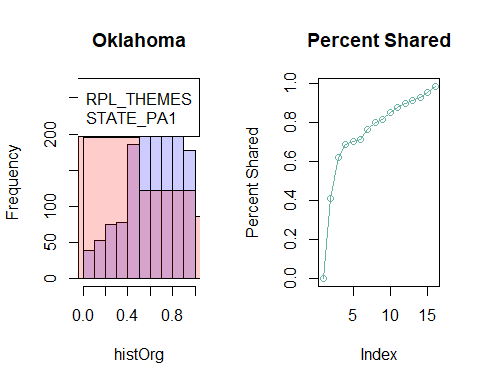
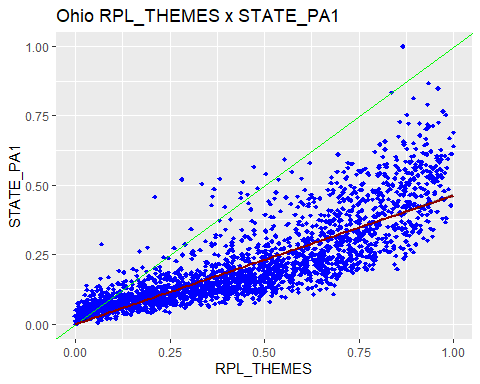
## `geom\_smooth()` using formula = 'y ~ x'



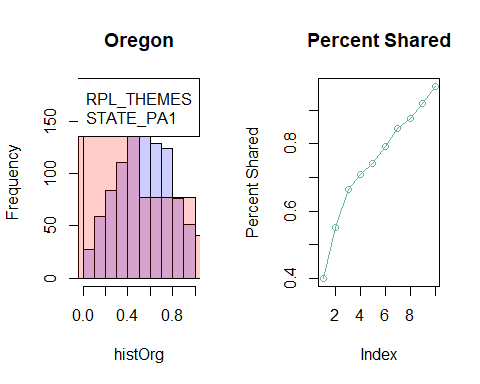
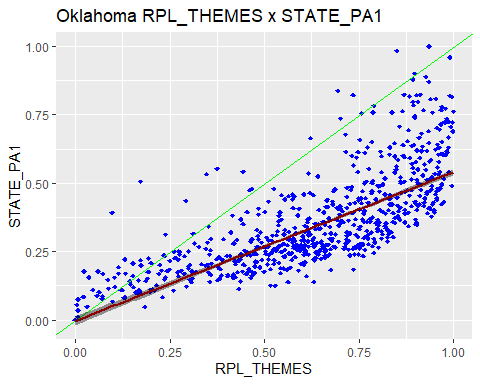
## `geom\_smooth()` using formula = 'y ~ x'



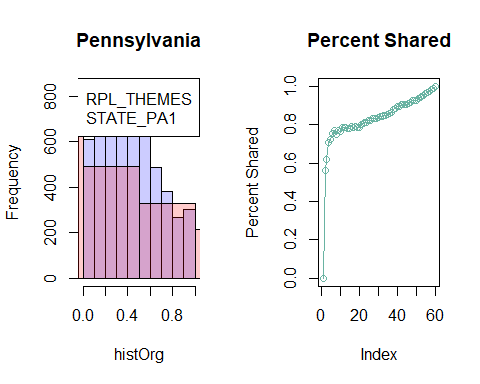
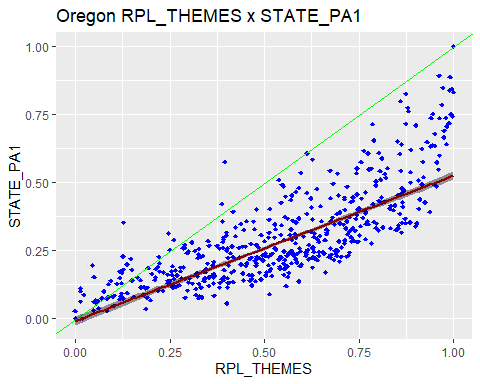
## `geom\_smooth()` using formula = 'y ~ x'



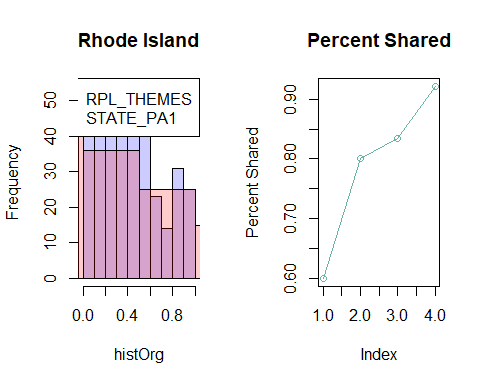
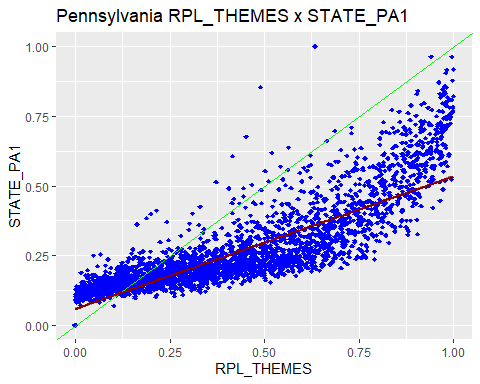
## `geom\_smooth()` using formula = 'y ~ x'



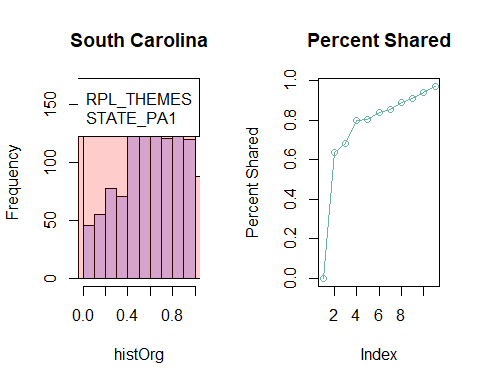
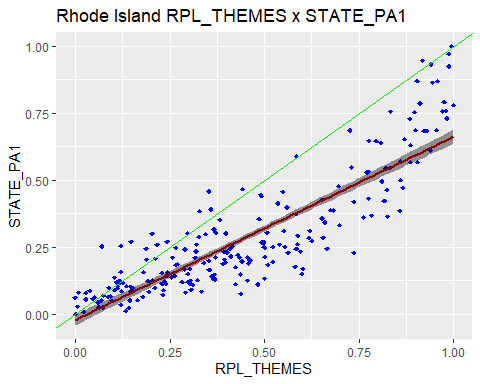
## `geom\_smooth()` using formula = 'y ~ x'



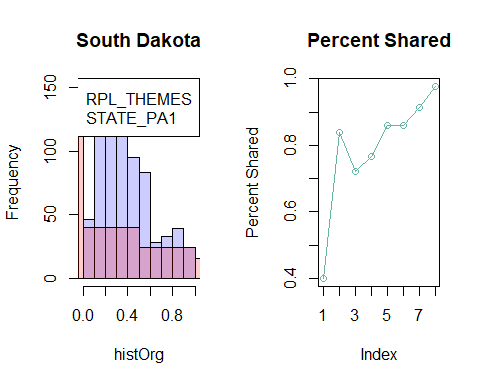
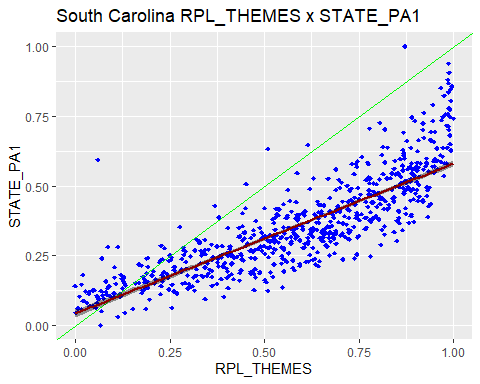
## `geom\_smooth()` using formula = 'y ~ x'



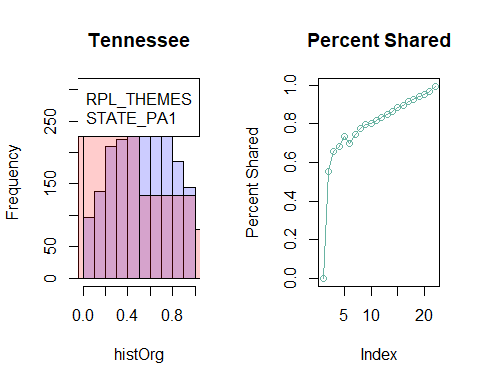
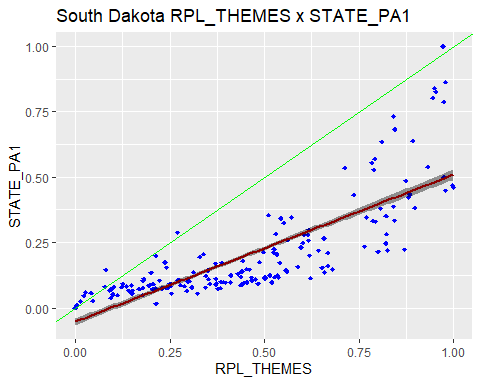
## `geom\_smooth()` using formula = 'y ~ x'



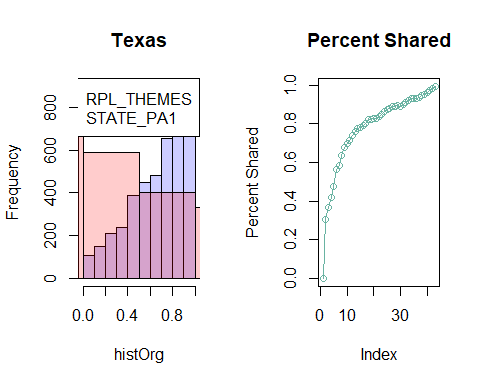
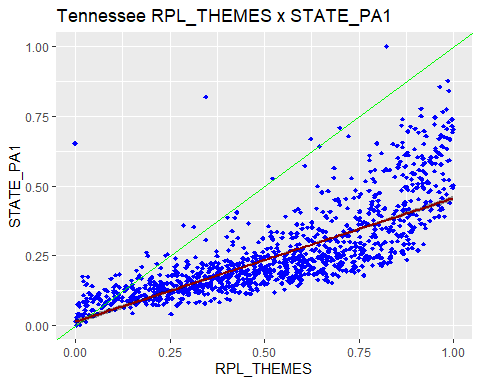
## `geom\_smooth()` using formula = 'y ~ x'



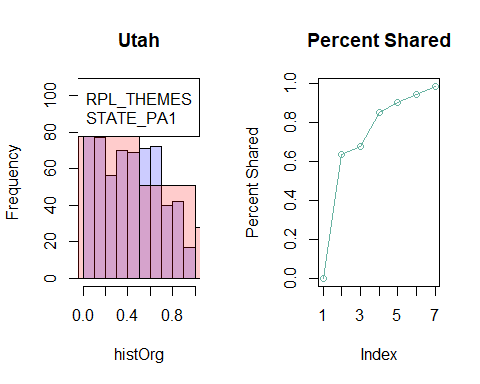
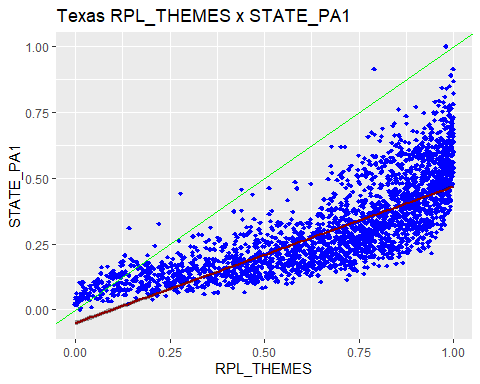
## `geom\_smooth()` using formula = 'y ~ x'



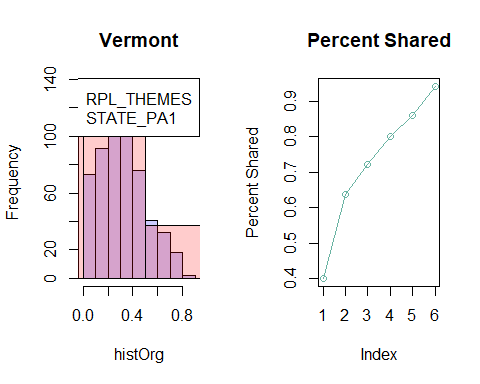
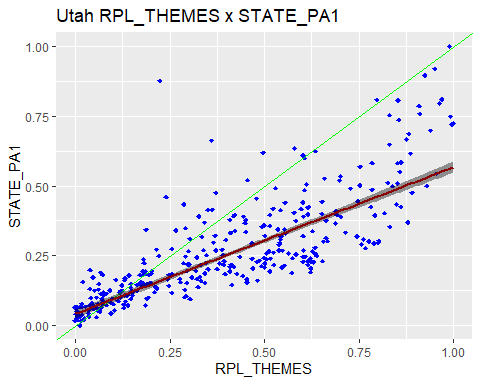
## `geom\_smooth()` using formula = 'y ~ x'



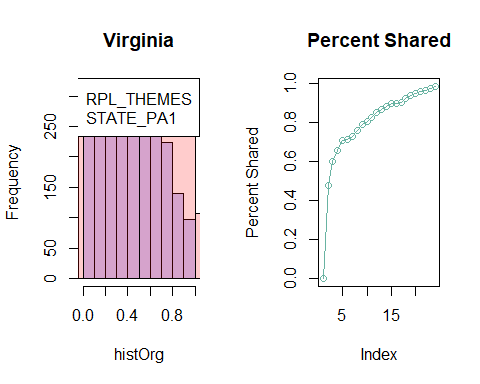
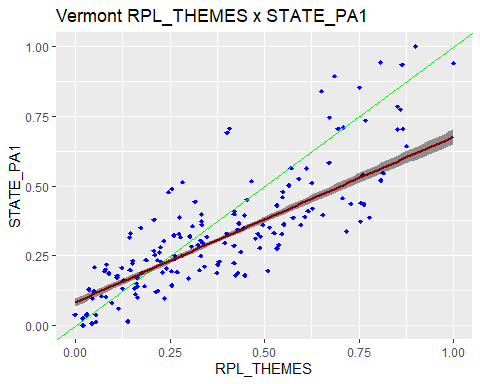
## `geom\_smooth()` using formula = 'y ~ x'



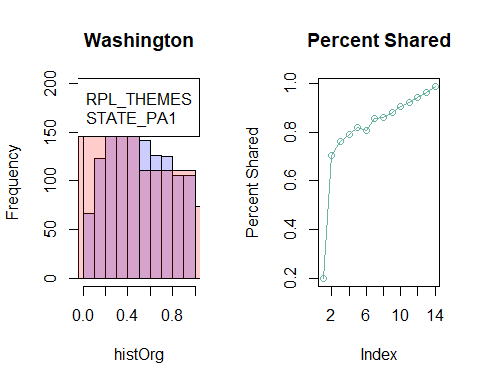
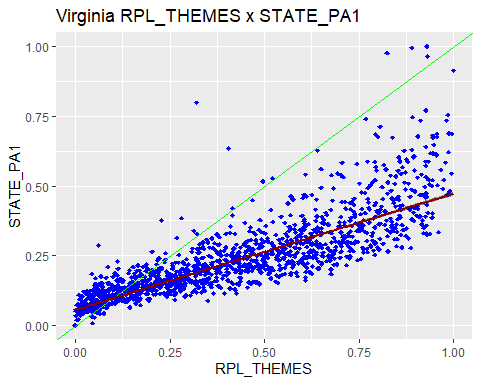
## `geom\_smooth()` using formula = 'y ~ x'



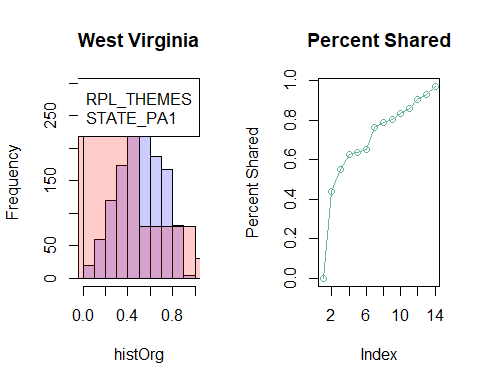
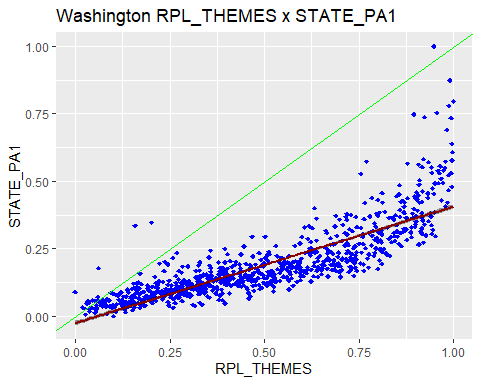
## `geom\_smooth()` using formula = 'y ~ x'



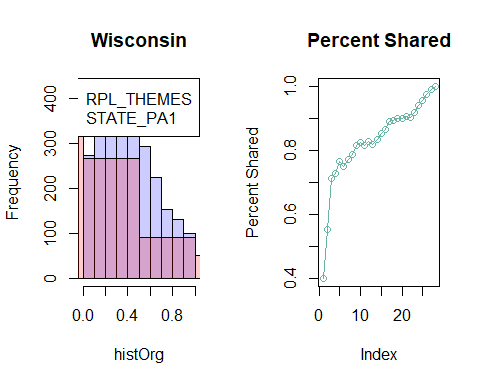
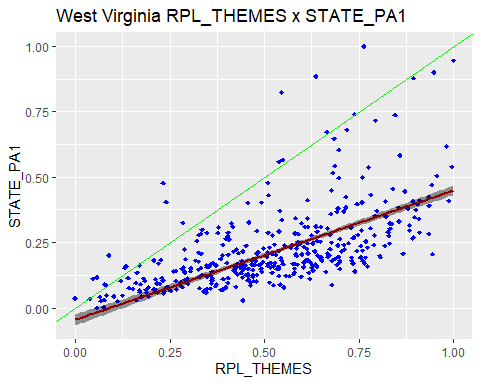
## `geom\_smooth()` using formula = 'y ~ x'



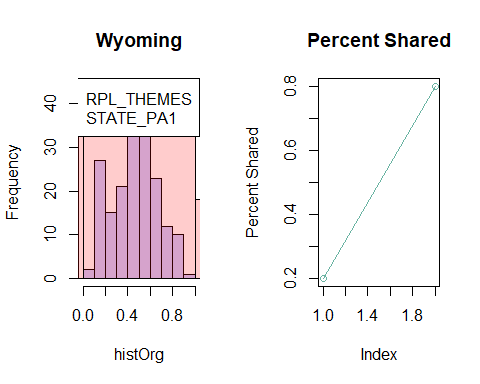
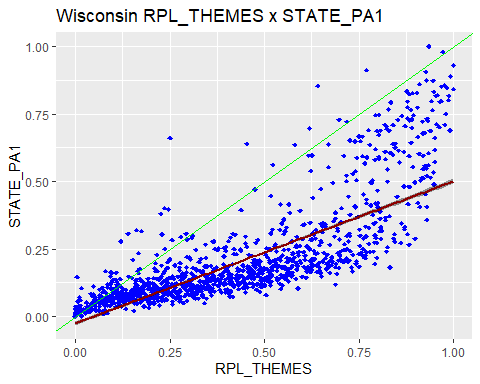
## `geom\_smooth()` using formula = 'y ~ x'



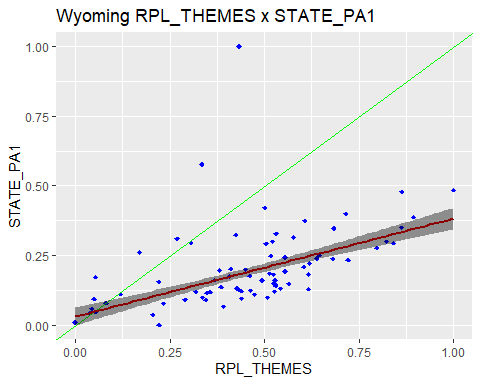
## `geom\_smooth()` using formula = 'y ~ x'



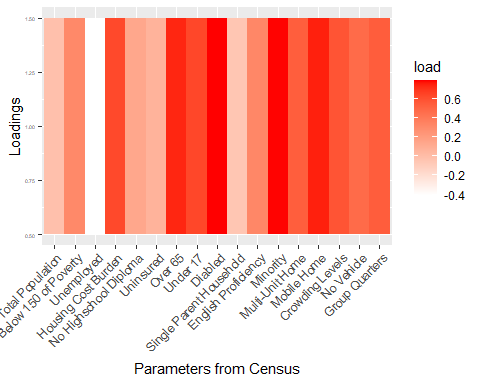
## `geom\_smooth()` using formula = 'y ~ x'



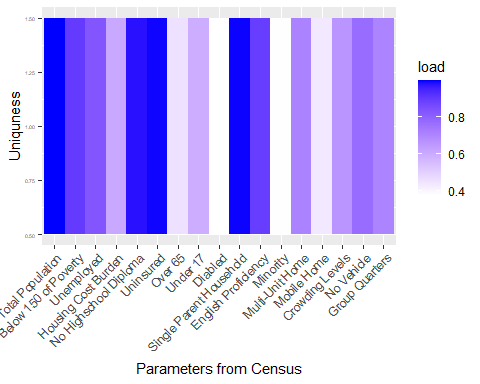
## `geom\_smooth()` using formula = 'y ~ x'



FA <- fa(cdcUnik[,5:21], nfactors = 1, fm = "pa", max.iter = 100, rotation = "promax")  
  
# Transform the matrix in long format  
loadngs <- melt(FA$loadings[,1])  
colnames(loadngs) <- c("load")  
  
loadngs$rowss <- colnames(cdcUnik[,5:21])  
  
#plots out   
ggplot(loadngs, aes(x = 1, y = rowss, fill = load)) +  
 geom\_tile() +  
 coord\_flip() + labs(x = "Loadings", y = "Parameters from Census") +  
 theme(axis.text.y = element\_text(size = 4),axis.text.x = element\_text(angle = 45, hjust=1)) +  
 scale\_fill\_gradient(low = "white", high = "red") +  
 scale\_y\_discrete(labels = c("Total Population","Below 150 of Poverty","Unemployed","Housing Cost Burden","No Highschool Diploma","Uninsured","Over 65","Under 17","Diabled","Single Parent Household","English Proficiency","Minority","Multi-Unit Home","Mobile Home","Crowding Levels","No Vehicle","Group Quarters"))



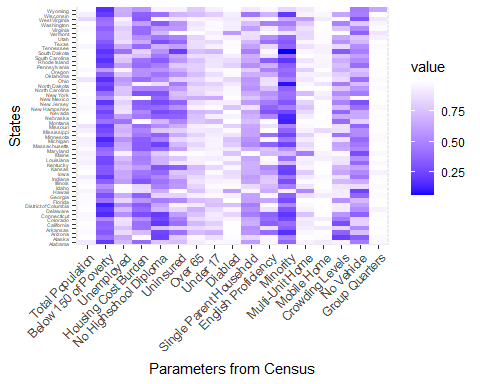
# Transform the matrix in long format  
loadngs <- melt(FA$uniquenesses)  
colnames(loadngs) <- c("load")  
  
loadngs$rowss <- colnames(cdcUnik[,5:21])  
  
#plots out   
ggplot(loadngs, aes(x = 1, y = rowss, fill = load)) +  
 geom\_tile() +  
 coord\_flip() + labs(x = "Uniquness", y = "Parameters from Census") +  
 theme(axis.text.y = element\_text(size = 4),axis.text.x = element\_text(angle = 45, hjust=1)) +  
 scale\_fill\_gradient(low = "white", high = "blue") +  
 scale\_y\_discrete(labels = c("Total Population","Below 150 of Poverty","Unemployed","Housing Cost Burden","No Highschool Diploma","Uninsured","Over 65","Under 17","Diabled","Single Parent Household","English Proficiency","Minority","Multi-Unit Home","Mobile Home","Crowding Levels","No Vehicle","Group Quarters"))



# Transform the matrix in long format  
df <- melt(byLine$uniqness\_by\_var)

## Using STATE as id variables

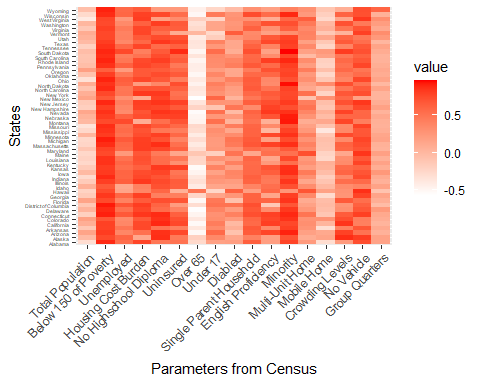
colnames(df) <- c("state", "cols", "value")  
  
#plots out   
ggplot(df, aes(x = state, y = cols, fill = value)) +  
 geom\_tile() +  
 coord\_flip() + labs(x = "States", y = "Parameters from Census") +  
 theme(axis.text.y = element\_text(size = 4),axis.text.x = element\_text(angle = 45, hjust=1)) +  
 scale\_fill\_gradient(low = "blue", high = "white") +  
 scale\_y\_discrete(labels = c("Total Population","Below 150 of Poverty","Unemployed","Housing Cost Burden","No Highschool Diploma","Uninsured","Over 65","Under 17","Diabled","Single Parent Household","English Proficiency","Minority","Multi-Unit Home","Mobile Home","Crowding Levels","No Vehicle","Group Quarters"))



# Transform the matrix in long format  
df <- melt(byLine$loadings\_by\_var)

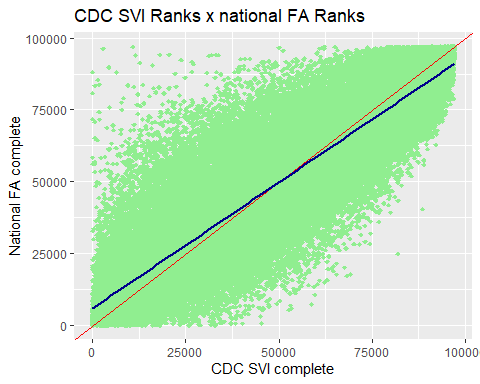
## Using STATE as id variables

colnames(df) <- c("state", "cols", "value")  
  
#plots out   
ggplot(df, aes(x = state, y = cols, fill = value)) +  
 geom\_tile() +  
 coord\_flip() + labs(x = "States", y = "Parameters from Census") +  
 theme(axis.text.y = element\_text(size = 4),axis.text.x = element\_text(angle = 45, hjust=1)) +  
 scale\_fill\_gradient(low = "white", high = "red") +  
 scale\_y\_discrete(labels = c("Total Population","Below 150 of Poverty","Unemployed","Housing Cost Burden","No Highschool Diploma","Uninsured","Over 65","Under 17","Diabled","Single Parent Household","English Proficiency","Minority","Multi-Unit Home","Mobile Home","Crowding Levels","No Vehicle","Group Quarters"))



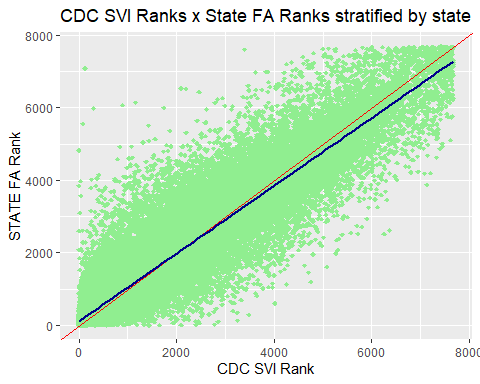
#this compares the national level FA vs the CDC SIV  
ggplot(withStrata, aes(x=rank(RPL\_THEMES), y=rank(FULL\_PA1))) +  
 geom\_point(shape=18, color="lightgreen") +  
 geom\_abline(intercept = 0, slope = 1, color="red") +  
 geom\_smooth(method=lm, se=T, color="blue4", fill="black") +  
 ggtitle(paste("CDC SVI Ranks x national FA Ranks")) +  
 xlab(paste("CDC SVI complete")) + # for the x axis label  
 ylab(paste("National FA complete")) # for the y axis label

## `geom\_smooth()` using formula = 'y ~ x'



#this compares the stratified state level FA vs the CDC SIV rankings  
stratStateRank <- c()  
  
for(i in unique(withStrata$STATE)){  
 subCat <- filter(withStrata,withStrata$STATE == i)  
 x <- rank(subCat$RPL\_THEMES)  
 y <- rank(subCat$STATE\_PA1)  
 stratStateRank <- as.data.frame(rbind(stratStateRank, cbind(x,y)))  
}  
  
  
ggplot(stratStateRank, aes(x=x, y= y)) +  
 geom\_point(shape=18, color="lightgreen") +  
 geom\_abline(intercept = 0, slope = 1, color="red") +  
 geom\_smooth(method=lm, se=T, color="blue4", fill="black") +  
 ggtitle(paste("CDC SVI Ranks x State FA Ranks stratified by state")) +  
 xlab(paste("CDC SVI Rank")) + # for the x axis label  
 ylab(paste("STATE FA Rank")) # for the y axis label

## `geom\_smooth()` using formula = 'y ~ x'



uneek <- unique(withStrata[["STATE"]]) #creates list to iterate thru  
plott <- c()  
corTable <- c()  
  
for(i in uneek){  
 subCat <- filter(withStrata,get("STATE") == i)  
 spearCor <- cor.test(x=rank(subCat$RPL\_THEMES), y=rank(subCat$STATE\_PA1), method = 'spearman')  
 corTable <- rbind(corTable, c(state = i, Estimate = spearCor$estimate, Pvalue = spearCor$p.value))  
 print(ggplot(subCat, aes(x=rank(subCat$RPL\_THEMES), y=rank(subCat$STATE\_PA1))) +  
 geom\_point(shape=18, color="lightgreen") +  
 geom\_abline(intercept = 0, slope = 1, color="green") +  
 geom\_smooth(method=lm, se=T, color="blue4", fill="black") +  
 ggtitle(paste(i, "CDC SVI Ranks x State FA Ranks")) +  
 xlab(paste("CDC SVI ", i)) + # for the x axis label  
 ylab(paste("STATE FA ", i))) # for the y axis label  
}

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

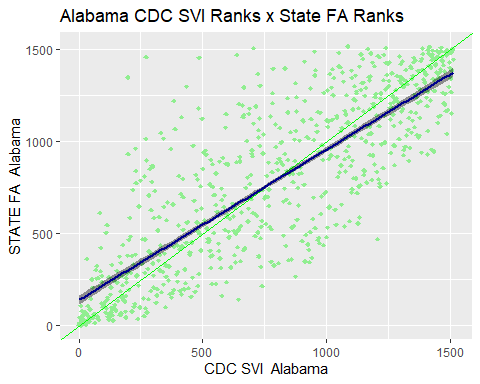
## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



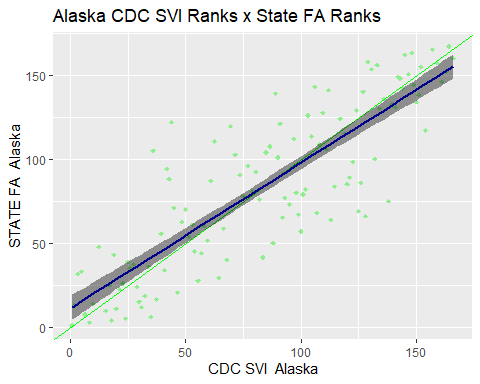
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



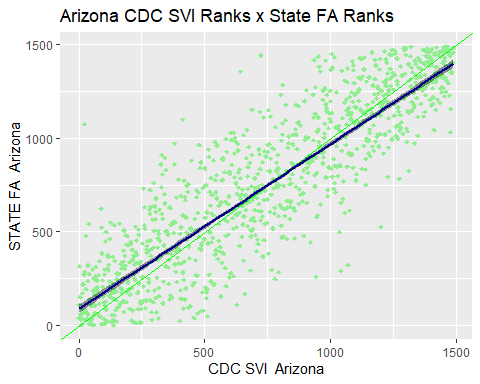
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



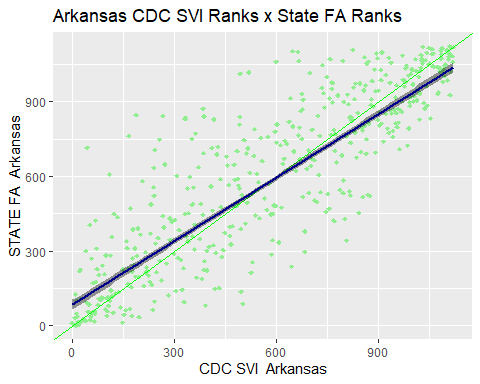
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



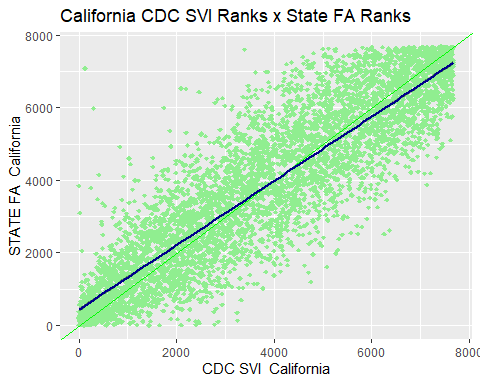
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



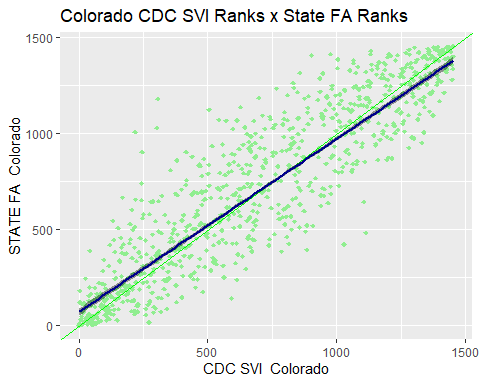
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



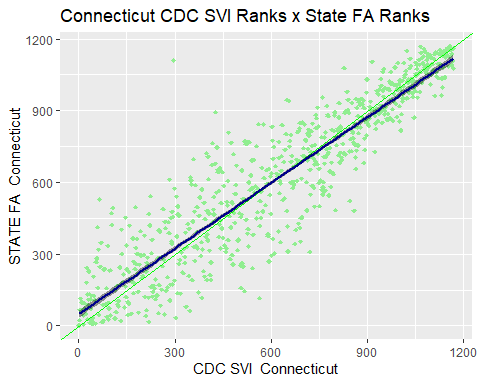
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



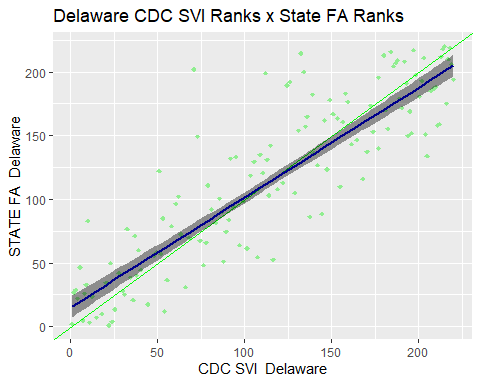
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



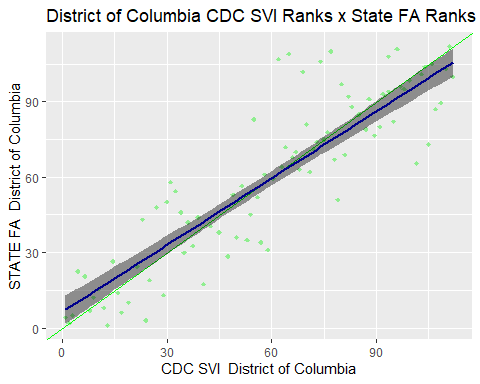
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
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## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



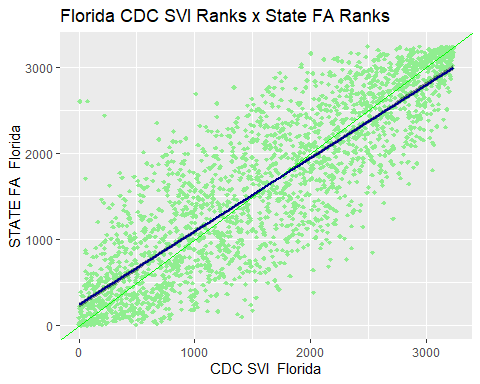
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
## Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.

## Warning: Use of `subCat$STATE\_PA1` is discouraged.  
## ℹ Use `STATE\_PA1` instead.

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in cor.test.default(x = rank(subCat$RPL\_THEMES), y =  
## rank(subCat$STATE\_PA1), : Cannot compute exact p-value with ties



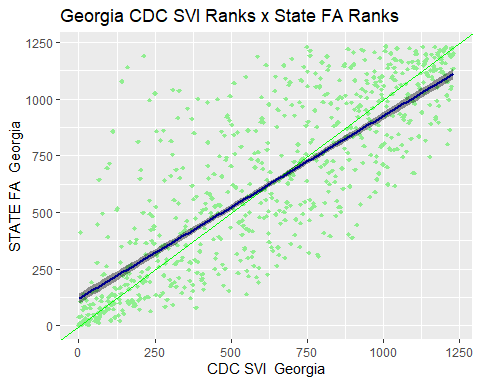
## Warning: Use of `subCat$RPL\_THEMES` is discouraged.  
## ℹ Use `RPL\_THEMES` instead.  
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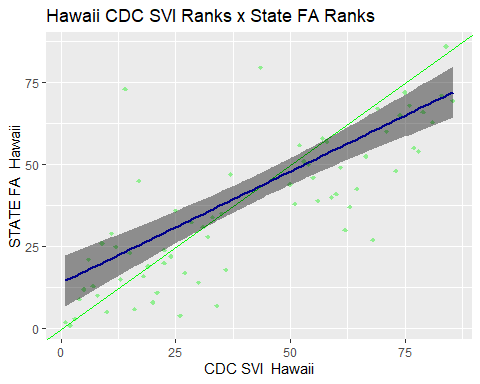
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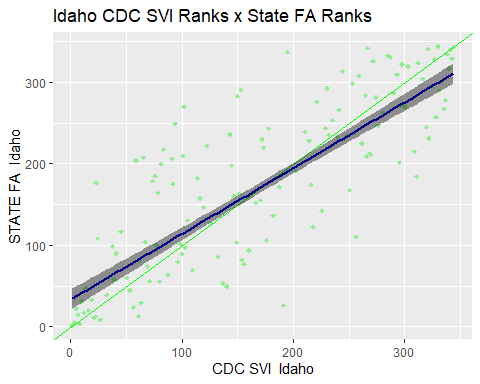
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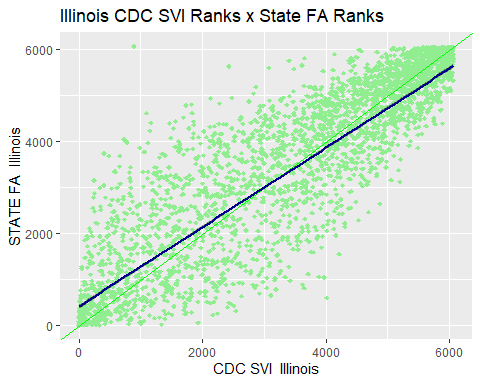
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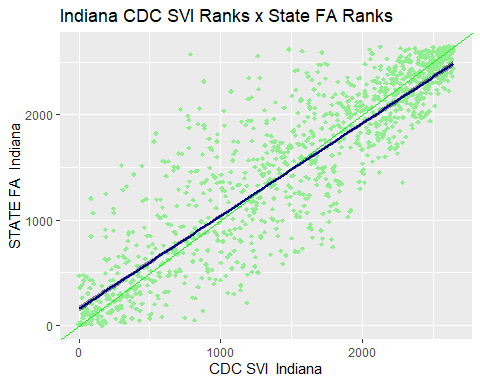
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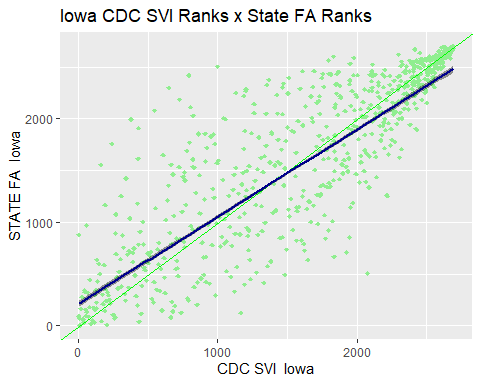
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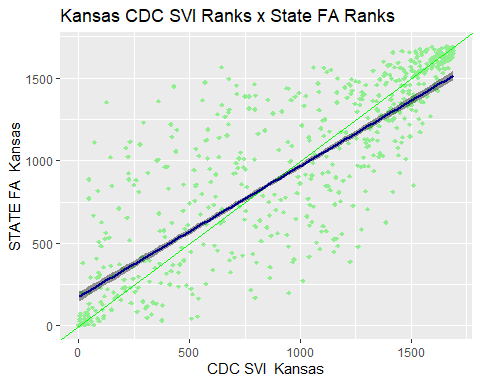
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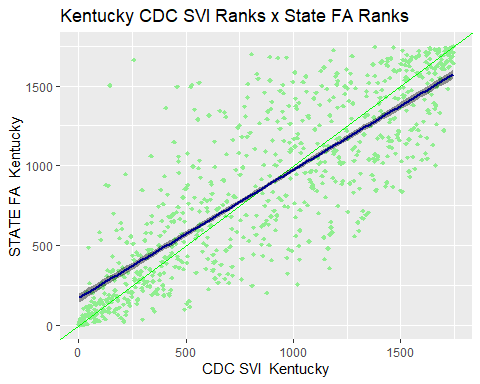
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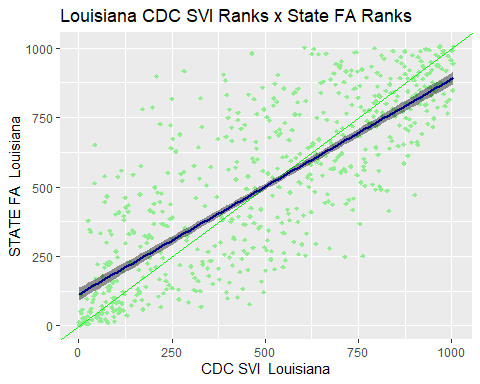
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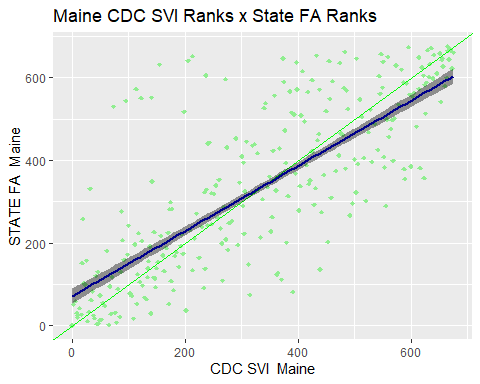
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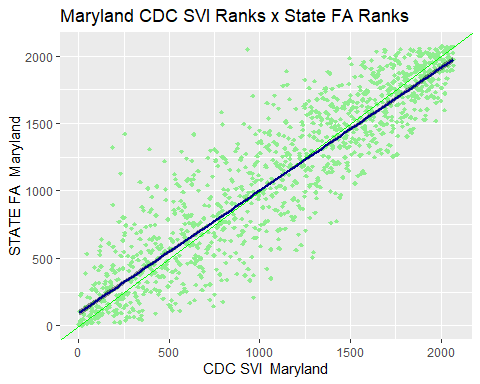
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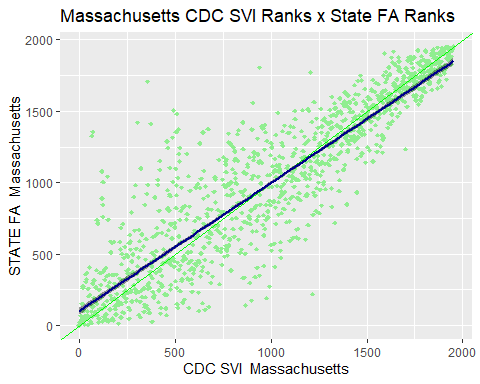
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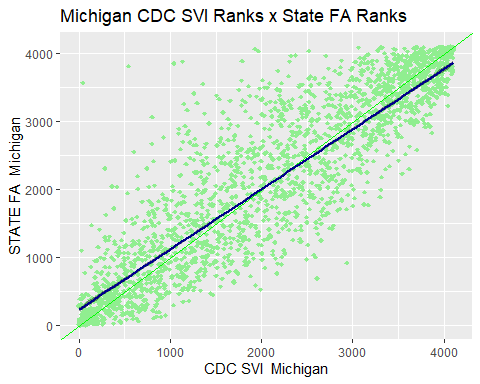
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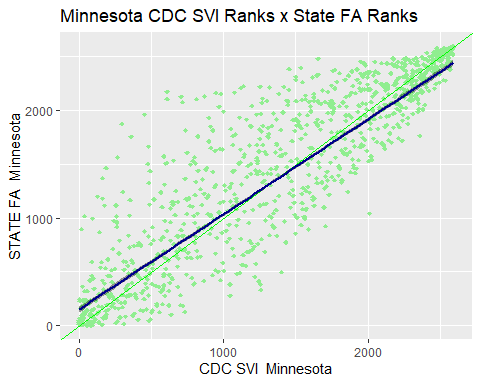
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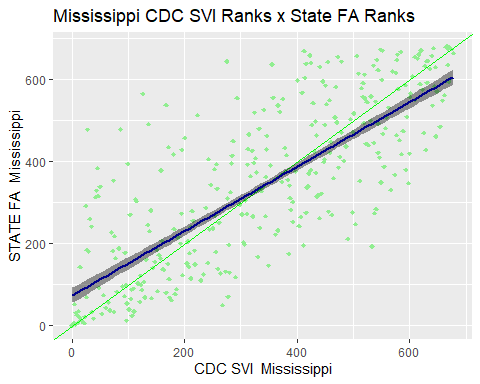
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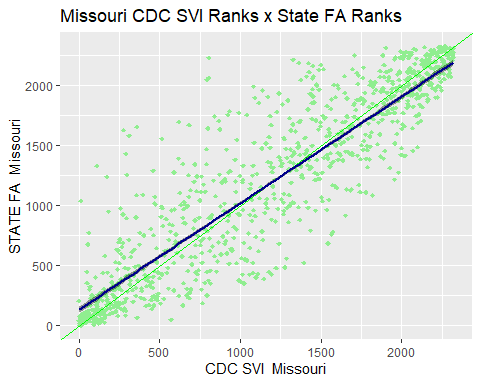
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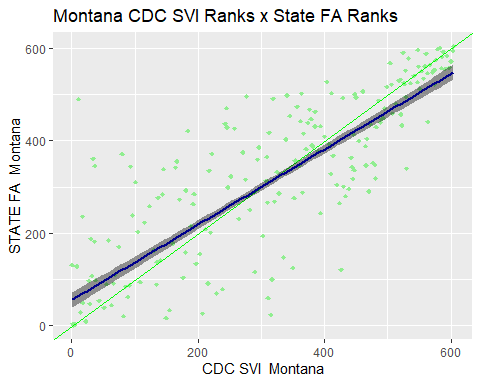
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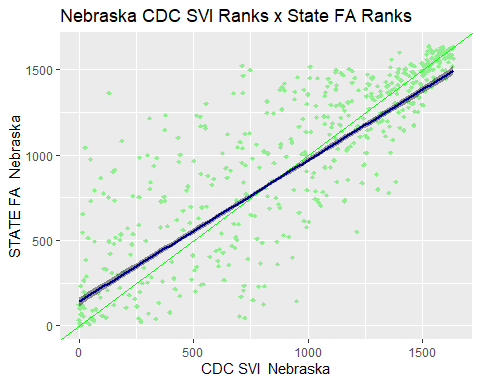
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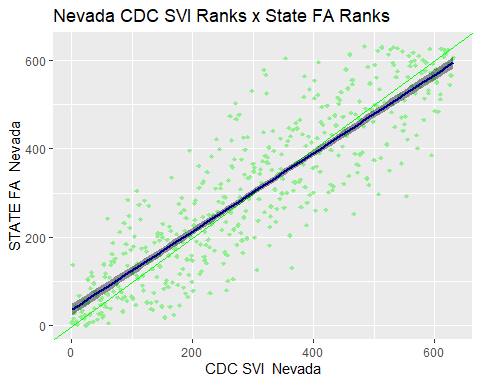
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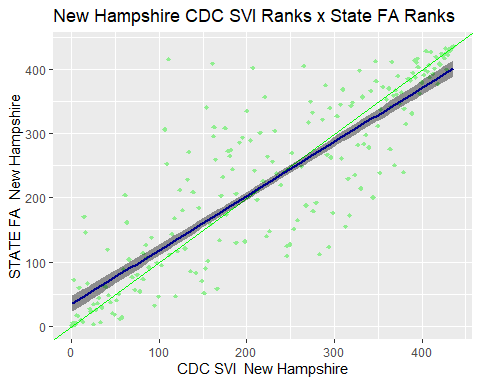
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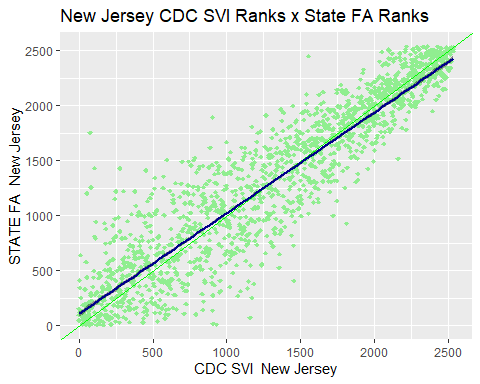
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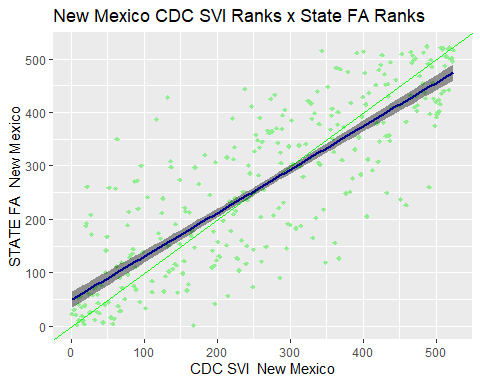
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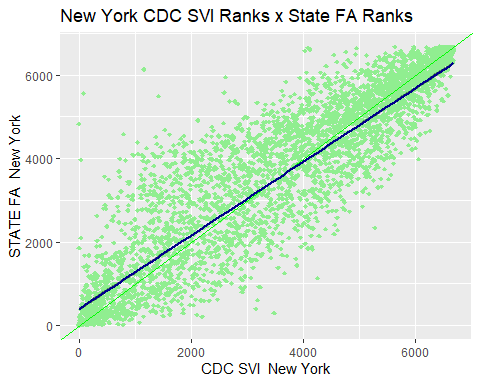
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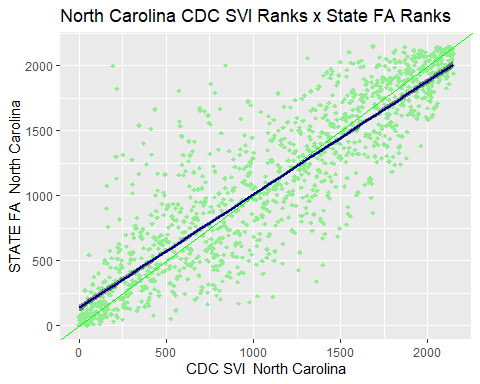
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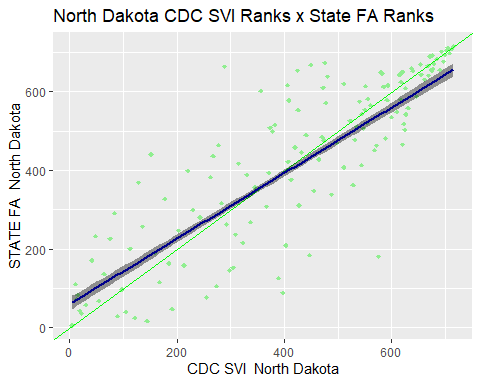
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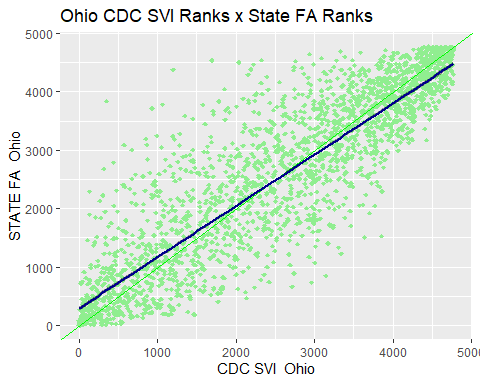
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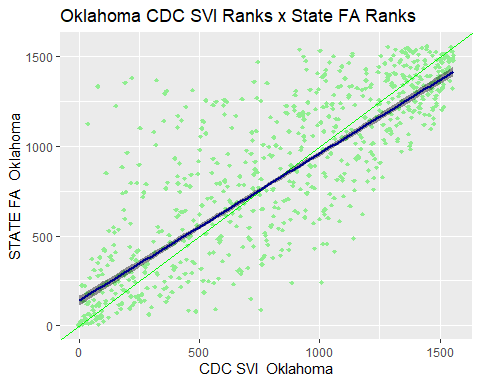
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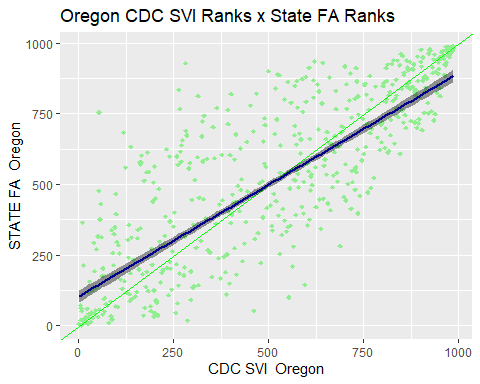
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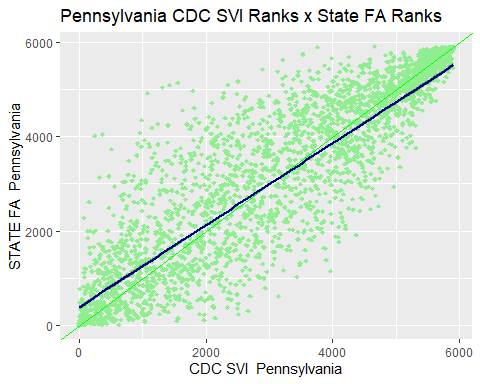
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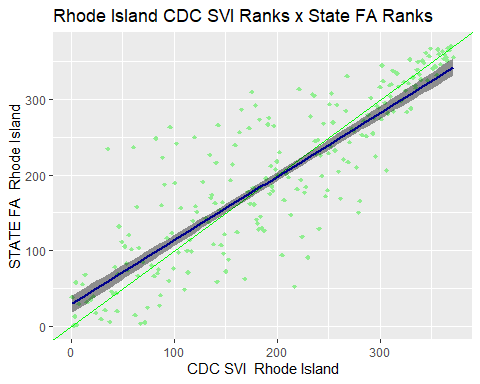
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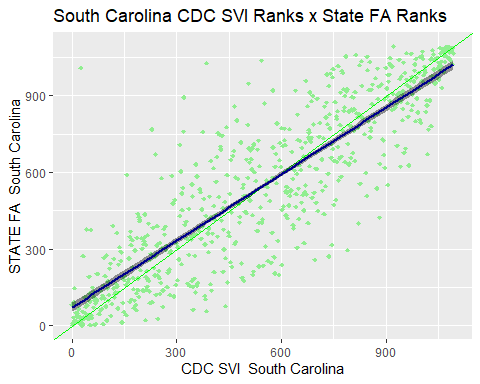
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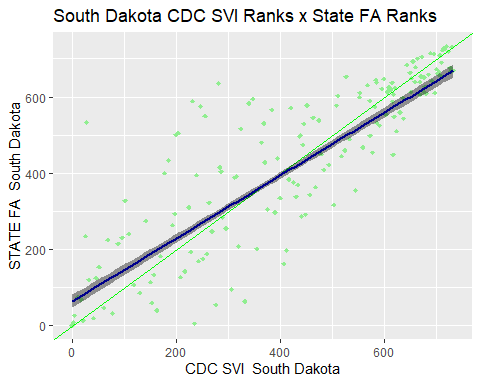
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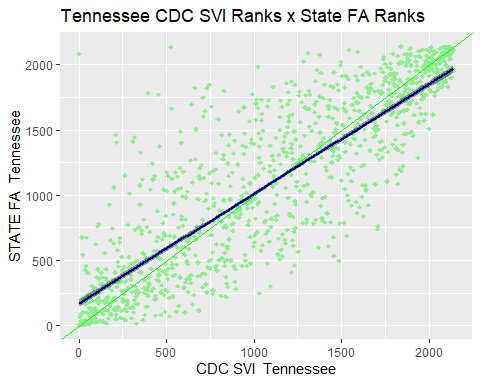
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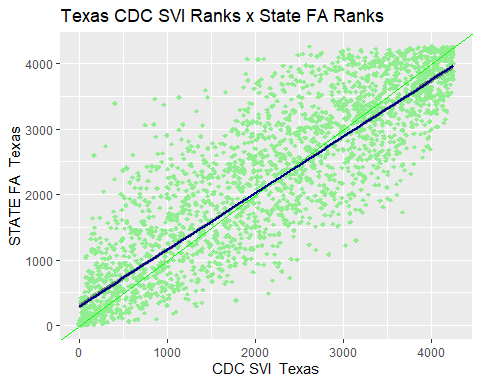
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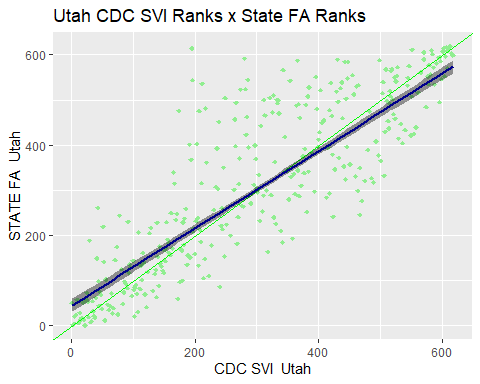
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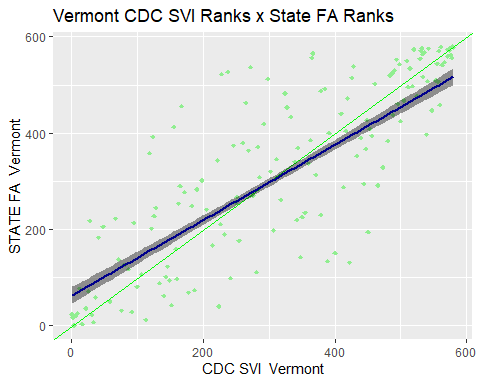
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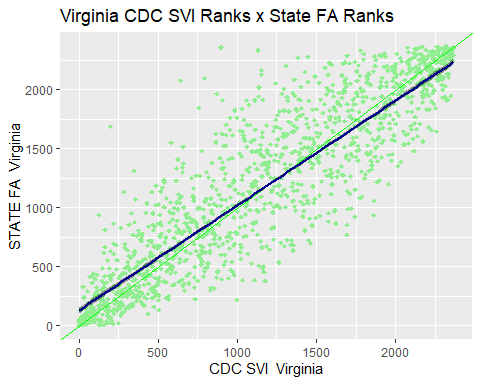
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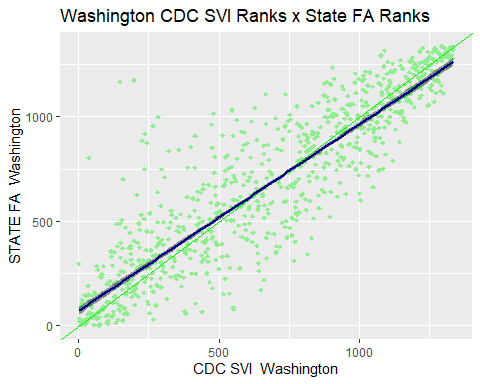
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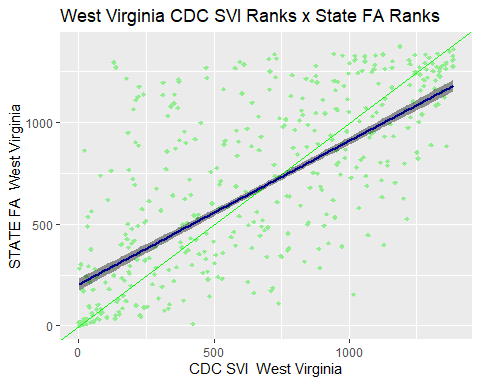
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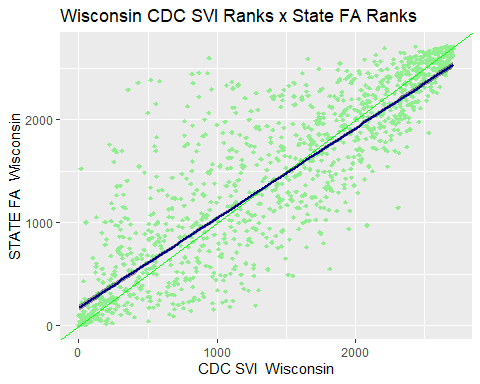
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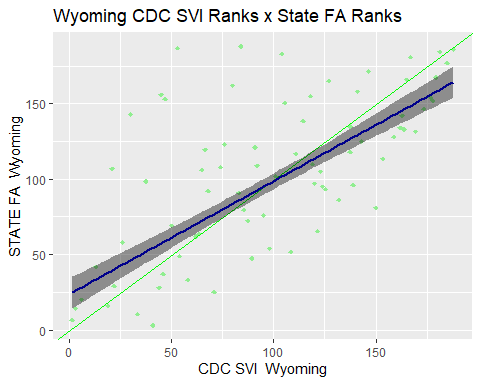


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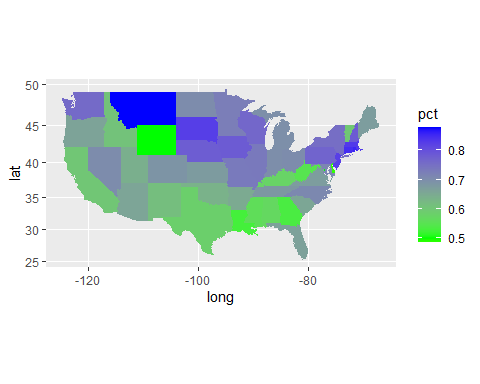
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#need to clean this up?? wrong col names  
corTable <- as.data.frame(corTable)

#create %overlap for each state  
perct <- 0.15  
region <- c()  
pct <- c()  
pctSharedbyState <- c()  
  
for(i in unique(withStrata$STATE)){  
 subCat <- filter(withStrata,get("STATE") == i)  
 lngth <- nrow(subCat) \* perct  
 #selects top amount  
 topOrg <- subCat %>% arrange(desc(get("RPL\_THEMES"))) %>% slice(1:lngth) %>% select(FIPS)  
 topStr <- subCat %>% arrange(desc(get("STATE\_PA1"))) %>% slice(1:lngth) %>% select(FIPS)  
 #compares Fips from each to see the overlap  
 samect <- round(sum(topStr[,1] %in% topOrg[,1])/nrow(topStr), 3)  
 region <- rbind(region, i)  
 pct <- rbind(pct, samect)  
 }   
  
pctSharedbyState <- cbind.data.frame(region =region,pct = pct)

states <- map\_data("state")  
colnames(pctSharedbyState) <- c("region","pct")  
pctSharedbyState$region <- tolower(pctSharedbyState$region)  
  
shared.geo <- merge(states,pctSharedbyState,by = "region")  
shared.geo <- shared.geo[order(shared.geo$order),]  
  
ggplot(shared.geo,aes(long, lat))+  
 geom\_polygon(aes(group=group, fill= pct))+  
 coord\_map() + scale\_fill\_gradient2(  
 low = "yellow",   
 mid = "green",   
 high = "blue",  
 midpoint = 0.5)



end.time <- Sys.time()  
time.taken <- end.time - start.time  
time.taken

## Time difference of 1.873366 mins