

Fema

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Introduction:

This is a dataset about the public assistance funded projects provided by FEMA. FEMA is a agency that coordinate the local state to response to the disaster, such as provides the local government with experts in special fields or funding for rebuilding efforts. In this project, we used the doughnut map to show the proportion of all types of damage caused by hurricanes that hit the country from 2008 to 2019, and the frequency distribution of damage in different states. To better present the data, then we show the data in more detail in terms of years.

```
# data from Fema, select data which incident type being "Hurricane" and happened between 2009 to 2018
df <- read.csv("D:\\R project\\615\\Project-FEMA\\PublicAssistanceFundedProjectsDetails.csv", header = TRUE)
df <- subset(df, df$incidentType == "Hurricane")
#summary(df$projectAmount)
#summary(df$federalShareObligated)
## delete data which is negative
#df <- subset(df, df$projectAmount > 0 & df$federalShareObligated > 0)
df <- read.csv("C:\\Users\\simu\\Desktop\\df.csv", header = TRUE)
df$year <- as.numeric(substr(df$declarationDate, 1, 4))
df <- subset(df, df$year>=2009 & df$year <= 2018)
df <- df %>% mutate(ID=str_c(state, county, sep = ","))
df$ID <- tolower(df$ID)
dy <- df # store the data frame for yearly figure
```

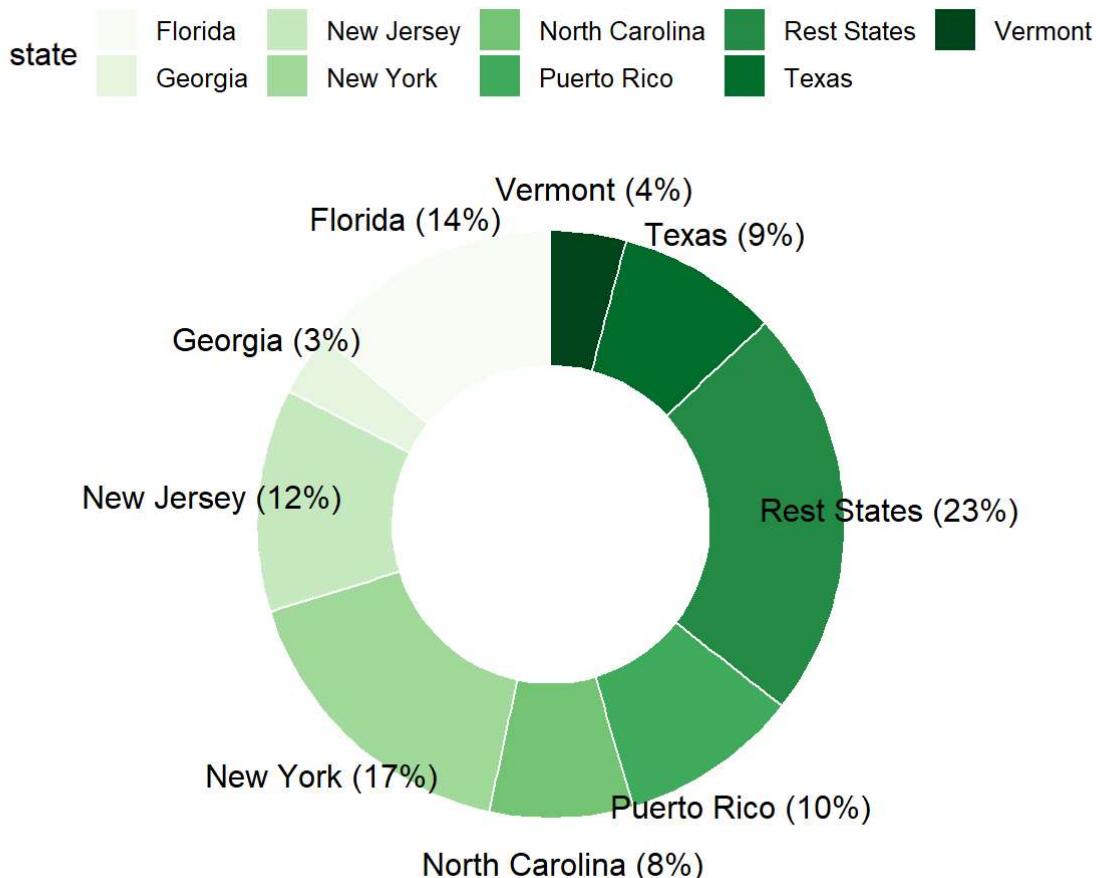
```
# unique(df$state)
counties_C <- c("alabama", "texas", "virgin islands of the U.S.", "north carolina", "massachusetts", "puerto rico", "new york", "virginia", "new hampshire", "maryland", "delaware", "west virginia", "louisiana", "florida", "new jersey", "vermont", "connecticut", "pennsylvania", "rhode island", "maine", "district of columbia", "mississippi", "ohio", "georgia", "south carolina", "american samoa", "hawaii")
state_CB <- map_data("state", counties_C)
counties_CB<- map_data("county", counties_C)
```

EDA

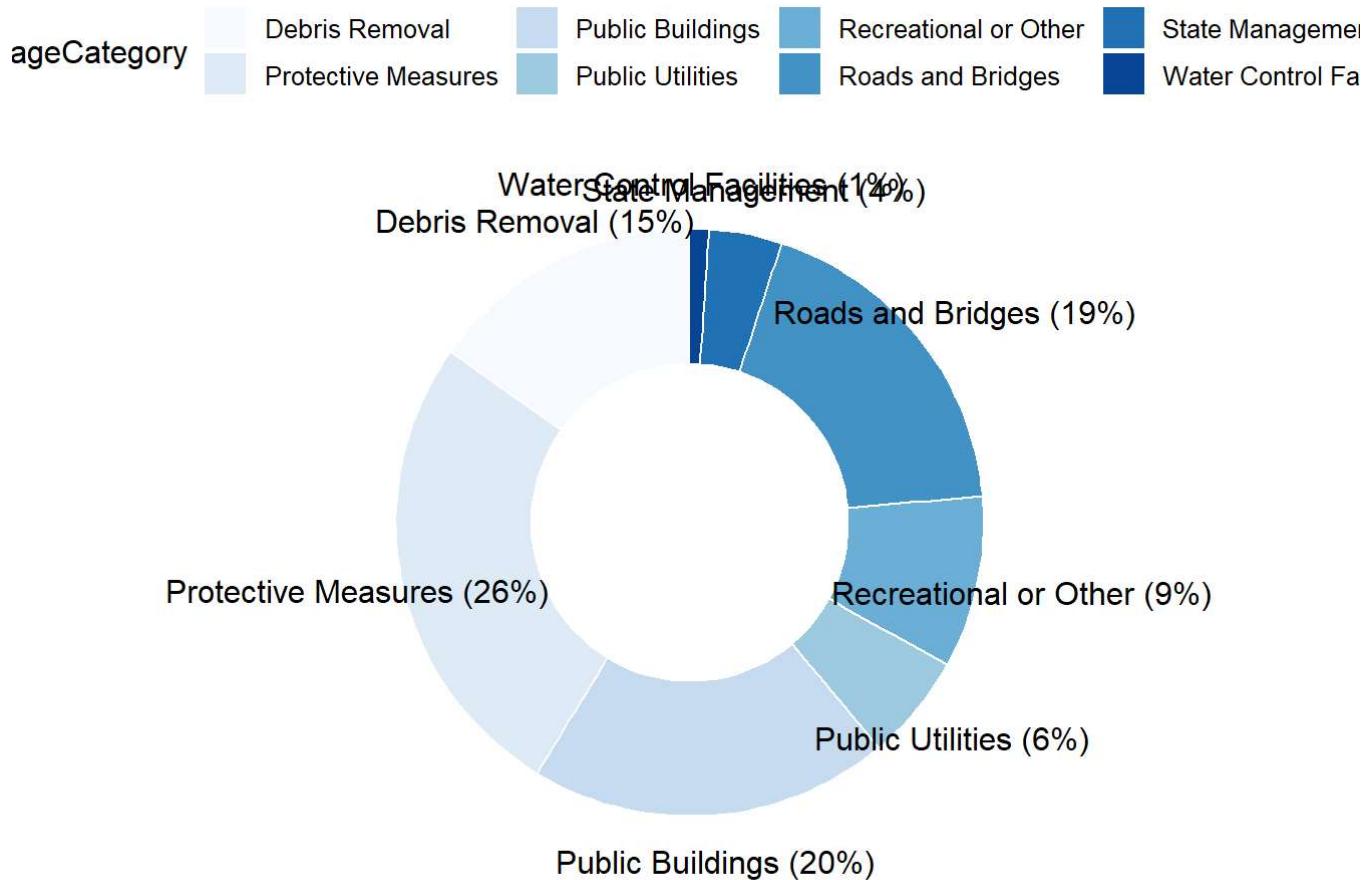
```

ds <- df
## focus on the frequency distribution of damage in different states, using donut chart
statecount <- ds %>% group_by(state) %>% summarize(count=sum(state!="0"))
statecount <- statecount[order(statecount$count), ]
# Georgia 2692
# Vermont 3218
# North Carolina 6162
# Texas 6914
# Puerto Rico 7704
# New Jersey 9576
# Florida 10979
# New York 13115
## calculate the sum of frequency of rest of the states
topstate <- statecount[20:27, ]
names(topstate) <- c("state", "count")
restcount <- sum(statecount$count)-sum(topstate$count)
reststate <- data.frame("Rest States", restcount)
names(reststate)<-c("state", "count")
newstate <- rbind(topstate, reststate)
newstate$percent_value = round(newstate$count/sum(newstate$count) * 100)
newstate$labs <- paste0(newstate$state, " (", newstate$percent_value, "%)")
ggdonutchart(newstate, "count",
             label = "labs",
             fill = "state",
             lab.adjust = 0,
             lab.font = c(4, "bold", "grey"),
             color = "white",
             palette = "Greens" ) +
coord_polar(theta = "y", start = 0, clip = "off")

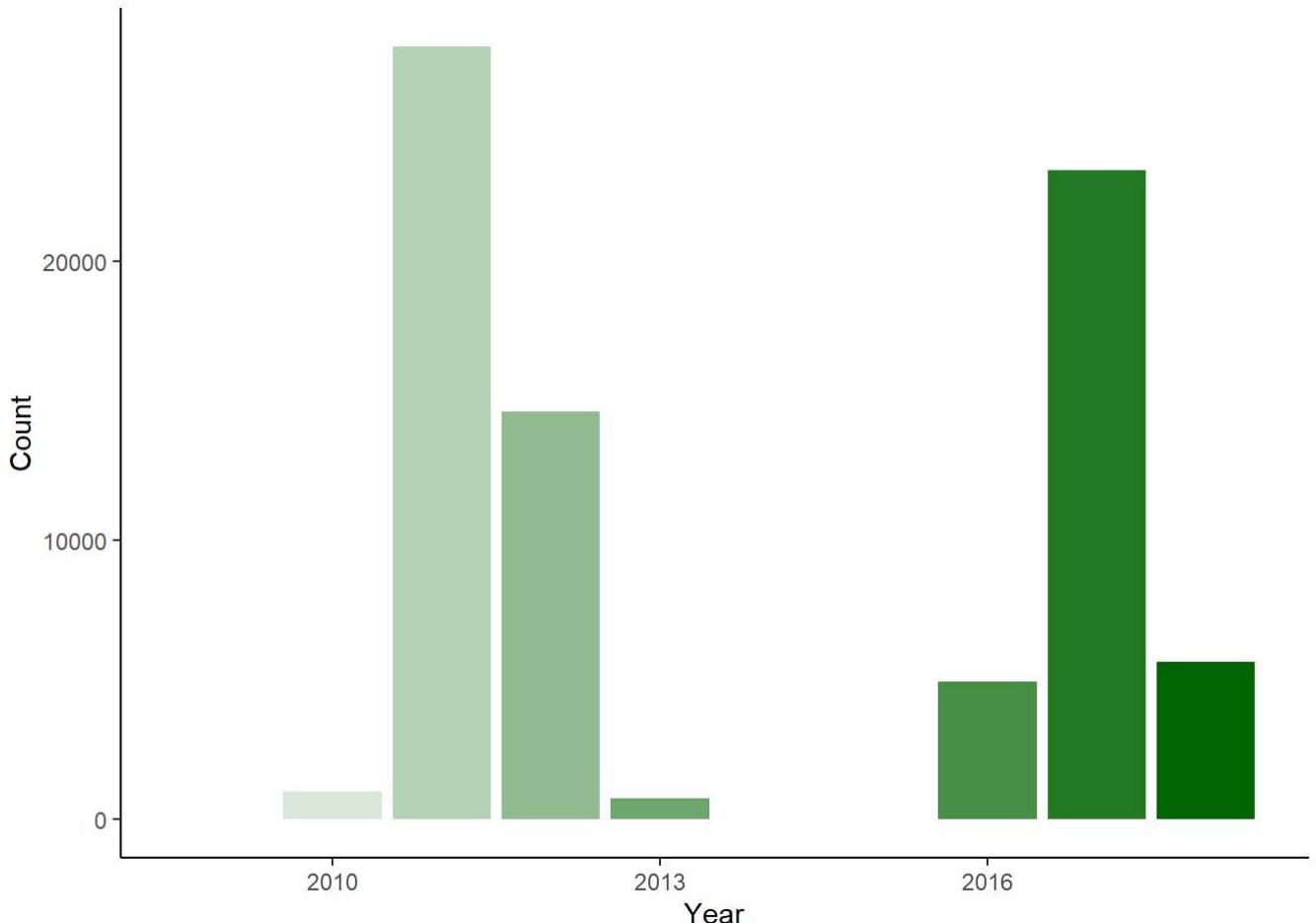
```



```
## focus on the distribution of damage category, using donut chart
dd <- df
damagecategorycount <- dd %>% group_by(damageCategory) %>% summarize(count=sum(damageCategory!= "0"))
damagecategorycount <- damagecategorycount[order(damagecategorycount$count), ]
damagecategorycount$percent_value = round(damagecategorycount$count/sum(damagecategorycount$count) * 100)
damagecategorycount$label <- paste0(damagecategorycount$damageCategory, " (", damagecategorycount$percent_value, "%)")
ggdonutchart(damagecategorycount, "count",
             label = "label",
             fill = "damageCategory",
             lab.adjust = 0,
             lab.font = c(2, "bold", "grey"),
             color = "white",
             palette = "Blues" ) +
coord_polar(theta = "y", start = 0, clip = "off")
```



```
## focus on the frequency distribution of disaster in terms of different years, using bar chart
du <- df
yearcount <- du %>% group_by(year) %>% summarize(count=sum(year!="0"))
colors <- colorRampPalette(c("white", "dark green"))(8)
ggplot(yearcount, mapping=aes(x=year, y=count)) +
  geom_bar(stat="identity", fill=colors) +
  labs(x="Year", y="Count") +
  theme_classic()
```



Mapping

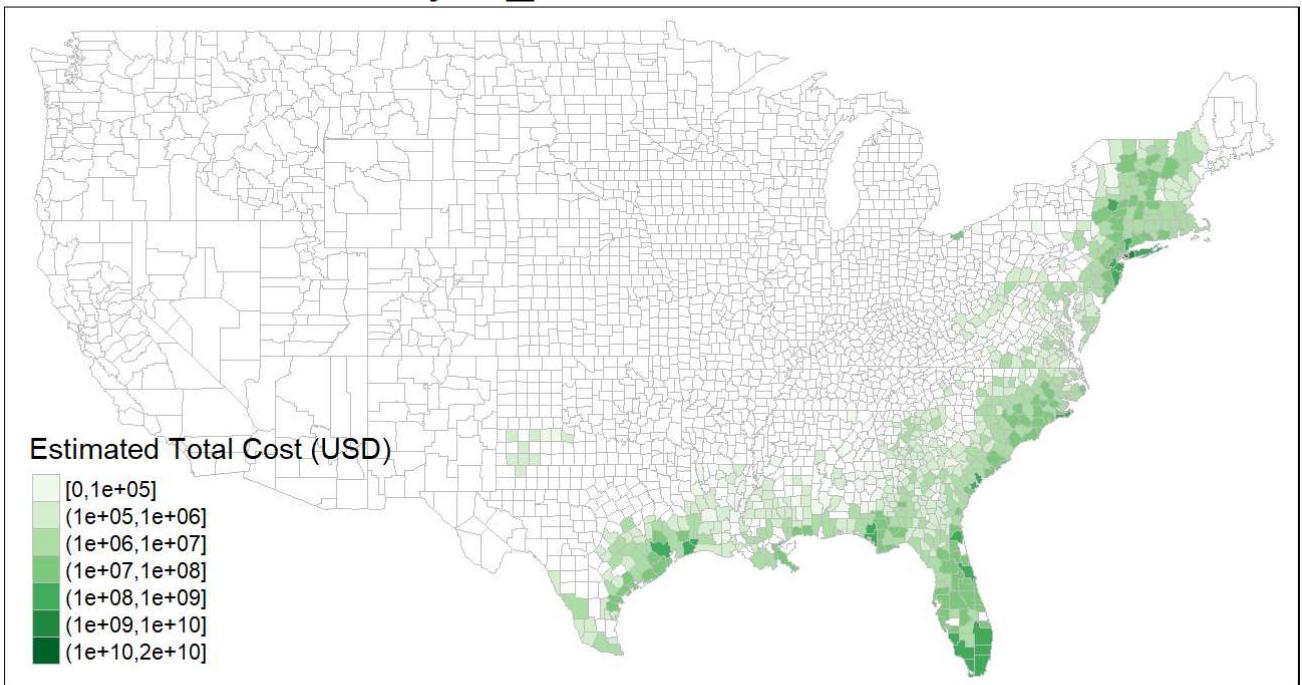
Focus on “Project Amount”

The estimated total cost of the Public Assistance grant project in dollars, without administrative costs. This amount is based on the damage survey.

```
## the estimated total cost of Public Assistance grant project from 2009 to 2018
df_c <- df %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
df_c <- df_c %>%
  mutate(`Estimated Total Cost (USD)` = cut(df_c$projectAmount,
                                             breaks=c(0, 100000, 1000000, 10000000, 100000000, 1000000000, 10000000000, 20000000000),
                                             include.lowest = TRUE))
ttMap <- st_as_sf(map("county", plot=F, fill=T))
df_c <- left_join(ttMap, df_c, by="ID")
df_c %<% select(-projectAmount)
```

```
# Mapping
tm_shape(df_c) +
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2009-2018', main.title.position="center")
```

Project_Amount 2009-2018



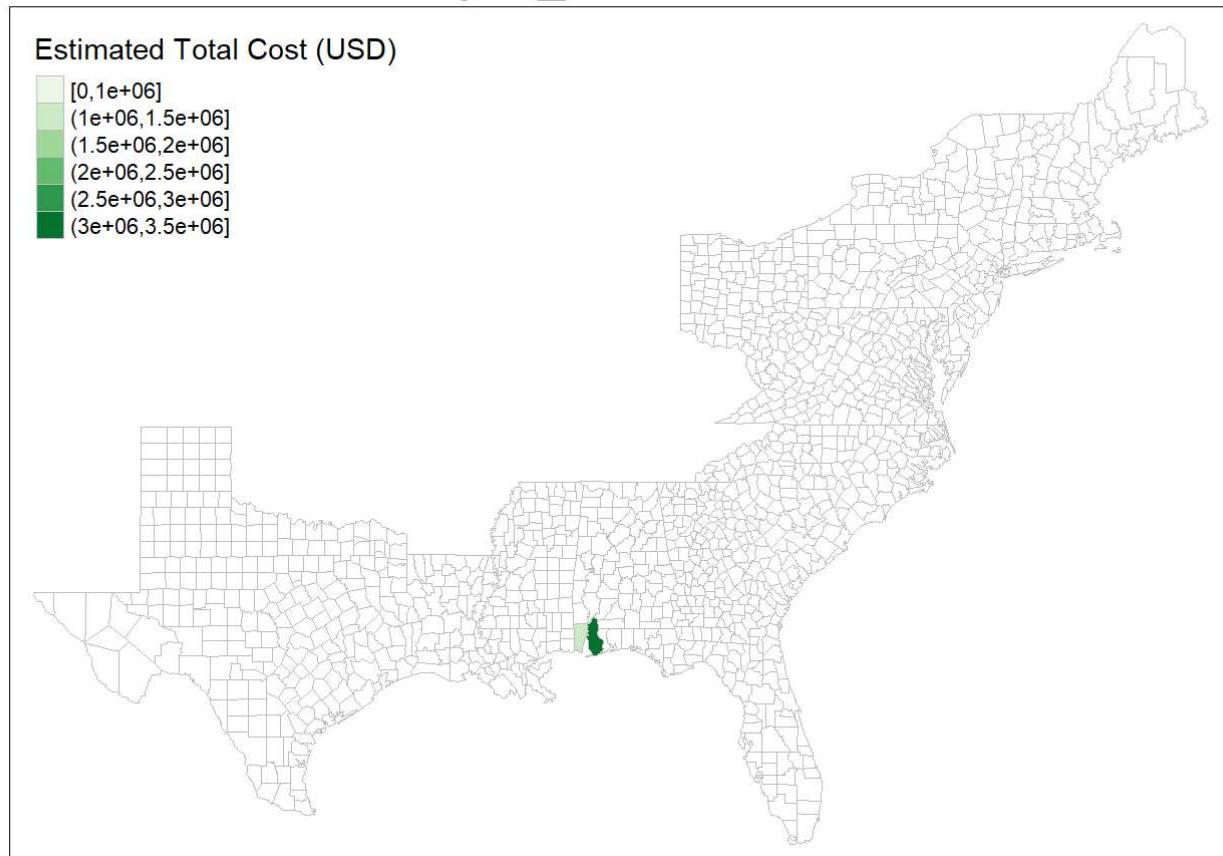
2009

```
## the estimated total cost of Public Assistance grant project for 2009
dy_2009 <- subset(dy, dy$year==2009)
dy_2009 <- dy_2009 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2009$projectAmount)
```

```
##      Min. 1st Qu. Median Mean 3rd Qu. Max.
## 1184470 1240211 1295953 1849006 2181274 3066595
```

```
dy_2009 <- dy_2009 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2009$projectAmount,
                                             breaks=c(0, 1000000, 1500000, 2000000, 2500000, 3000000, 3500000),
                                             include.lowest = TRUE))
tMap <- st_as_sf(map("county", counties_C, plot=F, fill=T))
dy_2009 <- left_join(tMap, dy_2009, by="ID")
dy_2009 %<>% select(-projectAmount)
## Mapping
tm_shape(dy_2009) +
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2009', main.title.position="center")
```

Project_Amount 2009



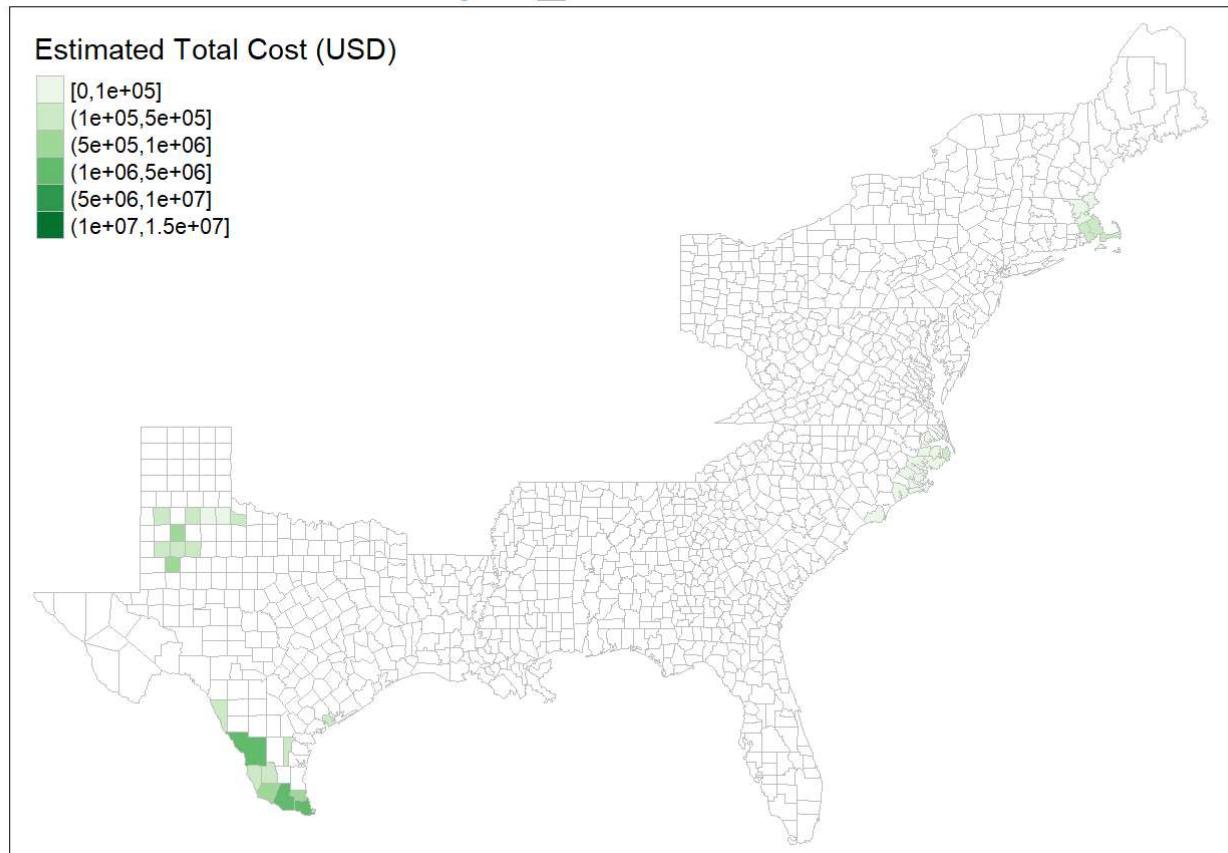
2010

```
## the estimated total cost of Public Assistance grant project for 2010
dy_2010 <- subset(dy, dy$year==2010)
dy_2010 <- dy_2010 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2010$projectAmount)
```

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	1837	17011	122852	704908	398640	10946933

```
dy_2010 <- dy_2010 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2010$projectAmount,
                                             breaks=c(0, 100000, 500000, 1000000, 5000000, 10000000, 15000000),
                                             include.lowest = TRUE))
dy_2010 <- left_join(tMap, dy_2010, by="ID")
dy_2010 %<>% select(-projectAmount)
## Mapping
tm_shape(dy_2010)+
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2010', main.title.position="center")
```

Project_Amount 2010



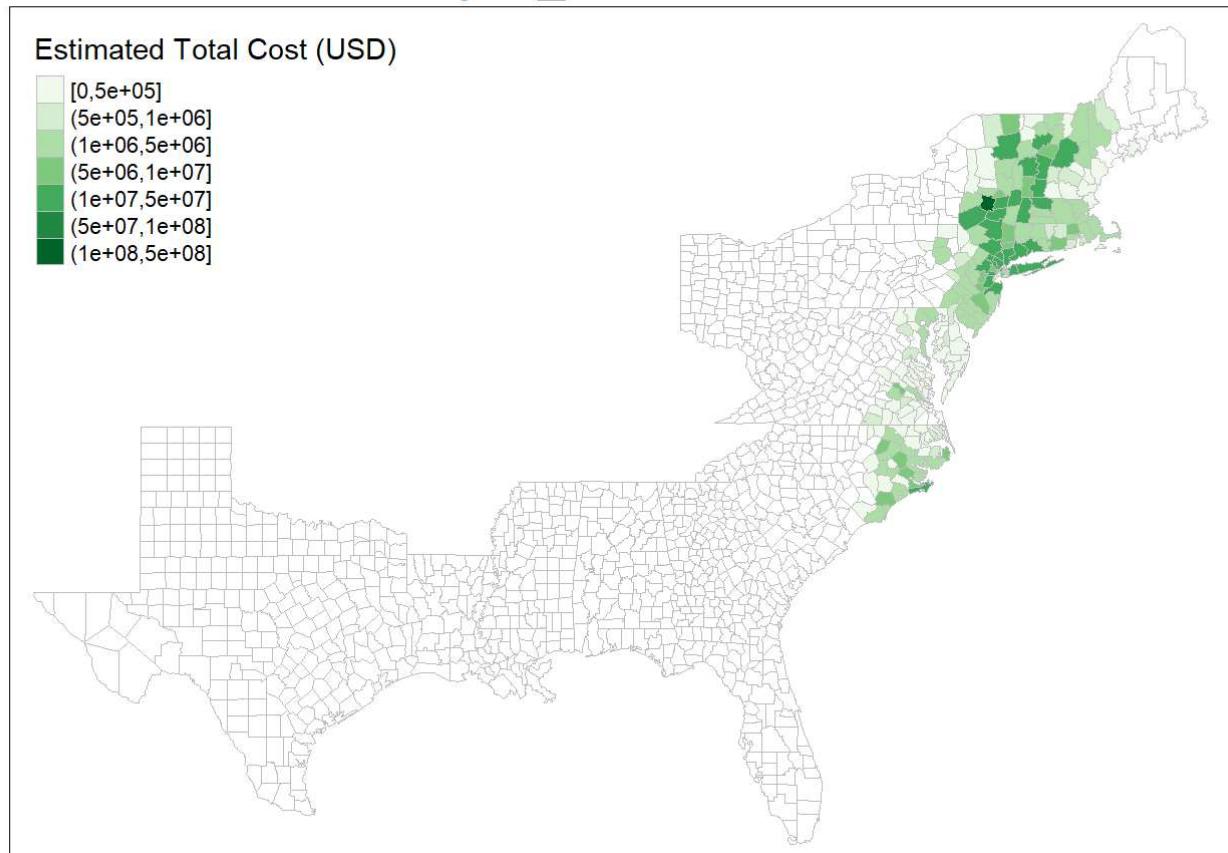
2011

```
## the estimated total cost of Public Assistance grant project for 2011
dy_2011 <- subset(dy, dy$year==2011)
dy_2011 <- dy_2011 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2011$projectAmount)
```

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	3751	307015	1002479	5224165	3357525	233833258

```
dy_2011 <- dy_2011 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2011$projectAmount,
                                             breaks=c(0, 500000, 1000000, 5000000, 10000000, 50000000, 100000000, 500000000),
                                             include.lowest = TRUE))
dy_2011 <- left_join(tMap, dy_2011, by="ID")
dy_2011 %<>% select(-projectAmount)
## Mapping
tm_shape(dy_2011) +
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2011', main.title.position="center")
```

Project_Amount 2011



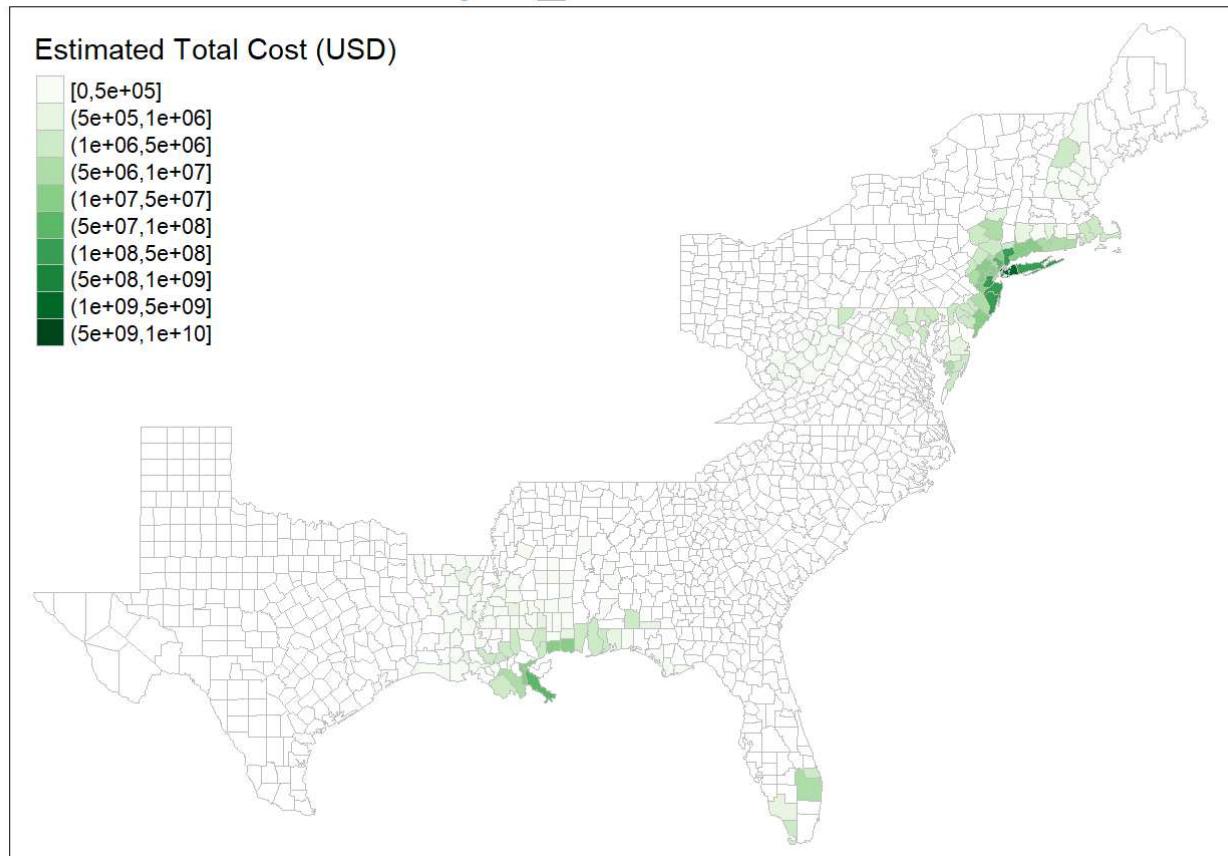
2012

```
## the estimated total cost of Public Assistance grant project for 2012
dy_2012<- subset(dy, dy$year==2012)
dy_2012 <- dy_2012 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2012$projectAmount)
```

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	1.356e+03	1.260e+05	4.781e+05	7.910e+07	3.786e+06	9.724e+09

```
dy_2012 <- dy_2012 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2012$projectAmount,
                                             breaks=c(0, 500000, 1000000, 5000000, 10000000, 50000000, 100000000, 500000000, 10
00000000, 5000000000, 10000000000),
        include.lowest = TRUE))
dy_2012 <- left_join(tMap, dy_2012, by="ID")
dy_2012 %<>% select(-projectAmount)
## Mapping
tm_shape(dy_2012)+
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2012', main.title.position="center")
```

Project_Amount 2012



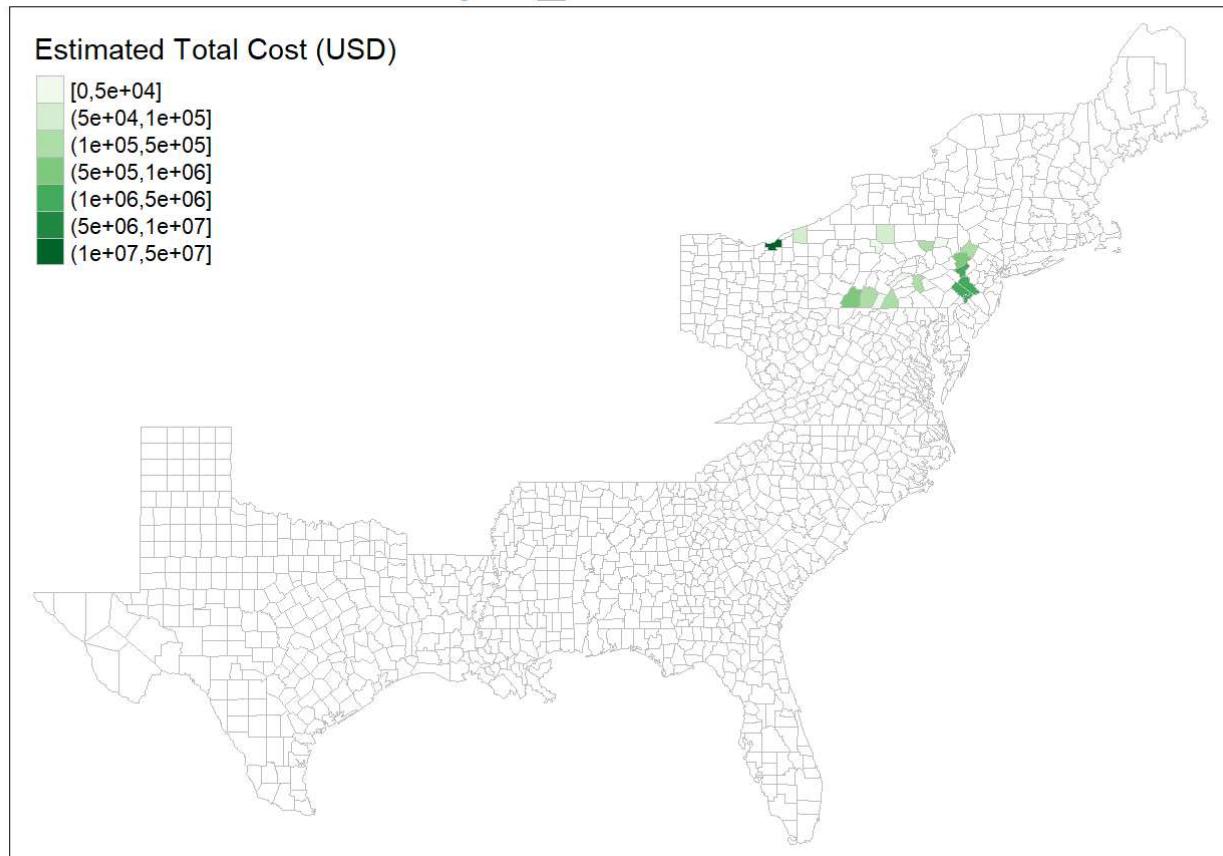
2013

```
## the estimated total cost of Public Assistance grant project for 2013
dy_2013<- subset(dy, dy$year==2013)
dy_2013 <- dy_2013 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2013$projectAmount)
```

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	6829	78559	216434	2011744	3002384	16217372

```
dy_2013 <- dy_2013 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2013$projectAmount,
                                             breaks=c(0, 50000, 100000, 500000, 1000000, 5000000, 10000000, 50000000),
                                             include.lowest = TRUE))
dy_2013 <- left_join(tMap, dy_2013, by="ID")
dy_2013 %>>% select(-projectAmount)
## Mapping
tm_shape(dy_2013)+
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2013', main.title.position="center")
```

Project_Amount 2013



2014

2016

2016

```
## the estimated total cost of Public Assistance grant project for 2016
dy_2016<- subset(dy, dy$year==2016)
dy_2016 <- dy_2016 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2016$projectAmount)
```

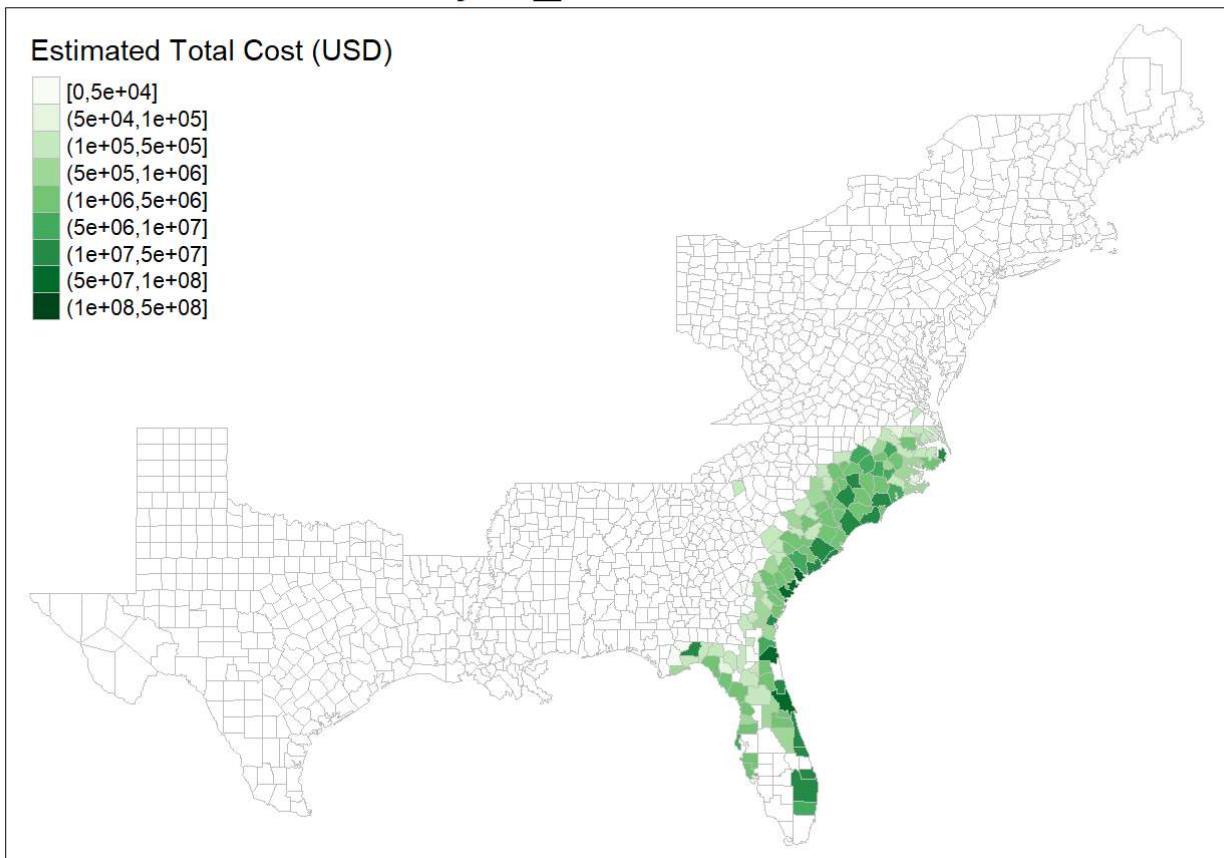
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	7621	286603	1528748	9343455	4805146	159800082

```

dy_2016 <- dy_2016 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2016$projectAmount,
                                             breaks=c(0, 50000, 100000, 500000, 1000000, 5000000, 10000000, 50000000, 100000000
                                             , 500000000),
         include.lowest = TRUE)
dy_2016 <- left_join(tMap, dy_2016, by="ID")
dy_2016 %>% select(-projectAmount)
## Mapping
tm_shape(dy_2016) +
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2016', main.title.position="center")

```

Project_Amount 2016



2017

```

## the estimated total cost of Public Assistance grant project for 2017
dy_2017<- subset(dy, dy$year==2017)
dy_2017 <- dy_2017 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2017$projectAmount)

```

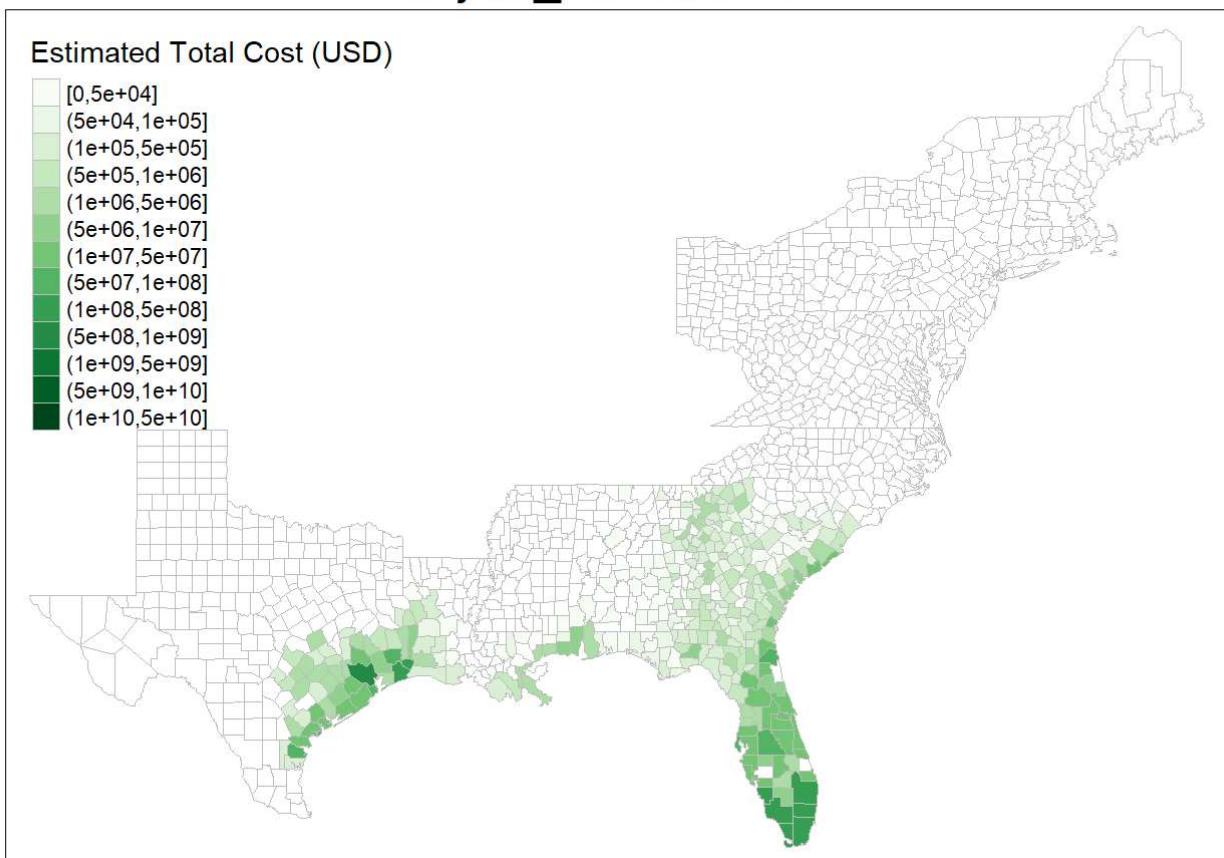
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	3.399e+03	9.809e+04	5.866e+05	6.492e+07	1.047e+07	1.894e+10

```

dy_2017 <- dy_2017 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2017$projectAmount,
                                             breaks=c(0, 50000, 100000, 500000, 1000000, 5000000, 10000000, 50000000, 100000000,
                                             , 500000000, 1000000000, 5000000000, 10000000000, 50000000000),
                                             include.lowest = TRUE))
dy_2017 <- left_join(tMap, dy_2017, by="ID")
dy_2017 %>% select(-projectAmount)
## Mapping
tm_shape(dy_2017) +
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2017', main.title.position="center")

```

Project_Amount 2017



2018

```

## the estimated total cost of Public Assistance grant project for 2018
dy_2018<- subset(dy, dy$year==2018)
dy_2018 <- dy_2018 %>%
  group_by(ID) %>%
  summarize(projectAmount = sum(projectAmount))
summary(dy_2018$projectAmount)

```

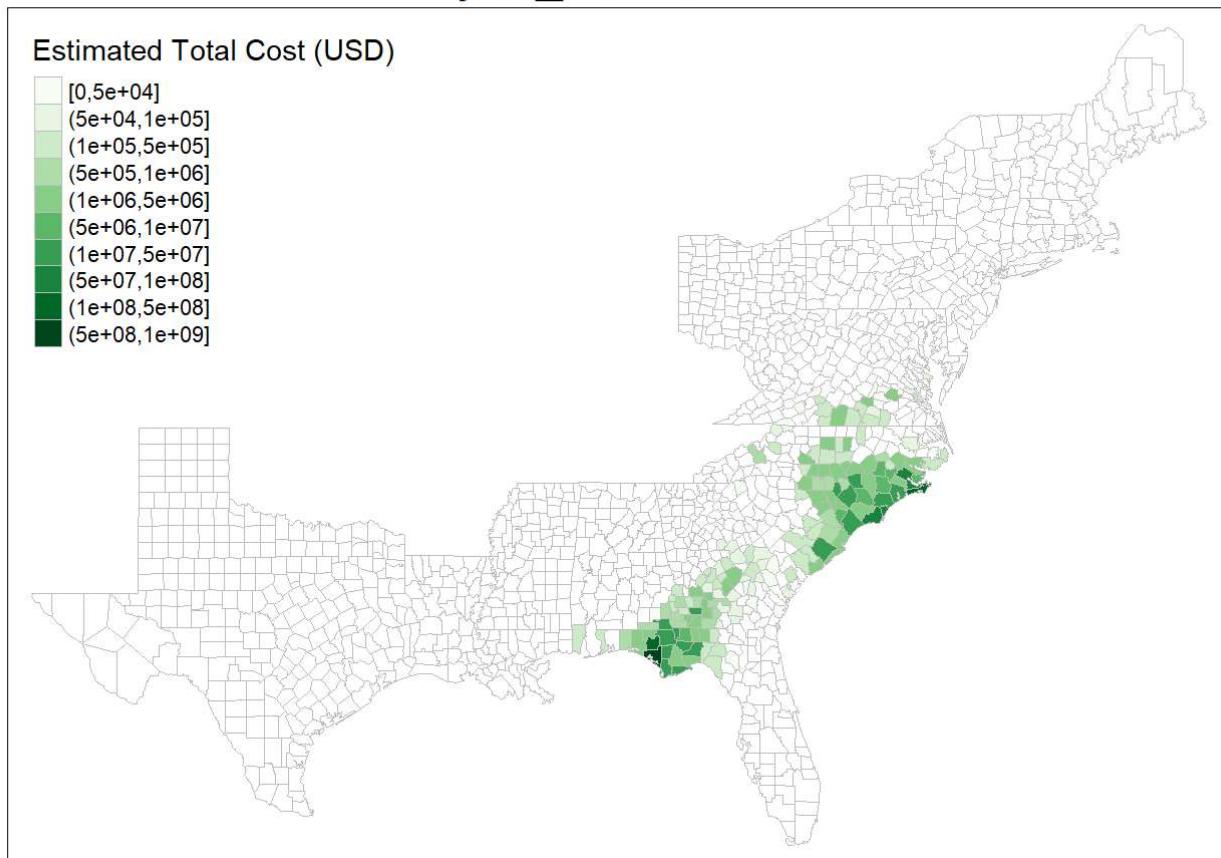
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	4376	100725	510967	14145725	2657303	696062983

```

dy_2018 <- dy_2018 %>%
  mutate(`Estimated Total Cost (USD)` = cut(dy_2018$projectAmount,
                                             breaks=c(0, 50000, 100000, 500000, 1000000, 5000000, 10000000, 50000000, 100000000
                                             , 500000000, 1000000000),
         include.lowest = TRUE))
dy_2018 <- left_join(tMap, dy_2018, by="ID")
dy_2018 %>% select(-projectAmount)
## Mapping
tm_shape(dy_2018) +
  tm_polygons("Estimated Total Cost (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Estimated Total Cost (USD)",
              palette = "Greens") +
  tm_layout(main.title = 'Project_Amount 2018', main.title.position="center")

```

Project_Amount 2018



Focus on “Federal Share Obligated”

The Public Assistance grant funding available to the grantee (State) in dollars, for sub-grantee's approved Project Worksheets.

```

df_d <- df %>%
  group_by(ID) %>%
  summarize(federalShare0bligated = sum(federalShare0bligated))
df_d <- df_d %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(df_d$federalShare0bligated,
                                                       breaks=c(0, 100000, 1000000, 10000000, 100000000, 1000000000, 10000000000, 200000
00000),
        include.lowest = TRUE))
ttMap <- st_as_sf(map("county", plot=F, fill=T))
df_d <- left_join(ttMap, df_d, by="ID")
df_d %>% select(-federalShare0bligated)

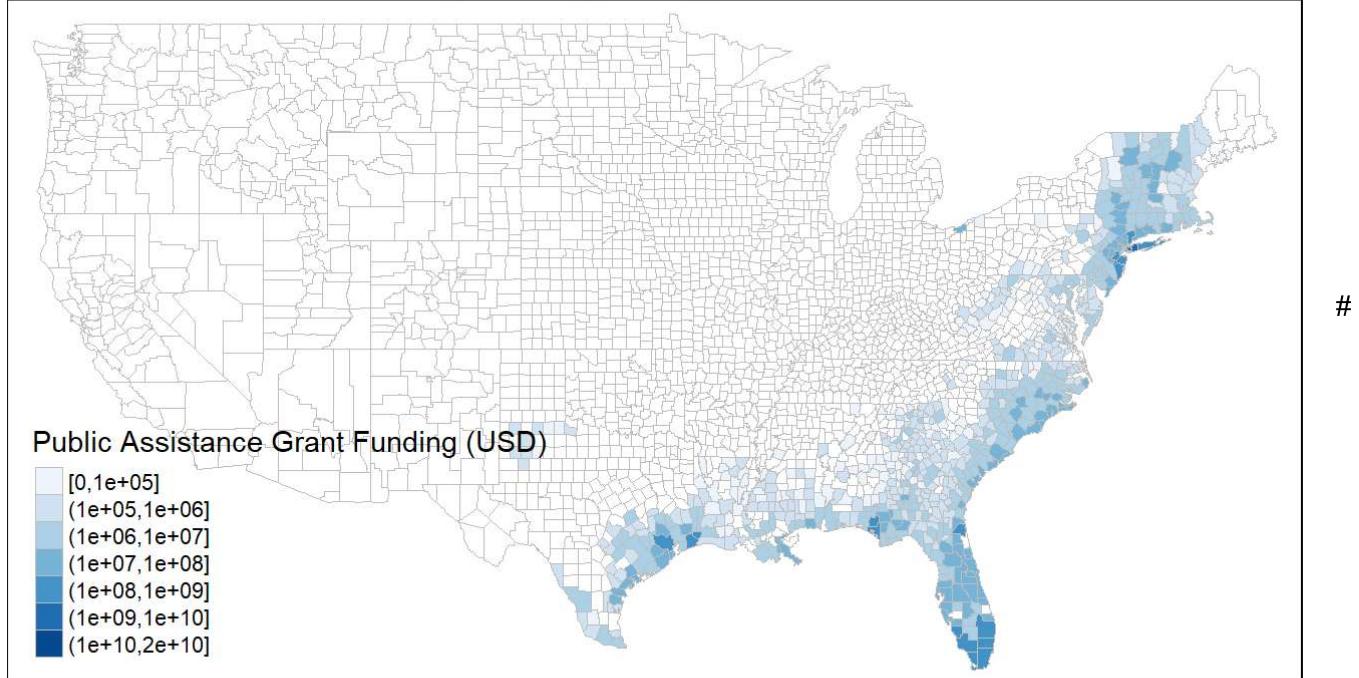
```

```

# Mapping
tm_shape(df_d) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Public Assistance Grant Funding (USD)",
              palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2009–2018', main.title.position="center")

```

Federal_Share_Obligated 2009–2018



2009

```

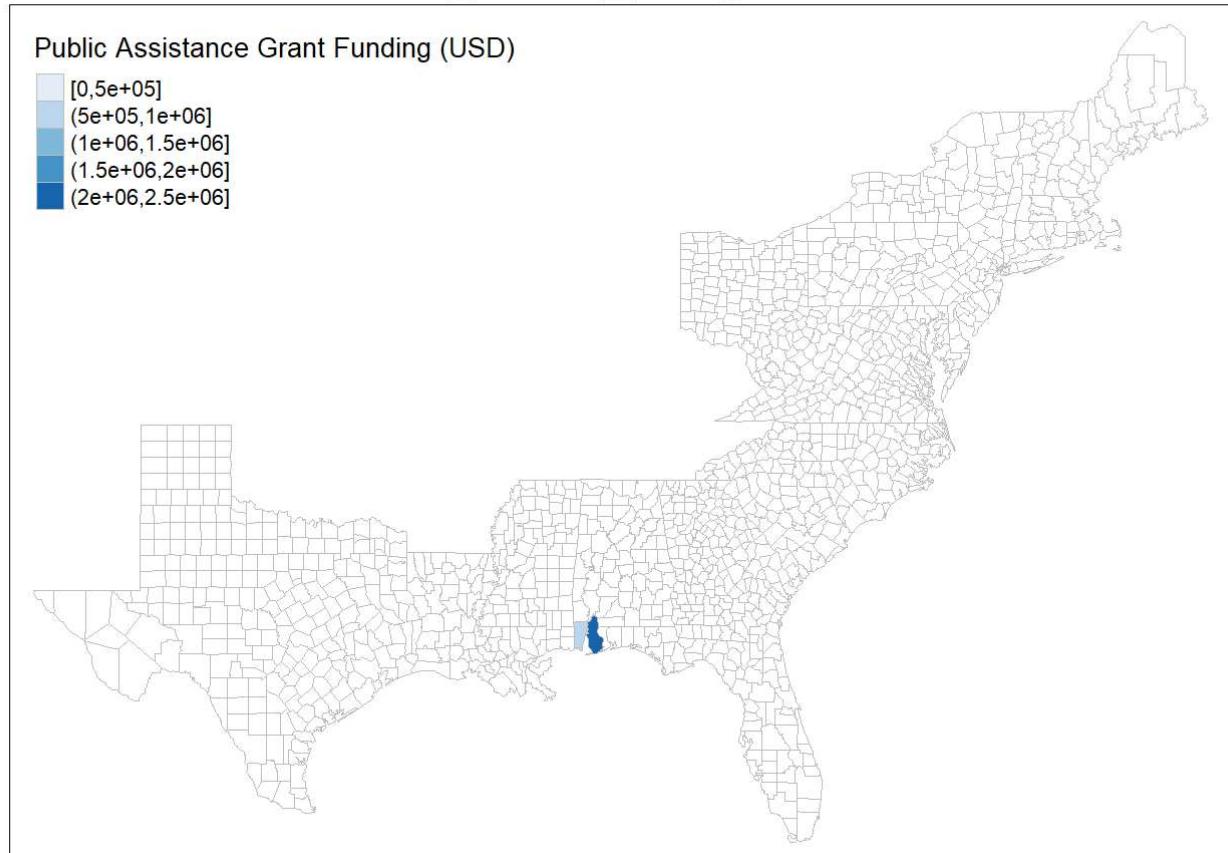
## the estimated Public Assistance grant funding available to the grantee (State) for 2009
dp_2009 <- subset(dy, dy$year==2009)
dp_2009 <- dp_2009 %>%
  group_by(ID) %>%
  summarize(federalShare0bligated = sum(federalShare0bligated))
summary(dp_2009$federalShare0bligated)

```

```
##      Min. 1st Qu. Median    Mean 3rd Qu.    Max.
## 888353  964497 1040641 1409647 1670294 2299946
```

```
dp_2009 <- dp_2009 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2009$federalShareObligated,
    breaks=c(0, 500000, 1000000, 1500000, 2000000, 2500000),
    include.lowest = TRUE))
tMap <- st_as_sf(map("county", counties_C, plot=F, fill=T))
dp_2009 <- left_join(tMap, dp_2009, by="ID")
dp_2009 %>>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2009) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
    lwd = 0.1, colorNA = NULL, style="cont",
    title = "Public Assistance Grant Funding (USD)",
    palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2009', main.title.position="center")
```

Federal_Share_Obligated 2009



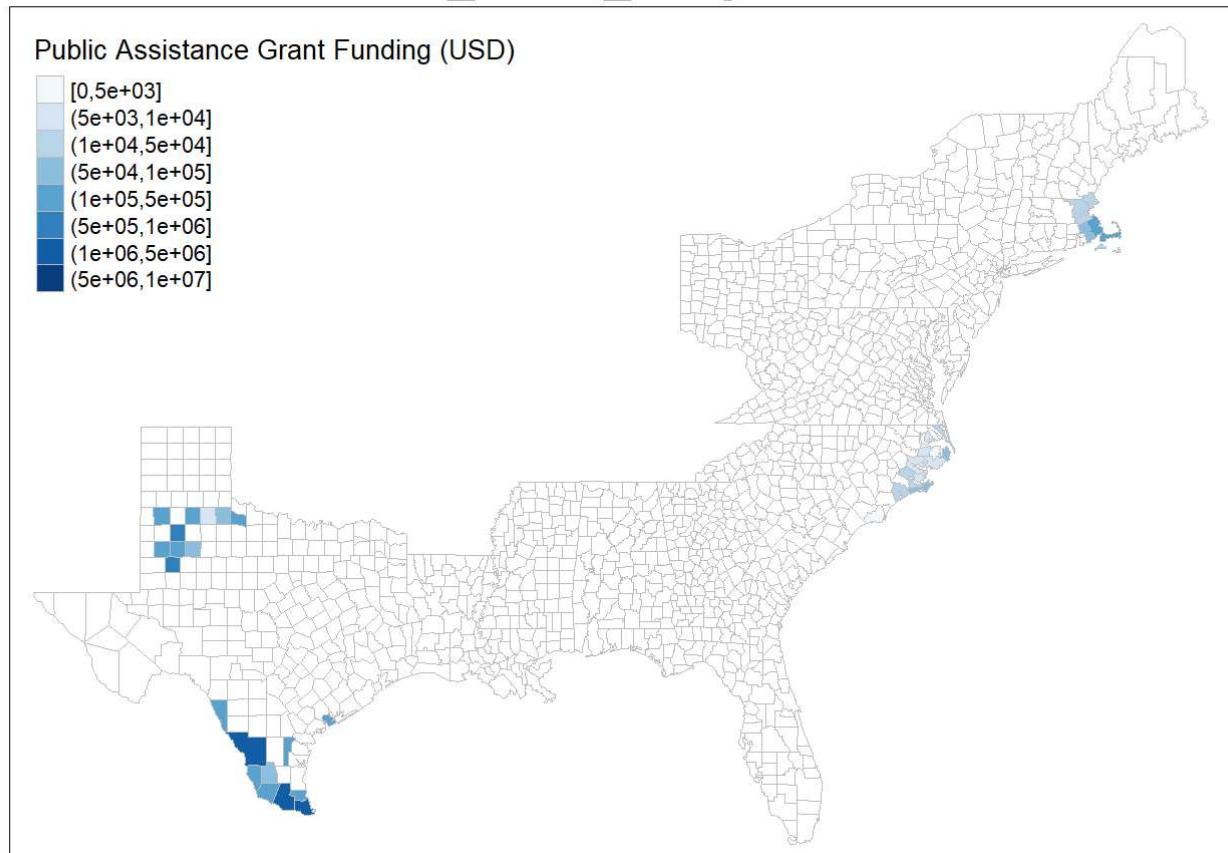
2010

```
## the estimated Public Assistance grant funding available to the grantee (State) for 2010
dp_2010 <- subset(dy, dy$year==2010)
dp_2010 <- dp_2010 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2010$federalShareObligated)
```

```
##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
##      1378   12759   92139  533081  298980 8386170
```

```
dp_2010 <- dp_2010 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2010$federalShareObligated,
    breaks=c(0, 5000, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000),
    include.lowest = TRUE))
dp_2010 <- left_join(tMap, dp_2010, by="ID")
dp_2010 %<>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2010) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
    lwd = 0.1, colorNA = NULL, style="cont",
    title = "Public Assistance Grant Funding (USD)",
    palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2010', main.title.position="center")
```

Federal_Share_Obligated 2010



#

2011

```
## the estimated Public Assistance grant funding available to the grantee (State) for 2011
dp_2011 <- subset(dy, dy$year==2011)
dp_2011 <- dp_2011 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2011$federalShareObligated)
```

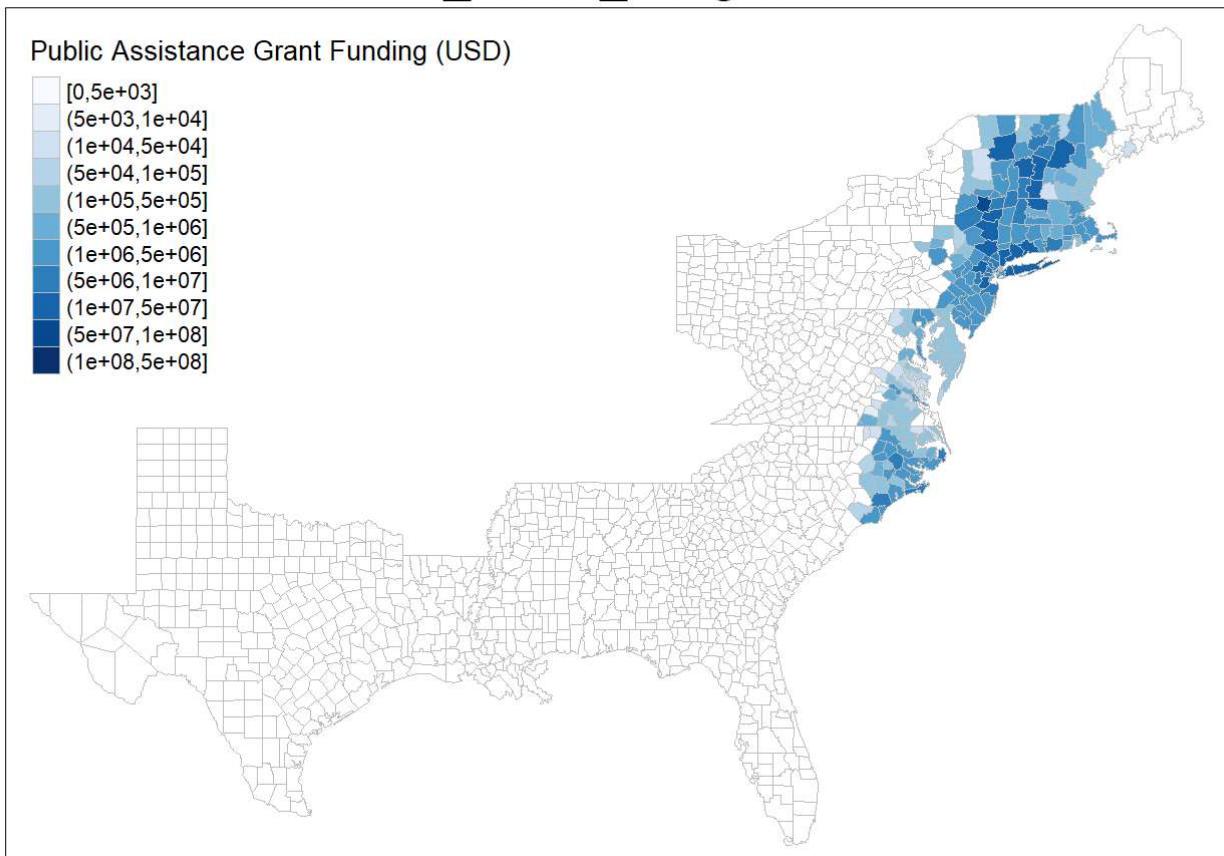
```
##      Min. 1st Qu. Median     Mean 3rd Qu.     Max.
##      2813   230261   751859  4040172  2572351 175447538
```

```

dp_2011 <- dp_2011 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2011$federalShareObligated,
    breaks=c(0, 5000, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000, 5000000
0, 100000000, 500000000),
    include.lowest = TRUE))
dp_2011 <- left_join(tMap, dp_2011, by="ID")
dp_2011 %>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2011) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
    lwd = 0.1, colorNA = NULL, style="cont",
    title = "Public Assistance Grant Funding (USD)",
    palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2011', main.title.position="center")

```

Federal_Share_Obligated 2011



2012

```

## the estimated Public Assistance grant funding available to the grantee (State) for 2012
dp_2012 <- subset(dy, dy$year==2012)
dp_2012 <- dp_2012 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2012$federalShareObligated)

```

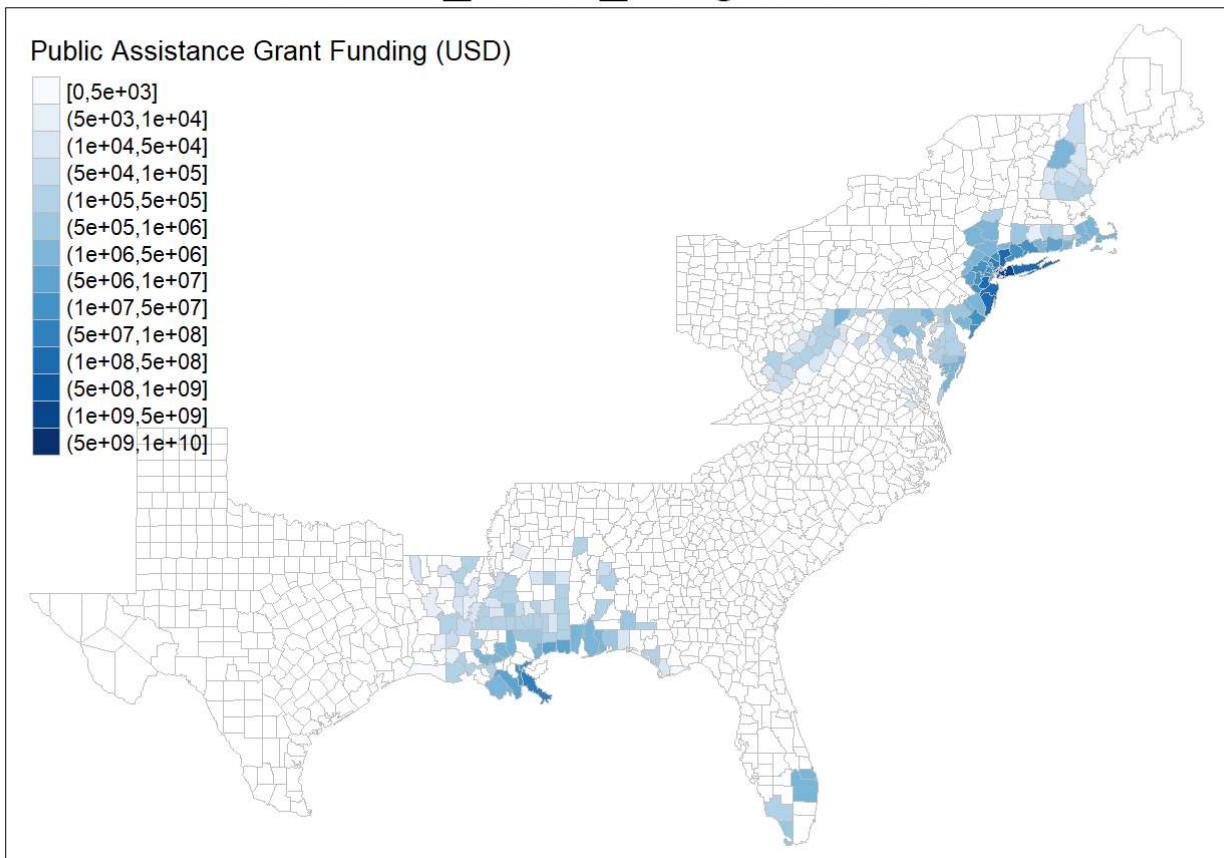
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	1.017e+03	9.426e+04	3.576e+05	7.083e+07	2.929e+06	8.751e+09

```

dp_2012 <- dp_2012 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2012$federalShareObligated,
    breaks=c(0, 5000, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000, 5000000
0, 100000000, 500000000, 1000000000, 5000000000, 10000000000),
    include.lowest = TRUE))
dp_2012 <- left_join(tMap, dp_2012, by="ID")
dp_2012 %>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2012) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
    lwd = 0.1, colorNA = NULL, style="cont",
    title = "Public Assistance Grant Funding (USD)",
    palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2012', main.title.position="center")

```

Federal_Share_Obligated 2012



2013

```

## the estimated Public Assistance grant funding available to the grantee (State) for 2013
dp_2013 <- subset(dy, dy$year==2013)
dp_2013 <- dp_2013 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2013$federalShareObligated)

```

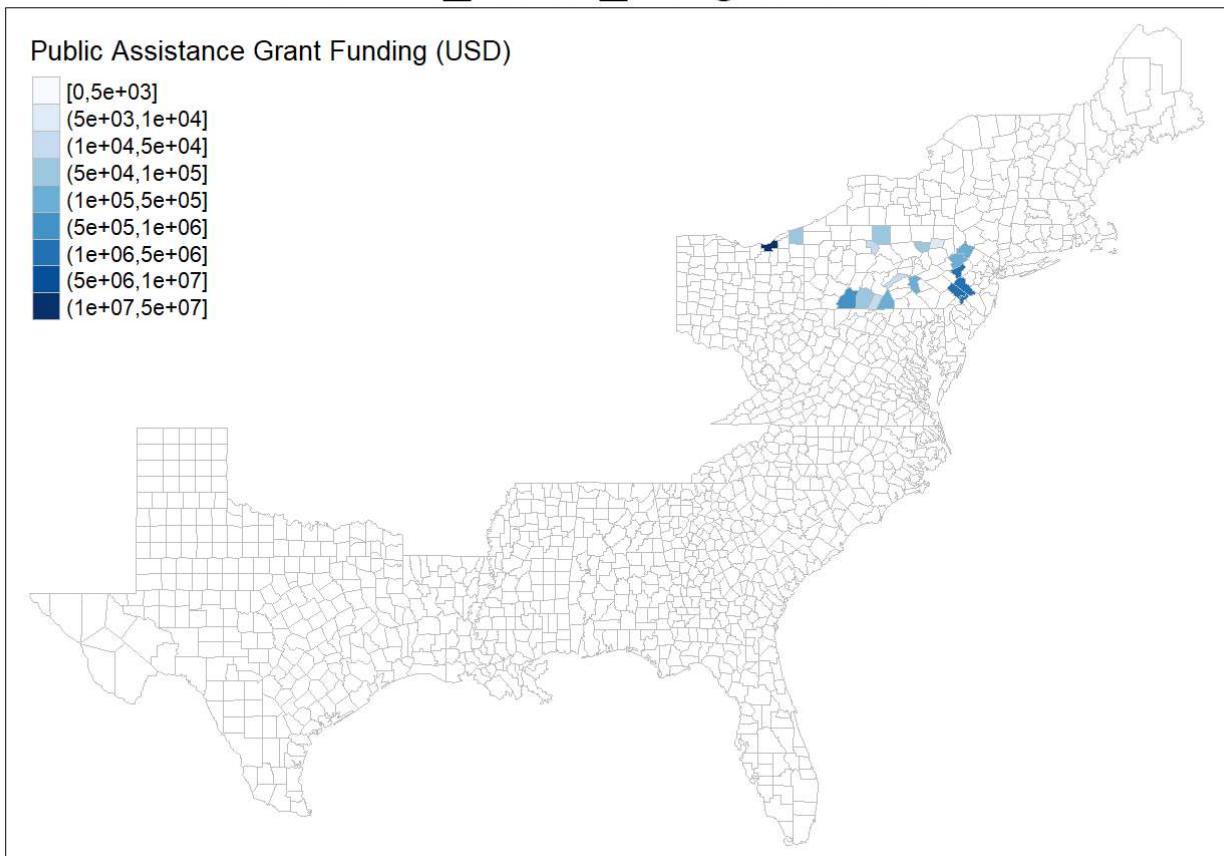
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	5122	58919	162325	1513826	2251788	12163029

```

dp_2013 <- dp_2013 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2013$federalShareObligated,
    breaks=c(0, 5000, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000, 5000000
0),
    include.lowest = TRUE))
dp_2013 <- left_join(tMap, dp_2013, by="ID")
dp_2013 %>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2013) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
    lwd = 0.1, colorNA = NULL, style="cont",
    title = "Public Assistance Grant Funding (USD)",
    palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2013', main.title.position="center")

```

Federal_Share_Obligated 2013



2014

2015

2016

```

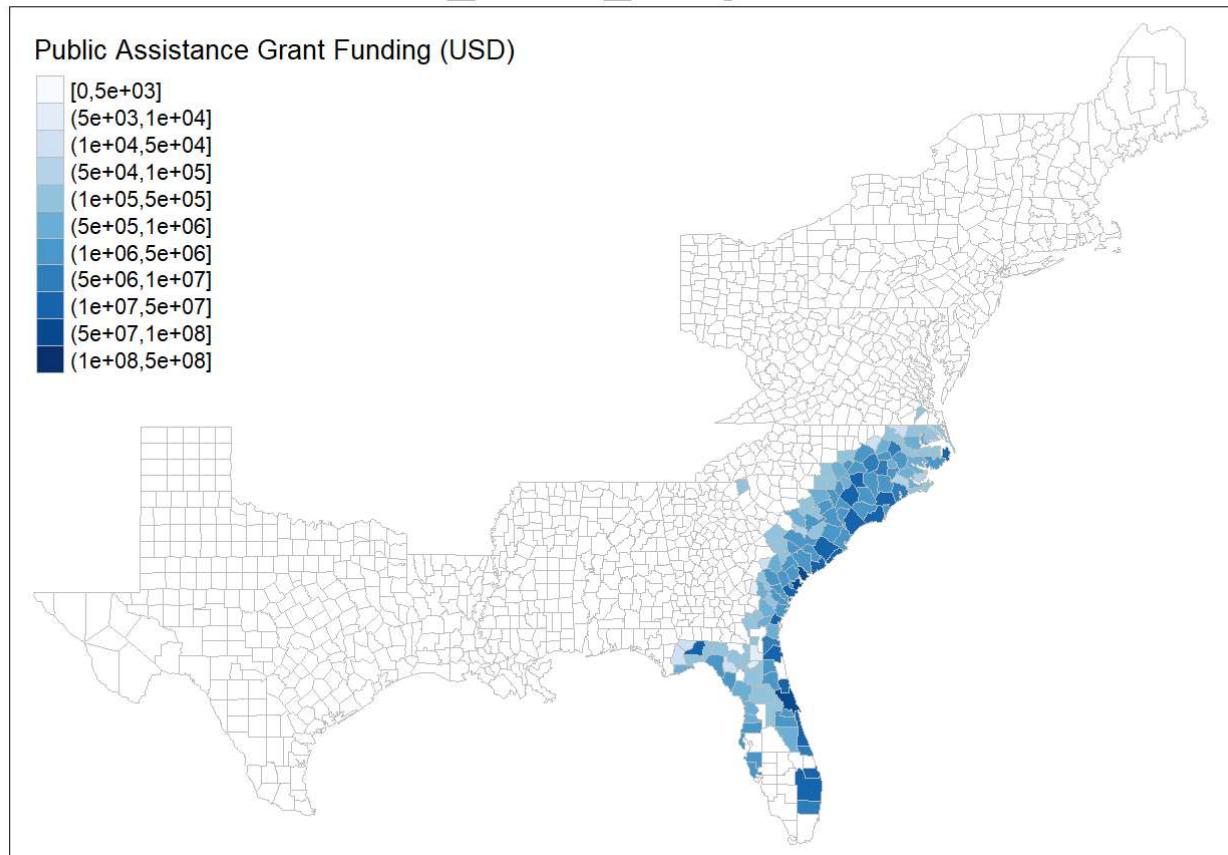
## the estimated Public Assistance grant funding available to the grantee (State) for 2016
dp_2016 <- subset(dy, dy$year==2016)
dp_2016 <- dp_2016 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2016$federalShareObligated)

```

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	6478	224222	1163009	7255198	3708394	124560548

```
dp_2016 <- dp_2016 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2016$federalShareObligated,
    breaks=c(0, 5000, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000, 5000000
0, 100000000, 500000000),
    include.lowest = TRUE))
dp_2016 <- left_join(tMap, dp_2016, by="ID")
dp_2016 %>>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2016) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
    lwd = 0.1, colorNA = NULL, style="cont",
    title = "Public Assistance Grant Funding (USD)",
    palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2016', main.title.position="center")
```

Federal_Share_Obligated 2016



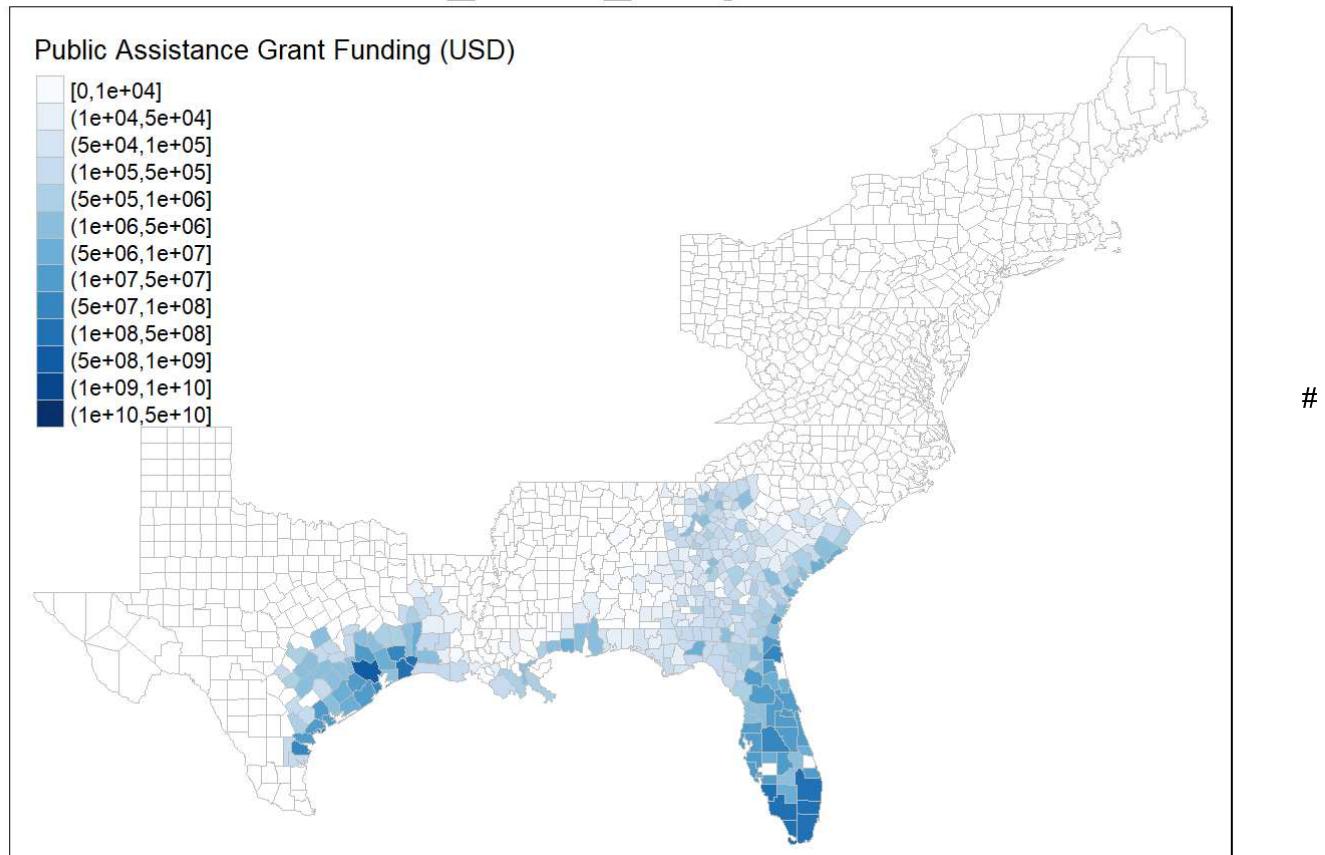
2017

```
## the estimated Public Assistance grant funding available to the grantee (State) for 2017
dp_2017 <- subset(dy, dy$year==2017)
dp_2017 <- dp_2017 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2017$federalShareObligated)
```

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## 2.549e+03 8.125e+04 4.899e+05 6.010e+07 9.480e+06 1.749e+10
```

```
dp_2017 <- dp_2017 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2017$federalShareObligated,
                                                       breaks=c(0, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000, 50000000, 100000000, 500000000, 1000000000, 10000000000, 50000000000),
                                                       include.lowest = TRUE))
dp_2017 <- left_join(tMap, dp_2017, by="ID")
dp_2017 %<>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2017) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Public Assistance Grant Funding (USD)",
              palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2017', main.title.position="center")
```

Federal_Share_Obligated 2017



2018

```
## the estimated Public Assistance grant funding available to the grantee (State) for 2018
dp_2018 <- subset(dy, dy$year==2018)
dp_2018 <- dp_2018 %>%
  group_by(ID) %>%
  summarize(federalShareObligated = sum(federalShareObligated))
summary(dp_2018$federalShareObligated)
```

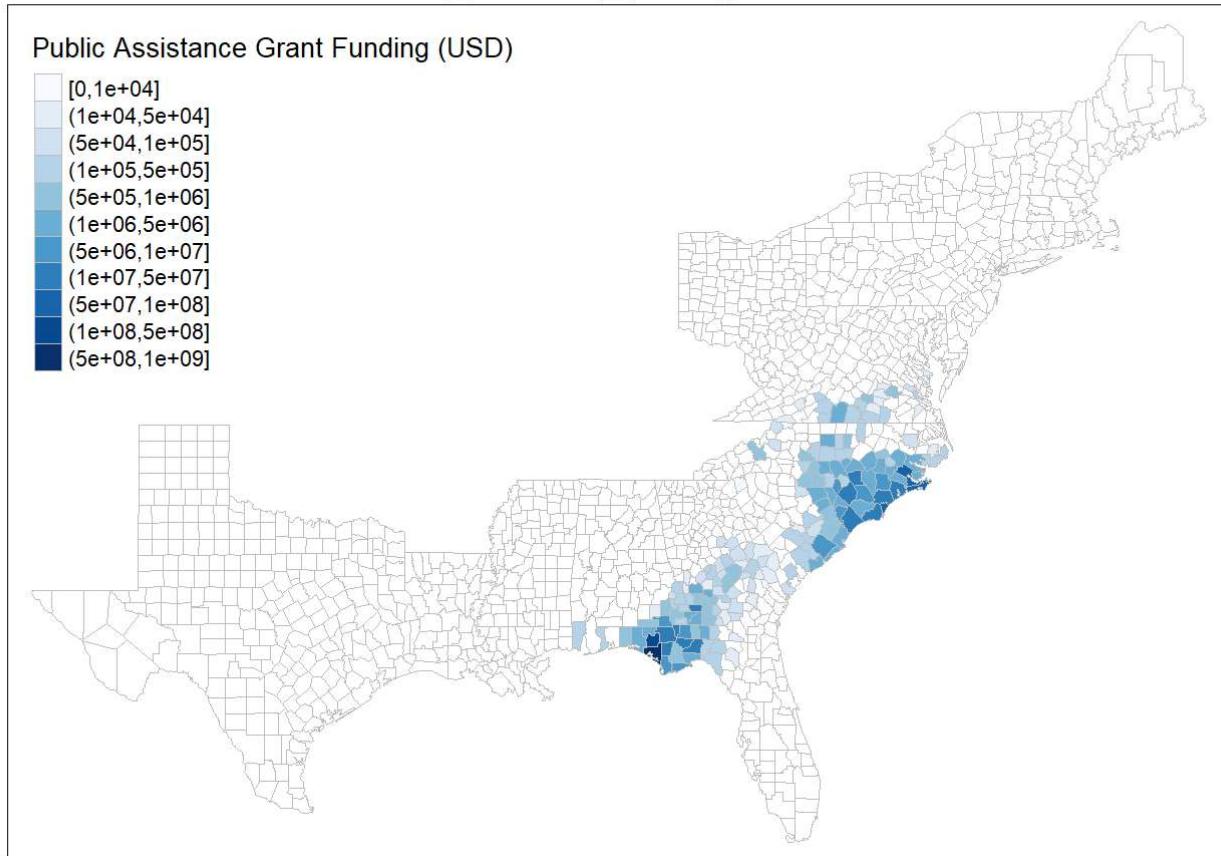
##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
##	3279	75689	382067	11849140	2003729	624918780

```

dp_2018 <- dp_2018 %>%
  mutate(`Public Assistance Grant Funding (USD)` = cut(dp_2018$federalShareObligated,
                                                    breaks=c(0, 10000, 50000, 100000, 500000, 1000000, 5000000, 10000000, 50000000, 100
000000, 500000000, 1000000000),
                                                    include.lowest = TRUE))
dp_2018 <- left_join(tMap, dp_2018, by="ID")
dp_2018 %>>% select(-federalShareObligated)
## Mapping
tm_shape(dp_2018) +
  tm_polygons("Public Assistance Grant Funding (USD)", border.col = "grey",
              lwd = 0.1, colorNA = NULL, style="cont",
              title = "Public Assistance Grant Funding (USD)",
              palette = "Blues") +
  tm_layout(main.title = 'Federal_Share_Obligated 2018', main.title.position="center")

```

Federal_Share_Obligated 2018



Summary:

We can roughly see that in those 11 years, protective measures, public buildings, roads and Bridges suffered the most damage in the hurricanes. Between 2009 and 2019, New York suffered the most hurricanes, accounting for 17% of the country's total. The second is Florida and New Jersey. Besides, 2011 and 2017 were the worst years for hurricanes in the United States.

In general, we can find that the cities that are hardest hit by hurricanes are those on the east coast, and they receive more aid each year.