

Imported Data Exploration

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```
library(here)

## here() starts at /Users/Alvin/Documents/NCSU_Fall_2021/NIH_SIP/flood-risk-health-effects
library(usmap)
library(ggplot2)
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.0 --
## v tibble  3.0.5     v dplyr   1.0.3
## v tidyr   1.1.2     v stringr 1.4.0
## v readr    1.4.0     vforcats 0.5.0
## v purrr   0.3.4

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()   masks stats::lag()

i_am("reports/imported_data_exploration.Rmd")

## here() starts at /Users/Alvin/Documents/NCSU_Fall_2021/NIH_SIP/flood-risk-health-effects
```

Exploration of Flood Risk Dataset

```
flood_risk <- read.csv(here("imported_data", "flood_risk", "County_level_risk_FEMA_FSF_v1.3.csv"))

summary(flood_risk)

##      fips          name       count_property      count_fema_sfha
##  Min. : 1001  Length:3028      Min. : 452  Min. : 0.0
##  1st Qu.:19040 Class :character  1st Qu.: 10730 1st Qu.: 405.5
##  Median :29756 Mode  :character  Median : 20276 Median : 1034.0
##  Mean   :30752                   Mean   : 46965 Mean   : 2862.8
##  3rd Qu.:46016                   3rd Qu.: 43015 3rd Qu.: 2274.2
##  Max.  :56045                   Max.  :2403985 Max.  :259884.0
##
##      pct_fema_sfha  count_fs_risk_2020_5 pct_fs_risk_2020_5 count_fs_risk_2050_5
##  Min.   : 0.000  Min.   : 4             Min.   : 0.000  Min.   : 5.0
##  1st Qu.: 2.100  1st Qu.: 401          1st Qu.: 2.300  1st Qu.: 418.8
##  Median : 4.300  Median : 861          Median : 3.800  Median : 908.0
##  Mean   : 6.509  Mean   : 1596         Mean   : 5.179  Mean   : 1900.8
##  3rd Qu.: 7.800  3rd Qu.: 1727         3rd Qu.: 6.225  3rd Qu.: 1857.0
```

```

##   Max.    :94.200   Max.    :73217       Max.    :66.000   Max.    :109359.0
##
##   pct_fs_risk_2050_5 count_fs_risk_2020_100 pct_fs_risk_2020_100
##   Min.    : 0.000   Min.    : 64       Min.    : 1.30
##   1st Qu.: 2.400   1st Qu.: 1182     1st Qu.: 7.90
##   Median  : 4.100   Median  : 2328     Median  :10.60
##   Mean    : 5.650   Mean    : 5330     Mean    :12.77
##   3rd Qu.: 6.625   3rd Qu.: 4912     3rd Qu.:14.80
##   Max.    :73.400   Max.    :228191    Max.    :93.70
##
##   count_fs_risk_2050_100 pct_fs_risk_2050_100 count_fs_risk_2020_500
##   Min.    : 70      Min.    : 1.3      Min.    : 81
##   1st Qu.: 1206    1st Qu.: 8.1      1st Qu.: 1494
##   Median  : 2409    Median  :10.9      Median  : 2970
##   Mean    : 5883    Mean    :13.5      Mean    : 7829
##   3rd Qu.: 5143    3rd Qu.:15.2      3rd Qu.: 6550
##   Max.    :253619   Max.    :99.5      Max.    :442643
##
##   pct_fs_risk_2020_500 count_fs_risk_2050_500 pct_fs_risk_2050_500
##   Min.    : 2.00    Min.    : 81      Min.    : 2.00
##   1st Qu.:10.40    1st Qu.: 1518    1st Qu.: 10.60
##   Median  :13.90    Median  : 3052    Median  : 14.15
##   Mean    :16.85    Mean    : 8406    Mean    : 17.57
##   3rd Qu.:19.40    3rd Qu.: 6780    3rd Qu.: 19.90
##   Max.    :99.90    Max.    :470448   Max.    :100.00
##
##   count_fs_fema_difference_2020 pct_fs_fema_difference_2020 avg_risk_score_all
##   Min.    :-65269   Min.    :-48.000   Min.    :1.090
##   1st Qu.: 396     1st Qu.: 3.075    1st Qu.:1.580
##   Median  :1082    Median  : 5.600    Median  :1.780
##   Mean    : 2467    Mean    : 6.264    Mean    :1.966
##   3rd Qu.: 2714    3rd Qu.: 9.225    3rd Qu.:2.100
##   Max.    :198516   Max.    :47.000    Max.    :8.430
##
##   avg_risk_score_2_10 avg_risk_fsf_2020_100 avg_risk_fsf_2020_500
##   Min.    :3.740    Min.    :4.330    Min.    :3.840
##   1st Qu.:5.888    1st Qu.:6.980    1st Qu.:6.030
##   Median  :6.550    Median  :7.495    Median  :6.680
##   Mean    :6.542    Mean    :7.478    Mean    :6.666
##   3rd Qu.:7.220    3rd Qu.:7.990    3rd Qu.:7.320
##   Max.    :9.520    Max.    :9.680    Max.    :9.550
##
##   avg_risk_score_sfha avg_risk_score_no_sfha count_floodfactor1
##   Min.    : 1.000   Min.    :0.04      Min.    : 41
##   1st Qu.: 4.290   1st Qu.:1.42      1st Qu.: 8634
##   Median  : 5.360   Median  :1.59      Median  :16483
##   Mean    : 5.357   Mean    :1.73      Mean    :38549
##   3rd Qu.: 6.430   3rd Qu.:1.85      3rd Qu.: 35625
##   Max.    :10.000   Max.    :7.68      Max.    :1946655
##   NA's    :64        NA's    :5
##
##   count_floodfactor2 count_floodfactor3 count_floodfactor4 count_floodfactor5
##   Min.    : 0.0      Min.    : 2.0      Min.    : 1      Min.    : 0.0
##   1st Qu.: 25.0     1st Qu.:107.0    1st Qu.: 123    1st Qu.: 71.0
##   Median  : 70.0     Median  :242.0    Median  : 298    Median  :158.5

```

```

##   Mean    : 439.6    Mean    : 1084.5    Mean    : 1417    Mean    : 585.4
## 3rd Qu.: 199.2    3rd Qu.: 631.5    3rd Qu.: 771     3rd Qu.: 379.2
## Max.    :61699.0    Max.    :120461.0   Max.    :151862   Max.    :50608.0
##
##   count_floodfactor6 count_floodfactor7 count_floodfactor8 count_floodfactor9
##   Min.    : 12.0    Min.    :  9.0    Min.    :  0.0    Min.    :  6.0
## 1st Qu.: 299.8    1st Qu.: 203.0    1st Qu.: 40.0    1st Qu.: 234.0
## Median : 631.0    Median : 397.0    Median : 81.0    Median : 487.0
## Mean   : 2109.3    Mean   : 807.4    Mean   : 165.8    Mean   : 910.5
## 3rd Qu.: 1489.2    3rd Qu.: 837.2    3rd Qu.: 170.2    3rd Qu.: 917.2
## Max.   :123857.0   Max.   :23369.0   Max.   :9157.0   Max.   :77254.0
##
##   count_floodfactor10
##   Min.    :  0.0
## 1st Qu.: 148.0
## Median : 357.5
## Mean   : 897.1
## 3rd Qu.: 848.0
## Max.   :49041.0
##

```

There are some missing values in the flood risk.

```
which(is.na(flood_risk), arr.ind = TRUE)
```

```

##      row col
## [1,] 159 24
## [2,] 195 24
## [3,] 220 24
## [4,] 243 24
## [5,] 870 24
## [6,] 872 24
## [7,] 877 24
## [8,] 887 24
## [9,] 922 24
## [10,] 930 24
## [11,] 931 24
## [12,] 934 24
## [13,] 938 24
## [14,] 1184 24
## [15,] 1185 24
## [16,] 1197 24
## [17,] 1206 24
## [18,] 1209 24
## [19,] 1214 24
## [20,] 1216 24
## [21,] 1217 24
## [22,] 1246 24
## [23,] 1522 24
## [24,] 1524 24
## [25,] 1537 24
## [26,] 1574 24
## [27,] 1575 24
## [28,] 1579 24
## [29,] 1616 24

```

```

## [30,] 1622 24
## [31,] 1623 24
## [32,] 1629 24
## [33,] 1645 24
## [34,] 1668 24
## [35,] 1912 24
## [36,] 1913 24
## [37,] 1936 24
## [38,] 1937 24
## [39,] 1939 24
## [40,] 1941 24
## [41,] 2271 24
## [42,] 2272 24
## [43,] 2288 24
## [44,] 2295 24
## [45,] 2297 24
## [46,] 2298 24
## [47,] 2307 24
## [48,] 2422 24
## [49,] 2433 24
## [50,] 2465 24
## [51,] 2466 24
## [52,] 2477 24
## [53,] 2501 24
## [54,] 2520 24
## [55,] 2545 24
## [56,] 2548 24
## [57,] 2563 24
## [58,] 2585 24
## [59,] 2592 24
## [60,] 2604 24
## [61,] 2609 24
## [62,] 2623 24
## [63,] 2671 24
## [64,] 2973 24
## [65,] 870 25
## [66,] 872 25
## [67,] 877 25
## [68,] 930 25
## [69,] 938 25

```

The 24th and 25th columns have missing values. These are average risk score of SFHA properties, and average risk score of non-SFHA properties.

```
names(flood_risk)[c(24, 25)]
```

```
## [1] "avg_risk_score_sfha"     "avg_risk_score_no_sfha"
```

Exploration of Life Expectancy/Mortality Risk data

```
life_expect_mort_no_ui <- readRDS(file = here("imported_data", "life_expectancy_mortality_risk",
                                              "life_expect_mort_no_ui.rds"))
```

```

summary(life_expect_mort_no_ui)

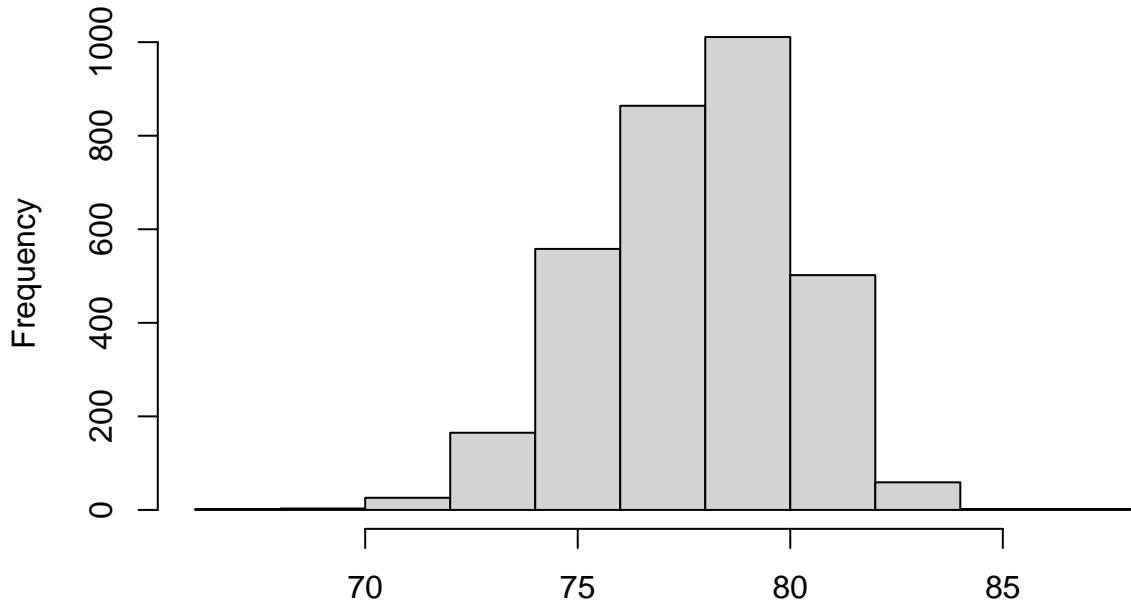
##      Location          fips      Life expectancy, 1980*
##  Length:3194      Min.   : 1   Min.   :61.25
##  Class :character  1st Qu.:18101  1st Qu.:72.73
##  Mode   :character  Median :29125  Median :73.93
##                  Mean   :29899  Mean   :73.78
##                  3rd Qu.:45055  3rd Qu.:75.01
##                  Max.   :56045  Max.   :79.44
##                  NA's    :1
##  Life expectancy, 1985* Life expectancy, 1990* Life expectancy, 1995*
##  Min.   :62.34      Min.   :62.53      Min.   :63.21
##  1st Qu.:73.55     1st Qu.:73.99     1st Qu.:74.22
##  Median :74.74     Median :75.32     Median :75.68
##  Mean   :74.62     Mean   :75.15     Mean   :75.49
##  3rd Qu.:75.83     3rd Qu.:76.50     3rd Qu.:76.89
##  Max.   :80.41     Max.   :81.73     Max.   :82.65
##
##  Life expectancy, 2000* Life expectancy, 2005* Life expectancy, 2010*
##  Min.   :64.80      Min.   :65.05      Min.   :66.25
##  1st Qu.:75.00     1st Qu.:75.37     1st Qu.:76.17
##  Median :76.50     Median :77.00     Median :77.91
##  Mean   :76.33     Mean   :76.82     Mean   :77.71
##  3rd Qu.:77.78     3rd Qu.:78.41     3rd Qu.:79.36
##  Max.   :83.88     Max.   :85.08     Max.   :86.33
##
##  Life expectancy, 2014* % Change in Life Expectancy, 1980-2014
##  Min.   :66.81      Min.   :-3.040
##  1st Qu.:76.13     1st Qu.: 4.093
##  Median :77.96     Median : 5.340
##  Mean   :77.77     Mean   : 5.411
##  3rd Qu.:79.50     3rd Qu.: 6.590
##  Max.   :86.83     Max.   :18.310
##

```

The first dependent variable we're focusing on is Life expectancy, 2014*.

```
hist(life_expect_mort_no_ui$`Life expectancy, 2014*`)
```

Histogram of life_expect_mort_no_ui\$'Life expectancy, 2014**



Exploration of CDC SVI data

```
# reading in the CDC SVI data
cdc_svi <- read.csv(here("imported_data", "CDC_SVI", "SVI2018_US_COUNTY.csv"))

summary(cdc_svi)

##          ST            STATE           ST_ABBR           COUNTY
##  Min.   : 1.00  Length:3142    Length:3142  Length:3142
##  1st Qu.:18.00  Class :character  Class :character  Class :character
##  Median :29.00  Mode   :character  Mode   :character  Mode   :character
##  Mean   :30.28
##  3rd Qu.:45.00
##  Max.   :56.00
##          FIPS            LOCATION          AREA_SQMI          E_TOTPOP
##  Min.   : 1001  Length:3142    Min.   : 2.05  Min.   :      75
##  1st Qu.:18178  Class :character  1st Qu.: 431.12 1st Qu.: 10948
##  Median :29176  Mode   :character  Median : 616.48  Median : 25736
##  Mean   :30384
##  3rd Qu.:45080
##  Max.   :56045
##          M_TOTPOP          E_HU            M_HU          E_HH
##  Min.   : 0.000  Min.   : 70  Min.   : 8.0  Min.   :    33
##  1st Qu.: 0.000  1st Qu.: 5488 1st Qu.: 53.0 1st Qu.: 4232
##  Median : 0.000  Median : 12466 Median : 87.0  Median : 9875
##  Mean   : 4.546  Mean   : 43407 Mean   :123.3  Mean   : 38106
##  3rd Qu.: 0.000  3rd Qu.: 31420 3rd Qu.:147.8  3rd Qu.: 26020
```

```

##  Max.   :380.000  Max.   :3524321  Max.   :1444.0  Max.   :3306109
##  M_HH      E_POV       M_POV       E_UNEMP
##  Min.   :  9.0  Min.   :-999  Min.   :-999.0  Min.   :-999.0
##  1st Qu.:174.0 1st Qu.:1592  1st Qu.: 318.0  1st Qu.: 255.2
##  Median :279.0  Median :3989  Median : 599.0  Median : 667.0
##  Mean   :386.9  Mean   :14082  Mean   : 884.4  Mean   : 3025.5
##  3rd Qu.:456.0 3rd Qu.: 9762  3rd Qu.:1046.0 3rd Qu.:1905.2
##  Max.   :5533.0  Max.   :1589956  Max.   :15303.0  Max.   :357178.0
##  M_UNEMP    E_PCI       M_PCI       E_NOHSDP
##  Min.   :-999.0  Min.   :-999  Min.   :-999.0  Min.   :     4
##  1st Qu.: 88.0  1st Qu.:22762  1st Qu.: 888.2  1st Qu.: 992
##  Median :174.0  Median :26244  Median :1304.5  Median : 2494
##  Mean   :273.4  Mean   :27028  Mean   :1603.8  Mean   : 8577
##  3rd Qu.:324.8 3rd Qu.:30108  3rd Qu.:1927.8 3rd Qu.: 5748
##  Max.   :4755.0  Max.   :72832  Max.   :19047.0  Max.   :1460718
##  M_NOHSDP    E_AGE65      M_AGE65      E_AGE17
##  Min.   :  6.0  Min.   : 12  Min.   : 0.00  Min.   :     4
##  1st Qu.:165.2 1st Qu.:2075  1st Qu.: 33.00  1st Qu.: 2421
##  Median :303.0  Median :4624  Median : 57.00  Median : 5791
##  Mean   :436.6  Mean   :15671  Mean   : 62.94  Mean   : 23410
##  3rd Qu.:512.8 3rd Qu.:11810  3rd Qu.: 86.00  3rd Qu.: 15144
##  Max.   :8002.0  Max.   :1299277  Max.   :339.00  Max.   :2246521
##  M_AGE17      E_DISABL      M_DISABL      E_SNGPNT
##  Min.   : 0.00  Min.   : 17  Min.   : 10.0  Min.   : 0.0
##  1st Qu.: 0.00  1st Qu.:1743  1st Qu.: 217.0  1st Qu.: 321.0
##  Median :33.00  Median :4236  Median : 386.0  Median : 835.5
##  Mean   :42.01  Mean   :12754  Mean   : 542.4  Mean   : 3403.8
##  3rd Qu.:63.00  3rd Qu.:10368 3rd Qu.: 662.8  3rd Qu.: 2255.2
##  Max.   :436.00  Max.   :993035  Max.   :6673.0  Max.   :309423.0
##  M_SNGPNT    E_MINRTY      M_MINRTY      E_LIMENG
##  Min.   :  2.2  Min.   :  0  Min.   : 1.00  Min.   : 0.0
##  1st Qu.: 98.1  1st Qu.:1207  1st Qu.: 17.00  1st Qu.: 40.0
##  Median :182.9  Median :4298  Median : 29.00  Median : 175.0
##  Mean   :271.4  Mean   :40013  Mean   : 88.32  Mean   : 4240.3
##  3rd Qu.:325.6  3rd Qu.:14937 3rd Qu.:105.75  3rd Qu.: 890.2
##  Max.   :3552.2  Max.   :7439000  Max.   :1372.00  Max.   :1297024.0
##  M_LIMENG    E_MUNIT       M_MUNIT       E_MOBILE
##  Min.   : 32.7  Min.   : 0.0  Min.   : 5.40  Min.   : 0.0
##  1st Qu.: 73.7  1st Qu.: 79.0  1st Qu.: 43.73  1st Qu.: 574.2
##  Median :116.7  Median :315.5  Median :108.75  Median :1489.5
##  Mean   :272.8  Mean   :5838.2  Mean   :240.94  Mean   :2709.2
##  3rd Qu.:255.4  3rd Qu.:1556.5 3rd Qu.:256.60  3rd Qu.:3122.8
##  Max.   :9152.6  Max.   :943920.0  Max.   :4861.30  Max.   :87453.0
##  M_MOBILE     E_CROWD       M_CROWD       E_NOVEH
##  Min.   :  8.0  Min.   : 0.0  Min.   : 3.6  Min.   : 0.0
##  1st Qu.:117.0  1st Qu.: 75.2  1st Qu.: 44.6  1st Qu.: 231.0
##  Median :211.0  Median :206.0  Median : 89.7  Median : 604.5
##  Mean   :247.3  Mean   :1276.4  Mean   :146.6  Mean   : 3317.9
##  3rd Qu.:326.0  3rd Qu.: 563.8  3rd Qu.:168.9  3rd Qu.:1577.2
##  Max.   :1695.0  Max.   :378286.0  Max.   :3448.2  Max.   :583837.0
##  M_NOVEH     E_GROUPQ      M_GROUPQ      EP_POV
##  Min.   :  2.0  Min.   : 0.0  Min.   : 0.0  Min.   :-999.00
##  1st Qu.: 79.0  1st Qu.:188.2  1st Qu.: 89.0  1st Qu.: 11.00
##  Median :151.0  Median :635.5  Median :167.0  Median : 14.70

```

```

##  Mean   : 224.4   Mean   : 2575.6   Mean   : 256.5   Mean   : 15.28
## 3rd Qu.: 262.0   3rd Qu.: 2249.0   3rd Qu.: 313.0   3rd Qu.: 19.10
##  Max.   :4595.0   Max.   :177480.0   Max.   :4225.0   Max.   : 55.10
##      MP_POV          EP_UNEMP          MP_UNEMP          EP_PCI
##  Min.   :-999.000   Min.   :-999.000   Min.   :-999.000   Min.   :-999
##  1st Qu.: 1.400     1st Qu.: 4.000     1st Qu.: 0.800     1st Qu.:22762
##  Median : 2.100     Median : 5.400     Median : 1.300     Median :26244
##  Mean   : 2.137     Mean   : 5.454     Mean   : 1.247     Mean   :27028
##  3rd Qu.: 3.200     3rd Qu.: 7.100     3rd Qu.: 2.000     3rd Qu.:30108
##  Max.   : 21.200    Max.   : 28.900    Max.   : 54.800    Max.   :72832
##      MP_PCI          EP_NOHSDP         MP_NOHSDP         EP_AGE65
##  Min.   :-999.0     Min.   : 1.20     Min.   : 0.100    Min.   : 3.80
##  1st Qu.: 888.2    1st Qu.: 8.80    1st Qu.: 0.900    1st Qu.:15.43
##  Median : 1304.5   Median :12.10    Median : 1.550    Median :18.00
##  Mean   : 1603.8   Mean   :13.41    Mean   : 1.783    Mean   :18.37
##  3rd Qu.: 1927.8   3rd Qu.:17.20    3rd Qu.: 2.300    3rd Qu.:20.80
##  Max.   :19047.0   Max.   :66.30    Max.   :16.600    Max.   :55.60
##      MP_AGE65         EP_AGE17          MP_AGE17          EP_DISABL
##  Min.   : 0.0000    Min.   : 5.30    Min.   : 0.0000    Min.   : 3.80
##  1st Qu.: 0.1000    1st Qu.:20.30   1st Qu.: 0.0000    1st Qu.:12.90
##  Median : 0.2000    Median :22.30    Median : 0.1000   Median :15.40
##  Mean   : 0.4865    Mean   :22.36    Mean   : 0.4544   Mean   :15.92
##  3rd Qu.: 0.3000    3rd Qu.:24.10   3rd Qu.: 0.3000   3rd Qu.:18.50
##  Max.   :21.8000    Max.   :40.50    Max.   :26.3000   Max.   :33.70
##      MP_DISABL        EP_SNGPNT         MP_SNGPNT         EP_MINRTY
##  Min.   : 0.100     Min.   : 0.000   Min.   : 0.100    Min.   : 0.00
##  1st Qu.: 0.900     1st Qu.: 6.600   1st Qu.: 1.100    1st Qu.: 7.30
##  Median : 1.400     Median : 8.100   Median : 1.700    Median :16.10
##  Mean   : 1.621     Mean   : 8.321   Mean   : 1.852    Mean   :23.51
##  3rd Qu.: 2.100     3rd Qu.: 9.800   3rd Qu.: 2.300    3rd Qu.:35.20
##  Max.   :18.900     Max.   :25.700   Max.   :55.800    Max.   :99.30
##      MP_MINRTY        EP_LIMENG         MP_LIMENG          EP_MUNIT
##  Min.   : 0.0000    Min.   : 0.000   Min.   : 0.1000   Min.   : 0.000
##  1st Qu.: 0.1000    1st Qu.: 0.300   1st Qu.: 0.3000   1st Qu.: 1.300
##  Median : 0.1000    Median : 0.700   Median : 0.5000   Median : 2.900
##  Mean   : 0.7701    Mean   : 1.701   Mean   : 0.8261   Mean   : 4.676
##  3rd Qu.: 0.2000    3rd Qu.: 1.900   3rd Qu.: 0.9000   3rd Qu.: 5.800
##  Max.   :63.2000    Max.   :30.400   Max.   :61.4000   Max.   :89.400
##      MP_MUNIT          EP_MOBILE          MP_MOBILE          EP_CROWD
##  Min.   : 0.1000    Min.   : 0.00    Min.   : 0.100   Min.   : 0.000
##  1st Qu.: 0.5000    1st Qu.: 5.30    1st Qu.: 0.800   1st Qu.: 1.200
##  Median : 0.8000    Median :10.90    Median : 1.600   Median : 1.900
##  Mean   : 0.9508    Mean   :12.93    Mean   : 1.865   Mean   : 2.424
##  3rd Qu.: 1.1000    3rd Qu.:18.70    3rd Qu.: 2.700   3rd Qu.: 2.900
##  Max.   :19.8000    Max.   :59.30    Max.   :25.400   Max.   :49.300
##      MP_CROWD          EP_NOVEH          MP_NOVEH          EP_GROUPQ
##  Min.   : 0.100     Min.   : 0.000   Min.   : 0.100   Min.   : 0.000
##  1st Qu.: 0.500     1st Qu.: 4.200   1st Qu.: 0.800   1st Qu.: 1.200
##  Median : 0.800     Median : 5.650   Median : 1.300   Median : 2.000
##  Mean   : 1.039     Mean   : 6.352   Mean   : 1.506   Mean   : 3.527
##  3rd Qu.: 1.200     3rd Qu.: 7.600   3rd Qu.: 1.900   3rd Qu.: 3.800
##  Max.   :49.000     Max.   :87.800   Max.   :57.300   Max.   :55.700
##      MP_GROUPQ         EPL_POV          EPL_UNEMP         EPL_PCI
##  Min.   : 0.0000    Min.   :-999.0000  Min.   :-999.0000  Min.   :-999.0000

```

```

## 1st Qu.: 0.3000 1st Qu.: 0.2497 1st Qu.: 0.2455 1st Qu.: 0.2498
## Median : 0.5000 Median : 0.4936 Median : 0.4876 Median : 0.4998
## Mean   : 0.8636 Mean   : 0.1795 Mean   : 0.1760 Mean   : 0.1819
## 3rd Qu.: 1.0000 3rd Qu.: 0.7494 3rd Qu.: 0.7481 3rd Qu.: 0.7499
## Max.   :38.9000 Max.   : 1.0000 Max.   : 1.0000 Max.   : 1.0000
##      EPL_NOHSDP      SPL_THEME1      RPL_THEME1      EPL_AGE65
## Min.   :0.0000  Min.   :-999.0000  Min.   :-999.0000  Min.   :0.0000
## 1st Qu.:0.2499  1st Qu.: 1.149   1st Qu.: 0.2498  1st Qu.:0.2440
## Median :0.4989  Median : 1.968   Median : 0.4997  Median :0.4893
## Mean   :0.4975  Mean   : 1.671   Mean   : 0.1819  Mean   :0.4966
## 3rd Qu.:0.7491  3rd Qu.: 2.793   3rd Qu.: 0.7499  3rd Qu.:0.7456
## Max.   :1.0000  Max.   : 3.965   Max.   : 1.0000  Max.   :1.0000
##      EPL_AGE17      EPL_DISABL      EPL_SNGPNT      SPL_THEME2
## Min.   :0.0000  Min.   :0.0000  Min.   :0.0000  Min.   :0.1372
## 1st Qu.:0.2471  1st Qu.:0.2483  1st Qu.:0.2385  1st Qu.:1.6677
## Median :0.4906  Median :0.4906  Median :0.4900  Median :2.0188
## Mean   :0.4953  Mean   :0.4967  Mean   :0.4942  Mean   :1.9829
## 3rd Qu.:0.7405  3rd Qu.:0.7434  3rd Qu.:0.7469  3rd Qu.:2.3284
## Max.   :1.0000  Max.   :1.0000  Max.   :1.0000  Max.   :3.6284
##      RPL_THEME2      EPL_MINRTY      EPL_LIMENG      SPL_THEME3
## Min.   :0.0000  Min.   :0.0000  Min.   :0.0000  Min.   :0.0003
## 1st Qu.:0.2500  1st Qu.:0.2474  1st Qu.:0.2270  1st Qu.:0.5342
## Median :0.4998  Median :0.4995  Median :0.4642  Median :0.9806
## Mean   :0.5000  Mean   :0.4988  Mean   :0.4797  Mean   :0.9785
## 3rd Qu.:0.7500  3rd Qu.:0.7494  3rd Qu.:0.7491  3rd Qu.:1.3923
## Max.   :1.0000  Max.   :1.0000  Max.   :1.0000  Max.   :1.9994
##      RPL_THEME3      EPL_MUNIT      EPL_MOBILE      EPL_CROWD
## Min.   :0.0000  Min.   :0.0000  Min.   :0.0000  Min.   :0.0000
## 1st Qu.:0.2499  1st Qu.:0.2416  1st Qu.:0.2455  1st Qu.:0.2203
## Median :0.5000  Median :0.4947  Median :0.4963  Median :0.4817
## Mean   :0.4998  Mean   :0.4941  Mean   :0.4982  Mean   :0.4879
## 3rd Qu.:0.7499  3rd Qu.:0.7453  3rd Qu.:0.7485  3rd Qu.:0.7434
## Max.   :1.0000  Max.   :1.0000  Max.   :1.0000  Max.   :1.0000
##      EPL_NOVEH      EPL_GROUPQ      SPL_THEME4      RPL_THEME4
## Min.   :0.0000  Min.   :0.0000  Min.   :0.1741  Min.   :0.0000
## 1st Qu.:0.2420  1st Qu.:0.2184  1st Qu.:1.9876  1st Qu.:0.2500
## Median :0.4924  Median :0.4995  Median :2.5167  Median :0.4998
## Mean   :0.4943  Mean   :0.4901  Mean   :2.4647  Mean   :0.5000
## 3rd Qu.:0.7498  3rd Qu.:0.7431  3rd Qu.:2.9707  3rd Qu.:0.7498
## Max.   :1.0000  Max.   :1.0000  Max.   :4.4467  Max.   :1.0000
##      SPL_THEMES      RPL_THEMES      F_POV        F_UNEMP
## Min.   :-999.0000  Min.   :-999.0000  Min.   :-999.0000  Min.   :-999.0000
## 1st Qu.: 5.923    1st Qu.: 0.2497   1st Qu.: 0.000   1st Qu.: 0.0000
## Median : 7.431    Median : 0.4998   Median : 0.000   Median : 0.0000
## Mean   : 7.094    Mean   : 0.1819   Mean   : -0.219  Mean   : -0.2187
## 3rd Qu.: 8.853    3rd Qu.: 0.7499   3rd Qu.: 0.000   3rd Qu.: 0.0000
## Max.   :12.650    Max.   : 1.0000   Max.   : 1.000   Max.   : 1.0000
##      F_PCI          F_NOHSDP      F_THEME1      F_AGE65
## Min.   :-999.0000  Min.   :0.00000  Min.   :-999.0000  Min.   :0.00000
## 1st Qu.: 0.0000  1st Qu.:0.00000  1st Qu.: 0.0000  1st Qu.:0.00000
## Median : 0.0000  Median :0.00000  Median : 0.0000  Median :0.00000
## Mean   : -0.2177  Mean   :0.09898  Mean   : 0.0796  Mean   :0.09675
## 3rd Qu.: 0.0000  3rd Qu.:0.00000  3rd Qu.: 0.0000  3rd Qu.:0.00000
## Max.   : 1.0000  Max.   :1.00000  Max.   : 4.0000  Max.   :1.00000

```

```

##      F AGE17          F DISABL          F SNGPNT          F THEME2
##  Min.   :0.00000  Min.   :0.00000  Min.   :0.00000  Min.   :0.0000
##  1st Qu.:0.00000  1st Qu.:0.00000  1st Qu.:0.00000  1st Qu.:0.0000
##  Median :0.00000  Median :0.00000  Median :0.00000  Median :0.0000
##  Mean   :0.09962  Mean   :0.09898  Mean   :0.09835  Mean   :0.3937
##  3rd Qu.:0.00000  3rd Qu.:0.00000  3rd Qu.:0.00000  3rd Qu.:1.0000
##  Max.   :1.00000  Max.   :1.00000  Max.   :1.00000  Max.   :3.0000
##      F MINRTY          F LIMENG          F THEME3          F MUNIT
##  Min.   :0.00000  Min.   :0.0000  Min.   :0.00000  Min.   :0.0000
##  1st Qu.:0.00000  1st Qu.:0.0000  1st Qu.:0.00000  1st Qu.:0.0000
##  Median :0.00000  Median :0.0000  Median :0.00000  Median :0.0000
##  Mean   :0.09962  Mean   :0.1003  Mean   :0.1999  Mean   :0.1003
##  3rd Qu.:0.00000  3rd Qu.:0.0000  3rd Qu.:0.00000  3rd Qu.:0.0000
##  Max.   :1.00000  Max.   :1.0000  Max.   :2.0000  Max.   :1.0000
##      F MOBILE          F CROWD           F NOVEH          F GROUPQ
##  Min.   :0.00000  Min.   :0.00000  Min.   :0.00000  Min.   :0.00000
##  1st Qu.:0.00000  1st Qu.:0.00000  1st Qu.:0.00000  1st Qu.:0.00000
##  Median :0.00000  Median :0.00000  Median :0.00000  Median :0.00000
##  Mean   :0.09962  Mean   :0.09612  Mean   :0.09803  Mean   :0.09962
##  3rd Qu.:0.00000  3rd Qu.:0.00000  3rd Qu.:0.00000  3rd Qu.:0.00000
##  Max.   :1.00000  Max.   :1.00000  Max.   :1.00000  Max.   :1.00000
##      F THEME4          F TOTAL           E UNINSUR          M UNINSUR
##  Min.   :0.0000  Min.   :-999.000  Min.   : 2.0  Min.   : 2.0
##  1st Qu.:0.0000  1st Qu.: 0.000  1st Qu.: 975.5 1st Qu.: 213.0
##  Median :0.0000  Median : 1.000  Median : 2402.5 Median : 397.5
##  Mean   :0.4936  Mean   : 1.166  Mean   : 9469.4 Mean   : 610.2
##  3rd Qu.:1.0000  3rd Qu.: 2.000  3rd Qu.: 6099.8 3rd Qu.: 705.8
##  Max.   :4.0000  Max.   :11.000  Max.   :1086657.0 Max.   :11938.0
##      EP UNINSUR          MP UNINSUR          E DAYPOP
##  Min.   : 1.70  Min.   : 0.100  Min.   :    66
##  1st Qu.: 6.20  1st Qu.: 0.900  1st Qu.: 9472
##  Median : 9.20  Median : 1.400  Median : 22756
##  Mean   :10.08  Mean   : 1.723  Mean   : 92688
##  3rd Qu.:12.68  3rd Qu.: 2.200  3rd Qu.: 62113
##  Max.   :45.60  Max.   :13.600  Max.   :8152241

```

Exploration of Smoking Prevalence Data

```
smoke_fips <- readRDS(here("intermediary_data/smoke_fips.rds"))
```

```
summary(smoke_fips)
```

```

##      county          state          sex          year
##  Length:3142  Length:3142  Length:3142  Min.   :2012
##  Class  :character  Class  :character  Class  :character  1st Qu.:2012
##  Mode   :character  Mode   :character  Mode   :character  Median :2012
##                                         Mean   :2012
##                                         3rd Qu.:2012
##                                         Max.   :2012
##                                         NA's   :11
##      total_mean      total_lb      total_ub      daily_mean
##  Min.   : 7.81  Min.   : 6.82  Min.   : 9.00  Min.   : 5.39

```

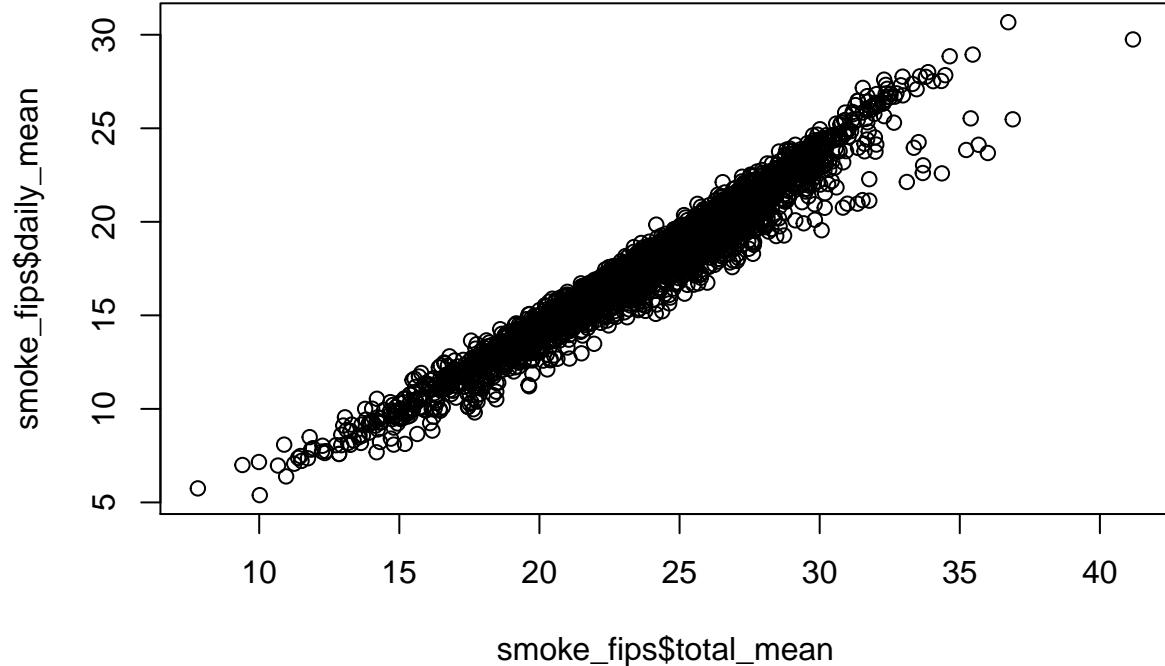
```

##  1st Qu.:21.05   1st Qu.:17.55   1st Qu.:25.01   1st Qu.:15.16
##  Median :23.68   Median :19.89   Median :27.91   Median :17.42
##  Mean   :23.63   Mean   :19.87   Mean   :27.82   Mean   :17.45
##  3rd Qu.:26.41   3rd Qu.:22.34   3rd Qu.:31.04   3rd Qu.:19.82
##  Max.   :41.18   Max.   :35.33   Max.   :46.78   Max.   :30.67
##  NA's    :11      NA's    :11      NA's    :11      NA's    :11
##          daily_lb      daily_ub      fips
##  Min.   : 4.10   Min.   : 6.79   Min.   :1001
##  1st Qu.:12.38   1st Qu.:18.33   1st Qu.:18178
##  Median :14.25   Median :21.06   Median :29176
##  Mean   :14.33   Mean   :21.03   Mean   :30384
##  3rd Qu.:16.31   3rd Qu.:23.90   3rd Qu.:45080
##  Max.   :25.94   Max.   :36.39   Max.   :56045
##  NA's    :11      NA's    :11

```

The reason there are 11 NAs in the dataset is because I ignored some counties in Alaska and Hawaii, which were merged with other counties in those states. I only “unmerged” the counties within the contiguous U.S.

```
plot(smoke_fips$total_mean, smoke_fips$daily_mean)
```



The two used variables in the dataset, total_mean and daily_mean, are very correlated (as expected).

Exploration of CACES LUR air pollution data

```

caces_lur <- read.csv(here("imported_data/caces_lur_air_pollution/caces_lur_air_pollution.csv"))

# convert from long to wide format

caces_lur_wide <- spread(caces_lur, pollutant, pred_wght)

summary(caces_lur_wide)

```

```

##      fips          year    state_abbr        lat
##  Min.   : 1001   Min.   :2015   Length:3108   Min.   :24.74
##  1st Qu.:19044  1st Qu.:2015   Class :character 1st Qu.:34.70
##  Median :29212  Median :2015   Mode  :character  Median :38.33
##  Mean   :30672  Mean   :2015                    Mean   :38.28
##  3rd Qu.:46008  3rd Qu.:2015                    3rd Qu.:41.69
##  Max.   :56045  Max.   :2015                    Max.   :48.87
##      lon          co       no2       o3
##  Min.   :-124.33  Min.   :0.07771  Min.   : 1.106  Min.   :28.10
##  1st Qu.:-98.03  1st Qu.:0.20056  1st Qu.: 2.746  1st Qu.:41.62
##  Median :-90.18  Median :0.22369  Median : 3.405  Median :43.73
##  Mean   :-91.66  Mean   :0.22084  Mean   : 3.825  Mean   :43.84
##  3rd Qu.:-83.38  3rd Qu.:0.23967  3rd Qu.: 4.405  3rd Qu.:45.88
##  Max.   :-67.46  Max.   :0.39429  Max.   :20.258  Max.   :57.24
##      pm10         pm25       so2
##  Min.   : 5.761  Min.   : 2.462  Min.   :0.1667
##  1st Qu.:13.505  1st Qu.: 6.371  1st Qu.:0.7428
##  Median :16.655  Median : 7.276  Median :0.9145
##  Mean   :16.563  Mean   : 7.175  Mean   :0.9441
##  3rd Qu.:19.437  3rd Qu.: 8.114  3rd Qu.:1.0858
##  Max.   :36.771  Max.   :13.198  Max.   :3.1609

```

There is information for all counties in the modeling dataset.

```

n_distinct(caces_lur$fips)

## [1] 3108

table(caces_lur$pollutant)

## 
##   co   no2   o3   pm10  pm25   so2
## 3108 3108 3108 3108 3108 3108

```

Joint exploration of data

The flood risk data doesn't have all the counties.

Exploring the merged dataset

```

flood_le_svi <- readRDS(file = here("intermediary_data/flood_le_svi.rds"))

dim(flood_le_svi)

## [1] 3108 183

```

Exploring the modeling dataset

```

fls_model_df <- readRDS(here("intermediary_data/fls_model_df.rds"))

# extract the response variable

Y <- fls_model_df$`Life expectancy, 2014*`

# extract the covariates matrix

X <- fls_model_df[, 17:(ncol(fls_model_df) - 1)]

```

```

X <- as.matrix(X)

summary(Y)

##      Min. 1st Qu. Median     Mean 3rd Qu.    Max.
##    66.81    76.10   77.92   77.75   79.47   86.83

summary(X)

##  pct_fs_risk_2020_5 pct_fs_risk_2050_5 pct_fs_risk_2020_100
##  Min.   : 0.000   Min.   : 0.000   Min.   : 1.30
##  1st Qu.: 2.300   1st Qu.: 2.400   1st Qu.: 7.90
##  Median : 3.800   Median : 4.100   Median :10.60
##  Mean   : 5.179   Mean   : 5.650   Mean   :12.77
##  3rd Qu.: 6.225   3rd Qu.: 6.625   3rd Qu.:14.80
##  Max.   :66.000   Max.   :73.400   Max.   :93.70
##  NA's   :80       NA's   :80       NA's   :80
##  pct_fs_risk_2050_100 pct_fs_risk_2020_500 pct_fs_risk_2050_500
##  Min.   : 1.3      Min.   : 2.00    Min.   : 2.00
##  1st Qu.: 8.1      1st Qu.:10.40   1st Qu.: 10.60
##  Median :10.9      Median :13.90   Median : 14.15
##  Mean   :13.5      Mean   :16.85   Mean   : 17.57
##  3rd Qu.:15.2      3rd Qu.:19.40   3rd Qu.: 19.90
##  Max.   :99.5      Max.   :99.90   Max.   :100.00
##  NA's   :80       NA's   :80       NA's   :80
##  avg_risk_score_all avg_risk_score_2_10 avg_risk_fsf_2020_100
##  Min.   :1.090     Min.   :3.740    Min.   :4.330
##  1st Qu.:1.580     1st Qu.:5.888    1st Qu.:6.980
##  Median :1.780     Median :6.550    Median :7.495
##  Mean   :1.966     Mean   :6.542    Mean   :7.478
##  3rd Qu.:2.100     3rd Qu.:7.220    3rd Qu.:7.990
##  Max.   :8.430     Max.   :9.520    Max.   :9.680
##  NA's   :80       NA's   :80       NA's   :80
##  avg_risk_fsf_2020_500 avg_risk_score_sfha avg_risk_score_no_sfha
##  Min.   :3.840     Min.   : 1.000   Min.   : 0.04
##  1st Qu.:6.030     1st Qu.: 4.290   1st Qu.:1.42
##  Median :6.680     Median : 5.360   Median :1.59
##  Mean   :6.666     Mean   : 5.357   Mean   :1.73
##  3rd Qu.:7.320     3rd Qu.: 6.430   3rd Qu.:1.85
##  Max.   :9.550     Max.   :10.000   Max.   :7.68
##  NA's   :80       NA's   :144     NA's   :85
##  count_floodfactor1 count_floodfactor2 count_floodfactor3 count_floodfactor4
##  Min.   :    41    Min.   :    0.0   Min.   :    2.0   Min.   :     1
##  1st Qu.: 8634    1st Qu.:  25.0   1st Qu.: 107.0  1st Qu.: 123
##  Median :16483    Median :  70.0   Median : 242.0  Median : 298
##  Mean   :38549     Mean   : 439.6   Mean   :1084.5  Mean   :1417
##  3rd Qu.:35625    3rd Qu.: 199.2   3rd Qu.: 631.5  3rd Qu.: 771
##  Max.   :1946655   Max.   :61699.0  Max.   :120461.0 Max.   :151862
##  NA's   :80       NA's   :80       NA's   :80       NA's   :80
##  count_floodfactor5 count_floodfactor6 count_floodfactor7 count_floodfactor8
##  Min.   :    0.0   Min.   :   12.0   Min.   :    9.0   Min.   :     0.0
##  1st Qu.:  71.0   1st Qu.: 299.8   1st Qu.: 203.0   1st Qu.:  40.0
##  Median :158.5    Median : 631.0   Median : 397.0   Median :  81.0
##  Mean   :585.4    Mean   :2109.3   Mean   : 807.4   Mean   : 165.8

```

```

## 3rd Qu.: 379.2    3rd Qu.: 1489.2   3rd Qu.: 837.2    3rd Qu.: 170.2
## Max.    :50608.0   Max.    :123857.0  Max.    :23369.0   Max.    :9157.0
## NA's     :80       NA's     :80       NA's     :80       NA's     :80
## count_floodfactor9 count_floodfactor10      EP_POV          EP_UNEMP
## Min.    : 6.0      Min.    : 0.0      Min.    : 2.30     Min.    : 0.000
## 1st Qu.: 234.0    1st Qu.: 148.0    1st Qu.:11.00    1st Qu.: 4.000
## Median  : 487.0    Median  : 357.5    Median  :14.80    Median  : 5.400
## Mean    : 910.5    Mean    : 897.1    Mean    :15.63    Mean    : 5.743
## 3rd Qu.: 917.2    3rd Qu.: 848.0    3rd Qu.:19.10    3rd Qu.: 7.100
## Max.    :77254.0   Max.    :49041.0   Max.    :55.10    Max.    :26.400
## NA's     :80       NA's     :80       NA's     :1       NA's     :1
##      EP_PCI        EP_NOHSDP      EP_AGE65        EP_AGE17
## Min.    :10148     Min.    : 1.20     Min.    : 3.80     Min.    : 7.30
## 1st Qu.:22746     1st Qu.: 8.80     1st Qu.:15.50    1st Qu.:20.30
## Median  :26215     Median  :12.10     Median  :18.10    Median  :22.30
## Mean    :26972     Mean    :13.45     Mean    :18.43    Mean    :22.35
## 3rd Qu.:29983     3rd Qu.:17.20     3rd Qu.:20.80    3rd Qu.:24.10
## Max.    :72832     Max.    :66.30     Max.    :55.60    Max.    :40.30
## NA's     :1
##      EP_DISABL      EP_SNGPNT      EP_MINRTY      EP_LIMENG
## Min.    : 3.80     Min.    : 0.000    Min.    : 0.000    Min.    : 0.000
## 1st Qu.:12.90     1st Qu.: 6.600    1st Qu.: 7.275    1st Qu.: 0.300
## Median  :15.50     Median  : 8.100    Median  :15.850    Median  : 0.700
## Mean    :15.95     Mean    : 8.298    Mean    :23.161    Mean    : 1.697
## 3rd Qu.:18.60     3rd Qu.: 9.800    3rd Qu.:34.900    3rd Qu.: 1.900
## Max.    :33.70     Max.    :25.600    Max.    :99.300    Max.    :30.400
##
##      EP_MUNIT      EP_MOBILE      EP_CROWD      EP_NOVEH
## Min.    : 0.000    Min.    : 0.00     Min.    : 0.000    Min.    : 0.000
## 1st Qu.: 1.300    1st Qu.: 5.40     1st Qu.: 1.200    1st Qu.: 4.200
## Median  : 2.900    Median  :11.05     Median  : 1.900    Median  : 5.600
## Mean    : 4.659    Mean    :13.02     Mean    : 2.331    Mean    : 6.192
## 3rd Qu.: 5.800    3rd Qu.:18.80     3rd Qu.: 2.900    3rd Qu.: 7.500
## Max.    :89.400    Max.    :59.30     Max.    :33.800    Max.    :77.000
##
##      EP_GROUPQ      EP_UNINSUR      co          no2
## Min.    : 0.000    Min.    : 1.700    Min.    :0.07771   Min.    : 1.106
## 1st Qu.: 1.200    1st Qu.: 6.200    1st Qu.:0.20057   1st Qu.: 2.747
## Median  : 1.900    Median  : 9.100    Median  :0.22370   Median  : 3.405
## Mean    : 3.481    Mean    : 9.999    Mean    :0.22087   Mean    : 3.826
## 3rd Qu.: 3.800    3rd Qu.:12.500    3rd Qu.:0.23968   3rd Qu.: 4.405
## Max.    :55.700    Max.    :42.400    Max.    :0.39429   Max.    :20.258
##
##      o3            pm10          pm25          so2
## Min.    :28.10     Min.    : 5.761    Min.    : 2.462    Min.    :0.1667
## 1st Qu.:41.62     1st Qu.:13.506   1st Qu.: 6.371    1st Qu.:0.7426
## Median  :43.73     Median  :16.659    Median  : 7.276    Median  :0.9146
## Mean    :43.84     Mean    :16.564    Mean    : 7.176    Mean    :0.9441
## 3rd Qu.:45.88     3rd Qu.:19.438   3rd Qu.: 8.114    3rd Qu.:1.0858
## Max.    :57.24     Max.    :36.771    Max.    :13.198    Max.    :3.1609
## NA's     :1         NA's     :1         NA's     :1         NA's     :1
##      total_mean      daily_mean
## Min.    : 7.81     Min.    : 5.39
## 1st Qu.:21.08     1st Qu.:15.18

```

```

## Median :23.68   Median :17.43
## Mean    :23.62   Mean    :17.45
## 3rd Qu.:26.40   3rd Qu.:19.82
## Max.    :36.73   Max.    :30.67
##

```

Maps

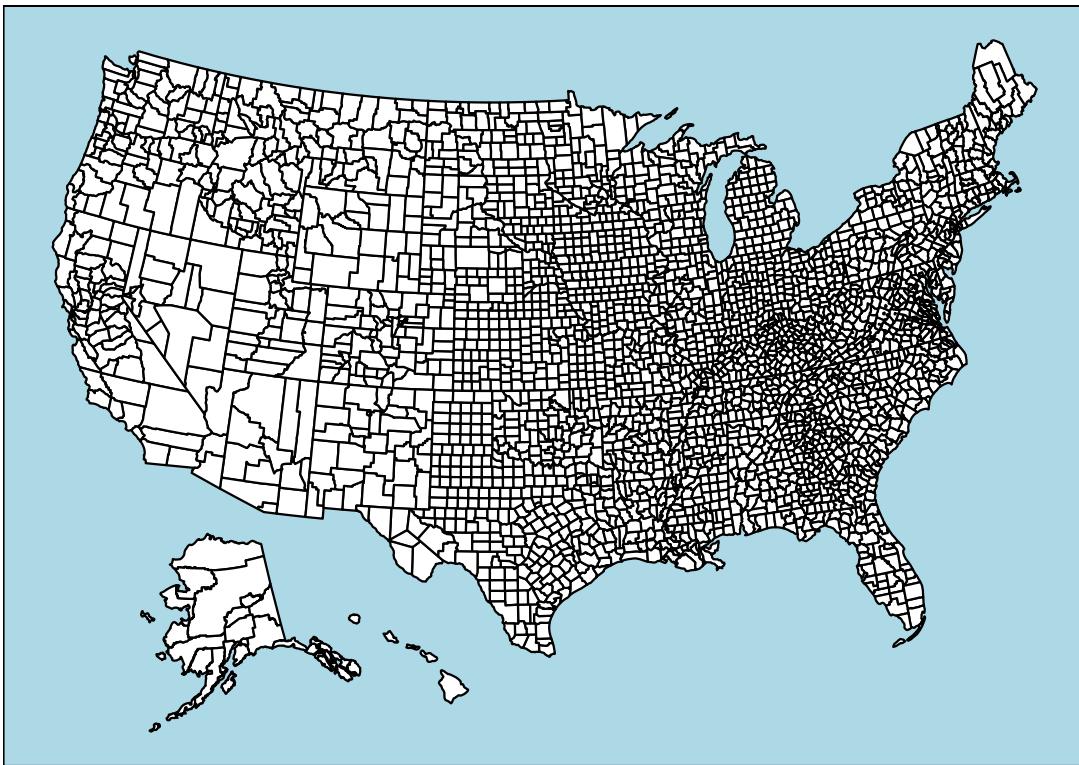
```

plot_usmap(regions = "counties") +
  labs(title = "US Counties",
       subtitle = "This is a blank map of the counties of the United States.") +
  theme(panel.background = element_rect(color = "black", fill = "lightblue"))

```

US Counties

This is a blank map of the counties of the United States.

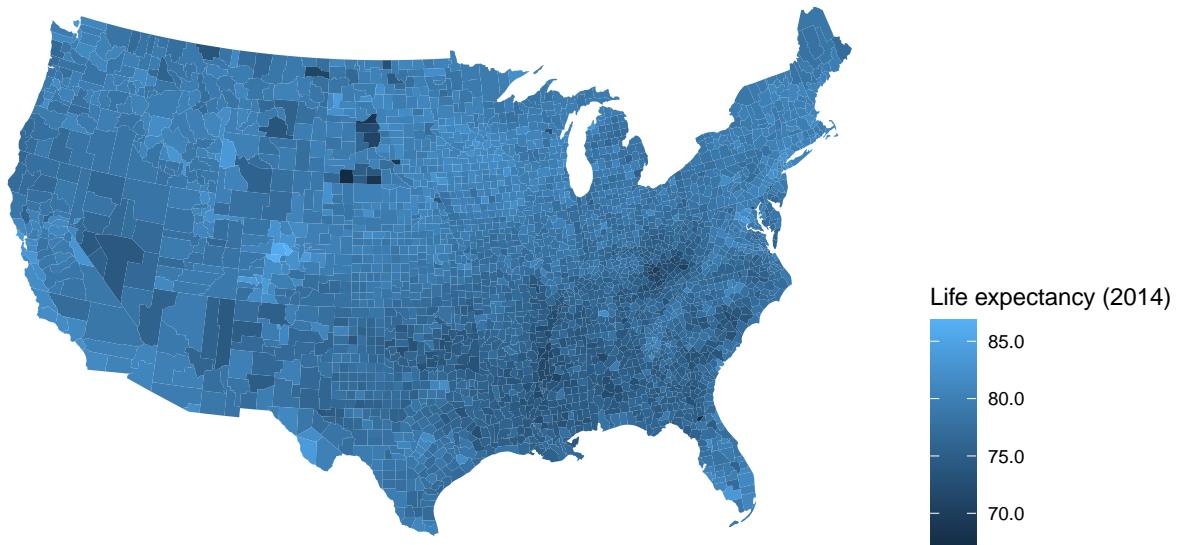


Outcome Variables

```

plot_usmap(regions = "counties", data = flood_le_svi,
           values = "Life expectancy, 2014*", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(name = "Life expectancy (2014)", label = scales::comma) +
  theme(legend.position = "right")

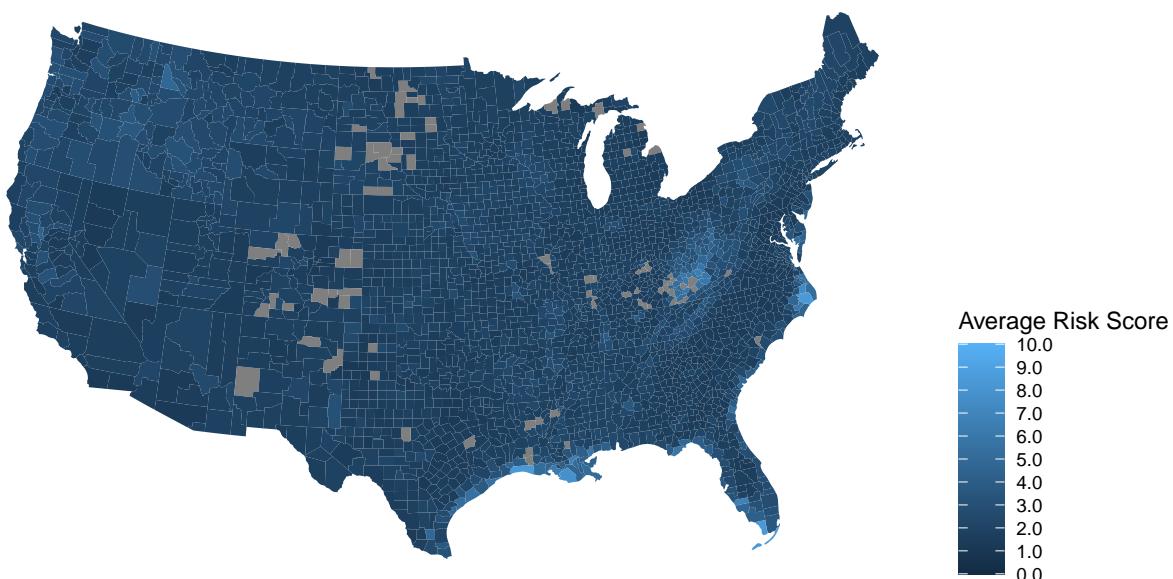
```



```
# labs(title = "US Counties",
#       subtitle = "This is a blank map of the counties of the United States.") +
# theme(panel.background = element_rect(color = "black", fill = "lightblue"))
```

Flood Risk Variables

```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "avg_risk_score_all", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(name = "Average Risk Score", label = scales::comma,
                        limits = c(0, 10),
                        breaks = seq(0, 10, 1)) +
  theme(legend.position = "right")
```

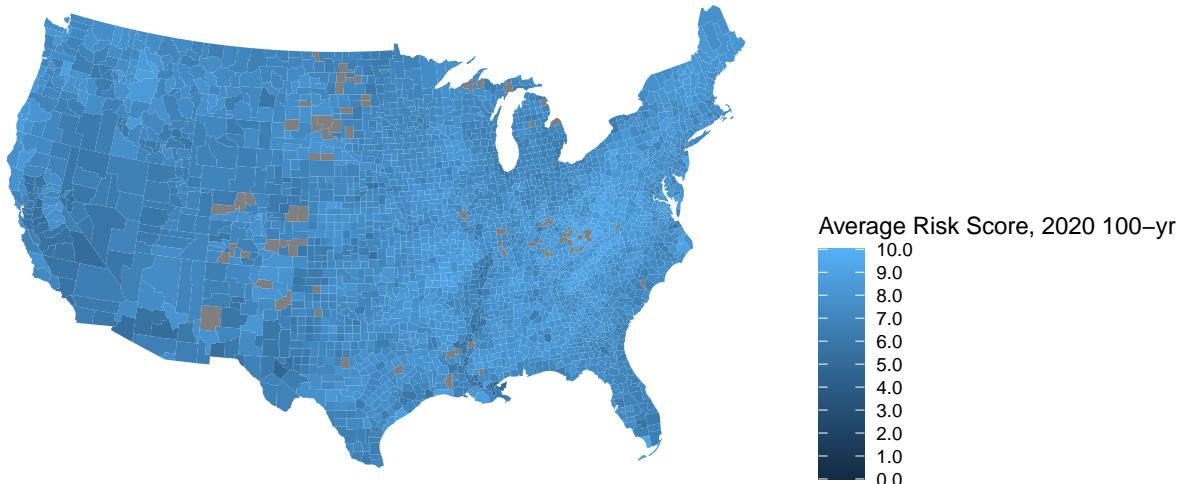


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "avg_risk_fsf_2020_100", color = NA,
```

```

    exclude = c("AK", "HI")) +
scale_fill_continuous(name = "Average Risk Score, 2020 100-yr", label = scales::comma,
                      limits = c(0, 10),
                      breaks = seq(0, 10, 1)) +
theme(legend.position = "right")

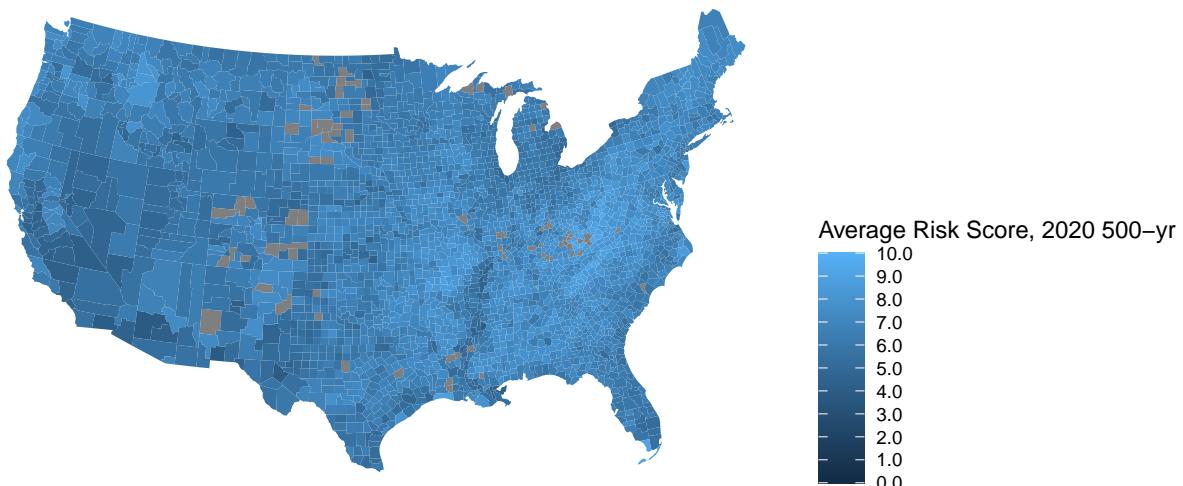
```



```

plot_usmap(regions = "counties", data = flood_le_svi,
           values = "avg_risk_fsf_2020_500", color = NA,
           exclude = c("AK", "HI")) +
scale_fill_continuous(name = "Average Risk Score, 2020 500-yr", label = scales::comma,
                      limits = c(0, 10),
                      breaks = seq(0, 10, 1)) +
theme(legend.position = "right")

```



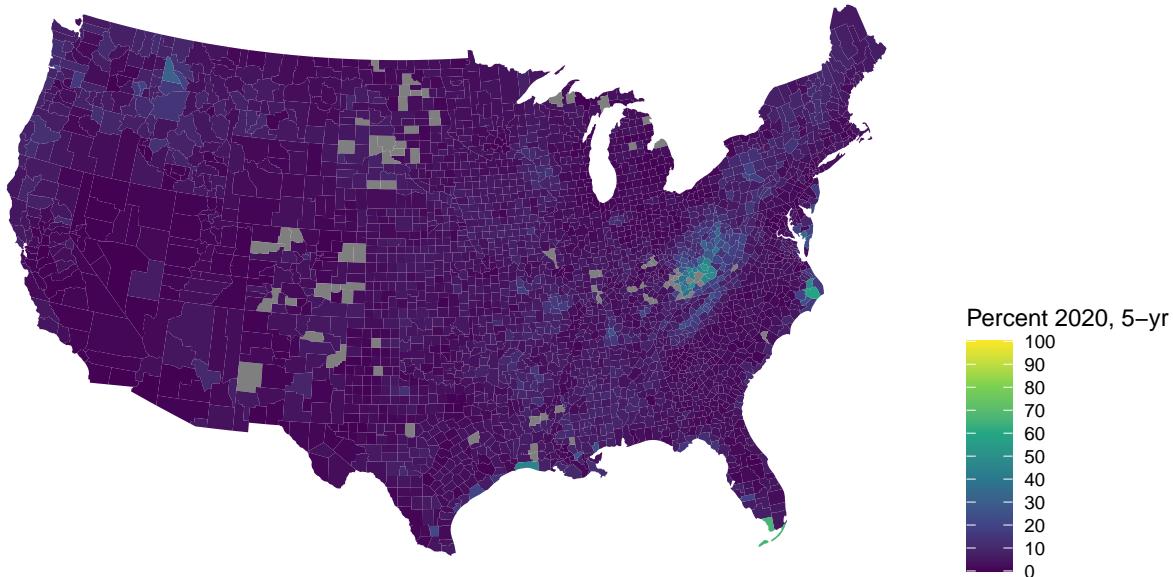
Percent of First Street Properties at 3 levels of severity and 2 time points

```

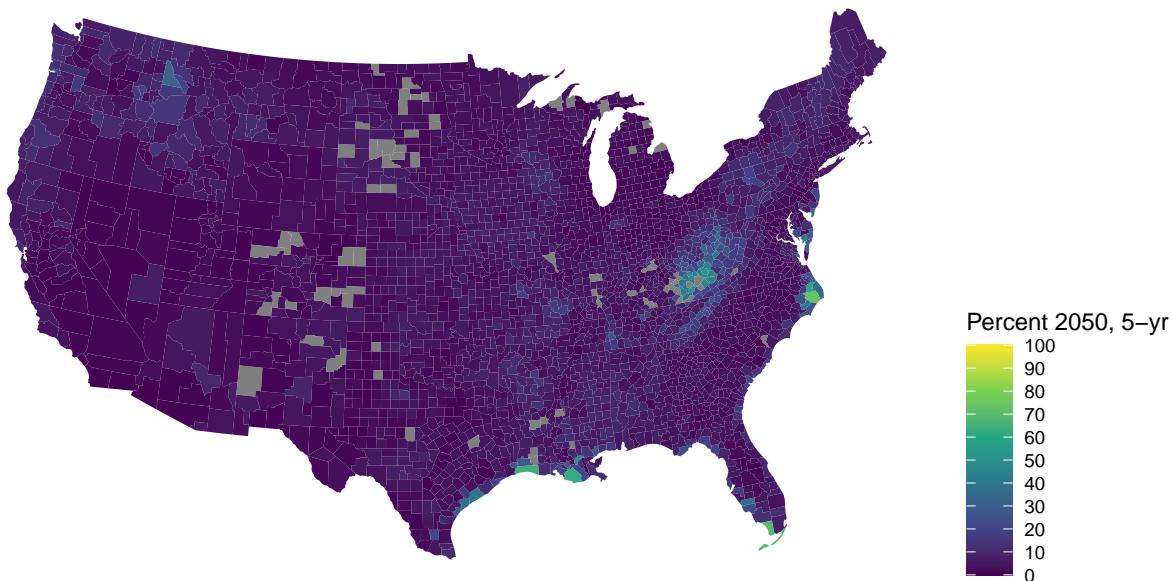
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "pct_fs_risk_2020_5", color = NA,
           exclude = c("AK", "HI")) +
theme(legend.position = "right") +
scale_fill_continuous(type = "viridis",

```

```
limits = c(0, 100),
breaks = seq(0, 100, 10),
guide_colourbar(nbin = 100),
name = "Percent 2020, 5-yr")
```



```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "pct_fs_risk_2050_5", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 100),
                        name = "Percent 2050, 5-yr") +
  theme(legend.position = "right")
```

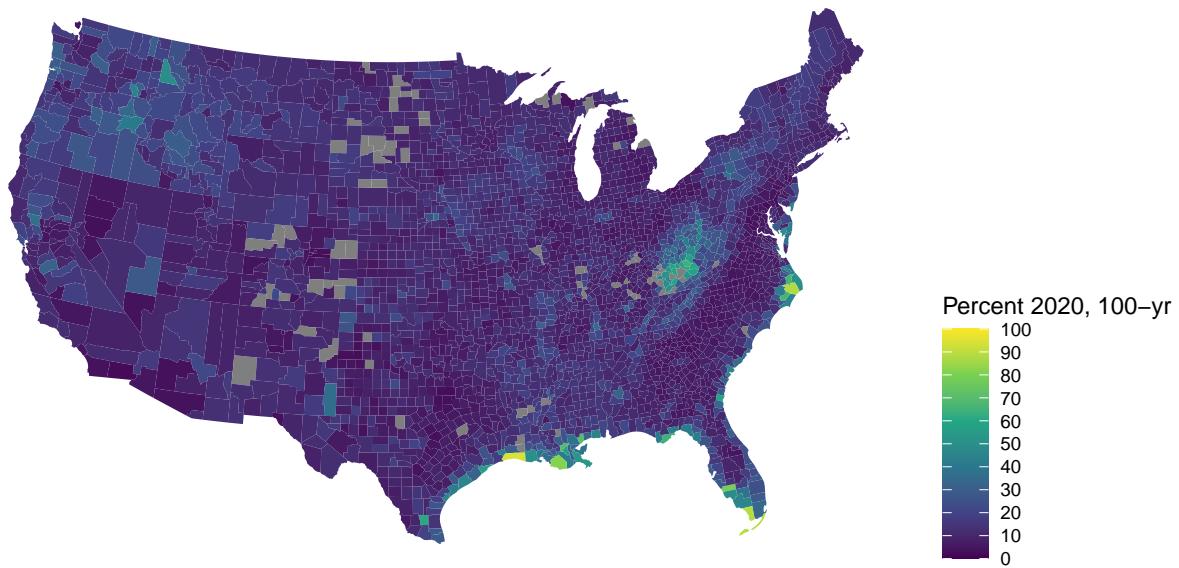


```
plot_usmap(regions = "counties", data = flood_le_svi,
```

```

values = "pct_fs_risk_2020_100", color = NA,
exclude = c("AK", "HI")) +
scale_fill_continuous(type = "viridis",
limits = c(0, 100),
breaks = seq(0, 100, 10),
guide_colourbar(nbin = 100),
name = "Percent 2020, 100-yr") +
theme(legend.position = "right")

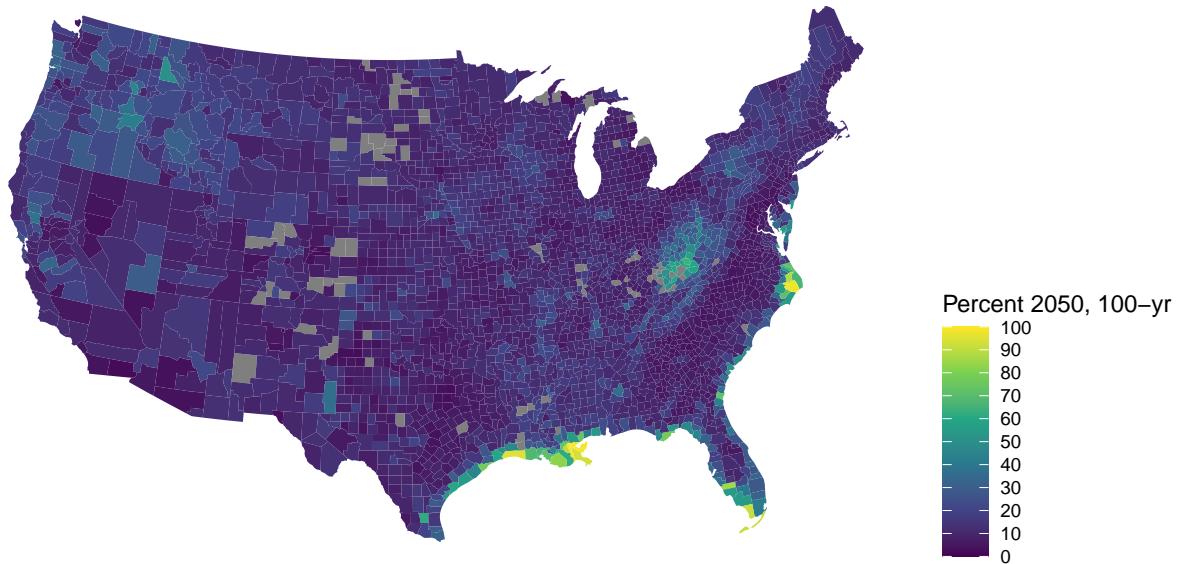
```



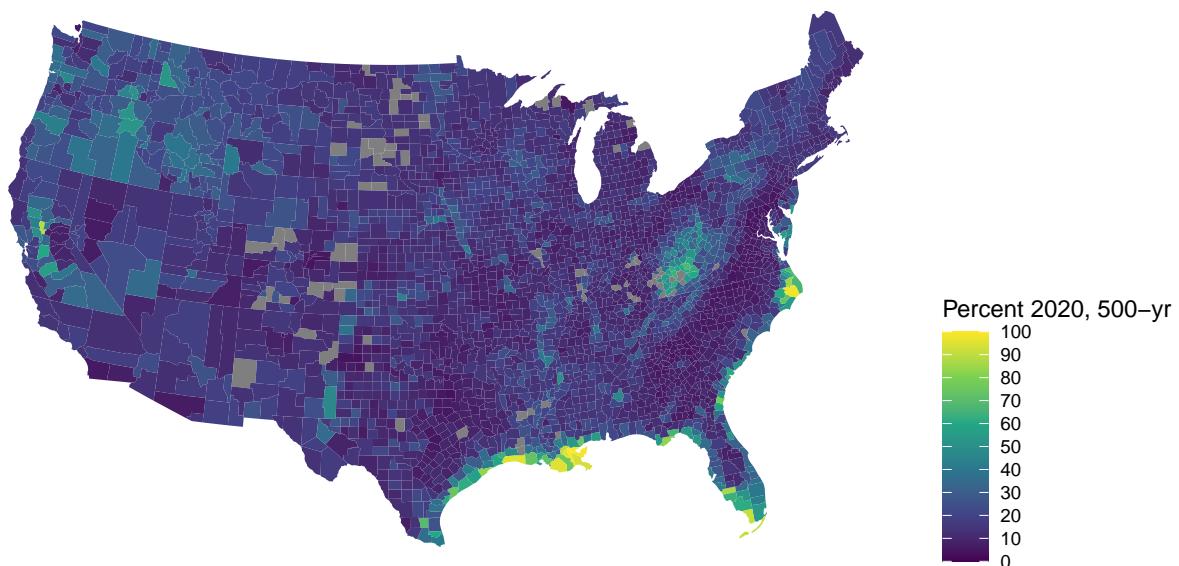
```

plot_usmap(regions = "counties", data = flood_le_svi,
values = "pct_fs_risk_2050_100", color = NA,
exclude = c("AK", "HI")) +
scale_fill_continuous(type = "viridis",
limits = c(0, 100),
breaks = seq(0, 100, 10),
guide_colourbar(nbin = 100),
name = "Percent 2050, 100-yr") +
theme(legend.position = "right")

```

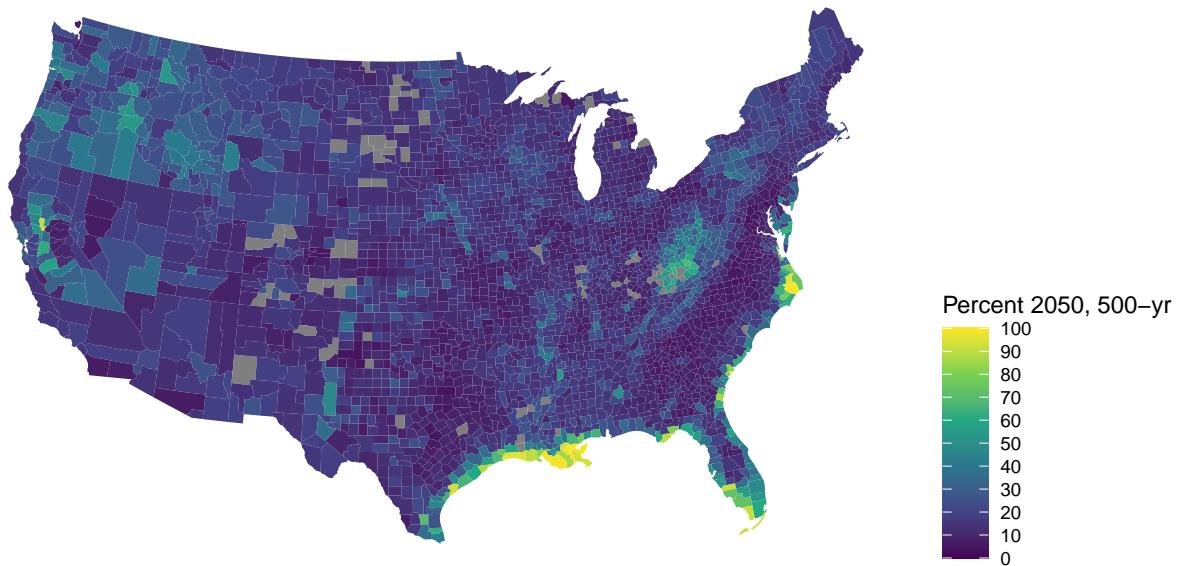


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "pct_fs_risk_2020_500", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 100),
                        name = "Percent 2020, 500-yr") +
  theme(legend.position = "right")
```



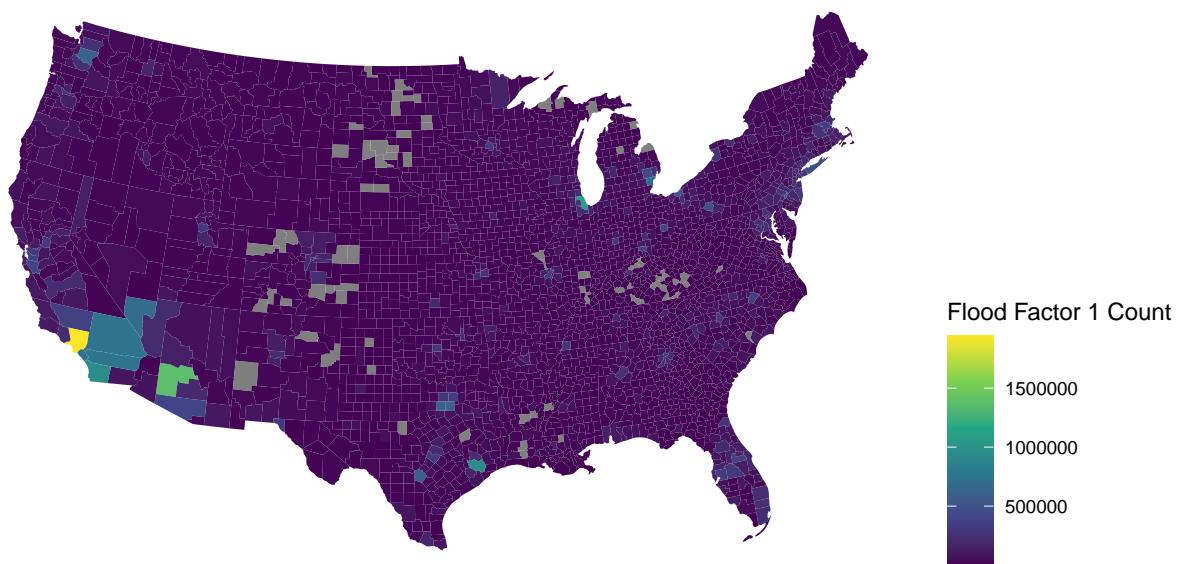
```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "pct_fs_risk_2050_500", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 100),
                        name = "Percent 2050, 500-yr") +
```

```
theme(legend.position = "right")
```



Count of Properties with a given Flood Factor

```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "count_floodfactor1", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        # limits = c(0, 100),
                        # breaks = seq(0, 100, 10),
                        # guide_colourbar(nbin = 100),
                        name = "Flood Factor 1 Count") +
  theme(legend.position = "right")
```

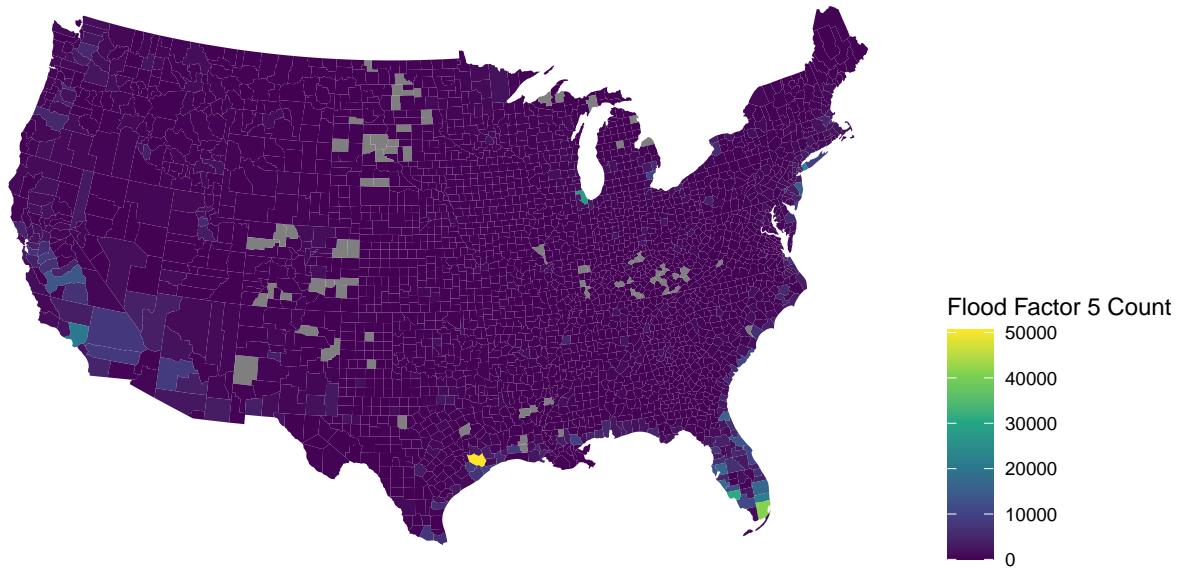


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "count_floodfactor5", color = NA,
```

```

exclude = c("AK", "HI")) +
scale_fill_continuous(type = "viridis",
# limits = c(0, 100),
# breaks = seq(0, 100, 10),
# guide_colourbar(nbin = 100),
name = "Flood Factor 5 Count") +
theme(legend.position = "right")

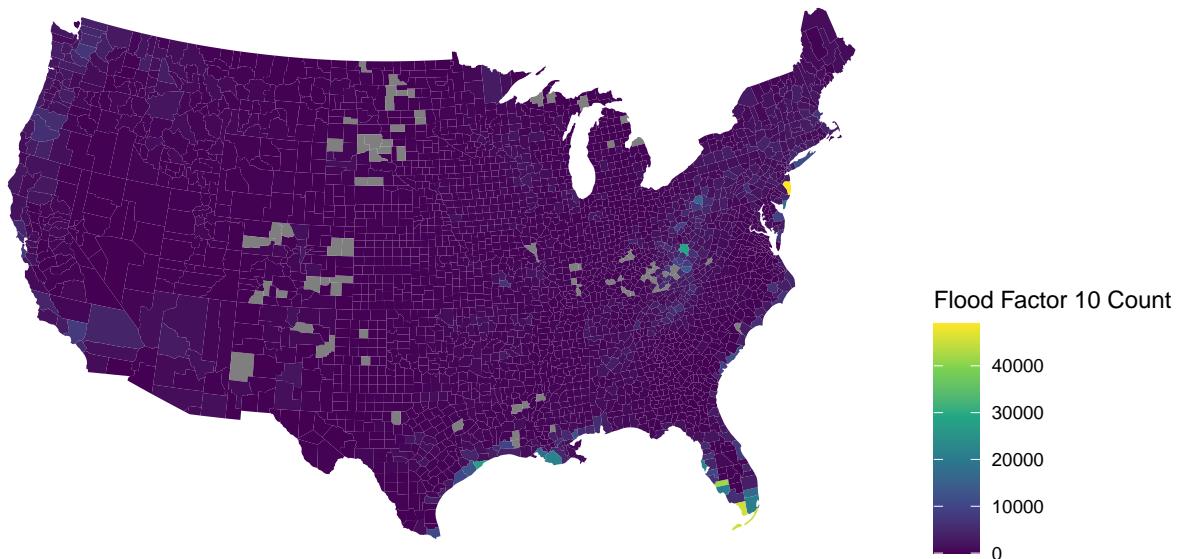
```



```

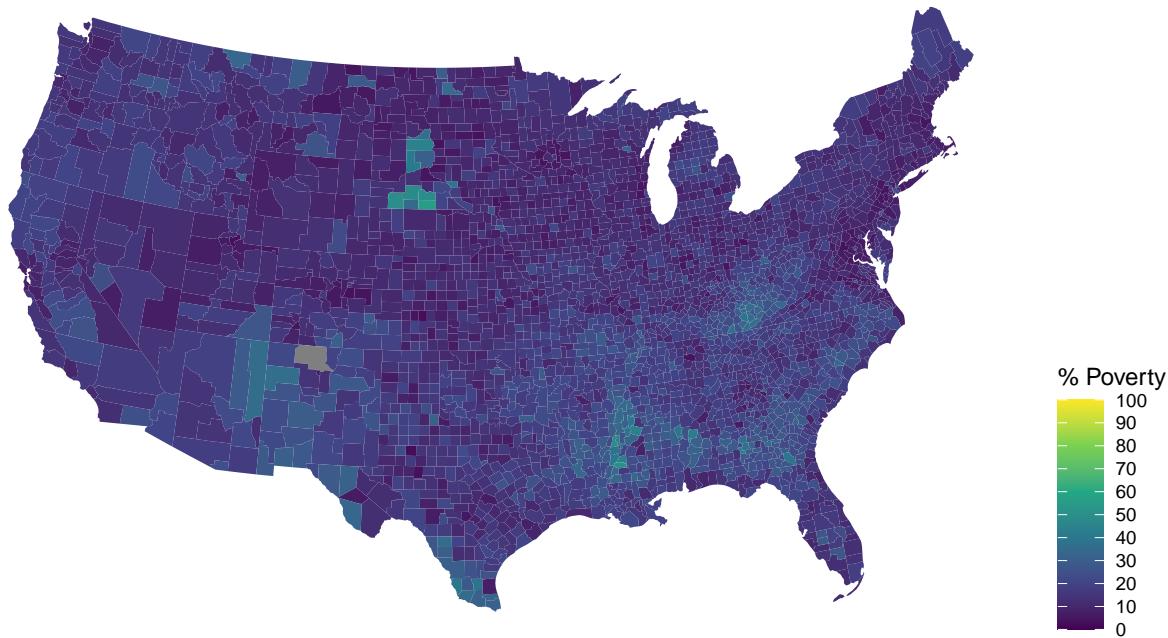
plot_usmap(regions = "counties", data = flood_le_svi,
values = "count_floodfactor10", color = NA,
exclude = c("AK", "HI")) +
scale_fill_continuous(type = "viridis",
# limits = c(0, 100),
# breaks = seq(0, 100, 10),
# guide_colourbar(nbin = 100),
name = "Flood Factor 10 Count") +
theme(legend.position = "right")

```

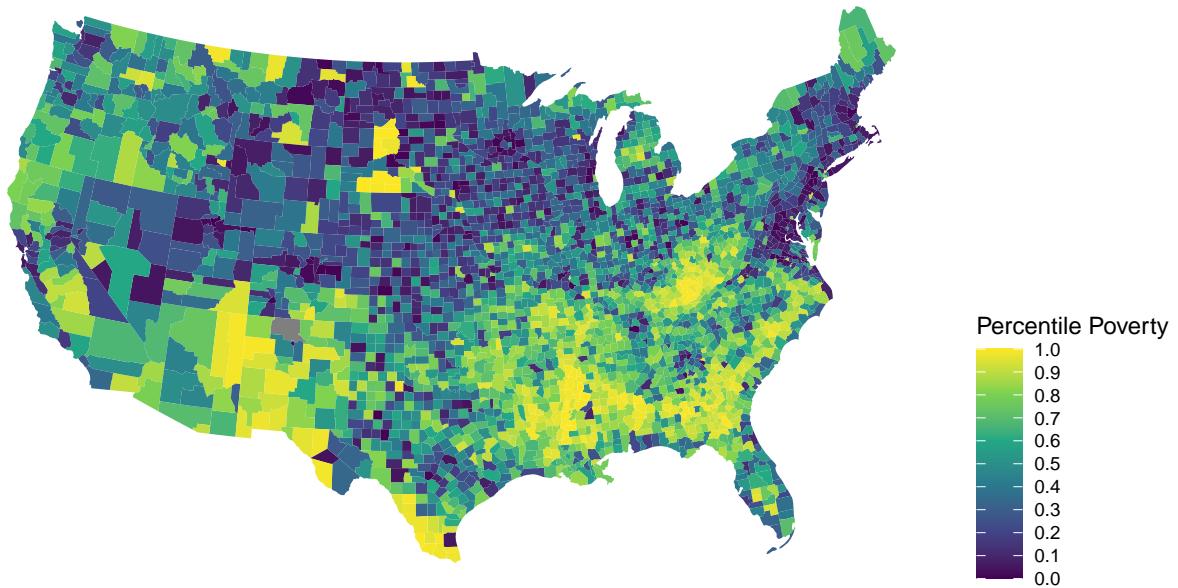


CDC SVI

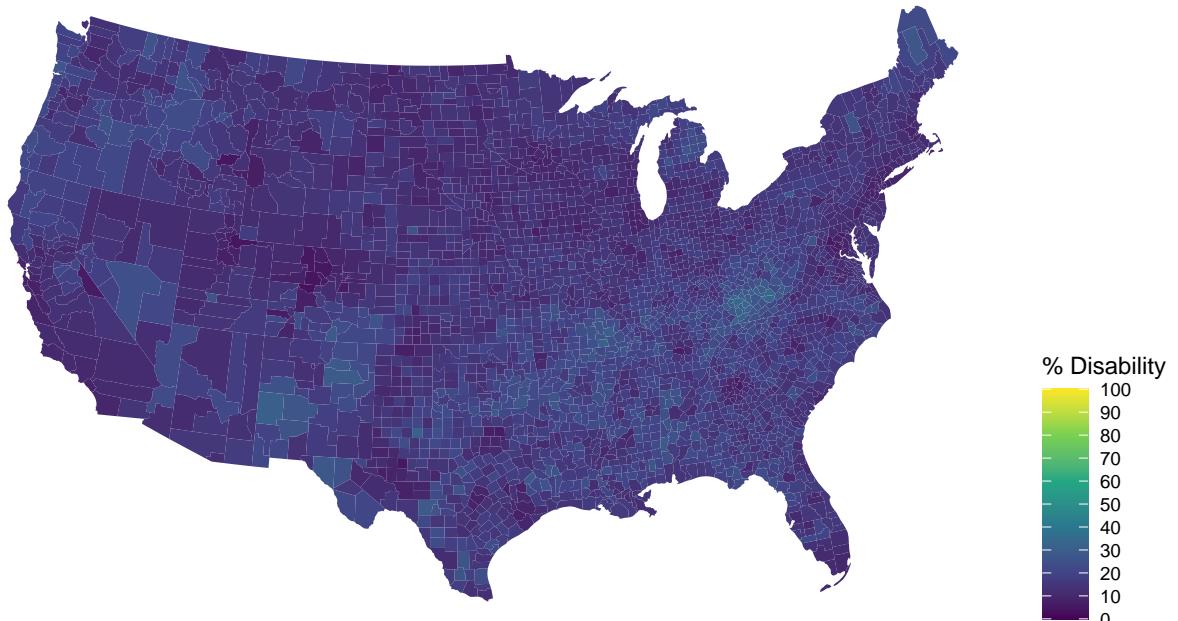
```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EP_POV", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 100),
                        name = "% Poverty") +
  theme(legend.position = "right")
```



```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EPL_POV", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 1),
                        breaks = seq(0, 1, .10),
                        guide_colourbar(nbin = 100),
                        name = "Percentile Poverty") +
  theme(legend.position = "right")
```



```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EP_DISABL", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 100),
                        name = "% Disability") +
  theme(legend.position = "right")
```

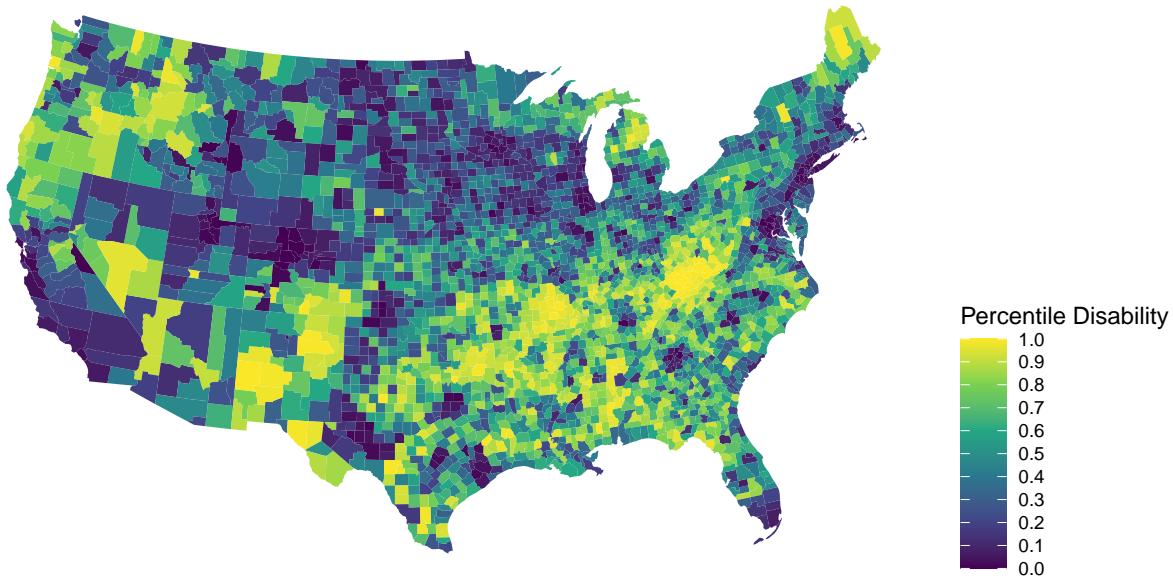


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EPL_DISABL", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 1),
```

```

    breaks = seq(0, 1, .10),
    guide_colourbar(nbin = 100),
    name = "Percentile Disability") +
theme(legend.position = "right")

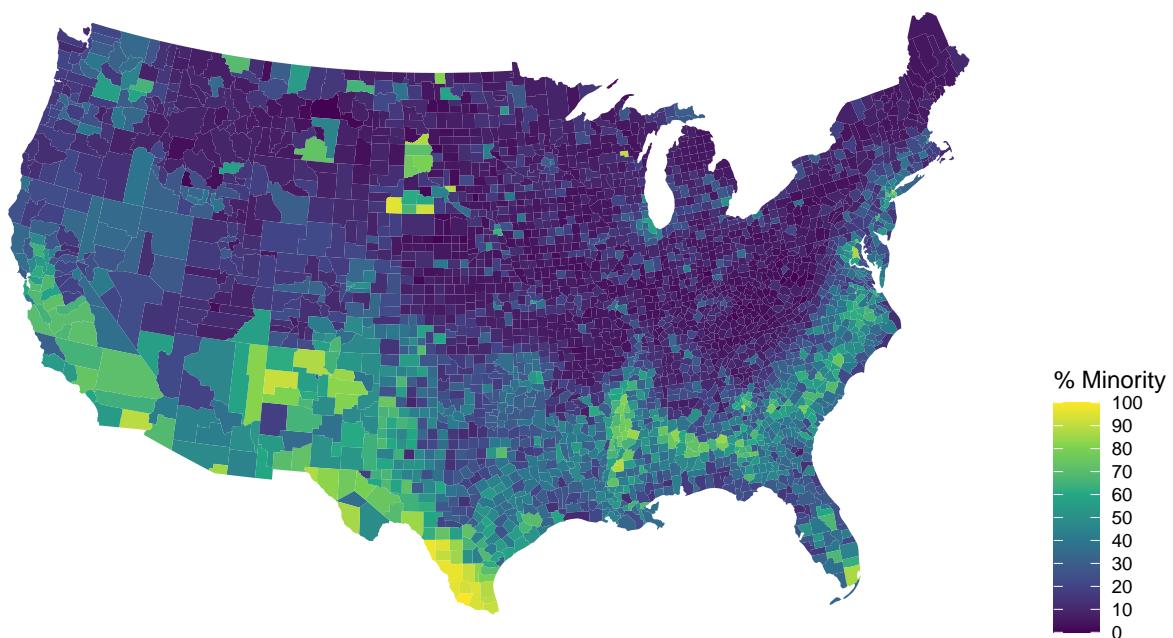
```



```

plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EP_MINRTY", color = NA,
           exclude = c("AK", "HI")) +
scale_fill_continuous(type = "viridis",
                      limits = c(0, 100),
                      breaks = seq(0, 100, 10),
                      guide_colourbar(nbin = 100),
                      name = "% Minority") +
theme(legend.position = "right")

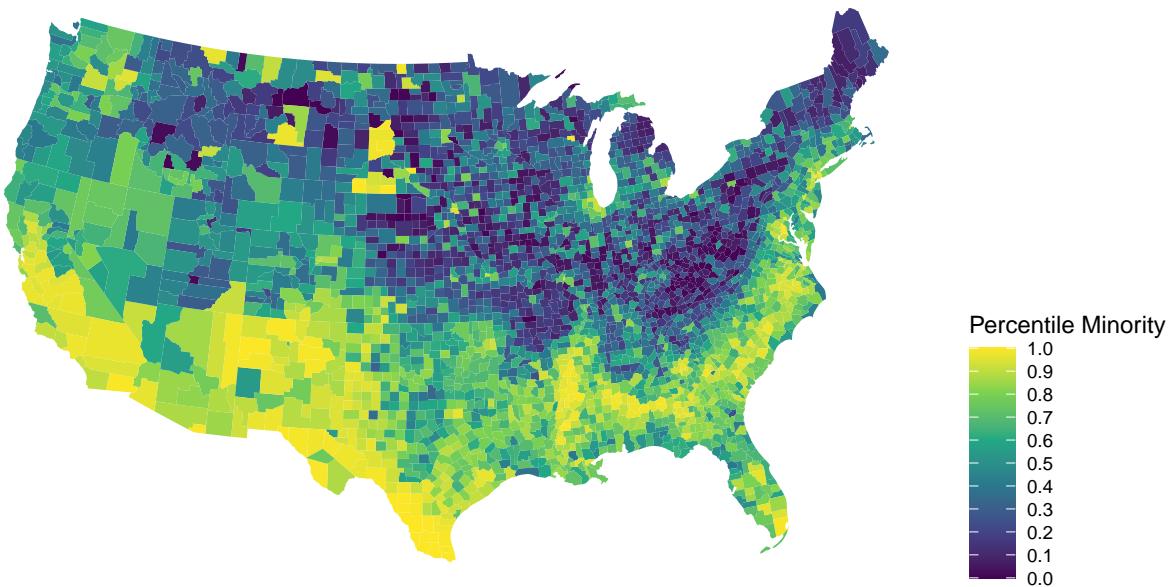
```



```

plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EPL_MINRTY", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 1),
                        breaks = seq(0, 1, .10),
                        guide_colourbar(nbin = 100),
                        name = "Percentile Minority") +
  theme(legend.position = "right")

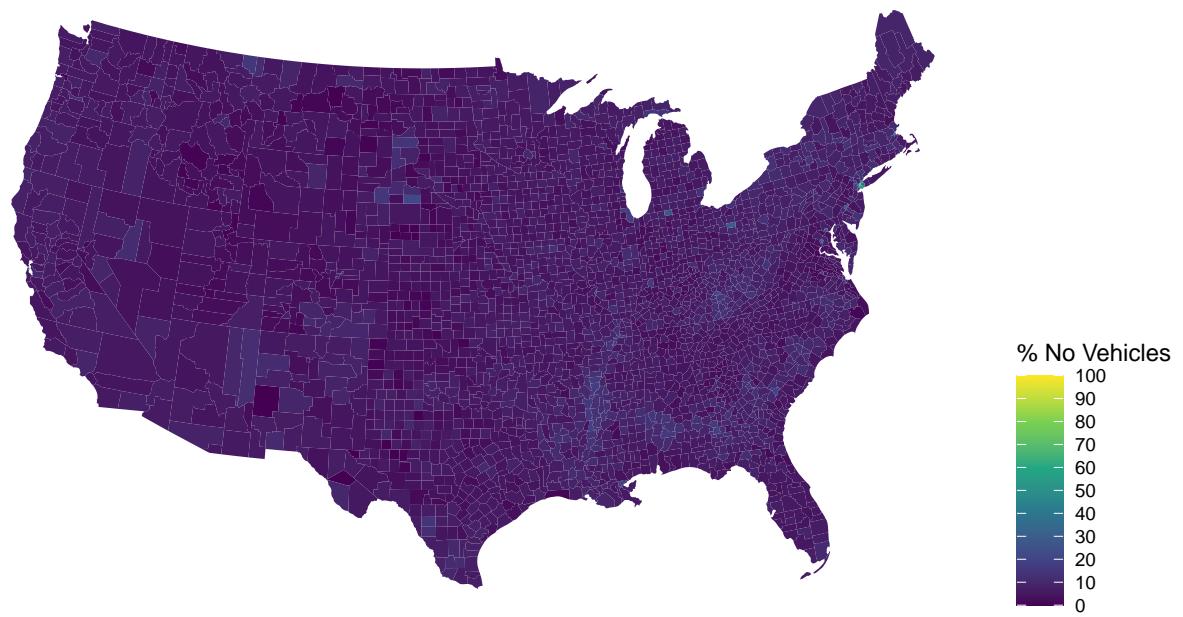
```



```

plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EP_NOVEH", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 100),
                        name = "% No Vehicles") +
  theme(legend.position = "right")

```



```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EPL_NOVEH", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 1),
                        breaks = seq(0, 1, .10),
                        guide_colourbar(nbin = 100),
                        name = "Percentile No Vehicles") +
  theme(legend.position = "right")
```

