

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

```

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
##

```

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. : 0.0 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. : 0.0 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.    :-999.000   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.    :-999.000   Min.    :-999.0000   Min.    :-999.000   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. :0.00000
## 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 :0.09898 Mean :0.09835 Mean :0.3937
## 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:1.00000
## Max. :1.00000 Max. :1.00000 Max. :1.00000 Max. :3.00000
## F_MINRTY F_LIMENG F_THEME3 F_MUNIT
## 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 :0.1003 Mean :0.1999 Mean :0.1003
## 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.00000
## Max. :1.00000 Max. :1.00000 Max. :2.0000 Max. :1.00000
## 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

```

Joint exploration of data

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

Exploring the merged dataset

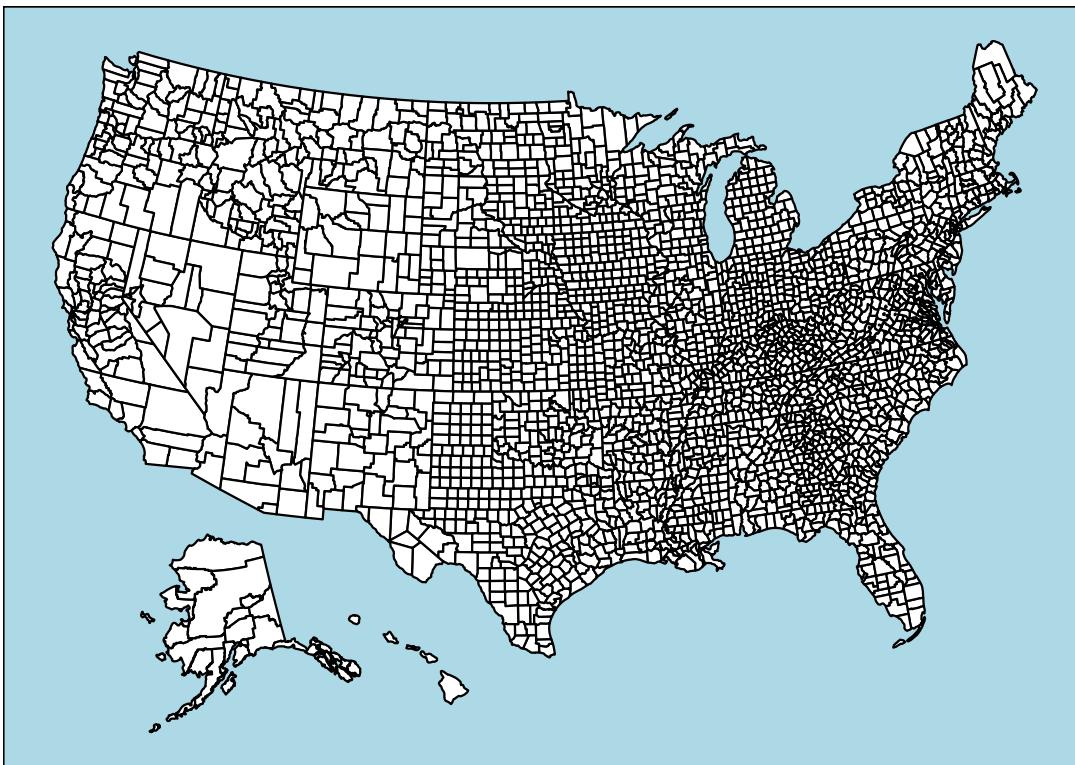
```
flood_le_svi <- readRDS(file = here("intermediary_data/flood_le_svi.rds"))
```

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"))
```

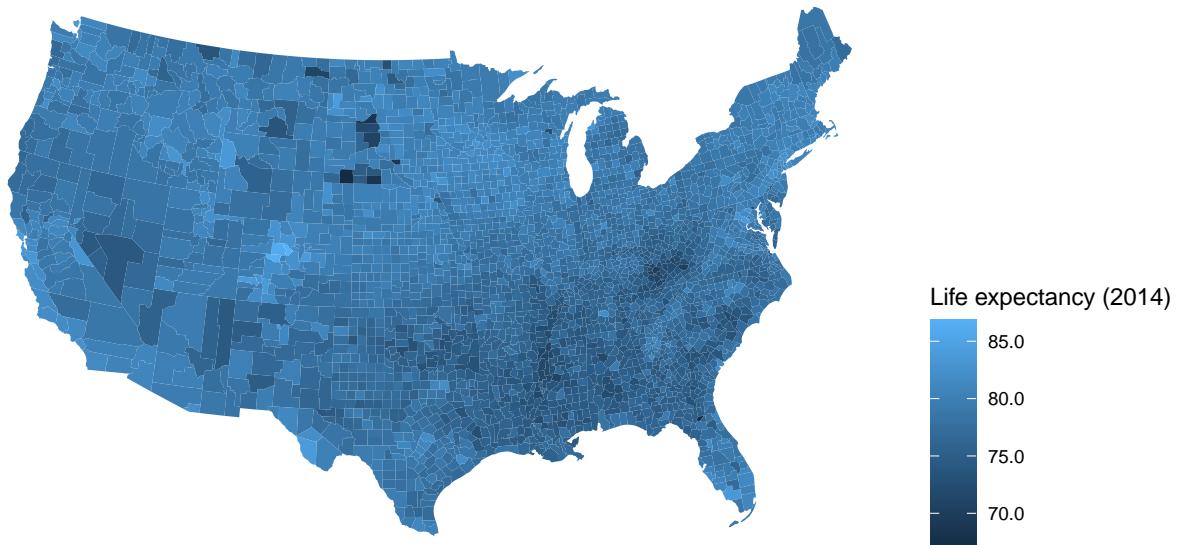
US Counties

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



Outcome Variables

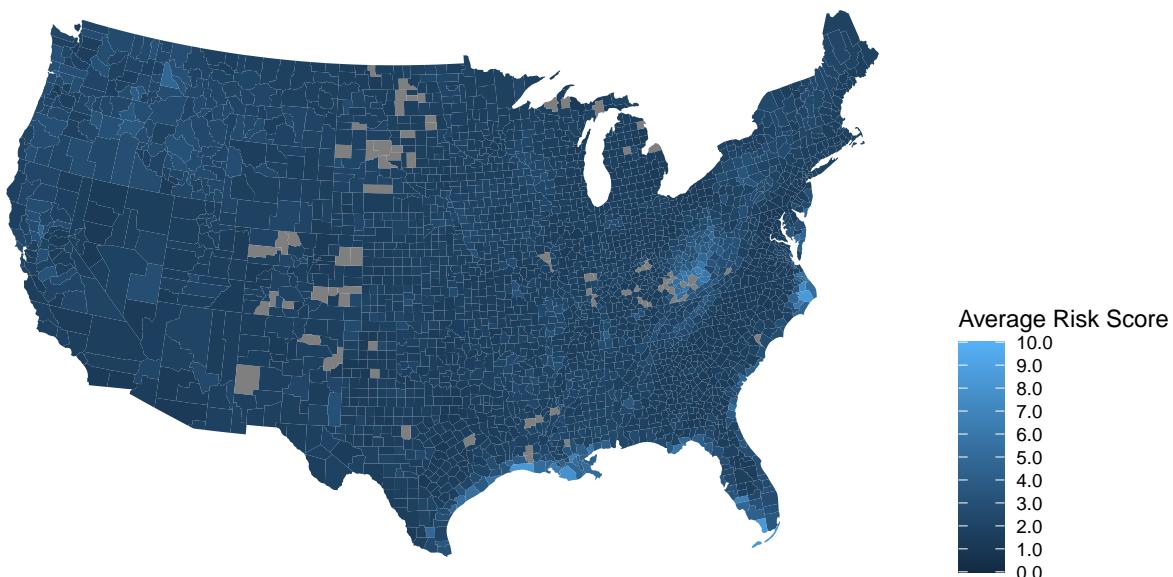
```
plot_usmap(regions = "counties", data = flood_le_svi,  
           values = "Life expectancy, 2014*", color = NA,  
           exclude = c("AK", "HI")) +  
  scale_fill_continuous(name = "Life expectancy (2014)", label = scales::comma) +  
  theme(legend.position = "right")
```



```
# 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")
```

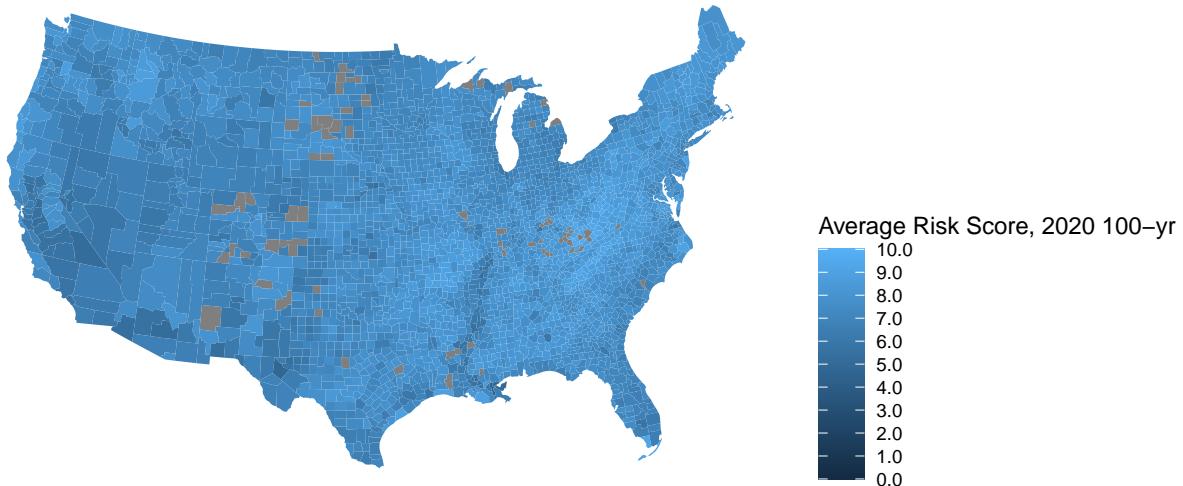


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "avg_risk_fsf_2020_100", color = NA,
```

```

    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")

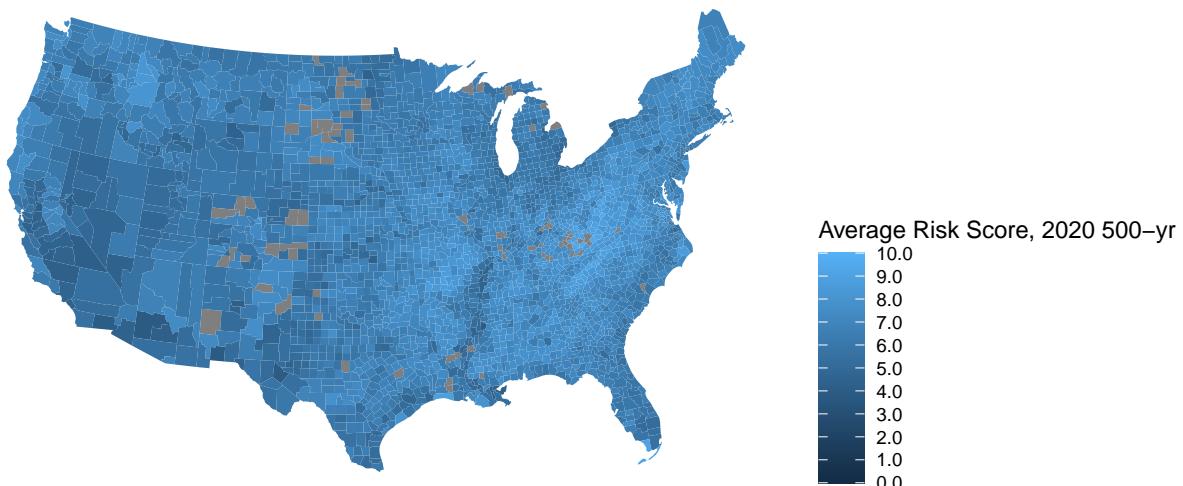
```



```

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")

```



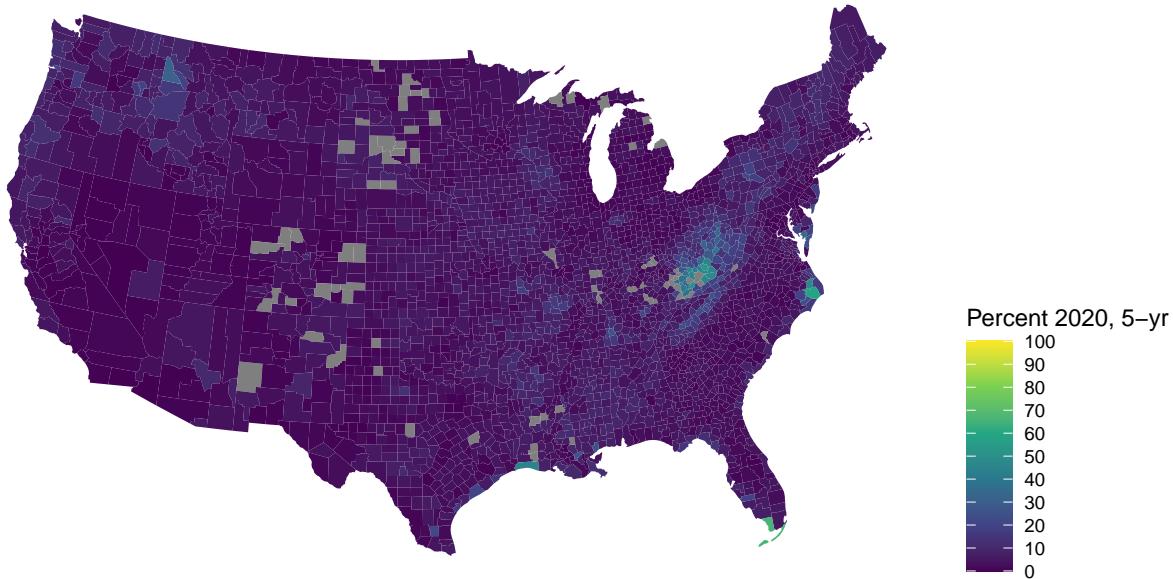
Percent of First Street Properties at 3 levels of severity and 2 time points

```

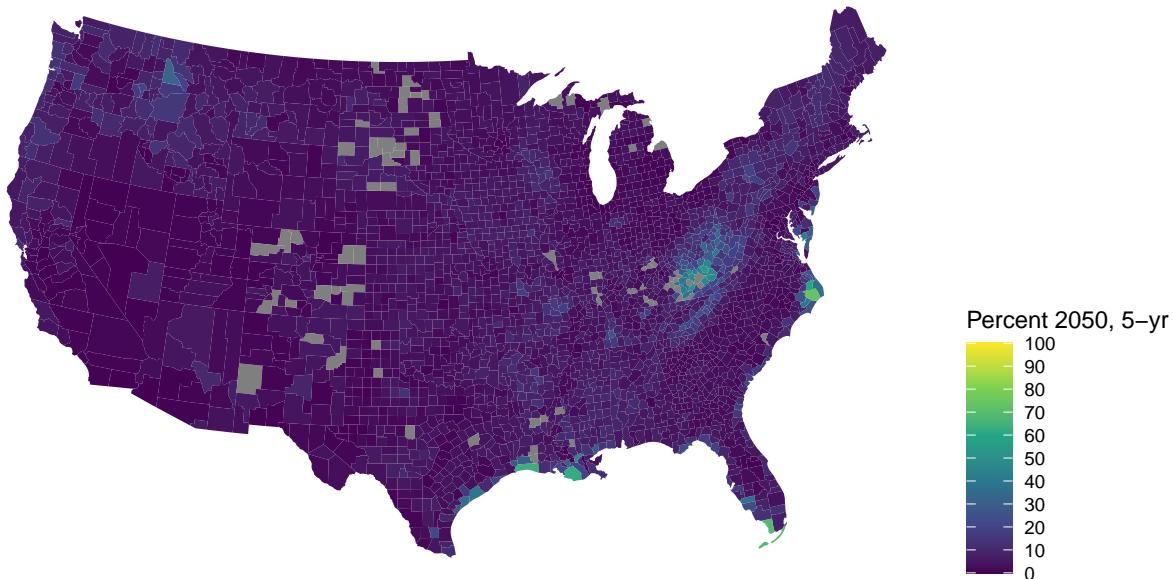
plot_usmap(regions = "counties", data = flood_le_svi,
            values = "pct_fs_risk_2020_5", color = NA,
            exclude = c("AK", "HI")) +
theme(legend.position = "right") +
scale_fill_continuous(type = "viridis",

```

```
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")
```

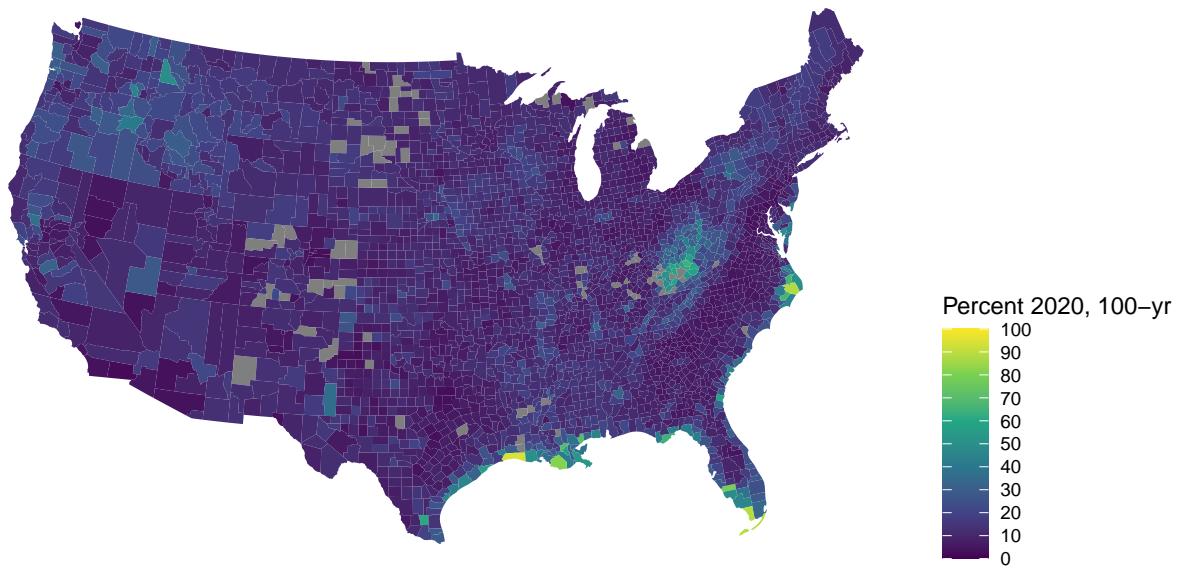


```
plot_usmap(regions = "counties", data = flood_le_svi,
```

```

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")

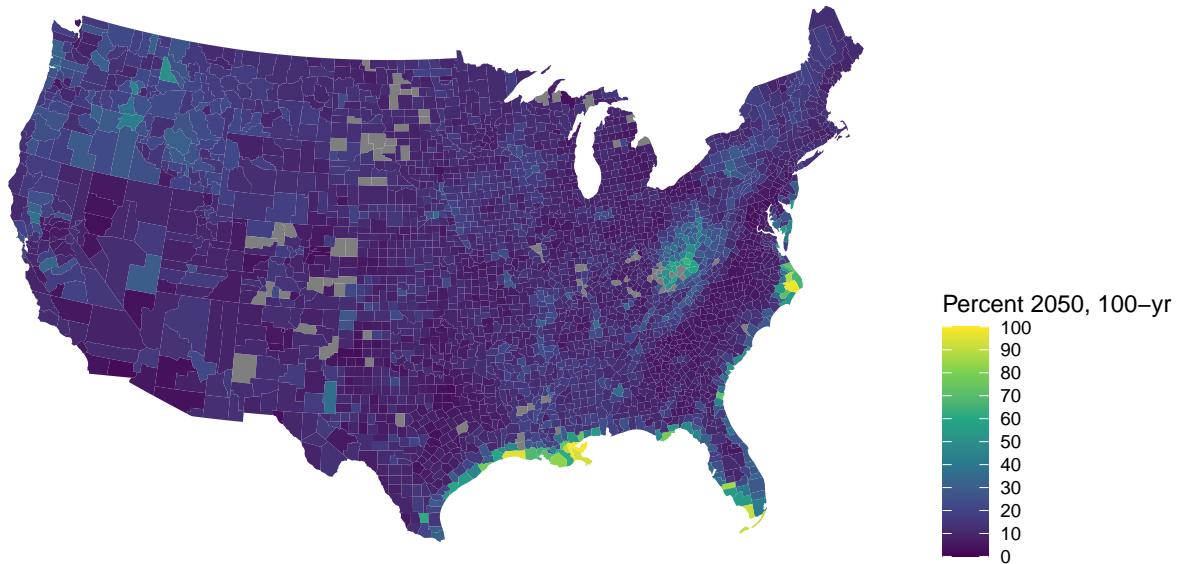
```



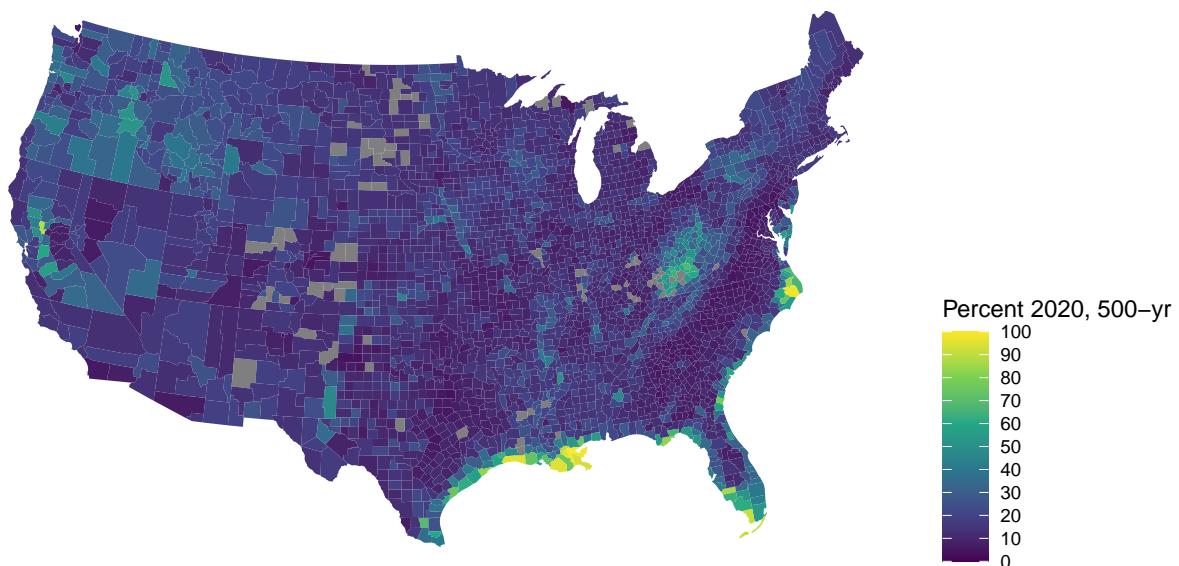
```

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")

```

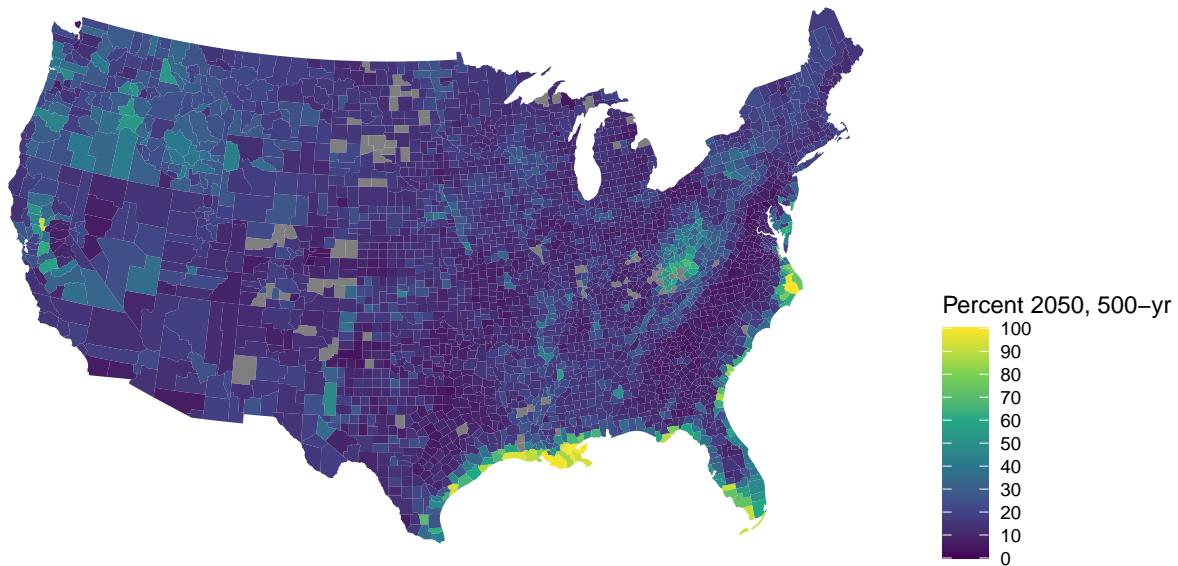


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "pct_fs_risk_2020_500", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
            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



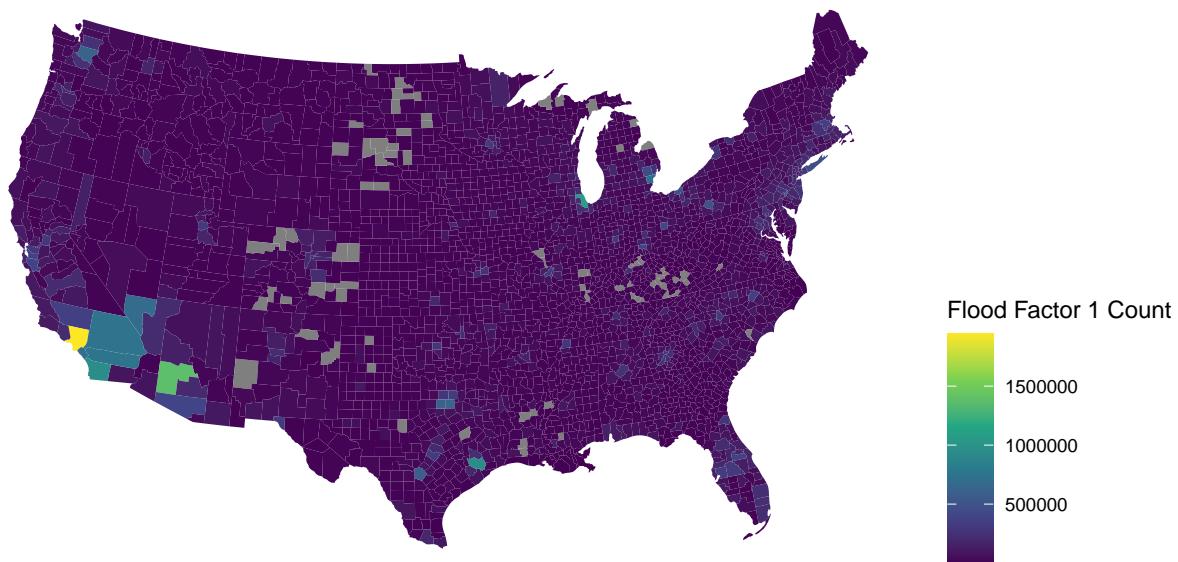
```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "pct_fs_risk_2050_500", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        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")
```

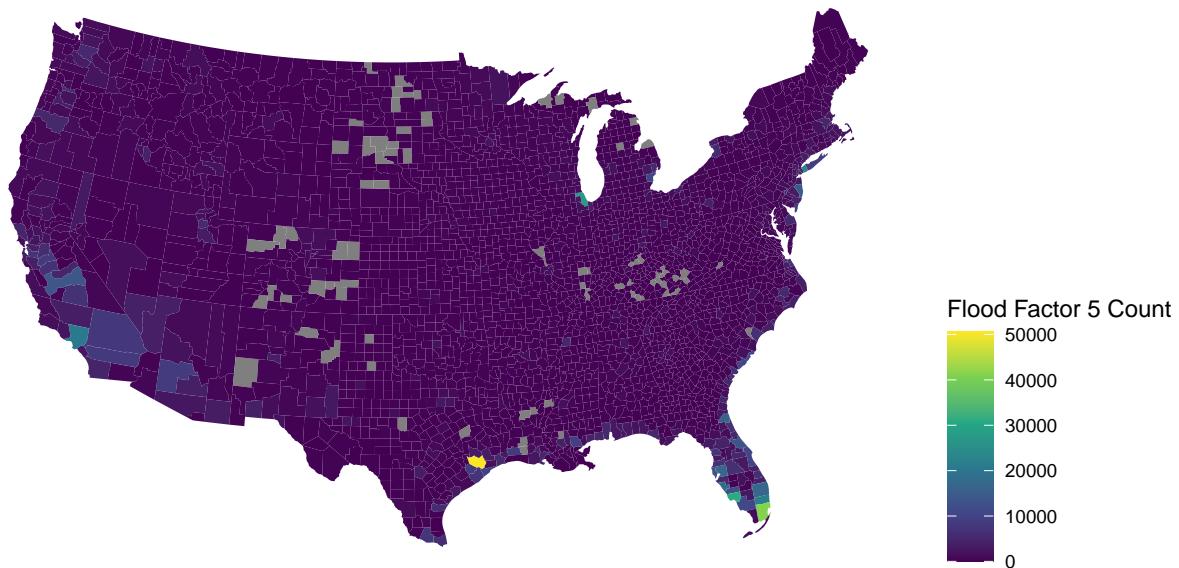


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "count_floodfactor5", color = NA,
```

```

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")

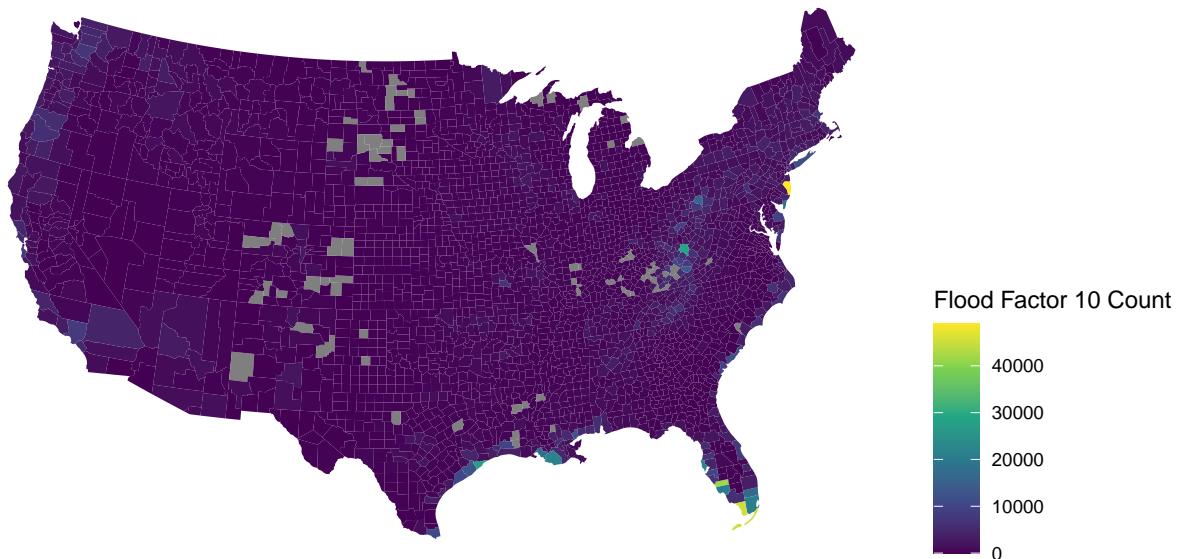
```



```

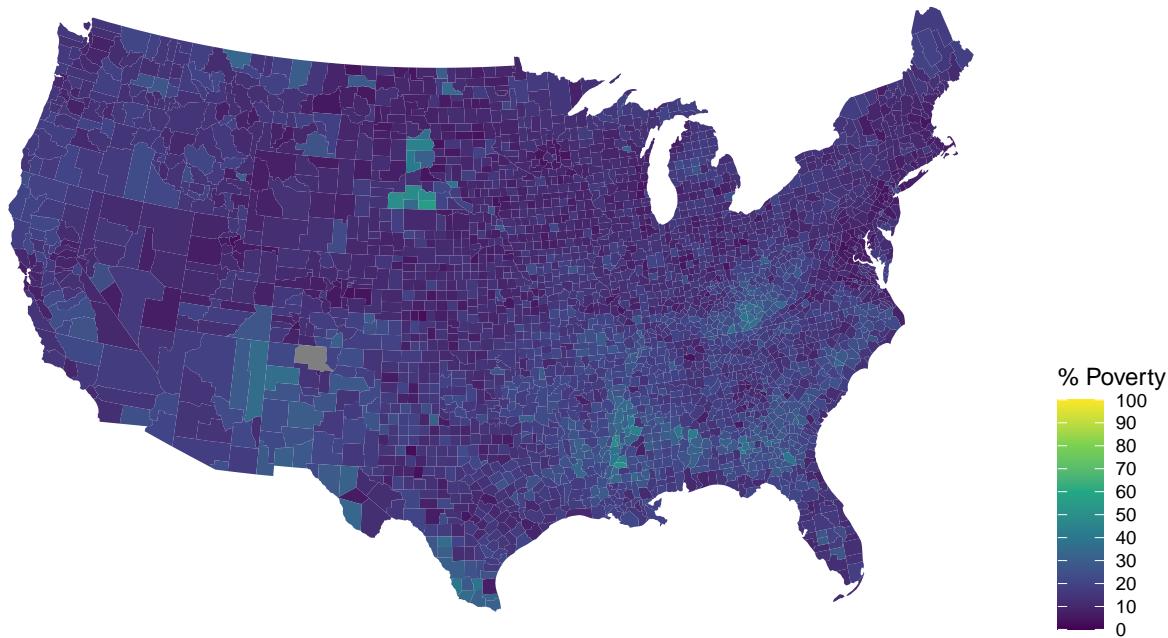
plot_usmap(regions = "counties", data = flood_le_svi,
values = "count_floodfactor10", color = NA,
exclude = c("AK", "HI")) +
scale_fill_continuous(type = "viridis",
# limits = c(0, 100),
# breaks = seq(0, 100, 10),
# guide_colourbar(nbin = 100),
name = "Flood Factor 10 Count") +
theme(legend.position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

```

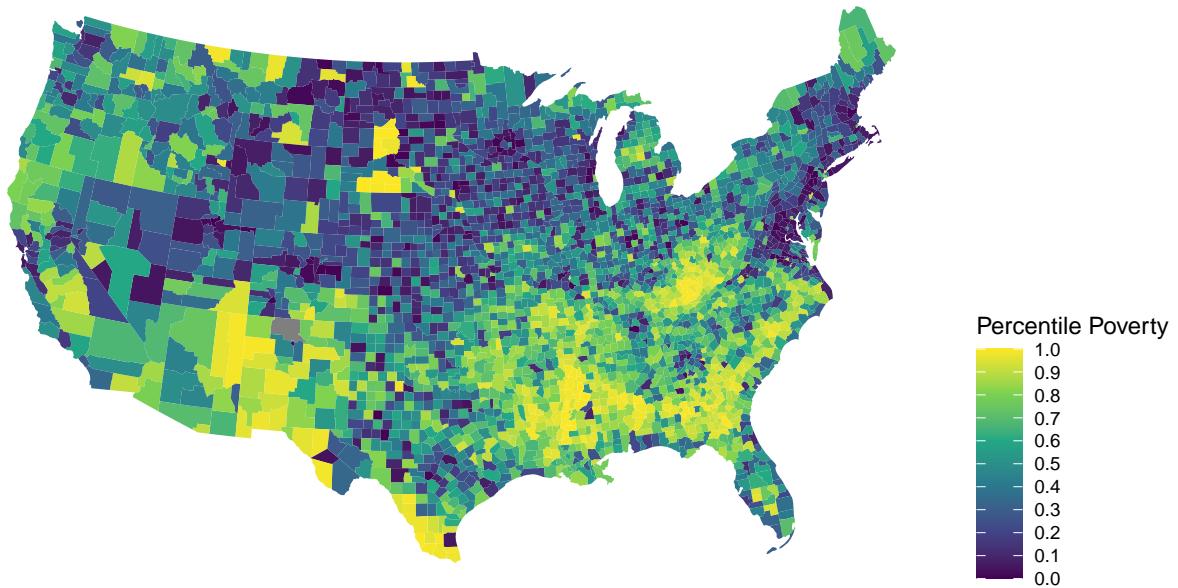


CDC SVI

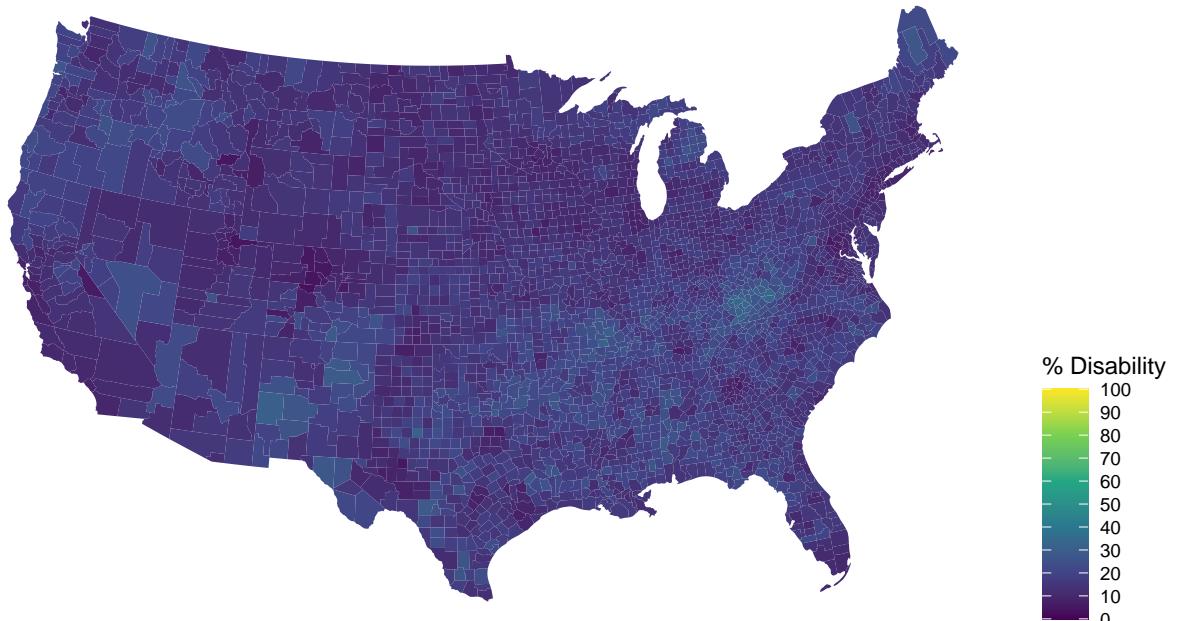
```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EP_POV", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 100),
                        breaks = seq(0, 100, 10),
                        guide_colourbar(nbin = 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")
```

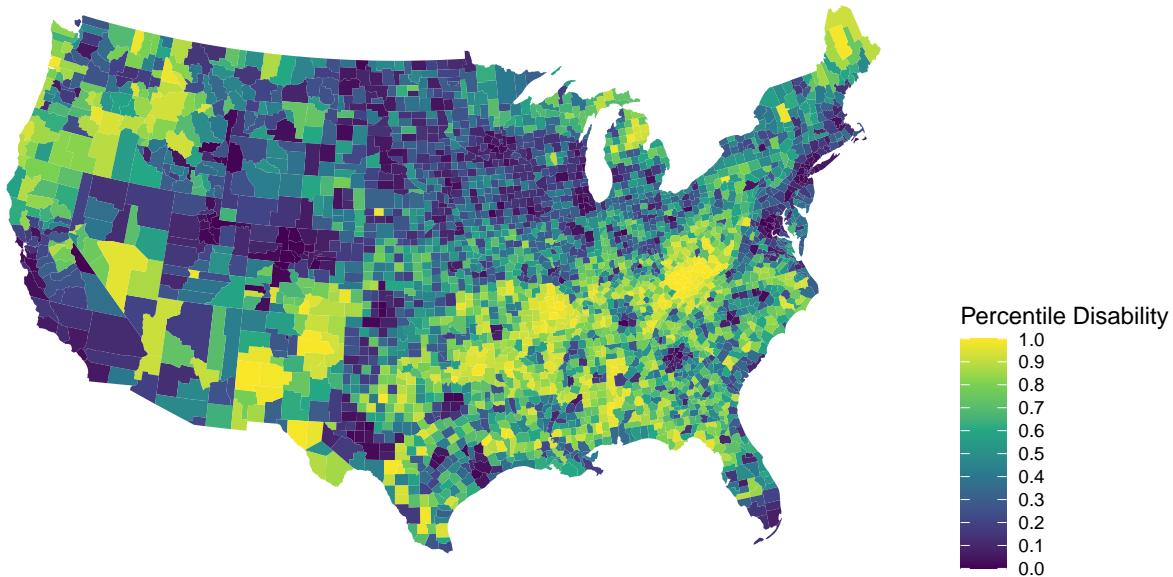


```
plot_usmap(regions = "counties", data = flood_le_svi,
           values = "EPL_DISABL", color = NA,
           exclude = c("AK", "HI")) +
  scale_fill_continuous(type = "viridis",
                        limits = c(0, 1),
```

```

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

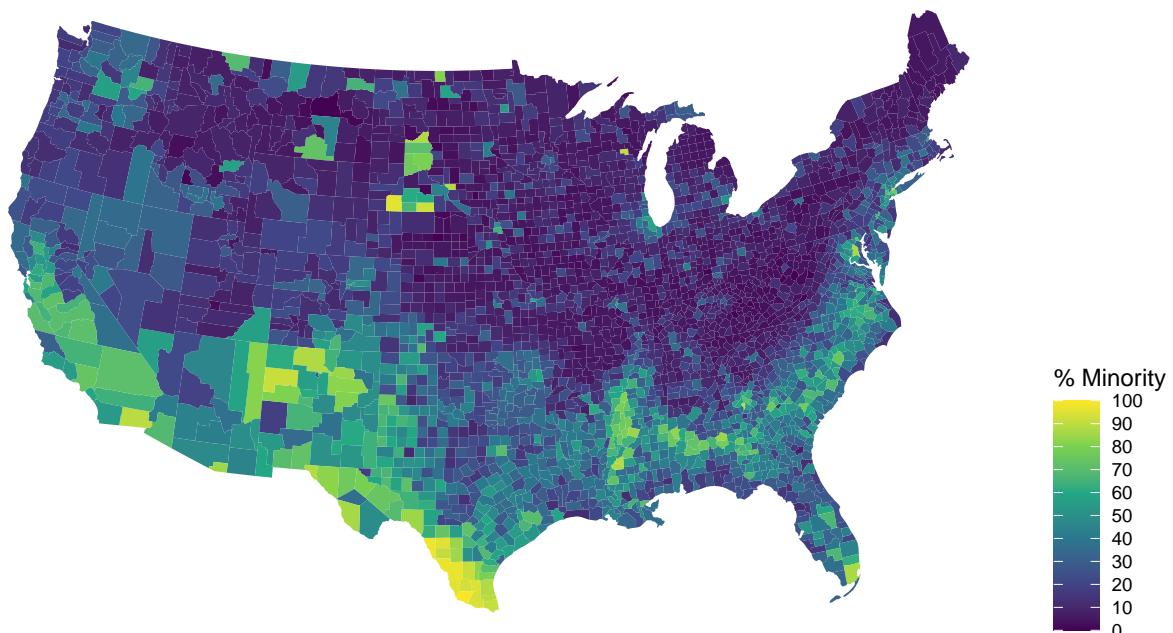
```



```

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")

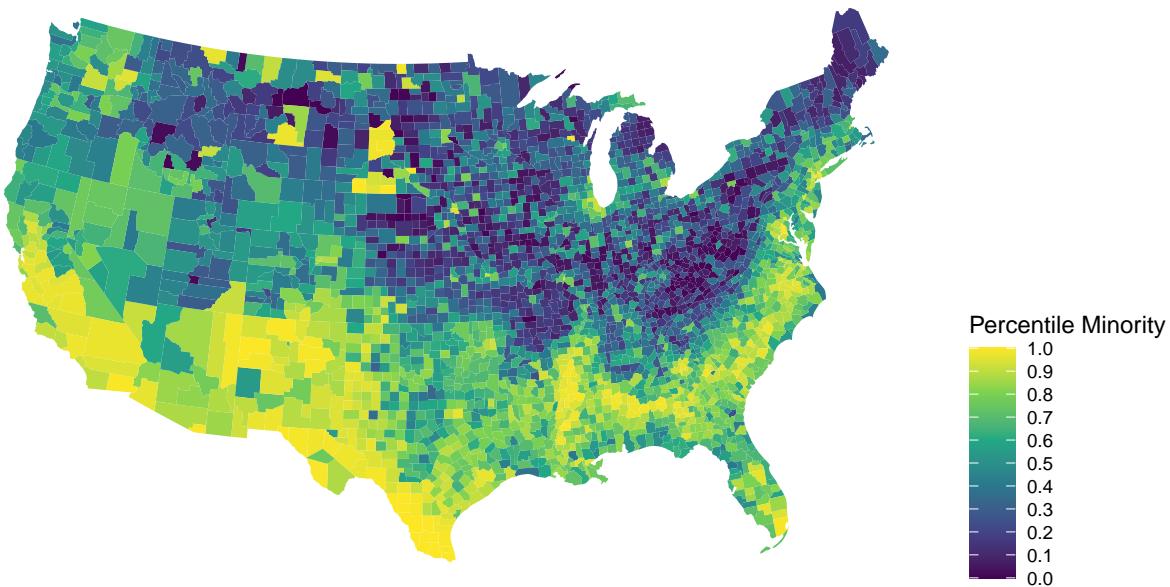
```



```

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")

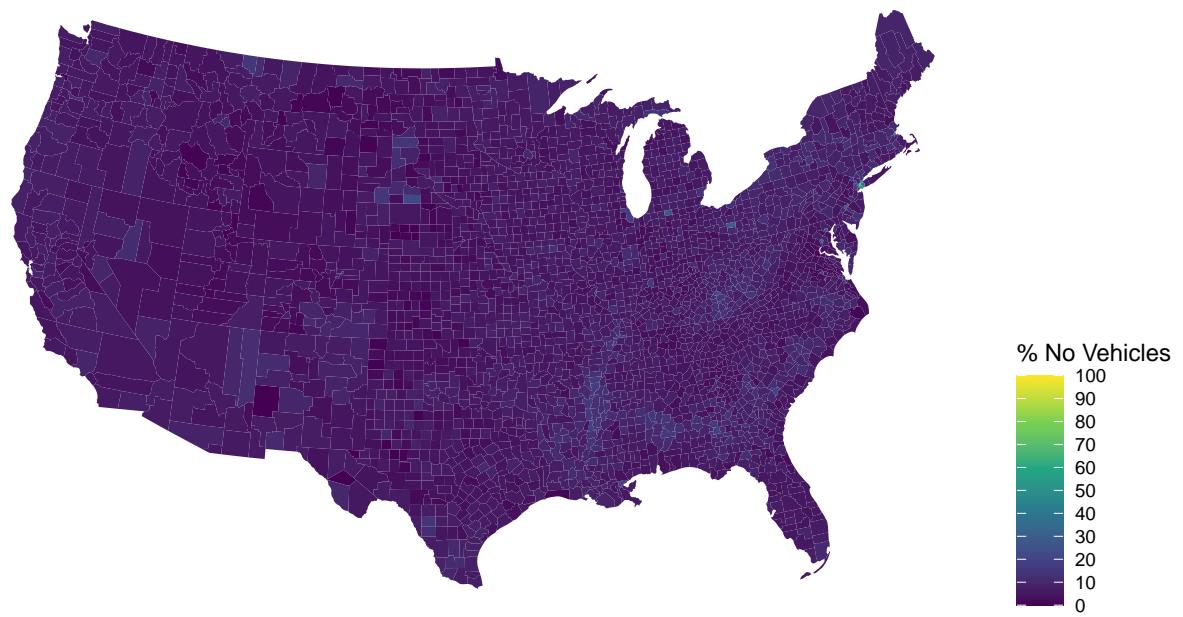
```



```

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")
```

