County

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Load R data

```
load("county.rda")
```

View only first few rows

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.8     v dplyr   1.0.9
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
county <- as.tibble(county)
```

```
## Warning: `as.tibble()` was deprecated in tibble 2.0.0.
## Please use `as_tibble()` instead.
## The signature and semantics have changed, see `?as_tibble`.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was generated.
```

```
head(county)
```

```
## # A tibble: 6 x 15
##   name     state pop2000 pop2010 pop2017 pop_c~1 poverty homeo~2 multi~3 unemp~4
##   <fct>    <fct>   <dbl>   <dbl>   <int>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1 Autauga~ Alab~   43671   54571   55504    1.48    13.7    77.5     7.2    3.86
## 2 Baldwin~ Alab~  140415  182265  212628    9.19    11.8    76.7    22.6    3.99
## 3 Barbour~ Alab~   29038   27457   25270   -6.22    27.2    68      11.1    5.9
## 4 Bibb Co~ Alab~   20826   22915   22668    0.73    15.2    82.9     6.6    4.39
## 5 Blount ~ Alab~   51024   57322   58013    0.68    15.6    82       3.7    4.02
## 6 Bullock~ Alab~   11714   10914   10309   -2.28    28.5    76.9     9.9    4.93
## # ... with 5 more variables: metro <fct>, median_edu <fct>,
## #   per_capita_income <dbl>, median_hh_income <int>, smoking_ban <fct>, and
## #   abbreviated variable names 1: pop_change, 2: homeownership, 3: multi_unit,
## #   4: unemployment_rate
## # i Use `colnames()` to see all variable names
```

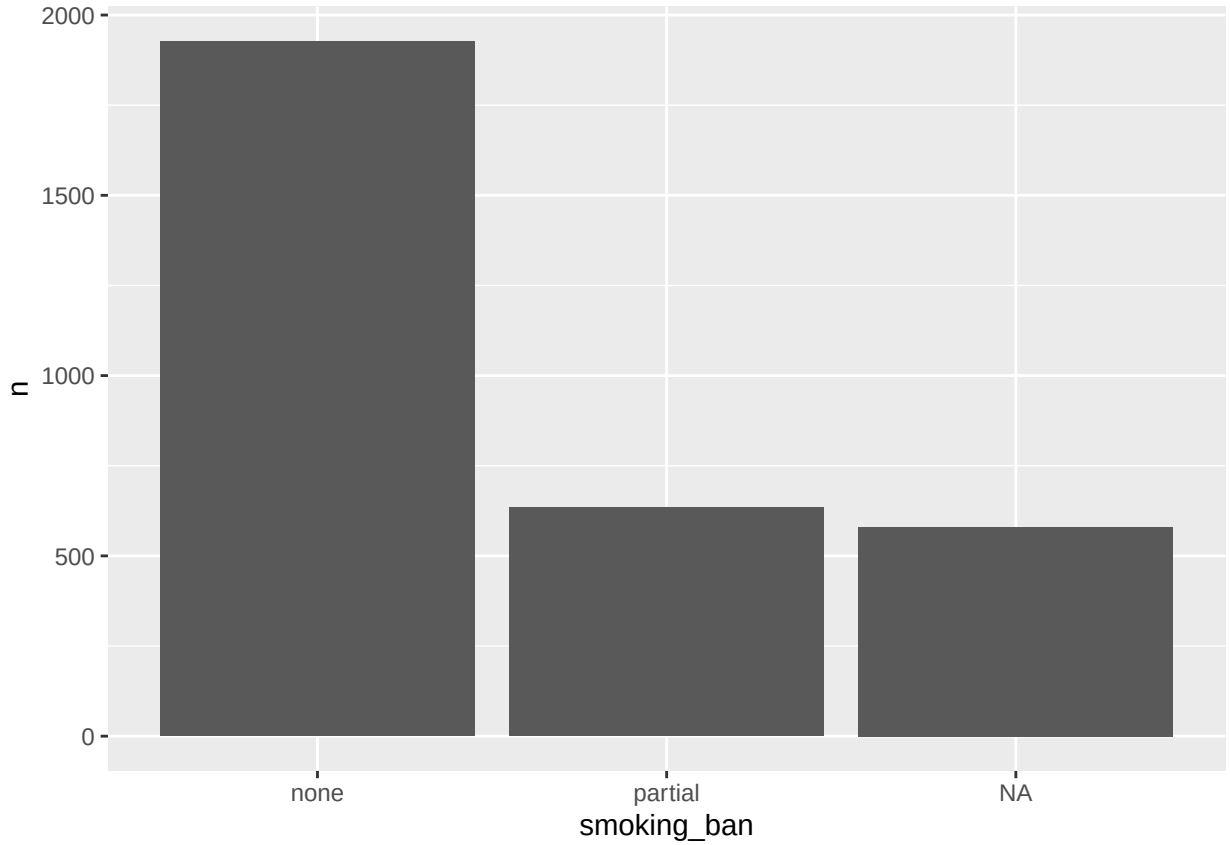
```
glimpse(county)
```

```
## Rows: 3,142
## Columns: 15
## $ name              <fct> Autauga County, Baldwin County, Barbour County, Bibb~
## $ state             <fct> Alabama, Alabama, Alabama, Alabama, Alabama, Alabama~
## $ pop2000           <dbl> 43671, 140415, 29038, 20826, 51024, 11714, 21399, 11~
## $ pop2010           <dbl> 54571, 182265, 27457, 22915, 57322, 10914, 20947, 11~
## $ pop2017           <int> 55504, 212628, 25270, 22668, 58013, 10309, 19825, 11~
## $ pop_change        <dbl> 1.48, 9.19, -6.22, 0.73, 0.68, -2.28, -2.69, -1.51, ~
## $ poverty           <dbl> 13.7, 11.8, 27.2, 15.2, 15.6, 28.5, 24.4, 18.6, 18.8~
## $ homeownership     <dbl> 77.5, 76.7, 68.0, 82.9, 82.0, 76.9, 69.0, 70.7, 71.4~
## $ multi_unit        <dbl> 7.2, 22.6, 11.1, 6.6, 3.7, 9.9, 13.7, 14.3, 8.7, 4.3~
## $ unemployment_rate <dbl> 3.86, 3.99, 5.90, 4.39, 4.02, 4.93, 5.49, 4.93, 4.08~
## $ metro             <fct> yes, yes, no, yes, yes, no, no, yes, no, no, yes, no~
## $ median_edu        <fct> some_college, some_college, hs_diploma, hs_diploma, ~
## $ per_capita_income <dbl> 27841.70, 27779.85, 17891.73, 20572.05, 21367.39, 15~
## $ median_hh_income  <int> 55317, 52562, 33368, 43404, 47412, 29655, 36326, 436~
## $ smoking_ban       <fct> none, none, partial, none, none, none, NA, NA, none,~
```

```
# summary in categorical variable
county %>%
  count(smoking_ban)
```

```
## # A tibble: 3 x 2
##   smoking_ban     n
##   <fct>       <int>
## 1 none         1927
## 2 partial       635
## 3 <NA>          580
```

```
county %>%
  count(smoking_ban) %>%
  ggplot(aes(smoking_ban, n)) +
  geom_col()
```




```
# summary in categorical variable
county %>%
  count(smoking_ban, metro)
```

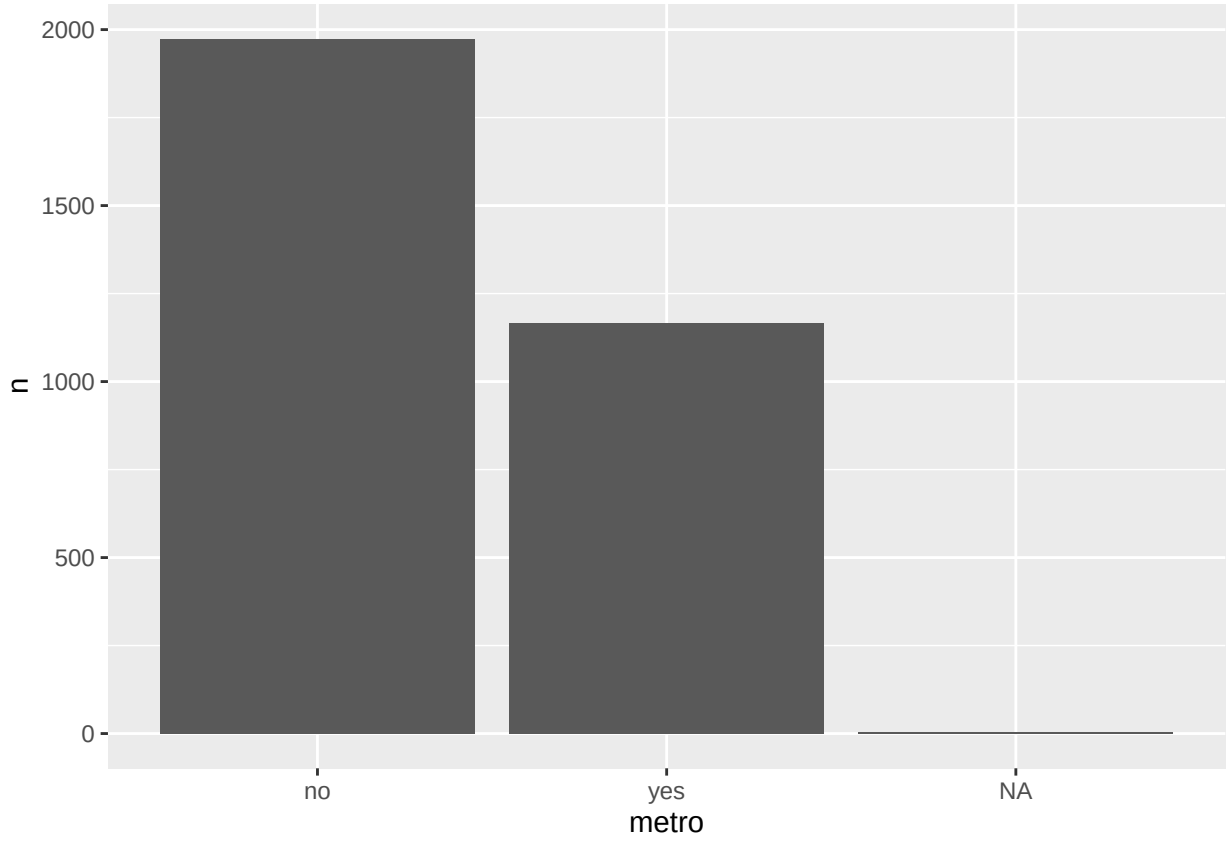
```
## # A tibble: 8 x 3
##   smoking_ban metro     n
##   <fct>       <fct> <int>
## 1 none        no     1202
## 2 none        yes     723
## 3 none        <NA>      2
## 4 partial     no      413
## 5 partial     yes     222
## 6 <NA>        no      359
## 7 <NA>        yes     220
## 8 <NA>        <NA>      1
```

```
county %>%
  count(metro)
```

```
## # A tibble: 3 x 2
##   metro     n
##   <fct> <int>
## 1 no     1974
## 2 yes    1165
## 3 <NA>      3
```

```
county %>%
  count(metro) %>%
```

```
  ggplot(aes(metro, n)) +
  geom_col()
```

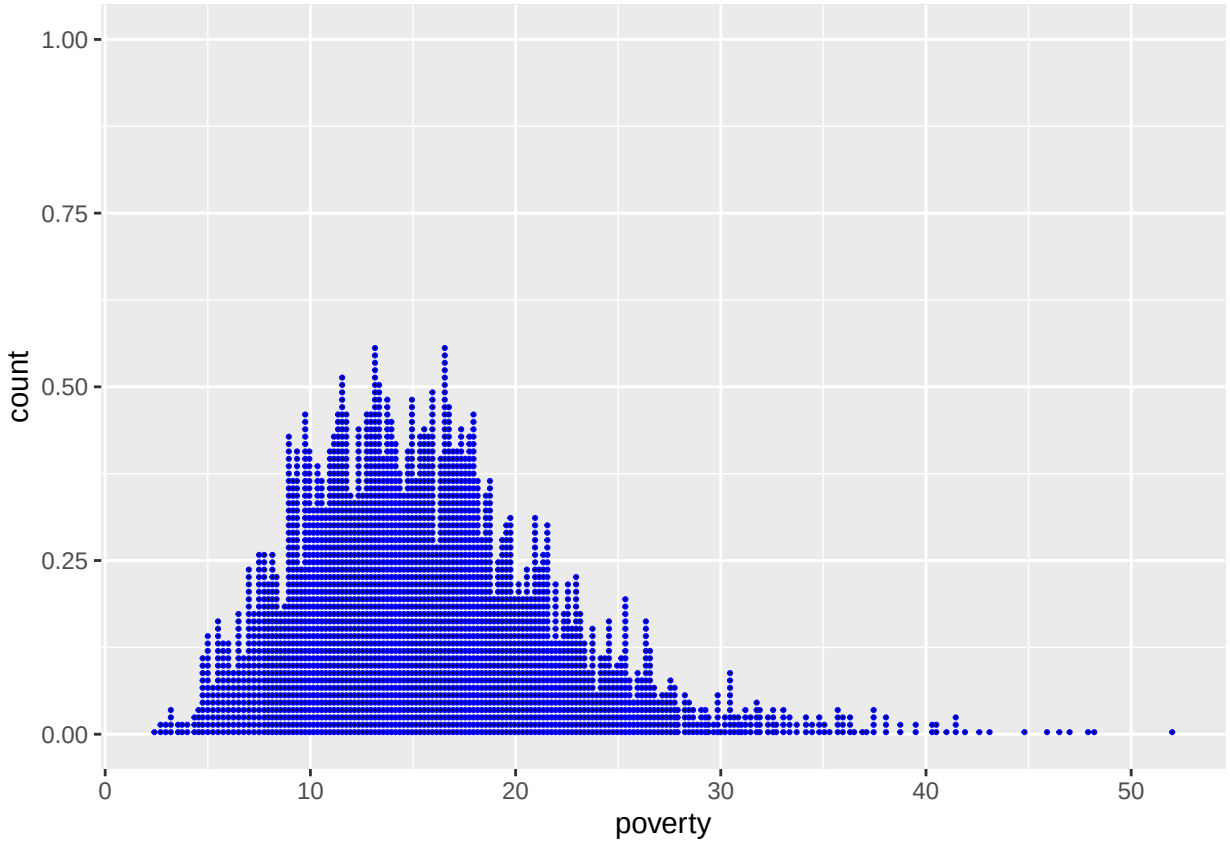



```
# pull out variables/columns, but only first 10 elements
county %>%
  select(pop2000, poverty, smoking_ban) %>%
  slice(1:10)
```

```
## # A tibble: 10 x 3
##    pop2000 poverty smoking_ban
##      <dbl>   <dbl> <fct>
##  1   43671    13.7 none
##  2  140415    11.8 none
##  3   29038    27.2 partial
##  4   20826    15.2 none
##  5   51024    15.6 none
##  6   11714    28.5 none
##  7   21399    24.4 <NA>
##  8  112249    18.6 <NA>
##  9   36583    18.8 none
## 10   23988    16.1 none
```

```
county %>%
  ggplot(aes(poverty)) +
  geom_dotplot(dotsize = 1,
               binwidth = 1/5,
               stackratio = 1.8, color = 'blue')
```

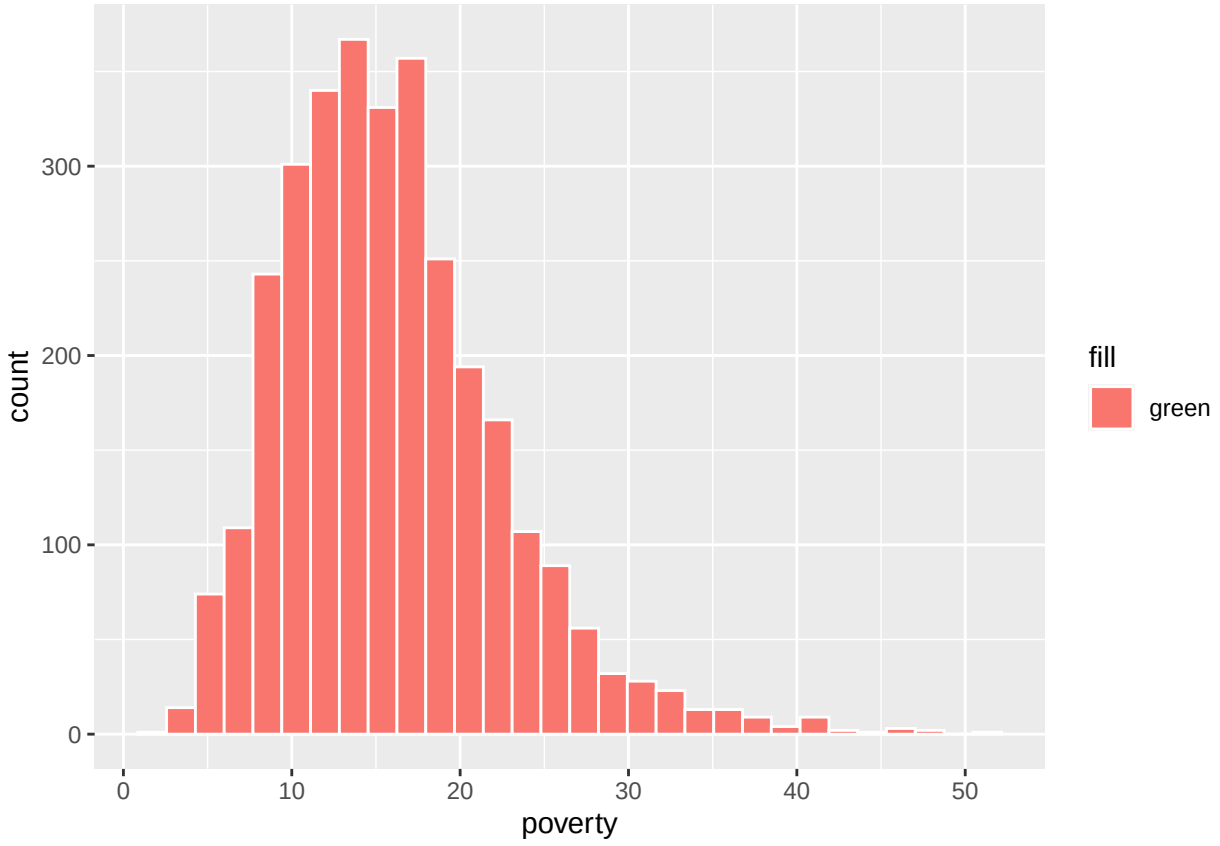
```
## Warning: Removed 2 rows containing non-finite values (stat_bindot).
```




```
county %>%
  ggplot(aes(poverty, fill = 'green')) +
  geom_histogram(color = 'white')
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

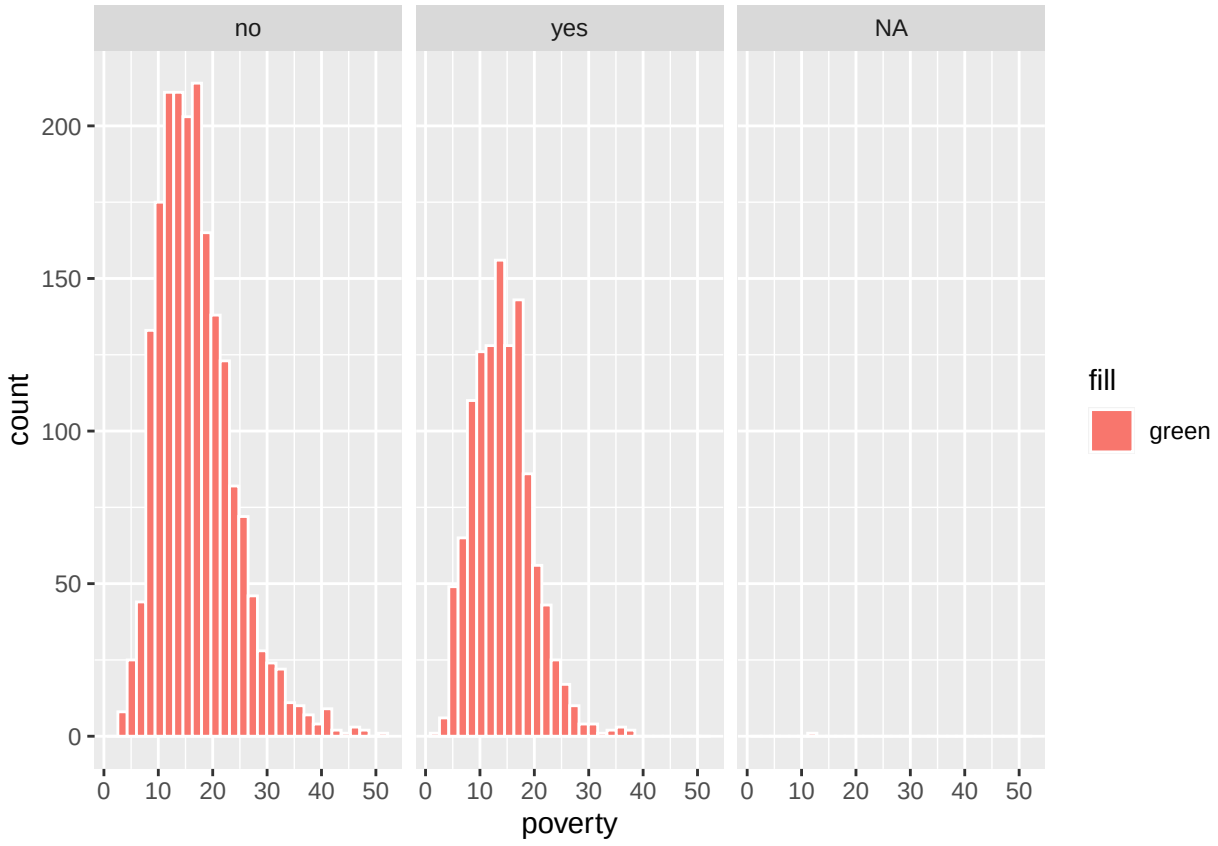
```
## Warning: Removed 2 rows containing non-finite values (stat_bin).
```




```
county %>%
  ggplot(aes(poverty, fill = 'green')) +
  geom_histogram(color = 'white') +
  facet_wrap(~metro)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

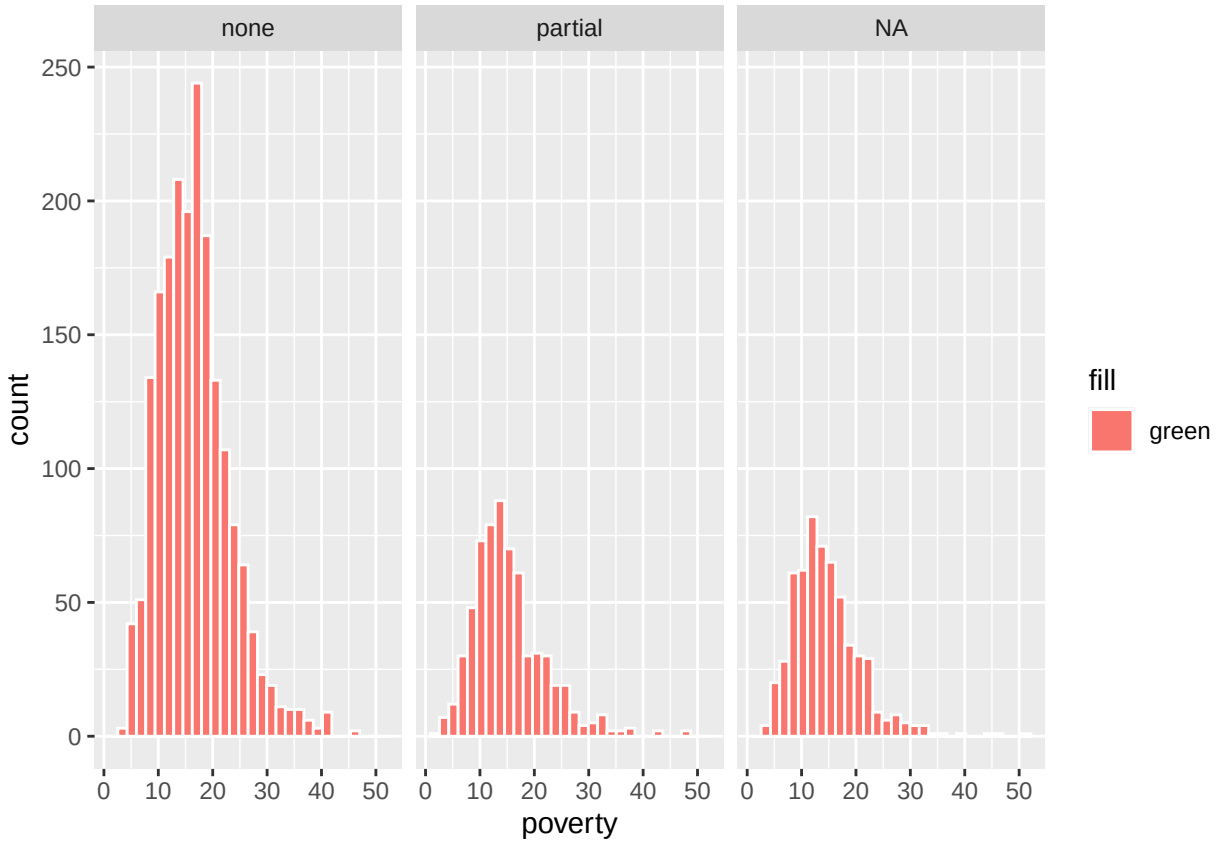
```
## Warning: Removed 2 rows containing non-finite values (stat_bin).
```




```
county %>%
  ggplot(aes(poverty, fill = 'green')) +
  geom_histogram(color = 'white') +
  facet_wrap(~smoking_ban)
```

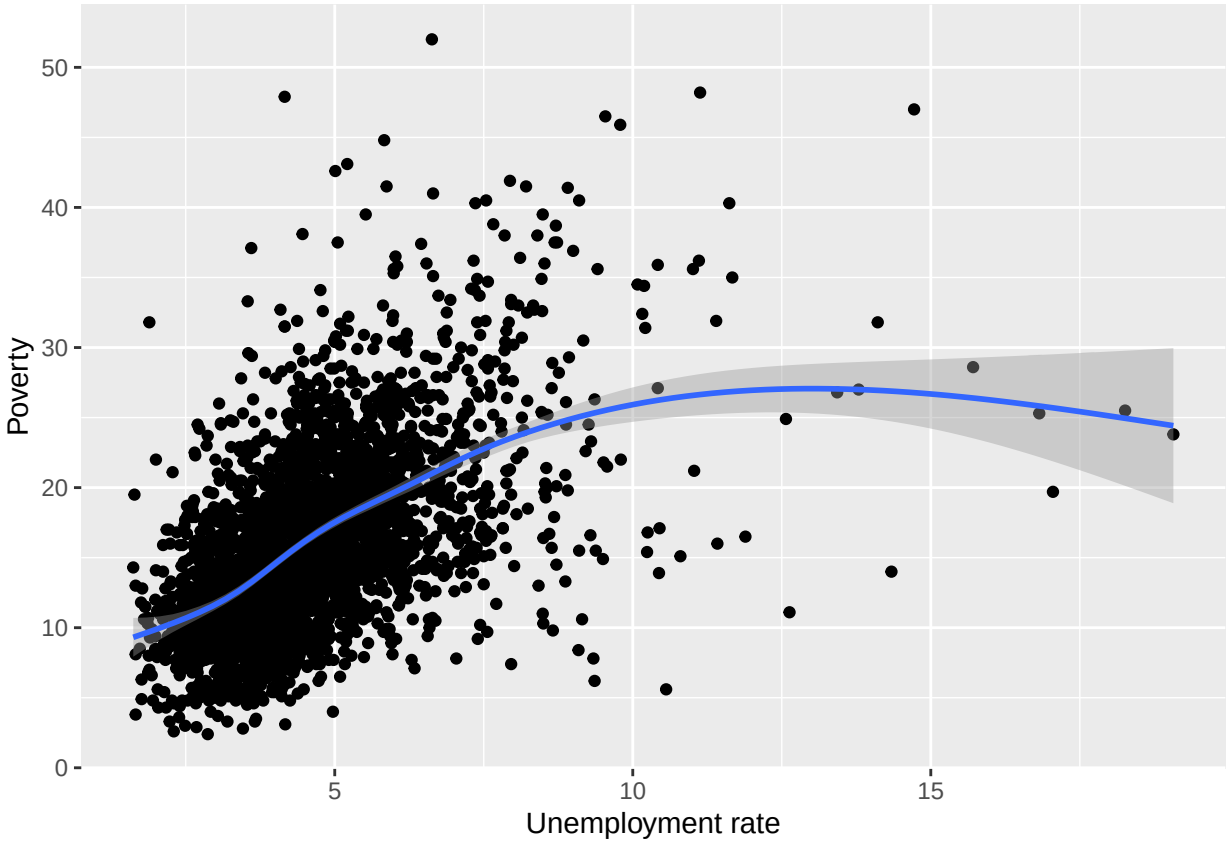
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
## Warning: Removed 2 rows containing non-finite values (stat_bin).
```




```
county %>%
  ggplot(aes(unemployment_rate, poverty)) +
  geom_point() +
  geom_smooth() +
  xlab('Unemployment rate') +
  ylab('Poverty')
```

```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
## Warning: Removed 3 rows containing non-finite values (stat_smooth).
## Warning: Removed 3 rows containing missing values (geom_point).
```




```
county %>%
  summarise()
```

```
## # A tibble: 1 x 0
```

```
# mean and median
mean(county$unemployment_rate, na.rm = T)
```

```
## [1] 4.611443
```

```
mean(county$poverty, na.rm = T)
```

```
## [1] 15.96885
```

```
median(county$unemployment_rate, na.rm = T)
```

```
## [1] 4.36
```

```
median(county$poverty, na.rm = T)
```

```
## [1] 15.2
```

```
attach(county)
# numerical summaries
summary(poverty, na.rm = T)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    2.40   11.30   15.20   15.97   19.40   52.00       2
```

```
# spread - IQR, sd, var
var(poverty)
```

```
## [1] NA
```

```
var(poverty, na.rm = T)
```

```
## [1] 42.45412
```

```
sd(poverty)
```

```
## [1] NA
```

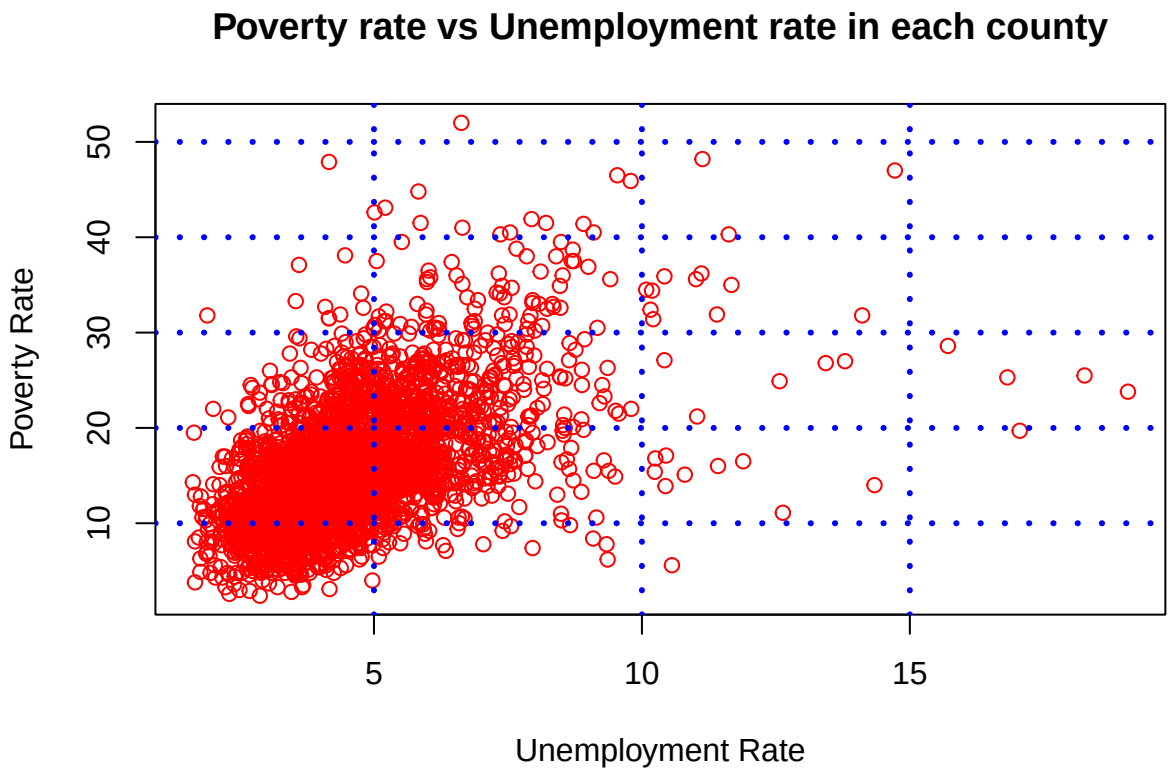
```
sd(poverty, na.rm = T)
```

```
## [1] 6.515682
```

```
IQR(poverty, na.rm = T)
```

```
## [1] 8.1
```

```
# scatterpot - understanding two variables
plot(unemployment_rate, poverty,
     main = 'Poverty rate vs Unemployment rate in each county',
     xlab = 'Unemployment Rate',
     ylab = 'Poverty Rate', col = 'red')
grid(lwd = 3, col = 'blue')
```




```
# reading from CSV
county2 = read.csv('county.csv')
head(county2 == county)
```

```
##      name state pop2000 pop2010 pop2017 pop_change poverty homeownership
```

```
## [1,] TRUE  TRUE    TRUE    TRUE    TRUE       TRUE    TRUE          TRUE
## [2,] TRUE  TRUE    TRUE    TRUE    TRUE       TRUE    TRUE          TRUE
## [3,] TRUE  TRUE    TRUE    TRUE    TRUE       TRUE    TRUE          TRUE
## [4,] TRUE  TRUE    TRUE    TRUE    TRUE       TRUE    TRUE          TRUE
## [5,] TRUE  TRUE    TRUE    TRUE    TRUE       TRUE    TRUE          TRUE
## [6,] TRUE  TRUE    TRUE    TRUE    TRUE       TRUE    TRUE          TRUE
##      multi_unit unemployment_rate metro median_edu per_capita_income
## [1,]       TRUE              TRUE  TRUE       TRUE              TRUE
## [2,]       TRUE              TRUE  TRUE       TRUE              TRUE
## [3,]       TRUE              TRUE  TRUE       TRUE              TRUE
## [4,]       TRUE              TRUE  TRUE       TRUE              TRUE
## [5,]       TRUE              TRUE  TRUE       TRUE              TRUE
## [6,]       TRUE              TRUE  TRUE       TRUE              TRUE
##      median_hh_income smoking_ban
## [1,]             TRUE        TRUE
## [2,]             TRUE        TRUE
## [3,]             TRUE        TRUE
## [4,]             TRUE        TRUE
## [5,]             TRUE        TRUE
## [6,]             TRUE        TRUE
```