

# Poverty and HS graduation rate

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3/4/2022

## Packages

Load tidyverse, broom, and ggdist.

```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.1 --
## v ggplot2 3.3.5      v purrr  0.3.4
## v tibble  3.1.6      v dplyr  1.0.7
## v tidyr   1.1.4      v stringr 1.4.0
## v readr   2.1.1      v forcats 0.5.1

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

library(broom)
library(ggdist)
```

## Data

We will use one of the datasets from our textbook authors with information about each of the roughly 3000 counties in the US.

The full codebook for the dataset is:

[https://www.openintro.org/data/index.php?data=county\\_2019](https://www.openintro.org/data/index.php?data=county_2019)

```
county_2019 <- read_csv("https://www.openintro.org/data/csv/county_2019.csv") %>% drop_na(hs_grad, pove)

## Rows: 3142 Columns: 95

## -- Column specification -----
## Delimiter: ","
## chr  (2): state, name
## dbl  (93): fips, age_over_18, age_over_18_moe, age_over_65, age_over_65_moe, ...

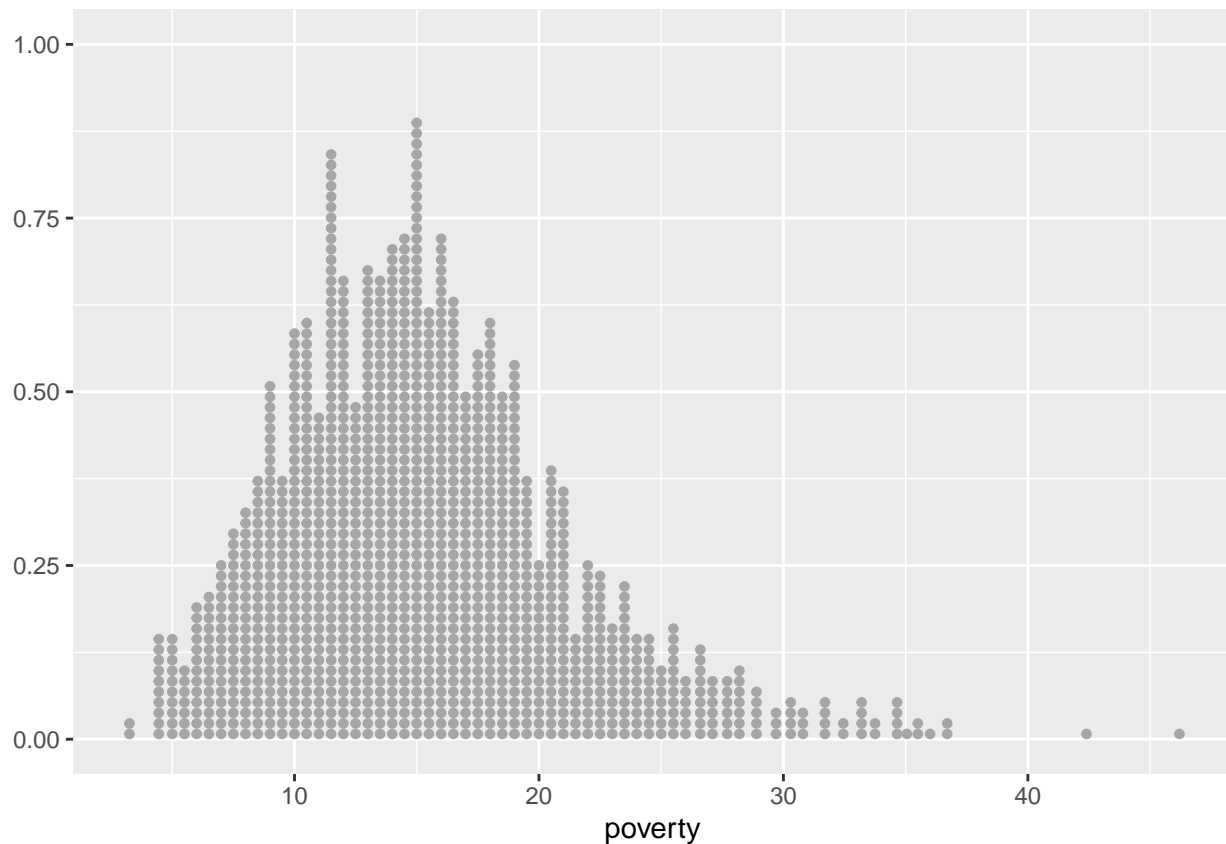
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

We will focus on the variables `hs_grad` and `poverty`, and so I have dropped all rows in the dataset missing data for those variables. A *lot* of rows were missing data: the original dataset has 3142 rows, and the dataset after dropping rows missing data only has 1266 rows. I don't know anything about which counties were missing data. We should be careful about drawing conclusions about all counties, since our sample of 1266 counties may not be representative of the population of all 3142 counties.

## Examining a single variable

1. Make a graph to show the distribution of the “poverty” variable, adding any appropriate axis labels. Do not use a jittered dotplot for your graph.

```
ggplot(data=county_2019, mapping = aes(x = poverty))+  
  geom_dots()
```



2. Write a description of the distribution of poverty rates in US counties, addressing center, spread, and shape and writing in context. Have R calculate some summary statistics to help you refine your description.

```
summary(county_2019$poverty)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   
##      3.10  11.30   14.80   15.43  18.60   46.20
```

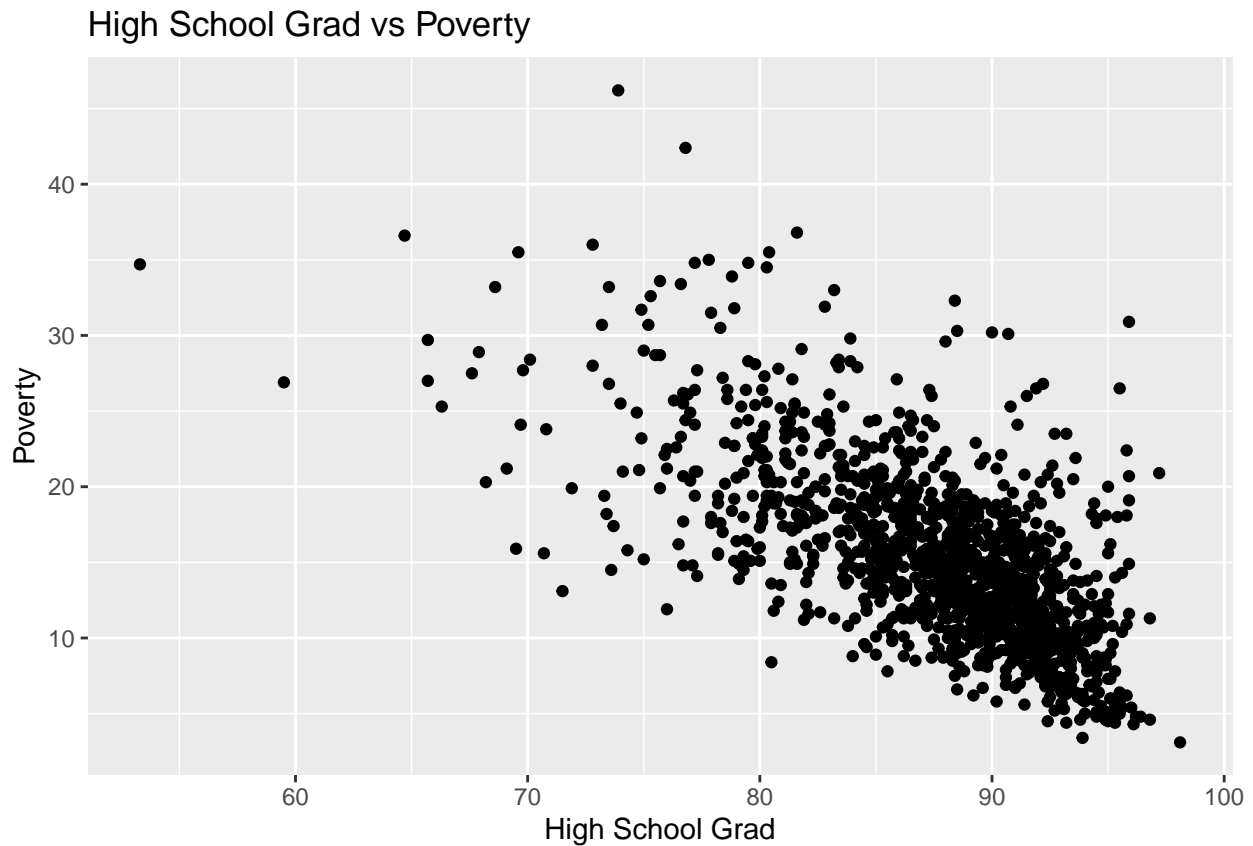
```
county_2019%>%  
  summarize(mean_poverty=mean(poverty),sd_poverty=sd(poverty))
```

```
## # A tibble: 1 x 2  
##   mean_poverty sd_poverty  
##       <dbl>     <dbl>  
## 1       15.4       5.97
```

## Graphing the data

3. Make a scatterplot of poverty versus `hs_grad`. Do something to address overplotting issues, and add appropriate axis labels to your graph.

```
ggplot(data = county_2019, mapping = aes(x = hs_grad, y = poverty)) +
  geom_point() + labs(x = "High School Grad", y = "Poverty", title = "High School Grad vs Poverty")
```



## Least-squares model

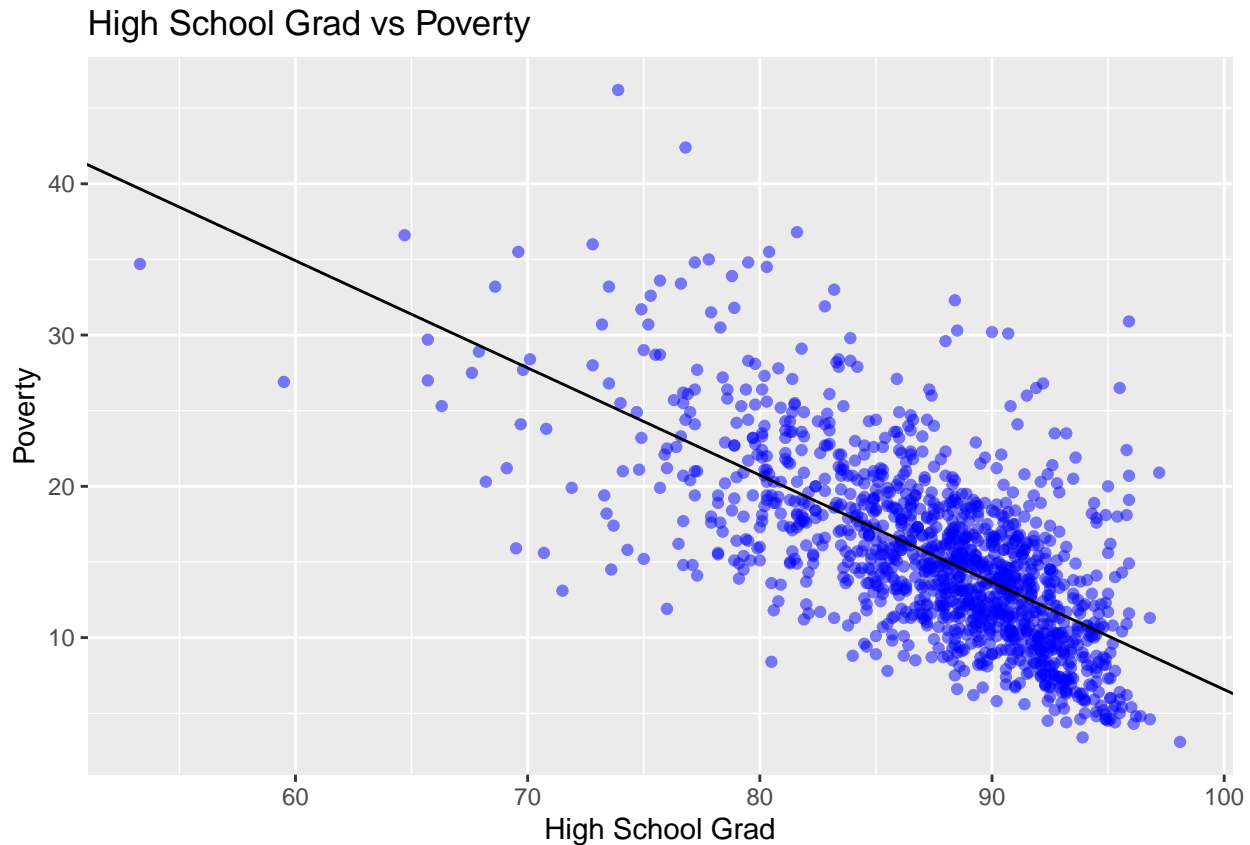
4. Have R calculate the slope and intercept for the least-squares model with `poverty` as the response variable and `hs_grad` as the predictor.

```
county_2019_model <- lm(poverty ~ hs_grad, data = county_2019)
county_2019_model
```

```
##
## Call:
## lm(formula = poverty ~ hs_grad, data = county_2019)
##
## Coefficients:
## (Intercept)      hs_grad
##    77.4447      -0.7088
```

5. Add a graph of this model to your scatterplot.

```
ggplot(data = county_2019, mapping = aes(x = hs_grad, y = poverty)) +
  geom_point(alpha=0.5, color= 'blue') + labs(x = "High School Grad", y = "Poverty", title = "High School Grad vs Poverty") +
  geom_abline(slope= -0.7088, intercept= 77.4447)
```



6. Write a description of the scatter plot. Some advice for your description:
- Write in sentences.
  - Use appropriate technical vocabulary.
  - Support general claims with numbers. For example, you can give examples of spread in columns to illustrate variability (strength of association). (Moderate, negative, weak)
  - Include a sentence interpreting the slope from the least-squares regression model to help with illustrating the direction of the trend.

This scatterplot shows the relationship between High School Grad and Poverty. Generally, there is a negative linear association between these variables: Higher High School Grad tend to promote a decrease in Poverty level. The relationship between these two variables is moderately strong, meaning that there is moderate variation in High School Grad and Poverty.

## Residuals

### Frederick County

7. What are the values of `poverty` and `hs_grad` for Frederick County, Maryland? (You might consider using an appropriate “filter” command.)

```
county_2019 %>%
  filter(name== "Frederick County")

## # A tibble: 2 x 95
##   state   name      fips age_over_18 age_over_18_moe age_over_65 age_over_65_moe
##   <chr>   <chr>   <dbl>      <dbl>         <dbl>      <dbl>         <dbl>
## 1 Maryland Freder~ 24021      76.6           0.1        14.1           0.1
## 2 Virginia Freder~ 51069      76.9           0.1        16.8           0.1
## # ... with 88 more variables: age_over_85 <dbl>, age_over_85_moe <dbl>,
## #   age_under_5 <dbl>, age_under_5_moe <dbl>, asian <dbl>, asian_moe <dbl>,
```

```
## #   avg_family_size <dbl>, avg_family_size_moe <dbl>, bachelors <dbl>,
## #   bachelors_moe <dbl>, black <dbl>, black_moe <dbl>, hispanic <dbl>,
## #   hispanic_moe <dbl>, household_has_broadband <dbl>,
## #   household_has_broadband_moe <dbl>, household_has_computer <dbl>,
## #   household_has_computer_moe <dbl>, household_has_smartphone <dbl>, ...
```

- What does the least-squares model predict for Frederick County, Maryland? What is the residual? The least-squares model predict 11.88070 for Frederick County, Maryland The residual for Frederick County, Maryland is -5.08070.

## Graphing residuals

- Add columns for fitted values (with the least-squares model) and for residuals to the `county_2019` data table.

```
county_2019 <- county_2019 %>%
  mutate(fitted = 77.4447 - 0.7088 * hs_grad, residual = poverty - fitted)

county_2019_model <- lm(hs_grad ~ poverty, data = county_2019)

fitted.values(county_2019_model)
```

```
##      1      2      3      4      5      6      7      8
## 87.63067 90.55192 78.19747 88.60442 85.98747 86.35262 85.25715 87.69153
##      9     10     11     12     13     14     15     16
## 87.44809 85.56145 87.81325 86.17004 79.17122 84.03997 89.88247 83.37051
##     17     18     19     20     21     22     23     24
## 86.29176 85.07458 83.49223 85.80489 85.56145 87.14379 87.99583 85.92661
##     25     26     27     28     29     30     31     32
## 84.95286 88.60442 89.27387 84.52684 85.43973 85.07458 87.99583 82.03161
##     33     34     35     36     37     38     39     40
## 84.28340 89.45645 92.31684 85.25715 85.37887 86.10918 85.86575 91.40395
##     41     42     43     44     45     46     47     48
## 92.01254 89.51731 90.61278 75.27622 86.77864 86.17004 83.73567 83.12708
##     49     50     51     52     53     54     55     56
## 88.48270 86.90036 79.90153 86.65692 88.84786 82.70106 88.96958 85.07458
##     57     58     59     60     61     62     63     64
## 88.90872 91.16051 87.93497 86.77864 86.41348 83.37051 86.71778 85.56145
##     65     66     67     68     69     70     71     72
## 86.90036 85.92661 86.71778 83.37051 83.06622 89.45645 84.64856 82.09247
##     73     74     75     76     77     78     79     80
## 82.76192 75.88481 85.43973 86.65692 81.72731 91.28223 85.62231 85.25715
##     81     82     83     84     85     86     87     88
## 86.90036 87.32637 90.85622 85.25715 91.58653 91.76911 83.18793 84.64856
##     89     90     91     92     93     94     95     96
## 82.21418 84.10083 85.80489 85.56145 87.81325 84.77028 92.49942 86.04833
##     97     98     99    100    101    102    103    104
## 83.97911 88.90872 92.13426 90.18676 90.24762 92.19512 88.54356 87.93497
##    105    106    107    108    109    110    111    112
## 91.76911 87.14379 89.82161 90.61278 88.05668 89.27387 92.80372 88.66528
##    113    114    115    116    117    118    119    120
## 92.31684 88.90872 86.71778 85.43973 91.09965 91.28223 87.69153 87.44809
##    121    122    123    124    125    126    127    128
## 83.43137 82.39676 89.09129 91.46481 85.25715 87.44809 90.30848 91.95168
##    129    130    131    132    133    134    135    136
```

##	89.76075	85.74403	89.03043	94.99465	90.73450	88.05668	92.56028	89.82161
##	137	138	139	140	141	142	143	144
##	88.23926	87.69153	85.37887	90.79536	91.46481	90.30848	92.68200	92.68200
##	145	146	147	148	149	150	151	152
##	89.76075	91.16051	92.43856	89.94333	88.66528	89.94333	90.00418	87.02208
##	153	154	155	156	157	158	159	160
##	83.85739	87.99583	89.69989	88.90872	90.12590	87.32637	90.67364	90.06504
##	161	162	163	164	165	166	167	168
##	87.26551	80.57098	88.05668	88.36098	89.33473	83.00536	82.21418	81.48387
##	169	170	171	172	173	174	175	176
##	88.30012	85.56145	87.99583	89.94333	85.07458	89.57817	88.90872	84.40512
##	177	178	179	180	181	182	183	184
##	84.28340	89.69989	87.08293	90.85622	86.47434	90.24762	90.49106	90.24762
##	185	186	187	188	189	190	191	192
##	84.10083	87.81325	87.87411	89.45645	89.15215	89.45645	87.26551	82.51848
##	193	194	195	196	197	198	199	200
##	91.89082	88.78700	90.97793	91.40395	90.43020	91.89082	87.81325	88.17840
##	201	202	203	204	205	206	207	208
##	88.84786	82.51848	89.21301	88.36098	81.72731	80.81442	87.44809	86.35262
##	209	210	211	212	213	214	215	216
##	90.85622	87.69153	92.31684	78.86692	85.56145	91.34309	84.77028	81.72731
##	217	218	219	220	221	222	223	224
##	92.31684	90.36934	77.46715	82.09247	87.69153	79.59723	89.09129	91.70825
##	225	226	227	228	229	230	231	232
##	93.53403	85.68317	93.41231	88.11754	85.86575	85.92661	90.36934	87.69153
##	233	234	235	236	237	238	239	240
##	88.42184	91.70825	88.42184	90.00418	80.38840	87.20465	82.03161	87.38723
##	241	242	243	244	245	246	247	248
##	84.28340	87.44809	91.89082	85.68317	82.88364	88.90872	85.98747	80.38840
##	249	250	251	252	253	254	255	256
##	85.19629	82.70106	82.70106	83.91825	87.08293	89.51731	81.72731	87.20465
##	257	258	259	260	261	262	263	264
##	87.38723	91.82997	91.95168	91.22137	90.30848	86.90036	90.06504	87.99583
##	265	266	267	268	269	270	271	272
##	90.49106	88.72614	89.76075	85.86575	78.07575	88.17840	89.27387	90.73450
##	273	274	275	276	277	278	279	280
##	84.70942	84.22254	88.11754	86.77864	92.98629	85.01372	80.75356	86.53520
##	281	282	283	284	285	286	287	288
##	91.16051	88.23926	94.14262	85.80489	92.07340	88.72614	83.55309	92.62114
##	289	290	291	292	293	294	295	296
##	87.81325	86.53520	88.42184	88.84786	86.10918	87.38723	88.36098	87.87411
##	297	298	299	300	301	302	303	304
##	88.05668	88.60442	91.82997	85.37887	90.36934	92.80372	88.42184	87.38723
##	305	306	307	308	309	310	311	312
##	86.65692	88.78700	88.72614	87.99583	90.73450	83.55309	89.33473	90.91708
##	313	314	315	316	317	318	319	320
##	85.92661	94.08176	92.80372	93.83832	87.69153	87.81325	87.99583	92.37770
##	321	322	323	324	325	326	327	328
##	87.44809	90.91708	87.38723	87.63067	89.33473	86.83950	86.04833	88.96958
##	329	330	331	332	333	334	335	336
##	82.57934	90.49106	90.85622	87.44809	85.50059	86.71778	85.25715	86.90036
##	337	338	339	340	341	342	343	344
##	87.26551	88.90872	87.08293	89.94333	85.86575	90.67364	90.55192	90.36934
##	345	346	347	348	349	350	351	352

##	89.51731	84.16168	87.81325	89.15215	91.09965	84.52684	85.92661	88.05668
##	353	354	355	356	357	358	359	360
##	93.59489	91.70825	86.59606	85.50059	89.03043	83.24879	89.88247	88.54356
##	361	362	363	364	365	366	367	368
##	89.94333	85.19629	82.15333	75.27622	92.49942	85.37887	91.40395	83.79653
##	369	370	371	372	373	374	375	376
##	88.66528	81.48387	84.95286	87.93497	74.60676	86.77864	86.65692	78.19747
##	377	378	379	380	381	382	383	384
##	89.33473	84.95286	81.42301	86.59606	88.84786	74.97192	85.62231	85.07458
##	385	386	387	388	389	390	391	392
##	88.23926	86.59606	89.88247	76.67598	82.76192	76.43254	87.26551	76.55426
##	393	394	395	396	397	398	399	400
##	85.37887	80.99700	81.72731	83.06622	79.90153	89.82161	86.65692	82.51848
##	401	402	403	404	405	406	407	408
##	82.15333	90.43020	82.03161	87.44809	86.41348	82.70106	86.35262	85.92661
##	409	410	411	412	413	414	415	416
##	79.41465	79.23208	83.43137	87.44809	85.25715	86.35262	87.38723	78.44090
##	417	418	419	420	421	422	423	424
##	89.33473	79.65809	77.22372	82.45762	81.84903	84.95286	78.31918	84.03997
##	425	426	427	428	429	430	431	432
##	90.06504	86.29176	80.93614	85.37887	84.89200	89.88247	83.85739	84.34426
##	433	434	435	436	437	438	439	440
##	86.17004	86.35262	82.03161	78.74520	89.69989	87.08293	91.40395	90.30848
##	441	442	443	444	445	446	447	448
##	89.09129	87.69153	87.87411	84.46598	85.37887	92.37770	86.83950	93.35145
##	449	450	451	452	453	454	455	456
##	91.40395	93.71661	90.91708	93.04715	92.74286	92.49942	93.83832	92.74286
##	457	458	459	460	461	462	463	464
##	91.70825	91.95168	89.45645	87.50895	83.97911	92.98629	90.24762	90.00418
##	465	466	467	468	469	470	471	472
##	90.55192	90.97793	86.90036	89.45645	92.37770	93.04715	92.37770	85.80489
##	473	474	475	476	477	478	479	480
##	90.73450	90.55192	87.26551	87.08293	87.26551	86.90036	89.51731	85.68317
##	481	482	483	484	485	486	487	488
##	83.06622	91.52567	90.73450	85.37887	91.03879	86.71778	87.02208	84.58770
##	489	490	491	492	493	494	495	496
##	84.95286	89.69989	81.05786	88.48270	87.81325	89.76075	90.73450	89.94333
##	497	498	499	500	501	502	503	504
##	93.71661	90.43020	87.38723	83.97911	90.55192	90.12590	88.11754	87.44809
##	505	506	507	508	509	510	511	512
##	86.77864	91.89082	91.70825	85.92661	89.15215	87.87411	87.69153	90.61278
##	513	514	515	516	517	518	519	520
##	88.23926	87.81325	88.36098	83.30965	93.29059	85.37887	86.17004	89.39559
##	521	522	523	524	525	526	527	528
##	90.30848	93.22973	90.55192	89.45645	90.49106	88.66528	91.76911	91.22137
##	529	530	531	532	533	534	535	536
##	88.36098	91.28223	88.30012	93.53403	92.98629	89.03043	94.26434	89.03043
##	537	538	539	540	541	542	543	544
##	94.08176	77.71059	87.75239	75.58051	75.70223	82.27504	91.28223	81.05786
##	545	546	547	548	549	550	551	552
##	85.62231	84.64856	83.91825	71.07692	87.02208	83.67481	83.43137	85.74403
##	553	554	555	556	557	558	559	560
##	84.22254	80.81442	87.99583	74.48504	84.10083	84.46598	91.03879	81.36215
##	561	562	563	564	565	566	567	568

##	85.43973	86.29176	81.30129	78.56262	84.52684	86.47434	76.79770	87.02208
##	569	570	571	572	573	574	575	576
##	83.55309	91.82997	81.36215	85.07458	77.58887	84.34426	76.24997	77.52801
##	577	578	579	580	581	582	583	584
##	84.03997	85.98747	86.41348	82.45762	87.87411	86.90036	91.40395	90.79536
##	585	586	587	588	589	590	591	592
##	91.89082	90.61278	81.24043	90.49106	86.90036	83.30965	87.93497	86.47434
##	593	594	595	596	597	598	599	600
##	91.03879	88.05668	87.75239	86.65692	90.18676	88.66528	86.90036	84.34426
##	601	602	603	604	605	606	607	608
##	93.10801	86.83950	87.69153	93.71661	87.44809	90.97793	84.83114	85.80489
##	609	610	611	612	613	614	615	616
##	87.93497	81.48387	86.04833	83.61395	88.78700	90.24762	90.00418	85.07458
##	617	618	619	620	621	622	623	624
##	90.55192	88.17840	89.39559	86.29176	90.91708	88.66528	89.57817	89.69989
##	625	626	627	628	629	630	631	632
##	89.27387	93.29059	88.54356	89.76075	89.82161	86.90036	90.00418	90.00418
##	633	634	635	636	637	638	639	640
##	91.40395	91.03879	92.13426	92.92543	94.08176	91.09965	88.78700	92.80372
##	641	642	643	644	645	646	647	648
##	93.16887	89.45645	90.91708	86.83950	87.26551	92.37770	87.63067	94.14262
##	649	650	651	652	653	654	655	656
##	89.82161	91.70825	92.68200	93.96004	90.73450	87.32637	89.33473	93.77747
##	657	658	659	660	661	662	663	664
##	93.89918	91.09965	92.25598	86.71778	85.07458	80.99700	84.16168	80.81442
##	665	666	667	668	669	670	671	672
##	87.99583	82.27504	87.26551	80.02325	75.70223	83.43137	82.27504	89.15215
##	673	674	675	676	677	678	679	680
##	84.10083	79.71895	89.09129	85.74403	86.59606	89.63903	86.59606	79.84067
##	681	682	683	684	685	686	687	688
##	86.29176	86.83950	89.51731	85.80489	88.42184	88.66528	87.75239	89.82161
##	689	690	691	692	693	694	695	696
##	86.90036	86.77864	91.40395	88.23926	86.04833	87.81325	90.24762	88.36098
##	697	698	699	700	701	702	703	704
##	88.60442	88.36098	84.70942	88.84786	90.91708	88.11754	84.83114	93.47317
##	705	706	707	708	709	710	711	712
##	87.26551	88.66528	87.44809	88.30012	91.58653	89.82161	86.53520	87.81325
##	713	714	715	716	717	718	719	720
##	89.45645	89.76075	89.76075	88.42184	85.98747	93.35145	89.94333	88.54356
##	721	722	723	724	725	726	727	728
##	92.68200	87.63067	90.67364	85.37887	88.48270	91.09965	90.00418	89.82161
##	729	730	731	732	733	734	735	736
##	91.52567	87.08293	85.56145	82.09247	89.69989	89.45645	85.86575	90.67364
##	737	738	739	740	741	742	743	744
##	87.69153	90.36934	88.84786	90.67364	84.46598	83.00536	87.63067	85.68317
##	745	746	747	748	749	750	751	752
##	87.50895	83.97911	87.63067	82.45762	86.65692	88.84786	88.05668	88.17840
##	753	754	755	756	757	758	759	760
##	87.26551	81.17958	87.26551	88.72614	90.24762	84.46598	90.24762	85.50059
##	761	762	763	764	765	766	767	768
##	89.27387	87.08293	82.76192	89.51731	86.65692	87.50895	89.82161	90.00418
##	769	770	771	772	773	774	775	776
##	87.63067	87.14379	88.84786	88.54356	87.32637	88.30012	87.08293	82.94450
##	777	778	779	780	781	782	783	784



##	87.63067	81.54473	80.02325	85.86575	87.20465	85.98747	84.16168	80.26668
##	785	786	787	788	789	790	791	792
##	89.03043	88.48270	86.90036	91.89082	84.22254	91.34309	81.48387	84.58770
##	793	794	795	796	797	798	799	800
##	86.10918	84.52684	87.50895	91.95168	90.36934	87.02208	91.09965	84.28340
##	801	802	803	804	805	806	807	808
##	88.42184	88.48270	84.77028	78.50176	89.39559	87.56981	89.27387	87.81325
##	809	810	811	812	813	814	815	816
##	91.40395	87.87411	88.17840	88.11754	87.81325	86.23090	90.49106	93.96004
##	817	818	819	820	821	822	823	824
##	89.76075	91.28223	87.32637	84.28340	93.35145	89.82161	84.77028	87.26551
##	825	826	827	828	829	830	831	832
##	90.30848	85.07458	88.84786	85.43973	86.23090	88.90872	91.95168	85.86575
##	833	834	835	836	837	838	839	840
##	90.49106	89.94333	88.66528	85.50059	86.23090	87.87411	93.22973	91.28223
##	841	842	843	844	845	846	847	848
##	86.77864	87.14379	85.25715	89.51731	85.50059	89.09129	88.66528	86.35262
##	849	850	851	852	853	854	855	856
##	89.82161	83.12708	89.09129	88.60442	88.84786	86.41348	89.09129	94.08176
##	857	858	859	860	861	862	863	864
##	88.23926	90.00418	89.03043	79.96239	86.47434	85.37887	91.89082	87.08293
##	865	866	867	868	869	870	871	872
##	83.43137	89.57817	87.08293	87.75239	85.80489	85.74403	88.48270	89.88247
##	873	874	875	876	877	878	879	880
##	86.35262	84.28340	88.36098	83.06622	85.86575	84.03997	87.14379	85.01372
##	881	882	883	884	885	886	887	888
##	87.38723	84.28340	80.57098	86.65692	87.93497	87.02208	90.85622	83.79653
##	889	890	891	892	893	894	895	896
##	88.17840	87.75239	90.55192	88.78700	85.25715	92.01254	89.76075	87.08293
##	897	898	899	900	901	902	903	904
##	90.30848	87.93497	87.44809	85.86575	85.01372	86.17004	86.96122	88.78700
##	905	906	907	908	909	910	911	912
##	83.61395	88.23926	88.48270	89.21301	85.98747	91.46481	89.51731	92.13426
##	913	914	915	916	917	918	919	920
##	89.82161	90.12590	90.18676	89.63903	89.57817	87.93497	89.15215	93.29059
##	921	922	923	924	925	926	927	928
##	91.89082	87.50895	89.76075	85.80489	92.98629	86.96122	87.99583	87.44809
##	929	930	931	932	933	934	935	936
##	87.75239	88.84786	92.68200	89.39559	90.79536	87.14379	86.35262	91.22137
##	937	938	939	940	941	942	943	944
##	86.96122	87.69153	87.93497	90.73450	88.48270	90.30848	89.27387	87.93497
##	945	946	947	948	949	950	951	952
##	88.60442	87.08293	88.42184	88.66528	90.06504	93.29059	91.64739	88.84786
##	953	954	955	956	957	958	959	960
##	82.09247	89.33473	89.33473	88.84786	89.03043	91.28223	89.94333	90.79536
##	961	962	963	964	965	966	967	968
##	91.03879	92.25598	91.58653	87.63067	91.64739	87.81325	87.99583	79.77981
##	969	970	971	972	973	974	975	976
##	90.67364	89.63903	88.54356	85.07458	84.95286	84.28340	82.94450	83.61395
##	977	978	979	980	981	982	983	984
##	84.70942	77.04114	89.51731	85.68317	85.98747	89.88247	84.22254	87.75239
##	985	986	987	988	989	990	991	992
##	86.10918	87.81325	88.72614	84.52684	89.27387	83.06622	80.81442	86.17004
##	993	994	995	996	997	998	999	1000

##	86.23090	82.51848	86.77864	87.02208	88.36098	85.50059	83.73567	80.81442
##	1001	1002	1003	1004	1005	1006	1007	1008
##	90.49106	90.79536	68.76426	88.48270	86.71778	88.17840	90.12590	87.14379
##	1009	1010	1011	1012	1013	1014	1015	1016
##	84.10083	83.43137	83.24879	82.57934	88.36098	88.48270	87.81325	88.60442
##	1017	1018	1019	1020	1021	1022	1023	1024
##	85.56145	88.11754	87.26551	86.71778	86.35262	89.09129	85.25715	84.64856
##	1025	1026	1027	1028	1029	1030	1031	1032
##	88.84786	88.05668	86.53520	90.00418	85.13543	85.62231	90.73450	85.68317
##	1033	1034	1035	1036	1037	1038	1039	1040
##	88.78700	84.03997	85.37887	85.13543	88.48270	89.88247	90.12590	88.54356
##	1041	1042	1043	1044	1045	1046	1047	1048
##	85.13543	87.20465	91.40395	89.33473	83.67481	87.50895	84.52684	94.20348
##	1049	1050	1051	1052	1053	1054	1055	1056
##	92.19512	87.81325	86.10918	87.87411	90.06504	88.42184	87.32637	86.77864
##	1057	1058	1059	1060	1061	1062	1063	1064
##	91.58653	82.03161	85.37887	79.29293	85.62231	86.90036	93.04715	92.25598
##	1065	1066	1067	1068	1069	1070	1071	1072
##	89.03043	87.50895	92.25598	89.63903	91.52567	84.58770	85.68317	92.37770
##	1073	1074	1075	1076	1077	1078	1079	1080
##	89.33473	88.90872	85.92661	91.34309	89.51731	87.32637	86.29176	88.54356
##	1081	1082	1083	1084	1085	1086	1087	1088
##	86.47434	78.80606	90.97793	88.36098	86.35262	87.08293	85.62231	86.10918
##	1089	1090	1091	1092	1093	1094	1095	1096
##	82.76192	90.67364	89.94333	89.76075	80.32754	86.29176	88.30012	85.37887
##	1097	1098	1099	1100	1101	1102	1103	1104
##	85.19629	85.37887	80.51012	90.00418	91.03879	91.22137	81.78817	86.53520
##	1105	1106	1107	1108	1109	1110	1111	1112
##	86.77864	88.78700	85.86575	91.95168	85.80489	84.46598	91.70825	89.69989
##	1113	1114	1115	1116	1117	1118	1119	1120
##	87.20465	83.12708	87.50895	75.76309	89.63903	87.69153	86.10918	88.66528
##	1121	1122	1123	1124	1125	1126	1127	1128
##	89.57817	87.14379	84.52684	88.60442	87.75239	83.24879	86.83950	80.14497
##	1129	1130	1131	1132	1133	1134	1135	1136
##	86.17004	86.59606	80.44926	92.98629	90.36934	87.99583	87.50895	93.59489
##	1137	1138	1139	1140	1141	1142	1143	1144
##	86.53520	91.28223	90.43020	89.69989	90.67364	89.51731	90.73450	90.43020
##	1145	1146	1147	1148	1149	1150	1151	1152
##	88.54356	91.28223	85.31801	91.34309	92.74286	91.58653	91.46481	79.59723
##	1153	1154	1155	1156	1157	1158	1159	1160
##	90.18676	92.74286	93.16887	88.05668	93.10801	93.65575	91.34309	85.86575
##	1161	1162	1163	1164	1165	1166	1167	1168
##	92.43856	81.36215	94.81207	82.57934	87.08293	92.86457	92.68200	91.52567
##	1169	1170	1171	1172	1173	1174	1175	1176
##	84.03997	89.88247	85.37887	92.62114	94.20348	86.23090	87.99583	83.43137
##	1177	1178	1179	1180	1181	1182	1183	1184
##	90.61278	82.21418	91.64739	83.24879	87.63067	79.65809	82.51848	85.01372
##	1185	1186	1187	1188	1189	1190	1191	1192
##	87.56981	85.50059	82.21418	86.65692	82.76192	84.22254	90.55192	92.43856
##	1193	1194	1195	1196	1197	1198	1199	1200
##	89.63903	89.76075	88.05668	91.22137	88.11754	89.82161	87.63067	87.87411
##	1201	1202	1203	1204	1205	1206	1207	1208
##	88.11754	92.13426	91.46481	91.58653	85.92661	88.90872	88.36098	85.01372
##	1209	1210	1211	1212	1213	1214	1215	1216

```
## 90.55192 89.57817 92.31684 88.54356 88.23926 90.55192 88.78700 88.30012
##      1217      1218      1219      1220      1221      1222      1223      1224
## 80.75356 86.29176 89.45645 83.30965 84.40512 87.14379 87.56981 86.41348
##      1225      1226      1227      1228      1229      1230      1231      1232
## 81.42301 76.67598 86.90036 84.83114 79.41465 84.22254 89.21301 90.91708
##      1233      1234      1235      1236      1237      1238      1239      1240
## 85.56145 82.76192 86.65692 90.36934 90.91708 90.61278 90.24762 91.82997
##      1241      1242      1243      1244      1245      1246      1247      1248
## 89.69989 88.48270 91.76911 87.63067 91.82997 89.39559 89.03043 90.79536
##      1249      1250      1251      1252      1253      1254      1255      1256
## 91.28223 88.84786 85.31801 90.00418 92.13426 89.51731 89.33473 89.09129
##      1257      1258      1259      1260      1261      1262      1263      1264
## 90.85622 92.49942 90.43020 94.08176 93.96004 90.00418 90.61278 84.28340
##      1265      1266
## 90.85622 91.16051
```

```
county_2019_model%>%
  fitted()
```

```
##      1      2      3      4      5      6      7      8
## 87.63067 90.55192 78.19747 88.60442 85.98747 86.35262 85.25715 87.69153
##      9     10     11     12     13     14     15     16
## 87.44809 85.56145 87.81325 86.17004 79.17122 84.03997 89.88247 83.37051
##     17     18     19     20     21     22     23     24
## 86.29176 85.07458 83.49223 85.80489 85.56145 87.14379 87.99583 85.92661
##     25     26     27     28     29     30     31     32
## 84.95286 88.60442 89.27387 84.52684 85.43973 85.07458 87.99583 82.03161
##     33     34     35     36     37     38     39     40
## 84.28340 89.45645 92.31684 85.25715 85.37887 86.10918 85.86575 91.40395
##     41     42     43     44     45     46     47     48
## 92.01254 89.51731 90.61278 75.27622 86.77864 86.17004 83.73567 83.12708
##     49     50     51     52     53     54     55     56
## 88.48270 86.90036 79.90153 86.65692 88.84786 82.70106 88.96958 85.07458
##     57     58     59     60     61     62     63     64
## 88.90872 91.16051 87.93497 86.77864 86.41348 83.37051 86.71778 85.56145
##     65     66     67     68     69     70     71     72
## 86.90036 85.92661 86.71778 83.37051 83.06622 89.45645 84.64856 82.09247
##     73     74     75     76     77     78     79     80
## 82.76192 75.88481 85.43973 86.65692 81.72731 91.28223 85.62231 85.25715
##     81     82     83     84     85     86     87     88
## 86.90036 87.32637 90.85622 85.25715 91.58653 91.76911 83.18793 84.64856
##     89     90     91     92     93     94     95     96
## 82.21418 84.10083 85.80489 85.56145 87.81325 84.77028 92.49942 86.04833
##     97     98     99    100    101    102    103    104
## 83.97911 88.90872 92.13426 90.18676 90.24762 92.19512 88.54356 87.93497
##    105    106    107    108    109    110    111    112
## 91.76911 87.14379 89.82161 90.61278 88.05668 89.27387 92.80372 88.66528
##    113    114    115    116    117    118    119    120
## 92.31684 88.90872 86.71778 85.43973 91.09965 91.28223 87.69153 87.44809
##    121    122    123    124    125    126    127    128
## 83.43137 82.39676 89.09129 91.46481 85.25715 87.44809 90.30848 91.95168
##    129    130    131    132    133    134    135    136
## 89.76075 85.74403 89.03043 94.99465 90.73450 88.05668 92.56028 89.82161
##    137    138    139    140    141    142    143    144
## 88.23926 87.69153 85.37887 90.79536 91.46481 90.30848 92.68200 92.68200
```

##	145	146	147	148	149	150	151	152
##	89.76075	91.16051	92.43856	89.94333	88.66528	89.94333	90.00418	87.02208
##	153	154	155	156	157	158	159	160
##	83.85739	87.99583	89.69989	88.90872	90.12590	87.32637	90.67364	90.06504
##	161	162	163	164	165	166	167	168
##	87.26551	80.57098	88.05668	88.36098	89.33473	83.00536	82.21418	81.48387
##	169	170	171	172	173	174	175	176
##	88.30012	85.56145	87.99583	89.94333	85.07458	89.57817	88.90872	84.40512
##	177	178	179	180	181	182	183	184
##	84.28340	89.69989	87.08293	90.85622	86.47434	90.24762	90.49106	90.24762
##	185	186	187	188	189	190	191	192
##	84.10083	87.81325	87.87411	89.45645	89.15215	89.45645	87.26551	82.51848
##	193	194	195	196	197	198	199	200
##	91.89082	88.78700	90.97793	91.40395	90.43020	91.89082	87.81325	88.17840
##	201	202	203	204	205	206	207	208
##	88.84786	82.51848	89.21301	88.36098	81.72731	80.81442	87.44809	86.35262
##	209	210	211	212	213	214	215	216
##	90.85622	87.69153	92.31684	78.86692	85.56145	91.34309	84.77028	81.72731
##	217	218	219	220	221	222	223	224
##	92.31684	90.36934	77.46715	82.09247	87.69153	79.59723	89.09129	91.70825
##	225	226	227	228	229	230	231	232
##	93.53403	85.68317	93.41231	88.11754	85.86575	85.92661	90.36934	87.69153
##	233	234	235	236	237	238	239	240
##	88.42184	91.70825	88.42184	90.00418	80.38840	87.20465	82.03161	87.38723
##	241	242	243	244	245	246	247	248
##	84.28340	87.44809	91.89082	85.68317	82.88364	88.90872	85.98747	80.38840
##	249	250	251	252	253	254	255	256
##	85.19629	82.70106	82.70106	83.91825	87.08293	89.51731	81.72731	87.20465
##	257	258	259	260	261	262	263	264
##	87.38723	91.82997	91.95168	91.22137	90.30848	86.90036	90.06504	87.99583
##	265	266	267	268	269	270	271	272
##	90.49106	88.72614	89.76075	85.86575	78.07575	88.17840	89.27387	90.73450
##	273	274	275	276	277	278	279	280
##	84.70942	84.22254	88.11754	86.77864	92.98629	85.01372	80.75356	86.53520
##	281	282	283	284	285	286	287	288
##	91.16051	88.23926	94.14262	85.80489	92.07340	88.72614	83.55309	92.62114
##	289	290	291	292	293	294	295	296
##	87.81325	86.53520	88.42184	88.84786	86.10918	87.38723	88.36098	87.87411
##	297	298	299	300	301	302	303	304
##	88.05668	88.60442	91.82997	85.37887	90.36934	92.80372	88.42184	87.38723
##	305	306	307	308	309	310	311	312
##	86.65692	88.78700	88.72614	87.99583	90.73450	83.55309	89.33473	90.91708
##	313	314	315	316	317	318	319	320
##	85.92661	94.08176	92.80372	93.83832	87.69153	87.81325	87.99583	92.37770
##	321	322	323	324	325	326	327	328
##	87.44809	90.91708	87.38723	87.63067	89.33473	86.83950	86.04833	88.96958
##	329	330	331	332	333	334	335	336
##	82.57934	90.49106	90.85622	87.44809	85.50059	86.71778	85.25715	86.90036
##	337	338	339	340	341	342	343	344
##	87.26551	88.90872	87.08293	89.94333	85.86575	90.67364	90.55192	90.36934
##	345	346	347	348	349	350	351	352
##	89.51731	84.16168	87.81325	89.15215	91.09965	84.52684	85.92661	88.05668
##	353	354	355	356	357	358	359	360
##	93.59489	91.70825	86.59606	85.50059	89.03043	83.24879	89.88247	88.54356

##	361	362	363	364	365	366	367	368
##	89.94333	85.19629	82.15333	75.27622	92.49942	85.37887	91.40395	83.79653
##	369	370	371	372	373	374	375	376
##	88.66528	81.48387	84.95286	87.93497	74.60676	86.77864	86.65692	78.19747
##	377	378	379	380	381	382	383	384
##	89.33473	84.95286	81.42301	86.59606	88.84786	74.97192	85.62231	85.07458
##	385	386	387	388	389	390	391	392
##	88.23926	86.59606	89.88247	76.67598	82.76192	76.43254	87.26551	76.55426
##	393	394	395	396	397	398	399	400
##	85.37887	80.99700	81.72731	83.06622	79.90153	89.82161	86.65692	82.51848
##	401	402	403	404	405	406	407	408
##	82.15333	90.43020	82.03161	87.44809	86.41348	82.70106	86.35262	85.92661
##	409	410	411	412	413	414	415	416
##	79.41465	79.23208	83.43137	87.44809	85.25715	86.35262	87.38723	78.44090
##	417	418	419	420	421	422	423	424
##	89.33473	79.65809	77.22372	82.45762	81.84903	84.95286	78.31918	84.03997
##	425	426	427	428	429	430	431	432
##	90.06504	86.29176	80.93614	85.37887	84.89200	89.88247	83.85739	84.34426
##	433	434	435	436	437	438	439	440
##	86.17004	86.35262	82.03161	78.74520	89.69989	87.08293	91.40395	90.30848
##	441	442	443	444	445	446	447	448
##	89.09129	87.69153	87.87411	84.46598	85.37887	92.37770	86.83950	93.35145
##	449	450	451	452	453	454	455	456
##	91.40395	93.71661	90.91708	93.04715	92.74286	92.49942	93.83832	92.74286
##	457	458	459	460	461	462	463	464
##	91.70825	91.95168	89.45645	87.50895	83.97911	92.98629	90.24762	90.00418
##	465	466	467	468	469	470	471	472
##	90.55192	90.97793	86.90036	89.45645	92.37770	93.04715	92.37770	85.80489
##	473	474	475	476	477	478	479	480
##	90.73450	90.55192	87.26551	87.08293	87.26551	86.90036	89.51731	85.68317
##	481	482	483	484	485	486	487	488
##	83.06622	91.52567	90.73450	85.37887	91.03879	86.71778	87.02208	84.58770
##	489	490	491	492	493	494	495	496
##	84.95286	89.69989	81.05786	88.48270	87.81325	89.76075	90.73450	89.94333
##	497	498	499	500	501	502	503	504
##	93.71661	90.43020	87.38723	83.97911	90.55192	90.12590	88.11754	87.44809
##	505	506	507	508	509	510	511	512
##	86.77864	91.89082	91.70825	85.92661	89.15215	87.87411	87.69153	90.61278
##	513	514	515	516	517	518	519	520
##	88.23926	87.81325	88.36098	83.30965	93.29059	85.37887	86.17004	89.39559
##	521	522	523	524	525	526	527	528
##	90.30848	93.22973	90.55192	89.45645	90.49106	88.66528	91.76911	91.22137
##	529	530	531	532	533	534	535	536
##	88.36098	91.28223	88.30012	93.53403	92.98629	89.03043	94.26434	89.03043
##	537	538	539	540	541	542	543	544
##	94.08176	77.71059	87.75239	75.58051	75.70223	82.27504	91.28223	81.05786
##	545	546	547	548	549	550	551	552
##	85.62231	84.64856	83.91825	71.07692	87.02208	83.67481	83.43137	85.74403
##	553	554	555	556	557	558	559	560
##	84.22254	80.81442	87.99583	74.48504	84.10083	84.46598	91.03879	81.36215
##	561	562	563	564	565	566	567	568
##	85.43973	86.29176	81.30129	78.56262	84.52684	86.47434	76.79770	87.02208
##	569	570	571	572	573	574	575	576
##	83.55309	91.82997	81.36215	85.07458	77.58887	84.34426	76.24997	77.52801

##	577	578	579	580	581	582	583	584
##	84.03997	85.98747	86.41348	82.45762	87.87411	86.90036	91.40395	90.79536
##	585	586	587	588	589	590	591	592
##	91.89082	90.61278	81.24043	90.49106	86.90036	83.30965	87.93497	86.47434
##	593	594	595	596	597	598	599	600
##	91.03879	88.05668	87.75239	86.65692	90.18676	88.66528	86.90036	84.34426
##	601	602	603	604	605	606	607	608
##	93.10801	86.83950	87.69153	93.71661	87.44809	90.97793	84.83114	85.80489
##	609	610	611	612	613	614	615	616
##	87.93497	81.48387	86.04833	83.61395	88.78700	90.24762	90.00418	85.07458
##	617	618	619	620	621	622	623	624
##	90.55192	88.17840	89.39559	86.29176	90.91708	88.66528	89.57817	89.69989
##	625	626	627	628	629	630	631	632
##	89.27387	93.29059	88.54356	89.76075	89.82161	86.90036	90.00418	90.00418
##	633	634	635	636	637	638	639	640
##	91.40395	91.03879	92.13426	92.92543	94.08176	91.09965	88.78700	92.80372
##	641	642	643	644	645	646	647	648
##	93.16887	89.45645	90.91708	86.83950	87.26551	92.37770	87.63067	94.14262
##	649	650	651	652	653	654	655	656
##	89.82161	91.70825	92.68200	93.96004	90.73450	87.32637	89.33473	93.77747
##	657	658	659	660	661	662	663	664
##	93.89918	91.09965	92.25598	86.71778	85.07458	80.99700	84.16168	80.81442
##	665	666	667	668	669	670	671	672
##	87.99583	82.27504	87.26551	80.02325	75.70223	83.43137	82.27504	89.15215
##	673	674	675	676	677	678	679	680
##	84.10083	79.71895	89.09129	85.74403	86.59606	89.63903	86.59606	79.84067
##	681	682	683	684	685	686	687	688
##	86.29176	86.83950	89.51731	85.80489	88.42184	88.66528	87.75239	89.82161
##	689	690	691	692	693	694	695	696
##	86.90036	86.77864	91.40395	88.23926	86.04833	87.81325	90.24762	88.36098
##	697	698	699	700	701	702	703	704
##	88.60442	88.36098	84.70942	88.84786	90.91708	88.11754	84.83114	93.47317
##	705	706	707	708	709	710	711	712
##	87.26551	88.66528	87.44809	88.30012	91.58653	89.82161	86.53520	87.81325
##	713	714	715	716	717	718	719	720
##	89.45645	89.76075	89.76075	88.42184	85.98747	93.35145	89.94333	88.54356
##	721	722	723	724	725	726	727	728
##	92.68200	87.63067	90.67364	85.37887	88.48270	91.09965	90.00418	89.82161
##	729	730	731	732	733	734	735	736
##	91.52567	87.08293	85.56145	82.09247	89.69989	89.45645	85.86575	90.67364
##	737	738	739	740	741	742	743	744
##	87.69153	90.36934	88.84786	90.67364	84.46598	83.00536	87.63067	85.68317
##	745	746	747	748	749	750	751	752
##	87.50895	83.97911	87.63067	82.45762	86.65692	88.84786	88.05668	88.17840
##	753	754	755	756	757	758	759	760
##	87.26551	81.17958	87.26551	88.72614	90.24762	84.46598	90.24762	85.50059
##	761	762	763	764	765	766	767	768
##	89.27387	87.08293	82.76192	89.51731	86.65692	87.50895	89.82161	90.00418
##	769	770	771	772	773	774	775	776
##	87.63067	87.14379	88.84786	88.54356	87.32637	88.30012	87.08293	82.94450
##	777	778	779	780	781	782	783	784
##	87.63067	81.54473	80.02325	85.86575	87.20465	85.98747	84.16168	80.26668
##	785	786	787	788	789	790	791	792
##	89.03043	88.48270	86.90036	91.89082	84.22254	91.34309	81.48387	84.58770

##	793	794	795	796	797	798	799	800
##	86.10918	84.52684	87.50895	91.95168	90.36934	87.02208	91.09965	84.28340
##	801	802	803	804	805	806	807	808
##	88.42184	88.48270	84.77028	78.50176	89.39559	87.56981	89.27387	87.81325
##	809	810	811	812	813	814	815	816
##	91.40395	87.87411	88.17840	88.11754	87.81325	86.23090	90.49106	93.96004
##	817	818	819	820	821	822	823	824
##	89.76075	91.28223	87.32637	84.28340	93.35145	89.82161	84.77028	87.26551
##	825	826	827	828	829	830	831	832
##	90.30848	85.07458	88.84786	85.43973	86.23090	88.90872	91.95168	85.86575
##	833	834	835	836	837	838	839	840
##	90.49106	89.94333	88.66528	85.50059	86.23090	87.87411	93.22973	91.28223
##	841	842	843	844	845	846	847	848
##	86.77864	87.14379	85.25715	89.51731	85.50059	89.09129	88.66528	86.35262
##	849	850	851	852	853	854	855	856
##	89.82161	83.12708	89.09129	88.60442	88.84786	86.41348	89.09129	94.08176
##	857	858	859	860	861	862	863	864
##	88.23926	90.00418	89.03043	79.96239	86.47434	85.37887	91.89082	87.08293
##	865	866	867	868	869	870	871	872
##	83.43137	89.57817	87.08293	87.75239	85.80489	85.74403	88.48270	89.88247
##	873	874	875	876	877	878	879	880
##	86.35262	84.28340	88.36098	83.06622	85.86575	84.03997	87.14379	85.01372
##	881	882	883	884	885	886	887	888
##	87.38723	84.28340	80.57098	86.65692	87.93497	87.02208	90.85622	83.79653
##	889	890	891	892	893	894	895	896
##	88.17840	87.75239	90.55192	88.78700	85.25715	92.01254	89.76075	87.08293
##	897	898	899	900	901	902	903	904
##	90.30848	87.93497	87.44809	85.86575	85.01372	86.17004	86.96122	88.78700
##	905	906	907	908	909	910	911	912
##	83.61395	88.23926	88.48270	89.21301	85.98747	91.46481	89.51731	92.13426
##	913	914	915	916	917	918	919	920
##	89.82161	90.12590	90.18676	89.63903	89.57817	87.93497	89.15215	93.29059
##	921	922	923	924	925	926	927	928
##	91.89082	87.50895	89.76075	85.80489	92.98629	86.96122	87.99583	87.44809
##	929	930	931	932	933	934	935	936
##	87.75239	88.84786	92.68200	89.39559	90.79536	87.14379	86.35262	91.22137
##	937	938	939	940	941	942	943	944
##	86.96122	87.69153	87.93497	90.73450	88.48270	90.30848	89.27387	87.93497
##	945	946	947	948	949	950	951	952
##	88.60442	87.08293	88.42184	88.66528	90.06504	93.29059	91.64739	88.84786
##	953	954	955	956	957	958	959	960
##	82.09247	89.33473	89.33473	88.84786	89.03043	91.28223	89.94333	90.79536
##	961	962	963	964	965	966	967	968
##	91.03879	92.25598	91.58653	87.63067	91.64739	87.81325	87.99583	79.77981
##	969	970	971	972	973	974	975	976
##	90.67364	89.63903	88.54356	85.07458	84.95286	84.28340	82.94450	83.61395
##	977	978	979	980	981	982	983	984
##	84.70942	77.04114	89.51731	85.68317	85.98747	89.88247	84.22254	87.75239
##	985	986	987	988	989	990	991	992
##	86.10918	87.81325	88.72614	84.52684	89.27387	83.06622	80.81442	86.17004
##	993	994	995	996	997	998	999	1000
##	86.23090	82.51848	86.77864	87.02208	88.36098	85.50059	83.73567	80.81442
##	1001	1002	1003	1004	1005	1006	1007	1008
##	90.49106	90.79536	68.76426	88.48270	86.71778	88.17840	90.12590	87.14379

##	1009	1010	1011	1012	1013	1014	1015	1016
##	84.10083	83.43137	83.24879	82.57934	88.36098	88.48270	87.81325	88.60442
##	1017	1018	1019	1020	1021	1022	1023	1024
##	85.56145	88.11754	87.26551	86.71778	86.35262	89.09129	85.25715	84.64856
##	1025	1026	1027	1028	1029	1030	1031	1032
##	88.84786	88.05668	86.53520	90.00418	85.13543	85.62231	90.73450	85.68317
##	1033	1034	1035	1036	1037	1038	1039	1040
##	88.78700	84.03997	85.37887	85.13543	88.48270	89.88247	90.12590	88.54356
##	1041	1042	1043	1044	1045	1046	1047	1048
##	85.13543	87.20465	91.40395	89.33473	83.67481	87.50895	84.52684	94.20348
##	1049	1050	1051	1052	1053	1054	1055	1056
##	92.19512	87.81325	86.10918	87.87411	90.06504	88.42184	87.32637	86.77864
##	1057	1058	1059	1060	1061	1062	1063	1064
##	91.58653	82.03161	85.37887	79.29293	85.62231	86.90036	93.04715	92.25598
##	1065	1066	1067	1068	1069	1070	1071	1072
##	89.03043	87.50895	92.25598	89.63903	91.52567	84.58770	85.68317	92.37770
##	1073	1074	1075	1076	1077	1078	1079	1080
##	89.33473	88.90872	85.92661	91.34309	89.51731	87.32637	86.29176	88.54356
##	1081	1082	1083	1084	1085	1086	1087	1088
##	86.47434	78.80606	90.97793	88.36098	86.35262	87.08293	85.62231	86.10918
##	1089	1090	1091	1092	1093	1094	1095	1096
##	82.76192	90.67364	89.94333	89.76075	80.32754	86.29176	88.30012	85.37887
##	1097	1098	1099	1100	1101	1102	1103	1104
##	85.19629	85.37887	80.51012	90.00418	91.03879	91.22137	81.78817	86.53520
##	1105	1106	1107	1108	1109	1110	1111	1112
##	86.77864	88.78700	85.86575	91.95168	85.80489	84.46598	91.70825	89.69989
##	1113	1114	1115	1116	1117	1118	1119	1120
##	87.20465	83.12708	87.50895	75.76309	89.63903	87.69153	86.10918	88.66528
##	1121	1122	1123	1124	1125	1126	1127	1128
##	89.57817	87.14379	84.52684	88.60442	87.75239	83.24879	86.83950	80.14497
##	1129	1130	1131	1132	1133	1134	1135	1136
##	86.17004	86.59606	80.44926	92.98629	90.36934	87.99583	87.50895	93.59489
##	1137	1138	1139	1140	1141	1142	1143	1144
##	86.53520	91.28223	90.43020	89.69989	90.67364	89.51731	90.73450	90.43020
##	1145	1146	1147	1148	1149	1150	1151	1152
##	88.54356	91.28223	85.31801	91.34309	92.74286	91.58653	91.46481	79.59723
##	1153	1154	1155	1156	1157	1158	1159	1160
##	90.18676	92.74286	93.16887	88.05668	93.10801	93.65575	91.34309	85.86575
##	1161	1162	1163	1164	1165	1166	1167	1168
##	92.43856	81.36215	94.81207	82.57934	87.08293	92.86457	92.68200	91.52567
##	1169	1170	1171	1172	1173	1174	1175	1176
##	84.03997	89.88247	85.37887	92.62114	94.20348	86.23090	87.99583	83.43137
##	1177	1178	1179	1180	1181	1182	1183	1184
##	90.61278	82.21418	91.64739	83.24879	87.63067	79.65809	82.51848	85.01372
##	1185	1186	1187	1188	1189	1190	1191	1192
##	87.56981	85.50059	82.21418	86.65692	82.76192	84.22254	90.55192	92.43856
##	1193	1194	1195	1196	1197	1198	1199	1200
##	89.63903	89.76075	88.05668	91.22137	88.11754	89.82161	87.63067	87.87411
##	1201	1202	1203	1204	1205	1206	1207	1208
##	88.11754	92.13426	91.46481	91.58653	85.92661	88.90872	88.36098	85.01372
##	1209	1210	1211	1212	1213	1214	1215	1216
##	90.55192	89.57817	92.31684	88.54356	88.23926	90.55192	88.78700	88.30012
##	1217	1218	1219	1220	1221	1222	1223	1224
##	80.75356	86.29176	89.45645	83.30965	84.40512	87.14379	87.56981	86.41348

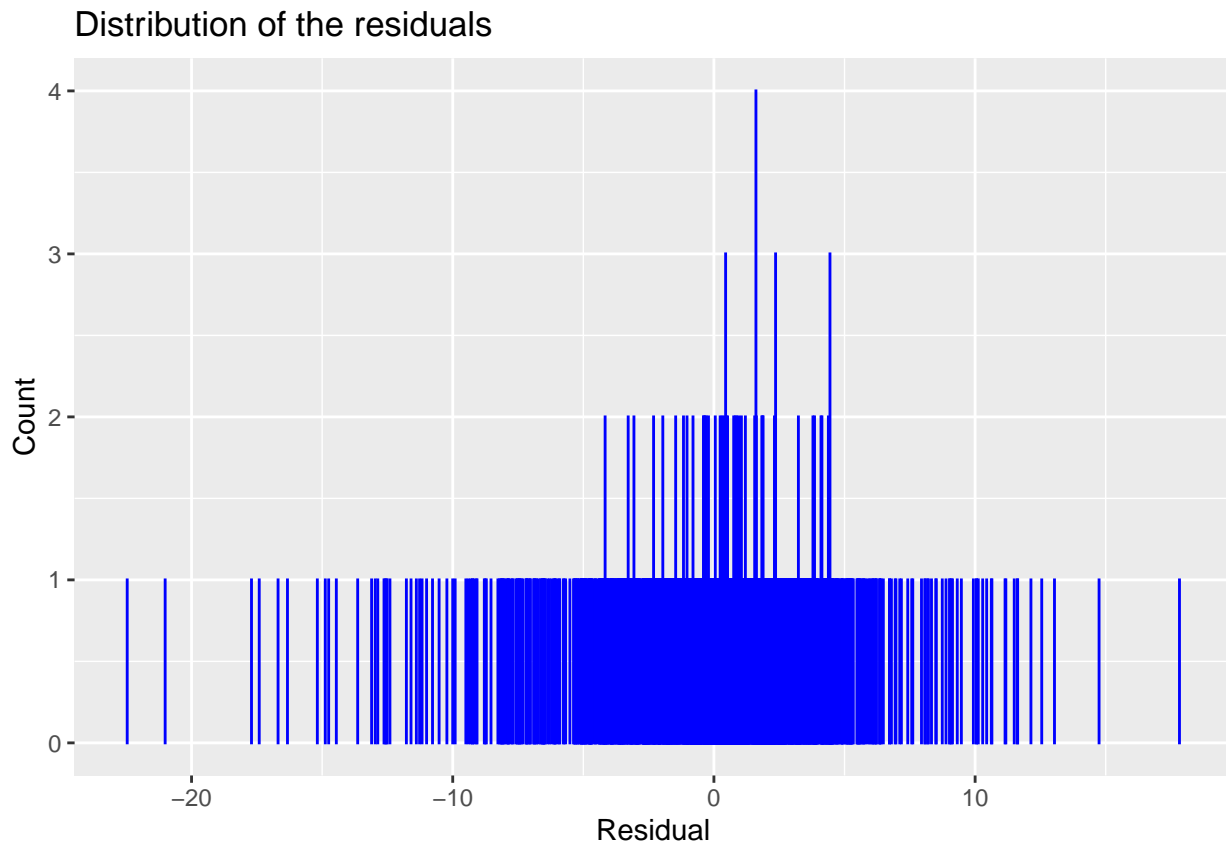


```
##      1225      1226      1227      1228      1229      1230      1231      1232
## 81.42301 76.67598 86.90036 84.83114 79.41465 84.22254 89.21301 90.91708
##      1233      1234      1235      1236      1237      1238      1239      1240
## 85.56145 82.76192 86.65692 90.36934 90.91708 90.61278 90.24762 91.82997
##      1241      1242      1243      1244      1245      1246      1247      1248
## 89.69989 88.48270 91.76911 87.63067 91.82997 89.39559 89.03043 90.79536
##      1249      1250      1251      1252      1253      1254      1255      1256
## 91.28223 88.84786 85.31801 90.00418 92.13426 89.51731 89.33473 89.09129
##      1257      1258      1259      1260      1261      1262      1263      1264
## 90.85622 92.49942 90.43020 94.08176 93.96004 90.00418 90.61278 84.28340
##      1265      1266
## 90.85622 91.16051
```

```
county_2019_augmented <- county_2019_model%>%
  augment()
```

10. Make a graph to show the distribution of the residuals.

```
ggplot(data = county_2019_augmented, mapping = aes(x = .resid, fill= .fitted))+
  geom_bar(alpha=0.5, color= 'blue') + labs(x = "Residual", y = "Count", title = "Distribution of the r
```



11. Make a scatterplot of residuals versus fitted values.

```
ggplot(data = county_2019_augmented, mapping = aes(x = .resid, y = .fitted)) +
  geom_point(alpha=0.5, color= 'blue') + labs(x = "Residual", y = "Fitted values", title = "Residual vs
```

Residual vs Fitted values

