

Solution 2

```
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.2 --
## v ggplot2 3.4.1      v purrr  1.0.1
## v tibble  3.1.8      v dplyr  1.1.0
## v tidyr   1.3.0      v stringr 1.5.0
## v readr   2.1.4      v forcats 1.0.0
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(miceadds)
```

```
## Loading required package: mice
##
## Attaching package: 'mice'
##
## The following object is masked from 'package:stats':
##
##   filter
##
## The following objects are masked from 'package:base':
##
##   cbind, rbind
##
## * miceadds 3.16-18 (2023-01-06 10:54:00)
```

```
df <- read.csv('https://raw.githubusercontent.com/rjblake34/waenroll/main/waenrolldf.csv', header=TRUE)
```

Run regressions

```
mod1 <- miceadds::glm.cluster(data=df,
                              formula = TwoYear ~ LowIncomePct + WhitePct + ELLPct + HighlyCapablePct +
                                TotalStudents + factor(District) + factor(Year),
                              cluster = "District",
                              family='gaussian')
```

```
## Loading required namespace: sandwich
```

```
mod2 <- miceadds::glm.cluster(data=df,
                              formula = FourYear ~ LowIncomePct + WhitePct + ELLPct + HighlyCapablePct +
                                TotalStudents + factor(District) + factor(Year),
                              cluster = "District",
```

```

                                family='gaussian')

mod3 <- miceadds::glm.cluster(data=df,
                                formula = TwoYear+FourYear ~ LowIncomePct + WhitePct + ELLPct + HighlyCapablePct +
                                TotalStudents + factor(District) + factor(Year),
                                cluster = "District",
                                family='gaussian')

```

Print results of model 1

```
summary(mod1$glm_res)
```

```
##
## Call:
## stats::glm(formula = formula, family = family, data = data, weights = wgt__)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.194189  -0.022226  -0.000744   0.020912   0.179524
##
## Coefficients:
##
##              Estimate Std. Error
## (Intercept)      1.054e-01  1.496e-01
## LowIncomePct      3.116e-02  4.608e-02
## WhitePct          2.111e-01  1.273e-01
## ELLPct            6.922e-02  7.372e-02
## HighlyCapablePct  8.894e-02  8.034e-02
## FemalePct        2.304e-01  2.395e-01
## TotalStudents   -6.614e-07  6.130e-06
## factor(District)Adna      8.019e-03  5.205e-02
## factor(District)Anacortes -1.207e-01  4.514e-02
## factor(District)Arlington -9.018e-02  4.439e-02
## factor(District)Asotin-Anatone -2.538e-01  5.171e-02
## factor(District)Auburn    -1.719e-02  8.270e-02
## factor(District)Bainbridge Island -2.706e-01  4.872e-02
## factor(District)Battle Ground -1.005e-01  8.149e-02
## factor(District)Bellevue  -8.998e-02  1.075e-01
## factor(District)Bellingham -8.071e-02  6.310e-02
## factor(District)Bethel    -9.554e-02  1.021e-01
## factor(District)Blaine    -9.718e-02  3.683e-02
## factor(District)Bremerton -3.335e-02  2.893e-02
## factor(District)Brewster   5.119e-02  7.066e-02
## factor(District)Burlington-Edison 3.762e-03  2.952e-02
## factor(District)Camas     -1.371e-01  5.049e-02
## factor(District)Cape Flattery 6.202e-02  6.787e-02
## factor(District)Cascade   -6.831e-02  3.320e-02
## factor(District)Castle Rock -1.005e-01  4.508e-02
## factor(District)Central Kitsap 1.356e-02  5.815e-02
## factor(District)Central Valley -1.515e-01  8.737e-02
## factor(District)Centralia  8.709e-03  2.745e-02
## factor(District)Chehalis   1.045e-02  3.582e-02
## factor(District)Cheney     -1.683e-01  4.169e-02
## factor(District)Chewelah   -1.760e-01  5.010e-02

```

## factor(District)Chimacum	-1.680e-01	4.296e-02
## factor(District)Clarkston	-2.355e-01	4.413e-02
## factor(District)Cle Elum-Roslyn	-2.608e-01	4.497e-02
## factor(District)Clover Park	-5.009e-02	6.548e-02
## factor(District)Colfax	-1.828e-01	5.197e-02
## factor(District)College Place	1.296e-01	4.136e-02
## factor(District)Columbia (Walla Walla)	1.938e-02	3.237e-02
## factor(District)Colville	-2.102e-01	4.748e-02
## factor(District)Concrete	-8.760e-02	6.348e-02
## factor(District)Coupeville	-1.553e-01	3.826e-02
## factor(District)Davenport	-2.549e-01	5.207e-02
## factor(District)Deer Park	-2.158e-01	5.116e-02
## factor(District)East Valley (Spokane)	-1.078e-01	4.123e-02
## factor(District)East Valley (Yakima)	-2.641e-02	2.961e-02
## factor(District)Eastmont	1.037e-02	3.181e-02
## factor(District)Eatonville	-1.738e-01	4.490e-02
## factor(District)Edmonds	1.240e-02	1.100e-01
## factor(District)Ellensburg	-2.681e-01	3.887e-02
## factor(District)Elma	-5.883e-02	3.267e-02
## factor(District)Enumclaw	-1.439e-01	4.259e-02
## factor(District)Ephrata	-6.373e-02	3.022e-02
## factor(District)Everett	-2.372e-02	1.069e-01
## factor(District)Evergreen (Clark)	-6.093e-02	1.405e-01
## factor(District)Federal Way	-2.653e-02	1.196e-01
## factor(District)Ferndale	-5.236e-02	3.367e-02
## factor(District)Fife	-5.796e-03	3.055e-02
## factor(District)Finley	-5.448e-02	3.299e-02
## factor(District)Franklin Pierce	-9.798e-02	4.208e-02
## factor(District)Goldendale	-1.007e-01	3.830e-02
## factor(District)Grand Coulee Dam	-8.070e-02	4.910e-02
## factor(District)Grandview	1.437e-02	6.518e-02
## factor(District)Granger	-7.817e-02	7.379e-02
## factor(District)Granite Falls	-1.303e-01	4.132e-02
## factor(District)Highland	2.195e-02	5.379e-02
## factor(District)Highline	1.342e-02	9.993e-02
## factor(District)Hockinson	-1.390e-01	5.174e-02
## factor(District)Hoquiam	5.415e-02	3.221e-02
## factor(District)Issaquah	-1.279e-01	1.088e-01
## factor(District)Kalama	-9.528e-02	5.028e-02
## factor(District)Kelso	-7.785e-02	3.768e-02
## factor(District)Kennewick	-5.074e-02	9.685e-02
## factor(District)Kent	4.136e-02	1.456e-01
## factor(District)Kettle Falls	-2.145e-01	4.564e-02
## factor(District)Kittitas	-2.102e-01	3.855e-02
## factor(District)La Center	-5.980e-02	5.229e-02
## factor(District)La Conner	-4.623e-02	3.540e-02
## factor(District)Lake Chelan	-4.425e-02	3.673e-02
## factor(District)Lake Stevens	-5.172e-02	5.356e-02
## factor(District)Lake Washington	-1.350e-01	1.619e-01
## factor(District)Lake Washington Institute of Technology	-1.883e-02	5.207e-02
## factor(District)Lakewood	-7.689e-02	3.469e-02
## factor(District)Liberty	-1.537e-01	5.131e-02
## factor(District)Longview	-5.255e-02	3.924e-02
## factor(District)Lynden	-4.219e-02	3.435e-02

## factor(District)Mabton	-3.940e-02	7.752e-02
## factor(District)Manson	3.590e-02	4.809e-02
## factor(District)Marysville	-1.027e-02	5.400e-02
## factor(District)Mead	-1.514e-01	6.719e-02
## factor(District)Medical Lake	-1.329e-01	4.006e-02
## factor(District)Mercer Island	-2.561e-01	4.404e-02
## factor(District)Meridian	-1.480e-02	3.486e-02
## factor(District)Methow Valley	-2.737e-01	5.129e-02
## factor(District)Monroe	-1.124e-01	4.462e-02
## factor(District)Montesano	5.293e-02	4.210e-02
## factor(District)Moses Lake	-3.276e-02	4.009e-02
## factor(District)Mount Adams	-1.195e-01	7.492e-02
## factor(District)Mount Vernon	2.081e-03	3.648e-02
## factor(District)Mukilteo	1.011e-02	7.695e-02
## factor(District)Napavine	-1.858e-02	4.313e-02
## factor(District)Newport	-2.281e-01	5.012e-02
## factor(District)Nine Mile Falls	-6.419e-02	4.870e-02
## factor(District)Nooksack Valley	1.161e-02	2.956e-02
## factor(District)North Franklin	-2.843e-02	4.852e-02
## factor(District)North Kitsap	-9.099e-02	3.853e-02
## factor(District)North Mason	-8.641e-02	3.212e-02
## factor(District)Northshore	-8.694e-02	1.212e-01
## factor(District)Oak Harbor	-9.840e-02	3.463e-02
## factor(District)Ocean Beach	-1.716e-01	3.699e-02
## factor(District)Ocosta	-6.012e-02	3.288e-02
## factor(District)Okanogan	-4.197e-02	3.091e-02
## factor(District)Olympia	-1.236e-01	5.608e-02
## factor(District)Omak	-1.457e-01	3.414e-02
## factor(District)Onalaska	1.587e-02	4.400e-02
## factor(District)Orcas Island	-2.301e-01	4.796e-02
## factor(District)Oroville	-1.325e-01	3.201e-02
## factor(District)Orting	-1.681e-01	3.782e-02
## factor(District>Othello	1.770e-02	6.190e-02
## factor(District)Pasco	2.998e-02	9.185e-02
## factor(District)Peninsula	-1.638e-01	6.048e-02
## factor(District)Port Angeles	-7.217e-02	3.655e-02
## factor(District)Port Townsend	-1.761e-01	4.251e-02
## factor(District)Prosser	-2.699e-02	4.030e-02
## factor(District)Pullman	-2.285e-01	3.598e-02
## factor(District)Puyallup	-8.683e-02	1.216e-01
## factor(District)Quillayute Valley	-1.081e-01	3.050e-02
## factor(District)Quincy	4.282e-02	6.301e-02
## factor(District)Rainier	-1.113e-01	4.215e-02
## factor(District)Raymond	7.972e-03	3.232e-02
## factor(District)Reardan-Edwall	-1.564e-01	4.813e-02
## factor(District)Renton	5.374e-02	7.990e-02
## factor(District)Richland	-1.347e-01	7.641e-02
## factor(District)Ridgefield	-5.593e-02	4.404e-02
## factor(District)Ritzville	-1.839e-01	4.668e-02
## factor(District)Riverside	-1.553e-01	4.968e-02
## factor(District)Riverview	-1.722e-01	4.531e-02
## factor(District)Rochester	-3.759e-02	3.221e-02
## factor(District)Royal	7.026e-02	6.024e-02
## factor(District)San Juan Island	-2.090e-01	3.876e-02

## factor(District)Sedro-Woolley	-9.615e-02	3.597e-02
## factor(District)Selah	-6.404e-02	3.166e-02
## factor(District)Sequim	-1.002e-01	3.900e-02
## factor(District)Shelton	-1.197e-01	2.793e-02
## factor(District)Shoreline	-4.604e-02	4.871e-02
## factor(District)Snohomish	-8.928e-02	6.337e-02
## factor(District)Snoqualmie Valley	-1.591e-01	5.510e-02
## factor(District)South Bend	7.392e-02	3.838e-02
## factor(District)South Kitsap	-9.449e-02	5.487e-02
## factor(District)South Whidbey	-1.931e-01	4.649e-02
## factor(District)Spokane	-1.132e-01	1.742e-01
## factor(District)Stanwood-Camano	-1.017e-01	4.715e-02
## factor(District)Stevenson-Carson	-2.010e-01	3.987e-02
## factor(District)Summit Public School: Olympus	-1.334e-01	6.720e-02
## factor(District)Summit Public School: Sierra	-6.921e-02	6.671e-02
## factor(District)Sumner	-1.287e-01	5.759e-02
## factor(District)Sunnyside	-2.570e-02	6.405e-02
## factor(District)Tacoma	-6.907e-02	1.623e-01
## factor(District)Tahoma	-6.799e-02	5.482e-02
## factor(District)Tenino	-6.778e-02	4.754e-02
## factor(District)Toledo	-8.804e-02	4.370e-02
## factor(District)Tonasket	-1.755e-01	3.042e-02
## factor(District)Toppenish	-2.739e-02	5.814e-02
## factor(District)Tukwila	3.888e-02	6.106e-02
## factor(District)Tumwater	-6.380e-02	4.497e-02
## factor(District)University Place	-3.273e-02	3.356e-02
## factor(District)Vancouver	-8.947e-02	1.264e-01
## factor(Year)2015	-7.835e-03	5.350e-03
## factor(Year)2016	-5.936e-03	5.662e-03
## factor(Year)2017	-1.590e-02	6.258e-03
## factor(Year)2018	-2.594e-02	6.708e-03
## factor(Year)2019	-2.672e-02	7.239e-03
##	t value	Pr(> t)
## (Intercept)	0.704	0.481560
## LowIncomePct	0.676	0.499196
## WhitePct	1.658	0.097691 .
## ELLPct	0.939	0.348054
## HighlyCapablePct	1.107	0.268638
## FemalePct	0.962	0.336293
## TotalStudents	-0.108	0.914113
## factor(District)Adna	0.154	0.877607
## factor(District)Anacortes	-2.674	0.007653 **
## factor(District)Arlington	-2.032	0.042546 *
## factor(District)Asotin-Anatone	-4.908	1.13e-06 ***
## factor(District)Auburn	-0.208	0.835420
## factor(District)Bainbridge Island	-5.555	3.85e-08 ***
## factor(District)Battle Ground	-1.233	0.218051
## factor(District)Bellevue	-0.837	0.403044
## factor(District)Bellingham	-1.279	0.201265
## factor(District)Bethel	-0.936	0.349576
## factor(District)Blaine	-2.639	0.008489 **
## factor(District)Bremerton	-1.152	0.249491
## factor(District)Brewster	0.725	0.468947
## factor(District)Burlington-Edison	0.127	0.898635

## factor(District)Camas	-2.715	0.006788	**
## factor(District)Cape Flattery	0.914	0.361104	
## factor(District)Cascade	-2.057	0.040000	*
## factor(District)Castle Rock	-2.229	0.026105	*
## factor(District)Central Kitsap	0.233	0.815718	
## factor(District)Central Valley	-1.734	0.083273	.
## factor(District)Centralia	0.317	0.751138	
## factor(District)Chehalis	0.292	0.770538	
## factor(District)Cheney	-4.036	5.98e-05	***
## factor(District)Chewelah	-3.514	0.000468	***
## factor(District)Chimacum	-3.910	0.000100	***
## factor(District)Clarkston	-5.337	1.25e-07	***
## factor(District)Cle Elum-Roslyn	-5.800	9.77e-09	***
## factor(District)Clover Park	-0.765	0.444552	
## factor(District)Colfax	-3.517	0.000463	***
## factor(District)College Place	3.133	0.001798	**
## factor(District)Columbia (Walla Walla)	0.599	0.549624	
## factor(District)Colville	-4.426	1.10e-05	***
## factor(District)Concrete	-1.380	0.168040	
## factor(District)Coupeville	-4.059	5.44e-05	***
## factor(District)Davenport	-4.895	1.20e-06	***
## factor(District)Deer Park	-4.217	2.77e-05	***
## factor(District)East Valley (Spokane)	-2.615	0.009091	**
## factor(District)East Valley (Yakima)	-0.892	0.372774	
## factor(District)Eastmont	0.326	0.744401	
## factor(District)Eatonville	-3.871	0.000118	***
## factor(District)Edmonds	0.113	0.910253	
## factor(District)Ellensburg	-6.898	1.12e-11	***
## factor(District)Elma	-1.801	0.072138	.
## factor(District)Enumclaw	-3.379	0.000765	***
## factor(District)Ephrata	-2.109	0.035308	*
## factor(District)Everett	-0.222	0.824395	
## factor(District)Evergreen (Clark)	-0.434	0.664753	
## factor(District)Federal Way	-0.222	0.824591	
## factor(District)Ferndale	-1.555	0.120389	
## factor(District)Fife	-0.190	0.849567	
## factor(District)Finley	-1.651	0.099074	.
## factor(District)Franklin Pierce	-2.328	0.020152	*
## factor(District)Goldendale	-2.631	0.008693	**
## factor(District)Grand Coulee Dam	-1.644	0.100695	
## factor(District)Grandview	0.220	0.825606	
## factor(District)Granger	-1.059	0.289777	
## factor(District)Granite Falls	-3.153	0.001681	**
## factor(District)Highland	0.408	0.683416	
## factor(District)Highline	0.134	0.893183	
## factor(District)Hockinson	-2.685	0.007402	**
## factor(District)Hoquiam	1.681	0.093206	.
## factor(District)Issaquah	-1.176	0.239991	
## factor(District)Kalama	-1.895	0.058455	.
## factor(District)Kelso	-2.066	0.039187	*
## factor(District)Kennewick	-0.524	0.600534	
## factor(District)Kent	0.284	0.776359	
## factor(District)Kettle Falls	-4.701	3.08e-06	***
## factor(District)Kittitas	-5.453	6.72e-08	***

## factor(District)La Center	-1.144	0.253125	
## factor(District)La Conner	-1.306	0.191988	
## factor(District)Lake Chelan	-1.205	0.228701	
## factor(District)Lake Stevens	-0.966	0.334568	
## factor(District)Lake Washington	-0.833	0.404873	
## factor(District)Lake Washington Institute of Technology	-0.362	0.717728	
## factor(District)Lakewood	-2.217	0.026948	*
## factor(District)Liberty	-2.996	0.002825	**
## factor(District)Longview	-1.339	0.180879	
## factor(District)Lynden	-1.228	0.219807	
## factor(District)Mabton	-0.508	0.611464	
## factor(District)Manson	0.746	0.455613	
## factor(District)Marysville	-0.190	0.849161	
## factor(District)Mead	-2.254	0.024497	*
## factor(District)Medical Lake	-3.316	0.000956	***
## factor(District)Mercer Island	-5.815	8.94e-09	***
## factor(District)Meridian	-0.424	0.671381	
## factor(District)Methow Valley	-5.336	1.26e-07	***
## factor(District)Monroe	-2.519	0.011974	*
## factor(District)Montesano	1.257	0.209097	
## factor(District)Moses Lake	-0.817	0.414052	
## factor(District)Mount Adams	-1.595	0.111185	
## factor(District)Mount Vernon	0.057	0.954519	
## factor(District)Mukilteo	0.131	0.895530	
## factor(District)Napavine	-0.431	0.666791	
## factor(District)Newport	-4.550	6.24e-06	***
## factor(District)Nine Mile Falls	-1.318	0.187825	
## factor(District)Nooksack Valley	0.393	0.694646	
## factor(District)North Franklin	-0.586	0.558117	
## factor(District)North Kitsap	-2.361	0.018461	*
## factor(District)North Mason	-2.691	0.007288	**
## factor(District)Northshore	-0.717	0.473506	
## factor(District)Oak Harbor	-2.841	0.004613	**
## factor(District)Ocean Beach	-4.640	4.11e-06	***
## factor(District)Ocosta	-1.829	0.067843	.
## factor(District)Okanogan	-1.358	0.174959	
## factor(District)Olympia	-2.204	0.027827	*
## factor(District)Omak	-4.268	2.22e-05	***
## factor(District)Onalaska	0.361	0.718503	
## factor(District)Orcas Island	-4.799	1.92e-06	***
## factor(District)Oroville	-4.140	3.86e-05	***
## factor(District)Orting	-4.446	1.01e-05	***
## factor(District>Othello	0.286	0.774966	
## factor(District)Pasco	0.326	0.744252	
## factor(District)Peninsula	-2.708	0.006915	**
## factor(District)Port Angeles	-1.975	0.048657	*
## factor(District)Port Townsend	-4.142	3.83e-05	***
## factor(District)Prosser	-0.670	0.503254	
## factor(District)Pullman	-6.351	3.70e-10	***
## factor(District)Puyallup	-0.714	0.475384	
## factor(District)Quillayute Valley	-3.542	0.000421	***
## factor(District)Quincy	0.680	0.496974	
## factor(District)Rainier	-2.640	0.008469	**
## factor(District)Raymond	0.247	0.805236	

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## factor(District)Reardan-Edwall      -3.250 0.001203 **
## factor(District)Renton              0.673 0.501376
## factor(District)Richland            -1.763 0.078331 .
## factor(District)Ridgefield          -1.270 0.204463
## factor(District)Ritzville           -3.940 8.92e-05 ***
## factor(District)Riverside           -3.127 0.001835 **
## factor(District)Riverview           -3.800 0.000157 ***
## factor(District)Rochester           -1.167 0.243561
## factor(District)Royal                1.166 0.243800
## factor(District)San Juan Island     -5.391 9.36e-08 ***
## factor(District)Sedro-Woolley       -2.673 0.007682 **
## factor(District)Selah               -2.022 0.043480 *
## factor(District)Sequim              -2.570 0.010360 *
## factor(District)Shelton             -4.287 2.05e-05 ***
## factor(District)Shoreline           -0.945 0.344845
## factor(District)Snohomish           -1.409 0.159254
## factor(District)Snoqualmie Valley   -2.887 0.004005 **
## factor(District)South Bend          1.926 0.054455 .
## factor(District)South Kitsap        -1.722 0.085487 .
## factor(District)South Whidbey       -4.153 3.66e-05 ***
## factor(District)Spokane             -0.650 0.516124
## factor(District)Stanwood-Camano     -2.156 0.031387 *
## factor(District)Stevenson-Carson    -5.041 5.80e-07 ***
## factor(District)Summit Public School: Olympus -1.985 0.047518 *
## factor(District)Summit Public School: Sierra -1.037 0.299852
## factor(District)Sumner              -2.235 0.025730 *
## factor(District)Sunnyside           -0.401 0.688399
## factor(District)Tacoma              -0.426 0.670514
## factor(District)Tahoma              -1.240 0.215266
## factor(District)Tenino              -1.426 0.154356
## factor(District)Toledo              -2.014 0.044322 *
## factor(District)Tonasket            -5.769 1.16e-08 ***
## factor(District)Toppenish           -0.471 0.637763
## factor(District)Tukwila             0.637 0.524537
## factor(District)Tumwater            -1.419 0.156425
## factor(District)University Place    -0.975 0.329705
## factor(District)Vancouver           -0.708 0.479341
## factor(Year)2015                    -1.465 0.143459
## factor(Year)2016                    -1.048 0.294832
## factor(Year)2017                    -2.541 0.011243 *
## factor(Year)2018                    -3.867 0.000120 ***
## factor(Year)2019                    -3.691 0.000240 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.002104546)
##
## Null deviance: 5.7568 on 926 degrees of freedom
## Residual deviance: 1.5910 on 756 degrees of freedom
## AIC: -2928
##
## Number of Fisher Scoring iterations: 2

```



```
with(summary(mod1$glm_res), 1 - deviance/null.deviance) #print r squared
```

```
## [1] 0.7236251
```

Print results of model 2

```
summary(mod2$glm_res)
```

```
##
## Call:
## stats::glm(formula = formula, family = family, data = data, weights = wgt_)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.217301  -0.023803  -0.000227   0.023125   0.174403
##
## Coefficients:
##                                     Estimate Std. Error
## (Intercept)                      3.398e-01  1.573e-01
## LowIncomePct                    -2.570e-02  4.846e-02
## WhitePct                        -1.615e-01  1.339e-01
## ELLPct                          -3.402e-02  7.751e-02
## HighlyCapablePct                -9.106e-02  8.448e-02
## FemalePct                       -1.558e-01  2.518e-01
## TotalStudents                   3.389e-06  6.446e-06
## factor(District)Adna             6.415e-02  5.473e-02
## factor(District)Anacortes        3.037e-01  4.747e-02
## factor(District)Arlington        1.188e-01  4.668e-02
## factor(District)Asotin-Anatone   3.569e-01  5.437e-02
## factor(District)Auburn           7.603e-02  8.696e-02
## factor(District)Bainbridge Island 5.463e-01  5.123e-02
## factor(District)Battle Ground    8.063e-02  8.568e-02
## factor(District)Bellevue         3.671e-01  1.131e-01
## factor(District)Bellingham       2.482e-01  6.635e-02
## factor(District)Bethel          -2.403e-02  1.073e-01
## factor(District)Blaine           1.292e-01  3.872e-02
## factor(District)Bremerton        1.768e-02  3.042e-02
## factor(District)Brewster         5.817e-02  7.429e-02
## factor(District)Burlington-Edison 9.236e-02  3.104e-02
## factor(District)Camas            2.953e-01  5.309e-02
## factor(District)Cape Flattery    -2.371e-02  7.137e-02
## factor(District)Cascade          2.090e-01  3.491e-02
## factor(District)Castle Rock      4.454e-02  4.740e-02
## factor(District)Central Kitsap   1.062e-01  6.114e-02
## factor(District)Central Valley   2.017e-01  9.187e-02
## factor(District)Centralia       -1.992e-02  2.886e-02
## factor(District)Chehalis         1.065e-01  3.766e-02
## factor(District)Cheney           2.160e-01  4.384e-02
## factor(District)Chewelah         1.578e-01  5.268e-02
## factor(District)Chimacum         1.256e-01  4.517e-02
## factor(District)Clarkston        2.239e-01  4.640e-02
## factor(District)Cle Elum-Roslyn  2.815e-01  4.729e-02
```

## factor(District)Clover Park	4.153e-02	6.885e-02
## factor(District)Colfax	3.461e-01	5.465e-02
## factor(District)College Place	4.613e-02	4.349e-02
## factor(District)Columbia (Walla Walla)	9.844e-02	3.404e-02
## factor(District)Colville	1.800e-01	4.993e-02
## factor(District)Concrete	7.026e-02	6.675e-02
## factor(District)Coupeville	2.042e-01	4.023e-02
## factor(District)Davenport	2.621e-01	5.475e-02
## factor(District)Deer Park	8.145e-02	5.379e-02
## factor(District)East Valley (Spokane)	1.008e-01	4.336e-02
## factor(District)East Valley (Yakima)	7.060e-02	3.114e-02
## factor(District)Eastmont	1.380e-02	3.345e-02
## factor(District)Eatonville	1.407e-01	4.721e-02
## factor(District)Edmonds	1.521e-01	1.156e-01
## factor(District)Ellensburg	2.998e-01	4.087e-02
## factor(District)Elma	6.734e-03	3.435e-02
## factor(District)Enumclaw	1.826e-01	4.478e-02
## factor(District)Ephrata	8.642e-02	3.178e-02
## factor(District)Everett	1.152e-01	1.124e-01
## factor(District)Evergreen (Clark)	2.803e-02	1.478e-01
## factor(District)Federal Way	8.506e-02	1.258e-01
## factor(District)Ferndale	1.404e-01	3.541e-02
## factor(District)Fife	1.138e-01	3.212e-02
## factor(District)Finley	-3.656e-02	3.469e-02
## factor(District)Franklin Pierce	9.872e-02	4.424e-02
## factor(District)Goldendale	8.494e-02	4.027e-02
## factor(District)Grand Coulee Dam	4.364e-02	5.163e-02
## factor(District)Grandview	-2.505e-02	6.853e-02
## factor(District)Granger	6.228e-02	7.759e-02
## factor(District)Granite Falls	4.206e-02	4.344e-02
## factor(District)Highland	3.455e-02	5.656e-02
## factor(District)Highline	1.947e-02	1.051e-01
## factor(District)Hockinson	3.084e-01	5.441e-02
## factor(District)Hoquiam	1.502e-02	3.387e-02
## factor(District)Issaquah	4.239e-01	1.144e-01
## factor(District)Kalama	1.017e-01	5.286e-02
## factor(District)Kelso	4.153e-02	3.962e-02
## factor(District)Kennewick	5.218e-02	1.018e-01
## factor(District)Kent	5.960e-02	1.531e-01
## factor(District)Kettle Falls	1.343e-01	4.799e-02
## factor(District)Kittitas	3.176e-01	4.054e-02
## factor(District)La Center	1.409e-01	5.498e-02
## factor(District)La Conner	2.867e-01	3.722e-02
## factor(District)Lake Chelan	1.852e-01	3.862e-02
## factor(District)Lake Stevens	1.194e-01	5.632e-02
## factor(District)Lake Washington	3.837e-01	1.703e-01
## factor(District)Lake Washington Institute of Technology	-1.199e-02	5.475e-02
## factor(District)Lakewood	6.769e-02	3.647e-02
## factor(District)Liberty	3.225e-01	5.396e-02
## factor(District)Longview	8.756e-02	4.126e-02
## factor(District)Lynden	1.194e-01	3.612e-02
## factor(District)Mabton	-3.429e-02	8.151e-02
## factor(District)Manson	9.681e-02	5.057e-02
## factor(District)Marysville	2.948e-02	5.678e-02

## factor(District)Mead	2.764e-01	7.065e-02
## factor(District)Medical Lake	1.661e-01	4.212e-02
## factor(District)Mercer Island	6.008e-01	4.631e-02
## factor(District)Meridian	1.395e-01	3.666e-02
## factor(District)Methow Valley	3.785e-01	5.393e-02
## factor(District)Monroe	1.782e-01	4.692e-02
## factor(District)Montesano	1.050e-01	4.427e-02
## factor(District)Moses Lake	5.706e-02	4.215e-02
## factor(District)Mount Adams	4.708e-02	7.878e-02
## factor(District)Mount Vernon	9.134e-02	3.836e-02
## factor(District)Mukilteo	1.262e-01	8.091e-02
## factor(District)Napavine	1.306e-02	4.535e-02
## factor(District)Newport	1.850e-01	5.270e-02
## factor(District)Nine Mile Falls	2.448e-01	5.120e-02
## factor(District)Nooksack Valley	7.294e-02	3.108e-02
## factor(District)North Franklin	2.570e-02	5.101e-02
## factor(District)North Kitsap	2.150e-01	4.052e-02
## factor(District)North Mason	4.278e-02	3.377e-02
## factor(District)Northshore	2.547e-01	1.275e-01
## factor(District)Oak Harbor	1.199e-01	3.641e-02
## factor(District)Ocean Beach	1.658e-01	3.890e-02
## factor(District)Ocosta	5.582e-02	3.457e-02
## factor(District)Okanogan	1.610e-01	3.250e-02
## factor(District)Olympia	3.160e-01	5.896e-02
## factor(District)Omak	1.127e-01	3.589e-02
## factor(District)Onalaska	3.396e-02	4.627e-02
## factor(District)Orcas Island	3.817e-01	5.043e-02
## factor(District)Oroville	9.771e-02	3.366e-02
## factor(District)Orting	1.016e-01	3.977e-02
## factor(District)Othello	2.388e-02	6.509e-02
## factor(District)Pasco	-9.202e-02	9.658e-02
## factor(District)Peninsula	2.951e-01	6.359e-02
## factor(District)Port Angeles	1.149e-01	3.843e-02
## factor(District)Port Townsend	2.510e-01	4.470e-02
## factor(District)Prosser	9.685e-02	4.237e-02
## factor(District)Pullman	4.249e-01	3.784e-02
## factor(District)Puyallup	1.205e-01	1.279e-01
## factor(District)Quillayute Valley	1.233e-02	3.207e-02
## factor(District)Quincy	1.705e-03	6.625e-02
## factor(District)Rainier	9.082e-02	4.432e-02
## factor(District)Raymond	9.822e-02	3.398e-02
## factor(District)Reardan-Edwall	2.048e-01	5.061e-02
## factor(District)Renton	7.482e-02	8.401e-02
## factor(District)Richland	1.678e-01	8.035e-02
## factor(District)Ridgefield	1.932e-01	4.631e-02
## factor(District)Ritzville	2.001e-01	4.908e-02
## factor(District)Riverside	1.206e-01	5.223e-02
## factor(District)Riverview	3.647e-01	4.765e-02
## factor(District)Rochester	-2.034e-02	3.387e-02
## factor(District)Royal	6.891e-04	6.334e-02
## factor(District)San Juan Island	3.672e-01	4.076e-02
## factor(District)Sedro-Woolley	6.117e-02	3.782e-02
## factor(District)Selah	1.434e-01	3.329e-02
## factor(District)Sequim	1.627e-01	4.101e-02

## factor(District)Shelton	6.993e-03	2.937e-02
## factor(District)Shoreline	3.297e-01	5.121e-02
## factor(District)Snohomish	2.470e-01	6.663e-02
## factor(District)Snoqualmie Valley	3.955e-01	5.794e-02
## factor(District)South Bend	2.158e-02	4.035e-02
## factor(District)South Kitsap	7.244e-02	5.770e-02
## factor(District)South Whidbey	3.044e-01	4.888e-02
## factor(District)Spokane	1.103e-01	1.832e-01
## factor(District)Stanwood-Camano	1.506e-01	4.957e-02
## factor(District)Stevenson-Carson	1.378e-01	4.192e-02
## factor(District)Summit Public School: Olympus	2.893e-01	7.066e-02
## factor(District)Summit Public School: Sierra	4.736e-01	7.014e-02
## factor(District)Sumner	2.097e-01	6.056e-02
## factor(District)Sunnyside	-3.893e-02	6.735e-02
## factor(District)Tacoma	7.841e-02	1.706e-01
## factor(District)Tahoma	2.507e-01	5.764e-02
## factor(District)Tenino	3.423e-02	4.999e-02
## factor(District)Toledo	7.180e-02	4.595e-02
## factor(District)Tonasket	1.177e-01	3.198e-02
## factor(District)Toppenish	4.523e-02	6.113e-02
## factor(District)Tukwila	8.801e-02	6.421e-02
## factor(District)Tumwater	1.724e-01	4.729e-02
## factor(District)University Place	2.521e-01	3.529e-02
## factor(District)Vancouver	1.293e-01	1.329e-01
## factor(Year)2015	2.611e-04	5.625e-03
## factor(Year)2016	-5.492e-03	5.954e-03
## factor(Year)2017	6.182e-03	6.580e-03
## factor(Year)2018	3.566e-03	7.054e-03
## factor(Year)2019	-1.120e-03	7.611e-03
##	t value	Pr(> t)
## (Intercept)	2.160	0.031096 *
## LowIncomePct	-0.530	0.596018
## WhitePct	-1.206	0.228140
## ELLPct	-0.439	0.660866
## HighlyCapablePct	-1.078	0.281408
## FemalePct	-0.619	0.536264
## TotalStudents	0.526	0.599255
## factor(District)Adna	1.172	0.241581
## factor(District)Anacortes	6.398	2.75e-10 ***
## factor(District)Arlington	2.544	0.011147 *
## factor(District)Asotin-Anatone	6.565	9.68e-11 ***
## factor(District)Auburn	0.874	0.382220
## factor(District)Bainbridge Island	10.664	< 2e-16 ***
## factor(District)Battle Ground	0.941	0.347023
## factor(District)Bellevue	3.246	0.001221 **
## factor(District)Bellingham	3.741	0.000197 ***
## factor(District)Bethel	-0.224	0.822927
## factor(District)Blaine	3.337	0.000887 ***
## factor(District)Bremerton	0.581	0.561390
## factor(District)Brewster	0.783	0.433909
## factor(District)Burlington-Edison	2.975	0.003020 **
## factor(District)Camas	5.562	3.69e-08 ***
## factor(District)Cape Flattery	-0.332	0.739768
## factor(District)Cascade	5.986	3.31e-09 ***

## factor(District)Castle Rock	0.940	0.347753	
## factor(District)Central Kitsap	1.737	0.082870	.
## factor(District)Central Valley	2.195	0.028454	*
## factor(District)Centralia	-0.690	0.490244	
## factor(District)Chehalis	2.826	0.004831	**
## factor(District)Cheney	4.928	1.02e-06	***
## factor(District)Chewelah	2.996	0.002828	**
## factor(District)Chimacum	2.780	0.005563	**
## factor(District)Clarkston	4.825	1.69e-06	***
## factor(District)Cle Elum-Roslyn	5.952	4.04e-09	***
## factor(District)Clover Park	0.603	0.546585	
## factor(District)Colfax	6.333	4.13e-10	***
## factor(District)College Place	1.061	0.289106	
## factor(District)Columbia (Walla Walla)	2.892	0.003936	**
## factor(District)Colville	3.605	0.000333	***
## factor(District)Concrete	1.053	0.292893	
## factor(District)Coupeville	5.075	4.88e-07	***
## factor(District)Davenport	4.787	2.03e-06	***
## factor(District)Deer Park	1.514	0.130432	
## factor(District)East Valley (Spokane)	2.326	0.020299	*
## factor(District)East Valley (Yakima)	2.267	0.023651	*
## factor(District)Eastmont	0.413	0.679918	
## factor(District)Eatonville	2.980	0.002970	**
## factor(District)Edmonds	1.316	0.188619	
## factor(District)Ellensburg	7.336	5.69e-13	***
## factor(District)Elma	0.196	0.844631	
## factor(District)Enumclaw	4.078	5.03e-05	***
## factor(District)Ephrata	2.719	0.006690	**
## factor(District)Everett	1.025	0.305801	
## factor(District)Evergreen (Clark)	0.190	0.849617	
## factor(District)Federal Way	0.676	0.499157	
## factor(District)Ferndale	3.964	8.06e-05	***
## factor(District)Fife	3.542	0.000422	***
## factor(District)Finley	-1.054	0.292260	
## factor(District)Franklin Pierce	2.231	0.025954	*
## factor(District)Goldendale	2.110	0.035227	*
## factor(District)Grand Coulee Dam	0.845	0.398291	
## factor(District)Grandview	-0.366	0.714803	
## factor(District)Granger	0.803	0.422399	
## factor(District)Granite Falls	0.968	0.333324	
## factor(District)Highland	0.611	0.541454	
## factor(District)Highline	0.185	0.853030	
## factor(District)Hockinson	5.668	2.06e-08	***
## factor(District)Hoquiam	0.443	0.657573	
## factor(District)Issaquah	3.707	0.000225	***
## factor(District)Kalama	1.923	0.054866	.
## factor(District)Kelso	1.048	0.294966	
## factor(District)Kennewick	0.512	0.608514	
## factor(District)Kent	0.389	0.697095	
## factor(District)Kettle Falls	2.799	0.005263	**
## factor(District)Kittitas	7.834	1.60e-14	***
## factor(District)La Center	2.562	0.010592	*
## factor(District)La Conner	7.704	4.16e-14	***
## factor(District)Lake Chelan	4.796	1.95e-06	***

## factor(District)Lake Stevens	2.121	0.034249	*
## factor(District)Lake Washington	2.253	0.024547	*
## factor(District)Lake Washington Institute of Technology	-0.219	0.826681	
## factor(District)Lakewood	1.856	0.063842	.
## factor(District)Liberty	5.977	3.51e-09	***
## factor(District)Longview	2.122	0.034146	*
## factor(District)Lynden	3.304	0.000997	***
## factor(District)Mabton	-0.421	0.674091	
## factor(District)Manson	1.915	0.055923	.
## factor(District)Marysville	0.519	0.603829	
## factor(District)Mead	3.912	9.97e-05	***
## factor(District)Medical Lake	3.944	8.76e-05	***
## factor(District)Mercer Island	12.974	< 2e-16	***
## factor(District)Meridian	3.806	0.000153	***
## factor(District)Methow Valley	7.018	5.00e-12	***
## factor(District)Monroe	3.798	0.000157	***
## factor(District)Montesano	2.372	0.017954	*
## factor(District)Moses Lake	1.354	0.176252	
## factor(District)Mount Adams	0.598	0.550304	
## factor(District)Mount Vernon	2.381	0.017504	*
## factor(District)Mukilteo	1.560	0.119203	
## factor(District)Napavine	0.288	0.773432	
## factor(District)Newport	3.510	0.000475	***
## factor(District)Nine Mile Falls	4.780	2.11e-06	***
## factor(District)Nooksack Valley	2.347	0.019203	*
## factor(District)North Franklin	0.504	0.614589	
## factor(District)North Kitsap	5.306	1.47e-07	***
## factor(District)North Mason	1.267	0.205649	
## factor(District)Northshore	1.998	0.046062	*
## factor(District)Oak Harbor	3.294	0.001035	**
## factor(District)Ocean Beach	4.264	2.27e-05	***
## factor(District)Ocosta	1.615	0.106819	
## factor(District)Okanogan	4.954	9.00e-07	***
## factor(District)Olympia	5.360	1.11e-07	***
## factor(District)Omak	3.140	0.001757	**
## factor(District)Onalaska	0.734	0.463128	
## factor(District)Orcas Island	7.569	1.10e-13	***
## factor(District)Oroville	2.903	0.003799	**
## factor(District)Orting	2.555	0.010822	*
## factor(District)Othello	0.367	0.713786	
## factor(District)Pasco	-0.953	0.340991	
## factor(District)Peninsula	4.640	4.11e-06	***
## factor(District)Port Angeles	2.990	0.002878	**
## factor(District)Port Townsend	5.614	2.78e-08	***
## factor(District)Prosser	2.285	0.022561	*
## factor(District)Pullman	11.230	< 2e-16	***
## factor(District)Puyallup	0.942	0.346263	
## factor(District)Quillayute Valley	0.384	0.700763	
## factor(District)Quincy	0.026	0.979476	
## factor(District)Rainier	2.049	0.040807	*
## factor(District)Raymond	2.890	0.003958	**
## factor(District)Reardan-Edwall	4.047	5.72e-05	***
## factor(District)Renton	0.891	0.373428	
## factor(District)Richland	2.088	0.037094	*

```
## factor(District)Ridgefield      4.172 3.37e-05 ***
## factor(District)Ritzville      4.077 5.04e-05 ***
## factor(District)Riverside      2.309 0.021210 *
## factor(District)Riverview      7.654 5.95e-14 ***
## factor(District)Rochester     -0.600 0.548373
## factor(District)Royal          0.011 0.991322
## factor(District)San Juan Island 9.009 < 2e-16 ***
## factor(District)Sedro-Woolley  1.617 0.106234
## factor(District)Selah          4.307 1.87e-05 ***
## factor(District)Sequim         3.966 8.00e-05 ***
## factor(District)Shelton        0.238 0.811860
## factor(District)Shoreline      6.437 2.17e-10 ***
## factor(District)Snohomish      3.707 0.000225 ***
## factor(District)Snoqualmie Valley 6.825 1.80e-11 ***
## factor(District)South Bend     0.535 0.592983
## factor(District)South Kitsap   1.256 0.209648
## factor(District)South Whidbey  6.228 7.84e-10 ***
## factor(District)Spokane        0.602 0.547292
## factor(District)Stanwood-Camano 3.037 0.002470 **
## factor(District)Stevenson-Carson 3.286 0.001063 **
## factor(District)Summit Public School: Olympus 4.095 4.68e-05 ***
## factor(District)Summit Public School: Sierra 6.752 2.91e-11 ***
## factor(District)Sumner         3.463 0.000565 ***
## factor(District)Sunnyside      -0.578 0.563389
## factor(District)Tacoma         0.460 0.645996
## factor(District)Tahoma         4.348 1.56e-05 ***
## factor(District)Tenino         0.685 0.493707
## factor(District)Toledo         1.563 0.118583
## factor(District)Tonasket       3.679 0.000251 ***
## factor(District)Toppenish      0.740 0.459649
## factor(District)Tukwila        1.371 0.170886
## factor(District)Tumwater       3.645 0.000285 ***
## factor(District)University Place 7.144 2.14e-12 ***
## factor(District)Vancouver      0.972 0.331164
## factor(Year)2015               0.046 0.962994
## factor(Year)2016              -0.922 0.356591
## factor(Year)2017               0.940 0.347750
## factor(Year)2018               0.506 0.613292
## factor(Year)2019              -0.147 0.883101
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.002326807)
##
## Null deviance: 14.7365 on 926 degrees of freedom
## Residual deviance: 1.7591 on 756 degrees of freedom
## AIC: -2835
##
## Number of Fisher Scoring iterations: 2
```

```
with(summary(mod2$glm_res), 1 - deviance/null.deviance) #print r squared
```

```
## [1] 0.8806317
```

Print results of model 3

```
summary(mod3$glm_res)
```

```
##
## Call:
## stats::glm(formula = formula, family = family, data = data, weights = wgt__)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.24450  -0.02355   0.00000   0.02549   0.25246
##
## Coefficients:
##                                     Estimate Std. Error
## (Intercept)                      4.451e-01  1.784e-01
## LowIncomePct                     5.457e-03  5.494e-02
## WhitePct                         4.966e-02  1.518e-01
## ELLPct                          3.520e-02  8.788e-02
## HighlyCapablePct                -2.121e-03  9.578e-02
## FemalePct                       7.461e-02  2.855e-01
## TotalStudents                   2.727e-06  7.308e-06
## factor(District)Adna             7.217e-02  6.206e-02
## factor(District)Anacortes        1.830e-01  5.381e-02
## factor(District)Arlington        2.857e-02  5.292e-02
## factor(District)Asotin-Anatone   1.031e-01  6.164e-02
## factor(District)Auburn           5.884e-02  9.859e-02
## factor(District)Bainbridge Island 2.757e-01  5.808e-02
## factor(District)Battle Ground    -1.983e-02  9.715e-02
## factor(District)Bellevue         2.771e-01  1.282e-01
## factor(District)Bellingham       1.675e-01  7.522e-02
## factor(District)Bethel           -1.196e-01  1.217e-01
## factor(District)Blaine           3.205e-02  4.390e-02
## factor(District)Bremerton        -1.567e-02  3.449e-02
## factor(District)Brewster         1.094e-01  8.423e-02
## factor(District)Burlington-Edison 9.612e-02  3.519e-02
## factor(District)Camas            1.583e-01  6.019e-02
## factor(District)Cape Flattery     3.831e-02  8.091e-02
## factor(District)Cascade          1.407e-01  3.958e-02
## factor(District)Castle Rock      -5.595e-02  5.374e-02
## factor(District)Central Kitsap    1.197e-01  6.932e-02
## factor(District)Central Valley    5.014e-02  1.042e-01
## factor(District)Centralia        -1.121e-02  3.272e-02
## factor(District)Chehalis         1.169e-01  4.270e-02
## factor(District)Cheney           4.774e-02  4.970e-02
## factor(District)Chewelah         -1.823e-02  5.973e-02
## factor(District)Chimacum         -4.239e-02  5.121e-02
## factor(District)Clarkston        -1.163e-02  5.261e-02
## factor(District)Cle Elum-Roslyn   2.065e-02  5.362e-02
## factor(District)Clover Park      -8.559e-03  7.806e-02
## factor(District)Colfax           1.633e-01  6.196e-02
## factor(District)College Place     1.757e-01  4.931e-02
## factor(District)Columbia (Walla Walla) 1.178e-01  3.859e-02
## factor(District)Colville         -3.018e-02  5.661e-02
## factor(District)Concrete         -1.734e-02  7.568e-02
```


## factor(District)Coupeville	4.887e-02	4.561e-02
## factor(District)Davenport	7.212e-03	6.207e-02
## factor(District)Deer Park	-1.343e-01	6.099e-02
## factor(District)East Valley (Spokane)	-7.008e-03	4.916e-02
## factor(District)East Valley (Yakima)	4.419e-02	3.530e-02
## factor(District)Eastmont	2.418e-02	3.792e-02
## factor(District)Eatonville	-3.311e-02	5.353e-02
## factor(District)Edmonds	1.645e-01	1.311e-01
## factor(District)Ellensburg	3.171e-02	4.634e-02
## factor(District)Elma	-5.209e-02	3.895e-02
## factor(District)Enumclaw	3.870e-02	5.077e-02
## factor(District)Ephrata	2.269e-02	3.603e-02
## factor(District)Everett	9.144e-02	1.274e-01
## factor(District)Evergreen (Clark)	-3.290e-02	1.675e-01
## factor(District)Federal Way	5.853e-02	1.426e-01
## factor(District)Ferndale	8.800e-02	4.014e-02
## factor(District)Fife	1.080e-01	3.642e-02
## factor(District)Finley	-9.104e-02	3.933e-02
## factor(District)Franklin Pierce	7.460e-04	5.016e-02
## factor(District)Goldendale	-1.580e-02	4.565e-02
## factor(District)Grand Coulee Dam	-3.707e-02	5.854e-02
## factor(District)Grandview	-1.069e-02	7.770e-02
## factor(District)Granger	-1.589e-02	8.797e-02
## factor(District)Granite Falls	-8.821e-02	4.926e-02
## factor(District)Highland	5.650e-02	6.413e-02
## factor(District)Highline	3.289e-02	1.191e-01
## factor(District)Hockinson	1.694e-01	6.168e-02
## factor(District)Hoquiam	6.917e-02	3.840e-02
## factor(District)Issaquah	2.960e-01	1.297e-01
## factor(District)Kalama	6.374e-03	5.994e-02
## factor(District)Kelso	-3.632e-02	4.492e-02
## factor(District)Kennewick	1.447e-03	1.155e-01
## factor(District)Kent	1.010e-01	1.735e-01
## factor(District)Kettle Falls	-8.024e-02	5.441e-02
## factor(District)Kittitas	1.073e-01	4.596e-02
## factor(District)La Center	8.107e-02	6.234e-02
## factor(District)La Conner	2.405e-01	4.220e-02
## factor(District)Lake Chelan	1.410e-01	4.379e-02
## factor(District)Lake Stevens	6.773e-02	6.385e-02
## factor(District)Lake Washington	2.487e-01	1.931e-01
## factor(District)Lake Washington Institute of Technology	-3.082e-02	6.207e-02
## factor(District)Lakewood	-9.194e-03	4.135e-02
## factor(District)Liberty	1.687e-01	6.117e-02
## factor(District)Longview	3.501e-02	4.678e-02
## factor(District)Lynden	7.717e-02	4.096e-02
## factor(District)Mabton	-7.369e-02	9.242e-02
## factor(District)Manson	1.327e-01	5.733e-02
## factor(District)Marysville	1.920e-02	6.438e-02
## factor(District)Mead	1.250e-01	8.010e-02
## factor(District)Medical Lake	3.327e-02	4.776e-02
## factor(District)Mercer Island	3.447e-01	5.250e-02
## factor(District)Meridian	1.247e-01	4.156e-02
## factor(District)Methow Valley	1.048e-01	6.114e-02
## factor(District)Monroe	6.581e-02	5.320e-02

## factor(District)Montesano	1.579e-01	5.019e-02
## factor(District)Moses Lake	2.430e-02	4.779e-02
## factor(District)Mount Adams	-7.240e-02	8.932e-02
## factor(District)Mount Vernon	9.342e-02	4.349e-02
## factor(District)Mukilteo	1.363e-01	9.173e-02
## factor(District)Napavine	-5.517e-03	5.142e-02
## factor(District)Newport	-4.309e-02	5.975e-02
## factor(District)Nine Mile Falls	1.806e-01	5.805e-02
## factor(District)Nooksack Valley	8.455e-02	3.524e-02
## factor(District)North Franklin	-2.728e-03	5.784e-02
## factor(District)North Kitsap	1.240e-01	4.594e-02
## factor(District)North Mason	-4.364e-02	3.829e-02
## factor(District)Northshore	1.678e-01	1.445e-01
## factor(District)Oak Harbor	2.153e-02	4.128e-02
## factor(District)Ocean Beach	-5.800e-03	4.410e-02
## factor(District)Ocosta	-4.306e-03	3.920e-02
## factor(District)Okanogan	1.190e-01	3.685e-02
## factor(District)Olympia	1.924e-01	6.685e-02
## factor(District)Omak	-3.300e-02	4.069e-02
## factor(District)Onalaska	4.983e-02	5.246e-02
## factor(District)Orcas Island	1.515e-01	5.717e-02
## factor(District)Oroville	-3.481e-02	3.816e-02
## factor(District)Orting	-6.654e-02	4.509e-02
## factor(District>Othello	4.158e-02	7.379e-02
## factor(District)Pasco	-6.205e-02	1.095e-01
## factor(District)Peninsula	1.313e-01	7.210e-02
## factor(District)Port Angeles	4.274e-02	4.357e-02
## factor(District)Port Townsend	7.486e-02	5.068e-02
## factor(District)Prosser	6.986e-02	4.804e-02
## factor(District)Pullman	1.964e-01	4.290e-02
## factor(District)Puyallup	3.366e-02	1.450e-01
## factor(District)Quillayute Valley	-9.572e-02	3.636e-02
## factor(District)Quincy	4.453e-02	7.511e-02
## factor(District)Rainier	-2.045e-02	5.025e-02
## factor(District)Raymond	1.062e-01	3.853e-02
## factor(District)Reardan-Edwall	4.837e-02	5.738e-02
## factor(District)Renton	1.286e-01	9.525e-02
## factor(District)Richland	3.309e-02	9.110e-02
## factor(District)Ridgefield	1.373e-01	5.250e-02
## factor(District)Ritzville	1.623e-02	5.564e-02
## factor(District)Riverside	-3.472e-02	5.922e-02
## factor(District)Riverview	1.925e-01	5.402e-02
## factor(District)Rochester	-5.793e-02	3.840e-02
## factor(District)Royal	7.095e-02	7.181e-02
## factor(District)San Juan Island	1.582e-01	4.621e-02
## factor(District)Sedro-Woolley	-3.498e-02	4.288e-02
## factor(District)Selah	7.937e-02	3.775e-02
## factor(District)Sequim	6.241e-02	4.650e-02
## factor(District)Shelton	-1.127e-01	3.330e-02
## factor(District)Shoreline	2.836e-01	5.807e-02
## factor(District)Snohomish	1.577e-01	7.554e-02
## factor(District)Snoqualmie Valley	2.364e-01	6.569e-02
## factor(District)South Bend	9.550e-02	4.575e-02
## factor(District)South Kitsap	-2.204e-02	6.541e-02

## factor(District)South Whidbey	1.114e-01	5.542e-02
## factor(District)Spokane	-2.883e-03	2.077e-01
## factor(District)Stanwood-Camano	4.891e-02	5.620e-02
## factor(District)Stevenson-Carson	-6.321e-02	4.753e-02
## factor(District)Summit Public School: Olympus	1.559e-01	8.011e-02
## factor(District)Summit Public School: Sierra	4.044e-01	7.952e-02
## factor(District)Sumner	8.098e-02	6.866e-02
## factor(District)Sunnyside	-6.463e-02	7.635e-02
## factor(District)Tacoma	9.341e-03	1.935e-01
## factor(District)Tahoma	1.827e-01	6.535e-02
## factor(District)Tenino	-3.355e-02	5.667e-02
## factor(District)Toledo	-1.623e-02	5.210e-02
## factor(District)Tonasket	-5.781e-02	3.626e-02
## factor(District)Toppenish	1.784e-02	6.931e-02
## factor(District)Tukwila	1.269e-01	7.280e-02
## factor(District)Tumwater	1.086e-01	5.362e-02
## factor(District)University Place	2.194e-01	4.001e-02
## factor(District)Vancouver	3.979e-02	1.507e-01
## factor(Year)2015	-7.574e-03	6.378e-03
## factor(Year)2016	-1.143e-02	6.750e-03
## factor(Year)2017	-9.721e-03	7.460e-03
## factor(Year)2018	-2.237e-02	7.997e-03
## factor(Year)2019	-2.784e-02	8.629e-03
##	t value	Pr(> t)
## (Intercept)	2.496	0.012783 *
## LowIncomePct	0.099	0.920900
## WhitePct	0.327	0.743665
## ELLPct	0.401	0.688888
## HighlyCapablePct	-0.022	0.982335
## FemalePct	0.261	0.793922
## TotalStudents	0.373	0.709125
## factor(District)Adna	1.163	0.245229
## factor(District)Anacortes	3.400	0.000709 ***
## factor(District)Arlington	0.540	0.589371
## factor(District)Asotin-Anatone	1.673	0.094715 .
## factor(District)Auburn	0.597	0.550795
## factor(District)Bainbridge Island	4.746	2.48e-06 ***
## factor(District)Battle Ground	-0.204	0.838308
## factor(District)Bellevue	2.161	0.030979 *
## factor(District)Bellingham	2.226	0.026275 *
## factor(District)Bethel	-0.983	0.326122
## factor(District)Blaine	0.730	0.465653
## factor(District)Bremerton	-0.454	0.649778
## factor(District)Brewster	1.298	0.194562
## factor(District)Burlington-Edison	2.731	0.006458 **
## factor(District)Camas	2.629	0.008735 **
## factor(District)Cape Flattery	0.473	0.636019
## factor(District)Cascade	3.554	0.000402 ***
## factor(District)Castle Rock	-1.041	0.298163
## factor(District)Central Kitsap	1.727	0.084531 .
## factor(District)Central Valley	0.481	0.630371
## factor(District)Centralia	-0.343	0.731922
## factor(District)Chehalis	2.738	0.006332 **
## factor(District)Cheney	0.960	0.337141

## factor(District)Chewelah	-0.305	0.760256	
## factor(District)Chimacum	-0.828	0.408116	
## factor(District)Clarkston	-0.221	0.825132	
## factor(District)Cle Elum-Roslyn	0.385	0.700181	
## factor(District)Clover Park	-0.110	0.912713	
## factor(District)Colfax	2.636	0.008571	**
## factor(District)College Place	3.564	0.000389	***
## factor(District)Columbia (Walla Walla)	3.053	0.002345	**
## factor(District)Colville	-0.533	0.594060	
## factor(District)Concrete	-0.229	0.818839	
## factor(District)Coupeville	1.071	0.284335	
## factor(District)Davenport	0.116	0.907538	
## factor(District)Deer Park	-2.202	0.027951	*
## factor(District)East Valley (Spokane)	-0.143	0.886671	
## factor(District)East Valley (Yakima)	1.252	0.211050	
## factor(District)Eastmont	0.638	0.523910	
## factor(District)Eatonville	-0.619	0.536414	
## factor(District)Edmonds	1.255	0.209794	
## factor(District)Ellensburg	0.684	0.493993	
## factor(District)Elma	-1.338	0.181417	
## factor(District)Enumclaw	0.762	0.446236	
## factor(District)Ephrata	0.630	0.529018	
## factor(District)Everett	0.718	0.473186	
## factor(District)Evergreen (Clark)	-0.196	0.844376	
## factor(District)Federal Way	0.410	0.681641	
## factor(District)Ferndale	2.192	0.028672	*
## factor(District)Fife	2.965	0.003126	**
## factor(District)Finley	-2.315	0.020890	*
## factor(District)Franklin Pierce	0.015	0.988138	
## factor(District)Goldendale	-0.346	0.729335	
## factor(District)Grand Coulee Dam	-0.633	0.526804	
## factor(District)Grandview	-0.138	0.890650	
## factor(District)Granger	-0.181	0.856710	
## factor(District)Granite Falls	-1.791	0.073713	.
## factor(District)Highland	0.881	0.378580	
## factor(District)Highline	0.276	0.782525	
## factor(District)Hockinson	2.746	0.006167	**
## factor(District)Hoquiam	1.801	0.072089	.
## factor(District)Issaquah	2.283	0.022714	*
## factor(District)Kalama	0.106	0.915342	
## factor(District)Kelso	-0.808	0.419059	
## factor(District)Kennewick	0.013	0.990007	
## factor(District)Kent	0.582	0.560859	
## factor(District)Kettle Falls	-1.475	0.140684	
## factor(District)Kittitas	2.336	0.019768	*
## factor(District)La Center	1.301	0.193787	
## factor(District)La Conner	5.699	1.72e-08	***
## factor(District)Lake Chelan	3.219	0.001340	**
## factor(District)Lake Stevens	1.061	0.289126	
## factor(District)Lake Washington	1.288	0.198116	
## factor(District)Lake Washington Institute of Technology	-0.497	0.619656	
## factor(District)Lakewood	-0.222	0.824121	
## factor(District)Liberty	2.758	0.005951	**
## factor(District)Longview	0.748	0.454471	

## factor(District)Lynden	1.884	0.059900	.
## factor(District)Mabton	-0.797	0.425492	
## factor(District)Manson	2.315	0.020887	*
## factor(District)Marysville	0.298	0.765570	
## factor(District)Mead	1.560	0.119170	
## factor(District)Medical Lake	0.697	0.486208	
## factor(District)Mercer Island	6.566	9.62e-11	***
## factor(District)Meridian	3.001	0.002781	**
## factor(District)Methow Valley	1.714	0.086853	.
## factor(District)Monroe	1.237	0.216409	
## factor(District)Montesano	3.146	0.001718	**
## factor(District)Moses Lake	0.508	0.611306	
## factor(District)Mount Adams	-0.811	0.417812	
## factor(District)Mount Vernon	2.148	0.032023	*
## factor(District)Mukilteo	1.486	0.137685	
## factor(District)Napavine	-0.107	0.914585	
## factor(District)Newport	-0.721	0.471009	
## factor(District)Nine Mile Falls	3.110	0.001939	**
## factor(District)Nooksack Valley	2.399	0.016674	*
## factor(District)North Franklin	-0.047	0.962394	
## factor(District)North Kitsap	2.700	0.007099	**
## factor(District)North Mason	-1.140	0.254740	
## factor(District)Northshore	1.161	0.246086	
## factor(District)Oak Harbor	0.522	0.602150	
## factor(District)Ocean Beach	-0.132	0.895388	
## factor(District)Ocosta	-0.110	0.912546	
## factor(District)Okanogan	3.230	0.001291	**
## factor(District)Olympia	2.879	0.004105	**
## factor(District)Omak	-0.811	0.417615	
## factor(District)Onalaska	0.950	0.342441	
## factor(District)Orcas Island	2.650	0.008208	**
## factor(District)Oroville	-0.912	0.361862	
## factor(District)Orting	-1.476	0.140380	
## factor(District)Othello	0.564	0.573247	
## factor(District)Pasco	-0.567	0.571124	
## factor(District)Peninsula	1.820	0.069093	.
## factor(District)Port Angeles	0.981	0.326917	
## factor(District)Port Townsend	1.477	0.140081	
## factor(District)Prosser	1.454	0.146342	
## factor(District)Pullman	4.578	5.50e-06	***
## factor(District)Puyallup	0.232	0.816411	
## factor(District)Quillayute Valley	-2.632	0.008649	**
## factor(District)Quincy	0.593	0.553519	
## factor(District)Rainier	-0.407	0.684122	
## factor(District)Raymond	2.756	0.005987	**
## factor(District)Reardan-Edwall	0.843	0.399484	
## factor(District)Renton	1.350	0.177495	
## factor(District)Richland	0.363	0.716488	
## factor(District)Ridgefield	2.615	0.009113	**
## factor(District)Ritzville	0.292	0.770592	
## factor(District)Riverside	-0.586	0.557915	
## factor(District)Riverview	3.564	0.000388	***
## factor(District)Rochester	-1.509	0.131823	
## factor(District)Royal	0.988	0.323441	

```

## factor(District)San Juan Island      3.423 0.000652 ***
## factor(District)Sedro-Woolley      -0.816 0.414966
## factor(District)Selah                2.103 0.035827 *
## factor(District)Sequim              1.342 0.179912
## factor(District)Shelton             -3.386 0.000746 ***
## factor(District)Shoreline           4.884 1.27e-06 ***
## factor(District)Snohomish           2.088 0.037155 *
## factor(District)Snoqualmie Valley   3.598 0.000341 ***
## factor(District)South Bend          2.087 0.037185 *
## factor(District)South Kitsap       -0.337 0.736233
## factor(District)South Whidbey       2.010 0.044822 *
## factor(District)Spokane            -0.014 0.988929
## factor(District)Stanwood-Camano     0.870 0.384459
## factor(District)Stevenson-Carson   -1.330 0.183900
## factor(District)Summit Public School: Olympus 1.947 0.051957 .
## factor(District)Summit Public School: Sierra 5.085 4.64e-07 ***
## factor(District)Sumner              1.180 0.238556
## factor(District)Sunnyside          -0.846 0.397600
## factor(District)Tacoma              0.048 0.961501
## factor(District)Tahoma              2.795 0.005320 **
## factor(District)Tenino             -0.592 0.554032
## factor(District)Toledo             -0.312 0.755456
## factor(District)Tonasket           -1.594 0.111295
## factor(District)Toppenish           0.257 0.796930
## factor(District)Tukwila             1.743 0.081739 .
## factor(District)Tumwater            2.025 0.043192 *
## factor(District)University Place    5.483 5.72e-08 ***
## factor(District)Vancouver           0.264 0.791839
## factor(Year)2015                   -1.188 0.235371
## factor(Year)2016                   -1.693 0.090873 .
## factor(Year)2017                   -1.303 0.192958
## factor(Year)2018                   -2.798 0.005280 **
## factor(Year)2019                   -3.226 0.001311 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.002990918)
##
##      Null deviance: 11.0121  on 926  degrees of freedom
## Residual deviance:  2.2611  on 756  degrees of freedom
## AIC: -2602.2
##
## Number of Fisher Scoring iterations: 2

with(summary(mod3$glm_res), 1 - deviance/null.deviance) #print r squared

## [1] 0.7946675

```

This analysis relies on data from the Washington State Office of the Superintendent of Public Instruction (OSPI). The panel data is created by combining datasets on college enrollment and demographics at the school district level for each year from 2014 to 2019. The purpose of this analysis is estimate the effect of school district demographic characteristics on college enrollment—i.e., does the makeup of a school district predict how many students choose college after high school?

Three models are estimated in this report. Enrollment at two year, enrollment at four year, and enrollment at either are used as the dependent variables in each model, respectively. The independent variables are rate statistics for low income, whiteness, English language learners, highly capable, female, and district size. All variables are calculated at the district level.

The analysis suggests districts that send more students to college tend to be whiter. However, the analysis also suggests that districts that send more students to college tend to have more low income students, more ELL students, and fewer highly capable students. There are many issues with this methodology that could produce these skewed results, but it's likely that college enrollment is being conflated with dual enrollment. For instance, districts with many highly capable students are more likely to have high rates of two year enrollment and low rates of four year enrollment, likely because many highly capable students are attending their local community college while in high school.

A better use for this panel data is to serve as a control for regression analysis on individual-level microdata from ACS.

The next step for this analysis is to perform a cluster analysis to learn if there are any commonalities among school districts with high college go-on rates, and then to incorporate ACS microdata.