ODOT Equity

Introduction

The analysis in this section attempts to identify equity implications of ODOT's scenario planning effort. The basic methodology consists of assessing the relationships between the equity data provided by ODOT, which is derived from demographic Census data, with the VE-State outputs at the household level. The workflow involves averaging the VE household metrics at the area type geographic level and then joining the ODOT equity block groups to the VE area types. The end result is an analysis of statistical relationships – using linear regression - between observed equity characteristics and modeled VE metrics.

ODOT Equity Data

- Census-derived demographic data summarized at the block-group level (2,525 records)
- Variables include Disability, Poverty Status, Limited English, Older Population, Younger Population, Race (White, Non-White), No Vehicle, Transit Distance, Overcrowding, Equity Index

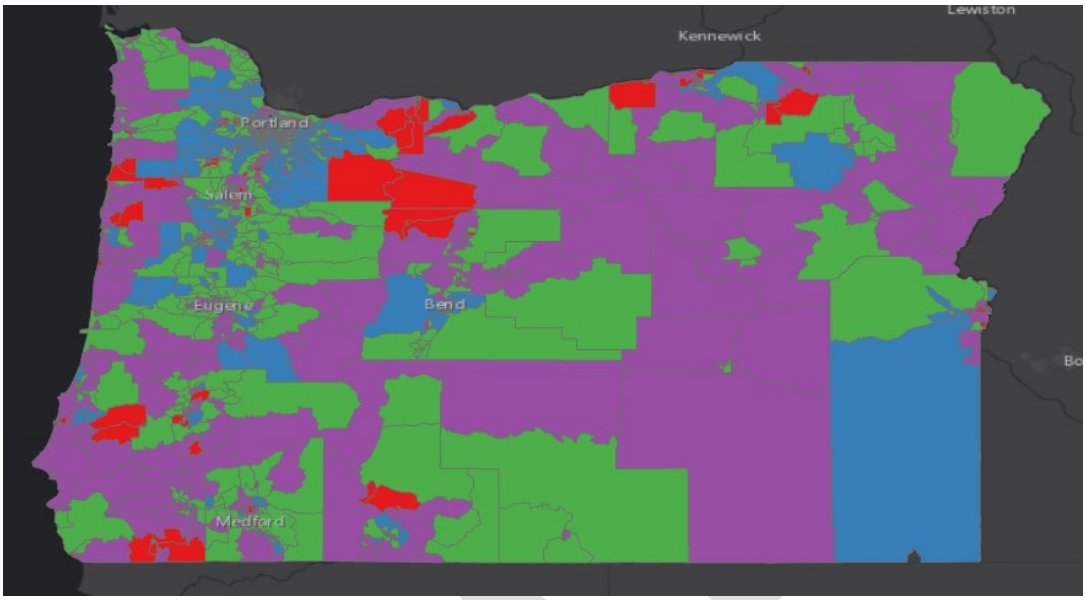
VisionEval Household Data

- 2010 base year household level VE data averaged at the area-type level (1.5 million household records averaged over 124 area types)
- Area type geometries were created via census block groups using the Place Types USA shiny app, which is based upon the EPA Smart Location Database. See Appendix A for parameters used to define area type geographies.
- Variables include VMT, Transit Trips, Walk Trips, Bike Trips, Vehicle Cost, CO2

Geographies

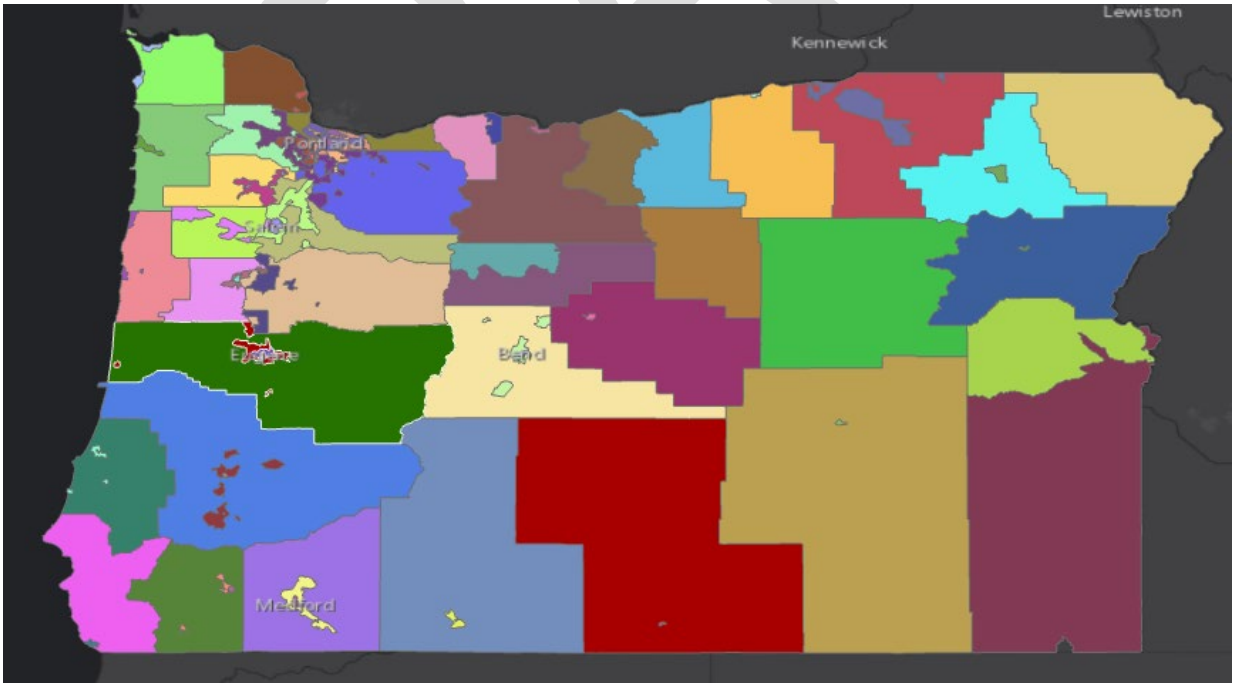
Equity block Groups

There are roughly 2,600 geographies in the state of Oregon, reported from the US Census.



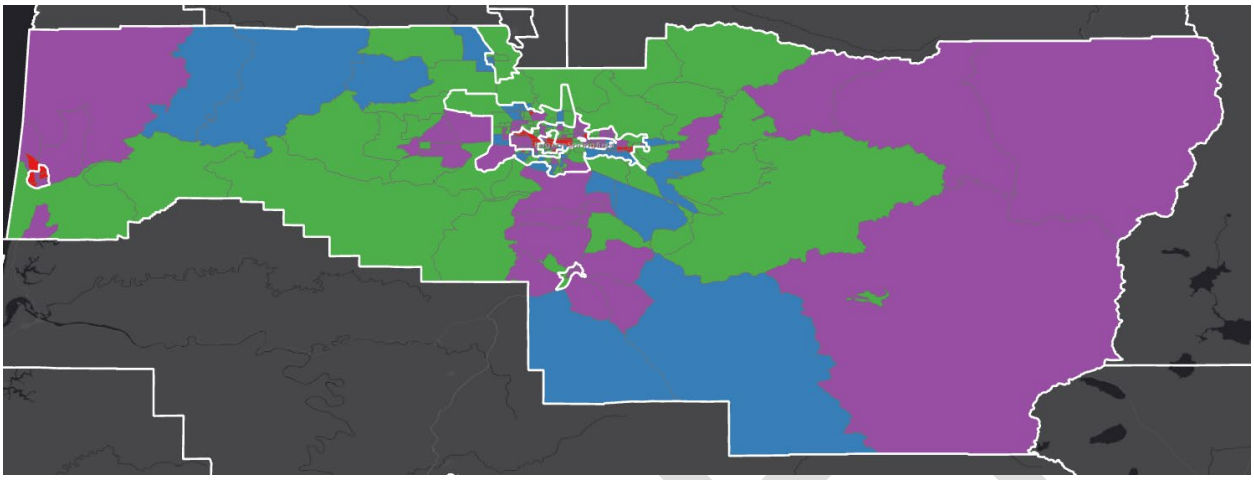
VisionEval Area Types

There are 127 area type geographies for Oregon in Vision Eval State. These geographies were created using the Place Type USA shiny app.



Overlay of Area Types and Block Groups

This analysis grouped the census block groups into the generally larger area type geometries. As part of this workflow, the equity data and VE outputs were summarized using weighted means and quartiles.



	GEOID	id	eq_cat	StateEquit	TransitTrips	BikeTrips	OwnCost	DailyCO2e
1001	410019503001	Baker-Fringe	low_med	0.9193139	0.1334816	0.04183525	6073.577	34.90521
1009	410019505001	Baker-Fringe	low_med	0.7451598	0.1334816	0.04183525	6073.577	34.90521
1010	410019502001	Baker-Fringe	low_med	0.9158498	0.1334816	0.04183525	6073.577	34.90521
1011	410019501001	Baker-Fringe	low_med	0.9287414	0.1334816	0.04183525	6073.577	34.90521
1842	410019506003	Baker-Fringe	med_high	1.0744669	0.1334816	0.04183525	6073.577	34.90521
1919	410019503003	Baker-Fringe	med_high	1.0942354	0.1334816	0.04183525	6073.577	34.90521
1920	410019501002	Baker-Fringe	med_high	1.1178975	0.1334816	0.04183525	6073.577	34.90521
1921	410019506001	Baker-Fringe	med_high	1.1204000	0.1334816	0.04183525	6073.577	34.90521
1922	410019503002	Baker-Fringe	med_high	1.0754110	0.1334816	0.04183525	6073.577	34.90521
1923	410019501003	Baker-Fringe	med_high	1.0056709	0.1334816	0.04183525	6073.577	34.90521
2443	410019506002	Baker-Fringe	med_high	1.0335125	0.1334816	0.04183525	6073.577	34.90521
37	410019504002	Baker-Outer	high	1.2685285	0.1113635	0.04347298	5498.419	30.88120
977	410019502002	Baker-Outer	low_med	0.8771768	0.1113635	0.04347298	5498.419	30.88120
1008	410019504003	Baker-Outer	low_med	0.7208948	0.1113635	0.04347298	5498.419	30.88120
1579	410019505002	Baker-Outer	low_med	0.8701959	0.1113635	0.04347298	5498.419	30.88120
1610	410019502003	Baker-Outer	low_med	0.9003504	0.1113635	0.04347298	5498.419	30.88120
1611	410019504001	Baker-Outer	low_med	0.8665700	0.1113635	0.04347298	5498.419	30.88120
577	410030101001	Benton-Fringe	low	0.5815777	0.1743470	0.06089412	6272.083	35.99230
578	410030101002	Benton-Fringe	low	0.4903475	0.1743470	0.06089412	6272.083	35.99230
579	410030101005	Benton-Fringe	low	0.6513184	0.1743470	0.06089412	6272.083	35.99230
583	410030005003	Benton-Fringe	low	0.6538305	0.1743470	0.06089412	6272.083	35.99230
600	410030104001	Benton-Fringe	low	0.5818346	0.1743470	0.06089412	6272.083	35.99230
601	410030102003	Benton-Fringe	low	0.6639452	0.1743470	0.06089412	6272.083	35.99230
602	410030102001	Benton-Fringe	low	0.5968098	0.1743470	0.06089412	6272.083	35.99230
603	410030101004	Benton-Fringe	low	0.5905023	0.1743470	0.06089412	6272.083	35.99230
606	410030109001	Benton-Fringe	low	0.6113738	0.1743470	0.06089412	6272.083	35.99230
608	410030103002	Benton-Fringe	low	0.6451966	0.1743470	0.06089412	6272.083	35.99230
1256	410030009004	Benton-Fringe	low_med	0.7817608	0.1743470	0.06089412	6272.083	35.99230
1258	410030104002	Benton-Fringe	low_med	0.7587282	0.1743470	0.06089412	6272.083	35.99230

Showing 1 to 30 of 2,625 entries, 8 total columns

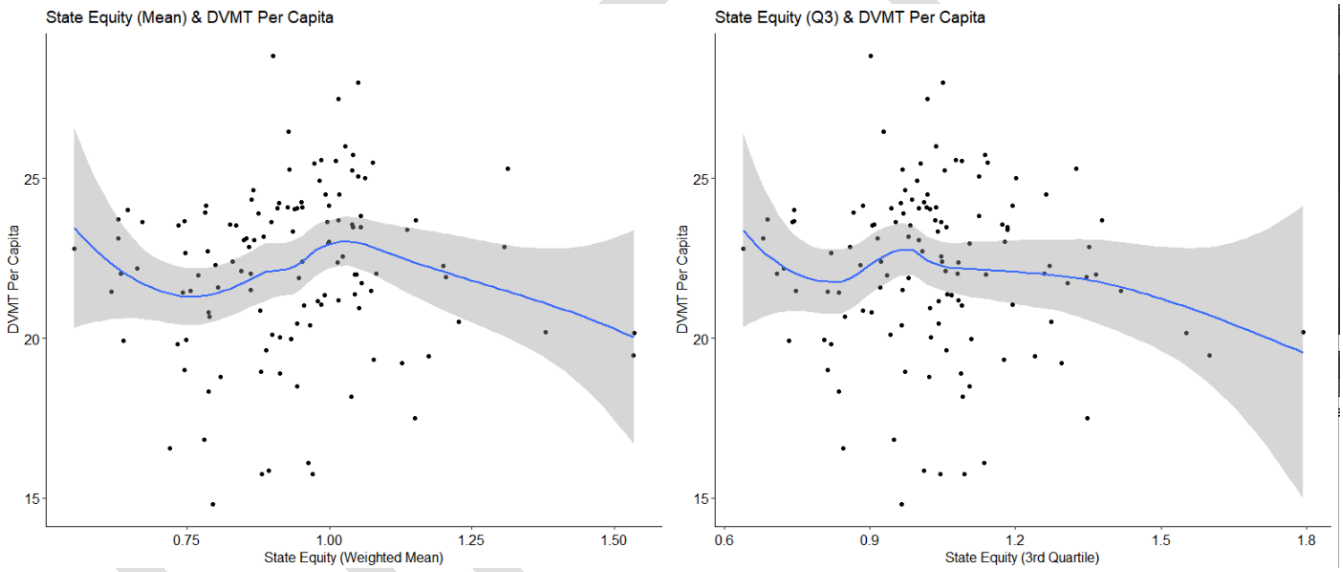
id	Dvmt_mean	TransitTrips_mean	WalkTrips_mean	OwnCost_mean	equity_mean
Baker-Fringe	60.18298	0.13574292	0.8555150	6673.927	1.0117415
Baker-Inner	41.04745	0.15484574	0.7101777	4132.539	0.8781079
Baker-Outer	53.43666	0.12003836	0.7763863	5788.651	0.7451598
Benton-Center	35.56878	0.26908888	0.8404661	4367.411	0.8937032
Benton-Fringe	61.95944	0.21230826	0.9446849	5911.223	0.6467344
Benton-Inner	45.47539	0.18576685	0.8090001	4854.678	0.7458801
Benton-Outer	58.71075	0.16152771	0.8198086	5691.753	0.7479116
Clackamas-Center	37.58085	0.31278340	0.8108398	4561.118	0.7209827
Clackamas-Fringe	62.26504	0.21322932	0.8607089	6149.448	0.6300817
Clackamas-Inner	49.99177	0.20890361	0.7890033	5350.137	0.6382368
Clackamas-Outer	58.65148	0.19820326	0.8205523	5916.466	0.6338226
Clatsop-Center	43.84637	0.15607118	0.7277733	4339.604	1.0523042
Clatsop-Fringe	59.14821	0.17926307	0.8836079	5685.296	0.8670296
Clatsop-Inner	45.74598	0.13836270	0.7375579	4696.345	0.9802737
Clatsop-Outer	55.34001	0.15133645	0.8030987	5429.222	0.8853139
Columbia-Center	46.74666	0.16404314	0.7442929	5158.359	0.7435966
Columbia-Fringe	61.96854	0.19231937	0.8886327	6619.255	0.7813985
Columbia-Inner	52.85303	0.16153623	0.8003283	6336.441	0.7487000
Columbia-Outer	57.75248	0.15959105	0.8124642	6284.708	0.8296019
Coos-Center	44.79418	0.12883672	0.7175902	5110.261	0.9858888
Coos-Fringe	54.11203	0.15181697	0.8339602	5817.249	0.9991084
Coos-Inner	48.95713	0.12770113	0.7735561	5817.176	0.9128029
Coos-Outer	54.68952	0.12966075	0.7941395	5890.454	0.9977678
Crook-Center	38.28738	0.18176967	0.8291887	4185.938	1.0382745
Crook-Fringe	59.42876	0.18138830	0.8876503	6610.227	0.9268131
Crook-Inner	55.94167	0.19997057	0.8124919	6030.610	1.0446973
Crook-Outer	54.73296	0.14099394	0.7981578	6143.808	1.0238153
Curry-Center	35.62230	0.09807434	0.6504455	3641.757	0.9657873
Curry-Fringe	57.82004	0.12505777	0.8639095	5432.855	0.9737420
Curry-Inner	40.59765	0.09226831	0.6822536	4059.489	1.0559223
Curry-Outer	49.49594	0.10190272	0.7505502	4768.883	1.0544059
Deschutes-Center	34.30879	0.36371003	0.7787438	4197.357	0.7802721
Deschutes-Fringe	62.30736	0.18668140	0.8602171	6214.372	0.7834891
Deschutes-Inner	51.65891	0.13651034	0.7043485	5330.302	0.7703396
Deschutes-Outer	59.76004	0.13794555	0.7585478	5959.539	0.8363413
Douglas-Center	45.85650	0.13635362	0.7445386	5284.077	0.9439101
Douglas-Fringe	59.25618	0.16514403	0.8765889	6398.020	0.9381305
Douglas-Inner	52.30279	0.12366459	0.7761339	5999.626	0.9912960
Douglas-Outer	53.54319	0.13514401	0.7908990	5933.042	1.0144183

ng 1 to 39 of 124 entries, 20 total columns

Analysis

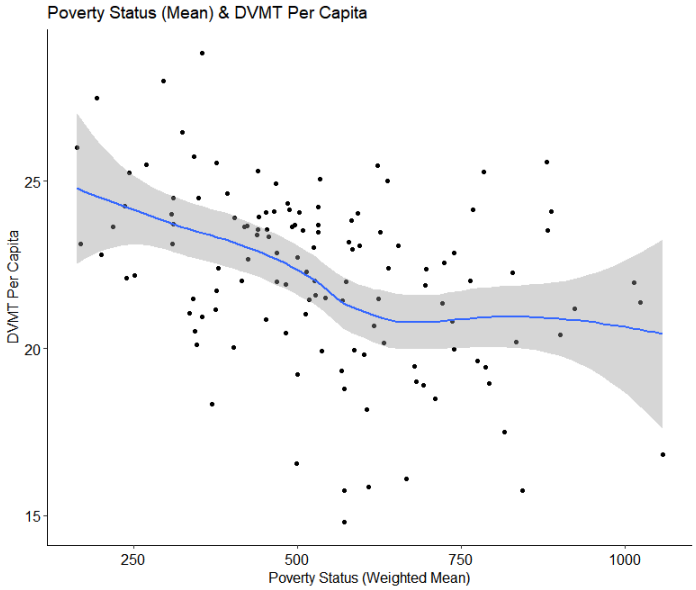
State Equity & VMT

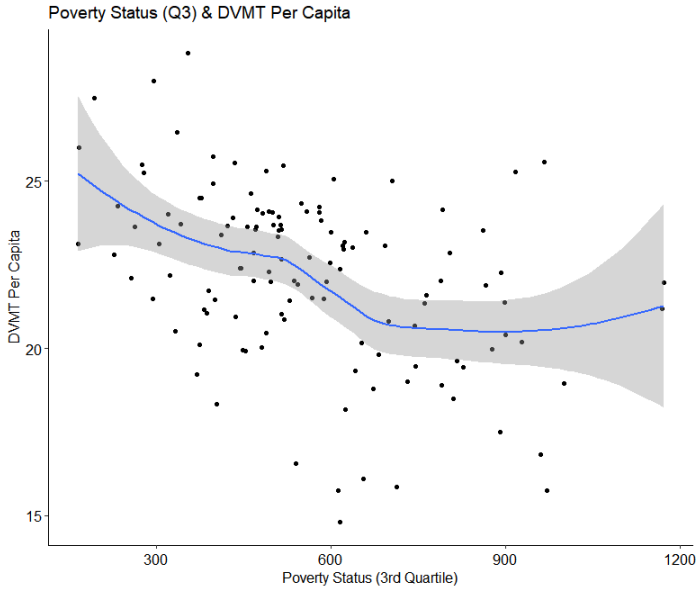
After exploring several ways to summarize the data, the first pertinent relationship we analyzed was vmt per capita and state equity. The state equity variable is an index value that incorporates a variety of demographic variables that indicate vulnerable or disadvantaged populations. For state equity, we looked at both the weighted mean, as well as the 3rd quartiles (75 percentile). Both analyses showed no relationship between state equity and vmt per capita, with very high p-values and low r-squared. It is likely that this lack of relationship is due to the fact that the state equity index combines a variety of different measures and averages all those measures across relatively large areas (area types), which generalizes the data too much to identify anything specific or meaningful.



Poverty & VMT

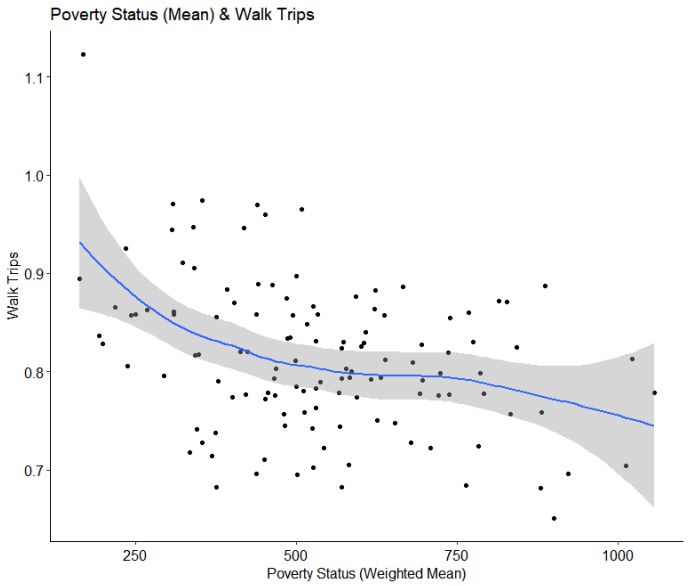
Next, we looked at the individual variables that comprise the equity index, in relation to the VE household outputs. First, poverty status and vmt per capita showed a relationship that was significant and an R2 at ~15% for both the mean and 3rd quartile of data. This initial analysis seems to indicate a negative relationship, where vmt per capita decreases as poverty status increases.

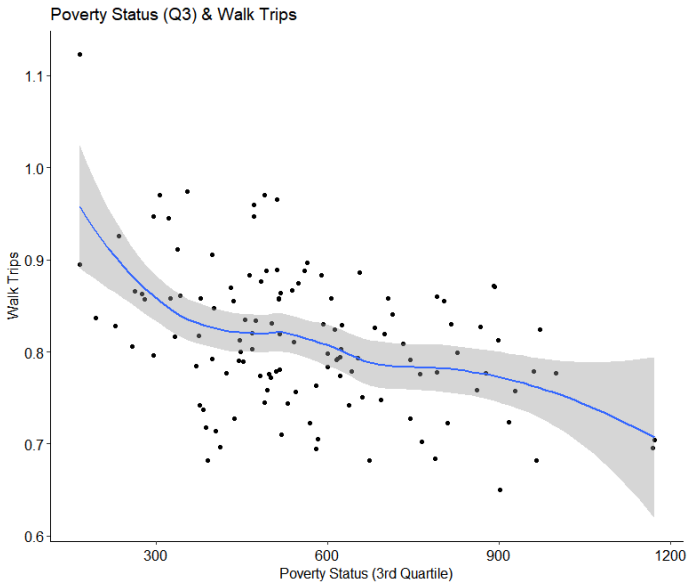




Poverty & Walk Trips

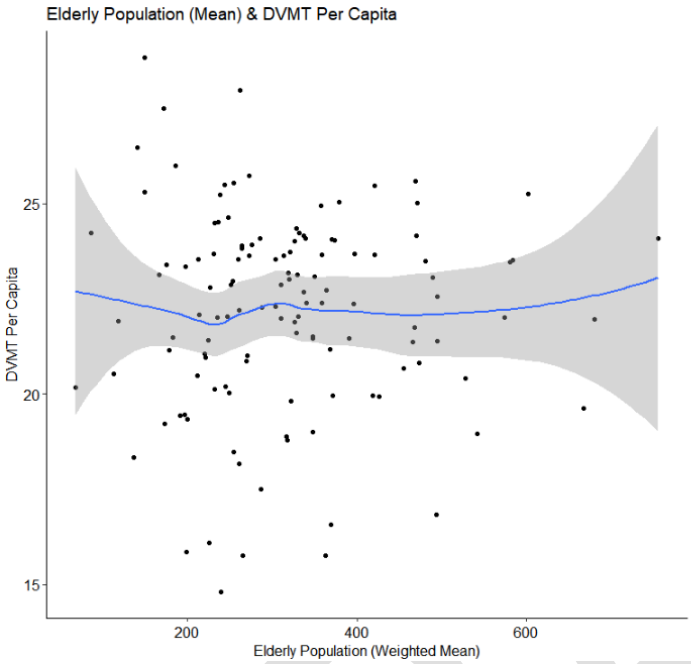
Next, we looked at poverty status but this time in relation to the average number of walk trips per area type. This analysis also yielded meaningful results, as the linear regression demonstrated a very small p value and an r-squared at 13% and 16% for the mean and 3rd quartile of data respectively. It appears as if there's a negative relationship between poverty status and the number of walk trips; as poverty status increases the number of walk trips decrease.

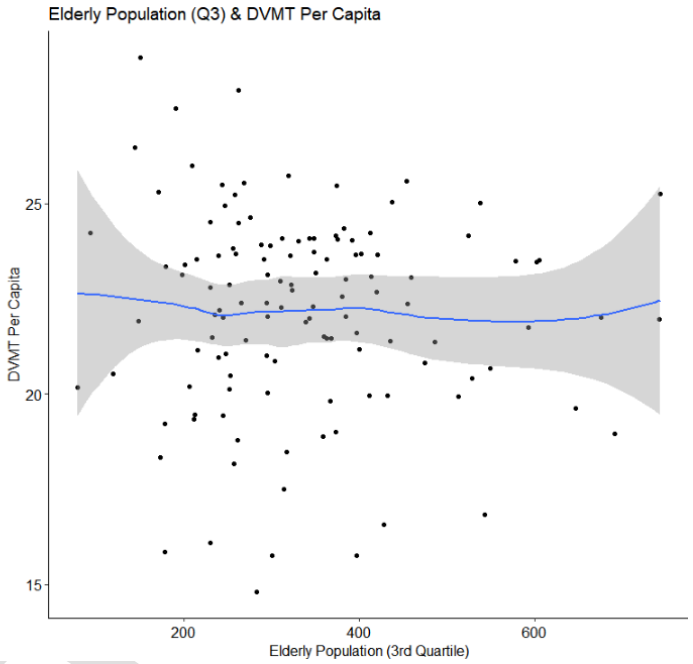




Elderly Population & VMT

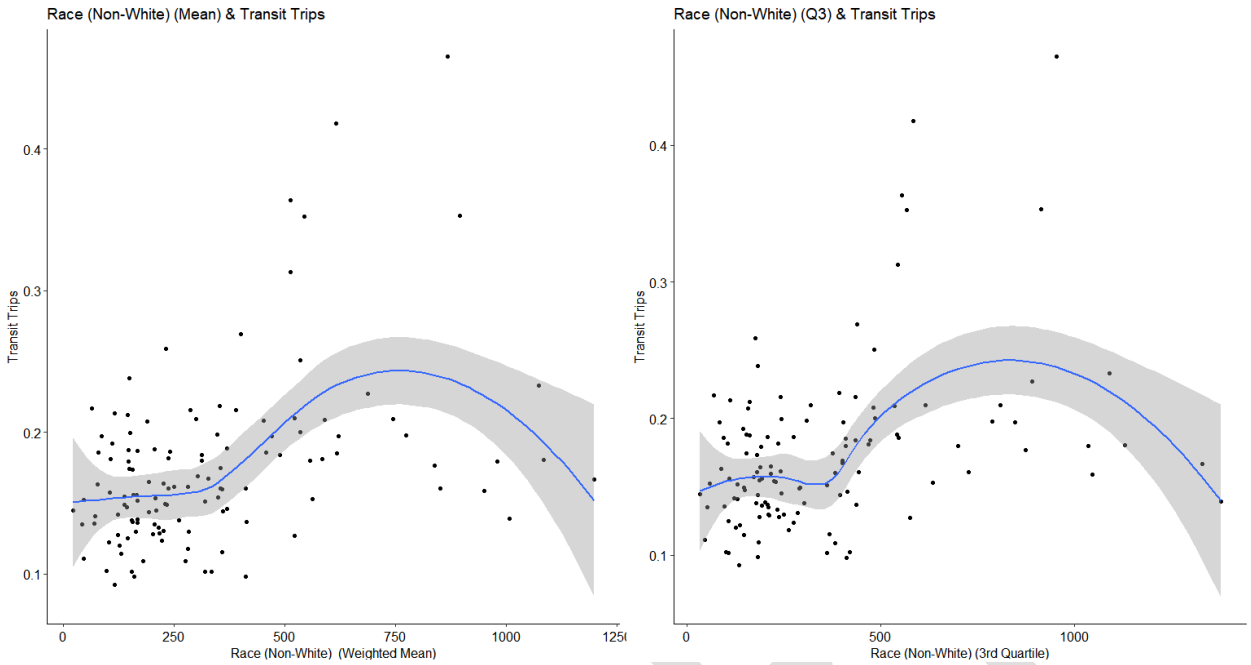
In addition, we looked at elderly population and vmt per capita but were unable to identify a meaningful relationship for both the weighted mean and 3rd quartile of values. Although further analysis should be considered, the available data indicates that there is not a relationship between an area type's share of elderly population and vmt per capita.





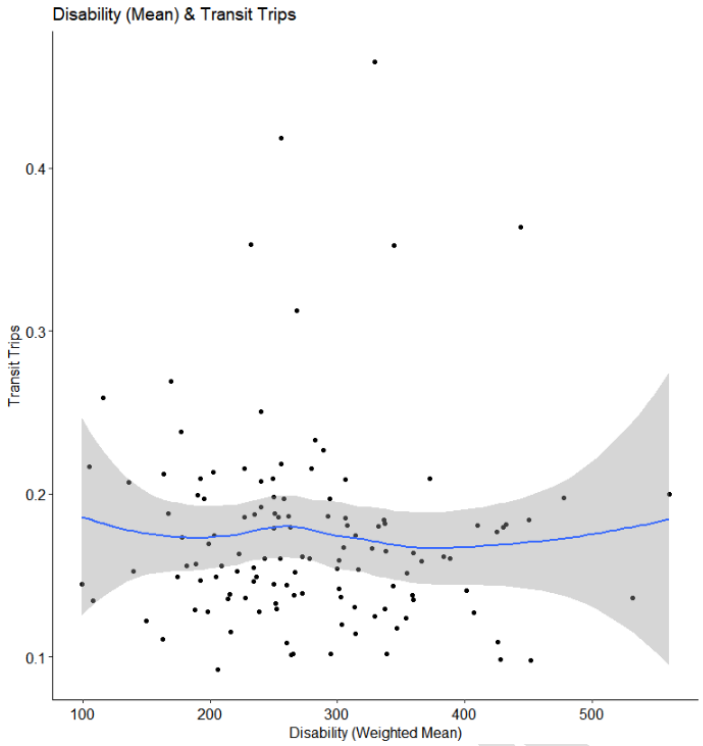
Race & Transit Trips

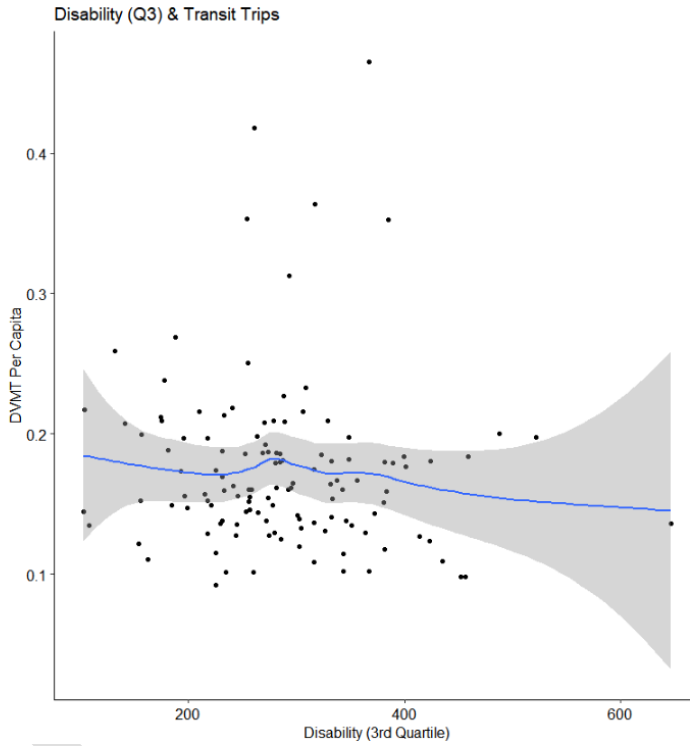
Another variable that comprises the state equity index is the proportion of non-white population. An initial regression analysis shows a significant relationship and an R2 of 13% and 16% for the mean and 3rd quartiles of the data. The graph indicates a positive relationship between the number of transit trips and the proportion of non-white population, though it is possible that the relationship is non-linear.

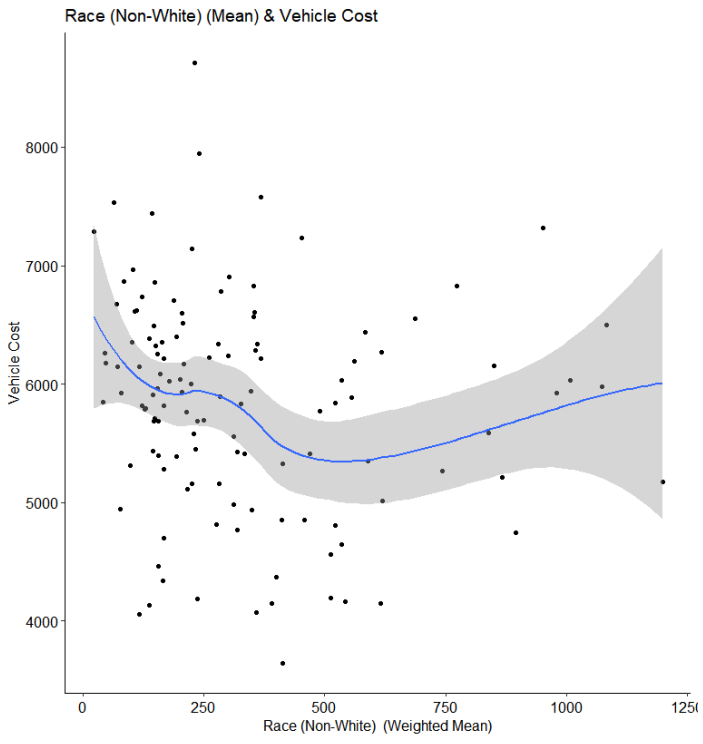


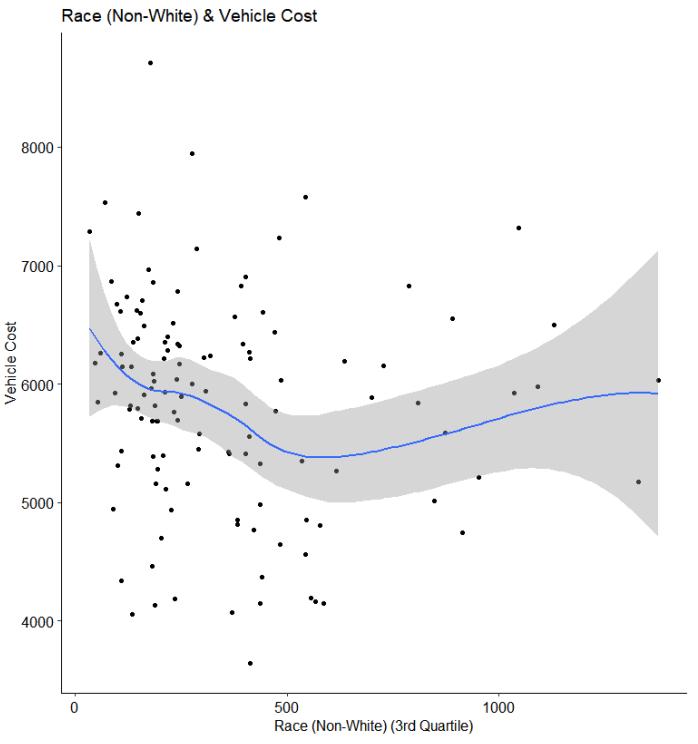
Other Relationships between variables

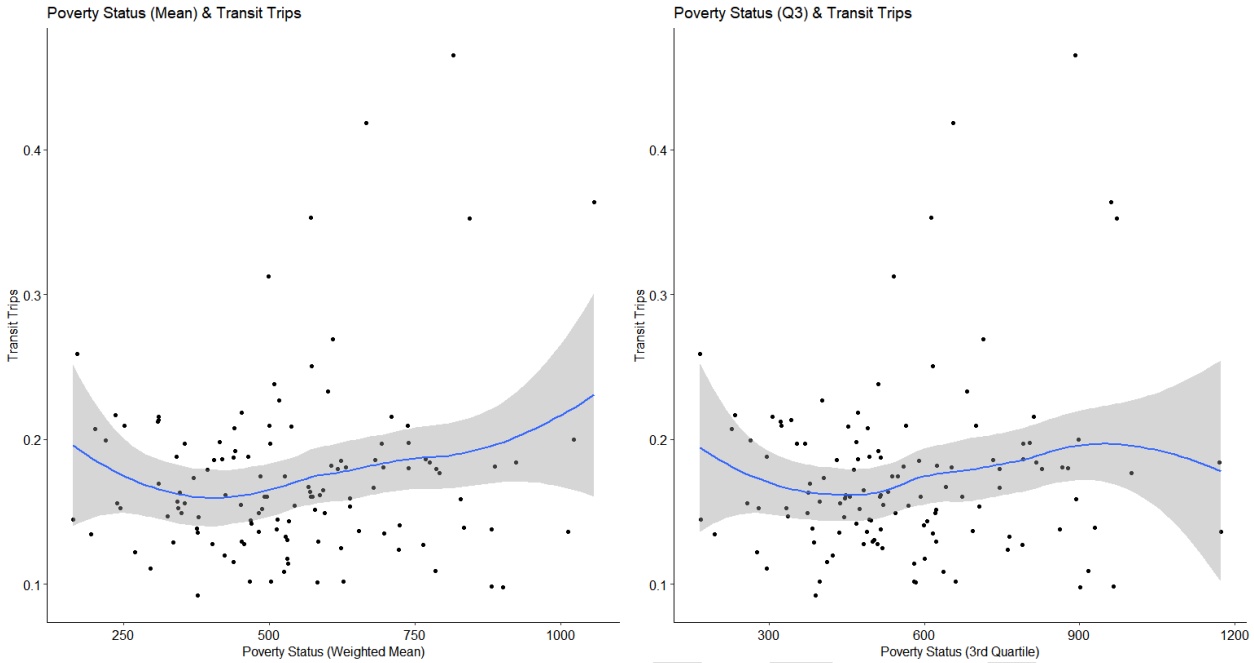
Lastly, we looked at the relationships between a variety of other variables, which did not yield any meaningful insights. This included looking at disabled population & transit trips, race & vehicle costs, and poverty status & transit trips. These analyses showed relationships that were not significant at the area type level. Again, it is possible that the geographic constraint of the area-type level household data is masking any meaningful relationships. It is possible that if that VE household data were able to be averaged at the block-group level, then meaningful relationships between these variables may arise.


Disability (Mean) & Transit Trips
Transit Trips
0.4
0.3
0.2
0.1
100
200
300
400
500
Disability (Weighted Mean)


Disability (Q3) & Transit Trips
DVMT Per Capita
0.4
0.3
0.2
0.1
200
400
600
Disability (3rd Quartile)


Race (Non-White) (Mean) & Vehicle Cost
Vehicle Cost
8000
7000
6000
5000
4000
0
250
500
750
1000
Race (Non-White) (Weighted Mean)


Race (Non-White) & Vehicle Cost
Vehicle Cost
8000
7000
6000
5000
4000
0
500
1000
Race (Non-White) (3rd Quartile)



Appendix A – PlaceTypes USA Shiny App Parameters