What Drives Place-Based Development in Maryland?

An Examination of 1980-2020

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December 1, 2020

Objective

The population of Maryland has been expanding rapidly. However, these population gains are not located uniformly across the state. The unique placement of two metropolitan areas (Baltimore and Washington D.C.), as well as the states unique geography impact where the population changes take place over time. The objective of this project is to identify main factors that coincide with the development of once rural areas. Here I focus on employment rates, housing, and transportation and the degree to which these, individually and in combination, influence where people choose to live. I examine these factors to help identify those areas of Maryland that contain population growth above the state average. Finally, I demonstrate how these primary drivers of population change are affecting these areas.
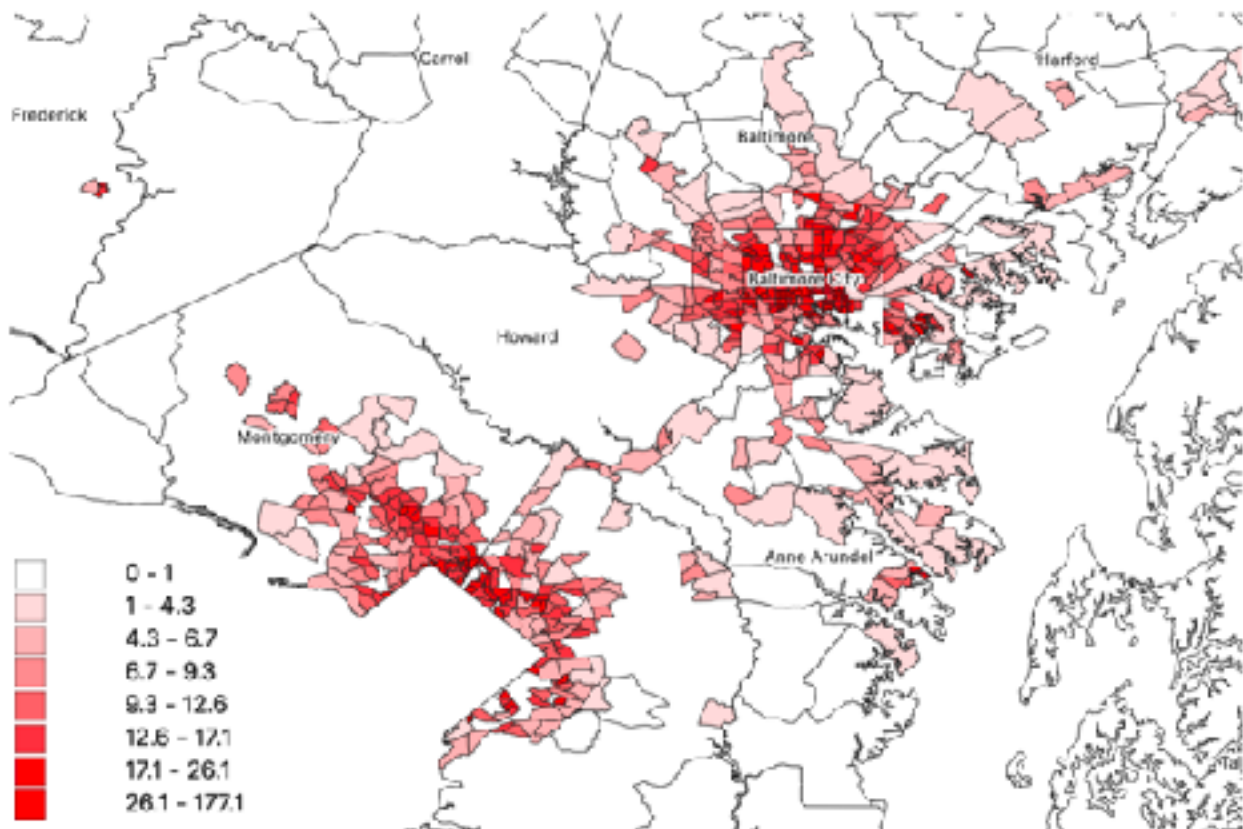

Figure 1: Population Increase (People sq/mi) 1980-2010

To begin, Figure 1 shows the increase of population density (people per sq/mi) in areas for which there is matching tract level data available.

Geography

Maryland has unique geographical characteristics that lead to variations in population settlement. On the east coast there is a coastline with the Atlantic Ocean featuring beaches that are popular with tourists, as well as farmland. In the in the western half of the state, dense urban and suburban development fades into rural and mountainous terrain. Additionally, its mid-Atlantic placement allows for a mild experience of all four climate seasons. The separation of the two halves of the state is done primarily by the Chesapeake Bay. The two sides are mainly linked by one bridge. This separation leads to a much different population characteristic as the eastern side of the state is isolated from many of the metropolitan influences.

Influencing Factors

Three factors I decided to focus heavily on were employment, housing, and transportation. These factors are closely related and dependent on each other. Combined, these factors may provide an insight into population change in Maryland over the period in question. Each factor can be quantified using mostly existing data. The following is how each factor was quantified in this project.

- Employment: Workforce compared to labor force (eligible to work vs employed)
  - Influencers:
    - Economy
    - Distribution of labor force
    - Pay

- Housing: Number of housing units as well as housing values
  - Influencers:
    - Environment (Schools, Parks, Community)
    - Commuting
    - Cost
- Transportation: Daily Traffic Volume and Rail Ridership
  - Influencers:
    - Population
    - State and local planning/funding

When choosing a place to live or a place to work, which comes first? Is the house chosen because of where the job is? Or is the job chosen based on the location of the home. This conflict proves that these two factors are closely dependent on one another. Transportation links the home with the workplace as well as the surrounding communities and is vital for growth. There needs to be proper infrastructure in place to support the growing population. Consistent improvements such as additional metro rail lines, new state routes, and highway widening need to be planned years in advance to keep up with increasing demand. Many of these population movements and growth can occur naturally, however, this is not always the case. Across the country, as well as in Maryland, there are areas of "transit oriented development". State incentives are provided to businesses and new residential communities located near major transit hubs. An example of this would be a large outdoor complex with restaurants, shopping and apartments centralized around a metro-rail station or bus depot. Maryland has specific programs targeted at improving this type of development near its new and existing rail stations.
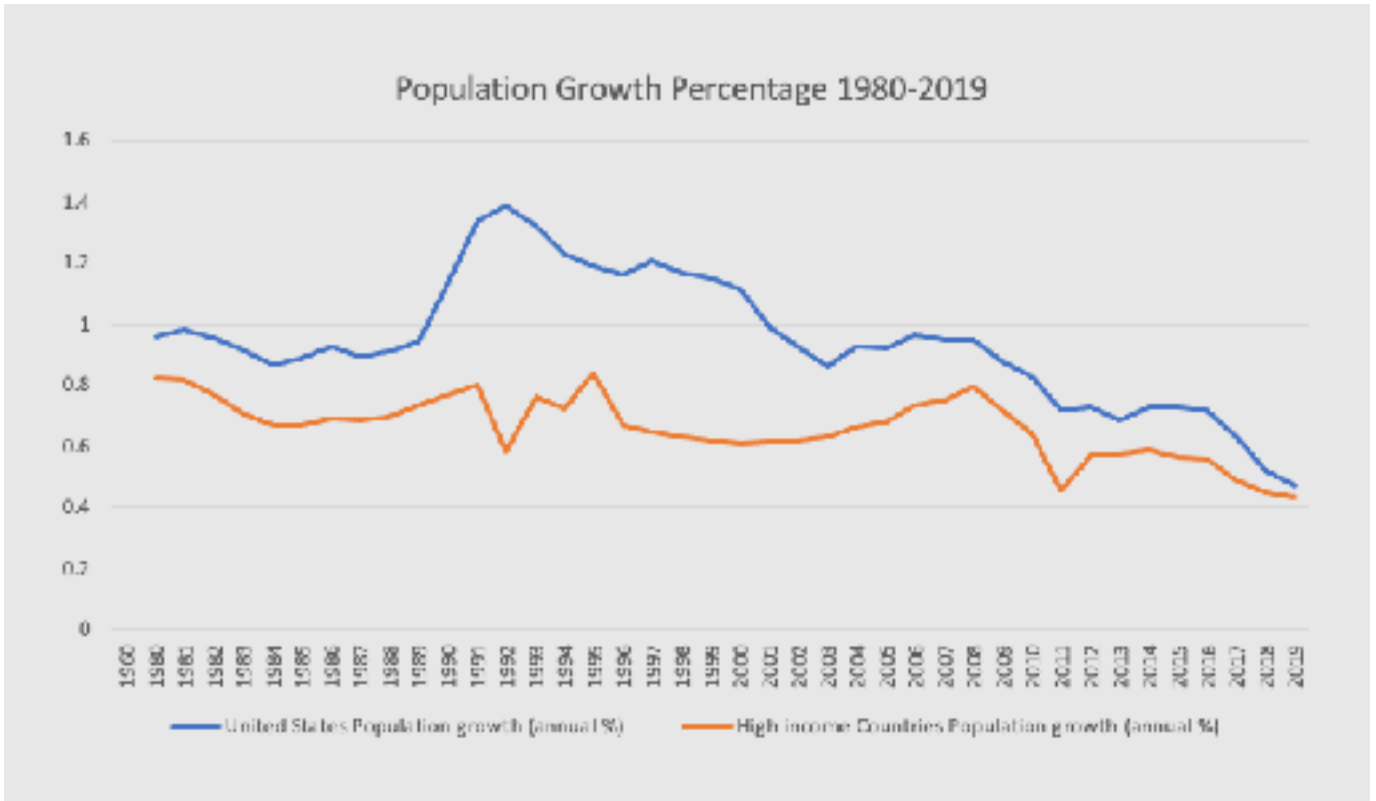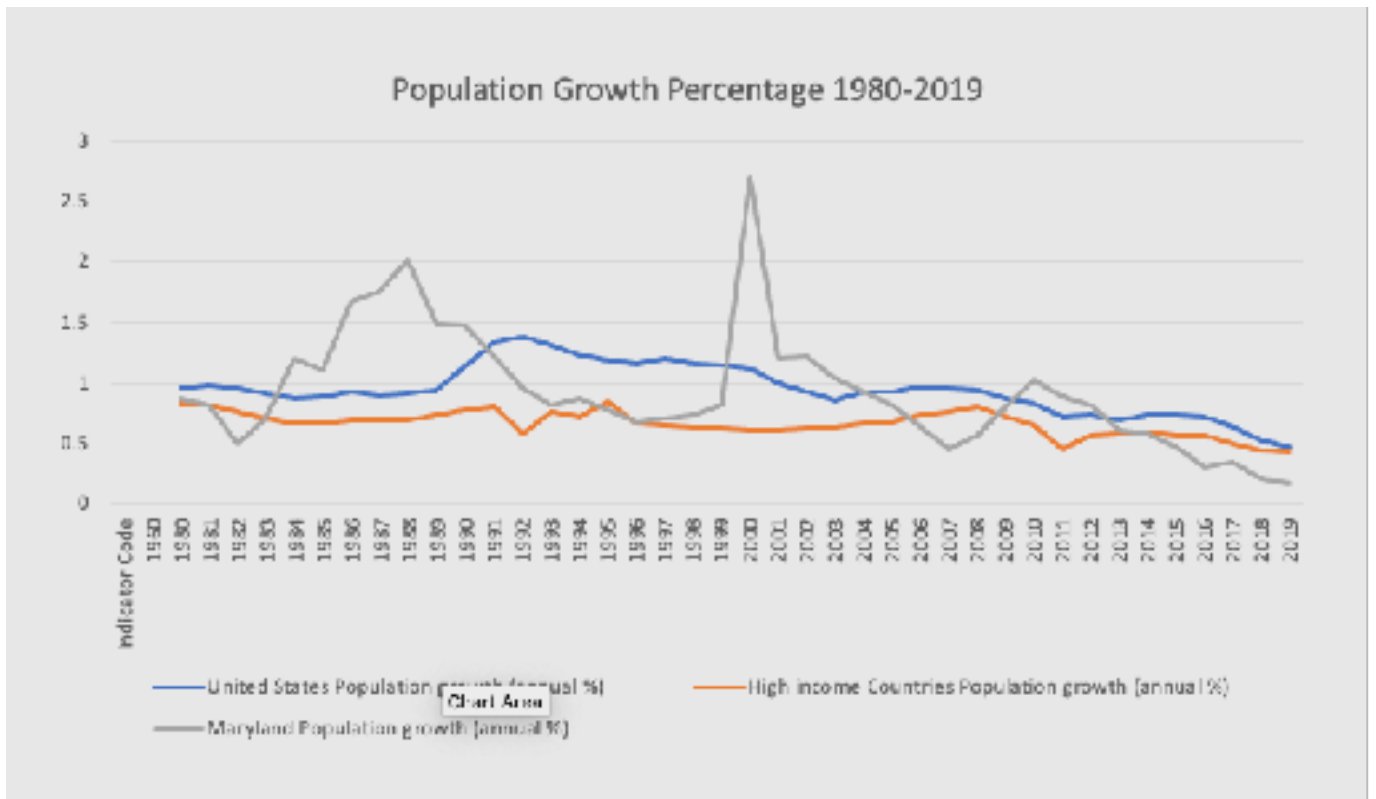
Figure 2

Figure 3

Population Growth

Figure 2 displays the annual population growth for both the United States in blue. Notice that while there is some variation, there is a general trend and they remain mostly consistent with one another between 0.5% and 1.5% year over year. Figure 3 includes the growth percentage for Maryland in grey. In several years, the growth rate exceeds two times the U.S. average and in 1988 and 2000 exceeded three times the global average. The overall population change from 1980 to 2019 was from 4.2-6.1 million people.

Employment

Federal and state government jobs are the largest single employer in Maryland. And while manufacturing jobs that were once plentiful in the 60's and 70's fade away to other parts of the country and the world, jobs in the professional services industry climbed. One example being in health and education. Many of these government positions are located both in and surrounding Washington DC. Allowing Maryland to be a great option for commuting workers. This combination leads to a more educated workforce. Figure 4 shows the variety of employment sectors as well as the number of jobs they bring to the Maryland workforce.
In the result, employment rate will need to either maintain, or generally improve over the course of the timeframe for each tract identified. A reduction in employment rate is not considered a positive sign of development. In future studies this could be applied to also help identify areas in decline.
Figure 5 displays the general stability that the labor market in Maryland has had over the past 40 years. With consistent growth and only minor jumps in unemployment occurring during major nationwide economic events. From
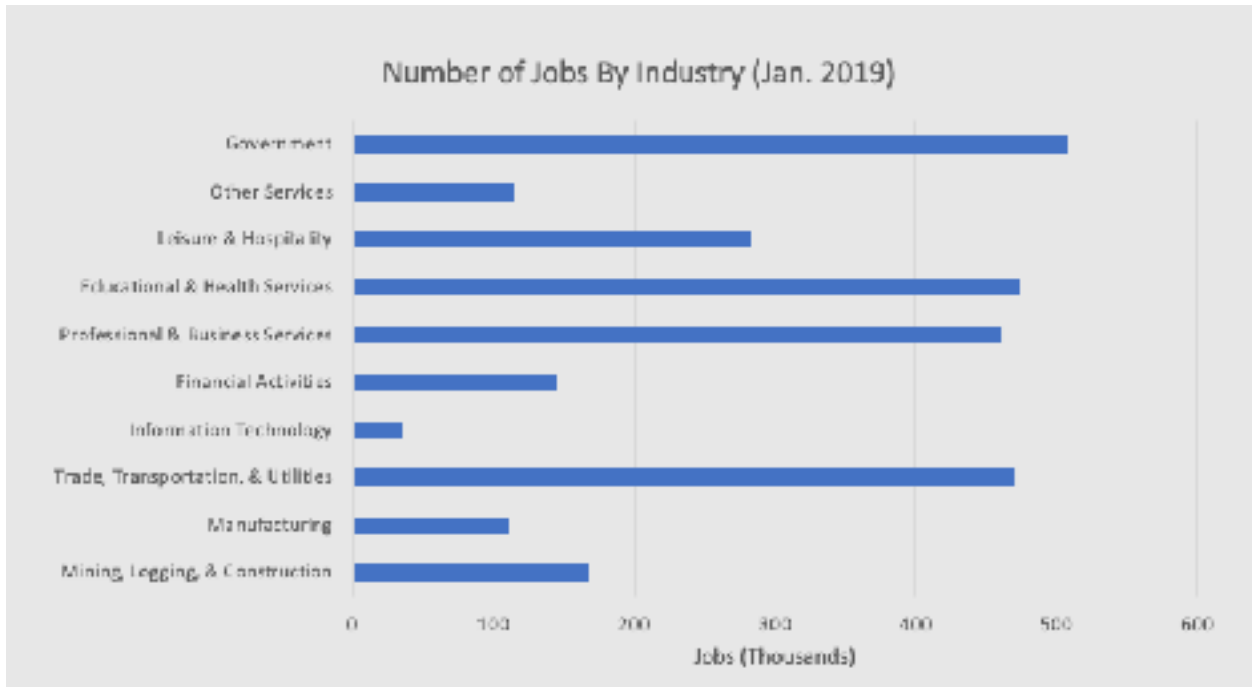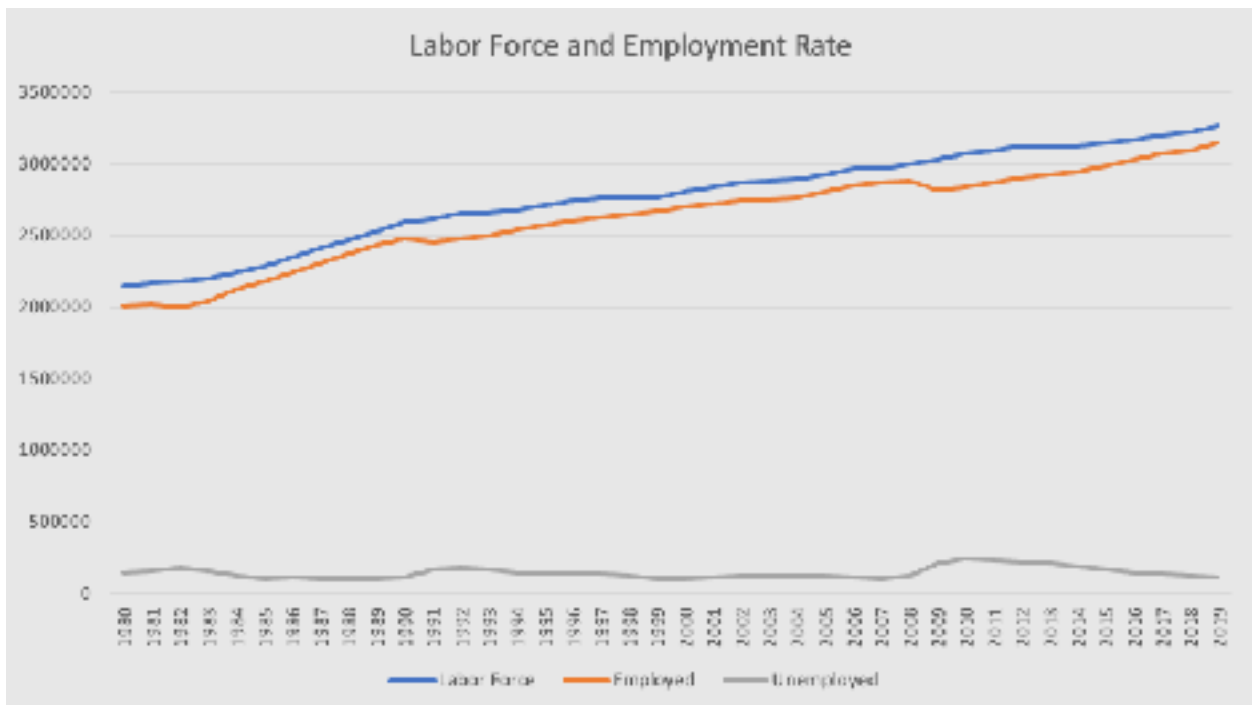
Figure 4

Figure 5

1980-2020, this amounts to ~65% increase in eligible workers and a 40 year average unemployment rate of ~5%. (U.S. Census Bureau)

Housing

The second factor considered was median housing values. Newly developed areas tend to go up in value while unimproved urban areas tend to go down in value. In order to analyze this, census tracts were categorized into three categories: rural, suburban and urban. (Figure 6) Then, five different census tracts that fell into each category were selected and averaged to provide median housing prices for the years 1980 and 2000. For example, five tracts that were rural in population density were selected, took their median housing value in 1980, and adjusted it for inflation; which during that time, is about 109% (Bureau of Labor Statistics). Then using the value of the same tract for the year 2000, the average percent change in median household value over the 20-year span was calculated. It was found that for rural and suburban neighborhoods that remained rural or suburban saw a gain between 31% and 35% on average. Leading to an adjusted 1.5% and 1.75% return on investment each year. Meanwhile, tracts that increased in population density saw an even larger jump with suburban homes going up 43% and rural homes going up 53% after adjusting for inflation. Figure 5 is a table showing the changes in population density effect on median housing prices for these census tracts.

For future studies, it was found that urban areas that were unimproved and saw and increase

Housing Type	1980 (in 2000's $'s)	2000	Delta
Rural --> Rural	$141,000	$185,000	31%
Rural -> Suburban	$139,000	$213,000	53%
Suburban -> Suburban	$344,000	$464,000	35%
Suburban-> urban	$211,000	$303,000	43%
Urban ->Urban	$62,000	$75,000	20%
Urban > High Crime Urban	$167,000	$105,000	-38%

Figure 6

in both crime and unemployment, fell by nearly the same rate that the others improved, on average, around 38%. This metric could be used to identify areas in need of additional resources.

Transportation

As population increases, infrastructure needs to continually improve and expand to keep up with demand. As a result, MD has added numerous additional state and interstate freeway segments since 1980. Including:

- The continuation of I-95 through Baltimore to D.C.
- Construction of the Ft. McHenry Tunnel
- Continuation of I-695 and construction of the Francis Scott Key Bridge.
- For Rail networks: (Over 120 commuter rail stations in Maryland)
  - MARC train offering commuter service between Baltimore and DC,
  - Baltimore Metro-rail
  - DC Metro system

Figure 7 shows a a basic outline of where these improvements and expansions have taken place. They are mainly in areas that have already undergone development. Therefore, are more than likely a result of previous rural development rather than a cause of new development. The presence of recent transportation infrastructure can be used as a symbol of growing and developing areas. Additional analysis on traffic for these areas was performed by calculating the difference in daily traffic volume from 2012 to 2018. From there, I found that the average volume increase was around 5%. Therefore, I determined that an increase in volume of three times the state average to be significant. Figure 7 highlights key roadways that saw at least a 15% increase in volume from 2012-2018. (MDOT)
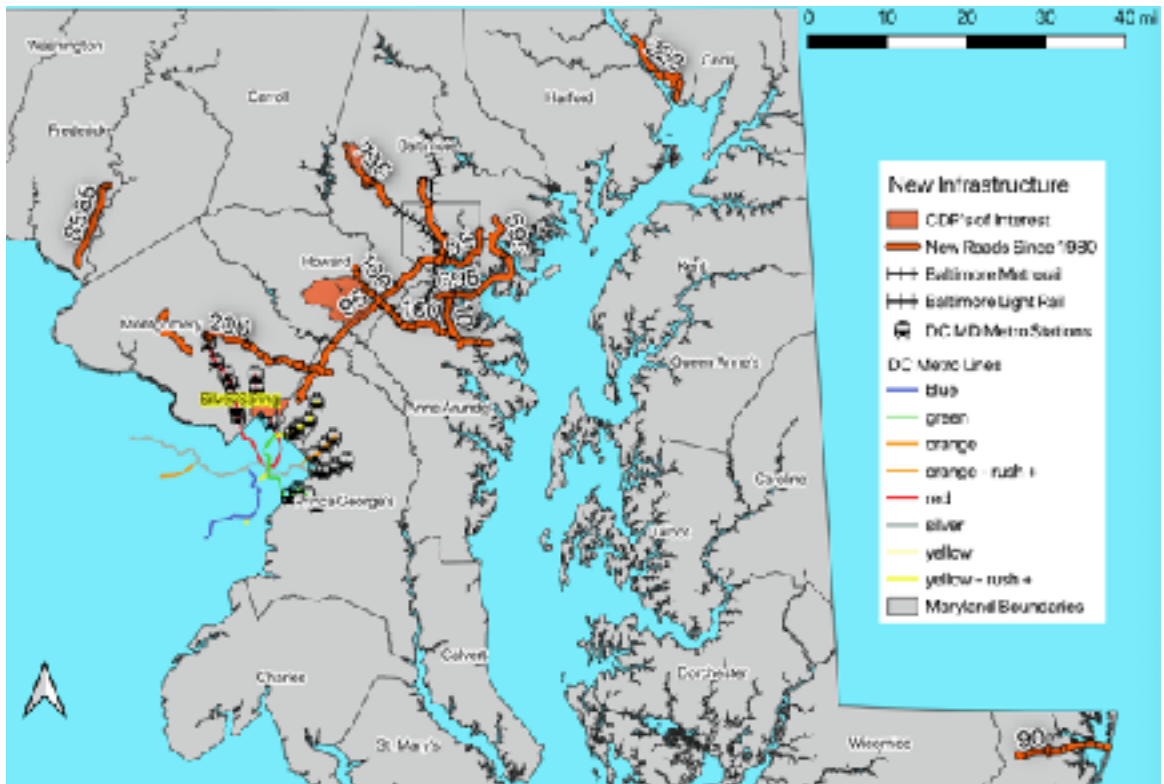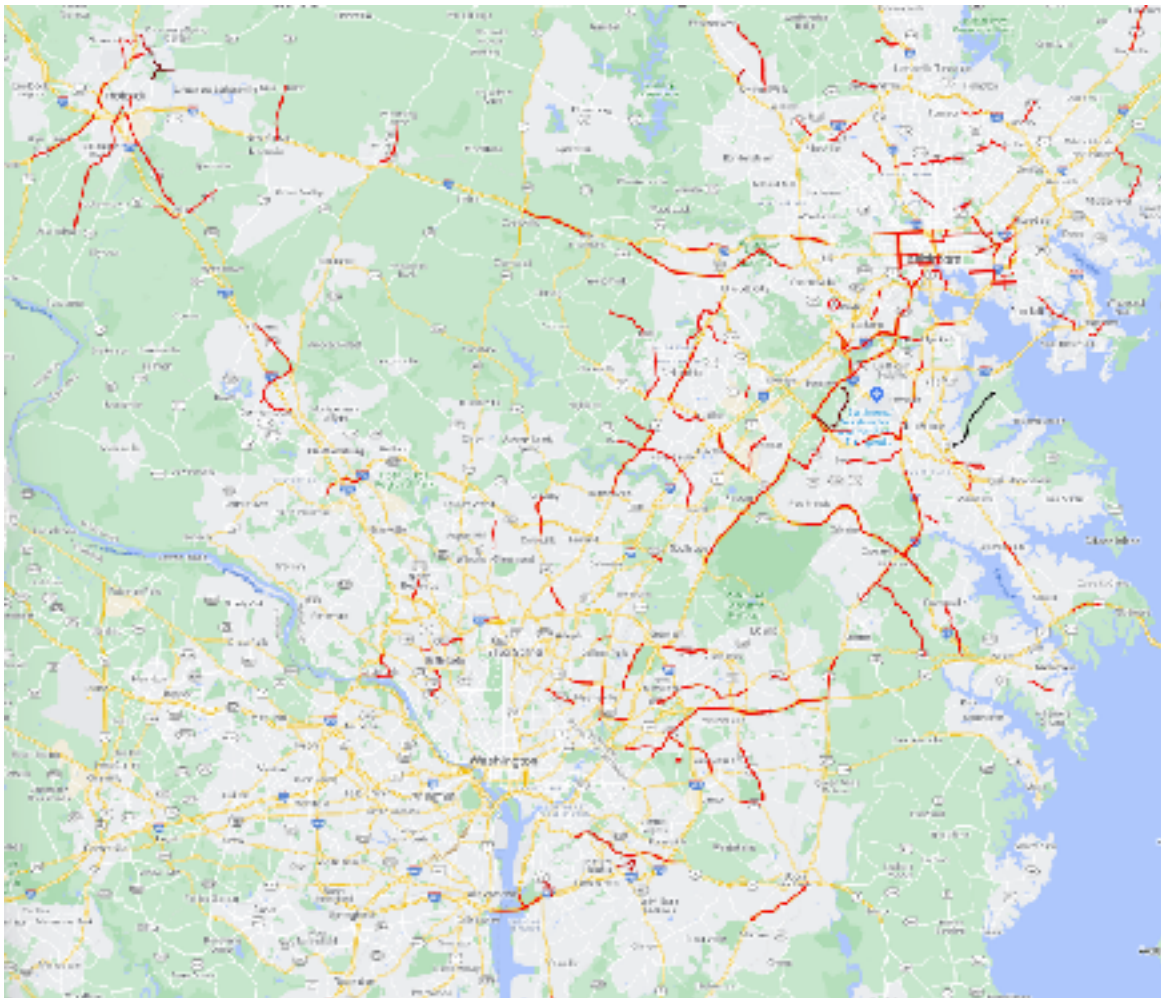
Figure 7

Figure 8

Freeways and divided highways are designed to handle increased volume. The lack of intersections and traffic signals allow people to keep moving at decent speed. However, on smaller local roads and feeder routes that are one or two lanes, the increased volume can drastically affect commuting times. Figure 8 displays all of the roads, including local ones, that saw an increase of at least 15% in traffic volume over 2012-2018. Before observing the population change a prediction can be made on which areas are going to be more densely populated. The areas surrounding DC, Baltimore and Frederick are the most likely.

Population Change

Figure 9 is a population density map by census tract for the year 1980. Here, the population centers are well defined in both Baltimore and Washington D.C. With smaller population groups forming in the northwest part of the state around Frederick and Hagerstown. However, most of the land between these areas is sparsely populated and mostly rural farmland.

Figure 10 is a population density map of 2010 by census tract. Clearly the areas in between the population centers have begun to fill in and develop.

Limitations

One limitation that affected the consistency of data was the use of the census tract as a spatial boundary. I initially wanted to use the tract as I believed it would allow me to hone-in on specific neighborhoods and designated places to analyze change. However, as populations change over time, tracts can be split, or combined to be different then boundaries from other census years. (Brown University, n.d.) While there are ways to estimate what the population of a 2010
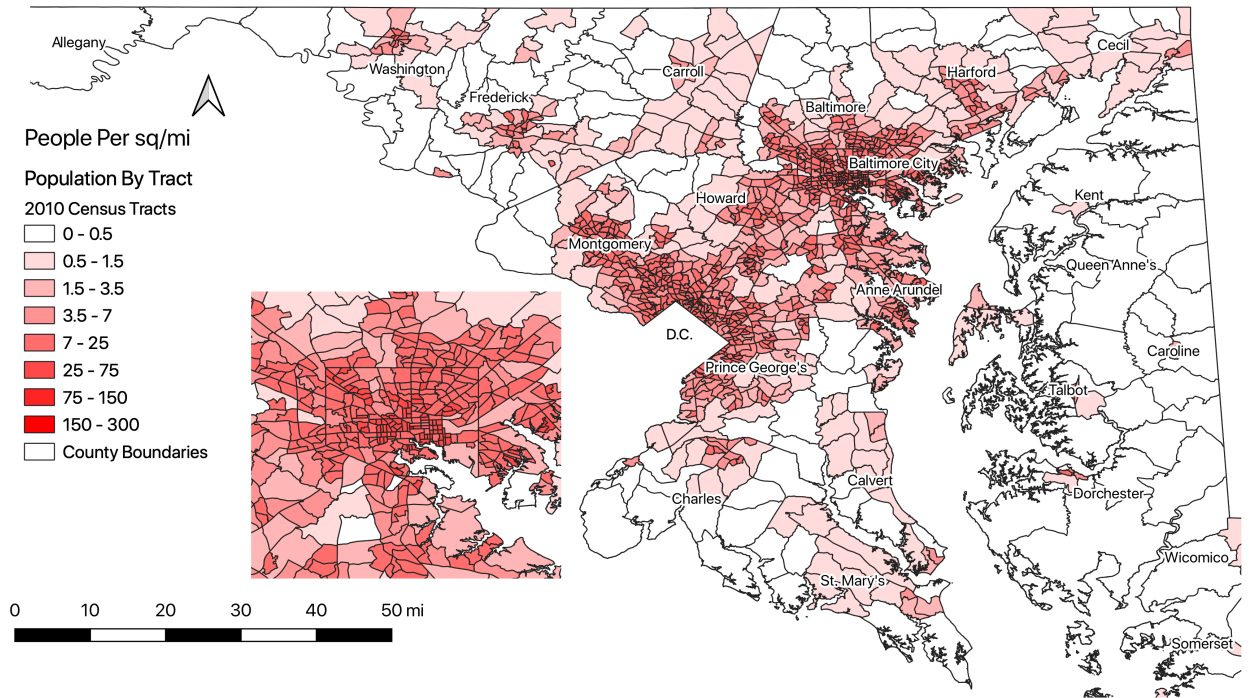
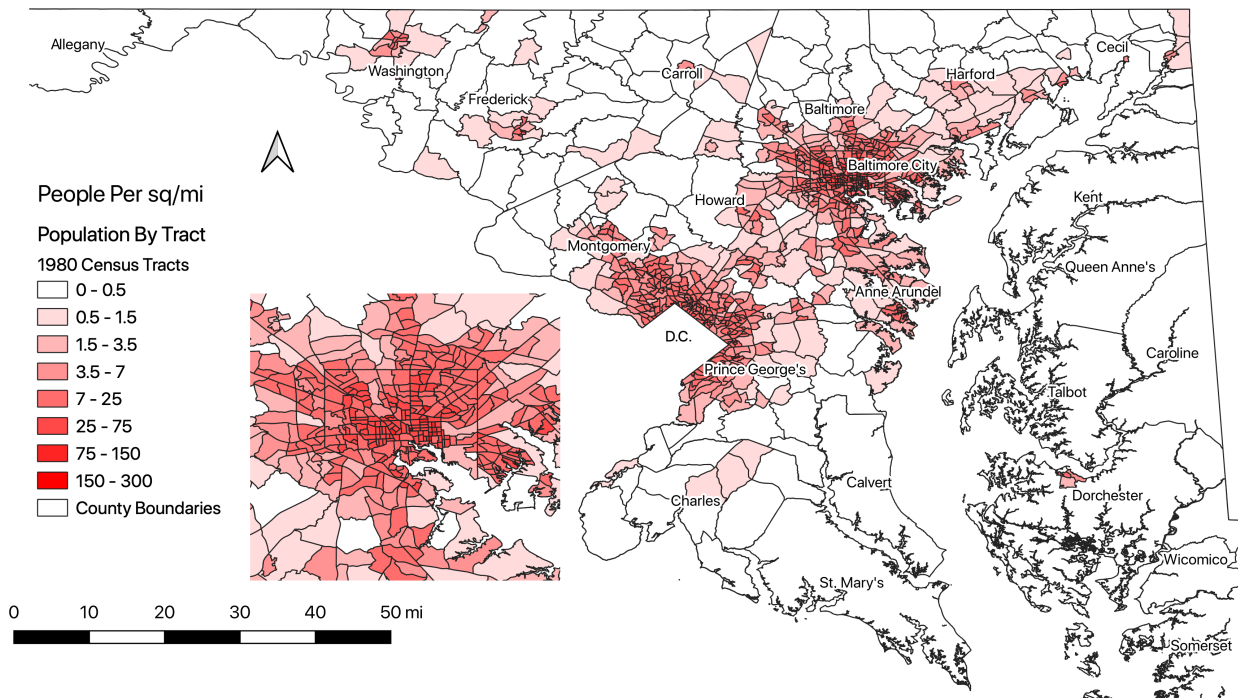Figure 10: Population Density 2010

Figure 9: Population Density 1980

census tract might have consisted of in 1970, it is only an estimate. Additionally, the information on employment and housing was difficult to apply on the tract level, especially from local sources. Some counties were not consistent with others in terms of publishing certain metrics such as historical housing values or employment rates down to the tract level. The ICPSR City and County Data Book had the most consistent temporal availability of metrics, however was missing data for some census tracts in earlier years such as 1970 and 1980.

This issue of data availability carried over to traffic volumes. I found it difficult to find data for the entire study period. For Maryland, the traffic data I used from the MDOT had average daily volumes for most roads in the state dating back until 2012. Before that, data for major roadways is available. However, most is located inside public works documents for each roadway or roadway improvement project study. The amount of time it would take to extract this historical data would increase the scope of this project far outside of the available timeline.

Conclusion

In order to draw a conclusion and properly identify new development, all three factors (employment, housing, and transportation) need to be combined in the selection criteria.

- The population density will have to increase over the state average for the time period.
- The median home value for the tract will have to increase by at least 40% from 1980-2010 after adjusting for inflation. I determined 40% to be the value of significance from the analysis of the sample tracts in figure 6.
- The tract must have direct or vicinity access to a roadway which has had its average daily traffic increase by at least 15%. I determined 15% to be significant

because it was three times the average volume increase of ~5% for 2012-2018. Vicinity access was determined by a roadway that passes through a particular census tract or contains a smaller feeder route that supplies it.

- The employment rate may not decrease. Understandably, there are going to be variations in employment from year to year and it is not uncommon for employment rate to decrease. However the overall trend over 10-20-30 years would be expected to increase or stay the same if the area is developing.

Overall the selection criteria yielded 56 census tracts that were once rural in 1980, but are now closer to being classified as suburban in population density. These tracts are also bordering currently suburban areas supporting the theory of natural urban sprawl. The selected tracts also are generally located around commuter routes that saw a significant increase in volume at the end of the study period. These tracts would be ideal commuter locations for some of the top employers by volume in the state as shown in Figure 12.

Future developments on this project can utilize existing, and additional factors to try and anticipate where the next round of rural development will take place. This would hopefully assist local and state agencies as well as commercial enterprises to be proactive in infrastructure expansion and planning, rather than being reactive to spikes in development. Additionally, searching for areas of decline in a similar manner would assist with the allocation of resources and improvements in an effort to reduce crime and areas of poverty.
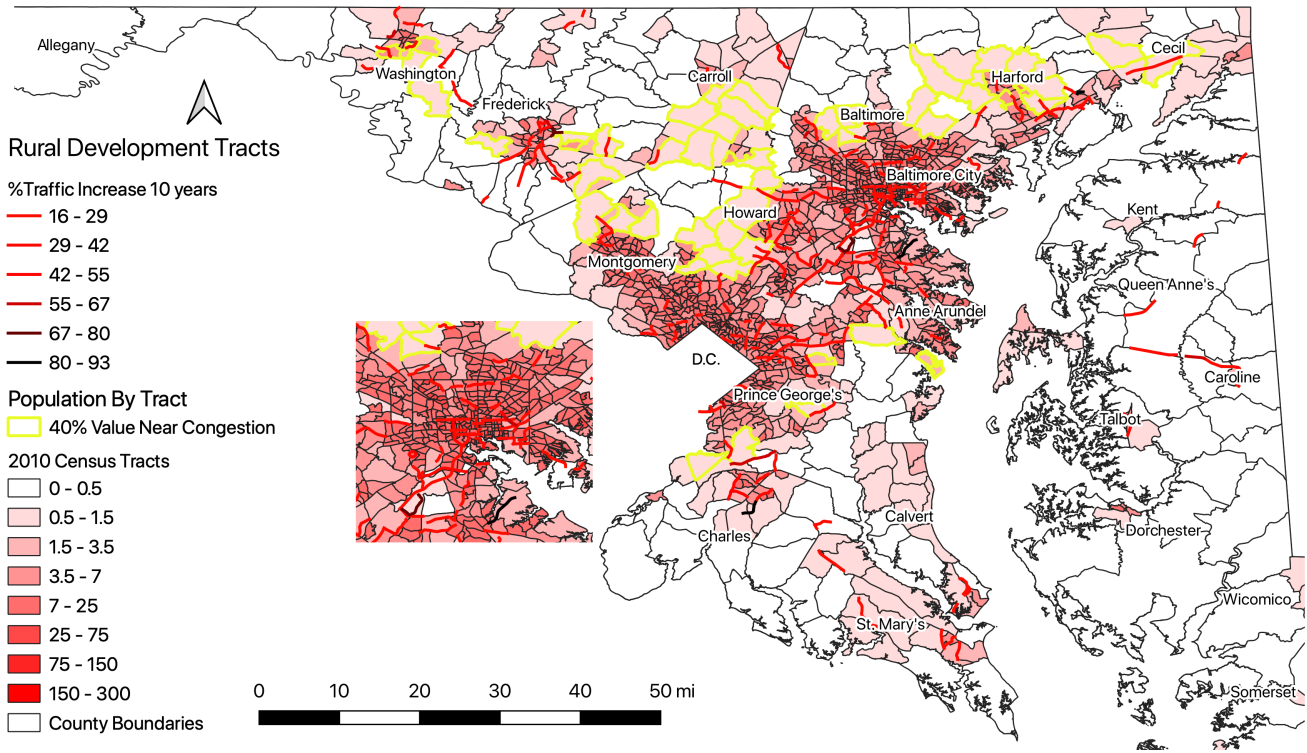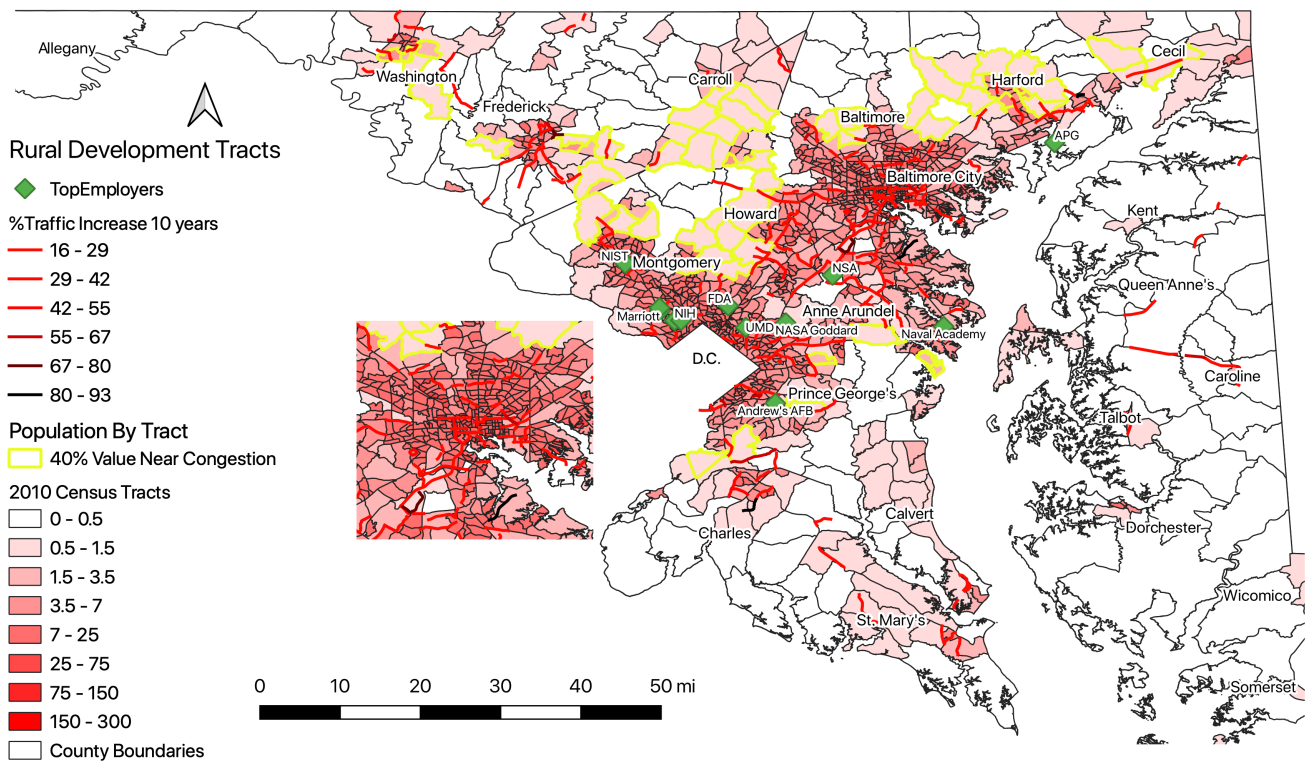
Figure 11

Figure 12

Resources

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United States Census Bureau: https://www.census.gov/data.html

Maryland Open Data: https://data-maryland.opendata.arcgis.com/pages/mdot

MD iMAP: Maryland Priority Funding Areas: https://opendata.maryland.gov/Planning/MD-iMAP-Maryland-Priority-Funding-Areas/wg4v-s9ym

MD iMAP: Maryland Archived Land Use Land Cover Boundary: https://opendata.maryland.gov/Planning/MD-iMAP-Maryland-Archived-Land-Use-Land-Cover-Boun/yk6j-f479

Total Acres Preserved in Maryland Counties by Program: https://opendata.maryland.gov/Planning/Total-Acres-Preserved-in-Maryland-Counties-by-Prog/tf6f-d4ak

MD iMAP: Maryland Archived Land Use Land Cover Boundary: https://opendata.maryland.gov/Planning/MD-iMAP-Maryland-Archived-Land-Use-Land-Cover-Boun/yk6j-f479

GIS Data:

Anne Arundel County: https://maps.aacounty.org
Baltimore City: https://data.baltimorecity.gov
Baltimore County: https://bcstat-bc-gis.hub.arcgis.com/pages/gisopen-data
Caroll County: https://www.carrollcountymd.gov/services/gis-maps/gis-open-data/
Frederick County: https://gis-fcgmd.opendata.arcgis.com
Howard County: https://data.howardcountymd.gov
Montgomery County: https://www.montgomerycountymd.gov/gis/data.html

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Master Plans:

Anne Arundel County: https://www.aacounty.org/departments/planning-and-zoning/master-plans/

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