Mike Messina

Who Pays for NFL Stadiums?

I. Abstract

NFL stadiums more often than not, are primarily paid for with public funding from tax revenue or other government subsidies which take away from other areas these tax revenues could be benefitting like public schooling or public transportation/infrastructure. This paper will use spatial analysis to attempt to find any relationships between how stadiums are paid for and the types of people that are directly affected, positively or negatively, by the building of these stadiums. Relational database management and thematic mapping techniques produced with ArcMap will illustrate there is an area of interest in the southern United States where low income minorities are spatially present to several stadiums which are predominately funded with public funds.

II. Introduction

Modern NFL stadiums are beautiful, monumental structures but also monumental in price. These structures provide a huge community enrichment in and around their surrounding areas in the form of economics and entertainment. They are carefully constructed and placed in key areas of the country and can instantly raise property values of homes in the surrounding area and do wonders for public perception of a city due to the perceived increased spending in the area. The caveat of these magnificent structures, however, is their cost. And a lot of the time, state and local taxpayers are on the hook to pay for a portion of these stadiums regardless if you're even a football fan or not through diverting taxes meant for public schooling or other uses or strictly by increasing taxes to generate additional tax revenue. According to the *Charles Koch Institute*, NFL stadiums on average have cost $525.4 million since 1997 with that number increasing exponentially in recent years. To put this in perspective: stadiums built between 1972 and 2009 cost on average $466.83 million while stadiums built since 2010 cost on average $1.733 *Billion*.

Reviews of past studies which assess the effects of subsidies given for professional sports stadiums are found to have most of their evidence argue against the public funding of these stadiums as the subsidies cannot be justified by the marginal local economic development, jobs created, or income growth. These studies also argue that a large portion of the money that new stadiums bring to the area does not stay in the local economy and rather, goes toward paying the organization and sometime even harming the economy surrounding the stadium.[4,5,6]

As each NFL team is owned and operated differently, I want to see if there is any relation to the socioeconomic area a stadium was built to how much of the costs the local taxpayers had to bear in the construction of the stadium. Are the stadium costs more balanced across less economically rich areas? Do wealthy suburbs bear more cost than minority areas of the country? Are some NFL

teams more conscious of this than others? These are some of the questions I will attempt to answer here. I want to see if there is any socio or economic disparity here and if anyone is being treated unfairly or being taken advantage of by these uber wealthy NFL owners who can pay for these stadiums personally. On average, every NFL stadium is paid for with 58% of public funds. Given the average stadium costs $525.4 million, this is $304.7 million that the taxpaying public will be paying for whether or not they are even a fan of the team or use the services of the stadium. As there is so much money being allocated to these sometimes-unnecessary stadiums, one would believe these taxpayer funds could be better allocated elsewhere to affect more people directly and in more enriching ways than entertainment.

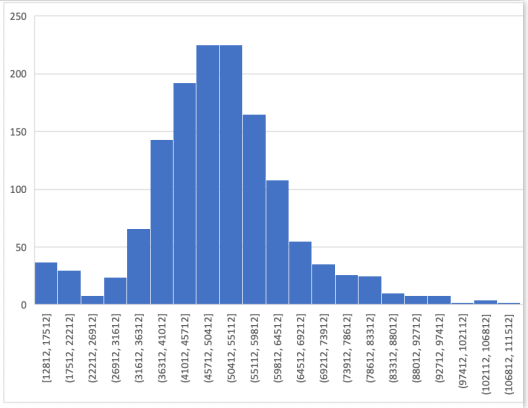
III. Data and Methods

Socioeconomic Data

2018 Income figures per US county from the US Census Bureau[1] online data library were pulled to represent a quantitative layer on the map to measure against the location of each NFL stadium. The table was normalized to only include the geoID of the county, the county name, and the median income per household in dollars. As illustrated in *figure 1*, the median incomes of each county are normally distributed which nicely allows me to use three levels to represent the income levels for each county (low, moderate, high).

Figure 1.

id	Name	MedianIncomeDollars
0500000US0	Autauga County, Alabama	58786
0500000US0	Baldwin County, Alabama	55962
0500000US0	Barbour County, Alabama	34186
0500000US0	Bibb County, Alabama	45340
0500000US0	Blount County, Alabama	48695
0500000US0	Bullock County, Alabama	32152
0500000US0	Butler County, Alabama	39109
0500000US0	Calhoun County, Alabama	45197
0500000US0	Chambers County, Alabama	39872
0500000US0	Cherokee County, Alabama	41014
0500000US0	Chilton County, Alabama	45182
0500000US0	Choctaw County, Alabama	34884
0500000US0	Clarke County, Alabama	36127
0500000US0	Clay County, Alabama	41225
0500000US0	Cleburne County, Alabama	40188
0500000US0	Coffee County, Alabama	53155
0500000US0	Colbert County, Alabama	47558
0500000US0	Conecuh County, Alabama	33177
0500000US0	Coosa County, Alabama	38301



Racial Demographic Data

To represent the racial landscape of the United States, I pulled data from the 2018 US census[1] which included the proportion of each race that makes up the population of each US county. The data was normalized to only include the geoID of the county, county name, racial proportions for White, Black, Native American, Asian, and Latino races (as a percent). A dummy variable of integers 1-5 was created to represent the race with the highest proportion of total population for each county: 1 – White. 2 – Black. 3 – Native American. 4 – Asian. 5 – Latino. By engineering this dummy variable, I can represent the majority race as a categorical feature on a map. See *figure 2* for a sample of the normalized data table.

Figure 2.

id	Name	TotalPop	White	Black	IndianNative	Asian	Latino	DummyRace
0500000US01001	Autauga County, Alabama	55200	76.9	19.1	0.3	1	2.8	1
0500000US01003	Baldwin County, Alabama	208107	86.3	9.5	0.7	0.8	4.5	1
0500000US01005	Barbour County, Alabama	25782	47.4	47.6	0.3	0.4	4.3	2
0500000US01007	Bibb County, Alabama	22527	76.7	22.3	0	0.2	2.4	1
0500000US01009	Blount County, Alabama	57645	95.5	1.5	0.2	0.3	9.1	1
0500000US01011	Bullock County, Alabama	10352	22	76.2	1.2	0.5	0.5	2
0500000US01013	Butler County, Alabama	20025	52	45.2	0	1.2	0.3	1
0500000US01015	Calhoun County, Alabama	115098	74.3	20.6	0.3	0.9	3.7	1
0500000US01017	Chambers County, Alabama	33826	57.6	39.4	0.3	1.2	2.3	1
0500000US01019	Cherokee County, Alabama	25853	92.8	4.9	0.9	0.2	1.5	1

Geographic Data

To form state and county boundaries on the maps, I utilized US state and county geographic tables from the 2018 US Census[1] which included the spatial files to draw these boundaries. A sample of the data is represented in *figure 3.* The STATEFP column represents the state ID and COUNTYFP column represents the county ID. These appended together represent the last 5 characters of the AFFGEOID for each row which was used as the foreign key to join this table with the race and income tables.

Figure 3.

FID	Shape	STATEFP	COUNTYFP	COUNTYNS	AFFGEOID *	GEOID	NAME
0	Polygon	24	510	01702381	0500000US24510	24510	Baltimore
1	Polygon	31	169	00835906	0500000US31169	31169	Thayer
2	Polygon	37	077	01008556	0500000US37077	37077	Granville
3	Polygon	46	091	01265759	0500000US46091	46091	Marshall
4	Polygon	39	075	01074050	0500000US39075	39075	Holmes
5	Polygon	39	033	01074029	0500000US39033	39033	Crawford
6	Polygon	54	055	01557645	0500000US54055	54055	Mercer
7	Polygon	17	005	00424204	0500000US17005	17005	Bond
8	Polygon	18	081	00450365	0500000US18081	18081	Johnson
9	Polygon	19	041	00465625	0500000US19041	19041	Clay
10	Polygon	26	113	01622999	0500000US26113	26113	Missaukee

Stadium Cost Data

In order to represent each NFL stadium, I sourced stadium cost information from *Conventions, Sports, and Leisure*[2] as well as *stadiumsofprofootball dot com*[3] to comprise a data table which broke down each currently used NFL stadium in 2020 with the total cost, the proportion of the cost that was paid for with public funds and which proportion was paid for with private funds (in decimal percent).

Figure 4.

Year	StadiumName	Address	City	State	TeamName	TotalCost	TotalPublic	TotalPrivate	PublicPercent	PrivatePercent
2020	SoFi Stadium	1000 S Prairie Ave	Inglewood	CA	Rams.Charge	4963	0	4963	0	1
2020	Allegiant Stadium	3333 Al Davis Way	Las Vegas	NV	Raiders	1900	750	1150	0.39	0.61
2018	Mercedes Benz Stadium	1 AMB Dr NW	Atlanta	GA	Falcons	1500	450	1050	0.3	0.7
2016	US Bank Stadium	401 Chicago Ave	Minneapolis	MN	Vikings	1070	498	572	0.47	0.53
2016	Hard Rock Stadium	347 Don Shula Dr	Miami Gardens	FL	Dolphins	115	103.5	11.5	0.9	0.1
2015	Levis Stadium	4900 Marie P DeBartolo Way	Santa Clara	CA	49ers	987	114	873	0.12	0.88
2010	MetLife Stadium	1 MetLife Stadium Dr	East Rutherford	NJ	Jets.Giants	1600	0	1600	0	1
2009	ATT Stadium	1 AT&T Way	Arlington	TX	Cowboys	1194	444	750	0.37	0.63
2008	Lucas Oil Stadium	500 S Capitol Ave	Indianapolis	IN	Colts	719.6	619.6	100	0.86	0.14

A sample of the data table is shown in *figure 4.* The addresses of each stadium were geocoded in ArcMap to generate latitude and longitude values for each stadium to specifically map each one. The cost data in the table is represented in millions of dollars so as to format with the long integer type of ArcMap and since the figures were not being compared to other cost data on different scales. I made the determination to display the public and private cost percentages as stacked proportional bar charts for each stadium symbol so as to maximize the data displayability of the map.

Methods

In order to implement the use of thematic mapping, I displayed the racial dummy variable in a choropleth map (see Map 1 in appendix) with the public and private stadium cost proportions displayed as stacked proportional bars located at the geocoded locations. As each county is shown with a categorical value of 1-5 representing the race with the highest proportion of the total county population, there are only 5 levels of hierarchy in the hues with the colors representing categorical information and not quantitative values. By combining the dummy variable with the stadium cost proportions, we can see if there are any relationships between certain racial regions with how each stadium is financed.

Inverse Distance Weighting (IDW) was utilized to attempt to show the geographic spread of if there are any relationships between region of the country and how stadiums are financed. See Map 2 in the appendix for the application of IDW. The public percent variable for each stadium was used as the variable to apply IDW as this feature can best represent areas that utilize public funds over private funds to finance these stadiums. A color hierarchy from red hues to green hues was utilized to illustrate regions with high public funding (reds) and low public funding (greens). Each stadium location was displayed with a basic symbol rather than using stacked proportional bar charts as this data is already displayed on the map with the IDW.

Another choropleth map, this time displaying quantitative values of median incomes, was generated using the joined table with county income data and stadium cost data (see Map 3 in Appendix for application). Similar to Map 1, this map is used to compare income levels to where stadiums are located and the proportion that these stadiums were funded with public and private money to see if we can see any relationships. Due to the median income data being normally distributed as noted previously, 3 classes were used to display this feature:

Low/red: $12.8k - $46.7k
Medium/yellow: $46.7k - $68.4k
High/green: $68.4k – 13.6k

IV. Results

Map 1 shows us that although the majority of counties in the United States are predominantly white, the Southern region from New Orleans, LA to Jacksonville, FL which are home to the largest population of predominantly black counties in the US, also have stadiums that were funded almost entirely with public funds. Atlanta, GA and Charlotte, NC are shown as exceptions to this however as these stadiums were funded primarily with private funds and are adjacent to predominantly black counties.

Turning our attention to Map 2, we can see that the regions of the US that are high in public funding used for NFL stadiums are in the Midwest and South. This can somewhat explain the prior paragraph that although the stadiums in New Orleans and Jacksonville were found to be adjacent to predominantly black counties, most stadiums in the southern region of the US, predominantly white areas included, are found to be funded primarily with public funds over private.

The east and west coasts of the country shown in Map 2 look to have lean more towards private stadium funding. A drawback to using IDW for this map is that since the IDW method stretches the data points across the spatial plane, the regions that have fewer datapoints (Midwest) will have their IDW values more biased to their own value compared to the regions on the coasts which have more stadiums per square mile and are less biased towards their own value since there are more datapoints spread across a smaller area.

We can take away from Map 3 that most of these stadiums, regardless if they are funded primarily with public or private funds, are very spatially close to high median income areas. Whether this is because the stadiums were chosen to be built in higher income areas to take advantage of communities more likely to spend money at and around the stadium or if the stadiums being built there actually had a direct effect on raising the median income levels to a high threshold (>$68k). Again, we can see that the southern region of the United States as we have previously found to be home to predominantly black areas and stadiums financed primarily with public funds, are also shown to be the largest areas of low median income levels in the country. It's inconclusive if the location of the stadium has influence over these median income levels or if it is a product of prior county income levels.

V. Conclusion

While there are no conclusive findings to say that NFL stadiums are being built in areas to take advantage of certain racial demographics or take away from other tax allocations, we can see the southern region of the US is definitely worth our time to examine with a more fine lens given the area is shown to have predominantly black communities with low median incomes while the stadiums in the region are financed using primarily public funding. To take this spatial analysis another step forward, we can also compare regions of the US with stadiums to how taxpayer money is allocated in these areas to regions with no sports stadiums and see how tax revenue is allocated here and look for economic differences that could be caused by stadiums being or not being built.

References

[1] www.data.census.gov

[2] https://web.archive.org/web/20190405090648/https://cbsminnesota.files.wordpress.com/2011/12/nfl-funding-summary-12-2-11.pdf

[3] https://www.stadiumsofprofootball.com/

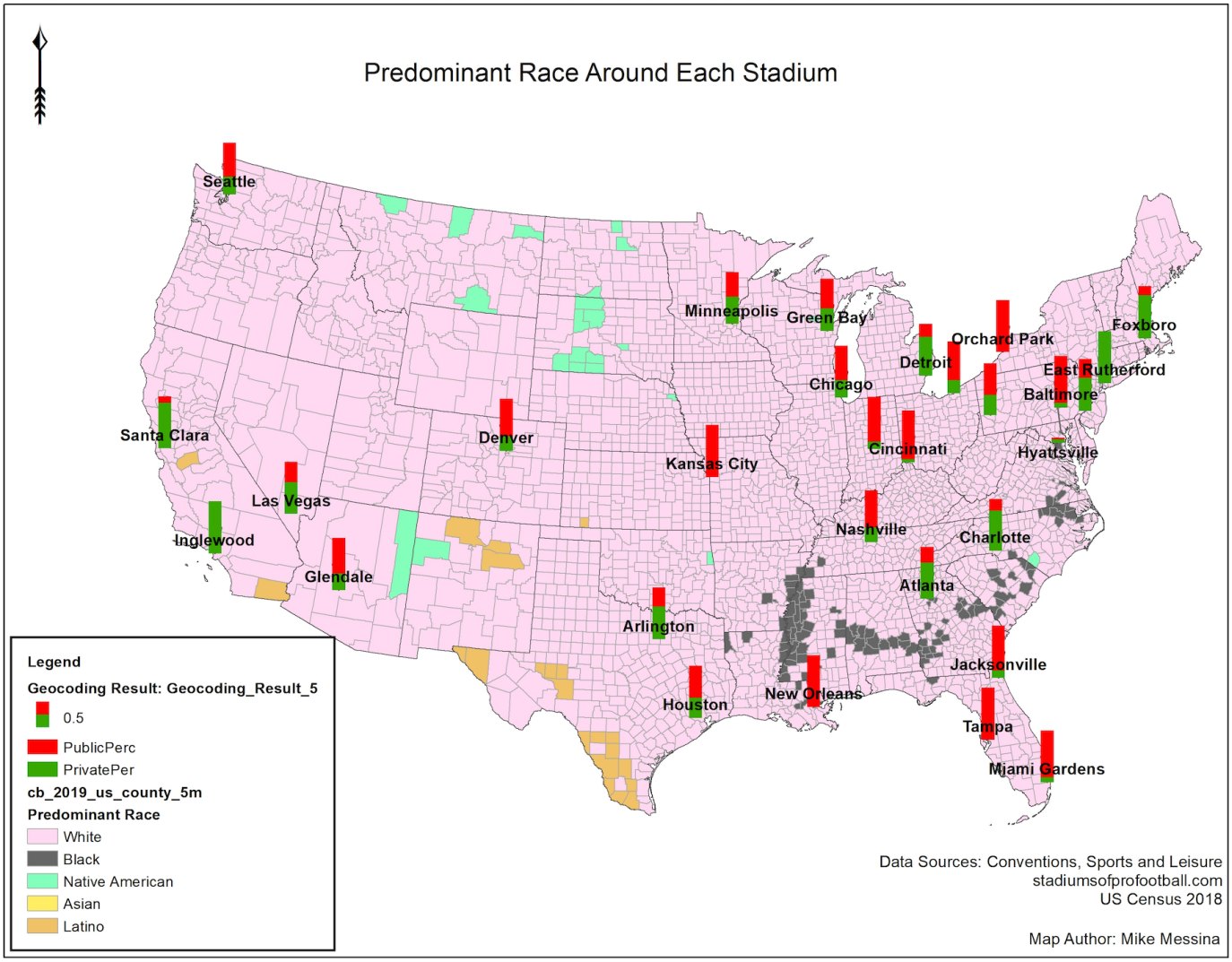
[4] Baade, Robert A.; Dye, Richard F. (April 1990). "The Impact of Stadium and Professional Sports on Metropolitan Area Development". *Growth and Change*. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1468-2257.1990.tb00513.x

[5] Coates, Dennis (October 2007). "Stadiums and Arenas: Economic Development or Economic Redistribution?". *Contemporary Economic Policy*. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1465-7287.2007.00073.x

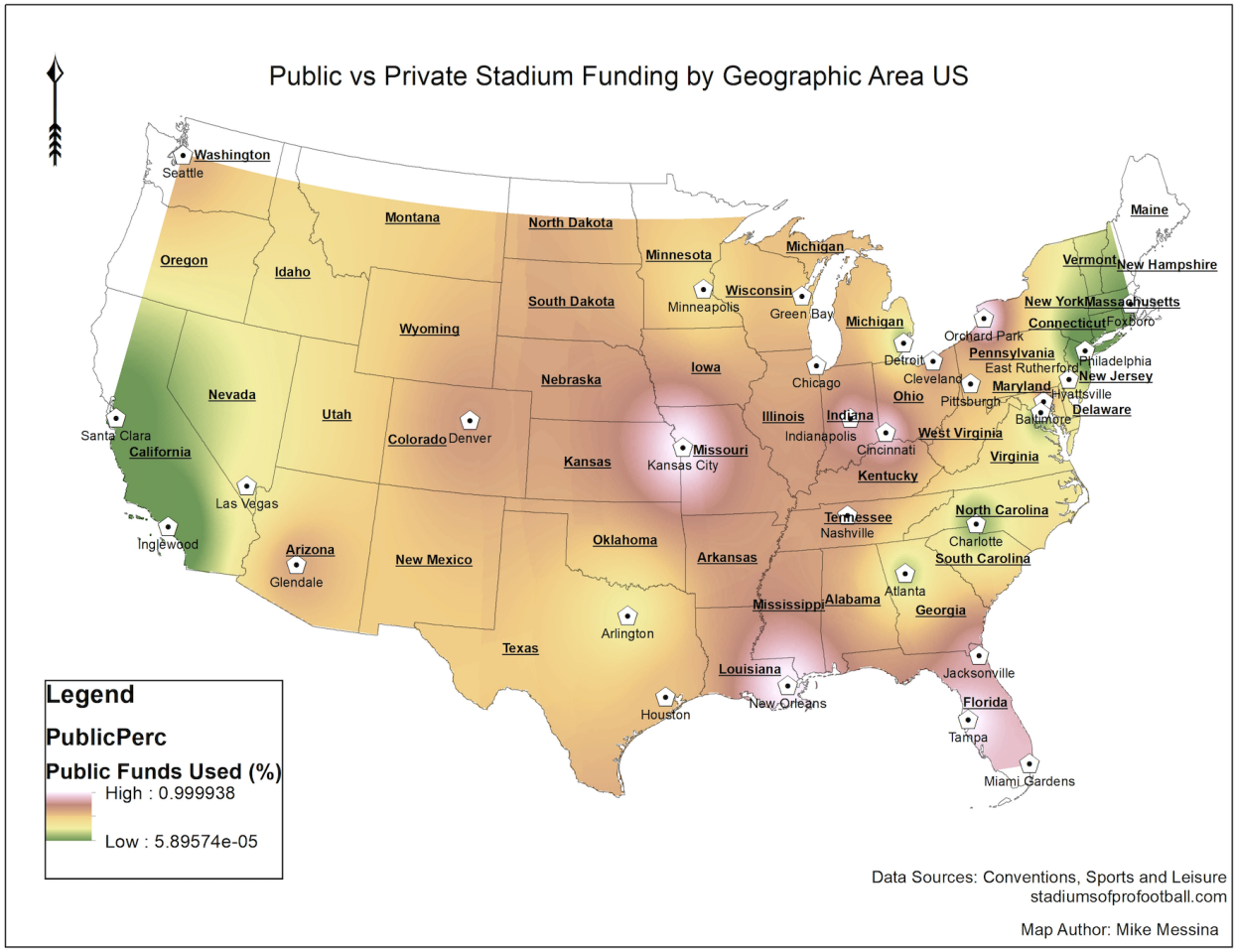
[6] Zaretsky, Adam M. (2001-04-01). "Should Cities Pay for Sports Facilities?". *The Regional Economist*. Federal Reserve Bank of St. Louis. https://www.stlouisfed.org/Publications/Regional-Economist/April-2001/Should-Cities-Pay-for-Sports-Facilities

Appendix

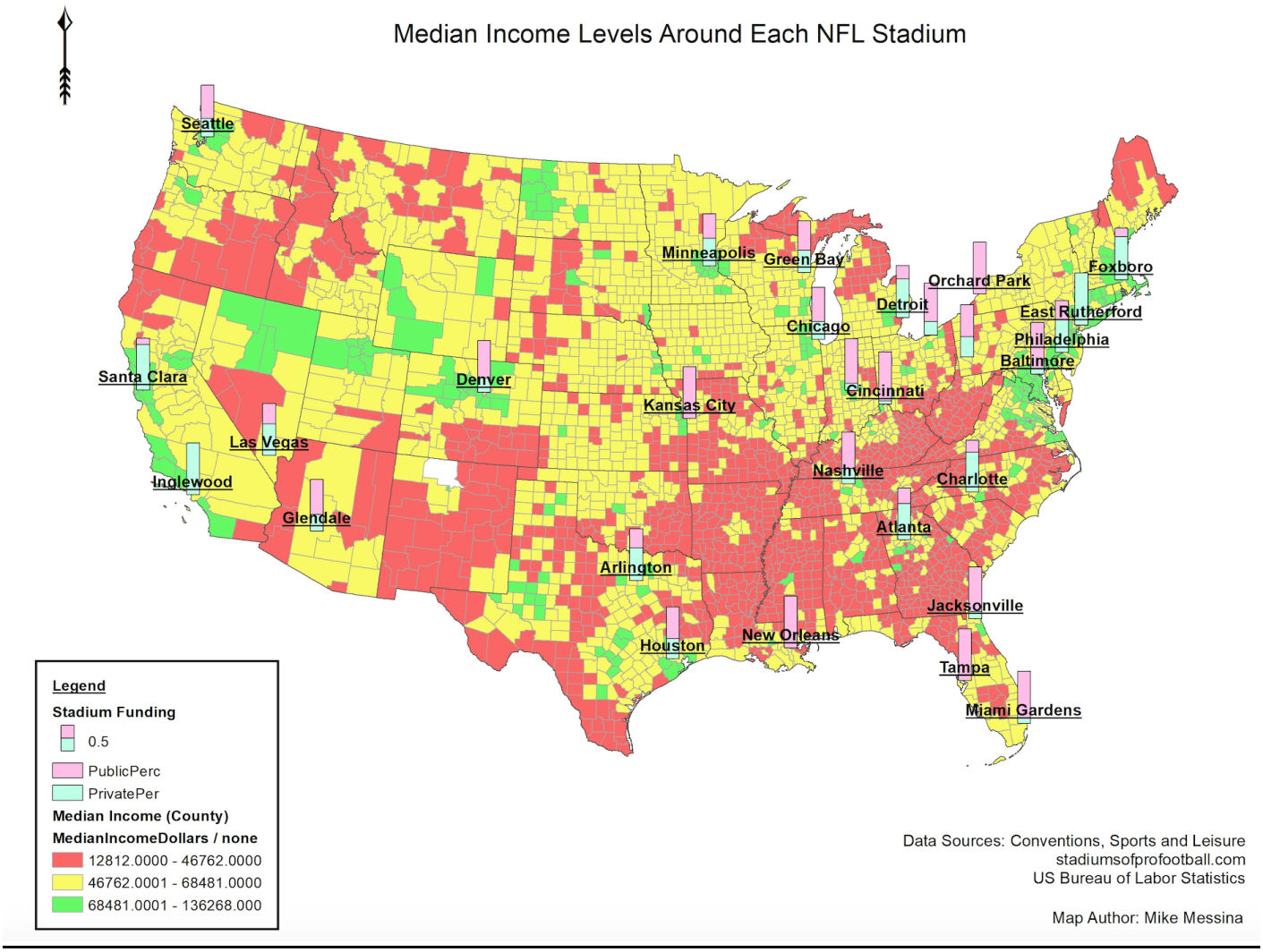
Map 1



Map 2


Public vs Private Stadium Funding by Geographic Area US
Washington
Seattle
Montana
North Dakota
Minnesota
Michigan
Oregon
Idaho
Wisconsin
Minneapolis
Green Bay
Michigan
South Dakota
Wyoming
Nebraska
Iowa
Chicago
Nevada
Utah
Colorado
Denver
Illinois
Indiana
Ohio
Santa Clara
California
Missouri
Kansas City
Indianapolis
Cincinnati
West Virginia
Kansas
Kentucky
Las Vegas
Inglewood
Arizona
Glendale
New Mexico
Oklahoma
Arkansas
Tennessee
Nashville
Mississippi
Alabama
Georgia
Atlanta
Arlington
Texas
Louisiana
New Orleans
Houston
Maine
Vermont
New Hampshire
New York
Massachusetts
Connecticut
FoxBoro
Orchard Park
Pennsylvania
Detroit
Cleveland
East Rutherford
Philadelphia
New Jersey
Maryland
Pittsburgh
Hyattsville
Delaware
Baltimore
Virginia
North Carolina
Charlotte
South Carolina
Jacksonville
Florida
Tampa
Miami Gardens
Legend
PublicPerc
Public Funds Used (%)
High : 0.999938
Low : 5.89574e-05
Data Sources: Conventions, Sports and Leisure
stadiumsofprofootball.com
Map Author: Mike Messina

Map 3


Median Income Levels Around Each NFL Stadium
Seattle
Minneapolis
Green Bay
Orchard Park
Foxboro
Detroit
East Rutherford
Chicago
Philadelphia
Baltimore
Santa Clara
Denver
Cincinnati
Kansas City
Las Vegas
Nashville
Charlotte
Inglewood
Glendale
Atlanta
Arlington
Jacksonville
New Orleans
Houston
Tampa
Miami Gardens
Legend
Stadium Funding
0.5
PublicPerc
PrivatePer
Median Income (County)
MedianIncomeDollars / none
12812.0000 - 46762.0000
46762.0001 - 68481.0000
68481.0001 - 136268.000
Data Sources: Conventions, Sports and Leisure
stadiumsofprofootball.com
US Bureau of Labor Statistics
Map Author: Mike Messina