Obesity, Car Accidents, Parks, and Transportation: A Web of Health Impacts

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The Planning Problem
The connection between planning and health has come to the forefront of academia as a result of the American obesity epidemic. Scholars such as David Sloane, Mia Papas, Katie Booth and planning bloggers from The Atlantic Cities, Streetsblog, and Curbed highlight how obesity is a multidisciplinary issue and planners are seeking to incorporate health research findings into the physical design of our cities.

The planning literature has linked the obesity epidemic to the genetics, dietary choices, physical activity, the social environment, and the built environment. For planners, the toolbox given to this profession directly influences the built environment. In Papas et al’s “The Built Environment and Obesity,” the authors conclude obesity is correlated with diet, physical activity, and the environment. The built environment that affects obesity ranges from schools, parks, work places, commuting patterns, highways, grocery stores, and more. While Papas et al cites the numerous studies conducted on access to quality food, planners can directly influence access to physical activity facilities—seeing as they most often fall in the public realm. Interestingly, the number, rather than the distance, of physical activity facilities most correlates with obesity. The authors further emphasized sidewalk activity, density, walkability scale, and types of streets as influencers of obesity (Papas et al 2007). Planners must actively strive toward increasing the number of public, recreational spaces in neighborhoods in order to help curtail the obesity epidemic in Los Angeles.

In Booth et al’s “Obesity and the Built Environment,” the authors analyzed the factors beyond physical activity and food sources set out by Papas et al. The authors linked obesity with “area of residence, resources, walkability, land use, sprawl, and level of deprivation,” and included urban design, public transit, and the pedestrian experience. The built environment with walking and bicycling trails, parks, playgrounds, less fast food restaurants, and perception or actualization of safety showed less obesity than neighborhoods with the opposite characteristics. These factors further exacerbate obesity in lower socioeconomic areas that experience higher rates of infrastructural degradation and decreased resources (Booth et al 2005). Booth et al’s latter point regarding increased obesity due to lower socioeconomic status highlights an issue prevalent in South Los Angeles. This project aims to analyze the built environment of South Los Angeles, in comparison with the rest of the City of Los Angeles, and its impacts on obesity.

South LA has notoriously high obesity rates, suggesting the residents lack physical activity. The lack of physical activity may result from poor eating habits, sedentary lifestyles, non-active transport, or few recreational opportunities, among others. GIS is a vital tool for this planning and health issue given the spatial qualities of the built environment. It is essential to understand the correlation between transit, bicycle pathways, parks, and collisions caused by automobiles in order to understand why obesity rates are profoundly higher in South Los Angeles than in wealthier areas of Los Angeles. The initial questions of this research surrounded the quality of the infrastructure associated with high numbers of collisions, patterns of recreational space and obesity, and whether transit affected obesity. By mapping planning and health data, we are able to visually identify the problematic areas of South Los Angeles. In this way, we can target specific areas when recommending planning solutions to obesity.
Data
The data layers used to answer these questions regarding the built environment and obesity were: council districts of Los Angeles, obesity, Metro rail, California Protected Areas, bike pathways, and pedestrian/bicyclist collisions caused by automobiles. This collection of data encompasses the official geographic boundaries within the City of Los Angeles, making the information susceptible to comparison. Though the City of Los Angeles is split into 35 community plans, the US Census Bureau and Los Angeles County do not recognize these communities as official geographic boundaries. The latter two agencies collect data at the census tracts/block groups or council districts at the finest grain. Los Angeles County Department of Public Health collects the primary data for this study, obesity, at the council district level for the City of LA. This, in essence, became the base of the study in which all data had to conform to. While a difficult task to find compatible data, the layers ultimately worked well together after a variety of editing methods.

The combination of permanent transit lines (rail), active transit (bike paths), hindrances to active transit (collisions), and permanent recreational facilities (open spaces/green spaces from the CA Protected Areas Database) highlighted the key influencing factors of obesity as mentioned in the literature. Bus lines were considered, but not included, given 66 routes run through the South Los Angeles region. With bus lines mapped, virtually nothing else would be visible behind the transit lines (see Metro Systems map in Appendix). Furthermore, given the saturation of studies conducted on food deserts, grocery stores, liquor stores, and fast food restaurants were left out of the spatial analysis, but included in the discussion. Later analysis will discuss the effects of each of these factors on obesity—specifically how South Los Angeles’s abundance of public transit is the only aspect of the built environment that plays a positive role in health in the community.

Data Layers
Layer 1: LA City Council Districts
The City of Los Angeles Council District outlines are available on the LA County GIS Portal. The data is formatted as a shapefile and formed the base layer for my maps. I turned on the labels for context.

Layer 2: Obesity
The County of Los Angeles Department of Public Health measures the obesity levels of adults and children, along with health-related reasons for death. The county publishes this information in its Obesity Report, also designating the quartile of where the city or council district is in comparison with the county. Through this report, I became aware of the obesity epidemic in South Los Angeles (located in CD-8 and CD-9). From this, I contacted Douglas Morales from the County of LA in order to acquire the data files for obesity. Morales forwarded me to the County website. With Bonnie’s help, we acquired the Excel table with the health data. I eliminated the data for areas outside of the City of LA. I also added a Council District column in order to join the obesity Excel table with the LA City Council Districts shapefile. Once joined, I allowed for 5 natural breaks with one or two decimal places. Rather than create a different type of break, I chose natural breaks because obesity data started in the 18th percentiles. I changed the quantity color gradation to exhibit a cold/hot relationship between the less obese areas (blue) and most obese areas (in red).
Layer 3: California Protected Areas
Initial attempts to acquire the green/open spaces in Los Angeles were difficult. I originally attempted mapping the Los Angeles County parks (which did not include the City of LA), Land Use types, and National Parks. However, none of these portrayed the complete number of parks in the City of Los Angeles. None of these layers accounted for the City of Los Angeles parks. After contacting a former employer from Stanford University’s Spatial History Lab, I was directed to the California Protected Areas Database. The CPAD’s shapefile combines all local, state, federal, and private green and open spaces in the entire state of California. The data is publically accessible with a free membership to their website. I downloaded the file and added it as a layer to my map (already colored green for open space). I later manually deleted the non-City of Los Angeles green spaces using the Editor tool in GIS.

Layer 4: Metro Rail and Stations
From Metro’s website, I acquired two shapefiles of the Metro Rail lines and the Metro Rail stations. These shapefiles each divided the layers by line (Red/Purple, Gold, Green, Blue, and Expo). I added this layer to the map and altered the colors to reflect the typology marketed by Metro. Metro combines Red and Purple lines as one given their shared routing after Vermont/Wilshire toward Union Station.

Layer 5: Bike Lanes
Metro tracks all city and county bike pathways on their website in a Bike Map. Knowing this, I immediately went to the Metro website for this data. I found a .kml file for all the bike lanes in the County of Los Angeles. I proceeded to convert the .kml to a shapefile in GIS. The results produced over 1500 individual layers in multiple colors. After initial attempts of attempting to edit the bike lanes, I found this a daunting task. I proceeded to inquire with the Metro bike team for a shapefile. I received a shapefile with four layers for Class I, Class II, Class III, and Cycle Tracks, which were manageable for editing. I manually deleted the bike pathways outside the City of Los Angeles and altered the color to reflect the signage and coloring of the lanes in the City (green).

Layer 6: Pedestrian and Bicyclist Collisions, Caused by Automobiles
After inquiring with Douglas Morales, I received an Excel table from Isabelle Sternfeld, an epidemiologist with the Injury and Violence Prevention Program in Los Angeles County of the pedestrian and bicyclist collisions caused by automobiles in the City of Los Angeles. I originally tried inputting the table into GIS for geocoding, but the intersections of accidents were in two separate columns. I added a new field for “Intersection” data, but the field calculator failed to populate the field. Bonnie helped me populate the field and sent me a .dbf with the combined street names as a new Intersection column. I added this data to my map as a layer and geocoded the addresses by Intersection. The results were 100% unmatched. I added a new field for City. Given my broken field calculator, I used the Editor tool to input Los Angeles in 5000+ rows. I geocoded addresses using Intersection and City and the results were 76% matched, 20% tied, and 4% unmatched. I then altered the symbol size and color for a readable result.
When combining all the data into a single map, I placed the shapefiles with polygons (obesity and open space) below the shapefiles with lines (rail, bike), and the points as the top layer (collisions).

This area has a high number of pedestrian and bicycle accidents caused by cars. This suggests the area is hostile to active transport such as walking and biking. Moreover, the area is park-poor, which signifies a deficiency in the number of parks compared to the number of residents. In an area that is hostile to walking and biking, combined with little access to areas designated for recreation, individuals have a higher rate of obesity.

**Results and Conclusions**

**Transit:** The maps show an abundance of transit in South Los Angeles, and the central core of the City of Los Angeles. South Los Angeles exhibits approximately 40 miles of bike lanes with two major North-South corridors and five major East-West corridors. As mentioned before, but not mapped personally, South Los Angeles is permeated by 66 bus routes (Metro, LA DOT, Foothill Transit, and other cities). There are also 15 Metro Rail stations in South Los Angeles from the Gold, Red/Purple, Blue, and Expo lines. The most prevalent are from the newest Expo Line. Despite having a number of rail, bus, and bicycling options, South Los Angeles still exhibits high obesity rates. This suggests that the correlation between walking to and from public transit and using active transit (bicycle paths) may not be a highly influencing factor for offsetting obesity in South LA.

**Obesity:** Obesity tends to be concentrated on the east and south areas of Los Angeles, with the San Fernando Valley as the anomaly. Council districts 6, 8, and 9 exhibited the highest levels of obesity (28.21%-29.3%), followed by council districts 1, 13, and 15 (26.61%-28.2%). The median obesity levels were in council district 10 and 14 (24.31%-26.2%). The second least obese districts were 2 and 4 (21.21%-24.3%), while the least obese districts were 3, 5, 11, and 12 (18.1%-21.2%). The least obese areas tend to be concentrated on the North and Western portions of Los Angeles. However, given that District 6 (San Fernando Valley) is an exception to this spatial pattern, it is necessary to consider how this district is related to South Los Angeles.

**Collisions:** The highest concentration of collisions is in South Los Angeles (Districts 8 and 9). The collisions exhibited a relatively even concentration throughout the entire community while other areas of Los Angeles exhibited collisions concentrated along specific corridors or clustered closer together. Based on the spatial distribution in the maps, it may be inferred that most collisions occur on bicycle pathways, with some exceptions. In particular, districts 2, 4, 5, and 11 contain areas largely unmarked by pedestrian and bicyclist collisions. Without doing a statistical regression analysis, it would appear that districts 8 and 9 are significantly discouraged to walk and bike within their community, given the large number and dispersion of collisions caused by automobiles. A factor of consideration for collisions on the Westside districts is the high level of car ownership and traffic. These factors produce more opportunities for collisions as result of having no alternative transportation options.

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1 All maps are included at the end of the document.
Parks: Based on the spatial location of the parks, there seems to be a correlation between a high acreage of green and open space and low obesity. District 11 is almost entirely green space through the Santa Monica Mountains, while Districts 3 and 12 directly abut (majority unmapped) Angeles National Forest. The park is largely unmapped because it falls outside the Los Angeles City lines. Of note, some of the Westside districts also have access to the beach for recreation (surfing, swimming, biking, skating, sand volleyball, and more). Further districts 2, 4, and 5 exhibit larger parks than the high obesity areas of districts 6, 8, and 9. Not only do these areas have significantly smaller parks, but there are seemingly fewer as well.

Based on the maps, the largest indicator of obesity is the abundance of park acreage/access to recreational facilities and the presence of pedestrian/bicyclist collisions. However, this may not be a complete picture. Papas et al suggests that while the built environment and recreational facilities play an important role in indicating obesity trends, socioeconomic status further exacerbates these disparities. Due to the potential influence on income on obesity, median household income for Los Angeles was mapped separately.

When analyzing median household income within the City of Los Angeles, the most disadvantaged areas were those that exhibited the highest obesity rates (District 6, 8, and 9). Of respondents that reported income data to the Census, 41% earned an annual income of $20,000 or less in South Los Angeles--$8,000 less than the average Angeleno (LA Times 2013). The central areas of Los Angeles also exhibited a low socioeconomic status that correlated with their obesity levels. The lower obesity levels from these areas, despite fairly similar socioeconomic statuses as South LA and San Fernando Valley, may be the differences in walkability indicators such as block size, density, and streetscape. Significant improvements have been implemented in the streetscapes of Downtown Los Angeles and Boyle Heights—and may be the difference between highest levels of obesity and slightly lower levels of obesity despite equally prevalent economic disadvantages. The highest income levels were also prevalent in the healthiest areas (Districts 3, 5, 11, and 12). The highest income areas were closest to the Santa Monica Mountains open spaces, the Angeles National Forest, and coastline. The $60,000-$80,000 income bracket, or ‘middle class’ was also prevalent in lower obesity areas.

The areas of the City of Los Angeles that were state or federal parks were excluded from the US Census Bureau’s collection of economic data—and thus show up as white spaces. Some areas where there should be residents’ income data collected show up as Null in the Census Tract IDs and have no median income either. Some of the other white spaces are the cities of San Fernando, Culver City, Santa Monica, Inglewood, Marina Del Rey, and Beverly Hills. To complete the map, the Census Tracts were downloaded from American Fact Finder as well as median household income data at the census level. The non-City of LA information was eliminated using the Editor tool. I manually created the brackets to reflect an income group of extreme poverty along with those that are moderately above poverty, a middle-income group, an upper-middle income group, and an upper income group.

The planning literature conducted made it evident to point out that while lower income groups, on average, use public transit more often, transit does not correlate with lower obesity levels in South Los Angeles because of other social environment factors such as income, crime, and lack of resources (Booth et al 2005). According to the LA Times Crime Map, South LA is home to
three of the city’s most violent areas, as well as three of LA’s highest property crime hotspots. Only 62% of South LA residents believe their neighborhood is safe, compared to 90% in West LA. This fear of crime can discourage residents from partaking in outdoor physical activity (CHC 2008). Locally high rates of auto-related pedestrian and cyclist deaths further contribute to this unhealthy situation (Transportation for America 2013).

South LA also has a predominantly unhealthy food landscape characterized by a concentration of fast food restaurants and liquor stores, with limited access to full-service grocery stores. As over 70% of the restaurants in South LA are considered fast food outlets, it is hardly surprising that over 50% of children and 42% of adults in the community eat fast food at least once a week (LACDPH 2009). Compared to West LA, South LA has nearly 7 times as many liquor stores and food facilities with a “C” or worse health ranking from the LA Department of Public Health (DPH). Additionally, South LA’s 60 full-service grocery stores each serve an average of 22,156 residents: twice as many on average as frequent West LA’s 57 equivalent venues (CHC 2010).

South Los Angeles’s numerous public transit options could not counter the effects of its high crime rates, high collisions, high number of fast food restaurants and liquor stores, and low-income levels. There is a pressing need to improve South LA’s physical landscape, and to provide greater access to healthier food alternatives in order to reduce residents’ heightened obesity.

Solutions
While many factors that influence obesity (including personal choices and genetics) are beyond the planner’s control, policymakers may be able to reshape some of the social and built environment forces that foster obesity. Although the City of Los Angeles suffers from relatively limited financial resources, it may be able to work with developers, private firms, or non-profit organizations to encourage healthy lifestyles in South Los Angeles.

Open space, access to food, quality of infrastructure, and improving active transit must be targeted through planning. During the recession, many grassroots citizen groups proved the effectiveness of transforming vacant lots into temporary urban gardens. Transforming underused parking lots or vacant properties into active green spaces can be one method of planning that will encourage recreational activity—be it gardening, baseball fields, or flexible green spaces.

Moreover, the City of Los Angeles has created an ordinance prohibiting stand-alone fast food restaurants from emerging. However, this does not eliminate the high number of fast food restaurants already located in South Los Angeles. In order to combat this, quality grocery stores must be encouraged to locate in South Los Angeles that are also fairly inexpensive (to meet the needs of low-income residents). It is also necessary for these grocery stores to cater to the residents of South Los Angeles—be they more ethnically inclined like Superior Grocers or otherwise “localized”.

In line with the citing of new grocery stores, health awareness programs must be instituted at the youth and parent levels alike. Students must be taught healthy eating habits through school nutritional programs, but parents must also be taught the essentials in order to prevent dinners at fast food restaurants.
Moreover, active transit must be emphasized and encouraged—especially for low-income groups. Effective marketing from either the city or from Metro must communicate that biking, walking, and transit are healthy and cost-effective compared to cars. In order for those messages to take hold, however, quality infrastructure must be put in place. Bike lanes must be more than shared bus-bike lanes or afterthoughts on street design. Quality Cycle Tracks (separated and buffered bike lanes) should be placed on the larger, most dangerous streets in order to prevent automobile collisions. Cycle Tracks currently do not exist in the City of Los Angeles, but are planned for Figueroa through the MyFig! project. They are, however, prevalent in bicycle-friendly Scandinavian countries. Bike boulevards must be combined with reduced speeds and narrow streets. It is not enough to paint sharrows onto the pavement—bicyclists must be protected from opening car doors and ongoing automobile traffic. Transit must also be priced to accommodate for the lowest income groups—oftentimes under $30,000/year.

**Data Limitations**

Had obesity been collected at a finer grain, the correlations between the built environment, the social environment, and obesity may have ultimately served planning recommendations best. By aggregating the data to such a large scale, it is much more difficult to present solutions that target specific locations. For future collection, obesity data should be collected at census tract or zip code levels.

Moreover, the collision data is organized by intersections with a “Distance from Intersection” category rather than an address. With the collection of the nearest addresses, the data would not be skewed toward intersections when some of the collisions are quite far from the intersection itself.

With more time, the social environment data mapping would have been beneficial as well—crime, fast food restaurants, and grocery stores. However, the difficulties with the data and software compatibility took longer than expected. I also wanted to reduce the redundancy of “food desert” projects. However, I have recognized it in the discussion that quality food access is a relevant factor to obesity.
Bibliography


Los Angeles Obesity and the Built Environment

Rail Lines, Open Space, and Obesity

- Class 1 Bikeways
- Class 2 Bikeways
- Class 3 Bikeways
- Cycle Track
- Red and Purple Line
- Green Line
- Gold Line
- Expo Line
- Blue Line
- California Protected Areas

OBESITY, in %
- 18.1 - 21.2
- 21.21 - 24.3
- 24.31 - 26.6
- 26.61 - 28.2
- 28.21 - 29.3
Hindrances to Active Transit

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0 0.5 1 2 Miles