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Final Project

Exploring Access to Urban Green Space for Children in Salem, MA

Introduction:

A large shift in the human-ecological landscape in the United States is the rapid population growth in major cities. Urban dwellers make up over 50% of the global population, and urban areas are expected to see even more population increases over the next few decades (1,2). For people in urban landscapes, accessing green spaces can be a challenge. There are numerous health and societal benefits associated with having access to urban green space (UGS) that have been studied extensively. From improving both mental and physical health (3,4), to providing opportunities for social interactions, accessing UGS is imperative to the quality of life of city dwellers (5).

While having access to UGS is important for people of all ages, research shows that having access to safe playgrounds is especially important in combatting the epidemic of childhood obesity, and may even improve academic performance (4). One study found that children who have access to a playground less than two-thirds of a mile from their home were five times more likely to have a healthy weight than children who did not (4).

Authors Kothencz, et al (3), examine in their article the personal benefits provided by access to green space, including an individual's self-reported quality of life. While this study looked specifically at the city of Szeged, Hungary, and its goal was to aid city planners, the

conclusions that were drawn regarding how recreational activities improve quality of life are likely transferable to other cities.

In an article by Wolch, Byre, and Newell (6), relevant literature on urban green space and public health is reviewed, noting that particular attention has been focused on parks and the childhood obesity epidemic. Of major relevance to my study is the statement that children with more access to green space for recreational purposes are more active than children with less access (6).

Inspired by this literature, this study uses a geographic information system to examine children's accessibility to UGS intended for active recreation in Salem, Massachusetts. A walking distance criterion was developed based on the age of the residents. Using a Service Area Analysis, buffers for the predetermined walking distances were created. These buffers were then overlaid with census data to determine both the number of children living within an acceptable walking distance, and the percentage of children in each age group that lives within an acceptable walking distance of a park or playground.

Methodology:

The town boundaries for Salem, Massachusetts were downloaded from MassGIS; the Community Boundaries (Towns) from Survey Points data layer was used. Salem includes several islands that are irrelevant to this study, and these were removed after using the Explode Multipart Features edit tool. The same island removal process was done for the Census data layer (discussed later). Data for urban green space were also downloaded from MassGIS; these sites are in the Protected and Recreational OpenSpace data layer. Unfortunately, many but not all school playgrounds were included in this data layer. This was corrected to include all school

playgrounds that are accessible to the public during off-school hours within city limits; missing playgrounds were digitized using imagery and added to the data. This Protected and Recreational OpenSpace data layer also includes many protected areas that are not actually accessible to the public, and others that cannot be considered recreational facilities. Areas like cemeteries, ponds, golf courses, marinas, and conservation land are not included in this study. While many of these areas could be included in the definition of urban green space, I am attempting to predict the percentage of school age children that would realistically walk to a site, and I believe active recreation is a larger draw for the age group in this study. After this correction process, thirty-three parks and playgrounds represent the UGS used in this study.

Data regarding age of the residents was downloaded from the American Community Survey 2016 five-year estimates, table B01001. This table provided data regarding both the age and sex of the residents, with each sex being divided into multiple age groups, from 'Under 5', to 'Over 85'. Because my analysis examines the accessibility for children, I included only the age groups: under five, five to nine, and ten to fourteen. Because I also am not making a distinction between males and females, these were summed together. For the purposes of this study, there are three defined walking distances based on age. Children ages four and under were assigned an acceptable walking distance of one quarter of a mile, children ages five to nine one half mile, and children ages ten to fourteen one mile. These distances reflect not necessarily the walking distance capabilities of these age groups, but the distance that children would not see as an impediment to playing in or visiting a park.

In order to run the Service Area Analysis, a Network data layer was created using the MassDOT Roads data layer. Because Service Area Analysis cannot be run using polygons, centroids were created for each of the thirty-three UGS used in this study (shown in Figure 1).

These centroids were then inputted into the Service Layer Analysis as the Facilities. Each of the three walking distances was entered into the tool as Restrictions. From this analysis tool, three polygons were created, one for each walking distance (shown in Figure 2). These polygons were then overlaid with the Census data using the Identity tool. The existing area acres fields were then recalculated. To get the proportion of each block group in the service areas, the newly calculated area acres was divided by the original entire block group area acres. This proportion was then multiplied by the number of people in each of the three walking distance overlay data layers (quarter mile, half mile, one mile). A Summary was then done on the blockgroup GEOID with a Sum of the count of the appropriate age group for each distance, giving the total number of children in each age group living within its distance for each blockgroup.

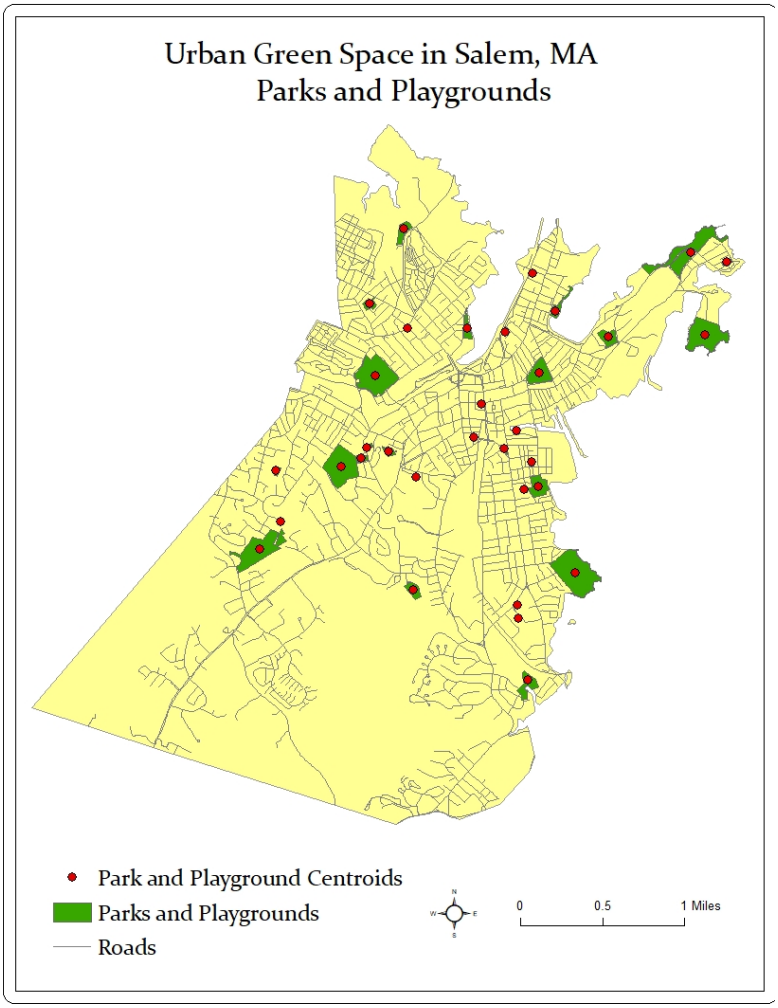

Figure 1

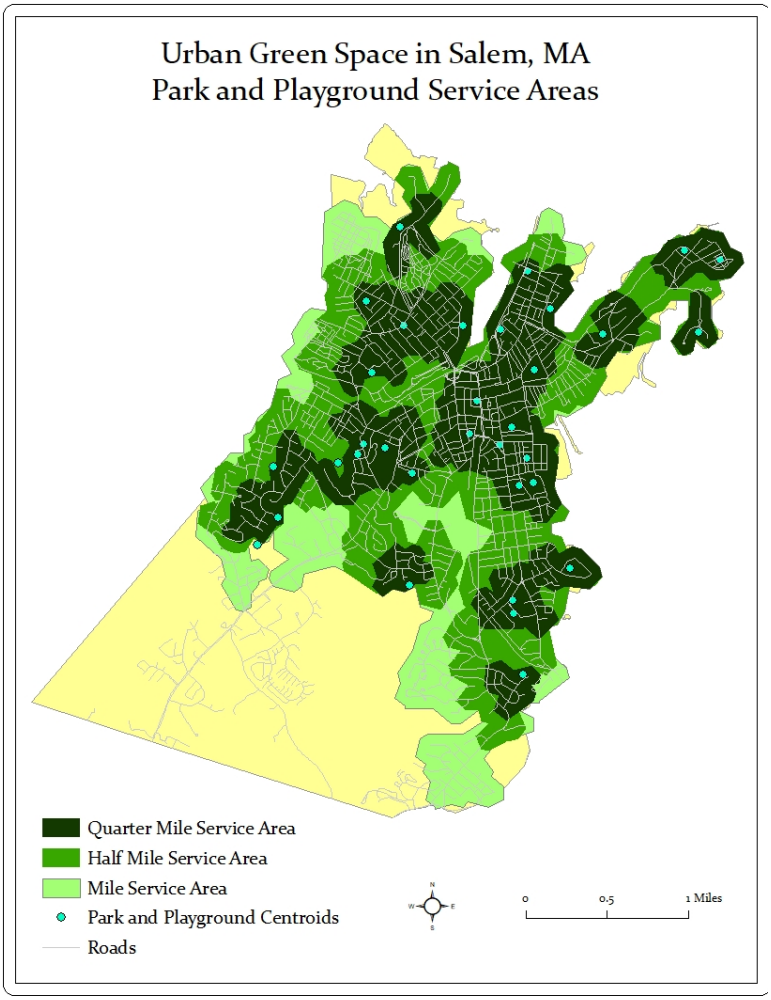

Figure 2

Results:

The results of this analysis show that, generally speaking, the children of Salem, Massachusetts have reasonably easy access to urban green space. The maps show that South Salem (Highland Avenue and near Vinnin Square) does not contain any UGS desirable for school-aged children. However, in this area there are also lower numbers of children across all age groups used in this study. Other than this South Salem area, UGS is reasonably evenly distributed across the city.

Figures 3 and 4 (following page) show the count and percentage of children under five years of age living within a quarter mile walking distance of UGS. Figures 5 and 6 show the count and percentage of children between the ages of five to nine living within a half mile walking distance of UGS. Figures 7 and 8 show the count and percentage of children between the ages of ten and fourteen living within a mile walking distance of UGS.

When looking at downtown Salem and the Point neighborhood, UGS is very accessible across all age groups. This part of the city also has comparably higher numbers of children than the rest of the city. The Winter Island area (North-East Salem) has increased access to UGS, but the number of children in this area is quite low.

When comparing the count of children with access to UGS versus the percentage of children with access, the maps are very different. Especially for children ages 5-14, the percentage of children with access is considerably higher than the count of children with access. The maps also show a pattern of increased access as children get older and are more likely to walk further.

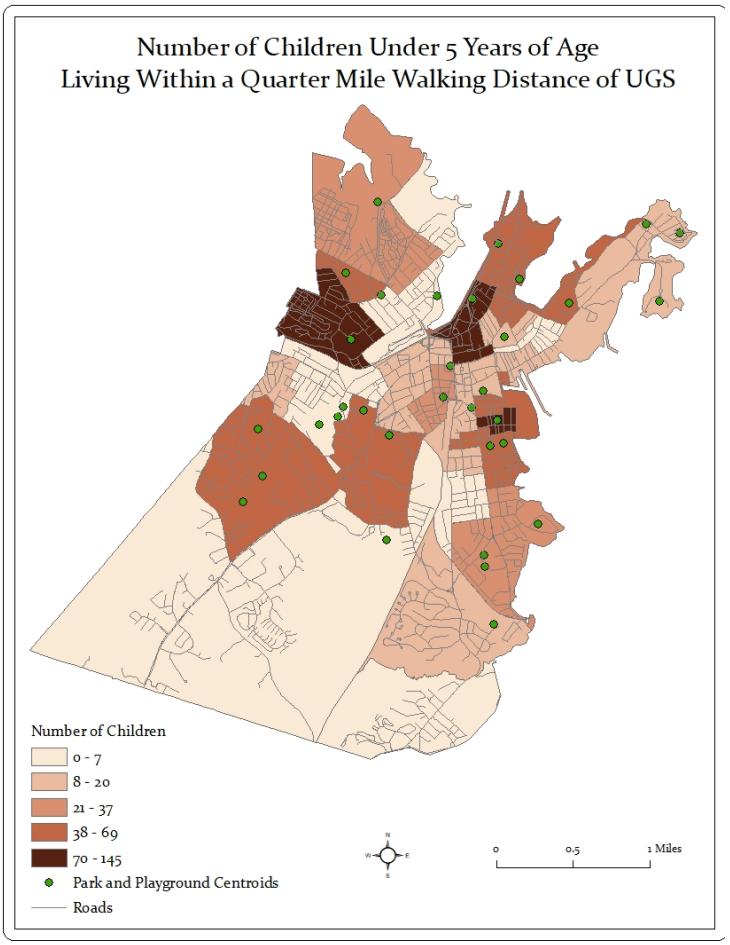

Figure 3

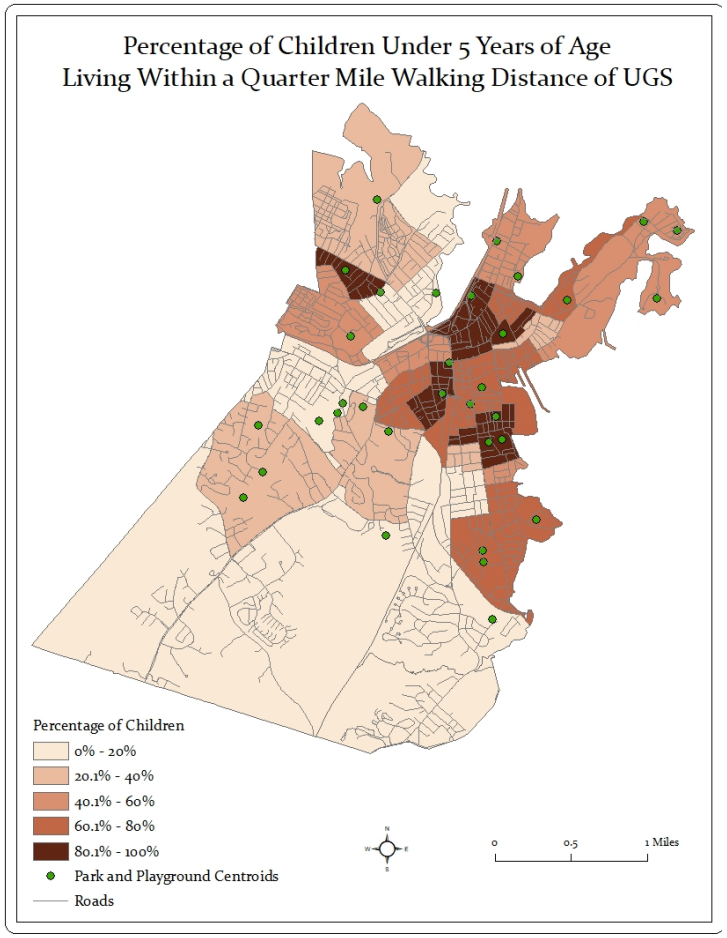

Figure 4

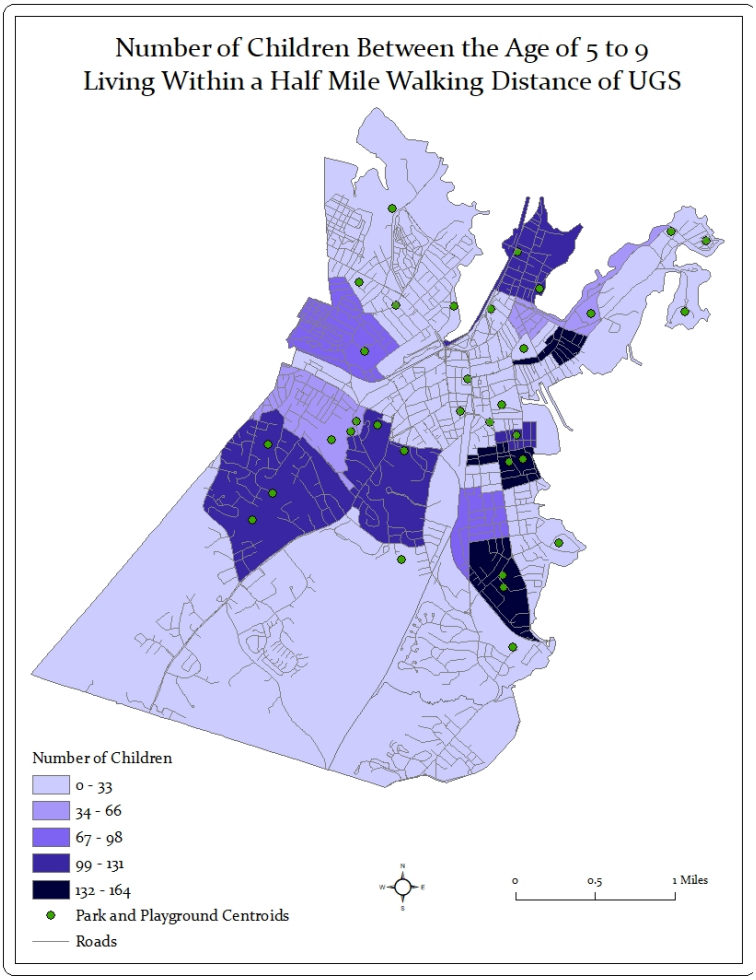

Figure 5

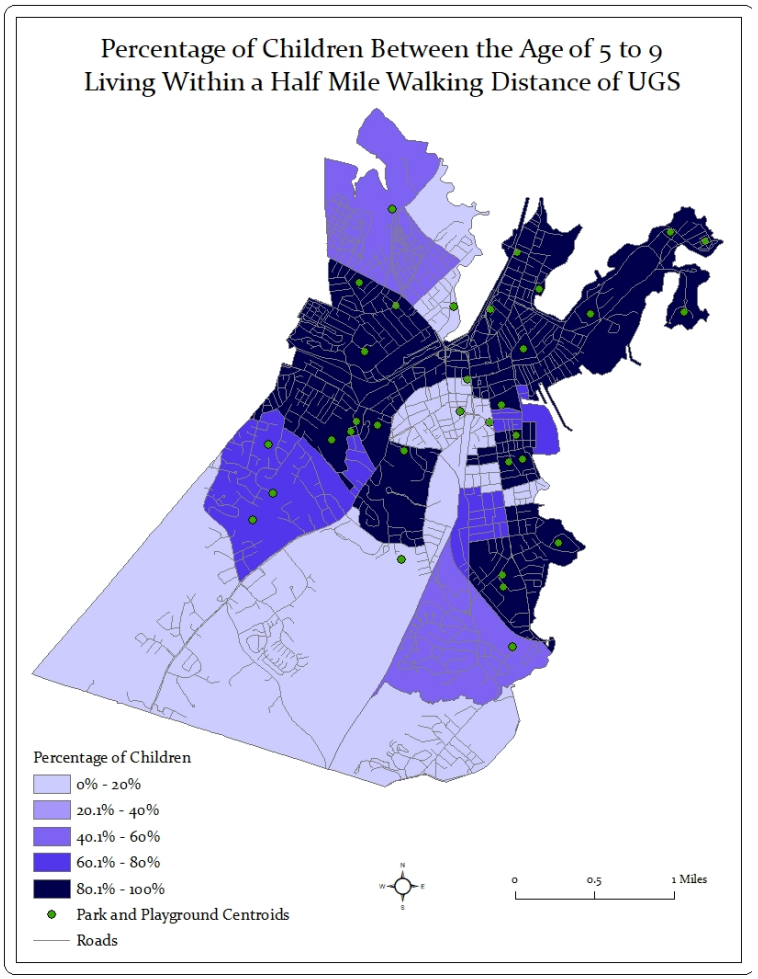

Figure 6

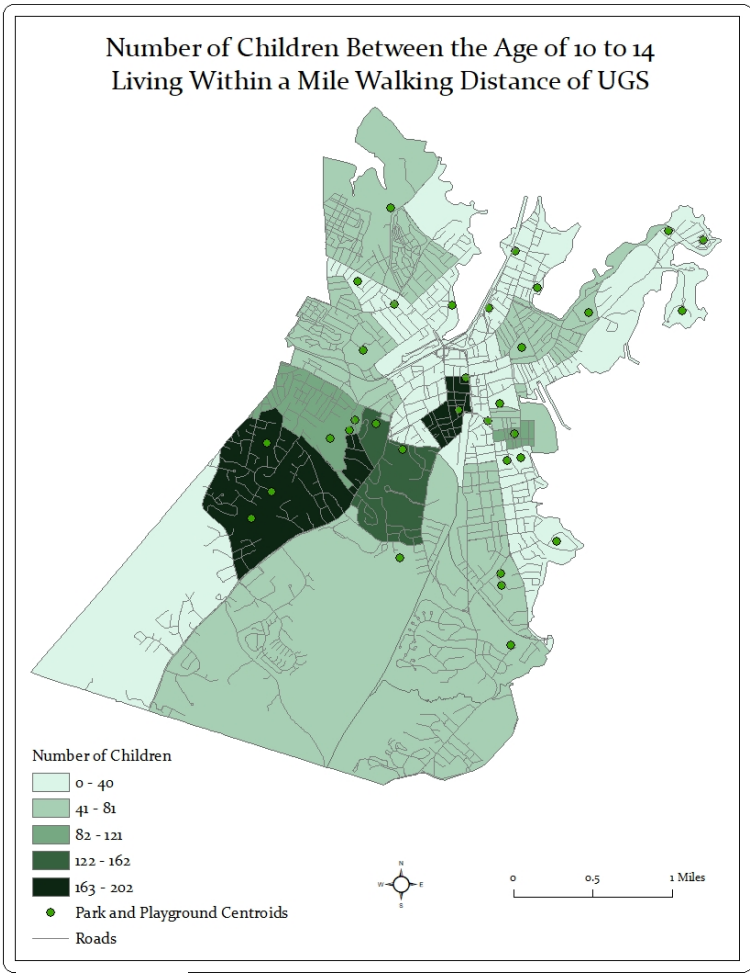

Figure 7

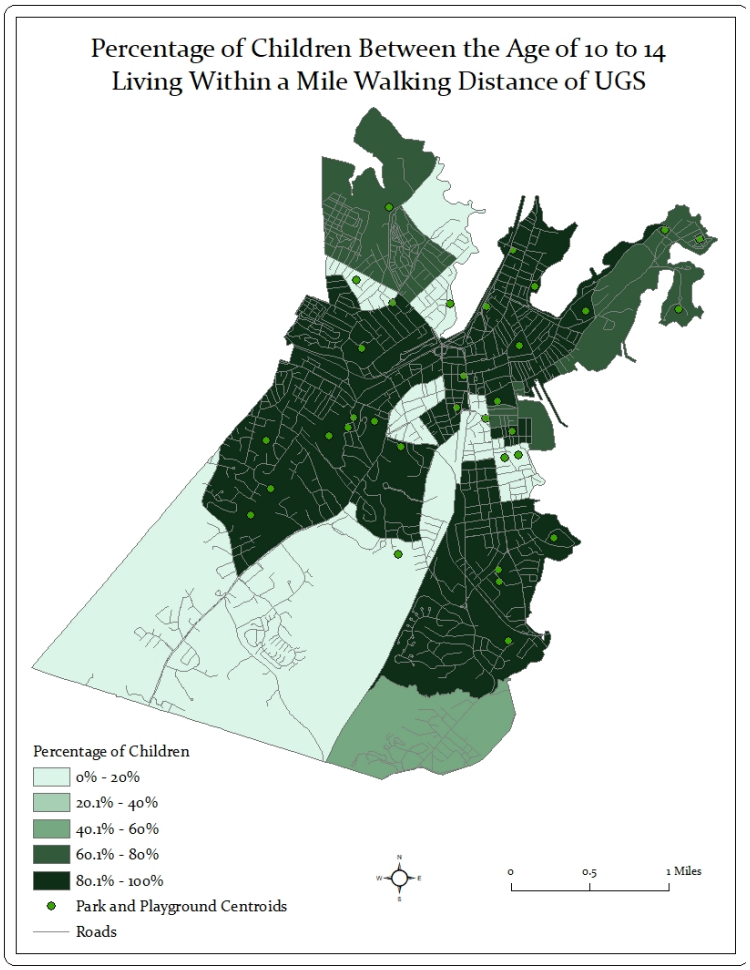

Figure 8

Conclusions:

This analysis shows that the children of the city of Salem, Massachusetts do have relatively easy access to desirable urban green space. This study could be used in the future as part of real estate evaluations. It also would be interesting to take this research a step further by gathering demographic data to determine if there is an access issue based on other factors, such as household income, race, or ethnicity.

This analysis was made easier by the fact that I have personal knowledge about the city of Salem. I was able to easily determine which parks were not originally included in the data and could also easily identify neighborhoods within the city.

This study does not incorporate the size of the park in relationship to population density. For example, in the Point neighborhood, which has a large population of children in all three age groups, technically does have good access to UGS. However, the park in the heart of that neighborhood, Mary Jane Park, is one of the smallest in the city. This study does not address the park capacity.

The area in South Salem that does not contain any parks or playgrounds (Highland Avenue and Vinnin Square) could be explained by land use and land cover patterns. Highland Avenue is considerably more industrial than the rest of the city. There are residential neighborhoods, but they are more spread out compared to the rest of the city. The area around Vinnin Square (Loring Avenue) is surrounded by wetlands, resulting in a lack of land suitable for a park or playground.

Using a Service Area Analysis rather than simply creating distance buffers results in a more accurate analysis because it follows the routes people actually travel, rather than using straight distance. One limitation of using this tool is that the Service Areas are created outward for each walking distance criteria from park centroid, which for larger parks could result in skewed data. It would be interesting to input the actual park entrances as the Facilities, rather than the park centroids, to see if the results are different.

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