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THE SOCIO-SPATIAL RELATIONS OF THE ACCESSIBILITY OF PARKS IN CHICAGO

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ABSTRACT

This study focuses on seven parks in Chicago, including Grant Park, Lincoln Park, Humboldt Park, Garfield Park, Douglas Park, Jackson Park, and Washington Park, to examine their accessibility within the city. Their accessibility is divided into three questions, through the analysis of integration, choice and connectivity values to see if their spatial configuration in the city has an affect on the people living in community areas around them.

In order to measure accessibility and study the socio-spatial relationships of the parks, analysis via the means of Space Syntax has been conducted. Additionally, Depthmap analysis of the parks is compared with information obtained from the city census, which reveal that all seven parks lie in neighbourhoods that vary not just geographically, but also racially and economically.

The analysis concludes that it is not always the most integrated or connected parks that lie in the city centre. Additionally, spatial configuration in terms of integration and connectivity does not necessarily contribute to social conditions such as housing or poverty levels, but sometimes is a result of historical factors such as Chicago's housing segregation.

KEYWORDS

Chicago; Parks; Accessibility; Space Syntax; Demographic

1. INTRODUCTION

Parks, especially for city-dwellers, have long been a place for recluse and recreation. Their value in the world of architecture, planning, and use has been questioned, and has been re-evaluated over time. What parks play as their role in the future of cities remains to be seen, but the simple fact that they are open spaces for the public to use allows for debate on how they are or are not being used, and the most affective ways they can play a role in the sustainability of cities.

The main goal of this study is to explore seven prominent parks within the city of Chicago, and to see what spatial and social characteristics they embody within the city as a whole, but also within the neighbourhoods they lie in. Chicago has a long history of parks, starting from the inception of the city itself, and offers not just an array of services that the parklands provide, but also invests and promotes in community activities year round. Questions about the roles of parks in modern day planning in the United States have evolved to not just parks being a place of recluse, but also how they can play a productive role in social and environmental planning in order to make cities more sustainable (Cranz, 1989). A great emphasis has been placed on the design of parks and how they are used in the communities and neighbourhoods they lie in. As Byrne and Wolch write, parks are "paradoxically described as crime havens, treasured family refuges, and oasis for urban residents" but there is no concrete solution to having a successful implementation of a so-called utopian park, since they vary in "size, age, design, ornamental embellishments, planting, facilities, maintenance, and patterns of use"

(2009, p. 743). While there have been studies conducted in the past based on parks and their relationships with ethnographic demographics as well as other studies looking at accessibility or spatial characteristics, the combination of studying both, the spatial as well as social analysis of parks are sparse.

The interest in studying parks in Chicago is based on the fact that it not only occupies a large physical space in urban life, but also the fact that the parks that are being studied in this research are the first parks that were created during the inception of the city itself. While prominent researchers like Galen Cranz and Paul Gobster have explored in great detail the history, designs, perils and successes of Chicago parks, little has been explored in terms of spatial configuration of the parks within the city.

One of the aims of this research is to study Chicago parks in a new light, specifically the accessibility of parks, using tools such as Space Syntax theory and methods to reveal, perhaps a different narrative on the role that parks have within the urban context. This study aims to answer the following questions in regards to parks and accessibility: do the parks allow for people to connect across different neighbourhoods from the city?; does the spatial configuration of the parks allow for the possibility of social interaction due to their virtue of proximity?; and lastly, do the parks' spatial location as well as characteristics reveal anything about the neighbourhoods that they lie in?

2. DATASETS AND METHODS

2.1 SYNTACTIC ANALYSIS

The importance of syntactic analysis is to not only produce images that show where parks are integrated and connected, but also provide data for each park, therefore offering insight into unique characteristics that each park has. As Hillier writes, "space syntax explains how cities work – how space, movement, land uses, human activity and psychology combine to create the complex forms we occupy and experience," hence it being a useful tool when studying urban spaces such as parks (2016, p. 199).

Before studying the parks themselves, a segment analysis has been done within Chicago city limits, so as to provide an initial, brief insight into any patterns that one can find while looking at the city. A segment map (Figure 1), which is used in the software called Depthmap, is essentially a linear representation of urban spaces composed of axial lines, which are defined by the longest straight lines that represent a point in space (Hillier and Hanson, 1984). The axial map "basically captures the cognitive accessibility in movement space in terms of directionality. With the axial map it is possible to quantitatively measure distance in number of changes in direction, in terms of 'axial steps'" (Ståhle, 2009, 7). With the help of the segment map, syntactic analysis can examine integration and choice values. As Hillier writes, integration shows "mathematical closeness, which measures how close each segment is to all others" (2009, p.4). Furthermore, integration values reveal how connected streets and areas are to each other (Hillier and Hanson, 1984). Choice on the other hand, is indicative of the word itself, whereby values indicate the possibility of segments that can be chosen between any two points in order to reach a destination.

The importance of choice values is that it measures "mathematical betweenness, which calculates how many distance-minimising paths between every pair of segment lies on under different definitions of distance" (Hillier, 2009, p.4). Choice values are often used to forecast pedestrian and vehicular movement. Thus, the higher the choice values are, the shorter the paths are to get from the point of origin to the destination. One of the important steps in order to measure accessibility is to compare the syntactic values of each park, be it choice, integration, or connectivity.

In order to continue the analysis in a manner that would help visualise the parks and their connection to the city, the segment map was imported into qGIS, one of the variations of Geographic Information Systems. GIS is often used for planning and management purposes, allows for segment analysis, and is especially useful when studying aspects such as accessibility. Using the inbuilt feature of the Bing road map, polygons, or 'shapes' of the parks were drawn out, a necessary step in order to measure accessibility. Furthermore, having the polygons of the parks allows for analysis between the parks and the segments, including integration, choice, and connectivity values.

Accessibility of parks can be measured in various ways, but for the purposes of this study, it was important to create buffers of the polygons. Creating a buffer involves implementing different radii of the parks with respect to the segments. Buffer distances (using 'as the crow flies' technique] of 60 meters, 400 meters, 1200 meters and 2000 meters have been done, as it measures the geographic centre of each park with respect to its surroundings (Nicholls, 2001).

The importance of setting up buffers at different distances helps capture accessibility both at a local and global scale.

Besides the buffers themselves, it is important to note that the mean values of integration, choice, and connectivity are measured in several radii including 400, 800, 1200, 2000, 5000, 10000, 20000, and n to properly compare and contrast the parks with each other, as well as to see if there are any differences within the various buffer radii. Essentially, this study involves both the analysis of the integration, choice, and connectivity of the segments as a whole, but also their interaction with the parks, thereby revealing some answers of accessibility as well as spatial configuration.

Other spatial characteristics around the parks can be revealed through the means of foreground and background networks. The foreground network can reveal "linked centres at all scales, from a couple of shops and a café at the smallest scale to whole sub-cities at the largest, all set into a background network of mainly residential space" (Hillier, 2009, 4). The benefits of analysing the foreground network is that it provides additional knowledge as to how the parks are situated within the communities they lie in.

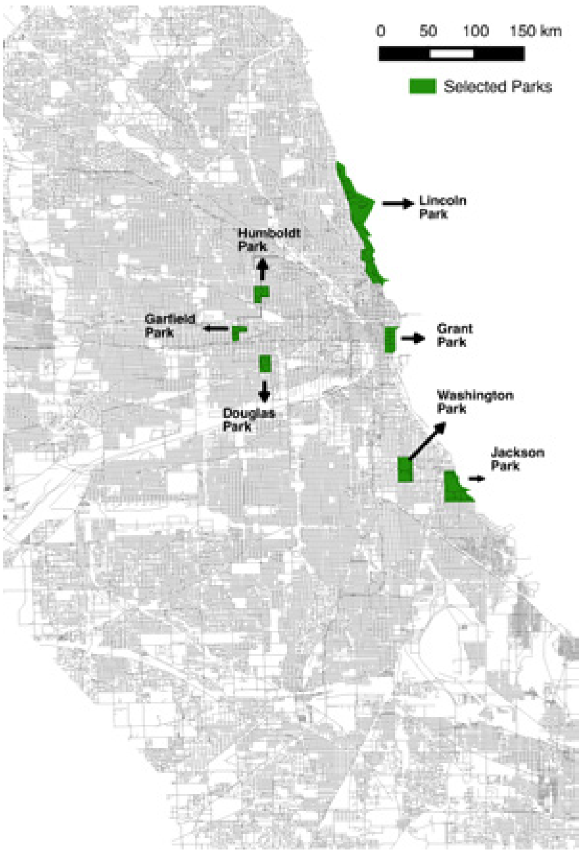

Figure 1 - Selected Parks in Segment Map

In order to examine the first research question, which asks, does the spatial configuration of the parks allow for the possibility of social interaction due to their virtue of proximity? In order to study this question, integration values are necessary to look at, particularly mean NAIN values, as they reveal ease of accessibility in the street network. In other words, integration measures "to-movement potential of a segment as a destination, since the measure describes its accessibility or how easy it is to get to from all other segments" (Hillier, 2009, p. 131). The second part of the research question asks, do the parks allow for people to connect across different neighbourhoods from the city? Choice values, or mean NACH values in syntactic terms, are used to measure and analyse the second question. Mean NACH values "define a network," specifically the background network of neighbourhoods (Hillier, 2005, p.26). Unlike normalised integration values that represent to-movement, NACH values signify through movements. The more segregated the depth of each segment is, the more likely it is that choice values will also reduce. Lastly, the research questions, do the parks' spatial locations as well as characteristics reveal anything about the neighbourhoods that they lie in? An analysis of angular connectivity has been conducted to best understand the components of the last question. Connectivity is "a property that can be seen from each space, in that wherever one is in the space one can see how many neighbouring spaces it connects to." (Hillier, 2007, p. 94). Therefore, the measures of connectivity indicate the number of immediate neighbourhoods that are directly connected to the respective parks. By measuring connectivity, the data can provide an insight into how intelligible and permeable the parks are for residents and users alike.

2.2 ETHNOGRAPHIC AND STATISTICAL DATA

The combination of syntactic analysis with that of ethnographic and statistical data provided by the city census can prove to be useful due to the fact that Chicago has a rich history of social and housing segregation. Racial divides have led to certain areas within the city in deep poverty, and studies reveal that areas with higher poverty rates and regions with ethnic minorities "were significantly associated with reduced availability of green spaces, parks, and public sports areas, while areas with higher household income had a greater frequency of such amenities" (Higgs et al., 2012, p. 328). Therefore, the amalgamation of data from both the syntactic analysis as well as demographic data from the city census and statistics encompass the spatial as well as the social realm.

3. CASE STUDIES

The history of parks in Chicago goes back to the 19th century with the Chicago Park District being one of the oldest and largest park districts in the United States (Bachrach, 2001). The story of the preservation, creation, and continuation of parklands began around the 1850s, with the emergence of a new government in Chicago, whose citizens rallied for a comprehensive park system so people could enjoy the views of Lake Michigan, as well as have public spaces available without the interference of private companies and landowners. This led to the beginnings of the first and largest park in Chicago, known as Lincoln Park. Consequently, the creation of Lincoln Park led to three independent park commissions known as the Lincoln, South, and West Park Commissions in 1869, with the goal of forming a "unified ribbon of green" that would encircle Chicago (Bachrach, 2001). Furthermore, with much lobbying from the public, the government of Chicago decided to keep the land east of Michigan Avenue, formerly known as Lake Park, now dubbed Grant Park, to be a public space permanently. By 1890, Chicago had a large and expansive park system, with Lincoln Park to the North, Garfield, Douglas, and Humboldt Parks to the West, Grant Park to the East, and Washington Park and Jackson Park to the South, therefore ensuring that the lakeshore front remained away from the private sectors and accessed and used purely for and by the public (McCarthy, 1972). By the end of the Great Depression, it was agreed upon that the different Park Commissions consolidate as one entity, now known as the Chicago Park District.

Indeed, it can be said that the above-mentioned parks were the first and most prominent parks that laid the foundation to the addition of subsequent parks within the city as well as Chicago-land in the future. What sets them apart from the rest of the parks is their shared history, dating back to the beginning of the formation of the city itself, to the fact that each of the parks are located in different areas of the city, thereby having their own distinct history with the neighbourhoods that they lie in.

In terms of syntactic analysis, Table 1 lists out the average for integration and choice values, as well as segment length.

	Nach20000	Nach10000	Nach5000	Nach2000	Nach1200	Nach800	Nach400	NachN
Average	0.947	0.966	0.984	0.999	0.997	0.978	1.512	0.899
	NAIN20000	**NAIN10000**	**NAIN5000**	**NAIN2000**	**NAIN1200**	**NAIN800**	**NAIN400**	**NAIN N**
Average	1.731	1.635	1.507	1.418	1.415	1.433	1.498	1.626
	Segment_Le							
Average	131.326							

Table 1

As can be seen from the table above, when looking at choice values, as the radius decreases, choice values increase, thereby allowing for more through movement. The opposite phenomenon happens when looking at integration, or NAIN values, where as the radii increase, so do the values. Supported by Table 1, Figure 2 illustrates that choice values are especially high in the city centre, which is indicated by the high concentration of red segment clusters. What is interesting to note is that there are clusters in close proximity to all the parks, thereby indicating that there are high levels of choice values around the parks.

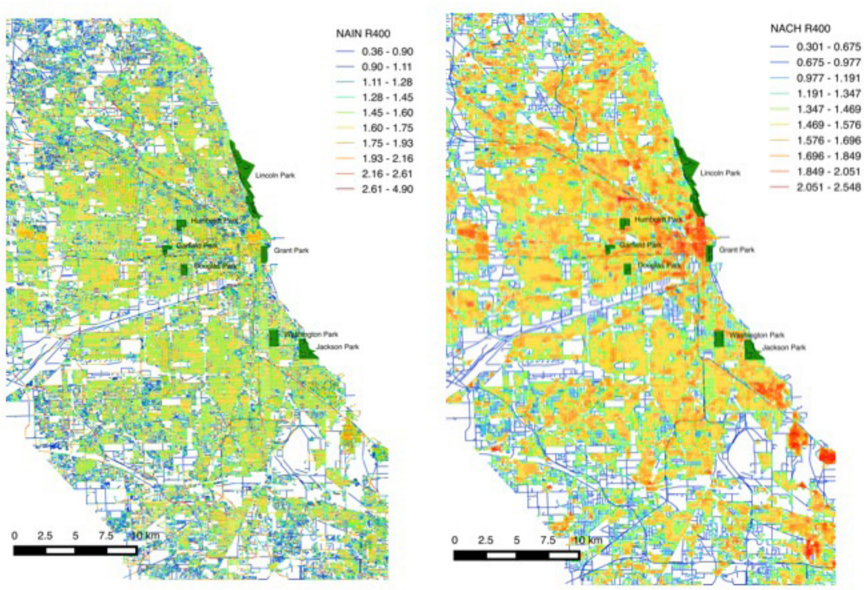

Figure 2: NAIN R400 vs NACH R400

4. ANALYSIS

4.1 MEAN NAIN VALUES

The importance of syntactic data, including integration and choice values is that they reveal to and through movements in a city. The first set of data helps to answer the first research question, which asks if the parks allow for people to connect across different neighbourhoods from the city. The tables and figures below present the mean NAIN values conducted at four different buffers, 60m, 400m, 1200m, and 2000m. The reason that these particular radii have been chosen is due to the fact that it depicts both local and global movements. As mentioned previously, the importance of obtaining integration values is that it highlights to movements on the foreground scale, from centre to centre (Hillier, 2001, 2009). Essentially, mean NAIN values are not just analysed at different radii for just a segment analysis, but also different buffer radii that depict what the relationship of the segments have with the parks themselves.

As can be seen from Table 2, the data shows mean integration values of the segments at the 60m buffer radius of the parks. When looking at NAIN values at the 2000 radius, there is an unusual spike. Values dip and surge at an oscillating fashion, where integration decreases significantly at 1200r and then increase again at 800r and finally decreases again at 400r.

	MEANNorm20000	MEANNorm10000	MEANNorm5000	MEANNorm2000	MEANNorm1200	MEANNorm800	MEANNorm400	MEANNormN
Lincoln Park	1.482	1.347	1.387	2.092	1.379	1.772	1.647	1.884
Grant Park	1.526	1.579	1.524	2.460	1.729	1.997	1.979	2.212
Humboldt Park	1.437	1.503	1.435	2.509	1.649	2.084	1.999	2.381
Garfield Park	1.474	1.443	1.370	2.345	1.624	1.947	1.999	2.256
Douglas Park	1.441	1.382	1.324	2.211	1.497	1.852	1.746	2.006
Jackson Park	1.463	1.239	1.297	1.743	1.275	1.619	1.527	1.724
Washington Park	1.490	1.431	1.399	2.068	1.535	1.788	1.808	2.034

Table 2 - Mean NAIN at 60m Buffer

	MEANNorm20000	MEANNorm10000	MEANNorm5000	MEANNorm2000	MEANNorm1200	MEANNorm800	MEANNorm400	MEANNormN
Lincoln Park	2.185	2.002	1.766	1.512	1.450	1.452	1.515	1.833
Grant Park	2.337	2.092	1.846	1.665	1.555	1.502	1.510	1.929
Humboldt Park	2.487	2.363	1.984	1.644	1.524	1.467	1.488	2.066
Garfield Park	2.348	2.246	1.989	1.635	1.482	1.418	1.481	1.964
Douglas Park	2.368	2.152	1.864	1.595	1.503	1.473	1.506	1.968
Jackson Park	1.750	1.718	1.532	1.309	1.282	1.332	1.445	1.622
Washington Park	2.037	1.961	1.747	1.550	1.481	1.459	1.510	1.786

Table 3 - Mean NAIN at 400m Buffer

	MEANNorm20000	MEANNorm10000	MEANNorm5000	MEANNorm2000	MEANNorm1200	MEANNorm800	MEANNorm400	MEANNormN
Lincoln Park	2.255	2.095	1.864	1.630	1.537	1.496	1.518	1.874
Grant Park	2.301	2.071	1.830	1.717	1.638	1.586	1.567	1.913
Humboldt Park	2.509	2.387	2.029	1.737	1.636	1.583	1.558	2.079
Garfield Park	2.410	2.287	2.026	1.723	1.613	1.558	1.545	2.009
Douglas Park	2.442	2.240	1.951	1.682	1.578	1.534	1.552	2.034
Jackson Park	1.846	1.820	1.648	1.461	1.412	1.424	1.501	1.716
Washington Park	2.086	2.018	1.804	1.631	1.574	1.546	1.558	1.827

Table 4 - Mean NAIN at 1200m Buffer

	MEANNorm20000	MEANNorm10000	MEANNorm5000	MEANNorm2000	MEANNorm1200	MEANNorm800	MEANNorm400	MEANNormN
Lincoln Park	2.274	2.120	1.894	1.677	1.580	1.532	1.536	1.882
Grant Park	2.334	2.108	1.858	1.712	1.624	1.567	1.552	1.931
Humboldt Park	2.512	2.396	2.049	1.754	1.649	1.589	1.572	2.074
Garfield Park	2.411	2.289	2.020	1.731	1.621	1.565	1.556	2.004
Douglas Park	2.451	2.269	1.983	1.731	1.629	1.568	1.555	2.036
Jackson Park	1.912	1.907	1.755	1.564	1.495	1.493	1.549	1.760
Washington Park	2.058	1.997	1.783	1.577	1.501	1.486	1.526	1.810

Table 5 - Mean NAIN at 2000m Buffer

While all the seven parks behave similarly in terms of integration values at different radii, it is important to note that it is not Grant Park, which is located within the city centre, but rather Humboldt Park to the west that has higher NAIN values, especially at the 2000 and 800 radii. Integration values at the 400m buffer radius is different from that of the 60m buffer radius in that all the parks' values decrease as radii decrease. Furthermore, Jackson Park has the lowest values when compared to the rest of the parks, while Humboldt Park has the highest NAIN values at the highest radius.

Like the integration values of the 400 meter buffer radius, mean NAIN values at the 1200 meter buffer radius decrease as the radii decrease. Again, Jackson Park consistently has the lowest values when compared with the rest of the Parks, while Humboldt Park has the highest value at the radii 20000 and 10000.

4.2 MEAN NACH VALUES

Moving on from integration values, the second research question asks if the spatial configuration of the parks allows for the possibility of social interaction due to their virtue of proximity. This leads to the next level of analysis, which is the mean choice, or NACH values. Normalised choice values reveal the shortest distance required to go from one point to another. Unlike integration which measures movement from origin to destination, choice values select the "intervening spaces that must be passed though" to go from one place to another (Hillier and Iida, 2005, p. 479).

	MEANNach20000	MEANNach10000	MEANNach5000	MEANNach2000	MEANNach1200	MEANNach800	MEANNach400	MEANNachN
Lincoln Park	1.001	1.023	1.042	1.054	1.042	1.018	1.592	0.939
Grant Park	1.015	1.039	1.054	1.066	1.054	1.031	1.706	0.958
Humboldt Park	1.047	1.065	1.071	1.076	1.067	1.043	1.600	1.019
Garfield Park	1.044	1.065	1.084	1.080	1.063	1.037	1.598	1.001
Douglas Park	1.016	1.032	1.047	1.048	1.032	1.004	1.515	0.993
Jackson Park	0.950	0.981	1.005	1.028	1.016	0.998	1.519	0.898
Washington Park	1.041	1.062	1.077	1.081	1.065	1.033	1.467	0.984

Table 6 - Mean NACH at 60m Buffer

	MEANNach20000	MEANNach10000	MEANNach5000	MEANNach2000	MEANNach1200	MEANNach800	MEANNach400	MEANNachN
Lincoln Park	1.015	1.037	1.056	1.065	1.055	1.032	1.619	0.957
Grant Park	1.014	1.038	1.055	1.062	1.050	1.028	1.711	0.956
Humboldt Park	1.054	1.073	1.079	1.083	1.072	1.046	1.608	1.024
Garfield Park	1.034	1.055	1.072	1.073	1.058	1.033	1.571	0.993
Douglas Park	1.036	1.053	1.066	1.068	1.052	1.023	1.537	1.003
Jackson Park	0.981	1.015	1.038	1.050	1.037	1.014	1.509	0.925
Washington Park	1.001	1.026	1.040	1.044	1.029	1.003	1.494	0.944

Table 7 - Mean NACH at 400m Buffer

	MEANNach20000	MEANNach10000	MEANNach5000	MEANNach2000	MEANNach1200	MEANNach800	MEANNach400	MEANNachN
Lincoln Park	0.974	0.948	0.971	0.974	0.964	0.932	1.286	0.856
Grant Park	1.016	1.040	1.046	1.017	0.980	0.935	1.474	0.961
Humboldt Park	1.038	1.052	1.058	1.061	1.046	1.020	1.566	1.025
Garfield Park	1.025	1.052	1.079	1.072	1.047	1.021	1.561	0.974
Douglas Park	0.974	0.992	1.021	1.042	1.031	0.997	1.421	0.941
Jackson Park	0.960	0.995	1.016	1.025	1.001	0.979	1.381	0.896
Washington Park	1.056	1.089	1.101	1.100	1.083	1.049	1.407	0.981

Table 8 - Mean NACH at 12000m Buffer

	MEANNach20000	MEANNach10000	MEANNach5000	MEANNach2000	MEANNach1200	MEANNach800	MEANNach400	MEANNachN
Lincoln Park	0.957	0.981	1.004	1.014	1.006	0.980	1.460	0.893
Grant Park	1.017	1.036	1.040	1.043	1.031	1.007	1.706	0.959
Humboldt Park	1.024	1.039	1.046	1.054	1.052	1.035	1.613	1.003
Garfield Park	1.004	1.031	1.054	1.049	1.030	1.006	1.607	0.957
Douglas Park	1.002	1.015	1.034	1.039	1.031	1.010	1.494	0.975
Jackson Park	0.917	0.949	0.972	0.992	0.985	0.973	1.477	0.859
Washington Park	1.013	1.041	1.059	1.066	1.059	1.031	1.471	0.947

Table 9 - Mean NACH at 2000m Buffer

It is noteworthy that in buffers 400m, 1200m, and 2000m, Grant Park appears to have the highest choice values at the lowest radius. What makes the parks different from each other then, are individual values when compared to each other. Therefore, the choice for connecting across different neighbourhoods through the means of parks is highest only on the local level. In other words, it is most convenient to access parks that are closest to the point of origin and through movement.

4.3 ANGULAR CONNECTIVITY

The last question in regards to parks and accessibility asks if the parks' spatial location as well as characteristics reveal anything about the neighbourhoods that they lie in. In order to examine this question, the mean angular connectivity is used to measure the number of spaces immediately connecting to the space of origin (Hillier and Hanson, 1984). By using connectivity for syntactic analysis, data can reveal how the parks are connected with respect to each other, as well as within the city.

For the purposes of a better visual illustration, the polygons of the parks reveal which parks are most connected at different buffers. At buffers 60m and 400m (Figure 3), it appears that Grant Park has the highest levels of connectivity while Lincoln Park has the lowest. What is interesting to note is that Humboldt Park has the second highest value in connectivity, despite the fact that it is not located within the city centre.

When comparing Figures 3 and 4, it is imperative to examine the difference in connectivity values, especially when comparing them to each other. While mean connectivity values remain the lowest at Lincoln Park and Jackson Park, it is important to note that at higher buffer radii, Jackson Park's connectivity values are lower than Lincoln Park's.

Furthermore, an unexpected shift occurs, where Humboldt Park's connectivity increases, and is higher than Grant Park, which is centrally located. Apart from the higher connectivity values of Humboldt Park at both the 1200m and 2000m buffers, when looking at Garfield Park and Douglas Park, there are differences in values when the two are compared to each other. For example, at the 1200m buffer radius, the connectivity values of Garfield Park are higher than that of Douglas Park. However, at the 2000m buffer radius, Douglas Park's connectivity values are higher than Garfield Park. However, at the 2000m buffer radius, Douglas Park's connectivity values are higher than Garfield Park. Looking at Washington Park, its connectivity values are higher at buffer radius 1200,

with a mean value of 5.038, and decreases to 4.868 at the 2000m buffer radius. What is interesting to note is that as the buffers increase, the park that has the highest integration, which is Grant Park in the city centre, is not the park with the highest connectivity. Instead, the park that is the most connected is Humboldt Park, one of the three parks located on the west side of Chicago. On the opposite side, Jackson Park has the least angular connectivity, suggesting that it is the most isolated of the parks.

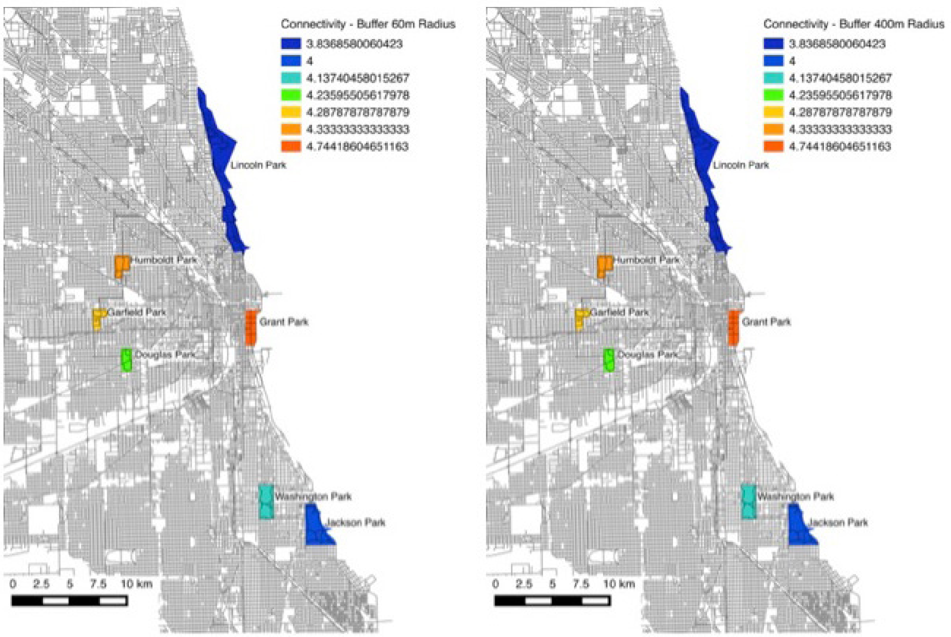

Figure 3 - Angular Connectivity of 60m and 400m Buffer Radii

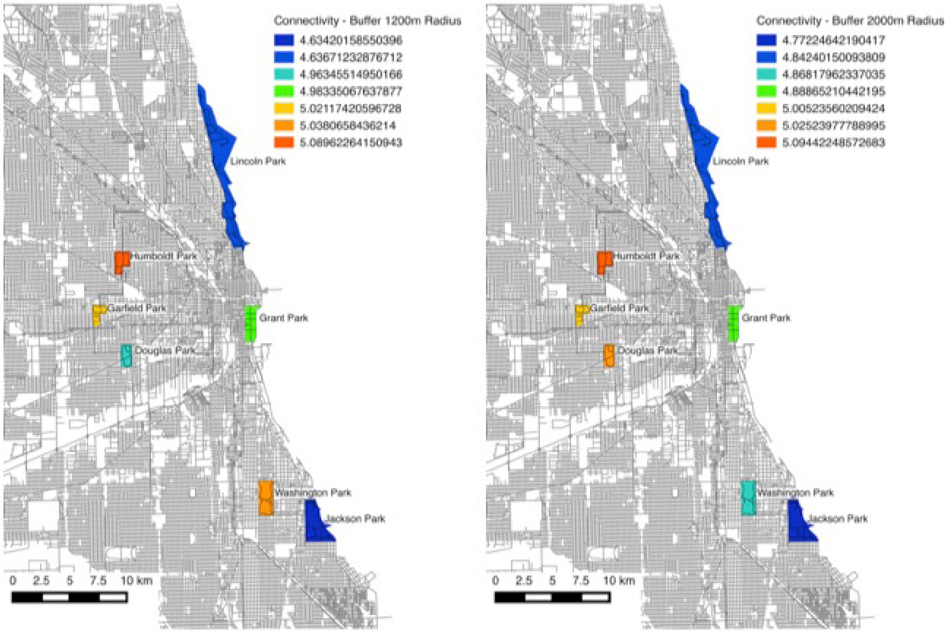

Figure 4 - Angular Connectivity of 1200m and 2000m Buffer Radii

4.4 CENSUS DATA

While it is true that the seven parks chosen in this research were green spaces created during the inception of Chicago, the city itself has evolved by not just expanding structurally, but also demographically. The combination of the influx of migration as well as the long history of racial and housing segregation has resulted in large portions of the city divided by race, and therefore income. Consequently, "many northern and mid-western cities [...] had separate parks for Whites and African-Americans, with people of colour confined to a park-deprived urban core while Whites enjoyed a park-abundant suburban periphery" (Kraus, 1969, cited in Byrne and Wolch, 2009, p. 747). For the purposes of this research, it is important to look at parks with respect to the socio-spatial relations within the city.

Figure 5 depicts the average income (USD) per community area. It is clear to see that those earning the highest income live closer to Grant Park and Lincoln Park. Similarly, looking at unemployment rates, community areas closer to Grant Park and Lincoln Park have lower unemployment rates while those areas in the south side and west side have higher unemployment rates. Lastly, figure 6 depicts community areas with percentages below the poverty line. Areas closer to Grant Park and Lincoln Park have lower percentages of poverty while those living closer to the west side parks and the south side parks have higher rates of poverty. Particularly, the community area by Douglas Park appears to have the highest poverty rate when compared to areas around the other six parks.

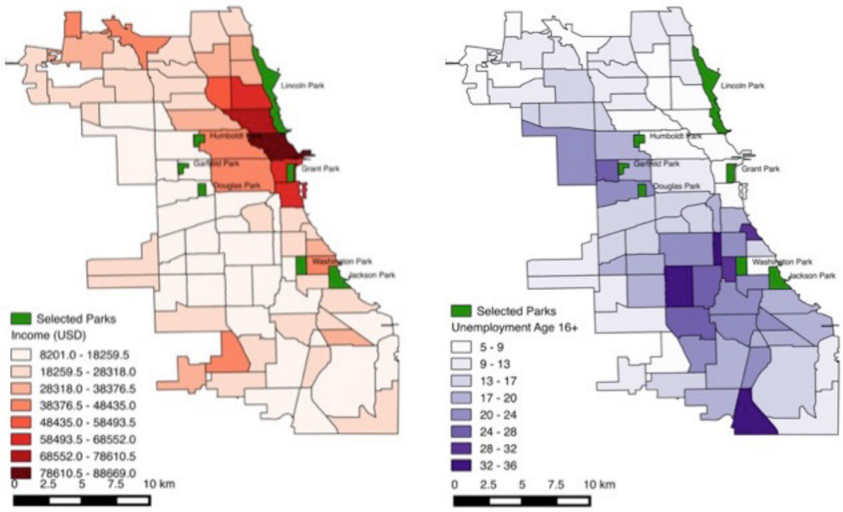

Figure 5 - Income (Left) and Percent Unemployment (Right)

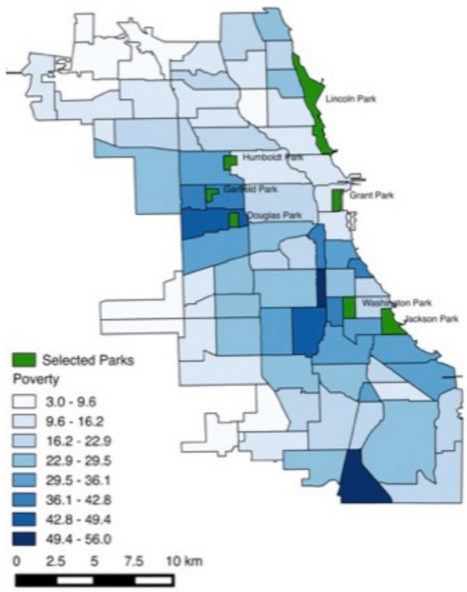

Figure 6 - Percent Below Poverty

5. DISCUSSION

It is clear that when looking at integration and choice values, integration and to-movement are more on a global scale as values are higher at larger radii, while choice values are based more on a local scale, as values increase only when radii decrease. So when the first question asks if the parks allow for people to connect across different neighbourhoods from the city, the use of integration values suggest that to-movement does occur, and since integration values are higher at a larger radius, it is suggested that there are more possibilities to connect across different neighbourhoods. However, it is important to note that just because the possibilities to connect to other parks are there, that does not necessarily mean that such connections will be made. It is the combination of the virtue of proximity as well as what the parks have to offer in terms of services that can result in additional trips being made to parks that might be far from home. Second, the research questions if the spatial configuration of the parks allow for the possibility of social interaction due to their virtue of proximity. Choice values suggests that it is less likely for such activity to occur since NACH values reveal that there is a higher possibility of interaction only if people are within the same park or are in the vicinity of the area. The last question asks if the parks' spatial location as well as characteristics reveal anything about the neighbourhoods that they lie in. The answer to the last question is not definitive due to the fact that spatial location does not necessarily reveal an important aspect about the social surroundings, including the neighbourhoods that they lie in. For example, Lincoln Park and Jackson Park are among the least integrated or connected parks and lie on opposite sides of the city, with Lincoln Park to the north and Jackson Park to the south. Yet, those who live around the Lincoln Park area earn a higher income than those that live in Jackson Park. Similarly, Humboldt Park, which is situated in the west side of Chicago, is highly integrated and connected like Grant Park which is located within the city centre. Yet, those that live by Humboldt Park have higher unemployment rates, have lower income, and have higher rates of those that live below poverty lines. With such examples like the ones stated above, it could be suggested that spatial properties of the parks do not necessarily reveal why there is a demographic segregation, and could instead be attributed to social causes that may have contributed to it. After all, when looking at the racial demographics, there is a clear divide in the fact that ethnic minorities live more on the west and south sides of Chicago. This, when combined with unemployment, poverty, and income suggests that those who are of colour, and especially those that identify as Latinos or African-Americans, are among those who live under conditions of higher rates of poverty, while those that earn higher wages happen to be White and live in or closer to the city centre. Despite the fact that African-Americans had been emancipated since the Civil War, "housing segregation in the United States developed slowly and deliberately," and has resulted in cities like Chicago to continue to remain heavily segregated in the present day (Seitles, 1998, p. 91). When they moved up north during the industrial revolution, Chicago's South Side soon came to be known as 'South Side Black Belt' (Hirsch, 2009). This suggests that those that live closer to the city centre near Grant Park or by Lincoln Park have easier access to additional park amenities offered at the two parks than those that live farther away.

This research has used different methodological tools in space syntax with the aim to answer the socio-spatial relations of parks in Chicago. While it can be determined that the spatial configuration of the parks do not necessarily determine the social demographics around the parks, further investigation can be conducted as to how the parks are used. For example, Lincoln Park provides more services and is the largest and most visited park in the city. Studying the demographics of the parks by counting the number of people that visit on a daily basis, as well as calculating demographics could prove useful, especially for planning purposes. Despite the fact that Humboldt Park is more integrated and connected, it is Lincoln Park and Grant Park that are more widely used. By analysing demographics of park users, planners may be able to better understand how to use park space effectively within the communities they lie in.

6. CONCLUSIONS

Cities are complex urban spaces that accommodate millions of people. The nature of their inherent duality of the foreground network of city centres linking to each other with the background network of residential spaces provides for opportunities to study how such dynamic urban grids effect social interaction. It is for this reason that green spaces such as parks have been studied in this research, in order to examine how parks, which are pockets of land that are largely not for commercial or residential use, fit within the urban context.

In the attempt to understand the accessibility of the parks, three main questions have been analysed via the means of space syntax as well as demographic data provided by the city census to determine the relationships of the parks within the urban grid as well as to each other. By using integration, choice and connectivity values, it can be suggested that there is a high possibility for people to connect across different neighbourhoods due to the higher integration values at larger radii. However, choice values reveal that there is more of a chance for the possibility of interaction when people are in close proximity to the park, due to the higher choice values at lower radii. Lastly, the combination of connectivity data and demographics suggest that the parks' spatial configuration does not necessarily effect or reveal characteristics of the neighbourhoods they lie in. Rather, it is the social causes of segregation that contribute in large part to higher rates of poverty and unemployment of those living near the south and west side parks.

While this study explains certain socio-spatial relations that parks have within the city of Chicago, further studies on park use and accessibility can be conducted in order to determine how best to use green spaces within communities that live below poverty. With many cities now aiming to transform urban grids to be sustainable places for people to live, how parks and other such open spaces are used is crucial when planning neighbourhood and community development.

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