The Relationship Between Residential Density and Neighborhood Cohesion in the Greater St. Louis Area

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Abstract

To date, research on residential built environment has focused mainly on accessibility to public transit and places for physical activity, walkable outdoor environment, and perception of safety. Adding to current literature, this study investigated how residential density may impact neighborhood cohesion by comparing three neighborhoods in the Greater St. Louis Area of relatively high, medium, and low residential density (Shaw, University City and Hazelwood). Empirical studies have shown that neighborhood cohesion is a solution to increasing health inequality and decline of social capital. This study uses the Neighborhood Cohesion Instrument to measure neighborhood cohesion outcomes among residents. Survey participants included 123 residents (49 men, 74 women). One-way ANOVA followed by post-hoc analysis was conducted to detect significant differences in outcomes. The urban study area with the highest residential density (Shaw) was found to have higher neighborhood cohesion outcomes than the other two study areas, located at the city outskirts (University City) and suburbs (Hazelwood). Furthermore, attraction-to-neighborhood and neighboring, two of three sub-categories of neighborhood cohesion, were positively and significantly associated with residential density. In conclusion, higher residential density may increase attraction-to-neighborhood and neighboring and, in turn, improve the overall neighborhood cohesion outcomes.

Keywords: residential density, neighborhood cohesion, urban-to-suburban settings

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Introduction

There are widespread claims in current literature that the quality of built environment promotes the development of social capital (Araya et al., 2006; Cabrera & Najarian, 2015; Cohen, Inagami, & Finch, 2008; Leyden, 2003; Wood et al., 2008) and is an important component of livable places for well-being (Nicola Dempsey, Bramley, Power, & Brown, 2011; Derrett, 2002; Handy, Boarnet, Ewing, & Killingsworth, 2002). The residential built environment, defined by its physical forms, consists of three components: 1) transportation systems in communities, e.g. accessibility to transit, 2) land use patterns in a neighborhood, e.g. diversity and density, and 3) community design, e.g. sidewalks, main streets, and recreational sites, etc. (J. Sallis, F. Johnson, J. Calfas, Caparosa, & Nichols, 1998). The elements of built environment allow much more specificity about how built environment at a neighborhood level correlates to social capital outcomes, such as neighborhood cohesion. Neighborhood cohesion represents resources that individual residents can access via community engagement and membership in a group. These resources include mutual trust, reciprocity, social ties and interaction, and civic participation and engagement (Cao & Rammohan, 2016; Drukker, Buka, Kaplan, McKenzie, & Van Os, 2005; I. Kawachi, Kennedy, & Glass, 1999; Kruger, Kodjebacheva, Kunkel, Smith, & Kruger, 2015; Leedahl, Chapin, & Little, 2015; Lochner, Kawachi, Brennan, & Buka, 2003; Oswald, Jopp, Rott, & Wahl, 2011; Schuurmans et al., 2005; Vilhjalmsdottir, Gardarsdottir, Bernburg, & Sigfusdottir, 2016; Wu, Hall, Canham, & Lam, 2016). If the built environment of such neighborhoods is poor, then obtaining social support may be difficult, especially for adults who live alone (Subramanian, Kubzansky, Berkman, Fay, & Kawachi, 2006). Thus, it might be argued that the better quality of residential built environment would enhance neighborhood cohesion among local residents.

Previous studies have observed a positive association between the quality of built environment in terms of accessibility to transit, walkable outdoor environment, perception of safety, and access to places for physical activity and neighborhood cohesion outcomes (Christian, Giles-Corti, Knuiman, Timperio, & Foster, 2011; Cohen et al., 2008; J. F. Sallis et al., 2009; van den Berg, Sharmeen, & Weijs-Perrée, 2017; Yip, Sarma, & Wilk, 2016). The association between residential density and neighborhood cohesion is, however, little-supported by empirical research. This paper investigates the association between residential density and neighborhood cohesion in an urban-to-suburban transect.

Literature Review

Neighborhood cohesion

Neighborhood cohesion, as known as social cohesion at the neighborhood level, is described as one element of social capital. Robert Putnam described social capital as “connections among individuals; social networks and the norms of reciprocity and trustworthiness that arise from them” (Putnam, 2001, p. 19). Although this gives a sense of what is meant by social capital, it would be difficult to create a definition satisfactory to everyone. The most acceptable definition

of social capital used in social science originates from Putnam. He categorized social capital consisting of five aspects: (1) networks, (2) engagement and participation, (3) identity and sense of belonging, (4) norms and altruism, and (5) trust. Similarly to Putnam, the Organization for Economic Cooperation and Development (OECD) defined social capital as "networks together with shared norms, values and understandings that facilitate cooperation within or among groups" (OECD, 2001, p. 41). For the sake of simplicity, revisiting the two definitions, social capital as it is used here will be considered the networks, links, shared norms, values and understandings in society that enable individuals to trust each other and work together. To comprehensively acquire the components of social capital, the main determinants of social capital are listed in Table 1.

Table 1
Determinants of social capital studied from existing literature

Social support	Novak et al., 2017
Social cohesion	Ichikawa, Fujiwara, & Kawachi, 2017; Strange, Bremner, Fisher, Howat & Wood, 2016
Trust	Asadi-Lari et al., 2016; Kruger, Kodjebacheva, Kunkel, Smith & Kruger, 2015; Tsuchiya et al., 2017; Wu, Hall, Canham & Lam, 2016
Consciousness	Heid, Pruchno, Cartwright & Wilson-Genderson, 2016
Connection	McAneney et al., 2015
Social network	Miyamoto, Iwakuma & Nakayama, 2015
Social contact	Miyamoto, Iwakuma & Nakayama, 2015
Social interaction	Miyamoto, Iwakuma & Nakayama, 2015
Participation	Cao & Rammohan, 2016; Wilmot & Dauner, 2016
Cooperation	Heid, Pruchno, Cartwright & Wilson-Genderson, 2016
Control	Quatrin, Galli, Moriguchi, Gastal, & Pattussi, 2014
Social ties	Vihjalmsdottir, Gardarsdottir, Bernburg & Sigfusdottir, 2016
Reciprocity	Leedahl, Chapin & Little, 2015
Collective efficacy	Heid, Pruchno, Cartwright & Wilson-Genderson, 2016
Group identity	Leedahl, Chapin & Little, 2015

Among those determinants, social cohesion is a result of shared values, goals and challenges, and a sense of community (Maxwell, University of Alberta, & Department of Economics, 1996). It refers to the extent of solidarity and connectedness in a community and represents common values and good that individuals can access (L. Kawachi & Berkman, 2000). Chan, To, & Chan (2006) defined social cohesion as "a state of affairs concerning both the vertical and horizontal interactions amongst members of society as characterized by a set of attitudes and norms that include trust, a sense of belonging and the willingness to participate and help, as well as their behavioral manifestations." The definitions of social cohesion show a broad concept that overlaps several dimensions, such as sense of belonging, reciprocity, mutual trust, social ties, and active participation. Neighborhood cohesion is the social cohesion that is particular considered in neighborhood conditions.

At the community level, the relationship between neighborhood cohesion and public health has been a trending topic for the past two decades and, based on the evidence, policy makers seem to regard neighborhood cohesion as a solution to increasing health inequality and decline of social capital (Chuang, Chuang, & Yang, 2013; Ellaway, Macintyre, & Kearns, 2001; Rios, Aiken, & Zautra, 2012). Growing evidence suggests that neighborhood cohesion is a key determinant of population health (Mulvaney-Day, Alegría, & Sribney, 2007; Wilkinson, 1999) and it is associated with less crime and greater engagement in community activities (Ferreira et al., 2007). In addition, Chao (2016) examined that neighborhood cohesion was associated with better physical health, especially better mental health well-being among older adults. In her study, the researcher measured neighborhood cohesion using the Neighborhood Social Cohesion and Disorder Scale[2] through 8-item questionnaire regarding community connectedness and community problems. The participants were also asked questions regarding mental health through a 10-item questionnaire from the Center for Epidemiological Studies – Depression (CES-D)[3]. The findings showed that neighborhood cohesion was significantly associated with lower rates of depression, and neighborhood cohesion mediated and moderated the relationship between outdoor activities and depression. Accordingly, neighborhood cohesion played an important role in between outdoor activities and depression, i.e. engagement in outdoor activities promoted a high level of neighborhood cohesion, while high neighborhood cohesion was negatively associated with depression.

A cohesive neighborhood is one where residents are protected against risk of coronary heart disease and stroke mortality (Clark Cari Jo et al., 2011). Fostering social cohesion in neighborhoods is about creating more inclusiveness and striving for greater civic participation. Accordingly, the built environment of neighborhoods may shape residents' social cohesion and behavior which may positively affect physical and mental health. Thus, providing quality of built environment offers the prospect of greater neighborhood cohesion and, in turn, promoting population health.

Residential density

In a document produced by the Local Government Commission in Cooperation with the United States Environmental Protection Agency (2003), residential density is defined as the number of residential units built on a given parcel of land (p.1). It measures the number of household units that have been built in a neighborhood per acre or square-mile. Some research has examined the factors that impact the built environment of neighborhood for the sake of sustainability, including walkable neighborhoods (Oakes, Forsyth, & Schmitz, 2007), multiple affordable housing choices (Haarhoff, Beattie, & Dupuis, 2016), transportation choices (Cheshmehzangi &

[2] Neighborhood cohesion measurement tool.
[3] Depressive symptoms measurement tool.

Butters, 2016), community public health support (Hanlon, Burstein, Masters, & Zhang, 2012), sense of safety (Dumbaugh & Rae, 2009), and environment protection (Audirac, Shermyen, & Smith, 1990). To date, the growing volume of studies argues that higher density is a sustainable development form in urban settings in terms of shortened travel distance and mixed use land patterns (Bramley & Power, 2009; Burton, Jenks, & Williams, 2003). However, research on various density and its consequences on social sustainability, for example, neighborhood cohesion, is very limited. Furthermore, a study in the United Kingdom showed that residents in the denser neighborhoods of cities are more likely to report perception of danger, so that less neighborhood cohesion occurs (Oakes, Forsyth, & Schmitz, 2007). There is little research on how residential density impacts neighborhood cohesion outcomes in the United States.

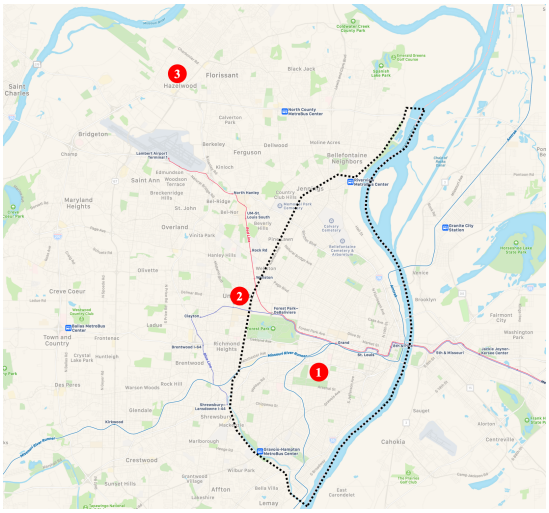
Method

Study design

The author selected three study areas (urban center to city boundary to suburban area) for this cross-sectional study – Shaw, St. Louis city, MO, University City, St. Louis county, MO, and Hazelwood, St. Louis county, MO (see figure 1 and Appendix I). These sites vary significantly in terms of residential density (11,351 households per square mile in Shaw, 2,709 households per square mile in University City, and 675 households per square mile in Hazelwood) but are similar in terms of demographics (see Table 2). Based on the calculated density, Shaw, University City, and Hazelwood have been categorized as study areas of high, medium, and low residential density, respectively. Due to the different recruitments applied across study areas, self-reported data was collected through face-to-face interviews in University City and Hazelwood, and through online surveys via Qualtrics in Shaw. This study was conducted in the spring of 2018 and the research protocol was approved by the Washington University in St. Louis Institutional Review Board (IRB ID #201804061).

Figure 1

A map of the three study areas



1, Shaw; 2, University City; 3, Hazelwood; Dotted line, city limits

Table 2

Demography and residential density of three study areas (data from the US Census Bureau)

	Shaw	University City	Hazelwood
Area	0.6 sq mi	5.9 sq mi	16.02 sq mi
Population	6,811	35,305	25,691
Sex			
Female	54.4%	50.4%	47%
Male	45.6%	49.6%	53%
Household	3,207	15,986	10,816
Ethnicity			
White	55%	50%	58.8%
Black	36.6%	38.3%	31.8%
Hispanic	1.7%	3.9%	3.7%
Asian	2.3%	3.8%	2.3%
Mixed	4.1%	2.9%	3%
Other	0.2%	0.3%	0.4%
Household income	$54.9k	$56.3k	$45.9k
Household types			
Married	31.7%	37.8%	35.7%
Single female	7.6%	13.1%	18.4%
Single male	4.6%	2.9%	5.5%
One-person	42.8%	35.2%	34.8%
Other	13.3%	11%	5.6%
Residential density	11,351 households/sq mi	2,709 households/sq mi	675 households/sq mi

Neighborhood cohesion instrument

The author used the 18-item Neighborhood Cohesion Instrument developed by Buckner (1988), which is generally considered one of the best instruments for assessing neighborhood cohesion (Li, Hsu, & Hsu, 2011). Buckner (1988) stated that "a neighborhood high in cohesion refers to a neighborhood where residents, on average, report feeling a strong sense of community, report engaging in frequent acts of neighboring, and are highly attracted to live in and remain residents of the neighborhood" (p.774). The Neighborhood Cohesion Instrument is comprised of 18 statements that respondents rate on a 5-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree). Included items are presented in Table 3. Based on the research of Buckner (1988), the 18 items of the neighborhood cohesion instrument were divided into three sub-categories: attraction-to-neighborhood (items 1, 5, and 13), neighboring (items 3, 7, 9, 11, 15, and 17), and sense of community (items 2, 4, 6, 8, 10, 12, 14, 16, and 18). This instrument measures dimensions of three sub-categories: attraction-to-neighborhood is explained as the eagerness to remain a resident in the neighborhood; neighboring is defined as the degree of interaction with neighbors; sense of community measures an attachment or shared emotional connection with the community.

According to Buckner (1988), the Neighborhood Cohesion Instrument can be applied to individual residents within neighborhoods of different residential density. The individual-level reported scores of the neighborhood cohesion instrument can be further aggregated to form a cumulative score to evaluate the neighborhood cohesion in different neighborhoods. A Canadian study found their results and Buckner's were similar and concluded that the instrument is robust for empirical research for investigating community cohesion (Robinson & Wilkinson, 1995). This instrument can also be found in previous studies (Li et al., 2011; Puddifoot, 1996).

Table 3

18-item Neighborhood Cohesion Instrument

1. Overall, I am very attracted to living in this neighborhood.
2. I feel like I belong to this neighborhood.
3. I visit with my neighbors in their homes.
4. The friendships and associations I have with other people in my neighborhood mean a lot to me.
5. Given the opportunity, I would like to move out of this neighborhood.
6. If the people in my neighborhood were planning something I'd think of it as something "we" were doing rather than "they" were doing.
7. If I needed advice about something I could go to someone in my neighborhood.
8. I think I agree with most people in my neighborhood about what is important in life.
9. I believe my neighbors would help me in an emergency.
10. I feel loyal to the people in my neighborhood.
11. I borrow things and exchange favors with my neighbors.
12. I would be willing to work together with others on something to improve my neighborhood.
13. I plan to remain a resident of this neighborhood for a number of years.
14. I like to think of myself as similar to the people who live in this neighborhood.
15. I rarely have neighbors over to my house to visit.
16. A feeling of fellowship runs deep between me and other people in this neighborhood.
17. I regularly stop and talk with people in my neighborhood.
18. Living in this neighborhood gives me a sense of community.

Participants

To understand the association between residential density and neighborhood cohesion, the study examined the perceptions of current residents in these study areas. The author contacted the Shaw Neighborhood Improvement Association for help with distributing online surveys through their network. The author contacted the Assistant Vice Chancellor for Community Relations and Local Government Affairs of Washington University to establish a connection with the director of University City Public Library, who provided a space to survey incoming library patrons who live in University City neighborhood. The author then enlisted the help of the City Director and Police Department of Hazelwood to acquire permission to knock on doors in the neighborhood to obtain survey participants. The recruiting process lasted from January to May 2018. Ultimately, the author recruited 123 community-dwelling residents in the surveys (43 from Shaw, 43 from University City, and 37 from Hazelwood), all age 18 or older, 49 of whom were men and 74 women. The details of participants are presented in the Results section.

Statistical analysis

The completed survey was sorted into three groups varied in sub-categories. The representation of three sub-categories, attraction-to-neighborhood, neighboring, and the sense of community, was calculated by taking the average score of the corresponding items. The outcome of the overall cohesion instrument was calculated by taking the mean score of these sub-categories. Statistical analysis was performed with SPSS. One-way ANOVA followed by post-hoc analysis was applied to each sub-category of the cohesion instrument to determine whether there was significant difference among the three neighborhoods. The Levene test was conducted to evaluate the homogeneity of variances. If the variance of a cohesion instrument among groups was not significantly different ($p>0.05$), Tukey post hoc analysis was applied to detect significant difference in a pairwise manner. If significant difference was then detected ($p<0.05$), Game-Howell post hoc analysis was used to detect the significant difference in a pairwise manner.

Results

The demographic information of participants is further described in Table 4. Areas of notable difference included gender (86% of respondents in Shaw were female, vs. 47% of respondents in University City, and 46% in Hazelwood), race (95% of respondents in Shaw were White, vs. 51% in University City and 65% in Hazelwood), household status (72% of respondents in Shaw did not live alone, vs. 60% in University City and 100% in Hazelwood), and duration of residence in the study area (the percentage of respondents who had lived in the study area for 0-5 years varied from 63% in Shaw to 37% in University City and 22% in Hazelwood; The percentage of respondents who had lived in the study area for 6-10 years ranged from 7% in Shaw to 14% in University City and 43% in Hazelwood.)

Table 4

Demography of the participants from the three study areas

	Shaw n=43	University City n=43	Hazelwood n=37
Gender			
Female	37	20	17
Male	6	23	20
Ethnicity			
White	41	22	24
Black	1	19	10
Asian		1	1
Native Hawaiian			
Native American			
Hispanic		1	2
Others	1		
Age range			

15-20			
21-30	8	9	2
31-40	20	6	10
41-50	9	5	17
51-64	4	12	6
65+	2	11	2
Educational level			
0-12	43	40	31
Greater than 12		3	6
Occupational status			
Currently employed	37	32	33
Currently unemployed	6	11	4
Child(ren) in household			
Yes	19	8	19
No	24	35	18
Household status			
Lives alone	31	26	37
Does not live alone	12	17	
Financial resources			
Lack		4	1
Adequate	34	33	30
Wealthy	9	6	6
Reside years			
0-5	27	16	8
6-10	3	6	16
11-20	11	9	7
21-30		4	3
Over 30	2	8	3

The author then collected and reviewed all responses. The response options of the 18-item neighborhood cohesion instrument ranged from strongly agree (5 points) to strongly disagree (1 point) on a five-point Likert Scale, giving each study area a maximum cumulative total score of 90 points. Table 5 presents mean scores of each 18-item Neighborhood Cohesion survey of Shaw, University City, and Hazelwood, along with mean cumulative scores from each study area. University City and Hazelwood showed similar scores of neighborhood cohesion (64.33 vs. 64.39 points), while Shaw had a higher score of 69.89 points. From this it can be deduced that the neighborhood cohesion outcomes of Shaw are relatively high compared to the other two study areas.

Table 5

Cumulative and mean scores of the 18-item Neighborhood Cohesion Instrument

	Shaw	University City	Hazelwood
Question 1	4.72	4.05	4.02
Question 2	4.16	4.16	3.86

Question 3	3.7	3	3.27
Question 4	4.09	3.81	3.76
Question 5	4.12	3.33	3.24
Question 6	3.63	3.42	3.32
Question 7	3.88	3.49	3.51
Question 8	3.49	3.42	3.41
Question 9	4.21	4.02	3.92
Question 10	3.74	3.79	3.84
Question 11	3.72	3.12	3.41
Question 12	4.47	4.02	3.81
Question 13	4	3.77	3.49
Question 14	3.79	3.7	3.68
Question 15	2.91	2.53	2.84
Question 16	3.4	3.42	3.5
Question 17	3.77	3.42	3.65
Question 18	4.09	3.86	3.86
Total	69.89	64.33	64.39

While the cumulative scores indicated that Shaw, a neighborhood of high density, might exhibit greater neighborhood cohesion, a statistical analysis was required to draw more solid conclusions. Here the author introduced one-way ANOVA followed by appropriate post hoc analysis, which provided more accurate detection of significant differences among the three independent groups – Shaw, University City, and Hazelwood.

Table 6

One-way ANOVA analysis between each two neighborhoods in overall neighborhood cohesion and its three sub-categories

		P-value
Neighborhood cohesion	Between groups	<0.01
Attraction-to-neighborhood	Between groups	<0.001
Neighboring	Between groups	<0.05
Sense of community	Between groups	n.s

*n.s., no significance

According to one-way ANOVA (see Table 6), there was a significant difference in overall neighborhood cohesion, and two of its subcategories (attraction-to-neighborhood and neighboring). Among these, attraction-to-neighborhood showed the most significant difference between neighborhoods ($p<0.001$). However, one-way ANOVA did not detect significant difference in the third subcategory – sense of community, suggesting that it is not directly related to the residential density of the neighborhood. Therefore, the following post-hoc analysis was only focused on overall neighborhood cohesion, attraction-to-neighborhood, and neighboring (see Table 7). In addition to this, mean scores of the three neighborhoods were calculated in Table 8 for better comprehension in the post-hoc analysis.

Table 7

Post-hoc analysis in neighborhood cohesion and its two sub-categories

	Neighborhood cohesion P-value	Attraction-to-neighborhood P-value	Neighboring P-value
Shaw – University City *High - Medium*	<0.01	<0.01	<0.01
Shaw – Hazelwood *High - Low*	<0.01	<0.001	n.s.
University – Hazelwood *Medium - Low*	n.s.	n.s.	n.s.

*n.s., no significance

Table 8

Mean scores of neighborhood cohesion and its two sub-categories from three neighborhood

	Shaw	University City	Hazelwood
Neighborhood cohesion	3.95	3.57	3.56
Attraction-to-neighborhood	4.28	3.71	3.59
Neighboring	3.7	3.26	3.43

According to post-hoc analysis, the neighborhood cohesion in Shaw was significantly higher than that of the University City and Hazelwood, which indicates that the density of a community may positively affect the neighborhood cohesion (see Table 6 & 7). Similarly, the attraction-to-neighborhood and neighboring were found to be greatest in the community of highest residential density. However, neighboring in Shaw was only significantly higher compared to University City, and was not found significantly different compared to Hazelwood. The detailed ANOVA and post hoc analyses are shown in Appendices II and III.

Discussion

The results of this study show a tendency of Shaw's neighborhood cohesion outcomes to differ significantly from the other two study areas. This was first seen in comparing the cumulative survey scores (see Table 5), in which University City (64.33) and Hazelwood (64.39) were not significantly different from one another, but Shaw's score (69.89) was higher. It was again seen in the one-way ANOVA analysis and the following post-hoc analysis of the two sub-categories (attraction-to-neighborhood and neighboring), in which University City and Hazelwood were again similar, but Shaw was significantly higher from the other study areas in these categories (with the exception of sense of community, in which Shaw showed no significant difference with Hazelwood).

A number of speculations can be made as to the cause of this discrepancy in neighborhood cohesion outcomes between Shaw and the other two study areas. One factor worth consideration is Shaw's location within central city, while University City is located on the western boundary

of the city, and Hazelwood is a suburb located even further from city boundary. Both of these study areas are of lower density in comparison to Shaw. This result aligns with Adams' (1992) research, which showed that people living in suburbs are no more likely to express higher satisfaction with their neighborhood or stronger feelings of neighborhood cohesion than urban residents, primarily due to lack of opportunities for employment. Furthermore, research by Peters, Elands, & Buijs (2010) indicates that urban settings with a high amount of ethnic diversity show a greater amount of neighborhood cohesion.

Another potential factor, which is also a limitation of the study, is the difference in the demographic makeup of the sample population collected at Shaw compared with the other two study areas. Among these differences is the gender of respondents, with 37 females in Shaw (86%) vs. 20 (46.5%) in University City and 17 (45.9%) in Hazelwood. Another area of demographic discrepancy worth noting is the race of participants. Although the overall ethnic makeup of all three study areas is similar, in the sample collected for the survey Shaw had a disproportionate number of white participants (41, 95.3%) and correspondingly few participants who were Black or of other ethnicity. The sample populations for the other two study areas were comparatively representative of their respective overall populations. One possible reason for this is the use of online surveys in the Shaw area versus face-to-face interviewing in the other areas. The online survey modality required more initiative to participate on the part of the respondents, as many surveys were sent out but left unanswered. It can then be postulated that for any number of reasons, white and female respondents in the Shaw area were more willing to communicate regarding their perceived sense of neighborhood cohesion. These results seem to indicate that in demographically diverse communities, white and female individuals experience a greater sense of cohesion than those of different gender or race. This concept is supported by Mitrany's (2005) research, which observed that in high-density communities, women seem to experience a greater sense of cohesion compared to men. Furthermore, the online survey participants had to actively respond; it is much easier to ignore an email survey than to decline a survey face-to-face. This could influence the survey results regardless of gender, race, etc. The results indicate that white females experience a greater sense of neighborhood cohesion, but this study doesn’t have enough participants to determine if gender and race were really significant factors. Therefore, future research should address that first and may be directed towards investigating factors influencing neighborhood cohesion outcomes among males and people of color, and interventions may be necessary to increase the sense of neighborhood cohesion among these groups.

The final major conclusion drawn by this study was the significant difference in overall neighborhood cohesion as well as its two sub-categories (attraction-to-neighborhood and neighboring), while no significant difference was shown with the third category – sense of community. Although it must be noted that a causal relationship cannot be deduced from this data, it can be seen that the two sub-categories: attraction-to-neighborhood and neighboring, which contribute to overall neighborhood cohesion, are most significantly correlated with

residential density. Whether the two sub-categories which influence residential density or the density which creates greater outcomes in the two sub-categories that has not yet been determined.

This study indicates that increasing residential density is likely to positively correlate with an increase in an area's attraction-to-neighborhood and neighboring. This may be extrapolated to increase the area's overall neighborhood cohesion outcomes. This correlation implies that the effects of residential density should be taken into consideration for promoting neighborhood cohesion, in turn, maximizing sustainability. Uzzell, Pol, & Badenas (2002) found that neighborhood cohesion impacts place-related social identity and its consequential impact on sustainability behavior.

The previous literature has shown that there is a significant association between built density and social capital, specifically between walkability or access to destinations and social cohesion (Mazumdar, Learnihan, Cochrane, & Davey, 2017). Thus, the current study's observation of the positive relationship between residential density and the two sub-categories (attraction-to-neighborhood and neighboring) provides further support for the correlation between density and social capital. Walkability and access to destinations may subjectively increase attraction-to-neighborhood and neighboring, but these are not incorporated in the Neighborhood Cohesion Instrument. A modified form of this survey which incorporates items pertaining to walkability and access to destinations may be useful in providing a clearer picture of the relationship between residential density and neighborhood cohesion.

In summary, after analyzing the neighborhood cohesion outcomes of three study areas ranging from city to suburbs, it might be concluded that residential density is associated with an area's neighborhood cohesion. The results of this study are opposed to Dempsey, Brown, & Bramley (2012) saying residents in a denser-urban neighborhood in the United Kingdom have lower neighborhood cohesion outcomes. This leads to study the differences between the United States and the United Kingdom in the future. As this study was conducted exclusively in residential areas, further studies are necessary which include a wider range of land uses, such as commercial areas, recreational areas, office space, etc. to determine the significance of built density specifically in urban settings. Further research can also be directed towards investigating which aspects of neighborhood density (such as walkability and accessibility) have the greatest influence on neighborhood cohesion outcomes.

Limitations

There are three possible research limitations that can affect the study primarily due to the different efforts from districts' authorities. First, the data collection should have used the exact data collection strategy at the three study areas to avoid bias and issues of self-selection and this could have skewed the results. Second, the sample size (123 responses) might not enough to

draw conclusions. Third, it is the different distribution of male/female among the three groups. For example, 86 percent of respondents from Shaw were female so that is not a representative sample.

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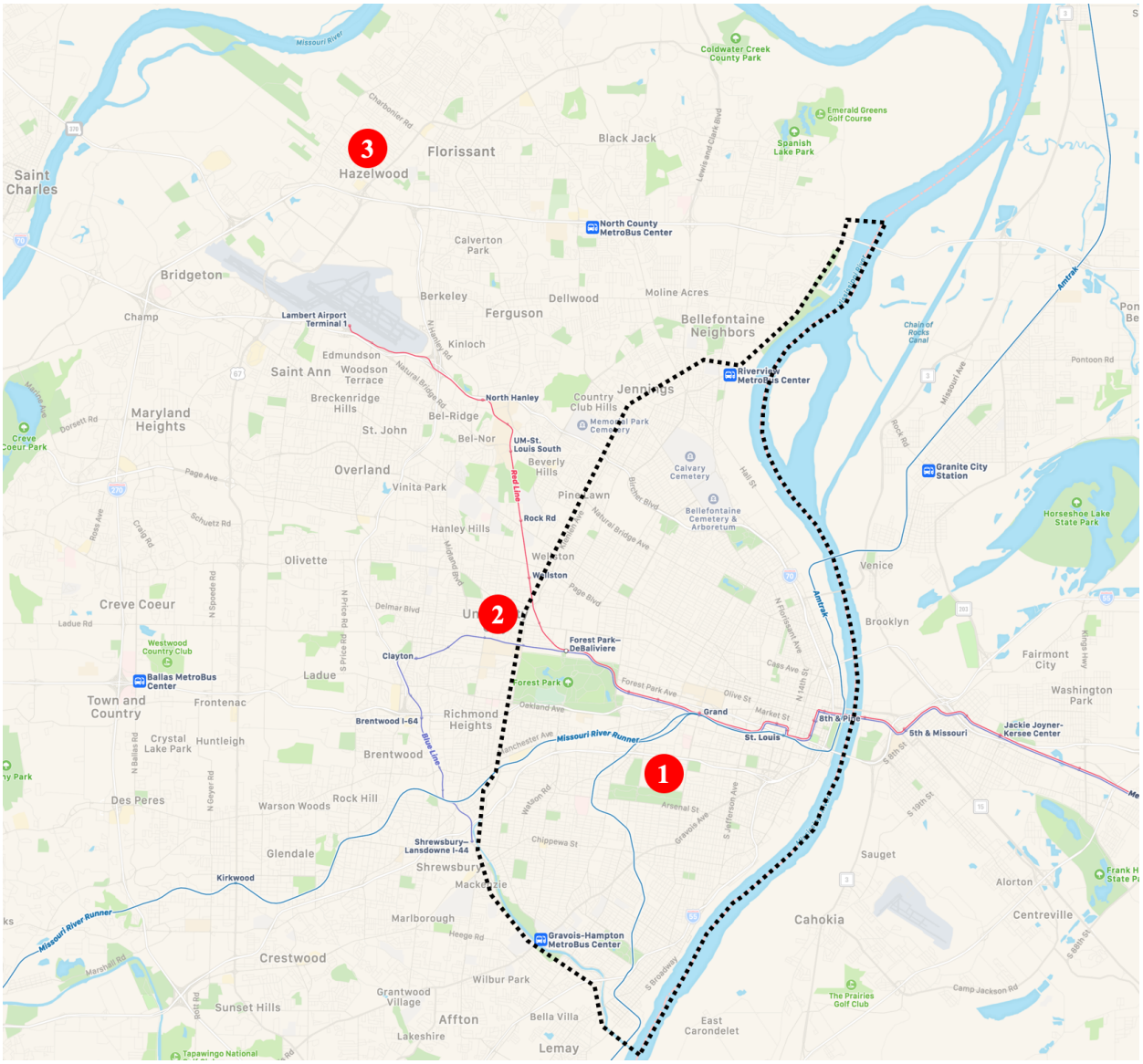
Appendix I A map of the three study areas



1, Shaw; 2, University City; 3, Hazelwood; Dotted line, city limits