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ABSTRACT

Problem, research strategy, and findings: Planners lack clarity about how they can promote the subjective wellbeing (SWB) of the communities they serve. In this research we use descriptive and econometric methods to explore the interconnections between three aspects of the objective and perceived neighborhood built environment (NBE)—walkability, transit, and parks—and one aspect of SWB—life satisfaction—drawing on a survey of 496 people in the Phoenix (AZ) region. Respondents who were more satisfied with the quantity of neighborhood parks and lived in objectively more walkable neighborhoods expressed higher life satisfaction. Park satisfaction is linked to other life satisfaction—promoting perceptions, including greater neighborhood social connection, nature engagement, exercise opportunities, and lower neighborhood disorder. However, what shapes links between life satisfaction and walkability is less clear. Notably, objective and perceived parks access and walkability were not strongly linked and an understudied factor—perceiving neighborhood geography narrowly—was linked to lower life satisfaction. Planners should be cautious in applying these findings because they do not derive from causal methods or fully account for the propensity of more satisfied people to feel more positively about their environments or live in neighborhoods with particular qualities. Future work should also consider how our findings apply to life satisfaction across diverse places and time.

Takeaway for practice: Life satisfaction is associated with neighborhood planning. Planning strategies that may increase residents' opportunities for higher life satisfaction include a) engaging with communities to better understand and plan for parks that meet residents' needs and b) enhancing neighborhood walkability. Planners should note that objective measures of the NBE, like walkability and parks, do not necessarily correspond to residents' perceptions of these qualities. Further investigation into the causal links between the NBE and life satisfaction, including the complex roles that transit accessibility and resident perceptions of neighborhood geography play, is warranted.

Keywords: health, neighborhood, parks, subjective wellbeing, walkability

What makes a person feel more positively about his or her life? Scholars have debated the drivers of this state, known as subjective wellbeing (SWB), across disciplines and time. Interest in the drivers of SWB has recently surged, along with growing concern about health. Scholars now understand more clearly how people's inherited characteristics, life circumstances, and social relationships affect different dimensions of SWB (e.g., Diener & Seligman, 2002; Dolan, Peasgood, & White, 2008). However, less is known about how the neighborhood built environment (NBE) relates to SWB, which limits possibilities for planning (Kent, Ma, & Mulley, 2017; Pfeiffer & Cloutier, 2016).

Our research explores this gap, drawing on survey data from metropolitan Phoenix (AZ) to examine interconnections between three neighborhood realms—walkability, transit, and parks—and one dimension of SWB: life satisfaction. We find evidence that these realms of planning are related to residents' life satisfaction. Respondents who expressed higher satisfaction with the quantity of neighborhood parks exhibited higher life satisfaction, which may relate to their greater neighborhood social connections, engagement with nature, exercise, and less neighborhood disorder. Respondents who lived in objectively more walkable neighborhoods also exhibited higher life satisfaction, though what underlies this relationship is unclear.

Our analysis also reveals a) inconsistencies between residents' perceptions and objective measurements of neighborhood walkability and parks and b) an understudied factor that is linked to life satisfaction: how people define their neighborhood geography.

Our results suggest that planning, like other aspects of governance, should be part of a broader policy agenda accounting for societal wellbeing (Diener, Lucas, Schimmack, & Helliwell, 2009). Practicing planners should engage with communities to better understand their park preferences and advocate for greater walkability because these factors relate to residents' life satisfaction. However, planners should keep in mind that our analysis does not test for causal effects; further, caution is warranted in predicting residents' outcomes based on objective measures of park acreage and walkability because these objective measures were not strongly associated with residents' perceptions of these features in Phoenix. Planning scholars have an important role to play in investigating the drivers of these disconnects and the potential for causal effects, as well as further examining the diverse ways in which transit accessibility and residents' perceptions of their neighborhood geography relate to life satisfaction.

Our exploration into the links between NBE and life satisfaction proceeds as follows. We first address the state of knowledge on NBE drivers of SWB, highlighting three planning considerations: compact design; access to open, natural, and green space; and transportation. We consider how factors like neighborhood social life, disorder, opportunities to engage with nature and exercise, and associated perceptions can influence relationships between NBE and SWB. We condense these insights into a conceptual model that undergirds our analysis. Next, we describe the study site, data, and methods and use descriptive and econometric analysis to explore first the correlation between NBE (objective and perceived neighborhood walkability, transit, and parks) and people's life satisfaction in Phoenix and, second, whether neighborhood social capital and identification, disorder, and ability to explore nature or exercise shape these correlations. We conclude with tasks for future research that are essential in exploring complex links among NBE and life satisfaction and planning recommendations for promoting residents' opportunities for higher life satisfaction.

How the Neighborhood Built Environment Relates to Subjective Wellbeing

SWB refers to evaluation of one's life; it integrates several components, including life satisfaction (a global judgment of one's life), satisfaction with important life

domains (e.g., relationships), and affect (i.e., the presence or absence of positive emotions and moods; Diener, 1984; Diener, Kesebir, & Tov, 2009). Researchers have identified numerous correlates of SWB, including individual inherent and acquired characteristics (e.g., Argyle, 1999; Diener, Kesebir, & Tov, 2009), personality traits and attitudes (Weiss, Bates, & Luciano, 2008), and social engagement, capital, and cohesion (Kent et al., 2017; Leung, Kier, Fung, Fung, & Sproule, 2013).

A small but growing set of cross-disciplinary survey- and interview-based studies addresses how the built environment—buildings, infrastructure systems, and open and green spaces, which planners influence through local regulations—relates to different aspects of SWB. Our research informs recent conversations on planners' roles in shaping physical health (e.g., Adkins, Makarewicz, Scanze, Ingram, & Luhr, 2017; Boarnet, 2006; Dannenberg, Frumpkin, & Jackson, 2011; Doyle, Kelly-Schwartz, Schlossberg, & Stockard, 2006; Frumpkin, Frank, & Jackson, 2004; Lowery, Sloane, Payán, Illum, & Lewis, 2016; Schweitzer & Zhou, 2010). A recent systematic review finds SWB-promoting effects for several NBE features, including compact design and access to open, natural, and green spaces (Pfeiffer & Cloutier, 2016). The following sections distill areas of agreement, debate, and ongoing inquiry related to this scholarship.

Compact Design, Disorder, and Social Capital

Social interactions and cohesion are fostered within NBE. Designing more compact and walkable neighborhoods may enrich neighbors' social relationships, which are strongly associated with SWB (Diener & Seligman, 2002; Dolan et al., 2008; Kent et al., 2017; Layard, 2005; Leyden, 2003; Lund, 2003; Mason, 2010; Mouratidis, 2018a). Neighborhood stability may further strengthen social relationships, as long-time residents establish deeper connections to place (Ross, Talmage, & Searle, 2019). Collectively, these relationships influence social capital, which are bonds built upon shared experiences, resources, and characteristics that can contribute to higher rates of civic engagement and neighborhood participation and attachment (Larsen et al., 2004; Zhu & Qiang, 2017).

Greater neighborhood compactness also may increase "eyes on the street" (e.g., more people socializing on sidewalks) and promote SWB by decreasing neighborhood disorder, including visual cues (e.g., litter, broken infrastructure, or abandoned lots) that signal minimal oversight of a neighborhood (Cohen & Felson, 1979; Skogan, 1990; Wilson & Kelling, 1982). Perceptions of neighborhood disorder, which are moderated by individual traits, experiences, and emotions, are linked to greater stress and feelings of unsafety: Both are

strongly connected to lower SWB, though these perceptions may occur independent of crimes (Abenzoza, Ceccato, Susilo, & Cats, 2018; Cohen & Felson, 1979; Cutrona et al., 2005; Dolan et al., 2008; Hinkle, 2015; Hoeben, Steenbeek, & Pauwels, 2018; Lelkes, 2006; Morris, 2011; Skogan, 1990; Wilson & Kelling, 1982).

Evidence for direct links between neighborhood compactness and SWB is scant, though two recent household surveys find that residents who lived in more walkable neighborhoods reported higher life satisfaction, accounting for other related environmental and demographic characteristics (Cao, 2016; Kent et al., 2017). Scholars continue to debate the relative SWB of residents in compact cities versus less dense suburbs and rural areas, with some arguing that urban residents are less satisfied than their suburban or rural counterparts (e.g., Morris, 2019; Mouratidis, 2018b; Okulicz-Kozaryn & Mazelis, 2018).

Access to Open, Natural, and Green Spaces

A well-developed literature underscores the SWB-promoting effects of access to open, natural, and green spaces, including desert open space that deviates from typical ideals of greenness (e.g., Akers et al., 2012; Andrade, Larson, Hondula, & Franklin, 2019; Campbell & Wiesen, 2010; Kaplan, 2001; Loukaitou-Sideris, Levy-Storms, Chen, & Brozen, 2016; Nieuwenhuijsen, Khreis, Triguero-Mas, Gascon, & Dadvand, 2017; Wells & Laquatra, 2010). These effects may stem from exposure to nature and improved opportunities for engagement, socializing, and exercise (e.g., Akers et al., 2012; Beatley, 2017; Ferrer-I-Carbonell & Gowdy, 2007; Mackerron & Mourato, 2013; Nieuwenhuijsen et al., 2017). Links between SWB and open or natural spaces may vary based on environmental, demographic, and social characteristics, such as population or housing density, residents' ages and recreational preferences, and community involvement in open space design (e.g., Anderson, Ruggeri, Steemers, & Huppert, 2017; Ibes, 2015; Kim & Jin, 2018; Loukaitou-Sideris et al., 2016).

Housing, Transportation, and Polluting Land Uses

Relationships between SWB and other features of NBE, including housing, transportation, and polluting land uses, are more debatable. Neighborhoods with more diverse housing types may allow for aging in place and maintaining SWB-promoting social connections over time; however, these places may also experience greater transience, diminishing social connections and SWB (Pfeiffer & Cloutier, 2016). Satisfaction with one's home may vary depending on the householder's financial security and perceived neighborhood satisfaction, amenities, and demographics (Greif, 2015; Zumbro,

2014). Homeowners express modestly greater life satisfaction but lower levels of day-to-day positive affect relative to renters, potentially reflecting time-intensive home maintenance activities that increase personal control and satisfaction (Morris, 2018).

Proximity to transit may offer more opportunities for SWB-promoting exercise but greater exposure to SWB-detracting crime and noise (e.g., Diener, 2000; Morris, 2015; Morris & Guerra, 2015; Olsson, Gärling, Ettema, Friman, & Fujii, 2013; Van Praag & Baarsma, 2005). Mode and safety perceptions also matter. Access to a personal vehicle or rail offers a small but meaningful SWB boost over access to buses (Morris, 2011). Increased disorder around transit stops, such as graffiti or litter, can heighten perceptions of crime, especially for certain populations, including women, seniors, or those who have direct or indirect experience with victimization (Abenzoza et al., 2018; Hinkle, 2015).

Exposure to noxious uses (e.g., major arterials, brownfields, or pollution) appears to inconsistently affect residents' SWB. Noxious uses may cause SWB-detracting health conditions; however, lower housing costs adjacent to these uses might promote SWB (e.g., Dolan & Laffan, 2016; Ferrer-I-Carbonell & Gowdy, 2007; Van Praag & Baarsma, 2005). The effect of noxious uses on SWB may be context dependent. For instance, a recent study finds that aircraft noise detracts from SWB during daytime (but not nighttime) hours (Lawton & Fujiwara, 2016).

Perceptions

Emerging conversations on the link between NBE and SWB are concerned with the interplay between objective qualities and individual perceptions of NBE and whether objective qualities contribute to SWB directly or indirectly, such as by shaping individual perceptions and behaviors (Ballas, 2013; Cao, 2016; Ettema & Schekkerman, 2016; Kent et al., 2017; Mouratidis, 2018c). Early evidence suggests that residents' perceptions of their environment—namely, its attractiveness and social conditions—may more strongly and directly shape their SWB than its objective qualities (Cao, 2016; Ettema & Schekkerman, 2016; Kent et al., 2017); these perceptions reflect the enduring role of individual agency in how residents' NBE influence their SWB (Kent et al., 2017).

Research Contribution

Our research supports these nascent conversations, responding to calls for greater attention to the interactions among environmental conditions and individual perceptions and behaviors in wellbeing studies (e.g., Ballas, 2013; Mouratidis, 2018c; Van Kamp, Leidelmeijer, Marsman, & De Hollander, 2003). We offer deeper insight into the complex correlations between objective

and perceived NBE and SWB by exploring three NBE aspects that fall squarely within the realm of planning practice—walkability, transit, and parks—and one dimension of SWB: life satisfaction. We answer three questions:

1. How do objective and perceived neighborhood walkability, transit, and parks relate to life satisfaction?
2. What aspects of objective and perceived NBE associate directly versus not directly with life satisfaction by shaping perceived neighborhood social capital, identification, disorder, and opportunities to engage with nature and exercise?
3. Do these relationships change after accounting for other individual and neighborhood characteristics related to life satisfaction?

We conceptualize our research in [Figure 1](#).

Linking the Neighborhood Built Environment and Life Satisfaction

We answer our research questions by linking data on life satisfaction, NBE, and associated individual and neighborhood conditions in the Phoenix region. We use ordinary least squares (OLS) regression with clustered standard errors to investigate the direct and not direct correlational relationships between objective and perceived NBE and life satisfaction.

Study Site

Our research is set in metropolitan Phoenix. Phoenix is a prototypical American suburban region, defined by expansive single-family subdivisions, dendritic street patterns, and commercial strip malls. These features reflect Phoenix's maturation after innovations in mass-produced housing, mortgage finance, and transportation laid the groundwork for large-scale suburbanization that blurs boundaries between the central cities and suburbs. Phoenix's location in the Sonoran Desert endows it with a semiarid climate. Scattered desert preserves offer easy access to hiking and mountain biking (Ibes, 2015); the region's historical access to diverse water supplies is reflected in its abundance of irrigated grass and human-made water features (Larson, Hoffmann, & Ripplinger, 2017).

Data and Measures

We used a survey to obtain data on individual life satisfaction and NBE. We mailed questionnaires in 2017 as a part of an interdisciplinary project aimed at understanding the interactions between residents and their local

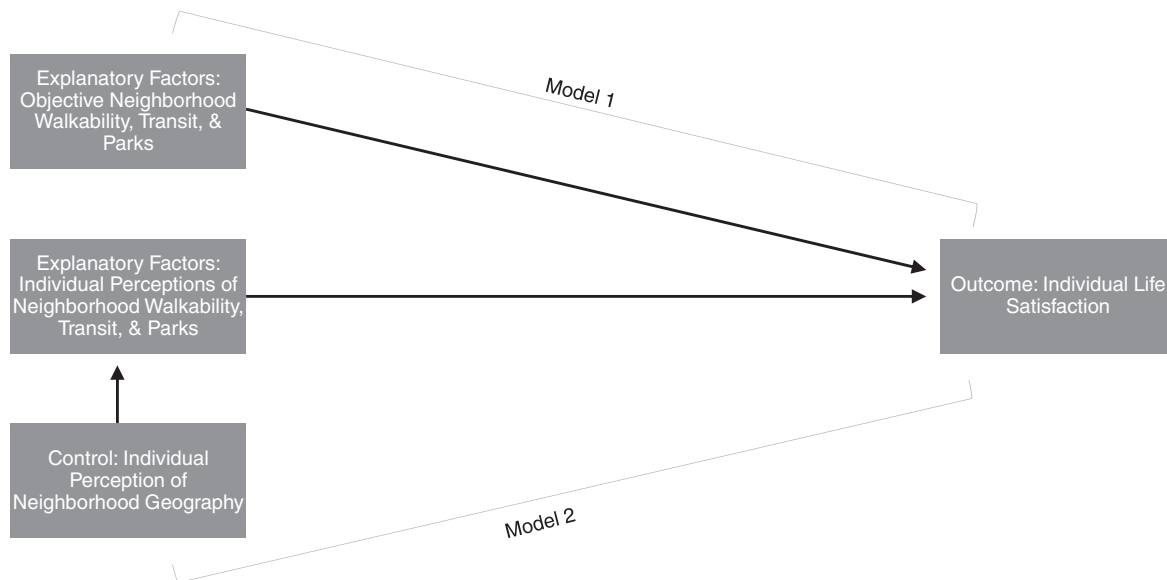
environments (Larson et al., 2017a). Participants were selected using stratified random sampling, wherein 12 census tracts were purposively chosen as sampling units to represent diverse built and natural environments in the region. The census tracts range from older, poorer, predominately Latinx urban core communities to newer, affluent, predominately White suburban communities (see [Technical Appendix, Table 1A](#); additional information [including photos] is available in Larson et al., 2017a). Households were mostly selected at random within the census tracts using U.S. Postal Service addresses (see [Technical Appendix, "Survey Sampling and Administration"](#)). The response rate was 39% ($n = 496$), though rates varied from a low of 22% ($n = 22$) to a high of 56% ($n = 60$) within the census tracts. Respondents reflected their census tracts' population ages and household incomes, but they were more educated (29% vs. 23% college attainment) and less likely to identify as Latinx (20% vs. 37%).

[Table 2A](#) in the Technical Appendix details the measures used. We measure life satisfaction using a version of the Satisfaction With Life Scale, which asks for respondents' agreement or disagreement with five statements about how their life is going overall (Diener, Emmons, Larsen, & Griffin, 1985). Respondents' ratings are averaged into a composite score, ranging from 1 (low life satisfaction) to 5 (high life satisfaction). The Satisfaction With Life Scale is a standard approach to measuring life satisfaction given its high internal consistency, temporal reliability, applicability to diverse age groups, and correlation with other dimensions of SWB (Diener et al., 1985; Pavot & Diener, 2009).

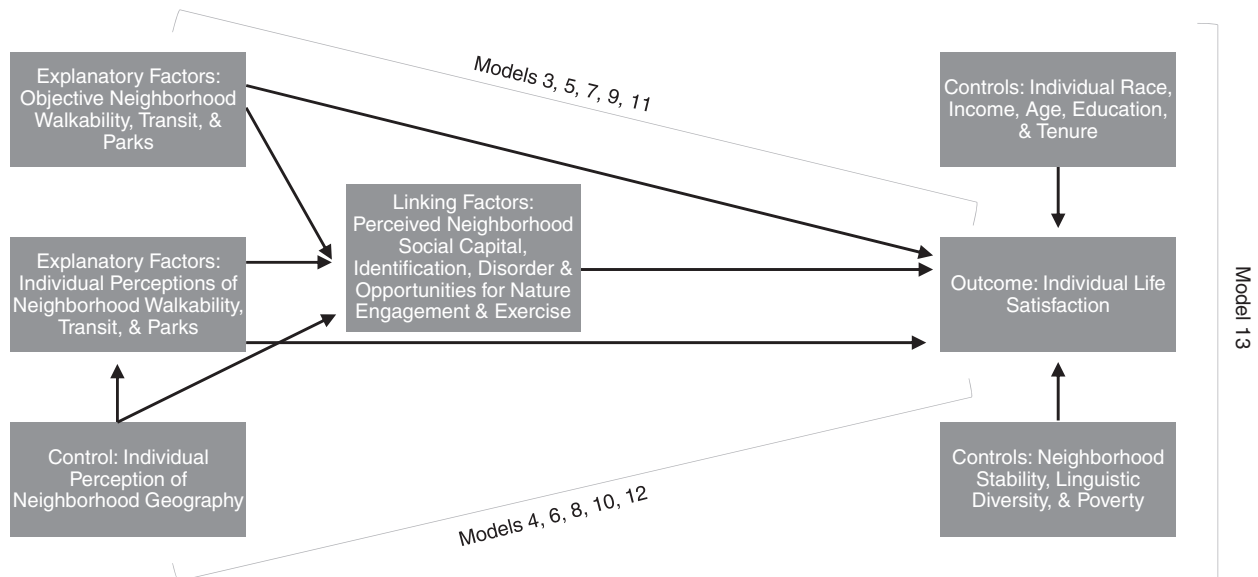
We measure respondents' neighborhood walkability, transit, and parks objectively and subjectively, similar to Kent et al. (2017; see [Technical Appendix, Table 2A](#)). We measure objective walkability using the 2013 National Walkability Index (U.S. Environmental Protection Agency, 2013), transit using AllTransitTM's 2019 Transit Connectivity Index (Center for Neighborhood Technology, 2019a, 2019b), and parks using 2013 Central Arizona Project acreage data (AZGEO Clearinghouse, 2013). We use the natural log of transit because few participants lived in neighborhoods with high transit accessibility. We subjectively measure walkability and transit by capturing respondents' agreement with two statements: "There are many places to go within easy walking distance of my home" and "It is easy to walk to a transit stop, either bus or light rail, from my home" (Sallis et al., 2009). We subjectively measure parks by capturing respondents' satisfaction with "the amount of neighborhood parks and open spaces."

We capture objective and perceived NBE conditions at two scales (see the [Technical Appendix, Table 2A](#)). Objective NBE conditions were gathered for respondents'

Q1: How do objective and perceived neighborhood walkability, transit, and parks relate to life satisfaction?



Q2 & Q3: What aspects of the objective and perceived NBE associate with life satisfaction directly versus not directly by shaping perceived neighborhood social capital, identification, disorder, and opportunities to engage with nature and exercise? Do these relationships change after accounting for other individual and neighborhood characteristics related to life satisfaction?



Note: The boxes convey the features that we suspect contribute to life satisfaction at different levels, while the arrows indicate the suspected direction of the relationships. The analysis does not formally test the mediating pathways suggested by the arrows. The model numbers refer to the statistical models used to explore the relationships (see Tables 2 and 4A).

Figure 1. Conceptual framework.

census block groups ($n = 57$), which are nested within the 12 census tracts used to stratify our sample. Respondents' subjective NBE conditions reflect a self-defined geography. We account for whether or not participants perceived their neighborhood geography narrowly

to capture how people's delineation of their residential environment might shape perceived NBE and potential linking factors (see below; Banerjee & Baer, 1984). Participants who perceived their neighborhood geography narrowly described their residential environment as

only 1) “the block or street” that they “live on” or 2) “several blocks or streets in each direction from [their] home.”¹ Readers should keep in mind that the term *neighborhood* is context dependent here, defined by the census block group for the objective NBE characteristics and self-defined by residents for the perceived NBE characteristics.

We also explore roles for several variables that are theorized to link NBE to SWB, which we call *linking factors* (see Figure 1 and the Technical Appendix, Table 2A). The first variable is neighborhood social capital, which is a scale that conveys whether neighbors’ relationships allow access to information, opportunities, and assets (Coleman, 1988; Larsen et al., 2004). The second variable is neighborhood identification, which is a scale that depicts whether residents personally feel their neighborhood is meaningful to them (Williams & Vaske, 2003). Other variables include respondents’ perceptions of neighborhood disorder and opportunities for engagement with nature and exercise, which are captured by their agreement with the statements that the “environment of the neighborhood” 1) “promotes criminal activities” and “provides opportunities” 2) “to explore and learn about nature” and 3) “for physical activities.”

Finally, we account for individual and neighborhood characteristics that may relate to SWB (see Technical Appendix, Table 2A). Individual characteristics include age, household income adjusted for household size, education, race, and tenure (Dolan et al., 2008; Morris, 2018). Neighborhood demographic conditions include neighborhood stability, linguistic diversity, and poverty (U.S. Census Bureau, 2017).² Neighborhood poverty approximates a range of unmeasured individual and neighborhood conditions related to SWB, such as human capital, school quality, and health, but does not adequately account for contextual factors, such as NBE quality or institutional supports (Dolan et al., 2008; Leung et al., 2013; Rollings, Wells, & Evans, 2015; Ross et al., 2019).

Analytical Approach

We examine associations among NBE, linking factors, and life satisfaction using OLS regression, which compares relationships for people with like individual and neighborhood characteristics. We report estimates using clustered standard errors, which helps to address similarities among people from the same neighborhood (see Technical Appendix, “Accounting for Neighborhood Clustering”). A large number of respondents were missing information for at least one variable (see Table 1). Respondents with missing values for life satisfaction (4%) were excluded, which reduced the sample size to 475. Missing values for the other factors

were imputed, meaning they were replaced with non-missing information from participants with similar characteristics (see Technical Appendix, “Missing Values and Multiple Imputation”).

Our results appear in 13 models, which are spread across Table 2 and Tables 4A and 5A in the Technical Appendix. The models explore specific posited links among NBE, linking factors, and life satisfaction (see Figure 1). Models 1 and 2 (see Table 4A in the Technical Appendix) answer our first research question: How do objective and perceived neighborhood walkability, transit, and parks relate to life satisfaction? Models 3 through 12 (see Table 4A) answer our second research question: What aspects of objective and perceived NBE associate with life satisfaction directly versus not directly by shaping perceived neighborhood social life, disorder, and opportunities to engage with nature and exercise? Model 13 (see Table 2) answers our third research question: Do these relationships change after accounting for other individual and neighborhood characteristics related to life satisfaction? We report a separate set of models that explore relationships between each of the linking factors and the NBE factors, using OLS or logit specifications as appropriate, controlling for related individual and neighborhood factors (see Technical Appendix, Table 5A; estimates of controls suppressed but available on request).

Limitations

Our research has six limitations. First, our results are generalizable to existing theory on the drivers of SWB but not necessarily to the Phoenix region (given the purposive sampling approach) or other places and times because the NBE predictors of wellbeing are context dependent (Hogan et al., 2016; Kytä, Broberg, Haybatollahi, & Schmidt-Thomé, 2016). Second, imputation of missing values may bias the results if participants’ assigned values differ from their actual values; however, we find no overt evidence of bias in the analysis (see Technical Appendix, “Missing Values and Multiple Imputation”). Third, caution is warranted in comparing objective and perceived NBE conditions, given that census block group boundaries and participant-defined neighborhood geographies may not align. Further, census block groups capture neighborhood conditions more accurately than larger units (e.g., zip codes; Krieger, 2002) and offer relative consistency over time (Iceland & Steinmetz, 2003), but they do not account for the porous nature of neighborhoods, including the influence of conditions in nearby communities (Oka & Wong, 2016).

Fourth, the objective NBE measures are not holistic. People walk for diverse reasons (e.g., exercise vs. transportation); what makes one area more walkable or

transit accessible than another is context dependent (e.g., sidewalk maintenance, adequacy of shade or lighting; Abenoza et al., 2018; Brownson, Hoehner, Day, Forsyth, & Sallis, 2009; Ewing & Handy, 2009; Forsyth, 2015). Access to parks is shaped by various unmeasured characteristics, including available amenities, hours of operation, and whether visitors must “pay to play” (Ibes, 2015; Kim & Jin, 2018; Loukaitou-Sideris et al., 2016). Further, objective walkability and parks were captured in 2013, which means that these measures might not accurately reflect participants’ lived experiences in 2017 if dramatic changes to NBE occurred.

Fifth, we examine respondents’ perceptions of neighborhood disorder imprecisely. We did not ask for respondents’ perceptions about specific kinds of physical or social disorder but rather for their global perceptions of whether their neighborhood environment promotes criminal activity. Readers should keep in mind that individuals interpret neighborhood disorder in diverse ways, which are influenced by differences in personal characteristics, such as experiences and emotions, and other contextual factors (e.g., Abenoza et al., 2018; Hinkle, 2015; Hoebe et al., 2018).

Last, we observe how residents’ current NBE, rather than changes in their NBE, relates to their life satisfaction. This approach does not control for self-selection bias, reverse causality, or the propensity for more satisfied people to live in neighborhoods with particular qualities or view their neighborhood environments more favorably. Unobserved factors might intervene in the relationship between participants’ NBE and their life satisfaction, such as their exposure to their neighborhood (e.g., how they travel through their neighborhood) and their personality (Jokela, Bleidorn, Lamb, Gosling, & Rentfrow, 2015). More sophisticated quasi-experimental and statistical approaches, like structural equation modeling, are needed to more fully control for self-selection bias and reverse causality and understand the direct and indirect effects of NBE on SWB. However, observational and correlational approaches still hold value in helping to build theory and provide an empirical basis to inform planning practice and research while more time-intensive methods are conducted.

The Qualities of Satisfied Neighbors

The typical survey respondent was moderately satisfied with his or her life (score of 3.7; see Table 1). About one-third reported high life satisfaction (average score of 4 or higher). Most respondents were satisfied with their neighborhood parks (64%); fewer felt that they lived in communities with walkable destinations and accessible transit (36% and 47%, respectively). Respondents on average lived in neighborhoods with moderate levels of walkability (about 8 on a 20-point scale), low levels of

transit accessibility (−1.7 [4 on a 100-point scale unlogged]), and 2 acres of parks within a 2-mile buffer.

Respondents typically reported moderate levels of neighborhood social capital and identification (average of 3.5 and 3.7, respectively). Most felt that their neighborhood environments allowed for engagement with nature and physical activity (53% and 68%, respectively) but did not provide opportunities for criminal activities (16%). The average participant resided in a low-poverty, relatively stable neighborhood. Participants had an average annual adjusted household income of \$61,478. Most were college educated (58%), non-Hispanic White (67%), and homeowners (73%).

Objective and perceived NBE factors were not consistently related to life satisfaction (see Table 1). People with high life satisfaction were more likely to report high levels of satisfaction with local parks (73%), compared with about 59% of less satisfied people ($p < .01$). However, differences in park acreage between people with and without high life satisfaction were negligible (2.2 vs. 1.8) and statistically not significant. In turn, people with high life satisfaction were more likely to live in neighborhoods with greater objective walkability (8.0 vs. 7.6; $p < .05$) and less objective transit accessibility (−2.7 vs. −1.2 [3.1 vs. 4.7 unlogged]; $p < .01$); perceptions of walkability and transit accessibility were not statistically related to life satisfaction.

Surprisingly, objective and perceived NBE characteristics were not consistently associated (see Table 3A in the Technical Appendix). Participants’ perceptions of neighborhood walkability and parks were not statistically related to objective measurements of these features. Participants had similar average walkability scores (7.9 vs. 7.6) and parks acreage (2.1 vs. 1.6), regardless of whether or not they agreed their neighborhood was walkable or expressed satisfaction with their neighborhood parks. A stronger relationship existed between objective and perceived neighborhood transit. Participants who agreed their neighborhood was transit accessible had much higher transit accessibility scores than those who disagreed (6.0 vs. 2.4; $p < .001$). These discrepancies are not explained by potential geographic differences in objective and perceived NBE measures because they persisted even after comparing participants who defined their neighborhoods more narrowly or expansively (unreported but available on request).

Table 1 suggests additional links between life satisfaction and other individual and neighborhood conditions. People who were older, non-Hispanic White, higher income, college-educated, and homeowners had higher life satisfaction than their counterparts. Highly satisfied people reported higher neighborhood social capital (3.8 vs. 3.3; $p < .001$) and stronger neighborhood identification (4.0 vs. 3.5; $p < .001$) than less satisfied people. People with high life satisfaction generally

Table 1. Respondent characteristics (n = 475).

Variables	t Tests of differences in means and proportions					
	Mean	SD	Minimum	Maximum	Nonmissing values	High life satisfaction
Life satisfaction	3.7	0.9	1.0	5.0	475	Not high life satisfaction
High life satisfaction (%)	33.7	N/A	0.0	1.0	475	
Built environment factors						
Walkability	7.7	2.3	3.8	11.3	475	8.0* 7.6*
Agrees neighborhood has places to walk to nearby (%)	36.2	N/A	0.0	1.0	473	40.5 34.0
Transit accessibility (Ln)	-1.7	5.0	-9.2	2.5	475	-2.7** -1.2**
Agrees neighborhood transit is easy to walk to (%)	46.6	N/A	0.0	1.0	474	47.8 46.0
Parks acreage	1.9	3.0	0.0	25.9	475	2.2 1.8
Satisfied with amount of neighborhood parks and open spaces (%)	64.0	N/A	0.0	1.0	472	73.0** 59.4**
Linking factors						
Neighborhood social capital	3.5	0.9	1.0	5.0	468	3.8*** 3.3***
Neighborhood identification	3.7	1.1	1.0	5.0	472	4.0*** 3.5***
Agrees neighborhood environment ...						
Promotes criminal activities (disorder) (%)	16.1	N/A	0.0	1.0	473	11.3* 18.5*
Allows for engagement with nature (%)	53.1	N/A	0.0	1.0	473	66.0*** 46.5***
Allows for physical activity (%)	68.1	N/A	0.0	1.0	470	78.5*** 62.8***
Individual controls						
Adjusted household income	\$61,478	\$39,917	\$4,082	\$200,000	446	\$78,041*** \$53,252***
College educated (%)	57.7	N/A	0.0	1.0	471	70.9*** 51.1***
Age (years)	51.0	18.0	17.0	116.0	469	53.9* 49.7*
Non-Hispanic White (%)	67.3	N/A	0.0	1.0	449	75.5** 63.2**
Homeowner (%)	73.4	N/A	0.0	1.0	473	84.9*** 67.5***
Perceives neighborhood geography narrowly (%)	55.9	N/A	0.0	1.0	467	51.0 58.3
Neighborhood demographic controls						
Long-term residents (%)	51.1	17.6	17.8	79.4	475	56.1*** 48.6***
Linguistic diversity	0.60	0.20	0.05	0.99	475	0.56** 0.62**
Poverty (%)	9.3	11.6	0.0	51.0	475	6.3*** 10.9***

Note: *p < .05. **p < .01. ***p < .001.

Sources: AZGEO Clearinghouse, 2013; Center for Neighborhood Technology, 2019b; Larson et al., 2017b; U.S. Census Bureau, 2017; U.S. Environmental Protection Agency, 2013.

perceived less disorder (11% vs. 19%; $p < .05$) and were more satisfied with opportunities for engagement with nature (66% vs. 47%; $p < .001$) and physical exercise (79% vs. 63%; $p < .001$) in their communities. Finally, people living in more stable, less linguistically diverse, and lower poverty neighborhoods were more likely to express high life satisfaction.

Greater Park Satisfaction and Objective Walkability Are Associated With Life Satisfaction

Here we discuss direct and nondirect associations between objective and perceived NBE and life satisfaction in Phoenix, drawing on our econometric modeling results (see Table 2 and Tables 4A and 5A in the Technical Appendix, and the earlier section “Analytical Approach” for a table guide). There are four main takeaways.

The first is that people who had greater perceived—not objective—neighborhood park access had higher life satisfaction. People who were satisfied with their quantity of neighborhood parks ranked their life satisfaction nearly 0.2 points higher ($p < .05$) than unsatisfied people (see Table 2, Model 13). Greater satisfaction with neighborhood parks also tended to align with higher neighborhood social capital, identification, opportunities for engagement with nature and exercise, and lower neighborhood disorder: conditions linked to higher life satisfaction. That these linking factors appear to shape the relationship between park and life satisfaction is evident by the decreased magnitude of the park satisfaction effect when these factors are controlled (see Table 4A, Models 4, 6, 8, 10, and 12) and the strong relationships between park satisfaction and these factors (see Table 5A).

The second takeaway is that people living in objectively—not subjectively—more walkable neighborhoods had slightly higher life satisfaction. A 1 *SD* increase in neighborhood walkability—about a two-level increase in the relative national neighborhood walkability rank—is associated with an increase of nearly 0.1 in life satisfaction ($p < .05$; see Table 2, Model 13). However, this relationship is not clearly shaped by the theorized linking factors. For instance, inclusion of neighborhood social capital, disorder, and engagement with nature sharply reduces the magnitude (and, in the case of disorder, statistical significance) of the walkability effect (see Models 3, 7, and 9 in Table 4A), but walkability is either not associated with these factors or is associated in unexpected ways (see Table 5A). For instance, people living in objectively more walkable neighborhoods tended to perceive *less* neighborhood social capital, which is inconsistent with expectations that this factor

helps to shape walkability's life satisfaction-promoting effect.

The third takeaway is that transit accessibility, parks acreage, and walkability perceptions were surprisingly unrelated to life satisfaction after other associated factors were controlled (see Table 2, Model 13). The lack of correlation between objective transit accessibility and life satisfaction was strongly influenced by six participants who had extremely low life satisfaction and transit accessibility. Excluding these participants from the model resulted in a marginally statistically significant negative association between objective transit accessibility and life satisfaction (-0.016 , $p = .05$).³ The inconsistent relationships between objective and perceived walkability and parks suggest that perceptions and objective measurements of these NBE features may account for different neighborhood conditions and experiences. Objective and perceived walkability had the most discrepancies; for instance, people who believed that their neighborhoods were more walkable were more likely to feel their neighborhoods offered physical exercise opportunities; meanwhile, people in objectively more walkable neighborhoods felt the opposite (see Table 5A in the Technical Appendix).

Last, residents' perceptions of their neighborhood boundaries were unexpectedly directly linked to life satisfaction. Having a narrow perception of one's neighborhood (i.e., including no more than a few nearby blocks or streets) was associated with a decrease of about 0.1 in life satisfaction ($p < .05$; see Table 2, Model 13). These respondents were also more likely to express other life satisfaction-detracting neighborhood perceptions, including lower neighborhood identification (3.5 vs. 3.9; $p < .001$) and higher disorder (19% vs. 12%; $p < .05$); the strong relationships between these factors and narrow perceptions of neighborhood geography also are evident in Table 5A in the Technical Appendix. This characteristic was somewhat correlated with income and race, consistent with Banerjee and Baer (1984). For instance, residents living in lower income households (\$58,337 vs. \$66,284; $p < .05$), but not necessarily higher poverty neighborhoods, were more likely to perceive their neighborhood geography narrowly. Further, respondents' likelihood of perceiving their neighborhood geography narrowly varied among the sampled census tracts, ranging from a high of 69% in census tract 711 (an older, predominately Latinx urban core community bisected by a railroad track) to a low of 47% in PWR (a newer, master-planned, predominately White community interspersed with agricultural land in the outer suburbs).

Our model accounts for about 33% of the variation in life satisfaction when respondents with missing values are excluded (see Table 2, Model 13; $n = 396$; effects unreported but available upon request). This is notable

Table 2. Associations between life satisfaction and objective and perceived neighborhood walkability, transit, and parks accounting for linking factors and other individual and neighborhood characteristics related to life satisfaction ($n = 475$).

Variables	Model 13: Objective and perceived NBE with linking factors and individual and neighborhood controls
Built environment factors	
Walkability	0.042* (0.018)
Agrees neighborhood has places to walk to nearby	−0.040 (0.068)
Transit accessibility (Ln)	−0.006 (0.008)
Agrees neighborhood transit is easy to walk to	0.039 (0.068)
Parks acreage	0.007 (0.015)
Satisfied with amount of neighborhood parks and open spaces	0.187* (0.084)
Linking factors	
Neighborhood social capital	0.184*** (0.047)
Neighborhood identification	0.075* (0.032)
Agrees neighborhood environment ...	
Promotes criminal activities (disorder)	−0.051 (0.114)
Allows for nature engagement	0.117 (0.083)
Allows for physical activity	−0.040 (0.078)
Individual controls	
Adjusted household income	0.00001** (0.000003)
Adjusted household income ²	−4.30 ^{−11} * (1.86 ^{−11})
College educated	0.087 (0.086)
Age	−0.049*** (0.011)
Age ²	0.0004*** (0.00009)
Non-Hispanic White	−0.040 (0.089)
Homeowner	0.194 (0.113)
Perceives neighborhood geography narrowly	−0.125* (0.058)
Neighborhood controls	
Long-term residents (%)	0.426 (0.243)
Linguistic diversity	0.624** (0.216)
Poverty (%)	0.326 (0.373)
Constant	2.316*** (0.438)
F	17.430
Prob > F	0.000
R ² (models excluding participants with missing variable values)	0.332

Notes: Cells report the estimated effect and standard error (in parentheses). * $p < .05$. ** $p < .01$. *** $p < .001$.

Sources: AZGEO Clearinghouse, 2013; Center for Neighborhood Technology, 2019b; Larson et al., 2017b; U.S. Census Bureau, 2017; U.S. Environmental Protection Agency, 2013.

given that genetics accounts for an estimated 33% to 50% of SWB (De Neve, Christakis, Fowler, & Frey, 2012; Lykken & Tellegen, 1996; Nes, Røysamb, Tambs, Harris, & Reichborn-Kjennerud, 2006). Significantly, objective and perceived neighborhood walkability, transit, and parks are associated with about 6% and 7% of variation in life satisfaction, respectively (see Table 4A, Models 1 and 2; about 11% of variation in a combined model; unreported but available on request).⁴

Planning for Residents' Life Satisfaction

Planners' ability to influence SWB is relatively unexamined, despite growing awareness of social and environmental health determinants. We offer new insights on the association between objective and perceived NBE and life satisfaction using a rich data set from the Phoenix region. The results support theories that neighborhoods with more compact design and access to parks might promote life satisfaction. Respondents who



Note: The boxes convey the features that we suspect contribute to life satisfaction at different levels, while the arrows indicate the suspected direction of the relationships. The analysis does not formally test the mediating pathways suggested by the arrows.

Figure 2. Revised conceptual framework.

were more satisfied with the quantity of neighborhood parks not only reported higher life satisfaction but also tended to perceive other life satisfaction–promoting conditions in their neighborhoods, including social connectedness, opportunities for engagement with nature and exercise, and personal security. Respondents living in more objectively walkable neighborhoods also reported higher life satisfaction, but we are unable to pinpoint possible reasons for this relationship. The results also highlight incongruities between people’s perceptions and the objective qualities of their NBE and reveal that residents’ neighborhood geography perceptions may relate to their life satisfaction. These discoveries, which are reflected in a revised conceptual model (see Figure 2), point to several promising research directions and interventions that may help planners facilitate opportunities for life satisfaction within neighborhoods.

Untangling the Interplay Between the Objective and Perceived Built Environment and Life Satisfaction

The time is ripe for scholars to further explore how objective measurements of planning conditions—like walkability, transit, and parks—reflect people’s perceptions of these conditions, potentially shaping their behaviors (Kent et al., 2017; Van Kamp et al., 2003). Notably, our objective and subjective measurements of respondents’ neighborhood walkability and parks are uncorrelated, which is inconsistent with other research on the interplay between these factors and life satisfaction (Kent et al., 2017). Objective and perceived transit access are more strongly correlated, signifying that

conceptions of transit accessibility are more concrete and consistently shared in Phoenix, though other scholarship shows potential for differences in transit perceptions depending on use and geography (Hess, 2012; Lee, 2013).

These discrepancies might reflect conditions specific to the Phoenix region and its residents. Scholars have demonstrated that the concept of walkability is contextualized to not only different locales but also individual conceptions of safety, aesthetics, or purpose (Forsyth, 2015; Forsyth, Hearst, Oakes, & Schmitz, 2008). For example, people in suburban neighborhoods near Phoenix’s outlying desert mountain parks may perceive more walkable destinations within their community (e.g., via hiking paths), which traditional walkability indicators might discount (Brownson et al., 2009). In turn, people who live in more objectively walkable, centrally located neighborhoods might feel unable to walk if shade, safety, or sidewalk conditions are lacking. Similar dynamics might explain discrepancies between objective and perceived parks access, with the latter better capturing whether the qualities of parks meet residents’ needs. Overall, planners must be careful in drawing assumptions about residents’ perceptions—and, in turn, behaviors—from more objective indicators of NBE until the link between these two forms of measurement is better understood.

Another pressing research direction is to explore what drives nuances in the relationship between neighborhood transit and life satisfaction. Greater objective neighborhood transit accessibility was typically associated with lower life satisfaction in Phoenix, but a small minority of respondents who had no or extremely low

transit access expressed very low life satisfaction, even after accounting for related characteristics, which rendered the effect of this feature statistically not significant. One explanation is that neighborhood transit manifests in more diverse ways than walkability and parks (e.g., different modes, frequency of routes, etc.); this may frustrate attempts to uncover generalizable, underlying links to life satisfaction. Another explanation is that an understudied factor, like personality, health, or noise, may intervene in the relationship between transit access and life satisfaction, leading to differing experiences of its costs and benefits (Jokela et al., 2015; Lawton & Fujiwara, 2016; Van Praag & Baarsma, 2005). For instance, the costs of noise from transit proximity may outweigh the benefits of greater mode choice for someone in poor health, whereas the opposite might occur for someone in good health.

A final research direction is to investigate how residents' perceptions of their neighborhood geography relate to their life satisfaction. Respondents with narrowly perceived neighborhood boundaries were less likely to express high life satisfaction than those with broadly perceived neighborhood boundaries. This finding may reflect barriers within the neighborhood built or social environment that disconnect residents from local amenities, like railroad tracks (supported by the results) or gang associations that are applied de facto because of living within a particular community (unmeasured in the data; Foster & Hipp, 2011; Foster, Pitner, Freedman, Bell, & Shaw, 2015; Grannis, 1998; Jorgensen & Stedman, 2011). Personal factors, like income and health, might also come into play (Banerjee & Baer, 1984); for example, perceptions of neighborhood boundaries may contract with the onset of depression (and limited social interactions) or a mobility-impairing bike accident. There is much to explore about how particular NBE factors may interact with residents' perceptions of their neighborhood boundaries, community involvement, and life satisfaction and the role of planning regulations in these dynamics (Banerjee & Baer, 1984).

Engaging With Communities to Plan to Meet Residents' Parks Needs and Enhancing Neighborhood Walkability

Our findings suggest several planning interventions. The first stems from the idea that perceptions matter; thus, planners must engage with communities to better understand their desires. Respondents who were more satisfied with their neighborhood parks reported higher life satisfaction, which might signify that those spaces better meet resident needs, which vary across cultures, lifestyles, and life stages (Ibes, 2015; Loukaitou-Sideris et al., 2016; Veitch et al., 2017). People who reported

greater park satisfaction also tended to report other life satisfaction—promoting conditions, like greater neighborhood social connection, safety, and opportunities to engage with nature and exercise, which may partly reflect their needs being met.

Planners can solicit input about residential preferences and enhance park quality in several ways. Visual preference surveys capture residents' reactions to different types of landscaping, amenities, or maintenance levels, allowing planners to understand preferences of various park users (Loukaitou-Sideris et al., 2016; Nordh & Østby, 2013; Veitch et al., 2017). Direct observation, including site visits and windshield surveys, can complement qualitative data, enabling planners to assess patterns in user activities and interactions (or lack thereof; Baran et al., 2014; Floyd et al., 2011). Ibes (2015) offers a park typology (ranging from preserves to urban parks) that may help planners inventory parks within their communities and consider park amenities relative to nearby communities' preferences.

The second intervention is to enhance neighborhood walkability, such as by improving street connectivity and advocating for mixed land uses. Respondents living in objectively more walkable communities reported slightly higher life satisfaction, controlling for related factors, which is consistent with other research (e.g., Kent et al., 2017). However, our results also suggest that residents may possess a utilitarian impression of these neighborhoods; respondents who lived in objectively more walkable communities tended to report lower neighborhood social capital and opportunities to exercise. Thus, planners should also consider the experiential side of walkability (e.g., safety, sociability, interest) in an effort to respond to diverse walkability needs and environments (Doyle et al., 2006; Forsyth, 2015). Walkability perceptions capture individual-level factors that influence one's choice to walk (or not walk) within—and interact with—one's neighborhood, such as one's appreciation of the neighborhood's architectural qualities or social environment (Jun & Hur, 2015; Kent et al., 2017). Indeed, the perception of walkability, though not statistically associated with life satisfaction in Phoenix, was positively associated with perceiving greater neighborhood opportunities for exercise (see [Technical Appendix, Table 5A](#)).

NBE quality, including visual interest, aesthetic conditions, and perceived safety, is a critical component when addressing objective walkability and enhancing opportunities for social interactions. For instance, planners may use form-based codes to codify enhanced walking experiences, including streetscaping (e.g., visually interesting landscaping, tree/shade canopies, signage) and active streets. Functional street lighting, pedestrian visibility and sight lines, and multiple access points are also important to addressing safety perceptions. These attributes are

especially important in distressed neighborhoods, where public services and amenities may be lacking, despite being more physically walkable.

Planning Amid Complexity

We conclude with two additional reflections on planning practice informed by our analysis. First, practitioners could benefit from better understanding residents' experiences of neighborhood transit systems, including stops, stations, and routes, while scholars untangle the relationship between transit accessibility and life satisfaction. Community engagement that prioritizes residents' perceptions could help planners identify remedies for potentially life satisfaction-detracting experiences. Examples include mind mapping, citizen photo documentation of transit interactions, or a community ride/walk to understand how individuals use and interpret various aspects of the transit experience. Second, in a big data era, where policy is guided by "machine learning" about neighborhoods through conditions observed objectively and consistently over time, planners must not lose sight of human variability (Kent et al., 2017). Data aggregated to administrative geographies (e.g., census tracts) cannot adequately capture qualitative differences among neighborhoods, including amenities and NBE qualities (e.g., Coulton, Cook, & Irwin, 2004; Sperling, 2012). Both of these lessons underscore the importance of public engagement processes and qualitative assessments as tools for planners at the neighborhood level.

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SUPPLEMENTAL MATERIAL

Supplemental data for this article can be accessed on the publisher's website.

NOTES

1. Respondents who did not perceive their neighborhood geography narrowly viewed their neighborhood as 1) "the area within a 15-min walk from [their] home" or 2) "an area larger than a 15-min walk from [their] home."
2. More stable, lower poverty, and more linguistically homogenous neighborhoods may possess more social capital and identification among residents and a greater ability to prevent crime and promote personal security, which are conditions associated with SWB (Cutrona et al., 2005; Diener & Seligman, 2002; Dolan et al., 2008; Lelkes, 2006; Leung et al., 2013; Morris, 2011; Ross et al., 2019).
3. The outliers had low life satisfaction but characteristics generally associated with high life satisfaction, such as high neighborhood social capital and identification and satisfaction with exercise opportunities and access to nature. The outliers also had extremely low subjective walkability and lived in neighborhoods with low poverty rates but also greater transience. Four of the six outliers lived in the same neighborhood (PWR, a newer master-planned community in the outer-ring suburbs) in the same or adjacent block groups. All but one of the outliers perceived their neighborhood geography narrowly. The outliers also had higher educational attainment and rates of homeownership but lower household incomes.
4. These findings exceed expectations from the existing literature but are in line with other recent research on the objective and subjective built environment correlates of life satisfaction (e.g., Kent et al., 2017; see **Technical Appendix**, "Reverse Causality, Type I & II Error, and Statistical Power").

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