

Article

Participatory Mapping of Holistic Youth Well-Being: A Mixed Methods Study

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Abstract: Urban environments influence well-being among young people in many ways, yet youth perspectives are often excluded from decision-making processes including urban planning and design. From 2020 to 2021, the Nashville Youth Design Team, a participatory action research and design collective composed of high school students in Metro Nashville-Davidson County, Tennessee investigated the influence of built environments on diverse aspects of youth well-being. By employing a comprehensive eight-element definition of wellness (i.e., environmental, financial, intellectual, mental, physical, recreational, social, and spiritual), the team created and disseminated a Youth Wellness survey to middle and high school students across Nashville-Davidson County. In their survey, youth researchers asked their peers to rate their own wellness across each of these eight domains. The participants were also encouraged to identify locations in the city that either supported or detracted from their sense of well-being. This study utilized these data to conduct a spatial analysis, exploring how proximity to wellness-supporting or detracting locations influenced young people's self-reported well-being. The data from open-ended survey questions were also analyzed qualitatively to provide context on how different environmental factors influence youth well-being. This research offers insights into the relationship between the built environment and youth wellness, highlighting the importance of incorporating youth perspectives into urban planning efforts.

Keywords: YPAR; built environment; participatory mapping; youth well-being; geospatial analysis



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1. Introduction

The U.N. Sustainable Development Goals (SDGs) are key components of the United Nations' 15-year agenda for sustainable development. These goals aim to address poverty and deprivation through improving health and education, reducing inequality, and supporting equitable economic development, while also considering the widespread effects of climate change [1]. Among these goals, the third objective seeks to “ensure healthy lives and promote well-being for people at all ages” [1]. One way that nations are working to achieve this goal is through the development of healthy, equitable, and sustainable urban environments while recognizing that cities have the ability to greatly impact human health and well-being. Research indicates that the physical environment has short- and long-term impacts on human health, spanning across various dimensions such as physical, mental, and social well-being [2,3]. These impacts manifest through traffic accidents, increased exposure to pollution and vulnerability to disasters, limitations to mobility, and more. Furthermore, residents often socially construct and associate their well-being and identities

with particular places through their interactions with these spaces. Well-maintained environments can foster and uphold individuals' well-being and sense of identity. Conversely, disruptions to these places, whether through processes like gentrification, displacement, urbanization, or disinvestment and neglect, can yield enduring adverse effects [3].

The impacts of the built environment are particularly salient in young people as they often lack autonomy and mobility, amplifying the influences of the local environment on their health and well-being [4]. David and Buchanan [5] (2020) explain that "The quality of the physical environment, that is, whether young people have spaces where they are free to roam, independently explore, and form bonds with others without being isolated, monitored, surveilled, and policed, can affect their overall quality of life" (p. 11). However, urban spaces are not often designed with young people in mind. As a result, urban planning repeatedly fails to consider youths' needs around safety, mobility, autonomy, and the enjoyment of public urban spaces, creating challenging conditions for young people to develop agency and thrive [2,6,7].

In this article, we examine Metro Nashville-Davidson County as a case study of how the built environment may influence youth well-being. This study was conducted through a youth-led participatory mapping process, which we discuss as an approach to integrating youth participation into urban planning processes. First, we review the literature on participatory planning methods and youth involvement in urban planning processes. After this, we describe the participatory mapping project that was the foundation for this study. The project was carried out by the Nashville Youth Design Team (NYDT), a youth-led mapping and design collective in Nashville, Tennessee, USA. Using data collected by the NYDT, we investigate how youth well-being may be influenced by proximity to locations which are viewed as supporting or detracting from wellness. We conclude by discussing this study's implications, emphasizing roles that young people can and should play in local planning and decision-making processes to ensure that urban spaces are more equitable and sustainable for all.

1.1. Participatory Planning and Sustainable Urban Development

Participatory planning has become an institutionalized method for integrating public participation into urban planning in many parts of the world [8,9]. As an approach intended to democratize planning decisions, participatory planning strives to integrate diverse forms of knowledge by involving various stakeholders (i.e., elected officials, city planners, residents, and experts) in decision-making processes [8,10,11]. The institutionalization of participatory planning is emphasized in the United Nations' SDGs, which call on nations to "Make cities and human settlements inclusive, safe, resilient and sustainable" [1] (Goal 11), specifically working to "enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management in all countries" [1] (Target 11.3). Involving residents in participatory planning activities has led to the increased democratization of planning processes through the improved integration of local knowledge, particularly knowledge held by marginalized people, as well as an increased capacity to handle inherent complexity within planning processes, and the development of innovative, efficient, and effective solutions [12,13]. Despite the benefits of participatory planning, numerous challenges in cultivating meaningful and impactful participation remain [9].

The most significant among these challenges is that participatory planning often fails to acknowledge, let alone address, historic power inequities within communities [14]. Though participatory planning processes typically aim to incorporate diverse perspectives, the processes tend to attract and engage predominately advantaged (e.g., White, highly educated) populations and leave out historically marginalized groups (e.g., people with lower incomes, people of color, and youths) [15]. Furthermore, a lack of transparency in urban planning processes as well as the bureaucratic structures that favor business interests and the agendas of powerful actors often reinforce existing power imbalances [14]. This calls into question whether participatory planning can legitimately influence planning

decisions and result in outcomes that reflect the needs of the larger community [8,16]. These limitations can lead to participatory planning upholding the status quo as opposed to meaningfully promoting social sustainability and collective processes.

1.2. Youth Participation in Urban Planning Processes

Although young people hold unique experiences and insights into how urban spaces are experienced and could be improved, they are commonly excluded from urban planning processes [6,17,18] (see [4,19,20] for exceptions). This lack of involvement is often attributed to social and structural barriers, such as concerns around youth capacity (e.g., skills, knowledge, and interest), the belief that adults can adequately represent youth experiences and desires, a lack of resources (i.e., time, money, and people) to adequately work with young people in planning processes, or the hesitancy to change existing bureaucratic structures to allow for youth participation [5,21]. Furthermore, when youths are included, they are often placed in tokenistic positions where they are seen as sources of information rather than active stakeholders and tend to be engaged only when it comes to decision making around youth-oriented spaces [22].

Despite a lack of meaningful youth engagement in most urban planning processes, youth participation is vital for the sustainable and equitable development of urban spaces, the social and civic development of young people, and the health and well-being of all [20,23–25]. Chawla [23] asserts that “a focus on children in development planning leads to attention to human development, community quality, basic needs, health-promoting environmental standards and the long-term consequences of decisions—a set of priorities which would increase social and environmental well-being for all ages, now and in the future” (p. 21). Thus, due to their unique positions within their local environments, young people’s involvement in urban planning can disrupt routine planning processes and power arrangements, leading to transformative and sustainable social and environmental change [25].

1.2.1. Influence on Sustainable and Equitable Urban Development

Engaging young people in urban planning processes is critical to the sustainable and equitable development of urban spaces. In addition to the characteristics outlined in the quote above by Chawla [23], studies indicate that when young people are included in planning and decision-making spaces, greater emphasis is placed on social integration, sustainability, and issues related to social justice, safety, and connectedness [19,22,24,26]. Consequently, young people’s involvement can lead to more ecologically and socially supportive communities, resulting in increased community resilience and transformed cities [25,27]. Moreover, Mansfield et al. [6] have found that failing to engage youth in these decision-making spaces can have long-term ramifications, such as “increas[ed] inequality, segregation, and favoring privileged sections of society” (p. 178).

1.2.2. Influence on Youth Social and Civic Development

Engaging young people in planning and decision-making processes also holds significant potential to positively shape youths’ social and civic development as well as increase their sense of belonging and connection to places [3,23–25]. When young people are meaningfully engaged and taken seriously in planning processes, this can have a tremendous impact on their social development, leading to increased confidence, pride, and communication skills and resulting in greater social resilience [19,24,25]. Furthermore, research indicates that participation in meaningful local planning and decision making helps shape young people’s views of government and collective action, and can lead to an increased sense of agency, psychological empowerment, and cross-cultural awareness [3,4,19,28,29].

In contrast, Mansfield et al. [6] found that when adults fail to integrate young people’s views into planning decisions, it can lead to “feelings of disillusionment, frustration, discouragement, and of being manipulated, devalued, and dismissed. . . affecting long-term confidence in democratic processes” (p. 178). Hence, engaging young people in

local democratic processes, such as planning and decision making, holds the potential to not only foster more equitable and sustainable urban environments, but also positively influence the civic and social development of young people, strengthening their democratic capacity [19,23].

1.2.3. Youth-Led Participatory Mapping

Participatory mapping is one method for involving youth in urban planning and community development decision making [15]. Mapping involves the compilation, display, and analysis of spatial data. When used in a participatory way, it can enable youths to actively participate in shaping their environments, fostering critical thinking about spatial and societal issues. Mapping also helps young people articulate their needs and perspectives so that they are better able to contribute to community change. Although the research on participatory mapping with young people is limited, studies emphasize mapping as a strategy for catalyzing youths' voices and agency [30–32]. By supporting young people as they learn to engage in participatory mapping processes, like photomapping and qualitative mapping, mapping collectives can influence decisions that affect the built environment [33]. The integration of advanced digital technologies, like Geographic Information Systems (GIS) web mapping in participatory mapping, has been particularly useful for enhancing the effectiveness and reach of participatory mapping initiatives, making them more accessible and engaging for young people [34,35].

Through participatory mapping, youths can identify and articulate community needs and highlight key community assets. For example, positive factors, such as social cohesion and belonging, and stressors, like the need for mental health services or impacts of urban redevelopment, can be understood spatially when youths leverage mapping [35–37]. Youth-led participatory mapping can be an effective approach across diverse cultural and geographic contexts, as these methods are adaptable and sensitive to a range of settings [38,39]. After the process of mapping concludes, these methodologies often lead to critical conversations about issues like personal safety, mobility, and technology [30], enhancing young people's awareness and understanding of their own environments.

Participatory maps informed and created by young people can deepen our understanding of how youths perceive and experience their neighborhoods [37,38,40]. These participatory processes can also foster a sense of ownership and responsibility among young people towards their communities [41]. Participatory maps can reveal youths' concerns, needs, and aspirations, which are often overlooked in urban planning and development processes [17]. Studies also demonstrate how youth participatory mapping processes can foster critical spatial thinking among youth [34,39]; helping young people understand the complex social and spatial dynamics of their communities, deepening their civic engagement, and supporting their ability to advocate for change.

1.3. The Current Study

This study is a mixed-methods inquiry into the impacts of built environmental factors on multiple domains of youth wellness in a single U.S. city, Metropolitan Nashville-Davidson County, TN (estimated population = 708,144 residents) [42]. Specifically, it seeks to answer the following questions: How does the built environment impact youth health and well-being in Nashville? What neighborhood locations and spatial characteristics support or detract from youth wellness? And how does proximity to wellness-supporting/detracting locations in young people's home neighborhoods impact their overall wellness? Geospatial analyses were conducted using self-reported data on youth wellness and locations in the city that were viewed as supporting or detracting from wellness. The data are from the Nashville Youth Wellness Survey, which was created by a local youth-led participatory urban design collective. The survey contained open-ended questions asking young people to convey their perspectives on the local built environment (e.g., why people come to or leave their neighborhoods and what they'd like to see changed in their neighborhoods or schools). These data were analyzed qualitatively to help explain

the results of the geospatial analyses. The results provide insights into the complexity of built environmental influences on youth well-being and highlight the need to incorporate young people's perspectives—and direct involvement—into decision-making processes regarding urban design and development.

2. Materials and Methods

2.1. Study Context: Metropolitan Nashville-Davidson County, TN

This study takes place in Metropolitan Nashville-Davidson County, TN, USA between the summer of 2020 and the summer of 2021. Metro Nashville-Davidson County is the largest city in Tennessee and serves as the state capitol. Since 1963, the city of Nashville and Davidson County have operated under a consolidated city–county government. Figure 1 presents the population density of Metro Nashville-Davidson County in 2020 by census tract (Figure 1A), the percentage of the population under 18 years old in 2020 by census tract (Figure 1B), and the change in the percentage of the population under 18 years old between 2010 and 2020 by census tract (Figure 1C).

Population of Metro Nashville-Davidson County, TN, USA

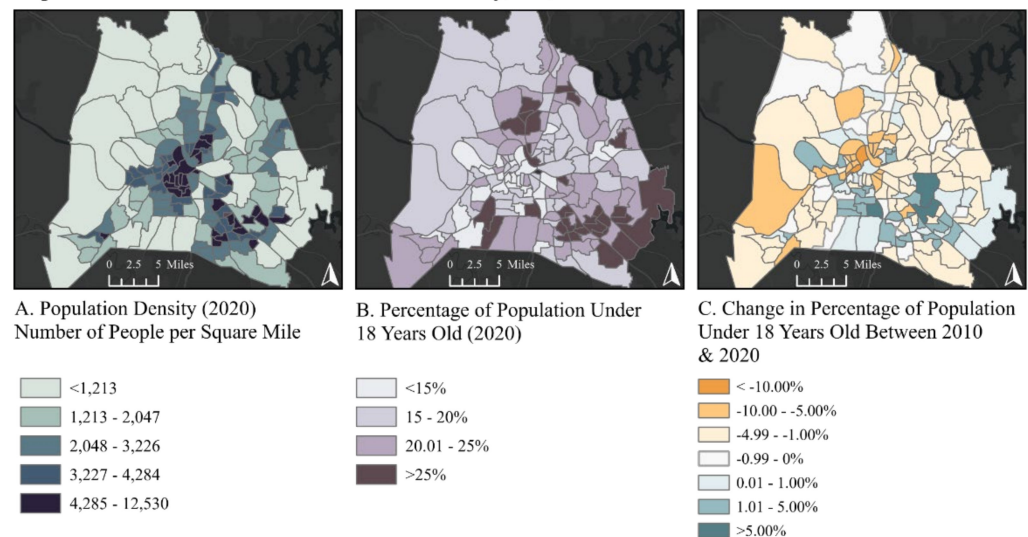


Figure 1. Population of Metro Nashville-Davidson County, TN, USA. (A) Population density in 2020 (number of people per square mile); (B) percentage of population under 18 years old (2020); (C) change in the percentage of population under 18 years old between 2010 and 2020. The maps reflect data from the 2010 and 2020 US decennial censuses downloaded through the National Historical Geographic Information System database [43]. Data are geospatially visualized at the census tract level. For (A,B), a quantile method was used to classify data classes. For (C), a manual intervals method was used to classify data classes; this method was utilized as a result of the distribution of the data, as well as to make the data easily interpretable.

2.2. The Nashville Youth Design Team and Youth Participatory Action Research

Launched in July 2020, the Nashville Youth Design Team (NYDT) is a youth-led participatory urban design collective based in Metro Nashville-Davidson County. It was born out of a collaboration between Vanderbilt University researchers and the Civic Design Center, a Nashville-based nonprofit (see [44,45]). Teenagers from diverse backgrounds and neighborhoods in Nashville apply to become a part of the NYDT in the summer before their freshman year and can remain engaged in the paid internship throughout high school.

The NYDT's approach is rooted in youth participatory action research (YPAR) (see [46]) with a specific focus on gathering data regarding youth wellness and converting these findings into practical urban design solutions. The NYDT's multifaceted approach to YPAR encompasses data collection, design, and action. The NYDT's process commences with a full-time, four-week annual summer intensive training period and work time. During this

phase, team members design and conduct participatory research projects, seeking input from their peers across Nashville about how their neighborhoods affect their well-being, including the positive and negative aspects of the neighborhoods. Findings from their research are then visualized on maps, enabling the team to identify trends within and across communities and make informed decisions about where to design interventions in the urban environment that can best contribute to youth wellness.

Following the data collection and analysis phases, the NYDT's work shifts to designing tactical urbanism projects, which are short-term, low-cost, and scalable interventions meant to catalyze long-term changes [47]. These projects aim to quickly test and demonstrate the potential of urban design solutions in public spaces so that young people are better equipped to advocate for long-term changes in the built environment. At the conclusion of the summer, the NYDT presents their designs to local stakeholders who participate in selecting a final tactical urbanism design for implementation.

Throughout each school year, the NYDT's focus shifts to refining the chosen tactical urbanism design and engaging with community members to facilitate its installation. This phase of the NYDT process requires youth–adult partnerships, as youth work with city leaders to seek community partnerships and funding. Previously realized tactical urbanism projects have included a glow-in-the-dark crosswalk at the most dangerous intersection in the city and a mini soccer pitch in an open green space in an international community. These projects respond to distinct needs that young people see across the city but are united in their goal of improving the wellness of Nashville's youths. Taken together, the team's members bring unique perspectives shaped by their experiences in Nashville, enriching the collective's YPAR approach, strengthening their ability to address inequities in the city's urban design, and ultimately promoting youth wellness [45].

2.3. Youth Wellness Survey and Mapping

During the summer of 2020, the NYDT developed the Nashville Youth Wellness Survey, a survey designed to understand how the built environment influences youth well-being within Metro Nashville-Davidson County. To design the survey, the team members drew from a definition of holistic wellness taught in their Metro Nashville Public School health classes. This definition includes eight domains of wellness: physical, environmental, recreational, social, financial, intellectual, mental, and spiritual. Within the survey, participants are asked to rate their wellness for each of the domains on a scale from one to ten, with one representing not well and ten representing extremely well. Using these scores as a guide, the survey asked participants to identify locations within the county (i.e., built environment) that support or detract from their wellness, providing an address or general location for each site, as well as an explanation for why the location either supported or detracted from their wellness. Additionally, the survey asked young people to explain why people move to or visit their neighborhoods, why people leave their neighborhoods, where they like to spend time, and changes they would like to make within their neighborhoods and around their schools. Within each of these questions, participants were asked to identify specific mappable locations.

The NYDT implemented the survey between the summer of 2020 and the summer of 2021, reaching 193 young people across Metro Nashville-Davidson County. During each summer, the NYDT translated the data from the survey into digital maps. For the first summer, the team used Google My Maps to map the various spatial data from the survey. The data from Google My Maps were later exported and uploaded to ArcGIS Online by the first, second, and fourth authors. For the second summer, the team directly entered the data into ArcGIS Online using an ArcGIS Online web application created by the first, second, and fourth authors. The final Nashville Youth Wellness Map can be found in the ArcGIS dashboard for Youth Wellness in Nashville, TN (see Figure 2).



Figure 2. ArcGIS online dashboard for Youth Wellness in Nashville, Tennessee: <https://www.arcgis.com/apps/dashboards/2f2bb2fff9a248da88d8fe6c5cf0d218> (accessed on 2 January 2024).

Since the creation of the Nashville Youth Wellness Map, the NYDT has used the data to generate themes across built environment elements that support or detract from youth wellness in Nashville, create infographics on youth wellness (by ZIP code and by wellness category), and identify areas to target tactical urbanism projects.

2.4. Data Collection

Data collection for the NYDT's Youth Wellness Survey took place between the summers of 2020 and 2021. A convenience sampling approach was used to recruit survey participants. During the summers, the NYDT members verbally administered the 50-question survey to their peers (e.g., friends and family members). These surveys were then entered into REDCap by NYDT members. REDCap is a secure, web-based data collection platform hosted at Vanderbilt University [48]. During the 2020–2021 school year, the survey was administered to students whose classrooms were involved with the Design Your Neighborhood (DYN) curriculum, a middle school place-based action civics curriculum developed by the Civic Design Center and Vanderbilt University researchers [44]. Surveys administered through DYN were completed through REDCap or on paper and then entered into REDCap by NYDT members. Table 1 provides an overview of the NYDT Youth Wellness Survey questions from which the data in this study are derived.

Table 1. Overview of the NYDT Youth Wellness Survey questions used in analysis.

Method	Variable	Examples of NYDT Youth Wellness Survey Questions Used in Analysis
Geospatial methods, including proximity analysis, geographically weighted regression, and optimized hot-spot analysis	Home Location	Where do you live? You can add your address or describe where you live so that we can add you to our map.
	Wellness Scores	On a scale of 1–10, what score would you give your physical wellness? (1 means not well and 10 means very well). Physical wellness includes things like eating well, exercising, and getting enough sleep. [The format of the question above is used for each of the eight domains of wellness: physical, environmental, recreational, social, financial, intellectual, mental, and spiritual]
	Wellness-Supporting Location	It looks like [wellness domain] is your highest category of wellness. What places in your neighborhood support your [wellness domain]? Where is [location]? How does [location] support your [wellness domain]?
	Wellness-Detracting Location	It looks like [wellness domain] is your lowest category of wellness. What about your neighborhood takes away from your [wellness domain]? How does [location] take away from your [wellness domain] wellness?

Table 1. *Cont.*

Method	Variable	Examples of NYDT Youth Wellness Survey Questions Used in Analysis
Qualitative, including inductive thematic coding within and across question and domain sub-groups	It looks like [wellness domain] is your highest category of wellness. What places in your neighborhood support your [wellness domain]? Where is [location]? How does [location] support your [wellness domain]?	
	It looks like [wellness domain] is your lowest category of wellness. What about your neighborhood takes away from your [wellness domain]? How does [location] take away from your [wellness domain] wellness?	

2.5. Participants

The study's participants included 146 young people in grades 6 through 12. Twenty-seven schools in Metro Nashville-Davidson County are represented in the sample: 10 middle schools, 13 high schools, and 4 K-12 schools (i.e., schools including elementary grades through high school). Over half of the participants identified as female (55.48%), with 37.67% identifying as male, 1.37% identifying as non-binary, and 5.48% not reporting gender. Most participants identified as White (32.88%), followed by Black or African American (31.51%), Hispanic (10.27%), other race or ethnicity (8.22%), Asian or Asian American (7.53%), Middle Eastern or North African (3.42%), and American Indian or Alaska Native (0.70%). Over 5% of participants did not report race or ethnicity. Table 2 provides an overview of the socio-demographics of the study participants.

Table 2. Summary of socio-demographics of study participants (N = 146).

Grade Level in School	
6	8.22%
7	43.15%
8	10.96%
9	12.33%
10	11.64%
11	4.79%
12	6.16%
Did not report grade	2.74%
Gender Identity	
Female	55.48%
Male	37.67%
Non-binary	1.37%
Did not report gender identity	5.48%
Race or Ethnicity	
Asian or Asian American	7.53%
Black	31.51%
Hispanic	10.27%
White	32.88%
Other	12.33%
Did not report race or ethnicity	5.48%

2.6. Geospatial Analysis

This paper used data from the NYDT's Youth Wellness Survey to geospatially examine the influence of urban built environments on self-reported youth wellness scores in Metro Nashville-Davidson County, TN. To carry this out, ArcGIS Pro (Version 3.2.0) was used to analyze possible relationships between individual youth wellness scores (the mean score

across the eight domains of wellness for each respondent) and the locations that the young people identified as supporting and detracting from their well-being.

Before conducting the analysis in ArcGIS Pro, the youth wellness scores data and the data on youth wellness-supporting and detracting locations were downloaded as shapefiles from ArcGIS Online. The data were cleaned to include only participants who reported at least six domains of wellness ($n = 146$). For the sample, a mean wellness score was calculated for each participant. Participant IDs were then assigned to each participant and the locations they had identified as supporting/detracting from their wellness. Participants identified between one and eight locations that either supported or detracted from their wellness, for a total of 195 wellness-supporting locations and 92 wellness-detracting locations. A one-to-many join was used to connect the two datasets using the participant ID as the join field to create the final dataset, which included the following: participants' wellness scores for each domain of wellness, an average wellness score, and the wellness-supporting and detracting locations. Before beginning spatial analyses, an exploratory regression was conducted to minimize issues with multicollinearity and assess the best combinations of variables to utilize in a geographically weighted regression.

2.6.1. Proximity Analysis

Distances between youth home locations and youth-identified wellness-supporting and detracting locations were derived by creating desire lines (spider diagrams) for each youth. Spider diagrams can be used to easily visualize proximity to resources. For this study, a participant's neighborhood is defined as the walkable one-mile area around their home location. One-mile walking "travel areas" were generated around each youth's home location using ArcGIS Online network analysis to quantify wellness-supporting and detracting locations within participants' neighborhoods [49].

2.6.2. Geographically Weighted Regressions

Based on the results from the exploratory regression, varying combinations of explanatory variables representing distance to wellness-supporting and detracting locations, as well as the census tract level density per 1000 persons of features (i.e., coffee shops, libraries, parks, polluting locations, and religious organizations) obtained through the Cognability dataset [50], were used to run geographically weighted regression (GWR). GWR was run using a Gaussian model with fixed-distance bands based on golden search neighborhood selection.

2.6.3. Optimized Hot-Spot Analysis

An exploration of the spatial clustering of each of the average wellness scores as well as the individual wellness metrics was conducted using optimized hot-spot analysis. The optimized hot-spot analysis tool explores various ways of aggregating and comparing the data to best understand the spatial clustering (low or high) of wellness values. By focusing on the stratified wellness scores and the holistic wellness score, the authors could investigate whether certain wellness metrics had statistically significant areas with lower-than-expected scores (cold spots) or higher-than-expected scores (hot spots) and potentially identify the wellness metrics which were influencing overall youth wellness the most.

2.7. Qualitative Data Analysis

Next, an explanatory sequential mixed-methods approach was used to analyze the qualitative data. These data were incorporated to help explain the results of the quantitative spatial analyses [51]. The dataset was exported from ArcGIS Pro in order to conduct qualitative coding using MAXQDA (Version 2022). First, an inductive coding process [52] was used to examine the spaces and places that youth identified as supporting and detracting from youth wellness across Metro Nashville-Davidson County, focusing on all eight domains of wellness. The coder (i.e., third author) also coded the characteristics of survey respondents' neighborhoods that contributed to and negatively impacted wellness.

Finally, the data were geographically subsetted, focusing on the areas that were identified as cold spots regarding the youth wellness score through the optimized hot-spot analysis. Within these cold-spot areas, elements that supported and detracted from the eight domains of wellness were coded to further understand what may be contributing to the statistically significant cold spots within the youth wellness score data.

3. Results

This study explored the possible influences of urban built environments on young people's self-reported wellness scores in Metro Nashville-Davidson County, Tennessee, USA. A geospatial analysis was used to explore the relationship between youth-identified wellness-supporting and detracting locations and youth wellness scores. Additionally, a qualitative analysis was incorporated to identify and highlight specific features within the built environment that either supported or detracted from the various domains of youth wellness and holistic youth wellness. The geospatial analysis results as well as the qualitative results are presented below.

3.1. Spatial Analysis

Multiple spatial analysis techniques were used to analyze the Nashville Youth Wellness Survey data, including geographically weighted regression (GWR), proximity analysis (spider map), and optimized hot spot analysis. The results from these various analyses are reported below.

Prior to conducting the more advanced spatial analyses, descriptive statistics (i.e., averages of each of the domains of wellness across all participants) were calculated (see Figure 3), and disaggregated wellness scores for each participant were mapped using the participants' home addresses as the locations for symbolizing the wellness scores. Among the average wellness scores across all participants, the scores ranged from 6.63 (mental wellness) to 7.96 (environmental wellness), with 7.22 being the average score across the eight domains of wellness. The highest average wellness scores reported by Nashville youths include environmental (7.96), intellectual (7.67), and financial (7.60) wellness. The lowest average wellness scores reported by Nashville youths include mental (6.63), physical (6.80), and social (6.91) wellness.

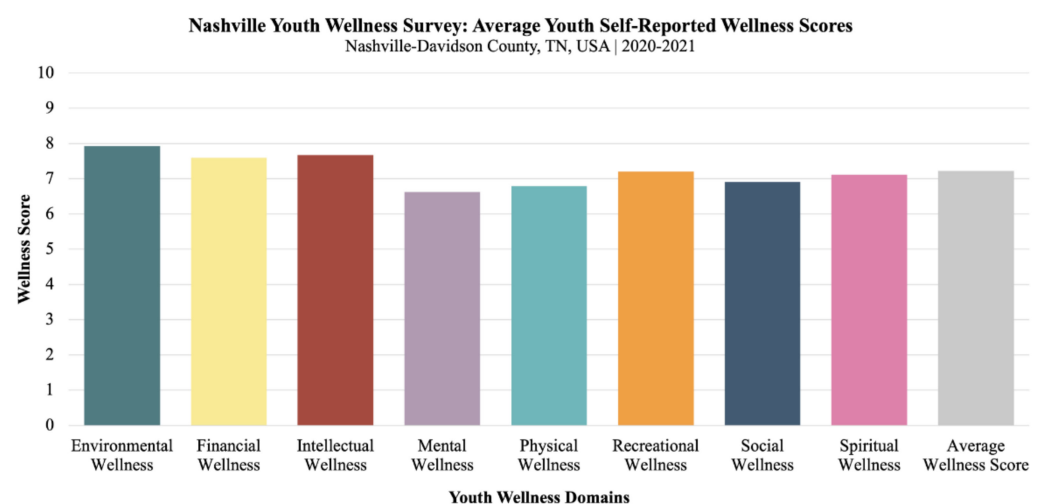


Figure 3. Average youth wellness scores for each of the eight domains of wellness, as reported in the NYDT's Youth Wellness Survey based on study population ($n = 146$). Figure 2 presents average youth wellness scores for the larger survey population ($n = 193$). Fifty-three individuals were excluded from the current study because they did not rate at least six domains of wellness.

Figure 4 presents the spatial distribution of domain-specific wellness scores, providing spatial context to the scores. However, due to the spatial extent and the desire to capture the whole county, it is difficult to differentiate individual scores within each domain.

Regardless, the maps show shifts in wellness scores depending on the domain of wellness being reported.

Nashville Youth Wellness Survey: Self-Reported Youth Wellness Scores

Nashville-Davidson County, TN, USA | 2020-2021

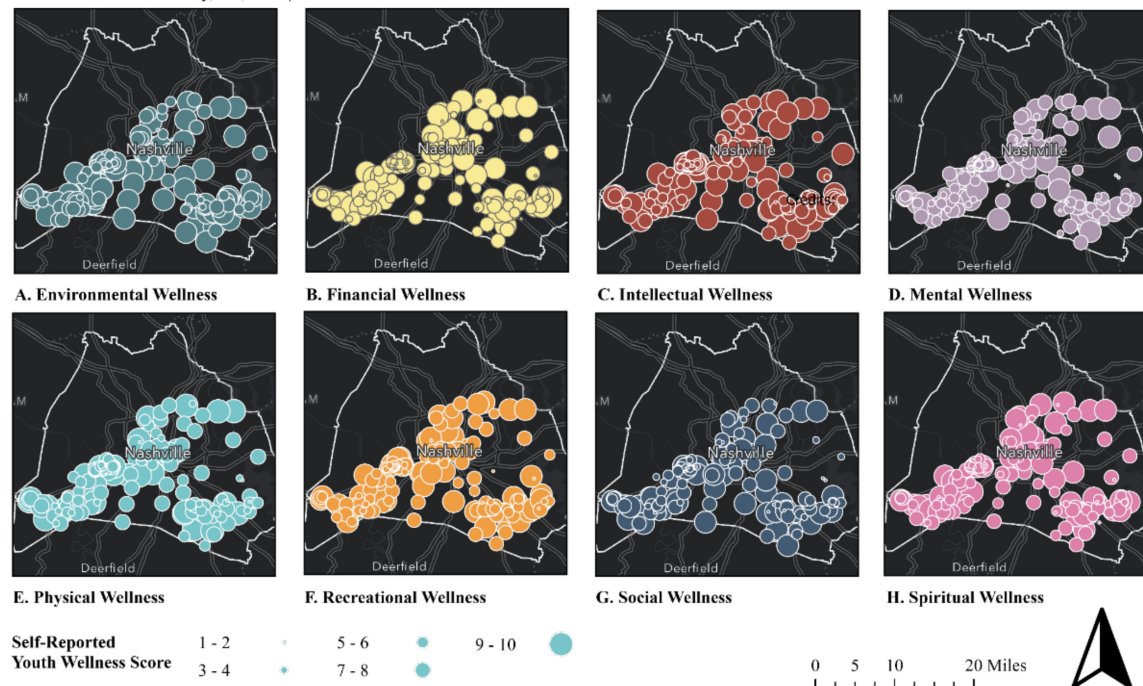


Figure 4. Spatial distribution of individual wellness scores for each of the eight domains of wellness: (A) environmental; (B) financial; (C) intellectual; (D) mental; (E) physical; (F) recreational; (G) social; and (H) spiritual. Scores are mapped at the locations of the participants' homes.

3.1.1. Geographically Weighted Regression

When examining the relationship between youth wellness scores and youth-identified wellness-supporting and detracting locations, as reported in the Youth Wellness Survey, the GWR model did not indicate a statistically significant relationship. Furthermore, when examining the relationship between youth wellness scores and built environment factors reported in the Cognability dataset (i.e., proximity to coffee shops, libraries, parks, polluting locations, and religious organizations) [50], the GWR model again did not produce statistically significant results.

3.1.2. Proximity Analysis

A proximity analysis was also used to explore the distances from the participants' homes to youth-identified wellness-supporting or detracting locations (see Figure 5) and the proportion of wellness-supporting and detracting locations within a walkable distance of young people's home locations. A "walkable distance" was defined as 1 mile, as used by the NYDT and others [49].

Of the 146 survey participants in our sample, 76.71% ($n = 112$) of participants lived within a one-mile walk from either a wellness-supporting or detracting location, 74.66% ($n = 109$) lived within a one-mile walk to a wellness-supporting location (see Figure 6), and 58.22% ($n = 85$) lived within a one-mile walk to a wellness-detracting location (see Figure 7). Moreover, 54.80% ($n = 80$) lived within a one mile walk to both a wellness-supporting and wellness-detracting location.

Walkability from Home to Youth-Identified Wellness Supporting/Detracting Locations (1 Mile)

Nashville-Davidson County, TN, USA | 2020-2021

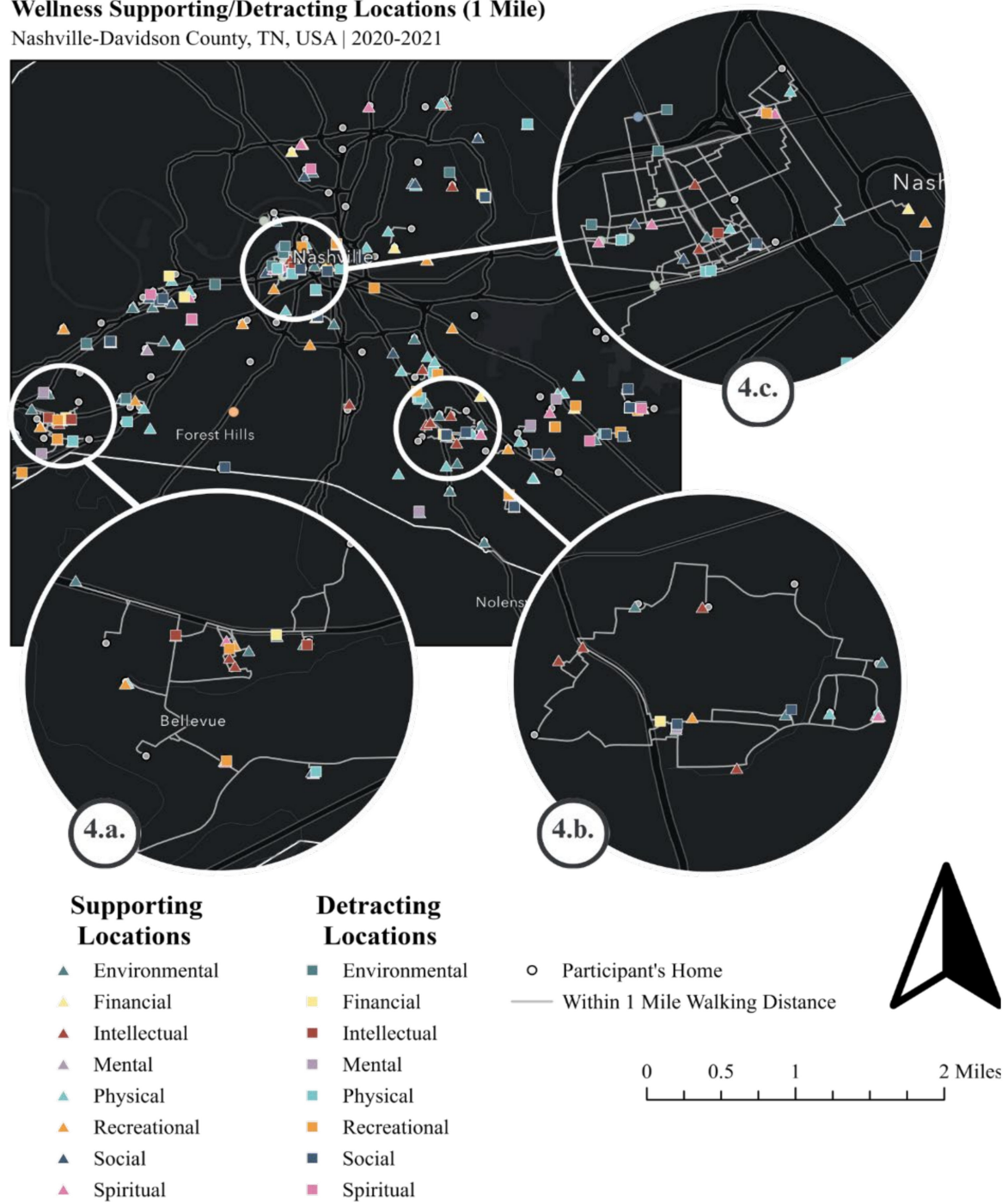


Figure 5. Proximity analysis of a one-mile walking distance from participants' homes to youth-identified wellness-supporting and detracting locations as reported in the NYDT's Youth Wellness Survey: (a) Bellevue; (b) Southeast Nashville; (c) North Nashville.

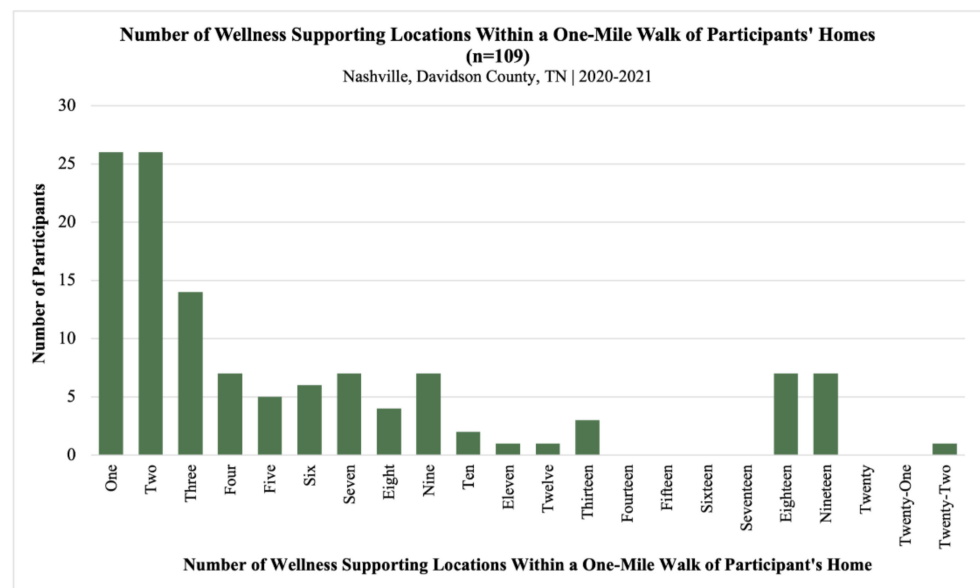


Figure 6. Number of youth-identified wellness-supporting locations within a one-mile walk of participants' homes as determined by proximity analysis.

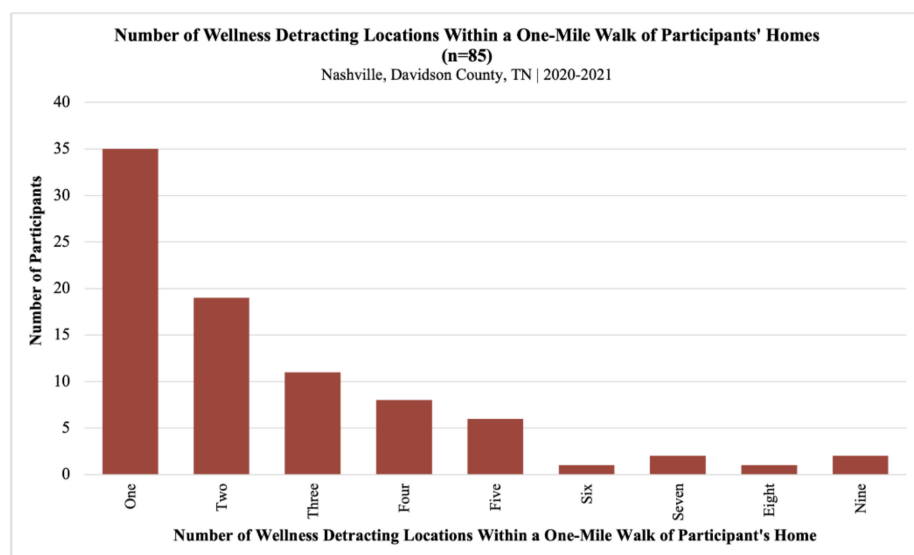


Figure 7. Number of youth-identified wellness-detracting locations within a one-mile walk from participants' homes as determined by proximity analysis.

This analysis revealed that a quarter of the surveyed young people (25.34%) did not live within a one-mile walking distance to any of the youth-identified wellness-supporting locations. Though it is understood that this could be a limitation of the data and does not capture all potential youth wellness-supporting locations, it calls into question the ability of young people to access spaces that may promote youth well-being.

Based on the proximity analysis, there were four areas within the city that had a high level of access (routing) based on the distance from the participants' homes to wellness-supporting and/or detracting locations: north Nashville, southeast Nashville, Bellevue, and west Nashville. The north Nashville area is closer to the urban core of the city where there are more sidewalks, lower speed limits, and higher residential and commercial density, making it a fairly walkable part of the city (see Figure 5C). However, Bellevue (Figure 5A) and southeast Nashville (Figure 5B) are located in suburban areas, where there are fewer sidewalks, higher speed limits around major pikes, and lower residential and commercial

density. Though there may be numerous wellness-supporting/detracting locations within one mile of the participants' homes, it is highly unlikely that young people would walk to reach those locations.

3.1.3. Optimized Hot Spot Analysis

The optimized hot spot analyses demonstrated a significant cold spot comprising 23 low scores in the west Nashville area, near the Nashville West shopping complex, and one weak hot spot in northeast Nashville (see Figure 8). The cold spot identified within the data was especially interesting considering the analysis identified many walkable features near these individuals; however, in order to access these features, youths would have to cross an interstate highway (I-40) or walk along Charlotte Pike (Highway 70), which has a high traffic volume and lacks sidewalks. Furthermore, the weak hot spot in northeast Nashville is surprising as it is located in a predominately suburban area and cut off from other parts of the city by the Cumberland River and Briley Parkway (TN-155), a major highway.

Hot Spot Analysis of Average Youth Wellness Score
Nashville-Davidson County, TN, USA | 2020-2021

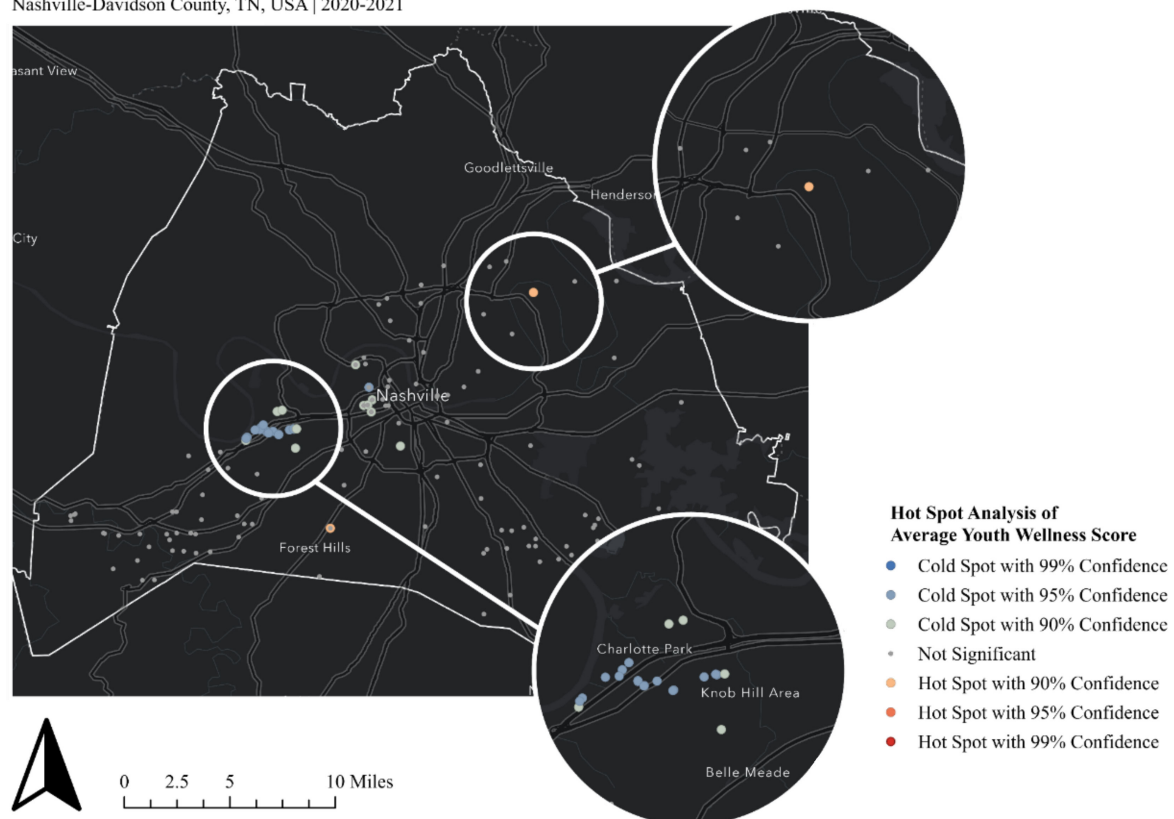


Figure 8. Optimized hot spot analysis of average youth wellness scores as reported in the NYDT's Youth Wellness Survey.

Additionally, an optimized hot spot analysis (Getis-Ord Gi*) was conducted for each of the eight domains of wellness. This spatial statistic displays where there are spatial clusters of features with either high or low values. To be a statistically significant hot or cold spot, a feature will have a high or low value and be surrounded by other features with high or low values, as well as with varying rates of confidence (at the 99%, 95%, and 90% confidence intervals, where 99% confidence means that there is 1% chance that the cluster is random). Statistically significant hot or cold spots were identified in four out of the eight wellness domains. These domains included environmental, intellectual, spiritual, and financial wellness. There was a significant cold spot of environmental wellness scores ($n = 6$) in the northwest section of the city, just outside of the downtown core (see

Figure 9A). This area is home to numerous historically Black communities, containing two historically black universities (i.e., Fisk University and Meharry Medical School), has a high density of rail lines, and is experiencing high rates of gentrification and touristification [53]. Additionally, there is a significant hot spot of environmental scores ($n = 1$) in the Forest Hills neighborhood, which is a predominantly affluent section of the city, containing properties with large lot sizes, and it is home to numerous celebrities (see Figure 9A).

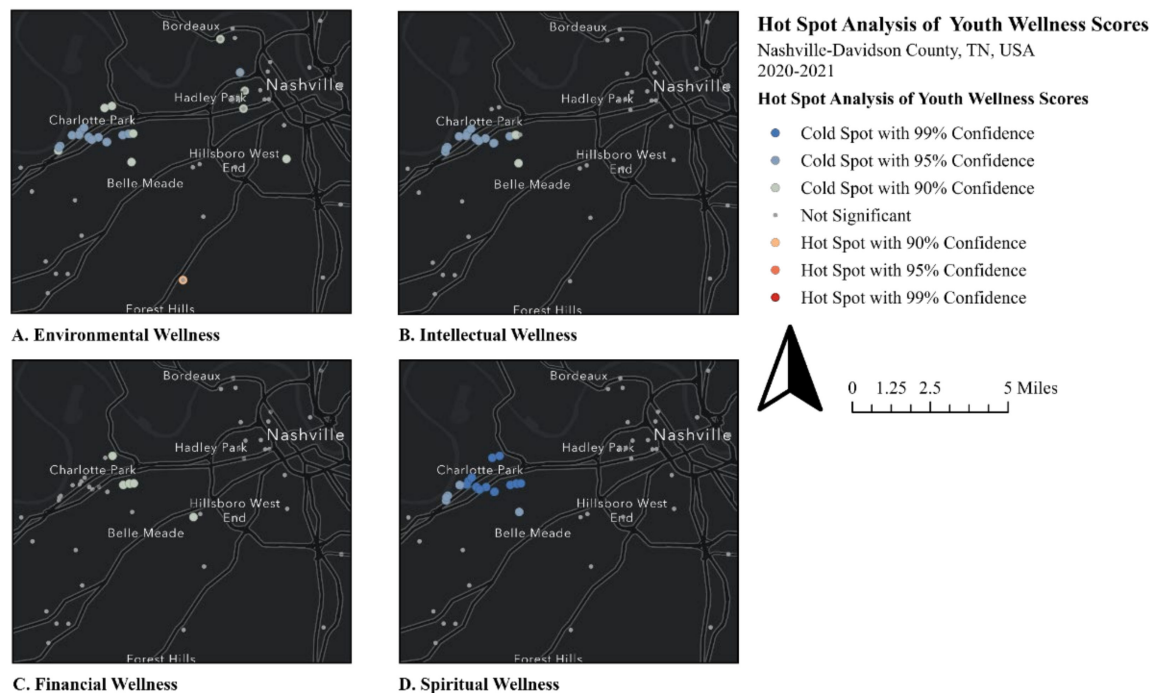


Figure 9. Optimized hot spot analysis of (A) environmental wellness scores, (B) intellectual wellness scores, (C) financial wellness scores, and (D) spiritual wellness scores, as reported in the NYDT's Youth Wellness Survey.

There are also significant cold spots for intellectual wellness (Figure 9B), financial wellness (Figure 9C), and spiritual wellness scores (Figure 9D) in the same west Nashville area, where a significant cold spot of average wellness scores was also identified. However, for both financial and spiritual wellness, additional cold spots emerged southeast of the area, but still in what is considered west Nashville.

3.2. Qualitative Analysis

To contextualize and further explain the results from the geospatial analysis, we qualitatively examined themes from open-ended survey questions across each of the eight domains of wellness. The survey questions used in this analysis included questions about specific domains of wellness. For example, the following questions were analyzed regarding physical wellness:

1. *What about your neighborhood supports your physical wellness?*
2. *Where is [answer to question #1]?*
3. *How does [answer to question #1] support your physical wellness?*
4. *What about your neighborhood takes away from your physical wellness?*
5. *How does [answer to question #4] take away from your physical wellness?*

It should be noted that piping was used within the survey to make it easier for the participants to understand the questions being asked; for the questions above, piping was used in questions two, three, and five.

Each of the following sections discusses the spaces and places as well as the characteristics of the participants' neighborhoods and/or the larger county that they identified

as supporting or detracting from each of the eight domains of wellness. In some cases, example quotes from open-ended responses are included (in *italics*) to illustrate themes in the data. Pseudonyms and the grade level in school at the time the survey was completed are provided for each respondent.

3.2.1. Physical Wellness

Young people felt that having opportunities to be active, such as through playing sports, walking, or running, most supported their physical wellness. Spaces identified as supporting physical wellness include sports fields, homes, sidewalks, parks, and greenspaces.

Jake, 9th Grade: *There are many parks and the neighborhood is safe to run, walk, and ride bikes.*

Dante, 11th Grade: *Practice and playing different sports at home.*

They also saw being outside and having food and nourishment as keys to their physical wellness.

Lucie, 12th Grade: *It [community center, sidewalks] helps me by having safe spaces to exercise and eat healthily.*

Young people shared that not having sidewalks or streets and having few opportunities to be active in their neighborhood took away from their physical wellness.

Aya, 7th Grade: *There isn't places to exercise or sidewalks.*

Levi, 8th Grade: *Lack of sidewalks from neighborhoods to shops and also highway 100, it makes me less likely to go walk places and forces me to take a car.*

Some participants also expressed that they did not think it was their neighborhood that took away from their physical wellness, but they felt "lazy" or knew they needed to be more active.

Violet, 7th Grade: *Myself while at my house—I get lazy and don't go outside or stay up later than I should, I can't put the blame on anyone else cause I know that's something I need to work on.*

3.2.2. Environmental Wellness

Feelings of safety emerged as the most supporting youth environmental wellness factor. The participants shared that their feelings of safety were strengthened by their connections with their family and their neighbors and that their environmental wellness was supported through their experiences of the kindness and friendliness of the people that live in their neighborhood.

Martín, 7th Grade: *It's very calm and safe so I can go outside and be safe—I feel safe when I go outside.*

Amy, 7th Grade: *My neighbors—They make me and my family comfortable around the people we live with.*

Jane, 7th Grade: *Everyone in the neighborhood knows each other—I don't worry about my safety whenever I'm out alone.*

Jake, 9th Grade: *My street—I feel safe and everybody is kind and friendly.*

Additionally, participants expressed that having nature, trees, or greenspaces in their neighborhood, as well as having places and opportunities where they can have fun or play, was critical to supporting their environmental wellness.

Inversely, feelings of a lack of safety and insecurity, as well as people in their neighborhood, detracted from the young people's sense of environmental wellness. Trash and litter within their neighborhoods were also shared as factors detracting from their environmental wellness.

3.2.3. Recreational Wellness

The participants' recreational wellness was supported by having kids, particularly neighbors, nearby to play with as well as having places to play sports like soccer and basketball and living near parks.

Dante, 11th Grade: *Video Games & basketball goal at home—I can play video games with my friends and also have fun outside with my neighbors.*

Eloise, 9th Grade: *Many things to do around the neighborhood.*

Chase, 6th Grade: *Soccer field in the apartment complex—It feels good to go there when I am bored, I even play by myself.*

The most common themes for what detracted from recreational wellness were perceptions of having “nowhere to go” or “nothing to do” in their neighborhoods. COVID-19 was also specifically mentioned as taking away from recreational wellness. For example, one respondent expressed the following:

Thomas, 7th Grade: *Because of COVID I can't hang with my friends as much anymore—I can't go to events and be with my friends as much as I used to, but it is getting better.*

3.2.4. Social Wellness

Young people's social wellness was supported most clearly through opportunities for engaging with others, including having neighbors and friends to connect with and perceiving that people in their neighborhood get along.

Jamal, 11th Grade: *I can easily walk outside and spark up a conversation with my neighbor. They are all pretty friendly.*

Olivia, 8th Grade: *My friend lives on my street.*

The most common places that supported youth socialization were home, outside, and friends' houses.

Sam, 7th Grade: *Friends, Neighbors, and Parks.*

Fatima, 8th Grade: *If there is a playground or a park the little kids are going to play with each other, and they are going to become friends. When they become friends, the parents would talk to each other which means they are going to have to become social with each other.*

When asked what detracted from social wellness, most participants shared that a lack of people to socialize with in their neighborhood negatively impacted their social wellness. Common responses included the following:

I don't have people my age to play with

I don't have a lotta friends nearby

Not many people

3.2.5. Financial Wellness

Physical places that supported or detracted from financial wellness were mentioned less frequently than in other wellness domains. For example, the most common answer to “What about your neighborhood supports your financial wellness?” was participants' parents, either through their jobs or by providing a home.

Miles, 10th Grade: *My parents are in a secure place financially.*

Layla, 8th Grade: *My dad's job— We have a roof over our heads, food, water, bills are able to be paid, and we live in a safe neighborhood.*

The second most common response to the questions about what supported participants' financial wellness was that people in their neighborhoods helped and supported

their financial well-being. This social support was named in multiple ways, including emotional support and tangible financial support.

Hannah, 7th Grade: *Yes, in my neighborhood everyone supports each other. What I mean by that is when someone is feeling down they always help them out no matter what, they help them through life.*

TJ, 7th Grade: *Neighbors help each other in North Nashville—They help when groceries and other things are needed.*

Sydney, 7th Grade: *My uncle isn't working right now, but we have enough to make it through and if we ever needed anything, which doesn't really happen a lot, we can ask the neighbors and they'll help us.*

Young people's neighborhoods were not always viewed as directly supporting financial wellness. Numerous respondents reported that they felt their neighborhoods did not support their financial wellness, offering responses such as "idk" or "it doesn't".

When asked how their neighborhoods took away from their financial wellness, most respondents replied that not having a job or their neighborhoods' costs of living detracted from their social wellness. When speaking about their lack of employment, the participants expressed that they did not have a job due to being too young or that they could not find employment near their homes. When elaborating about the high cost of living, young people expressed that their apartments or houses cost too much, property taxes are too high, or that they live in an expensive neighborhood.

3.2.6. Intellectual Wellness

While school was consistently named as the place that most supported young people's intellectual wellness, the answers for why school supported intellectual wellness differed. The respondents shared answers such as "It provides a good education", "I get to learn new things every day", or "I can study things like history, and math".

Beyond school, young people identified nature and their ability to be outside in parks and forests as factors that support their intellectual wellness.

Mia, 7th Grade: *The forest nearby, across the street—I get to explore and observe a lot of things, my school also offers a lot of learning experiences.*

Knox, 7th Grade: *In my neighborhood I get to go outside and my friends will tell me what bug that is or what bird that is. I get to learn new stuff.*

Scarlett, 7th Grade: *Parks across the street from where I live—I get to be exposed to gardens that help me study things like botanics.*

Riley, 7th Grade: *All the rural scenic routes and nature in the area—It helps me to draw closer to nature and learn to appreciate the growth process.*

Participants also shared that being immersed in culture and being able to connect with people who share different backgrounds supported their intellectual wellness.

Max, 9th Grade: *The local shops and libraries in Historic Nolensville allow me to be immersed in culture. It has many shops that embody Amish culture, as well as local history.*

Omar, 6th Grade: *In my neighborhood I am able to communicate with other people to learn English—Every day new people come out to play and I learn something new.*

Bo, 6th Grade: *Around my neighborhood there are a lot of Spanish speakers—they help me learn Spanish.*

The youth participants felt that a lack of opportunities or spaces in their neighborhoods for them to learn, or a lack of people to learn with, detracted from their intellectual wellness. This was represented in their responses, such as *no new things happen, we don't go outside, and no one has shared interests with me in my neighborhood.*

3.2.7. Mental Wellness

The young people reported that nature and the outdoors; relationships with family, friends, and neighbors; as well as opportunities to have fun and socialize supported their mental wellness.

Jamal, 11th Grade: *I live in a peaceful neighborhood. I can easily walk outside and just take a breather and collect my thoughts. By being at home, I can feel safe, and have my own space to deal with the situation.*

Mia, 7th Grade: *My house—Just being able to be around family.*

Peter, 7th Grade: *Playing with other kids in my neighborhood—it brings me enjoyment.*

However, inversely, participants expressed that isolation and loneliness, a lack of things to do, and not enjoying the people they live near detracted from their mental well-being.

3.2.8. Spiritual Wellness

The elements that supported youth spiritual wellness predominantly focused on opportunities to practice religion, but also included the ability to feel appreciated and connected to others as well as moments of mutual respect and care.

Violet, 7th Grade: *My friends who kind of live across the street— We talk and explain our differences at times and in certain ways. Yes, we don't all agree on everything, but I respect them and expect to be respected back.*

Bailey, 8th Grade: *Church—It is a place for people to learn more about their religion.*

Savannah, 8th Grade: *My house—My house is filled with people who have the same religion as me and religion is the way I use to figure out my purpose in life.*

Emma, 8th Grade: *We all appreciate each other and what we do—It makes me feel like I belong.*

Many youths reported low spiritual wellness; however, when asked what takes away from their spiritual wellness, the most common response was “N/A” or “IDK,” (I don’t know). Other responses expressed that a lack of things to do in the neighborhoods detracted from spiritual wellness. For example, participants shared the following:

Jamal, 11th Grade: *My neighborhood is bland or boring, which takes away from my spiritual wellness.*

Ryan, 7th Grade: *I can't do anything in my neighborhood.*

Will, 7th Grade: *My school negatively impacts my spiritual wellness.*

3.2.9. Themes across All Domains of Wellness

Across all eight domains of wellness, youth participants shared that having activities to perform and having opportunities to socialize and connect with neighbors were central to supporting their well-being. Places that positively impacted youth wellness included participants’ homes and outdoor spaces, such as nearby parks, sports fields, and basketball courts. “Play” and “fun” also emerged as important factors for supporting youth wellness across multiple domains (i.e., mental, physical, recreational, and environmental). Young people overwhelmingly voiced that the people, or a lack of people, in their neighborhood played critical roles in supporting and detracting from multiple domains of wellness (i.e., environmental, mental, social, spiritual, and recreational wellness). Moreover, many of the wellness domains were positively influenced by feelings of safety or security, either in a physical place or as a result of connections to neighbors, family, and friends.

These data were collected between the summer of 2020 and the summer of 2021, during the height of the COVID-19 pandemic. For a significant portion of that time period, schools in Metro Nashville-Davidson County moved online, activities for youth were canceled, and some families were maintaining strict social distancing practices. In the qualitative

responses, the COVID-19 pandemic was predominantly mentioned as detracting from participants' recreational wellness, and to a lesser degree, detracting from their social and mental wellness.

For some wellness domains, young people were less likely to identify elements in their neighborhoods that contributed to or detracted from their well-being (i.e., recreational, social, financial, and mental wellness). For these domains, the respondents were more likely to write "n/a" or "nothing" when asked what in their neighborhoods supported these domains of wellness. For example, the most common responses for what takes away from the respondents' recreational wellness in their neighborhoods were answers like "Not sure", "nothing", and "n/a", which indicate that the respondents did not always see their recreational wellness as being impacted by their neighborhoods. Multiple respondents noted that their social wellness was not impacted by their neighborhoods, sharing comments like "nothing, I find all my social life at school," and "they don't." Additionally, when identifying what detracts from mental wellness, the most common response was "my neighborhood doesn't impact my mental wellness", indicating that the youth respondents did not see neighborhood context as central to supporting their mental well-being.

4. Discussion

This study explores the impact of the built environment on youth health and well-being in Metro Nashville-Davidson County, TN, USA. Moreover, it examines the effect of spatial characteristics on youth wellness, specifically by investigating the impact of proximity to youth-identified wellness-supporting/detracting locations. The results from the geospatial analyses suggest that there is a complex connection between youth wellness across different wellness domains and the respondents' proximity to wellness-supporting or detracting locations. This is consistent with studies among adults, which have often found weak or negligible relationships between the built environment and well-being [54]. Although a sizable portion of the young people engaged in this study lived within a walkable distance of wellness-enhancing locations, the geographically weighted regressions did not show a relationship between physical proximity to these locations and overall wellness scores. The lack of significant results may indicate that a participant's home location, including its proximity to youth-identified wellness-supporting and detracting locations, as reported through the NYDT's Youth Wellness Survey and built environment factors reported in the Cognability dataset [50], is not strongly associated with the average youth wellness scores. Because the dataset is small ($n = 146$), and these are self-reported data with similarities in self-scoring between individuals, there are also limitations due to spatial homogeneity. This may indicate that spatial variability in their home locations and the lived experiences that influence young people's self-reported wellness scores remain comparable. However, the optimized hot-spot analysis illustrated how specific areas of the city (especially less walkable, more suburban, and more gentrified areas) faced significant disparities in youth wellness. Taken together, these findings complicate the relationship between the built environment and youth wellness, highlighting the need for further geospatial and quantitative research on the topic.

The qualitative findings further support a contextualized understanding of how built environment factors contribute to and detract from youth wellness across various domains of wellness. The positive contributors to wellness included both physical and social connections to people (e.g., family, friends, and neighbors) and places (e.g., parks, nature, sports fields, and religious spaces). Inversely, the detractors from youth wellness included feelings of physical and social isolation from people (e.g., not enjoying the people they live near or not living in proximity to friends) and places (e.g., a lack of spaces to learn and limited activities nearby). These findings highlight that connections to both physical places and the people who inhabit them have the ability to impact numerous domains of wellness (i.e., environmental, intellectual, mental, physical, social, spiritual, and recreational).

Taken together, the spatial and qualitative findings point to how youth wellness is influenced not only by the built environment, but also by sociohistorical, economic,

and personal factors that affect how young people move through and experience the city. This complexity reveals the limitations of urban planning approaches that overlook the needs and experiences of young residents, highlighting the importance of incorporating youth perspectives in urban planning and policymaking [23,25]. The insights gained from this research demonstrate that young people's perceptions of and experiences in their neighborhoods are critical in shaping their overall wellness. By integrating these perspectives, urban planners and policymakers can design more inclusive and equitable urban environments that support the holistic well-being of young residents.

4.1. The Nashville Youth Design Team

Through their research, design, and tactical urbanism projects, the NYDT is working to integrate the experiences and perspectives of young people into urban planning processes in Metro Nashville-Davidson County. During the summer of 2021, after collecting additional data through the NYDT Youth Wellness Survey and adding the data to the NYDT Youth Wellness Map, the team conducted zip-code-level analyses (i.e., descriptive statistics and thematic coding) of the data. Using these data, the team created infographics and podcast segments describing youth experiences and the state of the built environment in different Nashville zip codes. Through this work, the team identified five priority areas, including transportation, parks and open spaces, affordable housing, food resources, and community resources. By using these themes and working in small groups, the team created design interventions aimed at addressing these priorities. By drawing from the survey findings and additional secondary data sources, one team identified the need for increased pedestrian safety at the deadliest intersection in Nashville (Dickerson Pike and Hart Lane). To address this need, the team created a design including artistic and colorful bulb-outs used to create more space between pedestrians and vehicles and to slow down turning vehicles; delineators to separate pedestrians from oncoming traffic; and glow-in-the-dark beach balls to provide additional light and color to the intersection. During the fall of 2021, the team installed the design and conducted community walk audits and speed audits to assess the impact of their work. Through their design, the team hoped to bring more awareness to pedestrians crossing the intersection, improving the overall safety of the area.

The project as a whole received widespread recognition, attracting attention from local news stations, elected officials, city and state planners, and non-profit leaders. Following the design installation, the NYDT was invited to present their work to the Tennessee Department of Transportation (TDOT). As a result of this presentation, their work was later credited by the TDOT when announcing a USD 30 million complete street project on Dickerson Pike. Furthermore, the project was the first tactical urbanism project approved by the TDOT to be installed on a state road, expanding the possibility for future tactical urbanism projects. Although the data collected through the Nashville Youth Wellness survey do not provide conclusive evidence on the proximal influences of the built environment on youth well-being, it is useful in both descriptive and practical ways, contributing to real changes within Nashville's built environment and larger city decision-making processes.

The NYDT continues to refine this methodology to explore how urban design can be used to improve the health and well-being of young people in Metro Nashville-Davidson County. During the spring of 2023, the team developed the Dream City Workshop. The Dream City Workshop is a 2 hour workshop designed to capture young people's hopes and dreams for the future of Nashville. In the workshop, participants are asked to imagine their "dream city" while focusing on the needs of young people rather than the needs of adults. Following a quick training period, the participants work in groups to design their dream city using a fictional city layout and materials such as clay, pipe cleaners, foam, sticks, and markers. Upon completing their designs, the groups present their work, focusing on how various design elements support youth well-being. Following the presentations, the young people are asked to translate their ideas into real-life design components by completing a short survey. Since beginning the workshop in May 2023, the NYDT has led over 50 Dream City Workshops. Through these workshops, they have engaged over 1500 young

people (ages five to 18), gathering their perspectives and dreams for the future of Metro Nashville-Davidson County.

The Dream City Workshop is part of a larger city-wide initiative that is working to capture the values and goals for the city of Nashville as defined by residents. In this initiative, the NYDT has conducted all youth engagement activities, including the facilitation of the workshop and the corresponding twenty-three-question survey. The results from the Dream City Workshop will be integrated into the larger initiative and used to inform local decision-making processes and advocacy efforts around sustainable and equitable planning in Nashville.

4.2. Youth-Led Participatory Mapping

The findings from the geospatial analysis, which did not demonstrate a direct correlation between youth wellness and proximity to wellness-supporting locations, suggest the need for youth-centric, participatory approaches to mapping. These approaches can challenge traditional urban planning paradigms that prioritize physical infrastructure over the sociopolitical contexts that shape youth experiences. Participatory mapping can create spaces for young people to articulate their needs and perspectives, which is critical in light of the qualitative findings that indicate the importance of both social and physical connectedness as ways to support youth wellness.

Despite the lack of evidence from the Nashville Youth Wellness Survey on the direct influences of the proximal built environment on youth well-being, the participatory mapping process proved to be valuable as a method for engaging young people in urban planning and design decision making. Combining advanced spatial analyses and multivariate statistics with students' qualitative accounts of their community may enhance the effectiveness of participatory mapping initiatives, making them more accessible and engaging for young people and urban planners alike [15].

The NYDT's research, design, and tactical urbanism projects, all of which utilize data visualizations from the Youth Wellness Map, demonstrate how participatory mapping can contribute to real change within a city's built environment and decision-making processes. The insights gained from participatory mapping initiatives like those of the NYDT can guide urban planners and policymakers towards building healthier urban environments that support the holistic wellness of young residents. Engaging young people in these participatory mapping processes fosters their understanding of spatial and societal issues, influences the decisions that shape their environments, and cultivates a sense of ownership and responsibility within their communities [28,29].

5. Limitations and Future Directions

This study offers insights into the dynamics between youth experiences and the built environment in Metro Nashville-Davidson County, as well as insights into methods for engaging young people in shaping their environments. The findings should be interpreted in light of several limitations. However, these limitations also set the stage for future research.

5.1. Data Limitations

There are several limitations to the data used in this study. First, the survey responses reflect young people's perspectives at a single point in time, introducing the possibility that external factors, including the day, time, and setting (in school versus out of school) in which the survey was completed, may have impacted the survey responses. As a result, the self-reported wellness scores, as well as the identified wellness-supporting and detracting locations, may only represent a snapshot in time and may not be reflective of the participants' broader experiences. Second, the convenience sampling method used in the study introduces bias into the sample. The individuals included in this study were, in some way, connected to the Civic Design Center either as a participant of the DYN curriculum or as a friend/family member of an NYDT member. It is possible that these individuals, due to their connections with the Civic Design Center, may have specific understandings of the

built environment that are not commonly held by the larger Nashville youth population. Additionally, the study participants were asked to report anywhere between one to three wellness-supporting and wellness-detracting locations, meaning a complete census of these locations was not collected. It is highly probable that there are other wellness-supporting and detracting locations within Metro Nashville-Davidson County that were not reported by the participants and could thus potentially shift the results of this study. Moreover, although the participants' residential locations were dispersed broadly across Nashville, some areas of the city were not well represented in the spatial dataset and thus did not capture a complete range of youth experiences in Metro Nashville-Davidson County. Finally, oftentimes, the survey participants did not provide exact locations of the wellness-supporting and/or detracting locations, making it difficult or impossible for NYDT members to map the locations, thus resulting in numerous locations being excluded from the dataset and subsequent analyses. Despite the limitations of the data, the data collection process and subsequent analyses outlined in the study offer a novel approach for collecting youth perspectives on youth health and well-being, specifically to examine the impact of the built environment on youth wellness.

5.2. Generalizability

The findings from this study are specific to the context of Metro Nashville-Davidson County. Although the project's local focus and use of Nashville-specific geospatial data might appear as limitations to its broader generalizability, this study offers valuable insights and frameworks that can be applied in diverse urban contexts by other YPAR collectives as they work to enhance youth wellness.

Combining participatory mapping with qualitative and quantitative data collection offers a model for ensuring that research and interventions aimed at supporting youths are grounded in their lived experiences. The wellness framework adopted in this Youth Wellness Survey, which assesses a range of dimensions of well-being, provides a holistic lens through which cities can assess and plan for youth wellness. This framework can be applied in other settings and is a versatile tool for cities with varying social and environmental contexts. The insights gained from the spatial analyses of the wellness-supporting and detracting locations in Nashville suggest the critical roles of accessible, safe, and engaging public spaces in supporting youth wellness across multiple domains. These findings can inform similar analyses in other cities, helping urban planners identify and prioritize interventions that enhance youth wellness. By adapting these strategies to local contexts, cities can engage young people in shaping urban spaces that support their holistic well-being.

5.3. Future Directions

As Nashville continues to evolve, the quantitative, qualitative, and geospatial data from the Nashville Youth Wellness Survey present an opportunity to track how changes in the city's built environment affect young people's experiences over time. Future research can utilize and build on this rich dataset to identify trends, shifts in youth perspectives, and the impact of urban planning decisions on various domains of youth wellness.

A longitudinal quantitative analysis should be conducted to measure changes in youth wellness scores across time, correlating these changes with the shifting urban development and public policy landscape in Nashville. Statistical models could be developed to predict youth wellness outcomes based on shifts in the built environment, contributing to our understanding of how physical changes in the city influence young people's experiences in and perceptions of places. Utilizing GIS, future research could map changes to the city alongside shifts in youth wellness scores and perceptions. By analyzing spatial data over multiple years, researchers could visually represent the influences of health-promoting factors in the built environment, including parks, community centers, and other youth-centered development, on youth wellness. This geospatial approach may offer a powerful policy tool through visualizing the effects of urban planning decisions on young residents. Additionally, by continuing to capture qualitative data as part of the Youth Wellness Survey,

future research could examine how youth perceptions of safety, accessibility, community cohesion, and other positive developmental outcomes evolve as Nashville continues to grow and change.

The methods and approach described in this study could also be applied within other contexts. This could include different US and international cities or rural and suburban communities. Applying these methods in different geographical contexts, and specifically examining the similarities and differences across these spaces, could provide additional insights into how built environments impact youth health and well-being.

6. Conclusions: Sustainable and Equitable Urban Environments

Many of the changes to the built environment that this study's findings suggest are consistent with the U.N. SDGs and seek to improve urban environments to support the health and well-being of all residents. This includes increased social and physical connectedness to people and places as well as an improved sense of safety and security within one's environment. Furthermore, the participatory mapping method for involving young people in local decision making holds promise for achieving other sustainability-related changes in cities [55] and supports SDG Target 11.3, which seeks to “enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries” by 2030 [1]. Future studies may utilize similar participatory methods to center youth voices in sustainable development decisions, as well as to explore the roles young people can play in increasing sustainability and equity in urban planning. Finally, scholars should continue to use mixed-method approaches, including geospatial analyses, to understand the complex relationships between youth well-being and the urban environments in which they live.

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References

1. United Nations. The 17 Goals. Available online: <https://sdgs.un.org/goals> (accessed on 13 December 2023).
2. Cushing, D.F. Youth master plans as potential roadmaps to creating child- and youth-friendly cities. *Plan. Pract. Res.* **2016**, *31*, 154–173. [CrossRef]

3. Sancar, F.H.; Severcan, Y.C. Children's places: Rural–urban comparisons using participatory photography in the Bodrum Peninsula, Turkey. *J. Urban Des.* **2010**, *15*, 293–324. [\[CrossRef\]](#)
4. Knowles-Yáñez, K.L. Children's participation in planning processes. *J. Plan. Lit.* **2005**, *20*, 3–14. [\[CrossRef\]](#)
5. Palmy David, N.; Buchanan, A. Planning our future: Institutionalizing youth participation in local government planning efforts. *Plan. Theory Pract.* **2020**, *21*, 9–38. [\[CrossRef\]](#)
6. Mansfield, R.G.; Batagol, B.; Raven, R. 'Critical agents of change?': Opportunities and limits to children's participation in urban planning. *J. Plan. Lit.* **2021**, *36*, 170–186. [\[CrossRef\]](#)
7. Bartlett, S. Children's experience of the physical environment in poor urban settlements and the implications for policy, planning and practice. *Environ. Urban.* **1991**, *11*, 63–74. [\[CrossRef\]](#)
8. Eriksson, E.; Fredriksson, A.; Syssner, J. Opening the black box of participatory planning: A study of how planners handle citizens' input. *Eur. Plan. Stud.* **2022**, *30*, 994–1012. [\[CrossRef\]](#)
9. Kaza, N. Tyranny of the median and costly consent: A reflection on the justification for participatory urban planning processes. *Plan. Theory* **2006**, *5*, 255–270. [\[CrossRef\]](#)
10. Healey, P. Collaborative planning in perspective. *Plan. Theory* **2003**, *2*, 101–123. [\[CrossRef\]](#)
11. Fung, A. Associations and democracy: Between theories, hopes, and realities. *Annu. Rev. Sociol.* **2003**, *29*, 515–539. [\[CrossRef\]](#)
12. Innes, J.E.; Booher, D.E. Reframing public participation: Strategies for the 21st century. *Plan. Theory Pract.* **2004**, *5*, 419–436. [\[CrossRef\]](#)
13. Corburn, J. Bringing local knowledge into environmental decision making: Improving urban planning for communities at risk. *J. Plan. Educ. Res.* **2003**, *22*, 420–433. [\[CrossRef\]](#)
14. Cooper, D.G. Participatory urban planning. In *The Cambridge Handbook of Community Empowerment*; Christens, B.D., Ed.; Cambridge University Press: Cambridge, UK, 2024; pp. 241–261.
15. Kahila-Tani, M.; Kytta, M.; Geertman, S. Does mapping improve public participation? Exploring the pros and cons of using public participation GIS in urban planning practices. *Landsc. Urban Plan.* **2019**, *186*, 45–55. [\[CrossRef\]](#)
16. Eizenberg, E.; Jabareen, Y. Social sustainability: A new conceptual framework. *Sustainability* **2017**, *9*, 68. [\[CrossRef\]](#)
17. Checkoway, B. Youth civic engagement for dialogue and diversity at the metropolitan level. *Found. Rev.* **2009**, *1*, 41–50. [\[CrossRef\]](#)
18. Derr, V.; Chawla, L.; Mintzer, M.; Cushing, D.F.; Van Vliet, W. A city for all citizens: Integrating children and youth from marginalized populations into city planning. *Buildings* **2013**, *3*, 482–505. [\[CrossRef\]](#)
19. Derr, V.; Kovács, I.G. How participatory processes impact children and contribute to planning: A case study of neighborhood design from Boulder, Colorado, USA. *J. Urban. Int. Res. Placemaking Urban Sustain.* **2017**, *10*, 29–48. [\[CrossRef\]](#)
20. Frank, K.I. The potential of youth participation in planning. *J. Plan. Lit.* **2006**, *20*, 351–371. [\[CrossRef\]](#)
21. Checkoway, B.; Allison, T.; Montoya, C. Youth participation in public policy at the municipal level. *Child. Youth Serv. Rev.* **2005**, *27*, 1149–1162. [\[CrossRef\]](#)
22. Cunningham, C.J.; Jones, M.A.; Dillon, R. Children and urban regional planning: Participation in the public consultation process through story writing. *Child. Geogr.* **2003**, *1*, 201–221. [\[CrossRef\]](#)
23. Chawla, L. 'Insight, creativity and thoughts on the environment': Integrating children and youth into human settlement development. *Environ. Urban.* **2002**, *14*, 11–22. [\[CrossRef\]](#)
24. Nicotera, N. Children speak about neighborhoods: Using mixed methods to measure the construct neighborhood. *J. Commun. Psychol.* **2008**, *36*, 333–351. [\[CrossRef\]](#)
25. Nordström, M.; Wales, M. Enhancing urban transformative capacity through children's participation in planning. *Ambio* **2019**, *48*, 507–514. [\[CrossRef\]](#)
26. Chawla, L. Childhood's changing terrain: Incorporating childhood past and present into community evaluation. *Childhood* **1994**, *2*, 221–233. [\[CrossRef\]](#)
27. Chawla, L. Benefits of nature contact for children. *J. Plan. Lit.* **2015**, *30*, 433–452. [\[CrossRef\]](#)
28. Chawla, L.; Heft, H. Children's competence and the ecology of communities: A functional approach to the evaluation of participation. *J. Environ. Psychol.* **2002**, *22*, 201–216. [\[CrossRef\]](#)
29. Tsevreni, I. Towards an environmental education without scientific knowledge: An attempt to create an action model based on children's experiences, emotions and perceptions about their environment. *Environ. Educ. Res.* **2011**, *17*, 53–67. [\[CrossRef\]](#)
30. Literat, I. Participatory mapping with urban youth: The visual elicitation of socio-spatial research data. *Learn. Media Technol.* **2013**, *38*, 198–216. [\[CrossRef\]](#)
31. Teixeira, S. 'It seems like no one cares': Participatory photo mapping to understand youth perspectives on property vacancy. *J. Adolesc. Res.* **2015**, *30*, 390–414. [\[CrossRef\]](#)
32. Teixeira, S.; Hwang, D.; Spielvogel, B.; Cole, K.; Coley, R.L. Participatory photo mapping to understand youths' experiences in a public housing neighborhood preparing for redevelopment. *Hous. Policy Debate* **2020**, *30*, 766–782. [\[CrossRef\]](#)
33. Trott, C.D. Youth-led climate change action: Multi-level effects on children, families, and communities. *Sustainability* **2021**, *13*, 12355. [\[CrossRef\]](#)
34. Gordon, E.; Elwood, S.; Mitchell, K. Critical spatial learning: Participatory mapping, spatial histories, and youth civic engagement. *Child. Geogr.* **2016**, *14*, 558–572. [\[CrossRef\]](#)
35. Lundine, J.; Kovačič, P.; Poggiali, L. Youth and digital mapping in urban informal settlements: Lessons learned from participatory mapping processes in Mathare in Nairobi, Kenya. *Child. Youth Environ.* **2012**, *22*, 214. [\[CrossRef\]](#)

36. Suarez-Balcazar, Y.; Early, A.; Miranda, D.E.; Marquez, H.; Maldonado, A.; Garcia-Ramirez, M. Community-engaged asset mapping with Latinx immigrant families of youth with disabilities. *Am. J. Commun. Psychol.* **2022**, *70*, 89–101. [CrossRef] [PubMed]
37. Teixeira, S.; Gardner, R. Youth-led participatory photo mapping to understand urban environments. *Child. Youth Serv. Rev.* **2017**, *82*, 246–253. [CrossRef]
38. Richardson, D.M.; Pickus, H.; Parks, L. Pathways to mobility: Engaging Mexican American youth through participatory photo mapping. *J. Adolesc. Res.* **2019**, *34*, 55–84. [CrossRef]
39. Skinner, E.; Masuda, J.R. Right to a healthy city? Examining the relationship between urban space and health inequity by Aboriginal youth artist-activists in Winnipeg. *Soc. Sci. Med.* **2013**, *91*, 210–218. [CrossRef]
40. Flynn, K.; Mathias, B. 'I would say it's alive': Understanding the social construction of place, identity, and neighborhood effects through the lived experience of urban young adults. *Qual. Soc. Work.* **2020**, *19*, 481–500. [CrossRef]
41. Anyon, Y.; Bender, K.; Kennedy, H.; Dechants, J. A systematic review of youth participatory action research (YPAR) in the United States: Methodologies, youth outcomes, and future directions. *Health Educ. Behav.* **2018**, *45*, 865–878. [CrossRef]
42. U.S. Census Bureau. Quick Facts: Nashville-Davidson Metropolitan Government (Balance), Tennessee. Available online: <https://www.census.gov/quickfacts/fact/map/nashvilledavidsonmetropolitangovernmentbalance/ST045222> (accessed on 16 December 2023).
43. Manson, S.; Schroeder, J.; Van Riper, D.; Knowles, K.; Kugler, T.; Roberts, F.; Ruggles, S. *IPUMS National Historical Geographic Information System: Version 18.0 [Dataset]*; IPUMS: Minneapolis, MN, USA, 2023. [CrossRef]
44. Morgan, K.Y.; Christens, B.D.; Gibson, M. Design Your Neighborhood: The evolution of a city-wide urban design learning initiative in Nashville, Tennessee. In *Handbook on Participatory Action Research and Community Development*; Stoecker, R., Falcón, A., Eds.; Edward Elgar Publishing: Cheltenham, UK, 2022; pp. 281–300.
45. Morgan, K.Y.; Anderson, K.M.; Kakai, J.; Shaltaf, L.; Christens, B.D. 'Real change takes time': Building multi-dimensional youth community power in a participatory design collective. In *Handbook on Youth Activism*; Conner, J.O., Ed.; Edward Elgar Publishing: Cheltenham, UK, 2024; pp. 319–335.
46. Dickerson, K.; Kornbluh, M.; Duke, A.M. Youth participatory action research in school settings. In *The Cambridge Handbook of Community Empowerment*; Christens, B.D., Ed.; Cambridge University Press: Cambridge, UK, 2024; pp. 556–579.
47. Lydon, M.; Garcia, A. A tactical urbanism how-to. In *Tactical Urbanism: Short-Term Action for Long-Term Change*; Lydon, M., Garcia, A., Eds.; Island Press/Center for Resource Economics: Washington, DC, USA, 2015; pp. 171–208. [CrossRef]
48. Harris, P.A.; Taylor, R.; Thielke, R.; Payne, J.; Gonzalez, N.; Conde, J.G. Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *J. Biomed. Inform.* **2009**, *42*, 377–381. [CrossRef]
49. Chillón, P.; Panter, J.; Corder, K.; Jones, A.P.; Van Sluijs, E.M.F. A longitudinal study of the distance that young people walk to school. *Health Place* **2015**, *31*, 133–137. [CrossRef]
50. Finlay, J.; Esposito, M.; Langa, K.M.; Judd, S.; Clarke, P. Cognability: An ecological theory of neighborhoods and cognitive aging. *Soc. Sci. Med.* **2022**, *309*, 115220. [CrossRef]
51. Ivankova, N.V.; Creswell, J.W.; Stick, S.L. Using mixed-methods sequential explanatory design: From theory to practice. *Field Methods* **2006**, *18*, 3–20. [CrossRef]
52. Saldaña, J. *The Coding Manual for Qualitative Researchers*, 2nd ed.; Sage Publishing: Los Angeles, CA, USA, 2013.
53. Jover, J.; Díaz-Parra, I. Gentrification, transnational gentrification and touristification in Seville, Spain. *Urban Stud.* **2020**, *57*, 3044–3059. [CrossRef]
54. Moore, T.H.M.; Kesten, J.M.; López-López, J.A.; Ijaz, S.; McAleenan, A.; Richards, A.; Gray, S.; Savović, J.; Audrey, S. The effects of changes to the built environment on the mental health and well-being of adults: Systematic review. *Health Place* **2018**, *53*, 237–257. [CrossRef] [PubMed]
55. Trott, C.; Weinberg, A.; Sample McMeeking, L. Prefiguring sustainability through participatory action research experiences for undergraduates: Reflections and recommendations for student development. *Sustainability* **2018**, *10*, 3332. [CrossRef]

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