



## Strategic and integrated planning for healthy, connected cities: Chattanooga case study



Holly Elwell Bostrom, Bianca Shulaker \*, Jasmin Rippon, Rick Wood

*The Trust for Public Land, 100 M Street SE, Suite 700, Washington, DC 20003, United States*

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### ABSTRACT

The United States is facing unprecedented health challenges – such as obesity and cardiovascular disease – many of which are related to a lack of or insufficient physical activity. Maintaining or creating parks and other public recreation facilities that promote physical activity is particularly important for combating these. This brief describes a strategic planning initiative, known as “Healthy, Connected Chattanooga.” The City of Chattanooga, Tennessee, partnered with The Trust for Public Land, a national nonprofit organization, to analyze the city for physical activity opportunities and identify areas where interventions were of highest need. Interventions include the creation of new parks and the activation of existing ones through the installation of fitness facilities known as Fitness Zones®. Maps and an on-line decision-support tool (web portal) were developed between 2013 and 2015, and are being used by the city to make strategic investment decisions. The decision-support analysis described in this brief has engaged a wide variety of stakeholders, opened the door to a broader base of funding sources for health-related interventions, and provided evidence for discussions about equity, access to resources, and prioritization of future projects. This brief presents a framework for integrating scientific models with community and social metrics, enabling more complete and accurate understanding of cities and the identification of more equitable, strategic, and investable solutions to current and pressing challenges.

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### 1. Introduction

It is well established that inactivity is associated with causes for costly diseases such as cardiovascular disease or type 2 diabetes (Lee et al., 2012; Sallis et al., 2012), and providing access to green spaces, such as parks, can serve as a health promoting measure by promoting higher levels of physical activity (Wolch et al., 2014; Blanck et al., 2012; Gies, 2006). In addition to physical health, parks can contribute to improved mental health and provide social benefits (Jackson et al., 2013; Konijnendijk et al., 2013), as exposure to nature and green spaces can reduce stress and mental disorders (Sturm and Cohen, 2014; Ward Thompson et al., 2012) and strengthen a sense of social connectedness and social support (Maas et al., 2009).

In the City of Chattanooga, significant swaths of populations are disconnected from opportunities to enjoy, experience, and benefit from parklands due to a lack of physical access and connectivity, as well as a lack of recreational activities that serve the needs and wants of the community. Planning for the protection or redevelopment of green spaces is urgent – Chattanooga, like most cities, has a limited and decreasing amount of natural areas and other open space with which to work. The question addressed in this brief is one of how parks – both

in terms of individual sites and system wide planning – can be maximized to improve health and physical fitness. This brief focuses on two important elements of planning for parks: (1) access and (2) facilities, in particular Fitness Zones®, free outdoor fitness equipment often located in local parks.

Access, as defined here, includes both proximity to parks and equitable distribution. Close-to-home access to parks is strongly associated with park use and physical activity, and studies have shown that people living within a half-mile, or a ten-minute walk, of a park tend to participate in more physical activity than those who do not (Kaczynski et al., 2008; Cohen et al., 2007; Roemmich et al., 2006). Public parks are also shown to be essential physical activity resources for minority communities in particular (Wolch et al., 2014; Cohen et al., 2007), many of which have disproportionate health challenges and lack access to sufficient or appropriate park facilities (Jenkins et al., 2015; Bruton and Floyd, 2014).

Secondly, facilities are one significant attribute of parks that impact and can encourage use (Baran et al., 2014; McCormack et al., 2010). One type of facility, Fitness Zones®, has been studied in Los Angeles, and has been demonstrated to be a cost-effective intervention that increases physical activity and can bring new users to park spaces (Cohen et al., 2012). Park visitors demonstrated higher levels of moderate to vigorous levels of physical activity in Fitness Zones® than in other park areas, and this was seen across all age groups (Cohen et al., 2012). In addition to the type of facilities, the way in which they are chosen can

\* Corresponding author.

E-mail address: [Bianca.shulaker@tpl.org](mailto:Bianca.shulaker@tpl.org) (B. Shulaker).

be impactful. For instance, it is possible that community engagement and involvement in park design can lead to increases in park use and physical activity (Slater et al., 2016).

As many cities struggle with health concerns and limited funding, finding tools for sound strategic action is a high priority. The Trust for Public Land, a national nonprofit organization that protects land for people and creates parks nationwide, works through its Parks for People Initiative, to ensure that everyone living in American cities lives within a ten-minute walk to a park, playground, or protected natural area. The Trust for Public Land focuses park redevelopment efforts on low-income, historically underserved neighborhoods, and collaborates with a diverse group of partners to create livable, healthy, and resilient communities. In the case study presented here, The Trust for Public Land partnered with the City of Chattanooga on a project known as “Healthy, Connected Chattanooga.” This brief explores the data used in this planning effort to identify high-need areas (where enhanced access to parks was needed), as well as the way data informed site design decisions (where Fitness Zone® facilities would likely most be impactful).

## 2. Methods

“Healthy, Connected Chattanooga” is a planning initiative undertaken by the City of Chattanooga, recognized as a national leader in their creative use of green space and other public amenities to maintain a sustainable, healthy, and resilient city. In order to better integrate and leverage existing and long-term investments in resiliency and health, The Trust for Public Land partnered with various city departments to demonstrate how strategic green space planning can maximize multiple-benefit potential. These multiple benefits include offering opportunities for exercise and leisure time physical activity; connecting destinations with greenways and offering opportunities for non-motorized transportation; and increasing greenery to alleviate environmental issues such as flooding and urban heat island. This brief focuses on the analysis relating most directly to physical activity health impacts – in the form of (1) identifying opportunities to increase park access through potential new park creation, and (2) activation of existing green spaces through the incorporation of fitness-supporting facilities.

In terms of identifying areas for new green space creation, the first step was identifying gaps in park availability. To identify park access gaps, The Trust for Public Land used Esri Network Analyst (a geographic information systems, GIS, tool used to model routes) to analyze Chattanooga’s existing park system, which includes parkland owned by regional, state, and federal agencies. In 2013, at the time of tool creation, school playgrounds were not formally open to the public, so were not included in this analysis. The Esri Network Analyst software was used to identify all locations within a ten-minute walk of a park (defined as a half-mile walking distance to a public park entrance using the public road network and uninterrupted by physical barriers such as highways, train tracks, rivers, and fences). Areas not within these ten-minute service areas were identified as gaps.

A demographic profile was then developed for these park access gap areas, in order to create a “score” indicating relative park need. Areas with greater scores were determined to be the gap areas where new park creation would be most highly needed. These scores used the following data, weighted differently using the best available research and input from an advisory team comprised of experts in the fields of planning, health, transportation, and park creation: population density (50% of the score), percentage of population age 19 and younger (25%), and percentage of households with income less than 75% of city median income (25%). Data was from the 2013 Forecast Census block groups, provided by Esri.

In considering the prioritization of activations through Fitness Zones®, each park in the City of Chattanooga was “scored” based on health, demographics, and recreational facility access indicators. Health indicators include the percentage of obese teens ages 10 to 17,

likelihood of obese or overweight adults, likelihood of adults not meeting physical activity recommendations, likelihood of heart disease, likelihood of diabetes, likelihood of suicide, likelihood of stroke, and likelihood of respiratory disease. Demographic indicators include population density, percentage of population age 19 and younger, percentage of population age 65 and above, and percentage of low-income households. Data was provided by Esri, the Centers for Disease Control, and the Tennessee Department of Health (the Behavioral Risk Factor Surveillance System, BRFSS poll). Data was analyzed by block group, and, for much of the health data, a synthetic estimate of block group likelihood was derived from county-level statistics based on age and race using contingency table statistical analysis. More detail about this data is included in Table 1.

For recreational facility access, we mapped 10-minute walk (half-mile) service areas for park locations that provide unprogrammed public access to at least a portion of their recreational amenities and have no barriers to entry, such as membership or entrance fees. These data were provided by the City of Chattanooga.

Maps were created for each analysis – one to illustrate park access equity (gaps in access to existing parks and open space), and another (shown below) to illustrate activation-through-Fitness Zone® opportunities (parks with the highest opportunity for enhancement through fitness zones) (Fig. 1).

## 3. Results and discussion

Using the method described in this brief, project partners worked to develop strategic planning tools (in the form of an on-line mapping portal) in order to locate places where new parks or Fitness Zones® could have the most significant impact through park access and serve to increase physical activity in the highest-need communities. The analysis conducted revealed that 68% of the total City of Chattanooga population was not served by the existing park system; in other words, 117,630 people did not have a public park within a half-mile of their homes. In addition, 18 sites were identified as being in areas of “very high” need for activation through the installation of a Fitness Zone®.

The on-line mapping portal is shared among multiple departments and is being used to inform project selection and prioritize requests for funding. The Trust for Public Land has trained approximately 30 city employees, from multiple departments. This tool is also shared with other community groups, such as Greenspaces, the Foundation community, and United Way of Greater Chattanooga. While the portal was not designed as an open data asset, it has been used to improve or inform coordination among departments, decision-making for multiple-benefit projects, investment or funding prioritization decisions, and advocacy.

For instance, The Trust for Public Land has worked with the City of Chattanooga Transportation Department, The City of Chattanooga Water Quality Program, and The Economic and Community Development Department, to make the case for parks and greenway projects and raise over \$2.3 million for their implementation. Data is helping prioritize new parks in Chattanooga, including the Lynnbrook Park, a 1.4-acre community park that is located in an area with 2557 people living within a 10-minute walk of this currently-vacant lot. This park is in the Oak Grove neighborhood, which is denser, more low-income, and more diverse than the city as a whole, and also faces issues such as low perceptions of safety and diminished civic participation. According to the mapping analysis, this densely-populated area currently lacks sufficient park space, is mainly low income, has a high percentage of children, and has a high likelihood of obesity and diabetes. The Trust for Public Land will help redevelop this park, and recently received a \$50,000 grant for community participatory design.

In addition, The Youth and Family Development Department has partnered with The Trust for Public Land to secure \$600,000 for 6 Fitness Zones®, which will be located at facilities prioritized due to the level of need identified through the analysis described in this brief. Notably,

**Table 1**  
Healthy, Connected Chattanooga criteria descriptions.

Criteria	Data description	Source
<i>Demographics</i>		
Population density	Residents per acre by census block group.	2013 estimated demographics from Esri.
Percentage of population age 19 and younger	Percent children 19 and under by census block group.	2013 estimated demographics from Esri.
Percentage of population age 65 and above	Percent low income households by census block group. A low income household is defined as a household with less than \$33,000 annual income (approximately 75% of the median household income for the City of Chattanooga).	2013 estimated demographics from Esri.
Percentage of low-income households	Percent seniors 65 and older by census block group.	2013 estimated demographics from Esri.
<i>Health indicators</i>		
Percentage obese teens ages 10 to 17	Estimated % teens ages 10–17 in each block group that are in the 95th percentile for BMI-for-age index (classified as “obese” in the 2007 National Survey Children’s Health)	Centers for Disease Control and Prevention
Likelihood of obese or overweight adults	Likelihood of adults 18 years or older that are either overweight (BMI greater than or equal to 25) or obese (BMI greater than or equal to 30). County statistics were self-reported via 2009 BRFS poll. <sup>a</sup>	Tennessee Behavioral Risk Factor Surveillance System; 2013 census demographics by block group
Likelihood of adults not meeting physical activity recommendations	Likelihood of adults 18 years or older not meeting physical activity recommendations of participating in either moderate physical activity for 30 or more minutes per day on five or more days per week, or vigorous activity for 20 or more minutes per day on three or more days per week. County statistics were self-reported via 2009 BRFS poll. <sup>a</sup>	Hospital Discharge Data System, Tennessee Department of Health; Esri.
Likelihood of heart disease	Hospitalization rates (per 100,000 residents) in Hamilton County due to heart disease. Data are for discharges, not necessarily for unique patients and are calculated for all ages. Age adjusted to the 2000 standard US population. <sup>a</sup>	Hospital Discharge Data System, Tennessee Department of Health; Esri.
Likelihood of diabetes	Hospitalization rates (per 100,000 residents) in Hamilton County due to diabetes. Data are for discharges, not necessarily for unique patients and are calculated for all ages. Age adjusted to the 2000 standard US population. <sup>a</sup>	Hospital Discharge Data System, Tennessee Department of Health; Esri.
Likelihood of suicide	Mortality rate (deaths per 100,000 residents) in Hamilton County due to suicide 2007–2009. Age adjusted to the 2000 standard US population. <sup>a</sup>	TN Department of Health; Esri.
Likelihood of stroke	Hospitalization rates (per 100,000 residents) in Hamilton County due to	Hospital Discharge Data System, Tennessee Department of Health; Esri.

**Table 1 (continued)**

Criteria	Data description	Source
Likelihood of respiratory disease	stroke. Data are for discharges, not necessarily for unique patients and are calculated for all ages. Age adjusted to the 2000 standard US population. Hospitalization rates (per 100,000 residents) in Hamilton County due to CLRD (Chronic Lower Respiratory Disease). Data are for discharges, not necessarily for unique patients and are calculated for all ages. Age adjusted to the 2000 standard US population.	Hospital Discharge Data System, Tennessee Department of Health; Esri.
<i>Fitness facility access</i>		
Access to recreation facilities	Access to recreation facilities that provide un-programmed public access to at least a portion of their recreational amenities and have no barriers to entry, such as membership or entrance fees. These sites may provide unique partnership opportunities for establishing and maintaining new fitness zones. Areas within 1/2 mile of an existing recreation facilities were score highest. Areas within 1/2 to 1 mile were scored moderately.	City of Chattanooga

<sup>a</sup> For these criteria, a synthetic estimate of block group likelihood was derived from county level statistics based on age and race using contingency table statistical analysis.

locating these Fitness Zones® at existing recreational sites offers unique and effective partnership opportunities for establishing, programming, and maintaining new Fitness Zones®.

Creating new opportunities for exercise, while also focusing on creating healthy, safe connections throughout the community, could increase use and physical activity. Additional data can be incorporated in the on-line tool to refine mapping outcomes or considered in planning, siting, or design decisions. For instance, other factors, such as perceived quality, levels of safety, or programming, impact use of parks.

Currently, The Trust for Public Land is also working with the city and local universities to conduct evaluations to determine levels of park use and to assess how these sites are being received and used by both residents and park and recreation facility staff. Evaluation findings and lessons learned will also inform future projects to help maximize health impacts for high-need communities.

**4. Conclusions**

The methods and process for park planning described in this brief have informed changes in how and where funds are invested. The type of strategic planning, decision-support tool described here has engaged a wide variety of stakeholders – from park planners, to philanthropic foundations, to transportation officials, which has also opened the door to a broader base of funding sources that can be explored for health-related interventions. Furthermore, these tools have been shared with the public and local advocates, lending evidence to discussions about equity, access to resources, and prioritization of future projects.

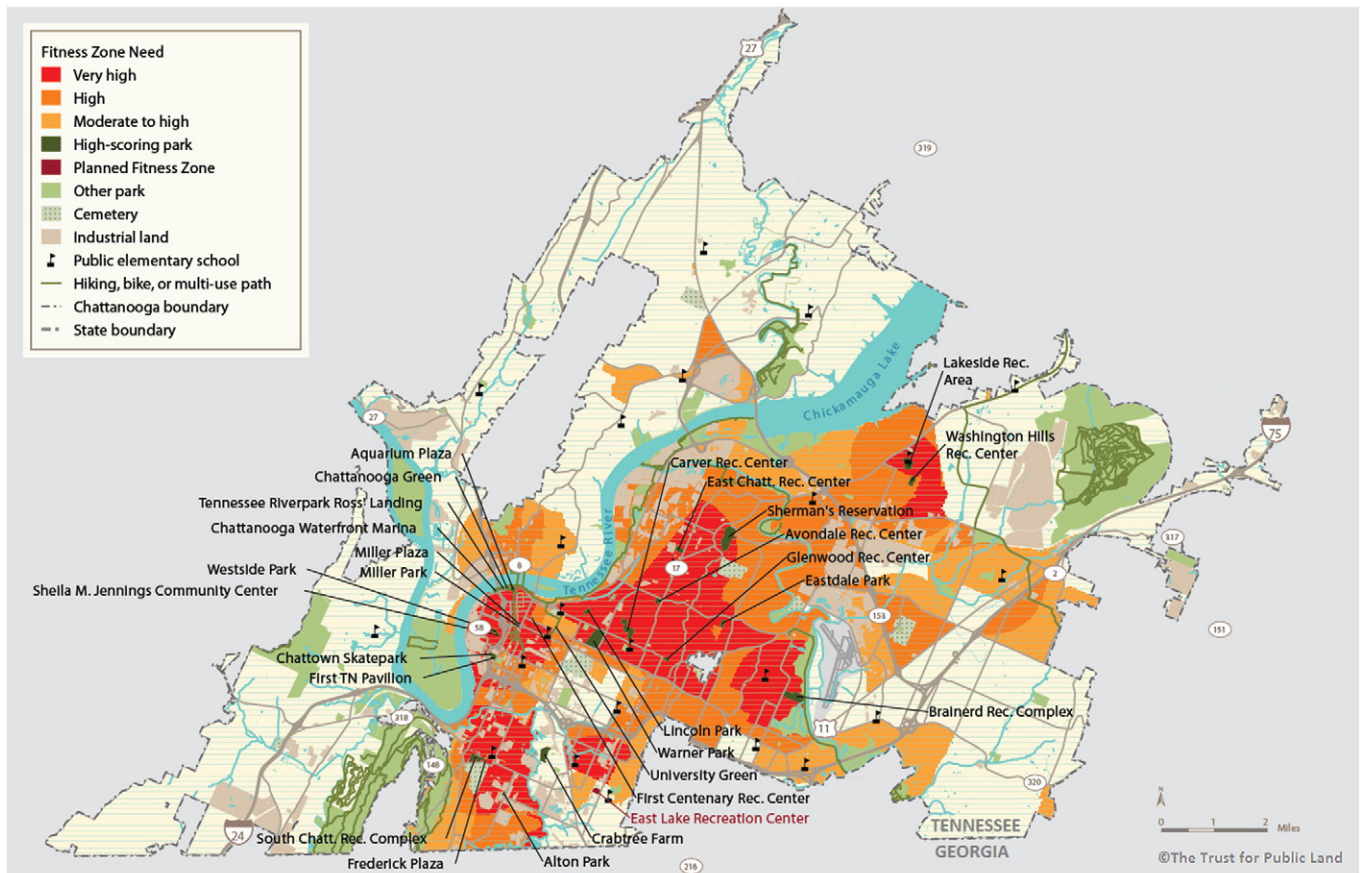


Fig. 1. Healthy, Connected Chattanooga Fitness Zone® map analysis.

While data is essential for informing long-term planning and decision-making, having a framework and tool for integrating scientific models with community and social metrics can enable the formation of a more comprehensive and accurate story. This in turn, can help identify more equitable, strategic, and investable solutions to increase access to physical activity resources for those communities with the greatest needs.

### Transparency document

The [Transparency document](#) associated with this article can be found, in the online version.

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### References

- Baran, P.K., Smith, W.R., Moore, R.C., Floyd, M.F., Bocarro, J.N., Cosco, N.G., Danninger, T.M., 2014. Park use among youth and adults: examination of individual, social, and urban form factors. *Environ. Behav.* 43 (6), 768–800.
- Blanck, H.M., Allen, D., Bashir, Z., Gordon, N., Goodman, A., Merriam, D., Rutt, C., 2012. Let's go to the park today! Let's go to the park today: the role of parks in obesity prevention and improving the public's health. *Child. Obes.* 8 (5).
- Bruton, C.M., Floyd, M.F., 2014. Disparities in built and natural features of urban parks: comparisons by neighborhood level race/ethnicity and income. *J. Urban Health* 91 (5), 894–907.
- Cohen, D.A., McKenzie, T.L., Sehgal, A., Williamson, S., Golinelli, D., Lurie, N., 2007. Contribution of public parks to physical activity. *Am. J. Public Health* 97 (3), 509–514.
- Cohen, D.A., Marsh, T., Williamson, S., Golinelli, D., McKenzie, T.L., 2012. Impact and cost-effectiveness of family fitness zones: a natural experiment in urban public parks. *Health Place* 18 (1), 39–45.
- Gies, E., 2006. The Health Benefits of Parks. White Paper. Trust for Public Land, San Francisco (Accessed February 2016. [www.tpl.org/sites/default/files/cloud.tpl.org/pubs/benefits\\_HealthBenefitsReport.pdf](http://www.tpl.org/sites/default/files/cloud.tpl.org/pubs/benefits_HealthBenefitsReport.pdf)).
- Jackson, R.J., Dannenberg, A.L., Frumkin, H., 2013. Health and the built environment: 10 years after. *Am. J. Public Health* 103 (9), 1542–1544.
- Jenkins, G., Yuen, H., Rose, E., Maher, A., Gregory, K., Cotton, M., 2015. Disparities in quality of park play spaces between two cities with diverse income and race/ethnicity composition: a pilot study. *Int. J. Environ. Res. Public Health* 12 (7), 8009–8022.
- Kaczynski, A.T., Potwarka, L.R., Saelens, B.E., 2008. Association of park size, distance, and features with physical activity in neighborhood parks. *Am. J. Public Health* 98 (8), 1451–1456.
- Konijnendijk, C.C., Annerstedt, M., Nielsen, A.B., Maruthaveeran, S., 2013. Benefits of Urban Parks: A Systematic Review. A Report for IFPPA.
- Lee, I.-M., Shiroma, E.J., Lobelo, F., Puska, P., Blair, S.N., Katzmarzyk, P.T., 2012. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 380 (9838), 219–229.
- Maas, J., van Dillenb, S.M.E., Verheija, R.A., Groenewegen, P.P., 2009. Social contacts as a possible mechanism behind the relation between green space and health. *Health Place* 15 (2), 586–595.
- Mccormack, G.R., Rock, M., Toohey, A.M., Hignell, D., 2010. Characteristics of urban parks associated with park use and physical activity: a review of qualitative research. *Health Place* 16 (4), 712–726.

- Roemmich, J.N., Epstein, L.H., Raja, S., Yin, L., Robinson, J., Winiewicz, D., 2006. Association of access to parks and recreational facilities with the physical activity of young children. *Prev. Med.* 43 (6), 437–441.
- Sallis, J.F., Floyd, M.F., Rodriguez, D.A., Saelens, B.E., 2012. Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation* 125 (5).
- Slater, S., Pugach, O., Lin, W., Bontu, A., 2016. If you build it will they come? Does involving community groups in playground renovations affect park utilization and physical activity? *Environ. Behav.* 48 (1), 246–265 (Accessed February 2016).
- Sturm, R., Cohen, D., 2014. Proximity to urban parks and mental health. *J. Ment. Health Policy Econ.* 17 (1), 19–24.
- Ward Thompson, C., Roe, J., Aspinall, P., Mitchell, R., Clowd, A., Miller, D., 2012. More green space is linked to less stress in deprived communities: evidence from salivary cortisol patterns. *Landscape Urban Plan.* 105 (3), 221–229.
- Wolch, J., Byrne, J., Newell, J.P., 2014. Urban green space, public health, and environmental justice: the challenge of making cities 'just green enough'. *Landscape Urban Plan.* 125, 234–244.