Journal of Park and Recreation Administration https://doi.org/10.18666/JPRA-2019-9591
Volume 38, Issue 2, Summer 2020, pp. 45–61

Regular Paper

Predictors of Return Visits to Trails with Self-Guided Materials for Children

Daniel G. Clark
Benjamin Ukert
Jason Urroz
Carolyn Ward
Michelle C. Kondo

Executive Summary

Participation in outdoor recreation can positively contribute to physical and emotional well-being. However, questions remain regarding the most effective way to implement programs that promote childhood engagement in outdoor recreation. Using seven years of data, we explored factors driving visitation to trailheads that offer self-guided materials for children at parks and recreation facilities of the Kids in Parks program. We evaluated the demographic, managerial, and physical predictors of visitation to the 115 trails included in the program. Of 769 visitors who made at least one return visit to a TRACK Trail, 305 (39.7%) returned to the same trail, 675 (87.8%) returned to a different trail, and 211 (27.4%) did both. Using multiple linear regression, we found that repeat visits to any trail and new trails increased ($p<0.01$) when the trail was in a state park or a national forest. Return visits to new trails were more likely to take place at locations without a visitor center, and at locations that were located farther away from

Daniel G. Clark completed his PhD in the Ecology and Evolution Graduate Program at Rutgers, the State University of New Jersey in July 2018. He works in environmental services for the state government.

Benjamin Ukert is a PhD candidate in the Wharton and the Leonard Davis Institute of Health Economics at the University of Pennsylvania.

Jason Urroz is the director of Kids in Parks, Blue Ridge Parkway Foundation.

Carolyn Ward is the chief executive officer with Kids in Parks, Blue Ridge Parkway Foundation.

Michelle C. Kondo is a research social scientist with the USDA-Forest Service, Northern Research Station.

The authors wish to acknowledge the support of the Center for Resilient Landscapes in facilitating this project, as well as the help and support of the following for their assistance in various stages of completing this work: Jason Grabosky, Sar Guterl, Tina Harrison, Krista Heinlein, Daniel Merchant, and Oscar Gato.

Please send correspondence to Daniel G. Clark, dangclark@gmail.com

visitors' homes. Visitors who made any return trail visits came from areas with significantly higher unemployment rates, compared to visitors who did not make repeat visits. The results of this study have broad applications in creating inclusive recreation opportunities for all residents, and guiding communities as they make management decisions.

Keywords

Parks, recreation programs, landscape, youth, trails

Introduction

Rates of obesity, heart disease, diabetes, and other chronic diseases have been increasing in the U.S. (Benjamin et al., 2017; Mozaffarian et al., 2016). Forty percent of Americans have two or more chronic conditions such as hypertension, diabetes, and mood disorders (Buttorff, Ruder, & Bauman, 2017). Many of these chronic diseases can be attributed to an increasingly sedentary lifestyle. Most Americans do not achieve the recommended amount of physical activity on a regular basis (Cohen et al., 2017). Approximately 5% of children meet the recommended 60 minutes per day of physically active time (Golightly et al., 2017). The statistics are worse for low-income urban children (Chen & Adler, 2019; Kabali et al., 2015; Kann et al., 2016).

Growing evidence suggests that public space characteristics, such as availability, accessibility, and walkability, affect the public's ability to visit and benefit from these spaces (Anderson et al., 2013; Besenyi et al., 2013; Carlton et al., 2017; Castro, 2011; Kaczynski et al., 2014; Rube et al., 2014). A variety of stakeholders including governmental agencies, the healthcare industry, communities, and nonprofit organizations are developing programs to combat chronic health issues related to sedentary lifestyles (Andrejewski, Mowen, & Kerstetter, 2011; Cohen et al., 2017; Feng & Astell-Burt, 2017; Ross, 2016; Sugiyama et al., 2017). Prior to 2006, use of national parks in the U.S. experienced a 30-year decline, associated with a rise in screen time (Pergams & Zaradic, 2006), and evidence suggests that this trend has continued (Stevens, Moore, & Markowski-Lindsay, 2014). Screen time has been linked elsewhere to higher rates of depression among children (LeBlanc et al., 2015; Liu, Wu, & Yao, 2016; Schmidt et al., 2012). Persons of lower socioeconomic position are especially susceptible to negative health outcomes related to lack of physical activity (Cohen et al., 2017; Das, Fan, & French, 2017; Farrigan, Hertz, & Parker, 2015; French et al., 2017; Vaughan et al., 2018). As such, public provisioning of recreation areas is a way of securing free or low-cost ways to combat these public health issues.

More research is needed to evaluate whether and how parks and recreation opportunities lead to increased use. While specific amenities or features may bring people into parks (Clark & Jordan, 2018; Cohen et al., 2017, Costigen et al., 2017; Kaczynski et al., 2014; Kamel, Ford, & Kaczynski, 2014; McCormack et al., 2010), features likely have varying influences on segments of the population defined by age or other characteristics (Besenyi et al., 2013; Kaczynski et al., 2008).

Park proximity may influence access and use. Some studies have found that distance negatively impacts park use, namely greater distance decreases park use (Giles-

Corti et al., 2005; McCormack et al., 2010). However, other studies have found that distance does not influence rates of use (Kaczynski et al., 2008; Ries et al., 2009). A study of rural parks in Australia found that presence of amenities, rather than distance, was the primary driver of park use by youth (Edwards et al., 2015). There is also evidence that public perception of the availability or convenience of public spaces is more predictive of park use than physical proximity (McCormack et al., 2010; Mowen et al., 2007; Ries et al., 2009).

In addition to availability and distance, park usage can depend highly on public perceptions of quality, aesthetics, and safety (Barrett et al., 2011; McCormack et al., 2010; Mowen et al., 2007; Tester & Baker, 2009). Personal attitudes and characteristics have also been cited as motivators for physical activity within parks (Perry, Saelens, & Thompson, 2011). Attracting and maintaining park users can be problematic, and some studies have shown that even with increased funding, park use can decrease with a lack of organized programming (Cohen et al., 2009). Finally, parks may not be equally accessible, and used, by various sociodemographic groups. Park usage is known to vary by age, racial and ethnic background, and socioeconomic position (Besenyi et al., 2013; Byrne & Cohen et al., 2017; Das et al., 2017; Floyd et al., 2011; French et al., 2017; Kamel et al., 2014; Lo et al., 2017). Prior research indicates disproportionate park use by non-Hispanic whites, lower park use among persons with the lowest incomes, and higher usage of trails among adults compared to other age groups. Questions remain regarding whether recreation amenity characteristics can successfully attract users from under-represented groups.

Prior studies have primarily examined the association between park use and physical features such as play facilities, sporting fields/courts, restrooms, and seating (Evenson et al., 2016; Kaczynski et al., 2008; Sevening & Janz, 2017), with comparatively little focus on amenities including electronic brochures (e-brochures) or trail guides, electronic registries, and social media-enabled tools. Technology has been widely studied in its role in facilitating outdoor and environmental education program goals; it has been found to be a source of increasing outdoor comfort and support as early as 2004 (Cuthbertson, Socha, & Potter, 2004). However, participation in trailhead programs that use mobile technology-based components and incentives have not been previously studied over an extended period of time.

Partnerships between various agencies, institutions, and nonprofit groups are developing innovative programs to increase and sustain visitation in recreational outings. In this study, we focus on user data from the TRACK Trails program, developed by the Blue Ridge Parkway Foundation and launched in 2009. This program offers families a way to track their visits to participating trails, called TRACK Trails, and provides at least four e-brochures for each activity, as well as hard copy brochures at trailheads. Children can earn virtual badges as well as physical rewards such as patches, discs, and bags, by tracking their visits to trails through the program's website (KidsInParks.com).

We explore both the amenity- and user-based predictors of visitation in a program designed to provide low-cost incentives to increase use of trails throughout the southeast and other parts of the U.S. using TRACK Trails user data. The overall aim of this study was to evaluate the predictors of return (or second-plus) visits, repeat visits to the same trail or new trail visits. Specifically, we explore the following questions:

1. Were features of the trails (e.g., visitors' centers, bathrooms, play and picnic areas, and natural features such as waterways) associated with future engagement?
2. What role did distance play in trail visits? Was there any relationship between distance and whether visitors made repeat visits to TRACK Trails facilities?
3. What role did demographic factors, including education levels, income, race and ethnicity play in trail visits?
4. Did park ownership or management influence trail visits?

Methods

Visitors, Management and Setting

The Blue Ridge Parkway Foundation, a 501(c)(3) organization, launched the TRACK Trails program via its Kids in Parks (KIP) initiative, in partnership with the National Park Service and the Blue Cross and Blue Shield of North Carolina Foundation. This program converts a park's preexisting trail into a TRACK Trail through the installation of self-guided materials (trailhead sign and brochure-led activities) designed to encourage exploration and fun. Once installed, the TRACK Trail materials are owned by the park (Figure 1 shows a typical trailhead sign). Since the materials are overlaid on an existing trail, the park does not need to provide additional maintenance other than restocking brochures and landscaping around the signs, to maintain visibility. Although most TRACK Trails adventures are hikes, there are also disc golf, paddling, and cycling activities. At the time of this study, the TRACK Trails program had 140 trailheads located in seven states, the Eastern Cherokee Nation, and Washington D.C. (see Figure 2). Trailheads were located on land managed by local, municipal, private, county, state and federal agencies (including the National Park Service and the U.S. Forest Service).

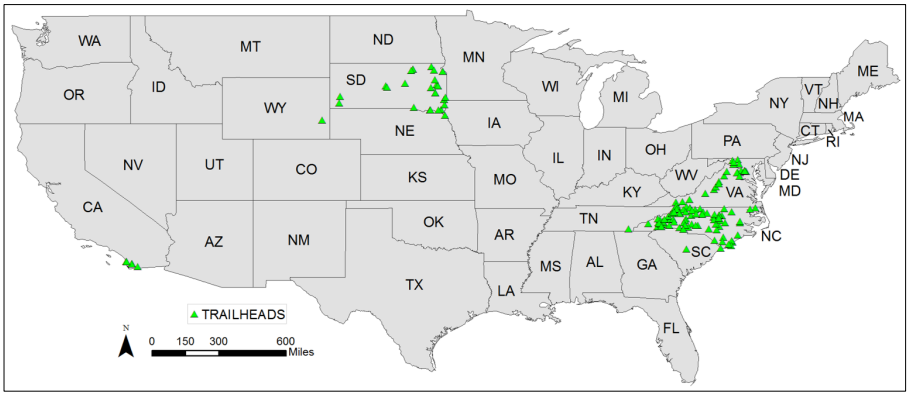
The headquarters of the Blue Ridge Parkway Foundation are located in North Carolina, and a majority of the facilities are located in that state, in addition to South Carolina, Virginia, Maryland and Washington D.C. The TRACK Trails are located in a variety of landscape types, ranging from relatively remote wildland areas, to suburban and urban areas. For example, there are facilities in a heavily forested area of Shenandoah National Park, as well as at the National Mall in Washington D.C.

Figure 1

Image of a TRACK Trails Sign at a Trailhead, and a Close-up of that Image (J. Urroz, 2018)

Figure 2

Map of TRACK Trails' Trailheads. Image Created by Authors Using ArcGIS 10, 2018.



The TRACK Trails program includes mobile-accessible content.Visitors can "track" (register) their trail usage on the KIP website and earn prizes, including a nature journal, custom sticker from the trail they visited, patches, backpacks, bandannas, first aid kits, and other accouterments, as well as "virtual medals" for their profile on the KIP website. These rewards are earned by logging information about the visits ("About Kids in Parks | Kids in Parks," 2018). When visitors register a hike, KIP asks them to enter the date of the hike, ages of visitors, how many people went on the hike, whether they would return, and if they had been to the location before. KIP also asks visitors to provide their home addresses in order to receive prizes. Adults can link their profile to multiple children so that each child can independently enter their own visits.

Between May 1, 2009 and December 31, 2016, visitors logged 8,006 visits (by 3,270 unique visitors and by 2,188 unique families) via the TRACK Trails program website. Most visitors visited trails in groups (e.g., family groups). Of the total visitors, 797 (24%) logged two or more visits between the dates given above.

We use the terms "visit" to indicate a single visit to a TRACK Trail by a visitor, and "trail" to refer to the physical location. For example, a "repeat visit" is a visit logged by a visitor to the same physical location that they had visited on an earlier outing.

Each registered visit to a trail was treated as an event for analysis. From an original 8,006 visits, we excluded 240 visits from the analysis (about 3% of all records). Two hundred thirty-four visits occurred at a corn maze that TRACK Trails managed for three months. KIP did not plan to manage a corn maze trailhead in the future and we therefore removed these data. We removed the remaining six visits in five cases because the visitor addresses were not in the U.S. We removed one visit because it was registered to an address that was not found in any database.

KIP provided visitor information from the TRACK Trails program. Information included visitor home ZIP code and census tract, dates and times of visits, group size, and whether visitors had been to a given park before. KIP geocoded visitor addresses to census tracts. No census tract was found for 395 visitors (out of 3,270 unique visitors). Therefore, we geocoded addresses at census tract centroids in 2,875 cases, and at ZIP code centroids in 395 cases.

This research centered around three outcomes. The first was whether a visitor returned to any trail in the system (second-plus), indicating that they recorded a minimum of any two visits in the KIP system. The second outcome of interest was that a visitor returned to the same trail (repeat), indicating that they recorded visiting the same trail at least twice during the seven-year study period. The third outcome was that a visitor visited a minimum of two different trails (new), indicating that the visitor recorded at least two trail visits and that those visits occurred at different trails during the seven-year study period. The second and third outcomes (repeat and new) are subsets of the first outcome (second-plus).

Table 1 summarizes this information. All "Repeat" and "New" trail visits are included in the "Second-Plus" return visit total. A total of 211 visitors made both a return visit to the same trail and a return visit to a different trail and are thus in all three categories.

Table 1

Summary of Trail Visit Meanings and Number of Occurrences

Designation in text	Explanation	Number of occurrences
"No Return"	Visited Trail "A"; made no other visits	990
"Second-Plus"	Visited Trail "A" more than once and/or visited Trail "A" and Trail "B"	769
"Repeat"	Visited Trail "A" more than once	305
"New"	Visited Trail "A" and visited Trail "B"	675

Trail Data

Not all of the activities in the TRACK Trails system were hiking trails. At the time of this study, there were two trails designated specifically for cycling, twenty disc golf courses, and one paddling trek. We present a summary of trail characteristics in Table 2. Each TRACK Trail had a series of self-guided brochure-led adventures. These brochures contained information on natural, cultural, and historic resources found along the trail. For those visitors that did not want to use a paper copy, the brochures could be downloaded from the TRACK Trails website and viewed digitally while using the trail.

Of the 140 trails in TRACK Trails' program, we excluded trailhead adventures that visitors did not make a return visit to, leaving 114 trailheads for our analysis. KIP provided attribute information including location, trail length, and trail amenities. These TRACK Trails were in parks managed by a city/county agency (n=38), a State agency (n=45), the U.S. Forest Service (n=4), the National Park Service (n=23), or private or other landowner (n=4).

We also included key trail attributes of in our models. Attributes included whether or not the trails had prominent views, prominent natural features, or water features (such as lakes and rivers). We indicated the presence of infrastructure including visitor centers, bathrooms, picnic areas including tables, and designated play areas or jungle gyms. We did not include requirements for paying an entrance fee due to a lack of consistent information.

We calculated average percent slope, weather and distance variables for each trail. We used data from the United States Geological Survey (U.S. Department of the Interior, U.S. Geological Survey, 2017) to calculate the mean slope around each trailhead. This variable was calculated within a buffered area with radius equal to the trail length

at each trailhead. We calculated the distance between visitors' residences (represented by the centroid of visitors' home census tract) and the trailhead visited. In addition, we noted whether hike dates were on weekdays versus weekends, and whether they coincided with federal holidays.

Weather We obtained information on weather on the day of the visit both at the visitors' home (ZIP code centroid) and at the location of the visit from Weather Underground. We did not have census tract locations for all visitors, and therefore we used ZIP code centroids. Furthermore, weather data is available on a daily level in a consistent and documentable way for ZIP codes, whereas inputting geolocation data for census tract centroids led to inconsistent data retrieval. The information we retrieved included maximum temperature, and a binary indicator of rainfall. We obtained this information using the rwunderground package for R, which queries data from the Weather Underground database (Shum, 2017; The Weather Company LLC, 2017).

Visitor Demographic and Neighborhood Information

For demographic data, we used visitors' addresses and obtained information on their census tract from the 5-year 2015 American Communities Survey (U.S. Census Bureau, 2016). We were unable to reliably match visitors to a single census tract in 395 cases due to inconsistencies in road name or no matches being found for the address provided. For these 395 visitors, we used the census tract of the ZIP code centroid. We included the following sociodemographic information: race (percent white), percentage of renters, family household composition (percentage of female heads of household), and socio-economic indicators (percent unemployed, percent less than high school diploma, and median household income).

Statistical Analyses

We calculated descriptive statistics using cross-tabulations. For each outcome, we also calculated differences in counts or means using the Wilcoxon rank-sum statistic, because the data were not uniformly normal in distribution. This test does not assume normality and is nearly as efficient as for normal distributions (Fay & Proschan, 2010) as a *t*-test. For second-plus, repeat, and new trail visits, the comparison group was visitors who did not register second TRACK Trails visit (no return visits). We then estimated multiple linear regression models for all three visit outcomes (second-plus, repeat, new). We used linear regression instead of logistic regression to allow clearer interpretation of the estimates for the variables of interest. Participants either made a repeat visit, or did not, and therefore our variables are not nominal. We chose multiple linear regression instead of logistic regression to allow clearer interpretation of the estimates for the variables of interest.

We also tested for collinearity among the predictor variables. The variance inflation factor (VIF) of all variables was <2.0 for all but two variables. Home and trail maximum temperature had VIF values of 6.18 and 6.17, respectively; however, VIF values under 10 are considered as non-collinear (Craney & Surles, 2002).

We used linear multiple regression models to assess the relationship between visit behaviors and predictors related to return visits and visitors. The units of observation were visits made by each visitor. Each regression model included a separate visit outcome (return for a second visit to any trail, return visit to the same trail, or return visit to a different trail) a series of twelve independent demographic covariates, agency fixed-effects, and home city fixed-effects. These fixed effects allowed us to isolate

variation attributable to differences unrelated to trail administrative agency and visitor home city, and understand the differences related to other trail or visitor characteristics or behaviors. These models were run separately to tease apart how different variables might generally relate to return visitation, as well as specifically how they specific relate to return visits to a single trail or to different trails within a system. This would allow trail managers to apply the general outcomes of these models as well as specifically tailor their efforts toward increasing single trail visits or trail system visits overall.

Predictors included three types of variables: those related to the individual and their home location, those related to the trail, and one combined variable (the distance from a visitor's home census tract to the trailhead). The individual variables included unemployment rate, percentage of persons with less than a high school diploma, percentage of female heads of household, and rain and temperature at visitors' homes. Trail features included management agency; trail length; presence of trail view, natural feature, water feature, infrastructure, visitor center, bathrooms, picnic area, or playground; average slope (for the area surrounding the trailhead); presence of rain; and maximum temperature at the trailhead. We also included a variable representing distance from visitors' homes to the trailhead.

The R^2 values from regression models were used at each geographic scale to compare fit. For purposes of this study, *p*-values of less than 0.05 indicated significant effect. This aligns with other studies of use of outdoor space and health (Das, Fan, & French, 2017; French et al., 2017; LeBlanc et al., 2015). Additionally, the work in this manuscript was largely exploratory, and designed to consider the range of possible or likely factors influencing return visits, which led to our use of a less restrictive threshold for inclusion. We performed all analyses using Stata 15 software (StataCorp., 2017).

Results

Descriptive Statistics of Trails and Visitors

There were 990 no-return visits included in the dataset. Visitors made 769 second-plus visits, 305 repeat visits, and 675 new trail return visits. Of the 305 visitors who made a repeat visit to the same trail, 211 also visited a new trail. Table 2 shows descriptive statistics for each of these visit categories, with Wilcoxon rank-sum statistics of differences between 1 and 0 values within each category. All scores are comparisons between that set and non-returns; second-plus vs. non-return, repeat vs. non-return, and new trail vs. non-return visits.

Trail Attributes

Based on simple means comparisons, the trails that were destinations for second-plus, repeat, or new trail return visits had significantly less presence of natural features, infrastructure and/or a visitor center, bathrooms, or a picnic area compared to trails that were destinations one-time only visitors.

The mean percent slope for visitors who did not return was 17.7%, 20.2% for second-plus return visitors ($p<0.001$), 19.7% for repeat visits ($p<0.05$), and 20.4% for new trail return visits ($p<0.001$). This would indicate that visitors who ended up making a return visit visited trails with greater slopes on their first visit than the trails visited by visitors who did not make a return visit.

Across all four types of visits, most visits were to National Parks; 39.1% for no-returns, 38.5% for second-plus, 36.1% for repeat visits, and 38.9% for new trail return

Table 2
Trail and Visitor Descriptive Statistics and Simple Means Comparisons

Variable	No Return (n=990)	Second-Plus (n=769)	Repeat (n=305)	New (n=675)
Trails				
Agency				
City/County park	280 (28.3)	137 (17.8)	73 (23.9)	105 (15.5)
State park	254 (25.7)	275 (37.8)	102 (33.4)	251 (37.2)
National Park	387 (39.1)	296 (38.5)	110 (36.1)	262 (38.9)
USFS forest	17 (1.7)	21 (2.7)	7 (2.3)	19 (2.8)
Private/Other	52 (5.3)	40 (5.2)	13 (4.3)	38 (5.6)
Length (miles)	1.2 (0.6)	1.3 (0.6)	1.3 (0.5)	1.3 (0.6)
Trail view	537 (15.5)	374 (13.8) *	0 (0)	329 (12.9) *
Natural feature	475 (15.6)	315 (13.6) **	129 (8.6)	277 (12.7) **
Water feature	579 (15.2)	429 (13.6)	169 (8.6)	377 (12.8)
Infrastructure	540 (15.4)	361 (13.8) ***	145 (8.7) *	311 (12.9) ***
Visitor center	749 (13)	509 (12.9) ***	213 (7.9) *	439 (12.2) ***
Bathrooms	888 (8.5)	667 (8.9) **	268 (5.4)	582 (8.6) **
Picnic	814 (11.4)	597 (11.2) **	247 (6.7)	515 (10.8) ***
Play area	177 (12)	128 (10.3)	54 (6.7)	113 (9.7)
Percent slope	17.7 (12.1)	20.2 (12.9) ***	19.7 (12.7) *	20.4 (12.9) ***
Rainfall on day of visit	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)
Max temperature on day of visit	75.6 (11.9)	75.5 (12.2)	75.1 (12.2)	75.5 (12.1)
Visitors				
% Unemployed	6.4 (4.4)	7.0 (4.6) **	7.3 (4.7) **	7.0 (4.6) *
% High school diploma	10.0 (7.4)	10.8 (7.1) **	10.9 (7.1) *	10.9 (7.1) **
% Female head of household	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
Rainfall on day of visit	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)
Max temperature on day of visit	45.8 (12.2)	45.5 (12.5)	45.1 (12.8)	45.7 (12.5)
Combined				
Home-trail distance (m)	142.6 (383.3)	160.9 (336.4) **	145.5 (392)	168.5 (339.2) ***

Note: *$p<0.05$, **$p<0.01$, ***$p<0.001$; Standard Error (SE) is shown for counts and standard deviation (SD) is shown for mean values. For Second-plus, Repeat, and New visits, values are in comparison to No Return visits. For example, the proportion of Second Plus visits to trails with a Trail View (13.8%) is significantly different from that of No Return visits (15.5) at the level of $p<0.05$.

visits. The largest difference was in use of city/county parks and state parks. These were relatively evenly split for non-return visits at 28.3% and 25.7%, respectively. However, for all three categories of return visits, the proportion of visits to state parks was much more than that in city/county parks; 37.8% vs. 17.8% overall for second-plus visits, with a breakdown of 33.4% vs. 23.9% for repeat visits, and 37.2% vs. 15.5% for new trail return visits.

Visitor Characteristics

Visitors that made second-plus, repeat or new trail return visits came from areas with significantly higher rates of unemployment than those who did not return for a second visit. For no-return visitors the mean unemployment rate was 6.4%, whereas it was 7.0% for second-plus visits and new trail visits, and 7.4% for repeat visits.

Visitors who made a return visit also came from areas with a higher percentage of persons with less than a high school diploma. Non-return visitors came from areas with an average of 10.0% of people with less than a high school diploma, while the rate of people with less than a high school diploma was 10.8% ($p<0.01$) for second-plus visits, 10.9% ($p<0.05$) for those repeat visits, and 10.9% ($p<0.01$) for new trail return visits. No other visitor attribute was significantly different between non-return visitors and any of the three return outcomes.

Home to Trail Distance

The mean home to trailhead distance was significantly different between visitors who made second-plus visits (160.9 km, $p<0.01$) compared to non-return visitors (142.6 km), and also compared between visitors who made a return visit to a new trail (168.5, $p<0.001$) and non-return visitors.

Predictors of Visits

Table 3 shows the coefficients from the multiple regressions for all three outcomes —second-plus visits, repeat visits and new trail visits. These tables also show which variables act as significant predictors of the three outcomes.

Compared to trails in local (city/county) parks, trails in parks managed at the state level or by the U.S. Forest Service attracted more repeat visits (overall, and among new trail return visits; $p<0.01$). Repeat visits (overall, and among new trail return visits) were more likely to occur at trails that did not have a visitor center ($p<0.01$). Return visits to new trails occurred more often at trails with no picnic amenities ($p<0.05$). Visitors who made second-plus return visits were more likely to live in areas with higher unemployment ($p<0.05$). Returning visitors were also more likely to travel farther from their homes on visits to new trails ($p<0.05$). However, the magnitude of the coefficient for home-trailhead distance is small.

Discussion

Our findings indicate that among TRACK Trails visitors, infrastructure does not seem to drive return visits, with the exception of bathrooms, nor do natural features or picnic areas. This is in contrast to findings from earlier studies, which have found that having more features (Kaczynski et al., 2014), or having specific physical features such as playgrounds and sports facilities (Kaczynski et al., 2008) led to greater use. Our findings contrast with those of a meta-analysis of qualitative studies that found that park features such as playgrounds, sports facilities, picnic tables, or barbeques are important in encouraging use (Edwards et al., 2015). In fact, visitors were more likely to return to trails without visitors' centers. However, while many of the TRACK Trails included in this study were located in wildland or forested non-urban areas, previous work has largely focused on park features that influence use in cities. In addition, no earlier studies have evaluated trailhead recreation programs over time that make use of electronic or Internet features.

Visitors may seek out more strenuous trails on return visits. The trails that visitors returned to tended to be steeper than the trails of their initial visits. This may indicate greater comfort or desire to engage in more strenuous activity. While there has been relatively sparse research on the possibility of this phenomenon, some medical research suggests that persons engaging in a hiking program may increase their functionality

Table 3

Ordinary Linear Regression Estimates of Predictors of Return Visits to Any Trail, the Same Trail, or Different Trail

Variable	Second-Plus Coef. (95% CI)	Repeat Coef. (95% CI)	New Coef. (95% CI)
Trails			
Agency[2]			
State park	0.213 (0.051, 0.373) **	0.093 (-0.033, 0.219)	0.218 (0.061, 0.374) **
National Park	0.108 (-0.064, 0.279)	0.021 (-0.114, 0.155)	0.121 (-0.045, 0.288)
USFS forest	0.447 (0.114, 0.779) **	0.098 (-0.162, 0.359)	0.485 (0.162, 0.807) **
Private/Other	0.026 (-0.182, 0.235)	-0.089 (-0.253, 0.075)	0.068 (-0.135, 0.270)
Length (miles)	0.014 (-0.064, 0.092)	0.043 (-0.018, 0.104)	0.008 (-0.067, 0.083)
Trail view	-0.106 (-0.262, 0.051)	-0.024 (-0.147, 0.099)	-0.133 (-0.285, 0.019)
Natural feature	-0.031 (-0.169, 0.108)	-0.008 (-0.116, 0.101)	-0.011 (-0.145, 0.123)
Water feature	0.027 (-0.083, 0.137)	-0.023 (-0.109, 0.064)	0.052 (-0.056, 0.159)
Infrastructure	-0.025 (-0.119, 0.069)	-0.067 (-0.14, 0.007)	-0.016 (-0.108, 0.075)
Visitor center	-0.140 (-0.244, -0.035) **	-0.027 (-0.109, 0.055)	-0.136 (-0.237, -0.034) **
Bathrooms	-0.039 (-0.181, 0.103)	0.014 (-0.098, 0.126)	-0.012 (-0.150, 0.126)
Picnic	-0.106 (-0.223, 0.010)	-0.020 (-0.111, 0.072)	-0.141 (-0.254, -0.027) *
Play area	0.102 (-0.019, 0.223)	0.072 (-0.023, 0.166)	0.088 (-0.029, 0.206)
Percent slope	-2.3e4 (-0.003, 0.003)	3.1e5 (0.002, 0.002)	0.000 (0.003, 0.003)
Rainfall on day of visit	-0.006 (-0.094, 0.083)	0.017 (-0.052, 0.086)	-0.008 (-0.093, 0.078)
Max temperature on day of visit	0.001 (0.004, 0.009)	3.7e4 (0.003, 0.004)	-3.7e4 (0.005, 0.005)
Visitors			
% Unemployed	0.010 (0.001, 0.019) *	0.007 (-2.8e4, 0.013)	0.008 (0.001, 0.016)
% High school diploma	-0.001 (0.008, 0.006)	-0.003 (0.008, 0.002)	0.000 (0.007, 0.006)
% Female head of household	-0.160 (-0.941, 0.622)	0.334 (-0.279, 0.948)	-0.211 (-0.970, 0.548)
Rainfall on day of visit	0.013 (-0.077, 0.103)	0.002 (-0.005, 0.072)	0.003 (-0.085, 0.091)
Max temperature on day of visit	-0.002 (0.007, 0.003)	-0.001 (-6.4e5, 0.003)	-2.8e4 (0.005, 3.4e4)
Combined			
Home-trail distance (m)	1.6e4 (-4.8e6, 3.1e4)	6.2e5 (-6.4e5, 1.9e4)	0.1.9e4 (2.9e5, 3.4e4) *
R-Squared	0.493	0.473	0.502

Note: *p<0.05, **p<0.01, ***p<0.001; 2. Reference Category: City/County Park. Fixed effects for home city were included in the model but are not shown here. Abbreviations: Coef: regression coefficient. 95% CI: 95% confidence interval.

and comfort over time (Hepperger et al., 2017). In planning areas for physical activity, it may be ideal to include options for different skills and comfort levels of visitors.

Among the trail resources that are a part of the TRACK Trails program, trails managed at the state level and by the U.S. Forest Service attracted more return visitors compared to trails managed by local entities. The U.S. Forest Service has a longer history of recreation management compared to that of many smaller governmental units, which could lead to more inter-generational habits of routine use. In addition, The U.S. Forest Service and state governments may have greater access to resources to support recreation compared to local government units, which could lead to more attractive programming for visitors.

Among TRACK Trails visitors, park visitation was not inherently driven by proximity. While the effect size was modest, close proximity of trails did not predict return visits. This finding aligns with some preceding research on the topic relating to more urban settings (Kaczynski, Potwarka, & Saelens, 2008; Ries et al., 2009), as well as research on trails outside of urban areas (Edwards et al., 2015; Rossi, Byrne, & Pickering, 2015). However this finding is contradictory to that of other studies done in urban areas (Giles-Corti et al., 2005; Kaczynski et al., 2014; McCormack et al., 2010; Mowen

et al., 2007) as well as in more rural settings (Edwards et al., 2015). This finding may indicate that persons choosing to visit another TRACK Trail were more influenced by a trail feature, a KIP-provided prize or incentive, or an individual characteristic or circumstance not captured in this study. Age has been found to contribute to willingness or ability to travel farther to parks outside of urban areas (Rossi et al., 2015), with individuals above retirement age having greater availability of free time to travel further; however, we cannot detect that association with this data set. Further, based on means comparisons we found that more repeat visits occurred on weekdays compared to on weekends.

It could also be the characteristics of visitors themselves that predicts whether or not they returned to a trail activity. While we did not have extensive data on personal characteristics, we were able to characterize visitors' places of residence. The average percent unemployment in visitors' residential areas was significantly higher among visitors who returned, compared to those that did not return, and based on adjusted regression models, higher unemployment rates were positively associated with return visits to any trail. This provides evidence that the program is successfully attracting and sustaining engagement from visitors from areas of lower socioeconomic status and educational attainment, who may otherwise lack recreational opportunities. This is somewhat contrary to the findings of earlier studies (Cohen et al., 2017; Das, Fan, & French, 2017; French et al., 2017; Kaczynski et. al., 2014) which have found that park users tend to be wealthier and better educated than the public as a whole.

There are limitations to this study. Our study is based on information from 769 program visits from a single program and therefore our findings may not be generalizable to other recreation programs. Many of the TRACK Trails activities cannot be reached via public transit, which limits the applicability of our findings for recreation planning in urban areas and areas with well-developed mass transit systems. We did not have demographic data directly from visitors and had to use Census tract-level data to approximate demographic variables. Likewise, we lacked systematic individual-level data, for example on personal characteristics, preferences, and access to natural resources. However, the data came from a range of trail locations and visitors, and as such, the trends here should provide some insight.

Future research could address the questions raised by this study. For example, a study of park and programming characteristics could assess why trailheads on land managed by the U.S. Forest Service and state agencies have attracted more return visitors than trailheads on land managed by other entities such as cities and counties. In addition, more research is needed to assess the relative efficacy of incorporating mobile devices and content as a recreation amenity, compared to more traditional physical park features.

Management Implications

Physical park features and amenities, besides restrooms, did not provide a significant draw of repeat visits to the trailhead adventure program featured in this study. It could be that the "virtual" features of the program, including mobile-accessible content and interactive website, provided enough incentive to motivate visitors to return, and even to travel greater distances to visit other program trailheads. Therefore, greater investments in technology-based programing and incentives might be important in

promoting public park use and engagement. Repeat visits were also more likely on trails with greater slopes. Having trails with a variety of slopes may be important, and managers may want to structure trails to allow for this when possible—for example by providing multiple loop and connection options within trails. Finally, management agencies may look to the U.S. Forest Service for examples of what attracts visitors to parks, especially for repeat visits.

References

About Kids in Parks | Kids in Parks. (2018). http://www.kidsinparks.com/about

Anderson, L., Foster, S., Flynn, R., & Fitterman, M. (2013). Assessing public policies and assets that affect obesity risk while building new public health partnerships, New Hampshire, 2011. *Preventing Chronic Disease, 10,* E134. https://doi.org/10.5888/pcd10.120349

Andrejewski, R., Mowen, A. J., & Kerstetter, D. L. (2011). An examination of children's outdoor time, nature connection, and environmental stewardship. Proceedings of the Northeastern Recreation Research Symposium, 2011. http://scholarworks.umass.edu/nerr/2011/Papers/2/

Barrett, J. L., Hannon, C., Keefe, L., Gortmaker, S. L., & Cradock, A. L. (2011). Playground renovations and quality at public parks in Boston, Massachusetts, 1996-2007. *Preventing Chronic Disease, 8*(4). http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3136986/

Benjamin, E. J., Blaha, M. J., Chiuve, S. E., Cushman, M., Das, S. R., Deo, R., …Muntner, P. (2017). Heart disease and stroke statistics—2017 update: A report from the American Heart Association. American Heart Association Statistics Committee and Stroke Statistics Subcommittee. http://doi.org/cck5

Besenyi, G. M., Kaczynski, A. T., Wilhelm Stanis, S. A., & Vaughan, K. B. (2013). Demographic variations in observed energy expenditure across park activity areas. *Preventive Medicine, 56*(1), 79–81. https://doi.org/10.1016/j.ypmed.2012.10.011

Buttorff, C., Ruder, T., & Bauman, M. (2017). *Multiple chronic conditions in the United States.* RAND Corporation. https://doi.org/10.7249/TL221

Byrne, J., & Wolch, J. (2009). Nature, race, and parks: past research and future directions for geographic research. *Progress in Human Geography, 33*(6), 743–765. https://doi.org/10.1177/0309132509103156

Carlton, T. A., Kanters, M. A., Bocarro, J. N., Floyd, M. F., Edwards, M. B., & Suau, L. J. (2017). Shared use agreements and leisure time physical activity in North Carolina public schools. *Preventive Medicine, 95*, S10–S16. https://doi.org/10.1016/j.ypmed.2016.08.037

Castro, M. del R. M. (2011). The influence of time spent in outdoor play on daily and aerobic step count in Costa Rican children. (Doctoral dissertation). Auburn University. https://holocron.lib.auburn.edu/handle/10415/2677

Chen, W., & Adler, J. L. (2019). Assessment of screen exposure in young children, 1997 to 2014. *JAMA Pediatrics, 173*(4), 391–393. http://doi.org/dvb2

Clark, D., & Jordan, R. (2018). An investigation of links between environmentally responsible behaviors and built and natural features of landscape in Central New Jersey. *Urban Science, 2*(4), 114. https://doi.org/10.3390/urbansci2040114

Cohen, D. A., Golinelli, D., Williamson, S., Sehgal, A., Marsh, T., & McKenzie, T. L. (2009). Effects of park improvements on park use and physical activity. *American Journal of Preventive Medicine, 37*(6), 475–480. https://doi.org/10.1016/j.amepre.2009.07.017

Cohen, D. A., Han, B., Derose, K. P., Williamson, S., Marsh, T., Raaen, L., & McKenzie, T. L. (2017). Promoting physical activity in high-poverty neighborhood parks: A cluster randomized controlled trial. *Social Science & Medicine, 186*, 130–138. https://doi.org/10.1016/j.socscimed.2017.06.001

Craney, T. A., & Surles, J. G. (2002). Model-dependent variance inflation factor cutoff values. *Quality Engineering, 3*(14), 393º–401. https://doi.org/10.1081/QEN-120001878

Cuthbertson, B., Socha, T. L., & Potter, T. G. (2004). The double-edged sword: Critical reflections on traditional and modern technology in outdoor education. *Journal of Adventure Education and Outdoor Learning, 4*(2), 133–144. https://doi.org/10.1080/14729670485200491

Das, K. V., Fan, Y., & French, S. A. (2017). Park-use behavior and perceptions by race, Hispanic origin, and immigrant status in Minneapolis, MN: implications on park strategies for addressing health disparities. *Journal of Immigrant and Minority Health, 19*(2), 318–327. https://doi.org/10.1007/s10903-015-0339-1

Edwards, N., Hooper, P., Knuiman, M., Foster, S., & Giles-Corti, B. (2015). Associations between park features and adolescent park use for physical activity. *International Journal of Behavioral Nutrition and Physical Activity, 12*(1), 21. doi: https://doi.org/10.1186/s12966-015-0178-4

Evenson, K. R., Jones, S. A., Holliday, K. M., Cohen, D. A., & McKenzie, T. L. (2016). Park characteristics, use, and physical activity: A review of studies using SOPARC (System for Observing Play and Recreation in Communities). *Preventive Medicine, 86*, 153–166. https://doi.org/10.1016/j.ypmed.2016.02.029

Farrigan, T., Hertz, T., & Parker, T. (2015). Rural poverty and well-being. USDA, Economic Research Service. Retrieved from https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being.aspx

Fay, M. P., & Proschan, M. A. (2010). Wilcoxon-Mann-Whitney or t-test? On assumptions for hypothesis tests and multiple interpretations of decision rules. *Statistics Surveys, 4*, 1–39. https://doi.org/10.1214/09-SS051

Feng, X., & Astell-Burt, T. (2017). Do greener areas promote more equitable child health? *Health & Place, 46*, 267–273. https://doi.org/10.1016/j.healthplace.2017.05.006

Floyd, M. F., Bocarro, J. N., Smith, W. R., Baran, P. K., Moore, R. C., Cosco, N. G., … Fang, K. (2011). Park-based physical activity among children and adolescents. *American Journal of Preventive Medicine, 41*(3), 258–265. https://doi.org/10.1016/j.amepre.2011.04.013

French, S. A., Sherwood, N. E., Mitchell, N. R., & Fan, Y. (2017). Park use is associated with less sedentary time among low-income parents and their preschool child: The NET-Works study. *Preventive Medicine Reports, 5*, 7–12. https://doi.org/10.1016/j.pmedr.2016.11.003

Giles-Corti, B., Broomhall, M. H., Knuiman, M., Collins, C., Douglas, K., Ng, K., Lange, A., & Donovan, R. J. (2005). Increasing walking. *American Journal of Preventive Medicine, 28*(2), 169–176. https://doi.org/10.1016/j.amepre.2004.10.018

Golightly, Y. M., Allen, K. D., Ambrose, K. R., Stiller, J. L., Evenson, K. R., Voisin, C., Hootman, J. M., & Callahan, L. F. (2017). Physical activity as a vital sign: A systematic review. *Preventing Chronic Disease, 14*(E123). http://doi.org/gczwt6

Hepperger, C., Gföller, P., Hoser, C., Ulmer, H., Fischer, F., Schobersberger, W., & Fink, C. (2017). The effects of a 3-month controlled hiking programme on the functional abilities of patients following total knee arthroplasty: A prospective, randomized trial. *Knee Surgery, Sports Traumatology, Arthroscopy, 25*(11), 3387–3395. https://doi.org/10.1007/s00167-016-4299-3

Kabali, H. K., Irigoyen, M. M., Nunez-Davis, R., Budacki, J. G., Mohanty, S. H., Leister, K. P., & Bonner, R. L. (2015). Exposure and use of mobile media devices by young children. *Pediatrics, 136*(6), 1044–1050. http://doi.org/gd7hh6

Kaczynski, A. T., Besenyi, G. M., Stanis, S. A. W., Koohsari, M. J., Oestman, K. B., Bergstrom, R., Potwarka, L. R., & Reis, R. S. (2014). Are park proximity and park features related to park use and park-based physical activity among adults? Variations by multiple sociodemographic characteristics. *International Journal of Behavioral Nutrition and Physical Activity, 11*(1). https://doi.org/10.1186/s12966-014-0146-4

Kaczynski, A. T., Potwarka, L. R., & Saelens, B. E. (2008). Association of park size, distance, and features with physical activity in neighborhood parks. *American Journal of Public Health, 98*(8), 1451–1456. https://doi.org/10.2105/AJPH.2007.129064

Kamel, A. A., Ford, P. B., & Kaczynski, A. T. (2014). Disparities in park availability, features, and characteristics by social determinants of health within a U.S.–Mexico border urban area. *Preventive Medicine, 69*, S111–S113. https://doi.org/10.1016/j.ypmed.2014.10.001

Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., & Zaza, S. (2016). Youth risk behavior surveillance-United States, 2015. *MMWR Surveillance Summaries, 65*(SS6), 1–174. http://dx.doi.org/10.15585/mmwr.ss6506a1

LeBlanc, A. G., Katzmarzyk, P. T., Barreira, T. V., Broyles, S. T., Chaput, J-P., Church, T. S.,… Tremblay, M. (2015). Correlates of total sedentary time and screen time in 9- to 11-year-old children around the world: The international study of childhood obesity, lifestyle and the environment. *PLoS ONE 10*(6): e0129622. https://doi.org/10.1371/journal.pone.0129622https://doi.org/10.1371/journal.pone.0129622

Liu, M., Wu, L., & Yao, S. (2016). Dose–response association of screen time-based sedentary behaviour in children and adolescents and depression: A meta-analysis of observational studies. *British Journal of Sports Medicine, 50*(20), 1252–1258. https://doi.org/10.1136/bjsports-2015-095084

Lo, B., Morgan, E., Folta, S., Graham, M., Paul, L., Nelson, M., Jew, N., Moffat, L., & Seguin, R. (2017). Environmental influences on physical activity among rural adults in Montana, United States: Views from built environment audits, resident focus groups, and key informant interviews. *International Journal of Environmental Research and Public Health, 14*(10), 1173. https://doi.org/10.3390/ijerph14101173

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. https://doi.org/10.1016/j.healthplace.2010.03.003

Mowen, A., Orsega-Smith, E., Payne, L., Ainsworth, B., & Godbey, G. (2007). The role of park proximity and social support in shaping park visitation, physical activity, and perceived health among older adults. *Journal of Physical Activity and Health, 4*(2), 167–179. https://doi.org/10.1123/jpah.4.2.167

Mozaffarian, D., Benjamin E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., … Turner, M. B. (2016). Heart disease and stroke statistics—2016 Update. *Circulation, 133*(4), e38–e360. https://doi.org/10.1161/CIR.0000000000000350

Pergams, O. R. W., & Zaradic, P. A. (2006). Is love of nature in the U.S. becoming love of electronic media? 16-year downtrend in national park visits explained by watching movies, playing video games, Internet use, and oil prices. *Journal of Environmental Management, 80*(4), 387–393. https://doi.org/10.1016/j.jenvman.2006.02.001

Perry, C. K., Saelens, B. E., & Thompson, B. (2011). Rural Latino youth park use: Characteristics, park amenities, and physical activity. *Journal of Community Health, 36*(3), 389–397. https://doi.org/10.1007/s10900-010-9320-z

Ries, A. V., Voorhees, C. C., Roche, K. M., Gittelsohn, J., Yan, A. F., & Astone, N. M. (2009). A quantitative examination of park characteristics related to park use and physical activity among urban youth. *Journal of Adolescent Health, 45*(3), S64–S70. https://doi.org/10.1016/j.jadohealth.2009.04.020

Ross, R. (2016). CSEP special supplement: Canadian 24-hour movement guidelines for children and youth: An integration of physical activity, sedentary behaviour, and sleep. *Applied Physiology, Nutrition, and Metabolism 41*(6–S3). https://link.galegroup.com/apps/doc/A456758503/AONE?sid=lms

Rossi, S. D., Byrne, J. A., & Pickering, C. M. (2015). The role of distance in peri-urban national park use: Who visits them and how far do they travel? *Applied Geography, 63*, 77–88. http://dx.doi.org/10.1016/j.apgeog.2015.06.008

Rube, K., Veatch, M., Huang, K., Sacks, R., Lent, M., Goldstein, G. P., & Lee, K. K. (2014). Developing built environment programs in local health departments: Lessons learned from a nationwide mentoring program. *American Journal of Public Health, 104*(5), e10–e18.

Schmidt, M. E., Haines, J., O'Brien, A., McDonald, J., Price, S., Sherry, B., & Taveras, E. M. (2012). Systematic review of effective strategies for reducing screen time among young children. *Obesity, 20*(7), 1338–1354. https://doi.org/10.1038/oby.2011.348

Sevening, H., & Janz, K. (2017). *Relation between park characteristics and physical activity levels in a rural Midwest community.* (Honors Thesis). University of Iowa. https://ir.uiowa.edu/cgi/viewcontent.cgi?article=1081&context=honors_theses

Shum, A. (2017). RWunderground Package for R. https://cran.r-project.org/web/packages/rwunderground/rwunderground.pdf

StataCorp. (2017). *Stata Statistical Software: Release 15.* (Version 15). College Station, TX.

Stevens, T. H., More, T. A., & Markowski-Lindsay, M. (2014). Declining national park visitation: An economic analysis. *Journal of Leisure Research, 46*(2), 153–164.

Sugiyama, T., Carver, A., Koohsari, M. J., & Veitch, J. (2018). Advantages of public green spaces in enhancing population health. *Landscape and Urban Planning, 178*, 12–17. https://doi.org/10.1016/j.landurbplan.2018.05.019

Tester, J., & Baker, R. (2009). Making the playfields even: Evaluating the impact of an environmental intervention on park use and physical activity. *Preventive Medicine, 48*(4), 316–320. https://doi.org/10.1016/j.ypmed.2009.01.010

The Interagency National Survey Consortium, Coordinated by the USDA Forest Service, Recreation, Wilderness, and Demographics Trends Research Group, and the Human Dimensions Research Laboratory, University of Tennessee, (2000). National Survey on Recreation and the Environment (NSRE): 2000-2002. Athens, GA Knoxville, TN: University of Tennessee. https://www.srs.fs.usda.gov/trends/nsre-directory/.

The Weather Company LLC. (2017). Weather Underground API service for weather history [Weather Underground]. The Weather Company LLC. wunderground.com

U.S. Census Bureau, D. I. S. (2010). Publications. http://www.census.gov/population/race/publications/

U.S. Department of the Interior, U.S. Geological Survey. (2017). The National Map. DEM, Land Use, USA.Gov. https://nationalmap.gov/

Vaughan, C. A., Colabianchi, N., Hunter, G. P., Beckman, R., & Dubowitz, T. (2018). Park use in low-income urban neighborhoods: Who uses the parks and why? *Journal of Urban Health, 95*(2), 222–231. https://doi.org/10.1007/s11524-017-0221-7

Copyright of Journal of Park & Recreation Administration is the property of Sagamore Publishing and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.