

# Trail Users in the Cincinnati Metropolitan Region: Purposes, Patterns, and Preferences

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## Abstract

The benefits of using multi-use trails have been recognized from different perspectives, such as improving public health, expanding active transportation options, and enhancing environmental quality. Trail managers in Greater Cincinnati have developed a 212-mile trail network, with plans to expand and connect the system. Given regional priorities for trail development, trail managers and advocates need to understand more about trail users and how they use the network. In response, two nonprofit organizations in this region, Tri-State Trails and Interact for Health, along with the assistance from researchers at the University of Minnesota, launched Greater Cincinnati's first comprehensive trail measurement program including both trail traffic monitoring and an intercept survey of trail users. Monitoring results show the network is heavily used: in 2017, monitoring results on 137 miles of the network showed users traveled an estimated 11 million miles on those segments annually (Lindsey et al. 2019).

This paper describes results of the survey which was designed with questions covering trip characteristics, perceptions of the trails, socio-demographics, and locational information. Between August 2017 and October 2017, 31 trail staff and volunteers administered the survey at 20 locations. 734 responses were obtained. Three methods are used to analyze the survey: descriptive summary, statistical association analysis, and geographical mapping. The descriptive results show 89% of respondents are recreational users while only 8.8% are utilitarian users. These utilitarian users cluster in areas close to Cincinnati downtown and along a centrally located, long trail that connects several communities. Most recreational users are female, white, between 35 and 64 years old, well-educated, and with relatively high incomes. These users primarily bicycled and walked on trails, drove less than 25 minutes to trail, and traveled less than 5 miles. In contrast, most utilitarian users are male, with income of less than \$59,999, walked or biked to trail, and traveled no more than 2 miles on trails. Recreational and utilitarian users' preferences are consistent with positive attitudes towards trail use and environment. Some differences between recreational and utilitarian users are statistically supported using the statistical association analysis. Geographically, the neighborhood context of trail users with different socio-demographics is displayed to illustrate clustering phenomenon among trail users by race and income.

The differences between recreational and utilitarian users imply the importance of developing policies to satisfy various needs of trail users. This analysis provides a valuable framework for local governments to evaluate, manage, and improve the multi-use trail network.

## **Introduction**

One trend in the U.S. DOT's Smart City vision is promoting more sustainable mobility choices, like cycling, walking and transit, through improved intermodal connections (DOT 2015). In response, the usage of multi-use trails has been promoted at both local and regional levels to answer growing demand for alternatives to car-based transportation and achieve potential improvements to public health, environmental quality, and community economies (Carames et al. 2017; VHB 2015). Trail managers in the Greater Cincinnati region (USA) have developed a 212-mile trail network, with plans to expand and connect the system. The network is heavily used: in 2017, monitoring results on 137 miles of the network showed users traveled an estimated 11 million miles on those segments annually (Lindsey et al. 2019). While interest in multi-use trails is growing, the fact of extremely low levels of cycling and walking in the U.S. may be a strong argument for low investment on related facilities such as urban trails (Darzi and Zhang 2018). Therefore, finding strategies to address this "chicken or the egg" dilemma and to develop a safe and comfortable cycling and walking network remains a big challenge.

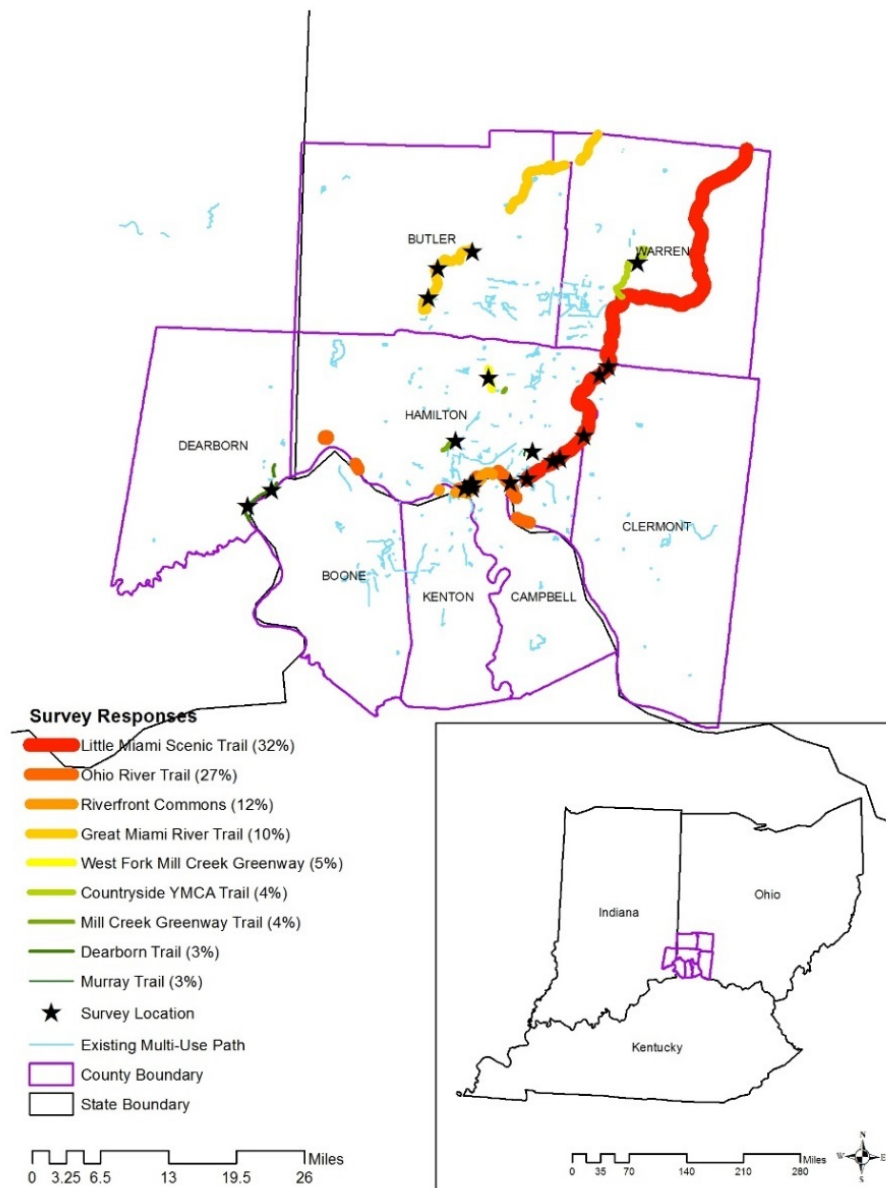
Trail managers and advocates are often asked to investigate trail users and assess the benefits of trail use. Two nonprofit organizations in the Greater Cincinnati region, Tri-State Trails and Interact for Health launched the Greater Cincinnati's first comprehensive trail measurement program including an intercept survey of trail users. This study focuses on the analysis of the intercept survey data for documenting and understanding the major characteristics of different urban trail users in this region, especially recreational and utilitarian users.

## **Background**

The dilemma between recognizing the benefits of multi-use trails and arguing against investment in related facilities due to low levels of cycling and walking is impelling more studies on urban trail use from different perspectives. These studies typically focus on either the use of trail segments and related facilities or trail users themselves. At the facility level, trail user counts are conducted to document how many users are on the trails and to serve as input for trail traffic demand estimation and impact analysis (Lindsey et al. 2015; New York State Office of Parks 2016; Wang et al. 2016). At the individual level, researchers undertake trail use surveys to collect data about who, why and how users access and use trails. These surveys often also explore trip purpose and travel patterns to/from and on trails (Akpınar 2016; Lindsey et al. 2015; New York State Office of Parks 2016; Price et al. 2012; Wang et al. 2013; Wolch et al. 2010). Existing research reveals considerable variation in trail use at both facility and individual levels. For example, urban trail traffic varies in situations with different weather, day of week, neighborhood socio-demographics, and the built environment (Hankey et al. 2012; Wang et al. 2013). Wolch et al. (2010) estimated that the probability of trail use and extent of trail use were related to both objective and subjective factors such as working class status, commuting distance, perceived trail safety, etc. However, the current body of literature does not shed much light onto the variations in urban trail use for different trip purposes (e.g., recreation and exercise, commuting, etc.). Understanding the differences in patterns and preferences of trail use between different trail users has implications for policy-makers and planners in prioritizing public investment strategies on multi-use trail facilities, locations, and environment. Thus far, few studies have attempted to investigate these differences. This study utilizes the trail user survey data collected by the Tri-State Trails and Interact for Health in the Greater Cincinnati region to explore and compare the characteristics and preferences of recreational and utilitarian users.

## Data and Methods

The dataset used in this study is a systematic intercept survey of trail users in the tri-state, Greater Cincinnati metropolitan region, which contains fifteen counties in three states (Ohio, Kentucky, and Indiana) of the United States around the Ohio city of Cincinnati, with a population of 2,114,580 as of the 2010 U.S. Census. This survey was designed and implemented in 2017 by the staff from Interact for Health and Tri-State Trails with assistance from researchers at the University of Minnesota. Using electronic tablets, the responses were collected at 20 trail access points throughout the regional trail network (see Figure 1) between August 2017 and October 2017 during peak hours and non-peak hours in the morning and afternoon. 25 questions in the survey cover trip characteristics, attitudes and preference towards trails and use, socio-demographics, and locational information (Tri-State Trails and Interact for Health 2019).



**Figure 1. Survey locations and responses.**

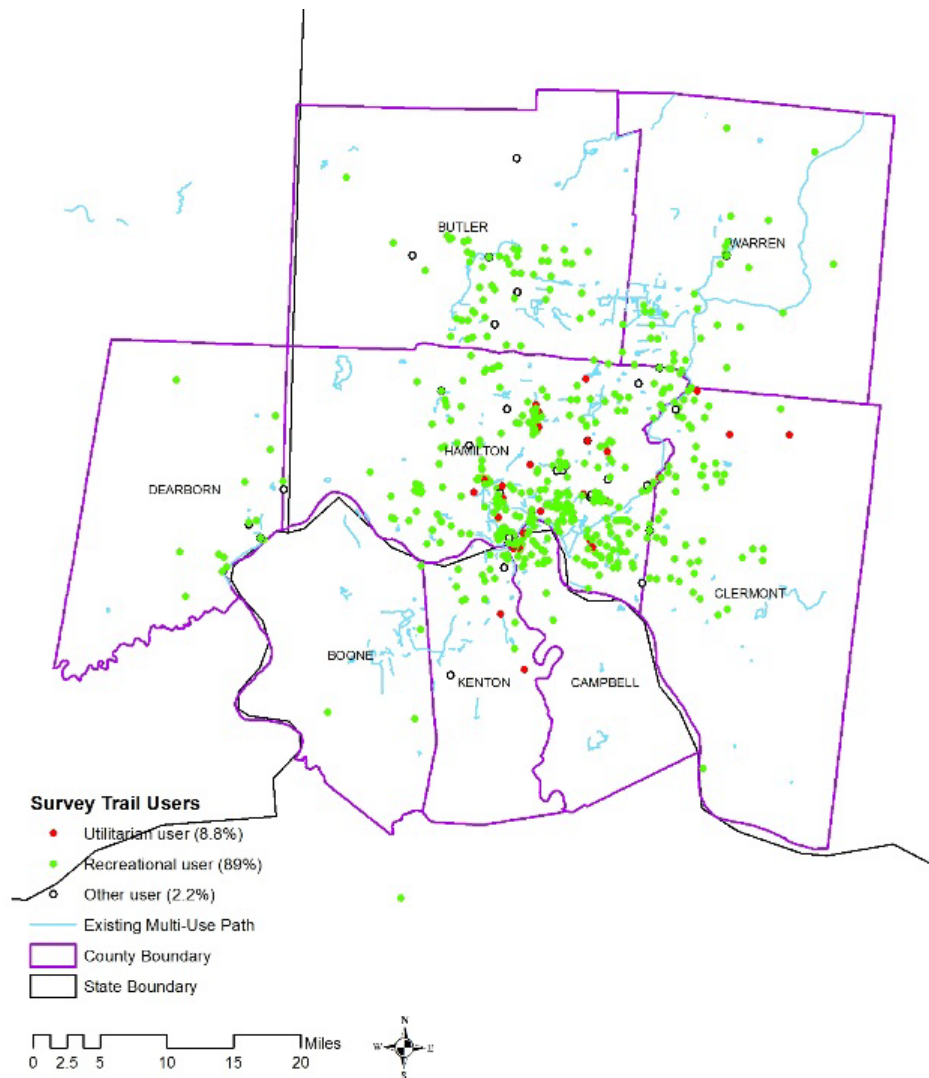
The main goal of this study is to provide a detailed profile of trail users for recreational and utilitarian purposes. The following three objectives and corresponding methods are developed to achieve the goal:

- Patterns of recreational and utilitarian trail users are presented separately using descriptive statistics;
- Statistical association analysis is conducted for the differences in the patterns identified above between two groups of users;
- Spatial distribution of recreational and utilitarian trail users is investigated through geographical mapping.

## Results

The intercept survey was designed with questions covering trip characteristics, user perceptions of the trails, socio-demographics, and locational information. A total of 734 responses were obtained from nine trails at 20 trail access points. Figure 1 presents the distribution of responses on these nine trails, showing that 32% of responses were collected at the Little Miami Scenic Trail access and 27% at the Ohio River Trail access. This distribution of responses reflects user patterns: these two trails are the two most heavily used in the region (Lindsey et al. 2019). 706 of these responses were geocoded in ArcGIS with valid addresses; 658 trail users are within the OKI (Ohio-Kentucky-Indiana) region. The geographical mapping result in Figure 2 shows 89% of respondents are recreational users while only 8.8% are utilitarian users. These utilitarian users cluster in the areas close to Cincinnati downtown and along a centrally located, long trail that connects several communities.

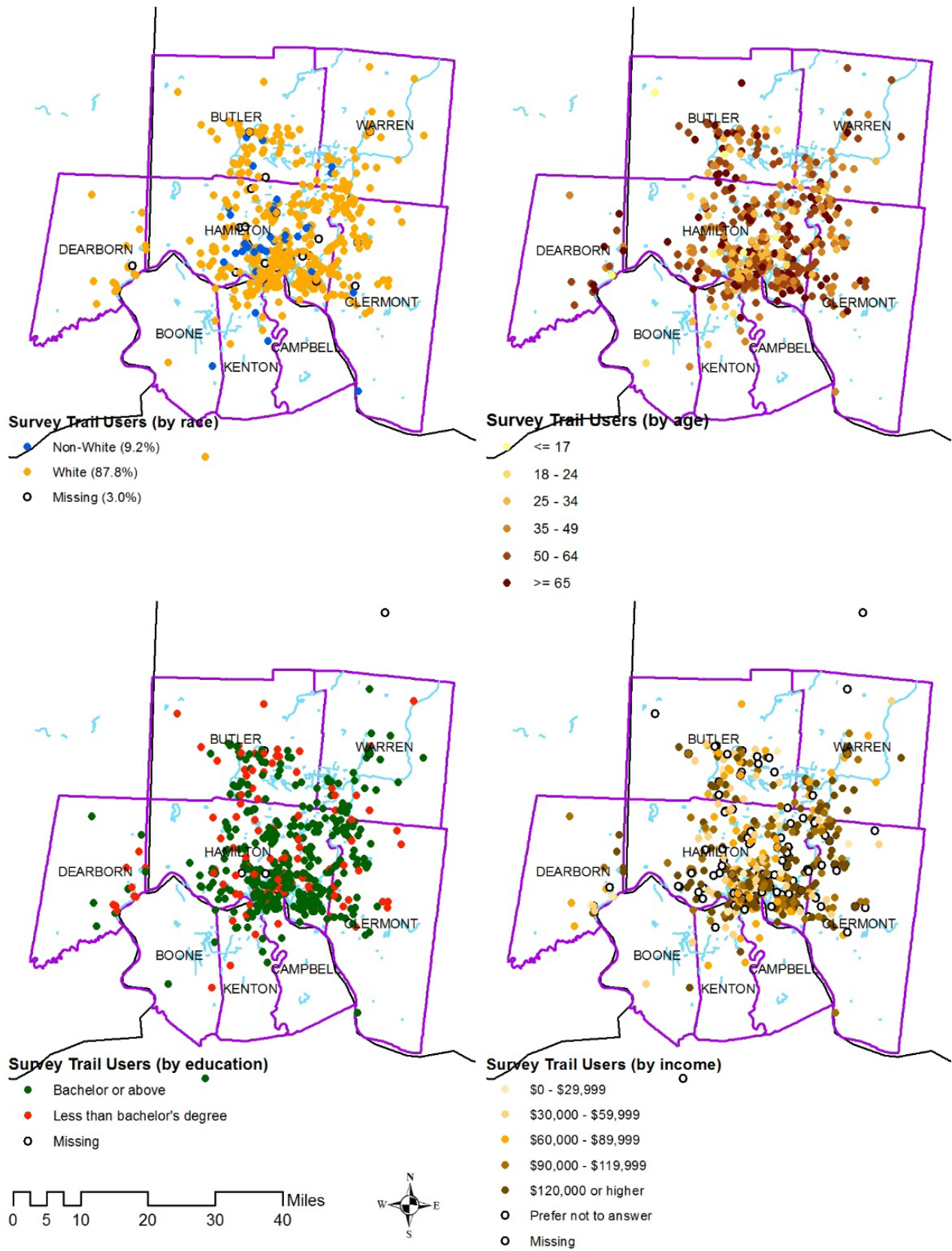
The detailed descriptive statistics along with statistical association analysis results are presented in Tables 1 and 2. Overall, the individual and household characteristics and travel patterns of the recreational and utilitarian users vary substantially. Most of these differences are statistically significant. For instance, more than half of the recreational users are female and the ones using trails for community, shopping and other utilitarian activities are primarily male. In terms of race, white is the major group using trails regardless of trip purpose. As shown in Figure 3, the non-white trail users cluster in urban core areas. Similarly, around 80% of the users are between 35 and 64 years old for both recreational and utilitarian purposes. The main difference between these groups of users regarding age is that relatively more recreational users are over 65 years old. Among the recreational users, 76.5% are well-educated with at least a bachelor's degree. This number drops to 54.8% for the utilitarian users. Most recreational users are from households with relatively high income (over \$90,000), while around 50% of the utilitarian users are living in households with incomes of less than \$59,999. Interestingly, most users locating surrounding urban core areas are relatively young with lower incomes (Figure 3). As expected, the majority of the trail users report very good health status.



**Figure 2 Distribution of survey trail users**

The variability in most trip-related patterns and characteristics between recreational and utilitarian users is even more distinct and significant. While both recreational and utilitarian users primarily bicycled and walked on trails, fewer utilitarian users ran or jogged. Most recreational users drove less than 25 minutes to the trail and traveled less than 5 miles on the trails. In contrast, most utilitarian users traveled no more than 2 miles on trails and spent less time (less than 15 minutes) to access the trail. When comparing transportation modes to trails, 58.2% of recreational users drove to trail while 51.6% of utilitarian users walked to the trail. Due to the intrinsic difference in using urban trails for recreational and utilitarian activities, it is expected that recreational users tend to use more trails during weekend with others than utilitarian users who generally visit one trail on weekday by themselves. The survey confirmed these expectations.

Table 2 presents recreational and utilitarian users' attitudes and preferences towards trail use and trail environment. The statistical association analysis results between these statements and two types of users on trails indicate that recreational and utilitarian users' preferences are consistent with positive attitudes towards trail use and environment.



**Figure 3 Distribution of survey trail users by socio-demographics**

**Table 1 Characteristics of survey sample based on trail use purposes**

<b>Variable</b>	<b>Recreational User (% within group)</b>	<b>Utilitarian User (% within group)</b>	<b>Recreational User (% in all)</b>	<b>Utilitarian User (% in all)</b>	<b>Total (%)</b>	<b>Total N</b>
<b>Primary Activity on trail</b>						
Bicycling	40.4	40.6	35.9	3.6	40.3	292
Running/Jogging	18.2	6.3	16.2	0.6	17.0	123
Walking/Hiking	40.2	50.0	35.8	4.4	41.2	298
Other	1.2	3.1	1.1	0.3	1.5	11
Likelihood-ratio Chi-Square statistics: 8.66 (p-value: 0.034)						
<b>Gender</b>						
Female	51.5	26.7	46.2	2.3	49.0	345
Male	48.5	73.3	43.5	6.3	51.0	359
Likelihood-ratio Chi-Square statistics: 14.68 (p-value: 0.001)						
<b>Race</b>						
Non-White	9.6	19.7	8.5	1.7	10.5	74
White	90.4	80.3	80.9	7.0	89.5	628
Likelihood-ratio Chi-Square statistics: 5.08 (p-value: 0.024)						
<b>Age</b>						
<= 17	1.7	3.5	1.5	0.3	1.8	12
18 - 24	2.7	7.0	2.4	0.6	3.1	21
25 - 34	14.5	22.8	13.0	1.9	15.4	103
35 - 49	25.0	33.3	22.4	2.8	25.5	171
50 - 64	36.0	26.3	32.2	2.2	35.1	235
>= 65	20.2	7.0	18.1	0.6	19.1	128
Likelihood-ratio Chi-Square statistics: 14.22 (p-value: 0.014)						
<b>Health</b>						
Excellent	30.7	31.7	27.4	2.8	224	31.1
Very good	48.1	36.5	42.9	3.2	335	46.5
Good	18.4	23.8	16.4	2.1	137	19.0
Fair	2.6	6.3	2.4	0.6	22	3.1
Poor	0.2	1.6	0.1	0.1	2	0.3
Likelihood-ratio Chi-Square statistics: 6.92 (p-value: 0.140)						
<b>Education</b>						
Bachelor or above	76.5	54.8	68.2	4.7	74.3	535
Below Bachelor	23.5	45.2	21.0	3.9	25.7	185
Likelihood-ratio Chi-Square statistics: 12.52 (p-value: 0.000)						
<b>Income</b>						
\$0 - \$29,999	4.1	21.8	3.6	2.1	5.7	33
\$30,000 - \$59,999	15.1	27.3	13.4	2.6	16.7	97
\$60,000 - \$89,999	19.8	25.5	17.6	2.4	20.3	118
\$90,000 - \$119,999	22.7	12.7	20.1	1.2	21.9	127
\$120,000 or higher	38.4	12.7	34.1	1.2	35.5	206
Likelihood-ratio Chi-Square statistics: 36.17 (p-value: 0.000)						
<b>Travel distance on trail</b>						
< 2 miles	20.6	51.6	18.4	4.6	24.0	174
2 - 4.99 miles	30.7	25.0	27.3	2.2	29.8	216
5 - 9.99 miles	15.5	12.5	13.8	1.1	15.2	110
10 - 14.99 miles	10.5	7.8	9.4	0.7	10.1	73
>= 15 miles	22.6	3.1	20.2	0.3	20.9	151
Likelihood-ratio Chi-Square statistics: 35.85 (p-value: 0.000)						
<b>Travel time to trail</b>						
0 - 5 minutes	23.1	29.7	20.6	2.6	23.6	171

Variable	Recreational User (% within group)	Utilitarian User (% within group)	Recreational User (% in all)	Utilitarian User (% in all)	Total (%)	Total N
6 - 15 minutes	39.4	40.6	35.1	3.6	39.6	287
16 - 25 minutes	22.8	7.8	20.3	0.7	21.1	153
26 - 45 minutes	6.2	15.6	5.5	1.4	7.2	52
46 - 60 minutes	3.9	4.7	3.5	0.4	4.0	29
> 1 hour	4.7	1.6	4.1	0.1	4.4	32
Likelihood-ratio Chi-Square statistics: 16.27 (p-value: 0.006)						
Mode choice to trail						
Carpooling or ridesharing	1.2	0.0	1.1	0.0	1.1	8
I biked	14.9	34.4	13.2	3.0	16.7	121
I ran/jogged	6.0	3.1	5.4	0.3	5.7	41
I walked	18.4	51.6	16.4	4.6	21.5	156
I drove	58.2	10.9	51.9	1.0	53.8	390
I took the bus or streetcar	0.8	0.0	0.7	0.0	0.8	6
Other	0.5	0.0	0.4	0.0	0.4	3
Likelihood-ratio Chi-Square statistics: 71.60 (p-value: 0.000)						
Number of trails used in the past 12 months						
1 - only this trail	18.4	37.5	16.4	3.3	20.2	146
2 - 3 different trails	39.3	28.1	35.0	2.5	38.4	277
4 - 5 different trails	18.2	12.5	16.2	1.1	17.5	126
More than 5 different trails	24.1	21.9	21.5	1.9	23.9	172
Likelihood-ratio Chi-Square statistics: 12.01 (p-value: 0.007)						
Day on trail						
Weekday	45.3	68.8	40.3	6.1	46.8	340
Weekend	54.7	31.2	48.7	2.8	53.2	387
Likelihood-ratio Chi-Square statistics: 13.06 (p-value: 0.000)						
Visit trail alone or with others						
Alone	35.1	60.9	31.3	5.4	270	37.3
With others	64.9	39.1	57.8	3.5	453	62.7
Likelihood-ratio Chi-Square statistics: 15.97 (p-value: 0.000)						
Visit trail with children						
Yes	16.5	34.8	15.3	1.8	83	18.4
No	83.5	65.2	77.4	3.3	369	81.6
Likelihood-ratio Chi-Square statistics: 4.25 (p-value: 0.039)						
Visit trail with expenditure						
Yes	29.0	38.1	25.8	3.3	215	29.9
No	71.0	61.9	63.3	5.4	505	70.1
Likelihood-ratio Chi-Square statistics: 2.19 (p-value: 0.139)						



**Table 2 Attitudes towards trail use and trail environment**

<b>Statement</b>	<b>Recreational User (% within group)</b>	<b>Utilitarian User (% within group)</b>	<b>Recreational User (% in all)</b>	<b>Utilitarian User (% in all)</b>	<b>Total (%)</b>	<b>Total N</b>
<b>I would commute more by bicycling or walking if trails and bike lanes were better connected to my place of work</b>						
Strongly disagree	7.0	3.3	6.3	0.3	6.6	47
Disagree	12.9	3.3	11.6	0.3	12.0	86
Neither agree nor disagree	24.3	14.8	21.8	1.3	23.7	170
Agree	25.5	36.1	22.9	3.1	26.1	187
Strongly agree	30.2	42.6	27.1	3.6	31.7	227
Likelihood-ratio Chi-Square statistics: 14.36 (p-value: 0.006)						
<b>This trail is attractive and well-maintained</b>						
Strongly disagree	3.1	1.6	2.8	0.1	2.9	21
Disagree	1.4	0.0	1.3	0.0	1.3	9
Neither agree nor disagree	3.1	6.3	2.8	0.6	3.3	24
Agree	34.5	39.7	30.7	3.5	35.5	255
Strongly agree	57.9	52.4	51.6	4.6	57.0	410
Likelihood-ratio Chi-Square statistics: 4.39 (p-value: 0.355)						
<b>In general, I feel safe on the trail</b>						
Strongly disagree	3.1	1.6	2.8	0.1	2.9	21
Disagree	0.6	3.2	0.6	0.3	0.8	6
Neither agree nor disagree	4.1	9.7	3.6	0.8	4.5	32
Agree	33.2	33.9	29.6	2.9	33.8	242
Strongly agree	59.0	51.6	52.7	4.5	58.0	415
Likelihood-ratio Chi-Square statistics: 6.91 (p-value: 0.141)						
<b>Traffic on the trail is free-flowing and not congested</b>						
Strongly disagree	2.8	1.6	2.5	0.1	2.7	19
Disagree	2.5	4.9	2.2	0.4	2.7	19
Neither agree nor disagree	8.6	8.2	7.7	0.7	8.4	60
Agree	41.0	34.4	36.6	2.9	40.8	291
Strongly agree	45.1	50.8	40.3	4.3	45.4	324
Likelihood-ratio Chi-Square statistics: 2.33 (p-value: 0.675)						
<b>Traffic on nearby streets is safe for cyclists</b>						
Strongly disagree	6.0	4.9	5.3	0.4	6.0	43
Disagree	21.4	23.0	19.1	2.0	21.7	155
Neither agree nor disagree	32.5	24.6	29.0	2.1	31.4	224
Agree	27.0	34.4	24.1	2.9	27.9	199
Strongly agree	13.2	13.1	11.8	1.1	12.9	92
Likelihood-ratio Chi-Square statistics: 2.39 (p-value: 0.664)						
<b>Cyclists and pedestrians rarely have conflict</b>						
Strongly disagree	4.9	1.6	4.4	0.1	4.5	32
Disagree	13.2	11.5	11.7	1.0	12.9	91
Neither agree nor disagree	18.2	24.6	16.3	2.1	18.5	131
Agree	43.3	39.3	38.6	3.4	43.6	308
Strongly agree	20.4	23.0	18.2	2.0	20.5	145
Likelihood-ratio Chi-Square statistics: 3.27 (p-value: 0.513)						

## Discussion and Conclusion

The important benefits of using multi-use trails have been recognized from the perspectives of transportation, recreation, and health. These benefits and the corresponding challenges have been motivating researchers and professionals to collect and analyze data on urban trail use at both individual and facility levels. Interact for Health, a health foundation, and Trail-State Trails, a nonprofit trail organization, together conducted an urban trail user intercept survey in 2017 to develop a profile of current trail users in the Greater Cincinnati region. The primary purpose of developing this profile is to support trail planning and management and thus to enhance vibrancy in communities with a regional trail network. Based on this survey, our study presents, analyzes and compares the characteristics, behaviors, patterns of use, and perspectives of recreational and utilitarian users in the Greater Cincinnati region. Among the 734 surveyed urban trail users, 89% of them used trails for recreational purposes while only 8.8% for utilitarian activities. The results from the three analysis approaches reveal significant differences in some socio-demographics and trip characteristics between these groups of users. Most recreational users are female, white, between 35 and 64 years old, well-educated, and with relatively high incomes. These users primarily bicycled and walked on trails, drove less than 25 minutes to trail, and traveled less than 5 miles on trails. They mostly used more than one different trails in the past year, visited trail on weekend with others but not with children. In contrast, most utilitarian users are male, with income of less than \$59,999, walked or biked to trail, and traveled no more than 2 miles on trails. This group of users typically used only one trail during weekdays and preferred to visit trail alone. While recreational and utilitarian users consistently said they are satisfied with the trail environment in terms of safety, traffic, and maintenance, these two groups of users differ significantly in terms of their willingness to commute more by bicycling or walking if the connectivity of trail networks is improved. Utilitarian users appear to be more sensitive to improvements in connectivity; while three-quarters of utilitarian users said they would commute more by walking or cycling if connectivity to their place of employment was improved, only about 50% of recreational users said so. Geographically, the neighborhood context of trail users with different socio-demographics reflected a clustering phenomenon among trail users by race, age, education, and income. Most of the users in urban core areas (e.g., Downtown Cincinnati) are non-white and young with relatively low income.

These differences between recreational and utilitarian users imply the importance of developing corresponding plans and policies to satisfy various needs and balance the interests of trail users. For example, the extremely small portion of non-white trail users and the clustering of non-white and low-income trail users in the urban core indirectly reflects the first-last mile issue (defined as the difficulty in getting people to a transportation station from their residential location and the difficulty getting people from the station to their final destination) for these groups. One possible explanation that people living in these areas do not use trails very often is that they lack access to transit and private vehicles for their first-last mile outside the trail network. In addition, the large number of recreational users who access trails by driving raises environmental conflicts while promoting physical activity. Understanding these different needs and interests is important in developed strategies for local governments and nonprofit organizations to evaluate, manage, and improve the multiuse trail networks.

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