

# 2021 NRPA

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**2021 NRPA Annual Conference**  
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**Abstracts from the  
2021 NRPA Research Sessions**

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## Preface

Welcome to the 44th year of research sessions at the National Recreation and Park Association (NRPA) Annual Conference. As we look forward to the future where we can fully gather in person again, we are grateful for the opportunity to again provide virtual/on-demand presentations of this year's NRPA Research Sessions (NRS). Though we are unable to share the research in person, we hope you find this book of abstracts a beneficial way to review a sample of the existing research related to parks and recreation.

The NRS abstracts are intended to both advance parks and recreation research and provide practical application for parks and recreation professionals and providers. As such, each abstract contains an overview of the research and an "Application to Practice" session that details how the research is relevant to the day-to-day management of parks and recreation programs and facilities. As you engage with the research, we encourage you to reach out to the author(s) with follow-up questions related to the research or how the research can be applied to parks and recreation administration. Our goal is to continue to strengthen the research-to-practice connection and ensure that research is provided in the service of the profession and the overall benefit of society. We believe that the research presented here does that, and hope you will continue the conversation by reaching out to the authors. Contact information for the lead author is provided at the end of each abstract.

The organization of NRS is a collaborative effort. We are especially grateful for the work of Kelly Moffet, Senior Education Manager at NRPA. Her assistance, dedication, and responsiveness has been invaluable. We also extend our thanks to the reviewers, whose commitment to service and the profession is much appreciated. This year, in addition to academic reviewers, we also asked parks and recreation professionals to review the abstracts. This provided an extra layer of rigor to ensure that the research presented here has practical application to the field. Their names are listed on the following page. And of course, none of this would be possible without the many researchers who submitted their work for consideration, and attended to the suggested edits of the reviewers. Thank you.

**Eric Legg, Ph.D.**

Arizona State University

**Bob Brookover, Ph.D.**

Clemson University

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## **APPLYING ENVIRONMENTAL VALUES INTO THE DEVELOPMENT OF MUNICIPAL RECREATIONAL DESTINATIONS**

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### **Introduction/Rationale**

Successful development and management of municipal nature-based recreation areas require parks, recreation, and cultural services have a comprehensive understanding of community members' values. The purpose of this study was to investigate the utility of understanding stakeholders' environmental values in the development of a new nature-based community recreation area. We utilized Kellert's Environmental Values Typology (1997) as a conceptual framework for investigating and discussing the range of attitudes toward the natural world. This framework has nine basic ways people attach meaning to and derive value from nature-based community recreation areas.

**Study Site:** Meals Hill is 184 acres of public land located near the Valdez Ferry Terminal in Valdez, AK. The land is permanently protected by a conservation easement, ensuring it will remain open to the public for recreation and that its valuable wildlife habitat will remain undeveloped. The Meals Hill property is a significant landmark with environmentally diverse habitat, and it has the potential to be a recreational destination for the City of Valdez. In addition to its' environmental significance, Meals Hill holds a rich historical significance for the City of Valdez. Likely utilized by Alaska Native Chugach and Ahtna tribes, Meals Hill has contributed to the development of Valdez since the 1898 gold rush. In November 2019, the Great Land Trust purchased the property from the Port of Valdez using Exxon Valdez Oil Spill (EVOS) Trustee Council funds and subsequently transferred the land to the City of Valdez. In accordance with the conservation easement, the City plans to transform Meals Hill into a non-motorized recreational area for community members, visitors, and all stakeholders.

### **Methods**

Data collection occurred between August 10<sup>th</sup> and October 18<sup>th</sup> of 2020. Mixed method surveys were administered in electronic-form. To investigate stakeholders' environmental values, respondents were asked to explain what they value most about the natural areas where they recreate. To further explore differences in recreation participation groups, we asked respondents to indicate what recreational activities they currently participate in and those in which they feel should be prioritized in the development of Meals Hill. A broad range of distribution methods were integrated to ensure a diverse stakeholder and visitor sample (e.g., Meals Hill Master Plan Development webpage, 2,025 postcards delivered in community members' post-office boxes, public radio broadcasts, poster-style advertisements displayed at the community theater, local symposium announcements). Following the completion of the data collection period, all completed surveys were reviewed by two researchers and cleaned for missing and un-reliable data. Respondents' environmental values were coded using Kellert's

typology of environmental values (Kellert, 2005\*). Two researchers each used the predefined value categories to code responses. Codes were compared and discrepancies were addressed to determine final code categories.

## **Results**

At the completion of data cleaning, the final sample size was 428 completed surveys. *Naturalistic* was the most common value represented (N=91) in respondent answers indicating that many stakeholders value the natural environment because it allows them to have a natural experience and connect with nature. A similar number of respondents (N=89) expressed an *Aesthetic* value of nature indicating that they value the natural environment because of its beauty. Many respondents (N=52) expressed a *Dominionistic* value which indicated that they value the natural environment because of their ability to control it. Fifty percent or more of stakeholders indicated that hiking (73%), nature viewing (69%), snow shoeing (55%), wildlife viewing (53%), and mountain biking (50%) should be prioritized in development. We further utilized respondents' current recreational participation to investigate differences in environmental values. Unique environmental values were identified within highly desired recreational activity groups.

## **Application to Practice**

The findings from our study indicate Kellert's Environmental Values Typology produced applicable data with which to guide the development of a park masterplan. Respondents' indicated unique environmental values based on the recreational opportunities they participate in (e.g. mountain biking, wildlife viewing, snow shoeing). These findings support further application of this framework and collection of environmental value data from stakeholders in future development of nature-based recreation areas. By gaining a greater understanding of the attached meaning to and derived benefits from natural environments in diverse communities, recreation professionals can design desirable opportunities sustainable for the long-term.

## **Application to Practice Outcomes:**

1. Knowledge of Kellert's Environmental Values Typology.
2. Awareness of practical applications associated with environmental value data.
3. Awareness of communication strategies associated with environmental value data.

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# **BODIES OUT OF PLACE: THE BLACK EXPERIENCE OF PUBLIC SWIMMING IN THE UNITED STATES**

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## **Introduction**

A long history of Jim Crow pools, violence, segregation, and lack of access to public swimming facilities, has served to alienate Black people from their own rich aquatic history (Dawson, 2018). A historically segregated approach to swimming in the US has led to reduced cultural capital, exclusion from public swimming pools, and the unacceptable fact that many Black people have not had access to safe swimming places to learn how to swim (Gadbury, 2018). Systemic white privilege within public swimming facilities has contributed to a disproportionate number of Black people being unsafe around water (Gadbury, 2018). Black children are 5.5 times more likely to die in swimming pools than white children (Gadbury, 2018). For perspective, if ten children a day on average were to drown in the United States, six of those ten children would be Black (Gadbury, 2018). The CDC has referred to this as a national emergency. Using historical research as a guide to the social history of swimming in the United States, this study applies Nirmal Puwar's critical BoP race theory to question the neutrality and safety of public pools for Black bodies (Puwar, 2004).

Black swimmers have been historically subjected to systemic racial discrimination, and often racially motivated violence, when attempting to access public swimming facilities in the United States (Wolcott, 2012). In order to ensure safe and equitable access to public swimming pools, aquatics professionals must understand the systemic forces that have created an environment of violence, tension and exclusion for Black swimmers in public pools. For Black swimmers in the United States, especially Black youth, public access to safe and welcoming public pools continues to be problematic. In 2015, excessive police force was used at a high school pool party in McKinney, Texas. Video of a white police officer sitting on a Black girl's neck went viral, causing public outrage (Combs, 2019). In 2009, the Valley Hunt Club in Philadelphia was charged with racial discrimination after the pool denied access to a group of young Black children participating in a summer day camp (Williams, 2014). These recent examples of racially motivated violence and discrimination at public pools demonstrates the continued need for awareness and vigilance within the aquatics profession.

## **Methods**

Black bodies in swimming contexts has come to signify what social historian Nirmal Puwar (2004) terms Black Bodies out of Place (BoP). An important extension of critical race theory, BoP questions the neutrality of the human body, and considers systemic racism of Black bodies within certain physical spaces as signifiers of heightened tension, violence and segregation (Puwar, 2004). The BoP framework applied to historical research on public swimming reveals a long and sustained narrative of racial violence and segregation for Black bodies in American swimming pools (Wolcott, 2012). Various social histories of swimming were analyzed from a BoP perspective to discover how Black bodies have been systematically segregated and discouraged from access to public swimming facilities in the United States (Dawson, 2018; Banks, 2014; Wolcott, 2012; Wiltse, 2007). Current drowning statistics of Black children, the McKinney Pool incident, and exclusion at The Valley Hunt Club in Philadelphia, were examined as aspects of BoP operating within contemporary swimming culture

(Combs, 2018). Application of the BoP framework to current events and statistical data on Black drowning deaths reveals how the public swimming pool continues to represent a racially charged public space for Black bodies.

## **Results**

This research places current drowning statistics concerning Black youth in the United States, and current incidents of violence and discrimination against Black youth in public pool settings, within a larger theoretical framework of BoP historical analysis. Understanding the historical and cultural forces of BoP in public swimming facilities provides aquatics professionals with the groundwork and motivation to advocate for change. Aquatics professionals must work to ensure safe and welcoming spaces for Black swimmers, and develop specific goals and programming to improve statistics around drowning and water safety for Black youth.

## **Application to Practice**

History has demonstrated the many ways in which Black people were prevented from accessing public swimming facilities. This study offers practical applications for aquatics professionals working to ensure that all swimmers have equitable, inclusive and safe access to community swimming pools. A few examples of applications to aquatics practice include developing learn to swim programs that work over time to grow and train Black youth into future lifeguards and swim instructors, hiring Black management teams at aquatics centers, partnering with school districts to offer low cost or free swim lessons to low income community schools, and partnering with other key stakeholders in community program development such as youth summer camps and after school programs. In addition, aquatic staff training in the segregated BoP history of swimming pools allows for ongoing awareness and development of best practices. Moving towards a future where drowning statistics and access to public pools is no longer a racially systemic problem, aquatics professionals must prioritize equitable and inclusive action.

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## CONSERVATION FOR THE FUTURE: LAND MANAGEMENT ISSUES ON THE PCT

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### Introduction and Literature

From Canada to Mexico, the 2,653-mile Pacific Crest Trail (PCT) passes through California, Oregon, and Washington. Day hikers access the trail regularly and over 7,000 thru-hike permits are issued per year (PTCA, 2019). Popularity of the trail increased after the 2014 movie *Wild* (Williams, 2015), and this impacted land managers' ability to conserve and protect the land. If future generations want to utilize and enjoy the trail, the various land managers in charge of different sections must carefully manage and conserve the land and the wilderness experience. Since the trail crosses multiple jurisdictions managed by a variety of agencies, such as the Pacific Crest Trail Association (PCTA), Bureau of Land Management, National Forest Service, National Park Service, state parks, and local agencies, the best practices for conservation and management of the land is complicated. Each agency manages the land with its own approach to access, trail behavior, education, and conservation. Inconsistencies of signage, education, and rule enforcement vary among the jurisdictions. The purpose of this study was to examine conservation themes of land managers and thru-hikers on the Pacific Crest Trail.

### Methods

Use of the PCT has increased dramatically in the past six years, and this study examined the impact to the environment and hiker experience. Qualitative interviews were conducted with 15 California land managers and 25 PCT thru-hikers who completed the trail in the last five years. To compare answers between land managers and thru-hikers, each interviewee was asked the same set of questions. The questions focused on conservation issues such as trash on the trail, enforcement of rules, and the permitting and education processes. Interviews were recorded and transcribed by the researchers. Constant comparison was used for analysis to find emerging themes. In the open coding process, three independent researchers coded the data to reach an intercoder reliability of approximately 90%. In axial coding, themes were compared by the researchers to find emerging relationships.

### Results

A total of 40 interviews were conducted, 25 with thru-hikers and 15 with land managers. Participants included 30 males (18 hikers and 12 land managers), 9 females (6 hikers and 3 land managers), and 1 individual self-identified as gender flexible (1 hiker). The average age of interviewees was 41.8 and age ranged from 20 to 63 years old. Many themes emerged regarding conservation of the trail including comments about trash on trail, enforcement of rules, and permitting/education on the trail.

*Trash on trail:* Most thru-hikers were not impacted by the very limited trash on the trail and 13 thru-hikers commented they would pick up trash when they saw it. Five land managers acknowledged that thru-hikers tend to be more conscientious towards conservation. One land manager stated that most thru-hikers have an understanding of Leave No Trace (LNT) principles and abuse of the trail “doesn’t come from the thru-hikers, it comes from the general public.”

*Enforcement of rules:* Rules of the trail tend to focus on conservation issues, such as LNT principles and proper use of the trail. Seven land managers said they did not believe the rules of the trail are enforced, and 16 hikers felt the same. This lack of enforcement of permits, camp sites, or fires can cause damage to the environment. However, there may not be a need for much enforcement, as one manager stated that, “people are passionate about the trail and really care about it.” Thru-hikers tended to agree and many explained that the rules of the trail are mainly self-enforced. Said one hiker, “there are sort of like informal checks that some hikers have on other hikers.”

*Permitting/Education process:* Conservation education starts at the permitting level. All thru-hikers apply for a permit. Nine thru-hikers said yes, they believed that the permitting process educated them on trail rules and regulations. One thru-hiker stated that education helps by “empowering others to buy into the system of stewardship and positive land management practice.” Seventeen thru-hikers stated that there was no enforced education and eight mentioned that education is up to the individual thru-hikers. Nine land managers said yes, they believed the permitting process educated thru-hikers on trail rules. Ten land managers mentioned that LNT education needs to be provided to thru-hikers prior to departure. Overall, land managers believed that education is crucial, and one person said, “people always want to do the right thing, sometimes it’s just a matter of education.”

### **Application to Practice**

To understand how to improve conservation efforts on public lands, it is important to listen to thru-hikers and land managers. Information learned from the PCT can be applied to other public lands. Outcomes from this study include increased education for all users of parks and public lands.

Various types of education can make a difference for conservation of the trail. Thru-hikers commented on the advantages of in-person education to solidify their understanding of LNT principles. For example, volunteers at the Southern border were often mentioned as being extremely beneficial to thru-hikers by providing essential safety and LNT education. Land managers should prioritize funding and resources for in-person education on public lands and especially at trailheads or trail crossings. One hiker recommended a trail stewardship program that included LNT ambassadors at trailheads who could educate the public on LNT principles before they hike.

Hikers also talked about a sense of ownership and stewardship of the trail, which mitigated the need for rule enforcement. Public park managers could increase stewardship of their trails by increasing signage that reminds the public of the shared responsibility for the land. Creating a sense of attachment to the land can increase the desire for conservation of the open spaces. Resources and funding should be allocated to educate the general public on trail rules and regulations on any public land. This can be done by providing in-person education, increased signage, and, if a permit is required, education prior to obtaining a permit.

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**PANEL: INTERGENERATIONAL ENGAGEMENT: BRINGING UNIVERSITIES AND COMMUNITIES TOGETHER THROUGH RECREATION PROGRAMMING**

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Katherine Uva, Appalachian State University

Shannon Shanely, Appalachian State University

Morgyn Manzer, Appalachian State University

Shannon Jarrott, The Ohio State University

With an aging population and an interest in improving and maintaining the quality of life of older adults through parks and recreation, one approach to programming is through an intergenerational lens. Intergenerational programs provide opportunities for youth (ages 24 and younger) and older adults (usually 50 and better) to participate in a meaningful activity for mutual benefit (Generations United, 2020). Examples of intergenerational activities include arts, gardening, reverse mentoring, social visits, and connections using technology. The value of intergenerational programs is that one's participation in meaningful intergenerational programs and relationships may decrease social isolation as well as increase sense of belonging among older adults (Barnes et al., 2004; Seeman et al., 2001). Technology programs such as CyberSeniors allow younger adults to become technology mentors for older adults that improves students' attitudes towards aging and older adults' interest in technology (Leedahl, et al., 2019). Service learning through university courses provides an opportunity for students to engage with local older adults (Turner, et al., 2017). By creating meaningful intergenerational programs, university faculty and recreation professionals have the opportunity to create mutual benefit and exchange between generations. The following three abstracts each address this topic.

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## **PLAYING TOGETHER ONLINE: CYBER-SENIORS AND COLLEGE STUDENTS**

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### **Introduction**

University curriculum often scaffolds learning for students as they progress through our accredited recreation management degree. In addition to allowing students to learn from their peers, we developed an intergenerational program planning opportunity connecting students to local older adults. Cyber-Seniors, a reverse mentoring program that uses technology as a means to connect generations, improves students' attitudes towards aging and older adults' interest in technology (Leedahl et al., 2019). Building upon the Cyber-Seniors program, we developed and assessed the potential for additional intergenerational virtual programming opportunities. Students complete a program planning course that focuses on the planning of recreation and leisure activities through the use of human and natural resources in public, private, and commercial recreation programs. We also offer a leisure and aging course that focuses on the leisure needs and characteristics of the senior citizen with particular attention paid to program development to meet problems inherent in leisure delivery systems for seniors. The purpose of this presentation is to connect findings from our intergenerational classroom experience to outcomes for recreation practitioners.

### **Methods/Results**

Qualitative data from community partners and university students will be collected in the 2021. Students who planned programs for class or participated as Cyber-Seniors mentors as well as community partners of the project will be invited to complete an online survey with open-ended questions inquiring about their experiences. Using thematic analysis (Braun & Clark, 2012), two members of the research team will individually review all responses and then meet to discuss potential themes. Once an initial thematic framework is identified, each researcher will re-code responses into themes. Any discrepancies will be discussed to achieve consensus.

### **Application to Practice**

Regardless of their employer, recreation students will use the same skills across government, non-profit, or private organizations. Being able to create programs or adapt mid-program is a skill necessary for practitioners. Through the teachings of these courses, students are prepared to serve in any given capacity. Due to COVID-19 restrictions, all recreation programs of this study took place in a virtual setting. Recreation management students learned how to utilize various digital platforms, such as Zoom, Google, and other streaming platforms to engage with peers and older-adults. Students had to develop feelings of connectedness, community, and buy-in from participants all online. A simple ice breaker is not so simple with new to Zoom older-adults. From preparing the technology, designating a team member to troubleshoot in real-time with participants experiencing technical difficulties, developing communication tools to encourage and manage engagement in a virtual setting, while delivering a recreation learned invaluable skills. Community partners expressed satisfaction in collaborating with students to provide virtual intergenerational programs, especially during COVID-19 when in-person programming was limited.

## **CONNECTING COMMUNITIES THROUGH INTERGENERATIONAL PROGRAMMING: FOOD FOR A LONG LIFE PROVIDES OLDER ADULT ACTIVITY KITS**

Morgyn Manzer, Appalachian State University

Jill Juris, Appalachian State University

Shannon Jarrott, The Ohio State University

### **Introduction**

As a result of the COVID-19 pandemic, older adults have been forced into social isolation as a needed precaution to protect them from the virus. However, this increased social isolation can lead to loneliness, depression, boredom, and other negative outcomes. With this in mind, the USDA Sustainable Community Program Food for a Long Life adjusted community programming to combat these negative impacts and promote a healthier overall well-being, while allowing older adult program participants to remain safely at home.

Through a Cooperative Extension partnership between the local PACE (Program for All-inclusive Care for the Elderly) program and preschool, Food for a Long Life provided intergenerational programs focused on increasing healthy food access, consumption, and education. Due to COVID-19 restrictions, the Food for a Long Life team shifted programming to meet PACE participants who were remaining safely at home rather than coming to the community center. Through Activity Kits sent to participants' homes, Food for a Long Life found an innovative solution to continue intergenerational ties with a connection to nutrition between home-bound older adults and local preschool students. The recreation program consisted of the creation and delivery of unique monthly activity kits to 120 PACE participants, in Lynchburg, VA. Activity kits varied in topic and activities from month to month, but all had a focus on recreation engagement and nutrition information. The kits also included elements of intergenerational programming such as art projects created by local preschoolers.

### **Methods/Results**

As a best practice to ensure project goals and objectives were being met, brief surveys were sent out along with each kit to be returned during the next visit to assess what participants wanted adjusted in following months to better match participant needs. Qualitative data from interviews with community partners involved in the intergenerational effort will be collected during summer 2021 as a formative assessment to improve future kits and move towards sustainability beyond the life of the grant.

### **Application to Practice**

In a post-COVID setting, senior center or community center directors can utilize themed activities, budget sheets, and best practices shared during this presentation to reach community members who do not attend programming on-site. With online options, practitioners can bring these proven activity kit ideas back to their communities. With activity kits varying in cost and theme, there is a potential match for practitioners to immediately adopt for their communities.

## **BEFORE CONNECTING GENERATIONS: TRAIN YOUR STAFF AND PLAN FOR EVALUATION**

Shannon Jarrott, The Ohio State University

Jill Juris, Appalachian State University

### **Introduction**

Evidence-based intergenerational community programs allow non-familial youth and older adults to participate in shared activities. Even with an understanding of the benefits of connecting generations, recreation professionals need to justify the time and energy required to create an intergenerational program to supervisors and stakeholders. Once there is authority support, where should program leaders turn for staff training specific to this unique participant population? Furthermore, when developing and implementing an intergenerational community program, site staff are often required to measure their outcomes. However, there are limited resources available specific to intergenerational community programs. Over 15 years, Jarrott and colleagues (2019) conducted practice and evaluation research on intergenerational programs resulting in the development of a self-paced course and The Intergenerational Evaluation Toolkit. This presentation will address training and evaluation gaps for practitioners and researchers interested in implementing intergenerational programs in their communities.

### **Methods/Results**

The Intergenerational Evaluation Toolkit (Jarrott, 2019) assists intergenerational community leaders in planning for program evaluation. A national survey of intergenerational program providers (N=298) revealed the need for trustworthy, accessible evaluation resources that could be adopted by persons without extensive evaluation experience. A Delphi panel of 20 intergenerational researchers and practitioners helped to shape the Intergenerational Practice Evaluation Tool, which was incorporated with other proven measures used by intergenerational research evaluators into a toolkit that supports intergenerational program evaluation. Practitioners and educators attending this session will obtain ready-to-implement evaluation plans, tools, and outcome measures.

### **Application to Practice**

Part of the planning process for creating intergenerational community programs is how to train staff and plan for program outcomes. This presentation will connect practitioners with a self-paced online course and evaluation resources to foster staff development of evidence-based strategies that promote positive intergenerational relationships. We will present an updated online training course for intergenerational program leaders. The self-paced course for 3 continuing education units (CEUs) includes three modules to guide learners through (1) assessing their community, (2) planning for healthy partnerships, and (3) incorporating evidence-based strategies in intergenerational programs. Recreation management faculty incorporating an intergenerational service learning or community program into their classrooms may find this course, available through Ohio State University's College of Social Work, a beneficial addition to their coursework to strengthen their students' practical skills prior to graduation.

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# INVESTIGATING THE RELATIONSHIP BETWEEN ACCESSIBILITY OF GREEN SPACE AND ADULT OBESITY RATES: A SECONDARY DATA ANALYSIS

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## Introduction

Obesity is a global public health issue. It is significantly associated with severe health problems and risks such as cardiovascular disease, cancers, diabetes, and premature mortality. Despite the seriousness of obesity-related health problems, the prevalence of obesity has been accelerating every year in the United States (U.S.), affecting individuals in all segments of society. However, there is limited research on how access to green space (e.g., parks and recreational facilities) is associated with obesity rates among adults. While some studies have provided evidence that the accessibility of green space is associated with the reduction of obesity rates among children, there has been little exploration of whether access to green space influences the obesity rate of adults in the U.S. Thus, this investigation of the relationship between access to green space and selected adults living in the State of Indiana is a main objective. We aimed to investigate our hypothesis that there would be a negative association between the accessibility of green space and obesity rates among adults, based on the rationale that adults who can easily access green space are likely to be physically active and, as a result, report low obesity rates.

## Method

*Dependent Variable.* The World Health Organization defined adult obesity as a body mass index (BMI) equal to or greater than 30 kg/m<sup>2</sup>. For this research, the adult obesity rate was calculated as the percentage of the adult population (age 20 and older) that reported a BMI equal to or greater than 30 kg/m<sup>2</sup> as reported in the 2020 County Health Rankings.

*Independent Variable.* Based on previous studies, we defined green space as parks and recreational facilities managed by federal, state, local (e.g., municipal city level), and non-government organizations and schools. Accessibility is a measure of how easily people can reach their intended destination, including such aspects as available transportation, shopping mall, work, and health care facility. Green-space accessibility refers to how many green space are available to residents within a specified distance or time interval. We operationalized accessibility of green space using buffer analysis with ArcMap, which created a buffer area with a specific width around the shape of space. Calculating the accessibility of green space involved three steps. First, we generated a 1-mile buffer zone around such green space as parks and recreational facilities since it was identified as a reasonable representation of an individual's walking distance. Second, we calculated the total coverage of green space including the 1-mile buffer zone by exploiting the dissolve function. Last, we standardized the total coverage of green space for each county as the ratio of total green space to total county area in order to accommodate different county sizes.

*Education Level (Moderator).* Education level was measured as the percentage of adults' educational attainment. Previous researchers found that education level meaningfully influenced the adult obesity rate. Thus, we predicted that the level of education moderates the association between adult obesity rate and accessibility of green space in that higher levels increase the likelihood of using available facilities.

*Control Variables.* We controlled seven social, economic, environmental, and geographical factors, which simultaneously influenced our focal independent and dependent variables: (a) county population (the *United States Census Bureau*), (b) county area (geometry calculation in ArcGIS), (c) unemployment rate (percentage of the population ages 16+ unemployed but seeking to work, *Bureau of Labor Statistics*), (d) median household income (the Small Area Income and Poverty Estimates [SAIPE] program of the *United States Census Bureau*), (e) percentage of females (the *United States Census Bureau*), (f) food insecurity (percentage of households lacking adequate access to food, Core Food Security Module of the Feeding America survey) and (g) physical inactivity (percentage of adults ages 20+ reporting no leisure-time physical activity, the Behavioral Risk Factor Surveillance System from *United States Diabetes Surveillance System*).

## **Results**

We conducted a multiple regression analysis to calibrate the unique effect of (1) the focal independent variable and (2) the interaction between the focal independent variable and the moderator. We used heteroskedasticity-robust standard error to deal with heteroskedasticity. We log-transformed two skewed variables: Green Space Access(GS access) and Population. We mean-centered the focal independent variable and moderator to reduce multicollinearity and enhance interpretability of the moderating effect. Lastly, we estimated variance inflation statistics to check multicollinearity. The overall model was significant:  $F(10, 81) = 5.04$ ,  $p < .01$ ; predictors explained 27.2% of the variance. Table indicated that a county's GS access was associated with a reduction in the adult obesity rate ( $b = -2.881$ ;  $p < .05$ ). More importantly, the interaction between GS access and education indicated that the effect of GS access on reducing adult obesity became greater as education level increased ( $b = -0.188$ ;  $p < .05$ ), suggesting that education level magnified the effect of GS access on reducing the adult obesity.

## **Application to Practice**

This study's findings provide important new policy implications regarding obesity reduction. First, this study found that accessibility of green space serves as a strong predictor of reduced obesity rates among adults, suggesting that adults who have better (vs. poor) access to green space are less likely to experience obesity. In addition, the negative association between the accessibility of green space and the obesity rate among adults was stronger (i.e., more negative) for counties with higher average education levels.

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**Table 1.**

*Multiple Regression Analysis of the Association Between Accessibility to Green Space and Adult Obesity*

<b>Dependent Variable: Adult Obesity%</b>	<b>Model</b>
GS Access (log)	-2.881** (1.390)
Education	-0.054 (0.052)
GS Access * Education	-0.188** (0.081)
<b><i>Controls</i></b>	
Population (log)	2.728*** (0.881)
County Area	-0.000** (0.000)
Unemployment	1.449* (0.846)
Median Income	-0.000 (0.000)
Female	0.096 (0.350)
Food Insecurity	-0.734* (0.374)
Physical Inactivity	0.253** (0.124)
Constant	27.124*** (3.496)
N	92
R <sup>2</sup>	0.272
F-Statistics	5.040***
<i>Note: Standard errors are in parentheses *** p&lt;.01, ** p&lt;.05, * p&lt;.1</i>	

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# **“IT JUST CHANGES MY MOOD”: CHILDREN’S EXPERIENCES OF BIKING IN THE CONTEXT OF COVID-19**

Erin Sharpe, Brock University

## **Introduction**

It is near to impossible to overstate the impacts of the COVID-19 pandemic on children’s lives. Certainly, the global pandemic and the resulting ‘lockdown’ responses instituted a ‘new normal’ in terms of where and how children engage in everyday activities. Research has reported marked declines in children’s physical activity and mobility, and detrimental impacts on children’s mental health due to increased social isolation. However, there is also some evidence pointing to ways that children have been adapting their everyday lives to the ‘new normal’ and managing and striving for physical and mental well-being in creative ways.

For example, the resurgence of interest in bicycling through the pandemic hints at one way that children have been creatively striving for physical and mental well-being through the COVID-19 pandemic. Indeed, one of the notable trends associated with the COVID-19 pandemic has been a ‘bike boom’, as evidenced by increases in sales, ridership, and mileage on bikes. This comes after a generation of decline of children’s participation in bicycling, even though biking tends to be imagined as an essential activity of childhood (Cox, 2019; Dauncey, 2012).

In this research we investigate children’s experiences of bike-riding in the context of the COVID-19 pandemic. Our interest was to hear directly from children about their experiences of biking in relation to navigating life and their physical and mental well-being in the context of the COVID-19 pandemic. To this end, we held semi-structured interviews with 14 children between the ages of 10 – 16 who indicated that they were regularly riding bicycles (at least once a week). Interviews were held in May and June 2020, which were the initial weeks of the first stage of provincial reopening following a 12-week province-wide stay-at-home order that included the closure of schools and the cancellation of all extra-curricular programs and activities.

## **Methodology**

Interpretive Phenomenological Analysis (IPA) served as the guiding methodology for this research. As a method with its roots in phenomenology, IPA is a particularity useful research approach for understanding the meaning participants place on experiences and events (Smith & Osborn, 2015). Interviews focused on their experiences of the COVID-19 pandemic and lockdown, and their involvement and experiences with biking both prior to and during this period. Interviews were held via videoconference and lasted between 30 and 55 minutes.

Data analysis followed the IPA procedure outlined by Smith and Osborn (2015), which follows a process of the analyst engaging first in open textual analysis of a transcript, then identifying essential qualities of experience as initial themes and clustering themes according to initial categories. This process is repeated with all interview transcripts so that convergences and divergences across experiences can be identified, and it culminates with the analyst identifying superordinate themes (presented below).

## **Findings: Children’s Experience of Bicycling in the Context of COVID-19**

*Biking as Physical Freedom and Escape:* To kids, biking was associated with the experience of freedom – an experience they associated with notions of choice, control, and escape. In context of the COVID-19 pandemic in which their lives had been collapsed into the

singular space of the home, biking afforded a physical escape from the confines of home, but also a break from the monotony of routine and from family with whom they spent (too much) time. Biking afforded children more freedom to do what *they* wanted, rather than what others wanted them to do. Tara (age 12) explained: when biking “*I get to go places that I wouldn't normally get to go when I'm with other people. And then I get to choose where we go.*” Feelings of freedom were most strongly associated with riding alone, rather than with friends or family. Nicholas (age 10) explained: “*When I'm biking with just [younger sibling], I have to go really slow or with [friend], it's not as fast. But I like going by myself because then I like being alone sometimes and it's nice to go at my own pace and where I want to go.*” For Taylor (age 12), riding alone was “*my own little bubble...it feels like freedom without siblings, where I'm able to do what I want.*”

*Biking as Mental Freedom and Restoration:* Along with the physical freedom, kids associated a feeling of mental freedom – the opportunity for “thinking freely” (Rybråten, Skår, & Nordh, 2019) – with the time they spent on their bikes. Biking offered them an opportunity to be alone with their thoughts or, alternatively, to not think at all. The feeling of mental freedom was most apparent when riders rode by themselves rather than with friends or family. Ryan (age 15) explained: “*When I'm with someone, I'll be talking and like just riding and like with that in my awareness or whatever. But when I'm alone, I'm just going with whatever's in my head. It's different. It's weird to explain.*” Rybråten, Skår, and Nordh suggest that mental freedom is fostered by the mentally absorbing and flow-like qualities of the experience. They also suggested that these experiences produce feelings of mental restoration. The children we interviewed similarly described feelings of mental restoration from biking, for example how going for a bike ride helped to settle feelings of frustration or anger or open up feelings of happiness. Stephanie (age 12) explained bicycling as a mood-changer: “*When I go on bike rides, I was like, kind of in a bad mood. If I'm angry at someone; if I'm sad; if I'm frustrated. Just flick a switch. I feel like when I go on bike rides, it's like, frustrated to happy or angry to confident or something like that. And then, I don't know how it works, but it just boosts my mood, every time I go on a bike ride. And then it is a great day...I feel better than when I left. Because usually when I leave, I feel not happy or not a good feeling when I feel good feel like a positive feeling. My life is great.*”

### **Application to Practice**

Our analysis of children’s experiences of bicycling in the context of the COVID-19 pandemic highlights (a) the agentic role of children in striving for their own physical and mental well-being; and (b) the importance of independence to children’s experience of bicycling as physically freeing and mentally restorative. Beyond the pandemic, we encourage practitioners to consider these findings when planning opportunities for children’s biking and more broadly in the planning of spaces, programs, and activities for children in a recreation and leisure context.

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# **“IT’S PRETTY HARD TO MAKE FRIENDS OVER A ZOOM MEETING ROOM”: UNDERSTANDING RECREATION EXPERIENCES OF YOUTH WITH TYPE 1 DIABETES DURING COVID**

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Ryan Malpaya, Old Dominion University

Eddie Hill, Old Dominion University

Justin Haegele, Old Dominion University

## **Introduction and Literature**

Participation in Out of School (OTS) programs can provide significant benefits for youth living with type 1 diabetes (Allen et al., 2021; Hill et al., 2015; 2019). For example, participation in medical specialty camps, which are a variant of the traditional camp models, can provide youth with the ability to learn, explore, build confidence, and bond with peers who share the same unique, chronic condition. Unfortunately, the COVID-19 pandemic, and associated social distancing recommendations and requirements, have led to the cancelation of many youth developments programs, including medical specialty camps and other OTS programs designed for youth living with type 1 diabetes. The purpose of this study was to explore how youth with type 1 diabetes make sense of their altered recreation environment as a result of COVID-19.

This study was conceptually grounded in the concept of resilience (Hill et al, 2007). Risk factors and risk-related life events are processes that encourage adverse life course outcomes (Fraser et al., 1999, p. 133), while protective factors are environmental or individual characteristics that modify risk by directly reducing disorder and dysfunction. Resilience can be described as the characteristics that can enhance an individual’s ability to cope, adjust, and respond to problems (Brown et al., 2012). Literature supports the ability of medical specialty camps to foster resilience among youth, but during COVID-19, social interaction such as camps, have been severely limited (Hill et al., 2019; McAuliffe-Fogarty et al., 2007; Taylor et al., 2012).

## **Methods**

This study was informed by an interpretive phenomenological analysis (IPA) research approach, which is concerned with the participant’s lived experience. Theoretically derived from phenomenology, hermeneutics, and ideography, IPA is interested in interpreting particular experiential phenomena (Smith et al., 2009). In this study, the phenomenon of interest was the recreation experience of youth with type 1 diabetes during COVID-19. The participants were three youth (two male, one female; one African American, two Caucasian) with type 1 diabetes. Each participant completed one semi-structured interview using Zoom, ranging from 25-35 minutes. Each of the youth previously participated in a medical specialty OST program, allowing them to reflect on their prior lived experiences and how those experiences have changed due to COVID-19 regulations. After completing the data collection process, transcripts were thematically analyzed using a three-step process. This process included (1) immersion and initial noting of the transcript at the singular case level, (2) the reduction of data into emergent themes within the case, and (3) the identification of recurring patterns across all three cases.

## **Results**

Four themes were constructed that described the youth’s experience as they navigated risk and protective factors of resilience due to COVID-19 regulations. The first theme navigation

of the virtual school environment highlights the participants' experience with one of the most significant changes within their lives amidst COVID-19, school attendance. For example, Cleo explains, "Because like, if I'm doing schoolwork, I'm like, 'well I gotta do this, and then this, and I gotta do this and then that' like I mean I gotta do the dishes, and then go [clean] my room, and I gotta do this assignment and just stuff like that... Especially since I'm at home because I'm like, 'I know I can do it now. But I also need to do this'. Because when I was in school, I could do all the schoolwork and then come home and do chores and stuff." The new [time] structure created barriers to recreate like they did before COVID-19. The second theme, an increase of independence, depicts the participant's reflection of their amplified independence within their altered environment attributed to the COVID-19 protocols in place. Jared shares, "Before COVID-19, you really didn't have that much independent time. But now you do." Some of the youth indicated with more independence came more responsibility and possibly creating another barrier to recreate. The third theme, the role of relationships, highlighted protective factors such as positive relationships within the youth's altered environment. For example, Ivan shared, "it's pretty hard to make some friends over Zoom meeting." The final theme, the accessibility of technology, depicts technology's availability within participants' experience for recreation and well-being. For example, Cleo explains, "I mean, I've kind of gotten used to it now, and I'm not going to see them, and I'll text them every now and then." Using the conceptual framework of resilience, presence of compensatory protective effects including insight, independence, fulfilling relationships, initiative, creativity, humor, and the capacity to "distinguish good from bad" (Fraser et al., 1999, p. 135) were highlighted in the participants' reflections about their experiences. The youth described how protective mechanisms, such as family support, engagement in positive relationships, increased independence within an altered environment, and increased technology function was perceived while experiencing risk-related life events (COVID-19 pandemic) and chronic illness.

### **Application to Practice**

The American Diabetes Association's three-year study of diabetes camp benefits indicates improvements in self-confidence, diabetes-related stress, knowledge of diabetes management, and overall diabetes management (American Diabetes Association, 2015). According to the participants, communication is one aspect that remained consistent before and during the pandemic due to technology. Consistent communication helps the participants maintain healthy relationships with their family and peers, but there were still barriers to recreation (e.g., except for gaming), more than before. Communications skills are often taught via recreation experience, something practitioners can highlight during these experiences. One significant change that the participants have observed is the increase in their independence in maintaining their blood sugar levels, aligning with research in resilient youth (Brown et al., 2012; Hill et al., 2015; Williams et al., 2013). Practitioners can also use this medical information to better understand the psych-social side of recreation among participants with diabetes. Most participants discussed their challenge of going to the nurse's office for their blood sugar checks before COVID-19, and how the pandemic encouraged them to increase their independence, which could transfer to other parts of life (e.g., identify new forms of recreation, chores, etc.).

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# **MAKING VIRTUAL COMMUNITIES WORK FOR YOUR COMMUNITY**

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## **Introduction and Rationale**

Park and recreation professionals are tasked with the challenge of keeping up with today's ever-changing technology, especially given that the current COVID-19 pandemic has shed light on the value of online programming and virtual communities during this time of reduced face-to-face programming. Although some practitioners feel a larger effort should be made to focus more on face-to-face program implementation, many believe that virtual programming is here to stay and that technology is one of several programmatic tools available and should continue to be used to positively enhance current and future programs (Duerden, Aaron, & Cromwell, 2011).

Additionally, professionals should consider technology as a way to reach community members and potential program participants in order to increase community involvement. One way this might be accomplished is via the formation of leisure-based virtual communities designed and fostered by park and recreation agencies. Virtual communities refer to a group of individuals for whom communication is facilitated through computers, gaming devices, or other internet-based mediums (Ridings, Gefen, & Arinze, 2002). For example, communities formed utilizing the Facebook groups function. Virtual communities are increasing in popularity with the advance of technology, new forms of socialization, and the current pandemic. However, even though virtual communities have been around for over thirty years (Ridings, Gefen, & Arinze, 2002), they have not been commonly adopted into the park and recreation professional "tool kit" in such a way as to be seen as valuable in program delivery or in reaching community members to foster stronger community connections and involvements. Therefore, the purpose of this study was to explore the perceptions of benefits and motivations among participants of a leisure-based virtual community. This insight can allow practitioners to better assess the usefulness of this technological tool in designing programs and in attracting participants.

## **Methods**

This study used a qualitative methodology, Netnography, which is geared toward understanding online experiences. Netnography is a specialized form of ethnography adapted to the unique environment of computer-mediated communication (Kozinets, 2010; 2015) and was used to explore the perceived benefits and motivations of members of the virtual community, The Hogwarts Running Club (HRC). The HRC was an ideal study setting due to the popularity of the community (over 16,000 members worldwide) and the leisure-based nature of the community (HRC, 2018). The HRC virtual interactions took place via a Facebook group where the focus of discussion was on Harry Potter and running. The sample for this study consisted of 2,134 posts collected over a six-month time period (Wu & Pearce, 2014). Analysis of the data utilized an inductive approach to build up individual observations that provided a holistic representation of the dataset (Kozinets, 2010; 2015).

## **Results**

Data analysis revealed three primary categories of perceived benefits and motivations among the Facebook posts collected: 1) improved physical health, 2) improved mental health, and 3) social and emotional support. Participants indicated that their participation in HRC

community events and the support and encouragement they received led to these perceived benefits.

### **Application to Practice**

As many park and recreation agencies have commitments to improve quality of life for their constituents, facilitating a leisure-based virtual community might be one avenue of doing so, as the finding of this study suggest. One means to apply the findings of this study is to use the structure of Self-Determination Theory (SDT) to formulate recommendations for practice. SDT has been used to understand individual behavior related to innate human needs and resulting benefits to well-being (Ryan & Deci, 2017). The findings of this study support this theory and extend current literature focused on face-to-face leisure settings to now include virtual leisure settings as places to meet human needs of autonomy, relatedness, and competence.

**Autonomy-building in flexibility and choice:** Autonomy is defined as the need to be an agent of change in one's own life and to feel control over decisions we make. In practice, the programmatic structure of the HRC demonstrated ways to incorporate elements of choice into a supportive community structure. For example, the nature of the virtual races offered not only gives participants the option to participate or not, but gives participants the control over when and where they will complete the race distance. For many members initially entering the running world, having the option to schedule the race on their own time and in their own space can be empowering. An agency wishing to capitalize on this should look to build this level of flexibility into their own virtual community, possibly in the design of community activities, discussion topics offered, or even the chance to utilize the virtual space to connect in-person.

**Relatedness- building in opportunities to belong:** Relatedness is described as the universal need to interact with others, care for others, and feel cared for in return. Study findings suggest the importance of promoting positive social interactions to the success of a virtual community as social support facilitated engagement in running and in the virtual community. Professionals seeking to establish virtual communities should consider ways to foster feelings of relatedness in their own programs and virtual communities. For example, agencies might consider providing opportunities for meaningful identity expression, establishing community policies that members are expected to be supportive, and utilize theming to facilitate positive relationships through shared interests.

**Competence- building in opportunities to achieve:** Competence is described as the process of working toward bettering oneself and seeking to control our experiences and outcomes of that process. HRC discussions regularly celebrated members' progress and accomplishments. In terms of practice, park and recreation professionals wishing to incorporate elements of competence into their own virtual community should consider following the model set forth by the HRC. For example, the HRC community has been structurally designed to incorporate opportunities for competence by giving participants the opportunity to earn achievement awards (race medals) or to work through levels of growth and participation with a completion award (Perfect Prefect status).

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# **PERCEIVED BENEFITS TO AND PERCEPTIONS OF ALL-FEMALE (GENDER-CENTRIC) OUTDOOR RECREATION ADVENTURES**

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Katie Gennarelli, Delta State University

## **Introduction**

Literature suggests there is an increasing number of people involved in outdoor recreation adventure (ORA), and participation is growing in some demographics, but not all – specifically female involvement (Ewert, Gilbertson, Lou, & Voight, 2013). With unequal demographic growth in ORA, it is important to assess motivating factors of and perspectives to female participation. Some researchers suggest women approach the world differently than men, and may not experience adventures without being aware of the boundaries their gender and body capabilities reveal (Kruger, 2016). Participation in ORA has the potential to evoke physical and personal triumphs, and even though women are seeking the same outcomes, they are reluctant to participate in ORA programs (Voight, 2004). Despite the reluctance, data suggests female participation can originate through intrinsic motivations, such as inner challenges and achievements, or from external factors, such as family or friends they trust. Motivations align with the ‘Adventure Model’ stating, “that as an individual’s engagement increases, there will be an increase in skill, frequency of participation, and that motivations being to be internal rather than external” (Ewert, Gilbertson, Lou, & Voight, 2013, pg. 16). This research sought to uncover motivations and benefits to and perceived barriers of women pursuing a ‘mega’ adventure using LTPA and gender-centric leadership as a platform to acquire skills abilities to hike the Hermit Trail in the Grand Canyon, considered a ‘mega-adventure’.

## **Rationale**

The research studied: 1) aspects of motivational influences that support female participation in outdoor recreation adventure choices, 2) perspectives and group dynamics associated with an all-female backpacking expedition, and 3) the use of a mega-outdoor adventure expedition as a training goal and tool to enhance physical fitness training during leisure-time physical activity (LTPA). Through this research, anticipated outcomes would to inspire and empower women through: a) heightened confidence, b) enhanced outdoor skill acquisition, and c) learned risk management and assessment strategies. From post-group interviews, the study showed positive connections were established supporting the notion that all-female, gender-centric expeditions can provide an accepting and inclusive outdoor adventure education environment, and allow females to feel empowered and able to communicate and lead and participate in ORA without reservations or inhibitions.

## **Methods**

Using a mixed methods approach, data was gathered from nine participants (N=9) using a modified version of the Leisure Motivation Scale (LMS) questionnaire (Beard & Ragheb, 1980). The LMS consists of 48 questions assessing motivational factors associated with participation influences surrounding outdoor recreation adventure into four categories: 1) intellectual, 2) social, 3) competence-mastery, and 4) stimulus-avoidance. Face-to-face, unstructured interviews pertaining to shared experiences and motivation, barriers, and LTPA progress, as well as researcher-based and conducted observations the group dynamic impact were executed pre-expedition, during the expedition, and post-expedition for evaluative purposes. Researchers

evaluated observable changes in teamwork strategies, bonding relationships, skill acquisition, self-confidence, and comradery among the group.

## **Results**

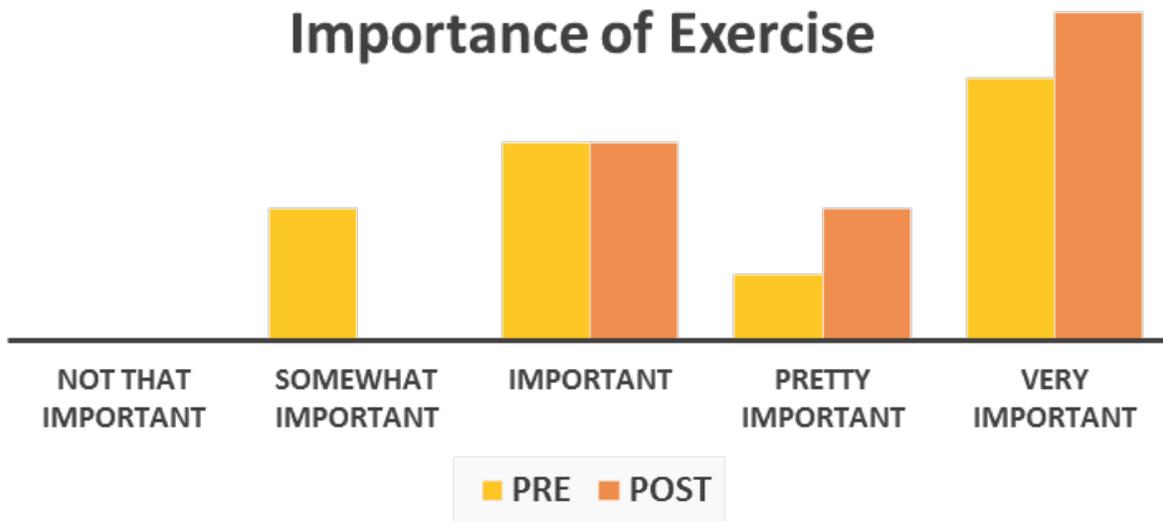
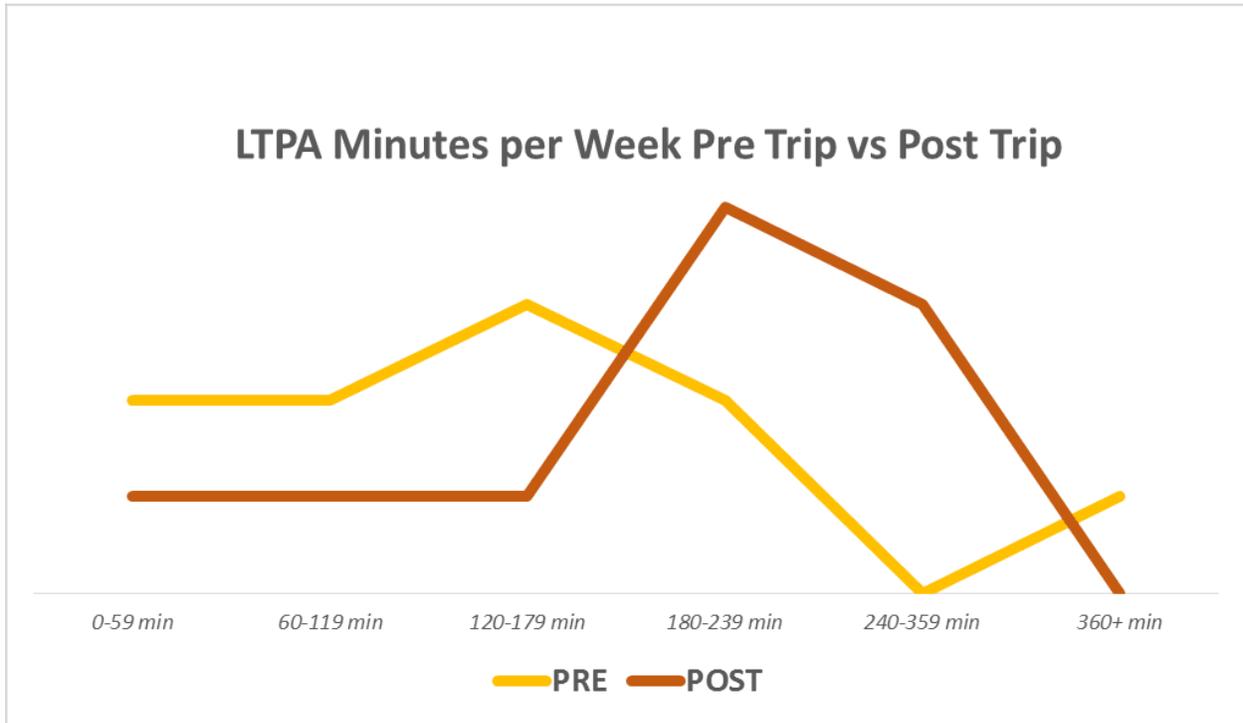
The nine women group were composed of 70%: 18-24-years-old, 10%: 25-30-years-old, and 20%: 31-45-years-old. Regarding the analysis of perceived importance of exercise, 50% of participants responded pre-expedition with exercise being somewhat important to important, yet post-expedition, participants responded with 80% that exercise is pretty to very important when participating in outdoor adventure recreation pursuits. A self-assessment of perceived skill level was conducted with 60% pre-expedition responding as amateur to novice in outdoor skills, yet post-expedition, 75% responded with their skill acquisition was at novice or skilled, shifting perceived skill level nearly from low skill to highly skilled. From post-expedition interviews three to four weeks after, all the participants shared similar perspectives when reflecting on the experience. Participants stated they, “felt empowered and listened to” when making critical decisions on the trail. Several stated, “it was refreshing to be with others that looked like you, felt like you, acted like you, and shared the same feelings as you.” Other participants stated, “I appreciated the fact that I felt as though I could speak up, ask questions, and provide my thoughts and perspectives without feeling ashamed or embarrassed by males.”

## **Application to Practice**

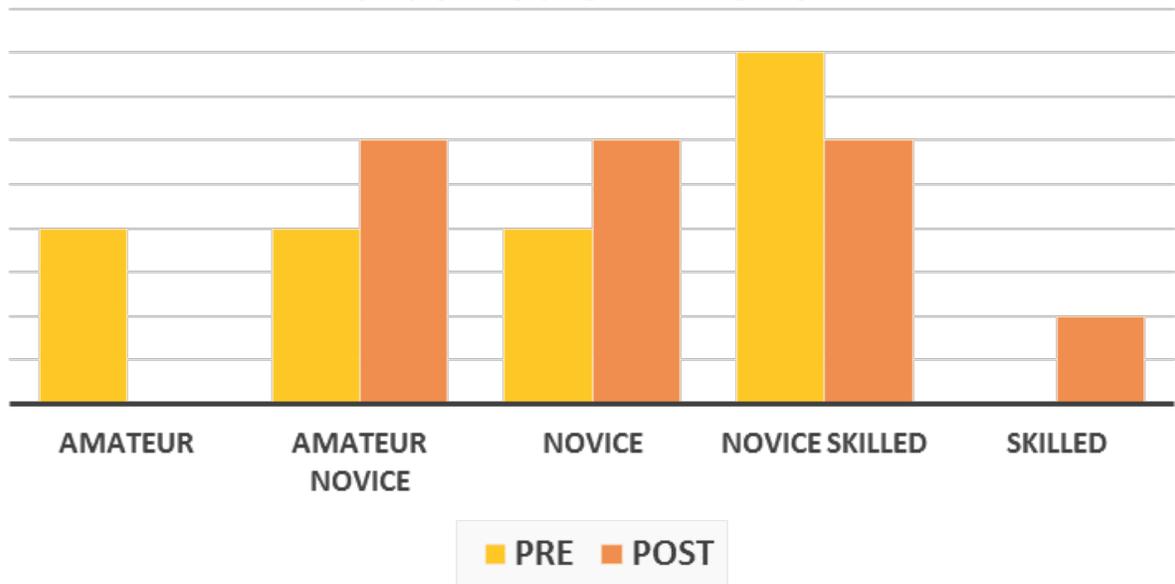
There were two practical goals of this study: 1) was to empower females through ORA and foster healthy leisure-time physical activity choices among females. The data showed positive results between the importance of exercise in the pre- and post- evaluations, suggesting exercise was perceived more important post expedition. Further data showed participants increased their physical activity participation after the expedition. 2) Through this experience, the researchers wanted to better understand motivational implications that could be transferred into programming; and help to bridge the gender adventure gap through skill acquisition and leadership opportunities using outdoor adventure recreation as a platform. Post expedition survey results yielded thematic key phrases and perspectives such as: positive experience, encouraging group dynamic, comfortable setting, sense of life-changing accomplishment, pushing personal limits past perceived capability, and extremely empowering. In the end, the researchers’ practical application intent is twofold; 1) to allow women positive, yet challenging experiences they can transfer the empowerment and capability into everyday life; and 2) to develop conversation and narrative surrounding the opportunities for women to garner the technical skills and leadership abilities needed to lead, guide, inspire, and empower other female outdoor adventure recreationalists among a male-dominated activity.

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**Tables and Figures**



## Perceived Skill Level



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# **THE ECONOMIC IMPACTS OF WATERPARKS FOR RURAL COMMUNITIES: A KENTUCKY CASE STUDY**

Stephen Sims, City of Somerset, Kentucky

Michael J. Bradley, Arkansas Tech University

James N. Maples, Eastern Kentucky University

Curtis Clemens, Gallaudet University

## **Introduction**

Currently, there is limited amount of research that examines how waterparks affect local communities, especially rural communities where waterpark development is often a significant investment given less available funds. Often, such projects are financed, and economic projections may aid local leadership in their decision-making process as the entire process and development is evaluated. A good initial step in this process would be to benchmark similar developments in similar-sized communities, but as noted, there is limited information available. This study examined economic impact at five waterparks located in the state of Kentucky. The authors find that these five waterparks represent useful economic value to the state, supporting around 145 jobs across the state.

## **Methods**

Using an in-person survey adapted from an economic impact questionnaire previously used by Crompton (1999), the authors collected data from 1,258 waterpark visitors to create mean expenditure patterns and then model those patterns in IMPLAN, an economic impact estimator. To calculate the impact of waterparks, the survey collected reported trip expenditures in twelve different economic impact categories. Surveys were administered throughout one waterpark season. In all, the researcher collected on-site surveys at all five research sites a total of 34 times from Memorial Day to Labor Day. The researcher approached a total of 1,258 possible adult visitors (age 18 and older) for this study; of those, 1,018 agreed to complete the on-site survey for an overall survey response rate of 80%.

## **Results**

The results show that waterparks can have a major role by providing an increase in revenue to a region. An excellent example of this is the estimated impact of the five waterparks in this study. The estimated effects on a region ranged from \$485,000 to over \$3 million, while the estimated impact on Kentucky's economy was over \$23.2 million. This type of impact on an economy could be crucial to rural areas that are turning to "tourism as an alternative development strategy for economic and social regeneration" (Briedenhamn and Wickens, 2004, p. 71). This study reveals positive economic outcomes; however that is not always the case. Sometimes, waterparks close for reasons such as low attendance, not being maintained properly, or becoming a burden on the community due to the cost of maintaining the facilities. Future research should examine if the cost to maintain a waterpark is worth the economic impact it provides to the community.

## **Application to Practice**

There were three implications the research noted regarding this study. First, rural communities can use the information in this study as an initial benchmarking evaluation when deciding whether to move forward with a project beyond the idea phase, where a project may be

deemed worthy of further exploration. Secondly, community leaders can use this information when gauging what size of waterpark to build based on target market (locals or tourist). Lastly, this study provides business leaders and entrepreneurs information regarding the waterpark benefits for community businesses that support or compliment waterpark tourism.

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Location	Total Impact	Employment	Labor Income	Value Added	Output
Somersplash	<b>Direct Effect</b>	33.61	\$1,059,398	\$1,317,946	\$1,811,580
	<b>Indirect Effect</b>	1.82	\$56,267	\$104,364	\$224,916
	<b>Induced Effect</b>	6.35	\$216,371	\$378,603	\$716,220
	<b>Total Effect</b>	41.78	\$1,332,035	\$1,800,914	\$2,752,715
Venture	<b>Direct Effect</b>	55.02	\$854,754	\$1,621,942	\$2,872,447
	<b>Indirect Effect</b>	3.43	\$84,631	\$123,718	\$298,186
	<b>Induced Effect</b>	2.81	\$63,924	\$150,353	\$301,527
	<b>Total Effect</b>	61.27	\$1,003,309	\$1,896,014	\$3,472,160
Juniper	<b>Direct Effect</b>	12.48	\$447,377	\$506,730	\$717,806
	<b>Indirect Effect</b>	0.67	\$24,892	\$45,446	\$84,095
	<b>Induced Effect</b>	1.63	\$54,343	\$100,529	\$180,991
	<b>Total Effect</b>	14.78	\$526,612	\$652,705	\$982,892
Paradise	<b>Direct Effect</b>	16.74	\$315,113	\$385,889	\$763,819
	<b>Indirect Effect</b>	1.23	\$35,499	\$63,888	\$127,726
	<b>Induced Effect</b>	1.71	\$51,679	\$97,118	\$178,959
	<b>Total Effect</b>	19.68	\$402,290	\$546,895	\$1,070,505
Tie Breaker	<b>Direct Effect</b>	7.90	\$185,128	\$205,725	\$383,582
	<b>Indirect Effect</b>	0.45	\$15,716	\$35,717	\$62,256
	<b>Induced Effect</b>	0.32	\$11,614	\$21,212	\$39,193
	<b>Total Effect</b>	8.67	\$212,458	\$262,655	\$485,031

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# TICK“NOT”: UNDERSTANDING TICK ENCOUNTERS ON RECREATIONAL TRAILS THROUGH ONLINE REVIEWS

Kristina R. Anderson, Indiana University-Bloomington  
Oghenekaro Omodior, Indiana University-Bloomington

## Introduction/Rationale

Ticks are prevalent across all 48 contiguous states; and tick-borne diseases have nearly doubled in recent decades (U.S. Centers for Disease Control and Prevention, 2018, 2019). Among the many settings where tick exposure occurs, outdoor recreation spaces represent a unique risk, and that risk varies dramatically based temporal, spatial, land management, terrain, and other factors (Adjemian et al., 2012; Fleeer, Foley, Calder, & Foley, 2014; Johnson et al., 2017; Mitcham, Talley, & Noden, 2018).

Outdoor recreation spaces also represent a particularly unique challenge from a public health management perspective: Because users often include nonresidents of the local area who may recreate and then travel prior to discovering a tick bite or seeking medical treatment due to tick-borne disease symptoms, discrepancies may occur in determining local risks of vector-borne disease (Eisen, Wong, Shelus, & Eisen, 2013). Additionally, even if the specific site of tick exposure is known, the degree to which this knowledge is successfully communicated to the relevant, local recreation management or public health agency is unclear (Eisen et al., 2013). Consequently, these challenges represent a need for innovative approaches in identifying and understanding tick encounters in areas of public outdoor recreation.

Based on online user reviews from AllTrails.com, we sought to determine 1) risk factors and 2) behavioral recommendations associated with tick encounters on recreational trails in the state of Indiana. We also seek to demonstrate an innovative method in identifying the patterns of activities and behaviors that increase tick exposure.

## Methods

We reviewed AllTrails.com user reviews across all 697 listed Indiana trails from April 1-October 31<sup>st</sup> over a two-year period (2019-2020) for a reference to “tick(s).” The themes elicited from each comment included tick experience (*Tick Presence*, *Tick Absence*, and *Tick General*), protective behaviors (including *Repellent Application*, *Protective Clothing*, and *Shower Post-Recreation* as well as *Recommendation* of protective behavior(s) to other users/readers), as well as a theme related to *Recreational Deterrence*. Finally, on a per-trail basis, in addition to *Tick Presence Reviews* (which reflected a count of all comments indicating *Tick Presence*), *Trail Length* (in miles), *Elevation Gain* (in feet), *Route Type*, *State Region*, and *Land Management Type* were also recorded.

Pearson chi-square tests of independence and Mann Whitney U Tests evaluated whether *Tick Presence* was associated with/differed based on several trail characteristics. A negative binomial model evaluated associations between *Tick Presence Reviews* and several trail characteristics.

## Results

Over the two-year period, users recorded 26,016 trail reviews. Of these, 147 (0.57%) reviews referenced ticks; 38 in 2019 and 109 in 2020. 124 indicated *Tick Presence*. *Tick Presence* was recorded at 9.5% (n = 65) Indiana trails (of 697 trails total).

### **Risk Factors**

Analysis of trail characteristic associations (Table 1) indicated significant associations between *Tick Presence* and trails' *State Region*  $\chi^2(2, N = 697) = 55.30, p < 0.001$ . Significant associations were also identified between *Tick Presence* and *Land Management Type*  $\chi^2(5, N = 697) = 61.15, p < 0.001$ . While the average *Trail Length* was 4.4 miles (Mdn = 2.4), this metric was significantly higher on trails indicating *Tick Presence* (M = 6.2, Mdn = 4.4) than those that did not (M = 4.2, Mdn = 2.2) ( $U = 12,552, p < 0.001$ ). Similarly, the average *Elevation Gain* on trails was 320.2 miles (Mdn = 124), with a significantly higher average gain on trails indicating *Tick Presence* (M = 721.3, Mdn = 472) than those that did not (M = 278.9, Mdn = 110) ( $U = 9,460, p < 0.001$ ). Results of the negative binomial regression model further indicated that the *Southern State Region* ( $p < 0.001$ ), *Federal Land Management Type* ( $p < 0.001$ ) and *Private Land Management Type* ( $p < 0.047$ ), were significantly more associated with each unit increase in *Tick Presence Reviews* than reference variables, holding all other else constant (Table 1). *Elevation Gain* (in feet) was also found to be significantly associated with each unit increase in *Tick Presence Reviews* ( $p = 0.050$ ).

### **Behavioral Recommendations**

Several user reviews indicated they had practiced *Repellent Application* ( $n = 14/147, 9.52\%$ ). Fewer users reported other protective behaviors, such as wearing *Protective Clothing* that may aide preventing a tick bite ( $n = 5/147, 3.40\%$ ). A larger proportion of tick-related reviews included a protective behavior *Recommendation*, wherein they suggest to future users that they practice a protective tick behavior at that site ( $n = 37/147, 25.17\%$ ). Another recurrent theme was that of *Recreational Deterrence*. This portion of tick-related reviews ( $11/147, 7.48\%$ ) included some reference to current or future deterrence from recreation at the specific trail of the review. More than half of these reviews (6) indicated that the ticks deterred recreation in the moment, forcing them to turn around and return to the trailhead.

### **Application to Practice**

Park and recreational professionals should consider employing online, user-generated reviews as an innovative, low-cost (and remote) method to identify tick exposure sites. Our methods also demonstrate how to analyze comments in order to understand users' trail experiences. Lastly, professionals in targeted areas, such as New England where many tick-borne diseases are endemic, or the Mountain West where large swaths of wild lands are publicly accessible, should explore applying this method.

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## Table and Figures

**Table 1**

*Description of Indiana Trails by Trail Characteristics and Tick Presence (N = 697)*

	Trails indicating Tick Presence		Trails not indicating Tick Presence		Overall		p-value
	n	%	n	%	n	%	
Count	65	-	632	-	697	100%	-
State Region							
North	12	18%	222	35%	234	34%	< 0.001***
Central	3	5%	212	34%	215	31%	
South	50	77%	198	31%	248	36%	
Land Management Type							
Municipal	3	5%	133	21%	136	20%	< 0.001***
County	1	2%	78	12%	79	11%	
State	31	48%	220	35%	251	36%	
Federal	22	34%	48	8%	70	10%	
Private	6	9%	101	16%	107	15%	
Unknown	2	3%	52	8%	54	8%	
Route Type							
Loop	53	82%	463	73%	516	74%	0.348
Out & back	9	14%	129	20%	138	20%	
Point to point	3	5%	40	6%	43	6%	
Average Trail Length, mi							
(Median, mi)	6.2	-	4.2	-	4.4	-	< 0.001***
	4.4		2.2		2.4		
Average Elevation Gain, ft							
(Median, ft)	721.3	-	278.9	-	319.9	-	< 0.001***
	472		111		124		

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# **TRAIL COUNTER USE: CONSIDERATIONS FOR RESEARCHERS AND PRACTITIONERS**

Katherine Ann Jordan, Ohio University  
Danny Twilley, West Virginia University

## **Introduction**

Trail counters are widely used to collect data about trail use for a variety of purposes. The information gathered (i.e., number of counts) is used to determine an estimated number of visitors/users of a trail, path, or site. This data can be utilized to inform management needs for outdoor resources as well as additional purposes such as supporting economic impact studies of outdoor resources (e.g., Rowe et al., 2018; Ziesler & Pettebone, 2018). With the increase in outdoor recreation participation during the COVID-19 pandemic, a trend that is predicted to continue (Cervený et al., 2020; Rice et al., 2020), it will be vital for recreation agencies to track and understand visitor use of their outdoor resources, therefore recreation agencies may consider investing in trail counters. However, there are limitations to the information that can be surmised from trail counter data and limitations to the general use of trail counters that should be taken into consideration before investing in and committing to the use of trail counters (e.g., Ziesler & Pettebone, 2018). This presentation will highlight issues and limitations to consider before utilizing trail counters. Suggestions for use and interpretation of data are also discussed.

During a review of literature to develop the methodology for a study utilizing trail counters, as one part of data collection, it became apparent that there are gaps and inconsistencies in the reporting of methods utilized with trail counters (e.g., Fisher et al., 2018; Rowe et al., 2018). These gaps and inconsistencies can make it challenging to replicate visitor use studies. There are many issues to consider in visitor uses studies with trail counters. These include determining trail counter locations, such as multiple entry points to a trail or path, visitors passing counters side by side, and whether there is the same entry and exit point (e.g., Ziesler & Pettebone, 2018). This means that when a recreation agency chooses to embark on a study utilizing trail counters, they will need to make decisions around these issues. The purpose of this presentation is to provide researchers and practitioners an overview of the issues, limitations, considerations, and recommendations for trail counter use.

## **Main Issues Encountered**

Two overarching issues with the reporting of trail counter related studies were identified: 1) methods used to calibrate trail counter data are not reported, inconsistent, or lack rationale and 2) the interpretation of trail counter data can be misleading. Trail counter manufacturers will provide information on how to calibrate trail counter data, yet in reports, it is not always clearly stated whether or how trail counters were calibrated or why they were calibrated a certain way. For instance, Rowe et al. (2018) provided details about their specific methods (e.g., focusing on two hour increments in which volunteers also counted, then halving visual and mechanical counts to create an average), yet there is no rationale provided for this method. Was this a recommendation from the counter manufacturer or previous research? Fisher et al. (2018) discussed that the researchers adjusted the settings and observed accuracy, but there is no explanation of how. This can lead to misunderstanding of what the trail counts mean and can also be misleading to individuals attempting to replicate a study. Furthermore, information such as whether trail counts were adjusted to account for out and back trails is not always clear (Gobster, Sachdeva, & Lindsey, 2017). The information that is left out or unclear in reporting

leads to the second issue, inaccurate interpretation of trail counter data. For instance, one count can mean one visitor, but two counts can either mean one or two visitors. Likewise, 300 counts may not mean that there were 300 visitors, rather it could mean that there were half that number or more than that number, especially if the trail counters were not calibrated. Conversely, counters might not count children, strollers, or people walking side by side. In sum, a count is not representative of an individual, rather, a count or counts can be utilized to understand estimates of number of visitors or trail use, not the number of unique visitors. Yet in reports, this is not made clear and sometimes is even presented as unique visitation, which can lead to misrepresentation and misunderstanding of trail counter data (e.g., Sage & Nickerson, 2018). Because we often rely on reports using similar methods to guide us on our data collection journeys, the reporting itself is an issue. Whether and how trail counters were calibrated and how counts were adjusted is not always discussed in reports. In addition, there lies the problem of whether counters are likely to count the same visitor once, twice, multiple times, or not at all. Depending on the counter's location, it may be reasonable to assume it is counting a visitor once or multiple times. If the counter is in a place where it is reasonable to assume a visitor will enter and exit at the same location, you would then halve the data from the counter after it has been calibrated. Yet this information is not always reported either.

### **Application to Practice Outcomes**

Those who are considering whether to invest in a project using trail counters will learn about key issues that should be on the forefront of their decision-making process: 1) Understand the goals of the stakeholders. Being clear about what can and cannot be gleaned from trail counter data is essential. For instance, counts from mechanical counters will not provide data on unique visits and they will not be 100% accurate. However, counters can help answer questions such as when does this trail/path see the most use? Which trailhead is used the most/least?; 2) Utilize research questions and local knowledge of the area to guide decisions about placement of counters. Placing trail counters on a wide path, going uphill or down, or trail in which visitors may be walking, running, or cycling beside each other will impact the trail counts. Likewise, trail counters on multi-use trails and paths that may be single track will also impact the trail counts. By placing counters in a relatively flat location, in a narrow part of the trail/path, and in a location with few entry/exit points, the data collected has the potential to be more accurate as well as easier to interpret; 3) Trail counters can over or underestimate use, therefore a plan must be in place. A specific plan for calibrating the counters and adjusting the total counts will need to be in place, understood, and adhered to; and 4) Trail counter studies take time, people, and money. The time commitment and people power it takes to accomplish a study utilizing trail counters is also important to consider for a multitude of reasons including budgetarily. This may mean going into the field bi-weekly to pull data from the counter and upload into the data storage software. Additional information from visitors may also need to be collected. Finally, trail counters will need to be in place for ideally a year to capture useful data.

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## **VISITOR AND STAFF PROTECTION DURING COVID-19: LESSONS FOR FUTURE EMERGENCIES**

Eric Vance Martin, Indiana University  
Gina Depper, US Fish and Wildlife Service  
Steve Wolter, Indiana University

### **Introduction and rationale**

The COVID-19 pandemic has seriously affected the United States, with over 24 million cases and 400,000 deaths by January, 2020 (CDC, 2021). Broadly implemented stay-at-home orders early in the pandemic and social distancing requirements have negatively impacted the economic, psychological, and social life of the nation (Le & Nguyen, 2020; Nicola et al., 2020), partly by decreasing the mobility associated with work and other purposes, including recreation (Lee, 2020). Parks were a relative bright spot during this time, however, firstly because they provided opportunities for socially distanced outdoor physical activity, recreation, and socialization (Geng, Innes, Wu, & Wang, 2020). Secondly, while visits to parks and time spent at recreation locations decreased in places with stay-at-home orders (Gigliotti & Martin, 2020), mobility declined less in places with parks (Heo, Lim, & Bell, 2020), and demand for parks generally increased (Geng et al., 2020). This is important because parks and recreation facilities and services play important roles in community health and well-being in a number of dimensions, including physical activity (Kaufman et al., 2019), healthy weight (Potwarka, Kaczynski, & Flack, 2008), and mental health (Lee, 2020). However, parks and recreation agencies are also workplaces, and protection of staff from COVID-19 is an important management concern (Cirriuncione et al., 2020). Many parks remained open by explicit exemption from shutdown and stay-at-home orders, and park maintenance work must generally be performed in person. Even outdoor workers are at risk of contracting COVID-19 (Bulfone, Malekinejad, Rutherford, & Razani, 2020). During COVID-19, and particularly early in the pandemic, when state governments were responding to a novel situation with little information, US parks and recreation agencies were forced to continue services under restrictive orders while protecting both workers and visitors. In this study, we asked: How, and to what degree, did local parks and recreation agencies respond to and implement governors' orders and public health recommendations? To what degree did they treat staff and visitors as distinct COVID-19 prevention targets? How can government and technical assistance organizations better support these agencies in future public health emergencies?

### **Methods**

Respondents in local public park and recreation agencies in Indiana and Michigan rated 99 policy and practice items relating either to visitors or staff (see examples in Table 1) on a five-point, ordinal implementation scale and provided information about agency characteristics, emerging training and technical assistance needs, and recommendations for similar situations. Item response theory factor models were used to explore differences in staff-focused and visitor-focused implementation.

### **Results**

We collected 119 responses—60% from Michigan—from May 15 to June 17, 2020. Most agencies had smaller staff sizes and served city political units, suburban areas, and smaller populations. No policy or practice was fully implemented by all respondents. Generally, practices of communicating with target audiences about the nature of COVID-19 and about recommended health behaviors were implemented more than those intended to facilitate health

behaviors or to reduce exposure directly. In communications about the nature of COVID-19 and health behaviors with staff and visitors, respectively, agencies were much more likely to address staff than to address visitors (see Table 2). Factor analysis suggested general, staff, and visitor dimensions. Implementation of visitor-related policies and practices was positively related to the agency's staff size, service population, and urbanity (see Table 3). Respondents asked that in future public health emergencies, government and supporting agencies respond with guidance, training, and information that is clear, unambiguous, and specific.

## **Discussion**

Our study and analysis: (a) allow state-level estimation of COVID-related policy implementation, (b) examine the implementation of comparable policies targeting staff and visitors, respectively, and (c) suggest means for understanding policy implementation variability by local parks and recreation agencies. Our results suggest that agencies serving more rural and less populated areas may need support for conceiving, prioritizing, and implementing visitor-focused policies during public health emergencies. We asked about the "greatest extent" of implementation, and data collection immediately followed the first case surge and the strictest lockdown orders in both states. Despite generally remaining open under governors' orders, parks and recreation agencies were not exempt from orders to protect employees and visitors. Non-universal implementation of certain measures in the results is therefore notable. For this outcome, more research may be needed to understand the relative impact of such influences as local voter preferences and ideology (Armstrong & Lucas, 2020), local outbreak seriousness (Armstrong & Lucas, 2020), risk perception (Zhang, Welch, & Miao, 2018), capacity (Mockrin, Fishler, & Stewart, 2018), and the influence of peer organizations versus and those in "vertical networks," such as government agencies that regulate and provide technical assistance (Chang, 2018), as well as supporting, private state and national organizations. Our qualitative results point to this last factor, suggesting that a reason for the non-universal implementation of these policies may have been a lack of clear and consistent messaging on the part of government agencies and private advocacy and technical assistance organizations about what was required and how it could or should be implemented—at least at this early point in the pandemic. Agencies expressed frustration that mandates and best practice suggestions seemed to vary substantially over time and by source. Research on emergency management (e.g., Mockrin et al., 2018) suggests that the shock associated with managing through COVID-19 may create an opportunity for improving planning, capacity, flexibility, and readiness for rapid internal policy changes in future public health emergencies. We suggest a system-wide approach, with training and planning facilitation for local agencies using a competency framework and a coordination focus for state and national governments, technical assistance providers, and advocacy organizations.

### **Application to practice outcomes**

Readers will be able to: (1) describe more and less-implemented kinds of policies in local parks and recreation agencies early in the COVID-19 pandemic; (2) describe community and agency characteristics that are related to general, staff-focused, and visitor-focused COVID-19 policy and practice implementation, and (3) describe three key lessons for agencies and organizations who support local parks and recreation during public health emergencies.

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## Tables & Figures

**Table 1**  
*Sample Item Wordings*

Framing Question or Text for a Set of Items	Item Text
What is the greatest extent to which your agency has described the following aspects of COVID-19 in any communications with visitors?	<i>How COVID-19 is transmitted</i>
What is the greatest extent to which your agency has implemented providing information about recommended health behaviors to visitors on the topic of...	<i>Handwashing?</i>
What is the greatest extent to which your agency has implemented the following policies or practices in order to limit the exposure of staff?	Increase the routine cleaning of workspaces

**Table 2**  
*Average Percentage Part or Full Implementation of Thematic Item Group*

	Policy/Practice Target			
	Visitor		Staff	
	Items	Average	Items	Average
Communication about health behaviors	10	64%	14	75%
Aspects of COVID-19 described	5	61%	4	82%
Actions related to food and dining	2	56%		
Use of indoor and outdoor spaces	8	54%		
Actions related to events	5	47%		
Reducing COVID-19 exposure			24	59%
Facilitating health behaviors			7	79%

**Table 3**  
*Statistically Significant Agency/Community Correlates of Factor Scores*

Variable	General			Staff			Visitor		
	b	p	r <sup>2</sup>	b	p	r <sup>2</sup>	b	p	r <sup>2</sup>
Full-time Staff (log(x+k))		ns			ns		0.15	.01	.06
Part-time Staff (log(x+k))		ns			ns		0.12	.01	.06
Volunteer Staff (log(x+k))	0.06	.04	0.04		ns				
Urbanity/Rurality									.09
Urban vs. Suburban		ns			ns		0.38	.03	
Rural vs. Suburban		ns			ns		-0.36	.07	
Population (log(x+k))		ns			ns		0.11	.01	.06

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# **VISITOR COUNTS USING INFRARED SENSORS: ACCURACY CHALLENGES AND CORRECTIONS**

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## **Introduction**

Visitation statistics are used by park managers to leverage funding, inform planning and educate stakeholders. While all park sites can benefit from the knowledge accrued by tracking visitation, the obligation to document visitor use varies significantly, with some agencies collecting information sporadically while others are mandated to systematically gather and report data. Government agencies that host tourists, in particular, are called upon to regularly document visitor use statistics.

The call for visitor counts and recreation use data that are collected consistently and with a defensible methodology has been in place for over two decades (see Loomis, 2000; Önder, Gunter & Gindl, 2020). Data collection procedures have evolved but are applied unevenly with mixed results. The application of technology-based methods, in particular, has gained traction in the past decade; however, the fact remains that many park sites do not have the financial capacity to install the necessary equipment.

When technology is not viewed as a viable option yet counts are required, hand counts remain a go-to methodology for visitor use counts. However, this approach is error-prone and constrained to the hours when staff are onsite. Whether using hand counts or technology-based approaches, algorithms are often applied to capture the full range of hours where tourists are likely to access the site of interest, but are seldom tested for accuracy. Big data approaches are more frequently being applied to the understanding of spatial dynamics, satisfaction and transaction analysis, yet related studies are typically reliant on volunteers and/or user-generated content that cannot be translated into reliable visitor counts (Li et al., 2018).

The purpose of this study is to document and analyze the accuracy challenges specific to visitor counting using infrared trail counters. Validation procedures and algorithm development will be detailed using a case study approach and a four-stage process is proposed for developing a large-scale, holistic visitor information system.

## **Methods**

Montgomery Parks, a system within the Maryland-National Capital Park and Planning Commission, is home to 424 parks across 37,072 acres (Montgomery Parks, 2021). A university research team partnered with Montgomery Parks to test infrared visitor counting sensors installed at four diverse parks, including Black Hill Regional Park, Germantown Town Center Urban Park, Long Branch Local Park and Ten Mile Creek Trail. The research team collected onsite data three times at each of the four parks, for a total of twelve days of data collection that took place between August 26, 2020 and October 18, 2020. Onsite hand counts were compared with sensor data to conduct validation analyses for each of the parks, and ten weeks of sensor data were analyzed to document visitation trends, pinpoint sensor anomalies and develop algorithms. Notably, this study took place during the COVID-19 pandemic. Social distancing protocols were put in place to ensure the safety of the guests and research team. Data were analyzed and plotted using Microsoft Excel.

## Results

Table 1 offers a sample validation analysis, using compiled data from Long Branch Local Park. The combined accuracy results (38.61%) were found to fall well below the expectation of 95%-100% accuracy, as indicated by the technology provider. Adjustments made for extreme outliers, based on factors that resulted in continuous counts, allowed the overall accuracy to improve considerably (90.36%). While there were park to park variations in accuracy challenges, all parks were found to have validation results that were well below the expected range.

The primary factors that negatively influenced accuracy included: 1) sensor placement that resulted in visitor counts that were up to twenty times higher than onsite hand counts; 2) extraneous sensors that resulted in quadruple counts for out and back trails; 3) the use of infrared trail counters in park settings that were not conducive to this technology; and 4) technology failure that resulted in no counts during portions of the study period at select parks. The study results confirm the value associated with implementing onsite technology validations, as minor adjustments result in significantly improved accuracy outcomes. Algorithm development allowed for the correction of data anomalies over time. In three of the four parks, researchers found that the suggested corrections would allow for continued usage of the infrared technology with sufficient reliability. Figure 1 summarizes future research recommendations that allow for single-site data to be refined, extrapolated to a larger park system and contextualized to consider the intersection of visitor counts, satisfaction and operations management.

## Application to Practice Outcomes

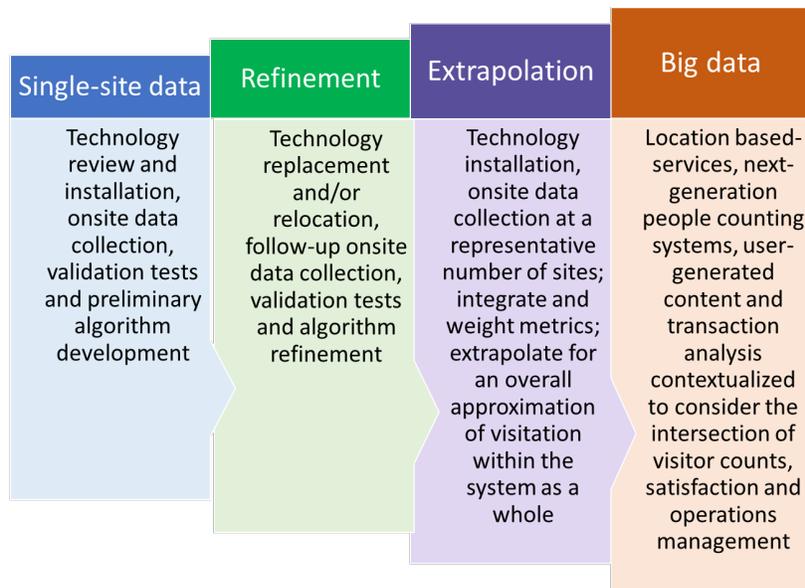
- Session attendees will be able to select and strategically install infrared sensor visitor counting technology within diverse park sites.
- Session attendees will be able to validate infrared sensor visitor count data and pinpoint variables that may influence accuracy.
- Session attendees will be able to create algorithms that can be applied to infrared sensor raw data to adjust for error and will result in reliable, defensible visitor counts.

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**Table 1**  
*Sample Validation Analysis: Long Branch Local Park*

Validation	Hourly Total Hand Count	Adjusted Count	Hourly Total Sensor
1a :11:00 – 11:59 a.m.	31.00	32.50	
1b: 11:00 – 11:59 a.m.	20.00	20.50	
1a: 12:00 – 12:59 p.m.	19.00	20.00	
1b: 12:00 – 12:59 p.m.	10.00	23.50	
1a: 1:00 – 1:59 p.m. *	<b>23.00</b>	<b>216.00</b>	
1b: 1:00 – 1:59 p.m.	26.00	26.50	
1a: 2:00 – 2:59 p.m.	45.00	13.00	
1b: 2:00 – 2:59 p.m.	22.00	48.00	
2a: 9:00 – 9:59 a.m.	18.00	17.00	
2b: 9:00 – 9:59 a.m.	24.00	16.00	
2a: 10:00 – 10:59 a.m.	33.00	25.00	
2b: 10:00 – 10:59 a.m.	25.00	29.00	
2a: 11:00 – 11:59 a.m.	41.00	65.50	
2b: 11:00 – 11:59 a.m.	33.00	47.50	
2a: 12:00 – 12:59 p.m.*	<b>13.00</b>	<b>255.00</b>	
2b: 12:00 – 12:59 a.m. *	<b>17.00</b>	<b>181.00</b>	
<b>TOTAL</b>	<b>400.00</b>	<b>1036.00</b>	
<b>TOTAL % Accuracy</b>	<b>38.61%</b>		
<b>TOTAL (Known Outliers Removed)</b>	<b>347.00</b>	<b>384.00</b>	
<b>TOTAL % Adjusted Accuracy (Known Outliers Removed)</b>	<b>90.36%</b>		

**Figure 1**  
*Four-stage research process: Holistic visitor information system*



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