Bike Path Valuation Methodology:

An Approach to Secure Funding

Capstone 4567

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Table of Contents

Executive Summary

When thinking of transportation methods that don't involve fossil fuels, one has to consider an important and increasingly popular option: bicycling. Bicycling involves no fuel and light maintenance, and also has a wide number of benefits for stakeholders, including economic benefits for businesses and individuals, health benefits from safety and activity, environmental benefits for biodiversity and well-being, and equity benefits for inclusion and access.

With all of these benefits, one might be surprised to find that in Columbus in 2017, only 0.8% of commuters cycled to work, even though Columbus is reported to have the most off-city pathways of any city in the U.S. (Mcleod, 2018 & Shilton, 2019). Central Ohio Greenways, the organization tasked with overseeing and planning Columbus' trails, has planned to add over 500 miles of trails to the existing 233 miles in the Central Ohio region (MORPC, 2018). Securing funding for such ambitious multi-use trails projects can be difficult, especially when it comes to conveying to stakeholders the many different types of value that these projects can generate.

The goal of this report is to enable Central Ohio communities to determine how an increased multi-use trail infrastructure may produce positive impacts. This report details findings in bike path valuation across 3 different categories, economics, health, and environment. These findings were compiled and used to develop a toolkit in order to help communities quantify the projected impacts of new bike path development. The methodology and assumptions used in developing the toolkit are discussed within this report so as to inform the user of relevant data and thought processes that went into developing this methodology. The subject of equity will also be discussed, and information on the importance of equity and bike trails will be explained.

Due to the broad scope of this project, an in-depth analysis on equity could not be completed at this time.

Our findings show extremely positive returns to the community to support the development and funding of additional bike path infrastructure. Based on our review of other research studies, we have developed an expected economic and health-based return for every average mile of trail built. In terms of economics, we estimate for every mile of trail built a 3.4% increase in property values of 10 homes that cost $250,000, average yearly rider expenditures of $1559.61/rider with a growth in ridership of .85 daily riders per mile, tourism returns of 180% of construction costs, and a corresponding increase in sales tax and real estate tax revenues it is reasonable to assume that for every one mile of trail built, returns to the local economy could easily be $1.3 million or a 204% return. It is important to note for this analysis we also assumed an average construction cost of 0.65 million per mile. Health benefits more than pay off construction costs, with an average of $918,000 in health benefits per mile of trail from 2020-2040. These health benefits reflect increased activity and reduced risk of fatal injury from bicycling, which are only a few of the health benefits of increased trails.

Introduction

Throughout this report, we illustrate the different components of value produced by new bike path construction. The focus of this research is on bike path valuation, an approach inspired by the Wayne National Forest's "pay for success" model. In this report, we discuss bike path valuation research and methodology for 3 main areas: economics, health, and environment, and we will also touch on the subject of equity. We also provide a guide for the toolkit we have developed to serve communities by allowing them to input specific project data and receive a projected valuation of the project in question. We will outline what data and variables are determinative for the valuation of each individual project.

The Wayne National Forest secured $5.4 million in upfront trail building costs through the pay for success model (El Kouarti, J., 2019). These funds will go towards building out the 88-mile Bailey's Trail system in the national forest. The "pay for success" model works by securing investment from private investors through the sale of investment bonds. As certain goals set out in the original agreement are met, investors are paid back with interest from the economic benefits generated by the investment. For example, "research and market analysis conducted by Quantified Ventures determined that the Baileys Trail System will draw more than 181,000 visitors per year. In 10 years, these visitors will result in $6.9 million in higher wages, $7.3 million in increased tax revenue, and $20.1 million in increased spending" (El Kouarti, J., 2019).

Our project was done in collaboration with Smart Columbus, Mid-Ohio Regional Planning Commission (MORPC), and Central Ohio Greenways (COG) in order to reduce commuter emissions in the city, while also empowering communities to more easily quantify the various benefits a bike path would have within their community. Our focus on multi-use trail valuation addresses these objectives and is in direct response to the need of COG to procure funding for over 500 miles of trails that they have planned to build.

This report and research is intended to inform as well as assist with the use of the toolkit developed in tandem. Throughout this report, the methodology and data used to develop the toolkit are discussed, with some sections giving high, low, and average cost and benefit estimates. This is in an effort to help the toolkit users understand the range of costs and benefits that are associated with their project. Certain assumptions must always be made in a high-level cost analysis of this type. However, we have tried to develop the strongest possible basis for these assumptions given the data available.

Economics

The focus of the economic analysis within this project is to identify all of the positive, as well as negative, economic impacts new bike path infrastructure may have on surrounding communities. The economic analysis focuses on four categories of impact: real estate value, increases in spending at local businesses, increases in tourism, and finally, increases in tax revenue. The initial buildout costs of the bike path are also outlined in our toolkit with a base of $0.65 million per mile of trail construction on average (MORPC). This amount will vary somewhat depending on geography and other variables, although it provides a good baseline estimate.

Real Estate Value:

There have been numerous hedonics-based studies in order to determine the effect on home values a nearby bike trail can have. A University of Cincinnati study found that the average value for a home within 1,000 feet of the Little Miami Scenic Trail was $9,000 higher than a comparable home in the community. This study was done across 1,762 houses, worth an average of $263,517 (Zimmerman, J. I., 2011). This represents an increase of about 3.4% in home values for those who live within a thousand feet of a trail. Similarly, a 2006 study done at the University of Delaware found that houses within 50 meters of a bike path showed a value increase of $8,800 over a comparable house given their regression (Racca, 2006). This study was slightly smaller with 909 houses, but still quite significant. This data illustrates the concept that many people would prefer to live near a bike path. This data is reflected in the toolkit with average property values near the path rising by 3.4%. Rising property values not only benefit the area's homeowners but also the local government in the form of property taxes. The only economic downside is that in areas with high rates of rental occupation, corresponding increases in rent may be problematic for current residents. There is no easy solution to this implication, although, low income tenants arguably stand to gain an equivalent or even greater benefit from the psychological and health benefits of having a bike path amenity in close proximity to their house. This is discussed in greater detail in the equity section, though our findings show that many bike paths currently are in far more affluent neighborhoods.

Increases in Spending at Local Businesses:

One of the most diverse and significant economic impacts of better bike path infrastructure is the increase in spending at local businesses. A study of the impacts of central Ohio trails found that trail users made significant expenditures not only on equipment and clothing for trail use, but also at local restaurants and businesses. The study surveyed 672 central Ohio trail users and found that the cumulative average amount spent on equipment by the 402 respondents who purchased equipment totaled $2,049.35 per person (Lindsey, 2015). The totals when considering the additional 270 individuals who made no purchases were still quite significant with total expenditures on equipment averaging $409.79 per person (Lindsey, 2015). The survey results show that trail users significant affect the local economy both in terms of larger equipment expenditures, as well as smaller food and beverage expenditures which averaged out to $6.91 per person per trip. While this is a fairly modest amount per trip, the number adds up quickly as Central Ohio trail data finds that the average user rides the trail 3.2 times per week. This adds up to annual food and beverage expenditure of $1,149.82

In a larger study, "business data was collected along York Avenue in Los Angeles before and after a road diet that replaced car lanes with bike lanes… sales tax revenue, a proxy for business success, was higher on the section of York with the new bike lane than the section without it, $1,116,745 to $574,778" (Jaffe, 2015). This demonstrates that businesses with close proximity to bike lanes had nearly twice the amount in taxable sales than those further away. This data is reflected in the toolkit with average taxable sales increasing by 62% and total bike related expenditures increasing by $1559.61 per additional rider. While this number may seem high an Indiana study found that trail users in the area averaged $3,564 per year in expenditures (Wolter, 2017). The Indiana study attributes these high expenditure rates to the prevalence of local businesses in close proximity to the trail. This illustrates the importance of trails to local businesses as seen in the study of Los Angeles as well.

Increases in Tourism:

Numerous studies across the county have found that bicycle related tourism can be a major source of revenue for a city. By improving Columbus' bike infrastructure, the city stands to gain significantly in the form of increased tourism revenues. A North Carolina Outer Banks study supports the proposition that the economic effects of bicycle tourism can easily offset construction costs. "By a conservative estimate, the Outer Banks generate $60 million in economic activity through bicycle tourism. The one-time investment of $6.7 million on bicycle infrastructure has resulted in an annual nine-to-one return" (Flusche, 2012). Additionally, a case study in Pikes Peak Colorado found that for every dollar invested in cycling infrastructure there was an expected direct economic return of $1.80 to $2.70 (Economic Impact, N.D.). Not only do the studies indicate that bicycle infrastructure investments increase tourist activity, but such activity provides particularly large economic benefits. A study done in Quebec found that bicycle tourists spent $83/day compared to the average $66 for other tourists (Flusche, 2012). All of these studies provide significant evidence to support the claim that increasing bike path infrastructure will lead to an increase in tourism spending that should alone cover the costs of development. This data is reflected in the toolkit by illustrating that increased tourism spending can deliver anywhere from 180% - 900% times the initial construction costs of the bike paths. This relatively high level of variance can be attributed to differences in weather as well as amenities nearby the trails. Areas with fewer months of warm weather should anticipate returns on the lower side while warmer climates are more likely to have greater returns.

Increases in Tax Income:

Finally, increases in tax revenues are a direct result of the other economic factors discussed above. The increase in tax revenue is a determining factor in the decision making, as the generation of tax dollars ultimately repays the initial investment of the bond investors, assuming of course that the project has been publicly financed. The two main benefits to tax income are increases in real estate value, as well as increases in collected sales tax. As discussed previously, real estate values within 1,000 yards can be expected to increase by around 3.5%. However, this increase will not translate into a significant difference in property tax revenues, as property tax valuations do not generally take this factor into account in the tax valuation appraisal process. The more significant impact to local government income is the increase in sales tax collected. For example, with an investment of $1 million towards cycling infrastructure, one can expect an increase of approximately $2 million in tourist spending, based upon the Pikes peak study mentioned previously. At the current 5.75% Ohio sales tax, this increase in spending would net the State of Ohio government around $115,000 in increased sales tax revenue or 11.5% of their original investment per year. This amount is in addition to the increase in local sales taxes which would generate an additional 0.75% to 2.25%, or $15,000 to $45,000 per year in local sales tax revenue, depending on the locality.

Health:

Introduction and Case Study

The health analysis performed for this project explored a number of possible statistics to include and calculated monetization of inactivity reduction and the value of statistical lives saved due to their wide applicability. Cavill et. al. (2009) noted that most other analyses involve specific diseases, limiting their relevance. These statistics appear to be novel to Columbus, as no pre-existing research on the health benefits of cycling in Central Ohio was found during (albeit limited) research. For their calculation, a wide variety of sources were used, with preference for government data and recent publications. Fuel savings from 2020-2040 were also calculated using predictions from the US EIA. The costs of trail-building were calculated for comparison, and all figures have been updated to 2020 costs using a 3% discount. The toolkit included with this report features the ability to calculate estimates of health benefits and building costs for any amount of trail length in the Central Ohio region.

Portland, Oregon serves as an excellent case study for cycling, as it has more cycling than any other American city its size: 639,635 people (as compared to Columbus' 862,643 population). 6.3% of Portland's population commuted to work on bicycle in 2016, with 0.6% of Columbus doing the same (League of American Bicyclists, pp. 9-10, 2016). A 2011 analysis by Thomas Gotschi was used as a framework for this analysis, owing to the high quality of the author's original work. He found enormous benefits associated with expanding the pre-existing multi-use trail network in Portland. Using three different scenarios made by the city government and a variety of government data, Gotschi showed the $328 million plan that put 80% of the population within a quarter mile of a low-stress bikeway had a 2.3:1 benefit to cost ratio from health benefits and fuel savings alone (p. 54). Cavill et. al. (2009) notes that the UK considers projects with a benefit-cost ratio over 2 "'high value for money'" (p.297). Such results point to the high value generated from health benefits. A health analysis for bicycling in Central Ohio is conducted below, using Gotschi's methodology as guidance and statistics from the Mid-Ohio Regional Planning Committee (MORPC) and others to determine Columbus' current status and aspirations.

Methodology

Using Gotchi's methodological framework, our analysis used an 8-step calculation process. Through the process, we determined the health benefits of increased activity and the value of statistical lives saved for existing multi-use trails and a proposed 500-mile addition from 2020-2040. Numerous sub-steps were required. An excel spreadsheet was produced and included in the toolkit, allowing the user to develop a cost-benefit health analysis of any proposed trail length in Central Ohio, excluding fuel costs due to programming difficulty. The methodology is presented below and results thereafter.

Step 1: Compile trail-building costs - To calculate future costs, Central Ohio Greenways' average construction and maintenance costs per mile of multi-use trail for 2015 were updated to 2020 costs - assuming a 3% annual inflation rate.

Step 2: Define current multi-use trail buildout status - We determined how many miles of trails there currently are in the area of study, how many miles are biked on those trails, and a recent historical growth rate for bicycle commuting. Data from MORPC and the League of American Bicyclists was utilized for this step in the analysis.

Step 3: Choose a proposed bike buildout - MORPC stated in 2018 that it had 500 miles of trail planned for Central Ohio. Using the total trail miles, annual miles biked, and the annual growth rate, we estimated the number of bike miles with the additional 500 miles of trails.

Step 4: Calculate physical activity from cycling - Using the bike mile projections for the existing and proposed multi-use trails in Steps 2 & 3, the number of daily active people (i.e. cyclists) is determined by dividing the annual bike miles by 365 (days in a year), dividing that by 10 mph to determine number of hours biked (assumed average speed for bicyclists), and then multiplying this quotient by 2 to account for a 30-minute activity cutoff between active and inactive people (taken from Gotschi, 2011).

Step 5: Monetize health benefits from physical activity - Using the daily active people values determined in Step 4 and an average healthcare cost per inactive person, a discounted medical care value is produced for both scenarios (taken from BLS commodity price index values [2.82% annual increase from 2010-2020]). .

Step 6: Calculate value of Statistical Lives Saved (SLS) - bicycling is safer than driving a car in most instances (especially when on bike paths); the death rates for bicycles vs motor vehicles, combined with daily active people from Step 4 and a USDOT value for a statistical life, show how many lives are saved from people choosing cycling as mode of transport.

Step 7: Cost / Benefit of Multi-Use Trail Construction - the final step summarizes the work completed in Steps 1-7 and brings the benefits and costs to present value for a final comparison.

Results

A product of this analysis is the health analysis excel toolkit, which is provided in a separate Excel file. This enables users to plug in their current trail mileage, usage, and growth, with an aspirational goal, and determines the costs and benefits associated with both the current and aspirational trail buildout. Table 2 below shows the results of using Columbus statistics in the toolkit, with the addition of fuel savings, for a net benefit of $144 million for the MORPC proposed buildout.

Health Analysis Results (in Millions of $)

Statistic	Business-as-usual (233 Miles)	Additional multi-use trails (733 miles)	Difference
Initial Build Cost	$0	($3.2 million)	($3.2 million)
PV of cumulative maintenance costs	($25.3 million)	($79.6 million)	($54.3 million)
PV of cumulative inactivity reduction medical care value	$82.2 million	$258.7 million	$176.4 million
PV of cumulative statistical lives saved	$131.7 million	$414.5 million	$282.7 million
Total	$188.6 million	$269.5 million	$80.8 million

Table 2 - Results of adding costs and health benefits of additional multi-use trails

Discussion

The table above shows the importance of health savings associated with bicycle commuting, as the benefits from inactivity reduction and lives saved more than offset the costs of the new trails. Policymakers and educators can use the toolkit to display how bike paths provide health benefits in their communities. Potential issues with the toolkit include an undervaluation of benefits due to focus on inactivity and mortality reduction, assumptions made when converting annual bike miles to daily riders, and some of the dates for the data and metrics used. Regardless, all of the results were updated to 2020 terms, and only governmental and/or peer reviewed research was utilized, providing for some accuracy.

Environment:

The purpose of this section is to provide the reader with a consistent set of evaluation and analysis tools to allow self-assessment, or as an input into planning activities related to community bike paths, their construction and use related to reducing commuter-based emissions. Correct planning of a bike path will maximize environmental benefits for local ecosystems and the well-being of users.

In the planning stage of building a bike path, there are site assessment indicators that should be considered in order to prevent harm to local ecosystems and remediate them if possible. When determining the location of a future bike path, the habitat and surrounding vegetation must be taken into consideration. Routes should minimize habitat modification or introduce beneficial fauna. Environmentally sensitive areas or wildlife should be avoided via relocation or adjusting trail size and materials (Portland Parks and Recreation, 2009). Bike paths should be concise and well planned to minimize unnecessary exit points or width that would require additional inputs and take up more space that could be dedicated to vegetation (Portland Parks and Recreation, 2009).

Land use and access is another dimension of route design and planning that is fundamental to the environmental health of a bike path. To ensure the minimizing of environmental impacts, private property should be avoided if possible. Utilizing public land allows the mitigation of erosion, runoff, and pollution that could not be accomplished on private land (Portland Parks and Recreation, 2009). To minimize the number of users going off road to access nearby water systems, it is vital to include views or access points of nearby waterways (Portland Parks and Recreation, 2009). Access points should be chosen carefully to mitigate the risk of increased local disturbance around the path area such as people cutting their own footpaths to the trail outside of access points (Portland Parks and Recreation, 2009). Maintenance costs should be considered in the design phase to provide adequate waste disposal, erosion control, and habitat upkeep (Portland Parks and Recreation, 2009). The proposed routes should be evaluated in terms of users per day and intensity to determine the best locations that minimize environmental impacts.

Soil is a critical consideration in bike route planning. Soils that are high in silt, clay, or large rocks should be avoided for the safety of users and to minimize the maintenance costs (Portland Parks and Recreation, 2009). Routes should be planned to avoid specific terrain features such as downslope orientations that are subject to erosion or rock slides (Portland Parks and Recreation, 2009). Ideally, an evaluation should be performed to determine the effect of local drainage on slope stability. Furthermore, long flat trails should be avoided due to runoff flowing away from natural water patterns (Portland Parks and Recreation, 2009). The best practice is to have small bumps and other features included in the trails that contain proper drainage systems (Portland Parks and Recreation, 2009). Large foliage and trees near stream crossings add to the destruction of habitat and encourage erosion (Portland Parks and Recreation, 2009). Overall, the paths should be built parallel to natural terrain features.

Trails can be an additional resource for already existing ecosystem remediation. If possible, routes should be built closer to areas where natural resource restoration is happening or planned. Barriers can be created to prevent degradation and promote habitat health and diversity (Portland Parks and Recreation, 2009). Examples include planting native vegetation along the path, mitigating urban green spaces where existing structures are altering the flow of runoff, or removing any HAZMAT hazards along the trail system (Portland Parks and Recreation, 2009).

This step is visually beneficial for users that enjoy a healthy outdoor environment and also draws in another sector of society that is focused on environmental involvement.

Bike routes can be efficiently utilized to repurpose land that would otherwise be wasted and minimize the removal of existing natural areas. Bike paths should be built on existing disturbance corridors such as old rail lines or power line corridors (Portland Parks and Recreation, 2009). Routes should run in tension zones to create a natural buffer between human disturbance and natural environments (Portland Parks and Recreation, 2009). Paths should avoid fragmenting habitats and not create paths that affect migration, feeding, or mating areas along connective corridors (Portland Parks and Recreation, 2009). Trail routings through areas that are vital for wildlife migration or mating should be avoided. (Portland Parks and Recreation, 2009). If unavoidable, trails should be closed to protect local species and even utilized as a public education tool (Portland Parks and Recreation, 2009). Local environmental organizations should be involved in the design and planning process so that additional data can be utilized pertaining to invasive species prevalence, common wildlife behaviors, and other information collected via citizen science. There are many local environmental organizations in Columbus that would gladly aid in planting and maintenance, as well as use the trail as an education tool. These organizations include Sierra Club, Friends of the Lower Olentangy Watershed, Franklin County Master Gardeners, and the Ohio Bird Conservation Initiative among others.

It is inevitable that routes will cross some form of water system. It is ideal to avoid any disturbance or pollution to local water resources. Paths should not be routed across floodplains, streams, wetlands, and high groundwater heights (Portland Parks and Recreation, 2009). This consideration is important for user safety as well as minimizing ecosystem disturbance. Routes should be located downstream of meadows and wetlands (Portland Parks and Recreation, 2009).

A water system evaluation should be conducted to identify areas to avoid and evaluate potential areas of disturbance.

A critical environmental benefit of installing new bike paths is the reduction in the number of single occupant commuter vehicles. Included in the Health calculations portion of the toolkit is an annual fuel saving calculation section. Cost savings for the city in terms of gasoline consumption can be quantified using the calculations provided. A decline in the consumption of gasoline will reduce local air pollution, extraction damages and contributions to climate change.

If all of these considerations are put into practice, a bike path can become a significant environmental resource. Newly introduced trees and plants can create habitats and mating grounds for local animal species. Planting trees also reduces air pollution and sequesters the carbon emissions that contribute to climate change. Running water can be filtered through plants along the trail to reduce pollution runoff. If properly planned, the trail can reduce preexisting erosion by creating new slopes in the landscape. Columbus residents have already demonstrated a desire to more deeply connect through their environment and a bike path would be an exciting resource to advance the ecological well-being of our community.

Equity:

Equity is also an important aspect of project planning when considering expanding bike trails in the future. Equity means that the needs of everyone in the community should be considered, not just certain community members. This means people of color, seniors, children, and lower income households should have the same access to trails. There are various ways in which equity can improve communities such as providing greater environmental and social justice, access to safe and reliable transportation, and health benefits to more community members, as well as other social and economic benefits that bike trails in more communities would provide. Many of these benefits are explored previously in paper.

Participants in an online survey performed by MORPC and COG answered a set of questions on trial characteristics, and below are the demographics of those participants. It was stated in the survey that these outcomes were somewhat expected, due to how the results were gathered (e.g. online). This table does however, outline the disconnect between Columbus trails, and all community members. Many of these trails are in wealthy, predominantly white neighborhoods. By planning future trail build outs to be more inclusive to all community members, greater equity benefits would accrue.

Demographic Question	Majority or plurality response category	Percent	Second most common response	Percent
Gender	Male	72 %	Female	28 %
Age	35 – 49	34 %	50 – 64	33 %
Level of Education	Bachelor's Degree	42 %	Graduate Degree or Higher	42 %
Race	White or Caucasian	92 %	Black or African American	2 %
Hispanic, Latino, or Spanish Origin	Not of Hispanic, Latino, or Spanish Origin	91 %	Hispanic, Latino, or Spanish Origin	1 %
Estimated Annual Household Income before Taxes	Greater than $75,000	63 %	$50,000 - $74,000	18 %

Figure 1- This figure describes the demographic characteristics of individuals who responded to an online survey on the impacts of Central Ohio Trails, prepared by MORPC and COG.

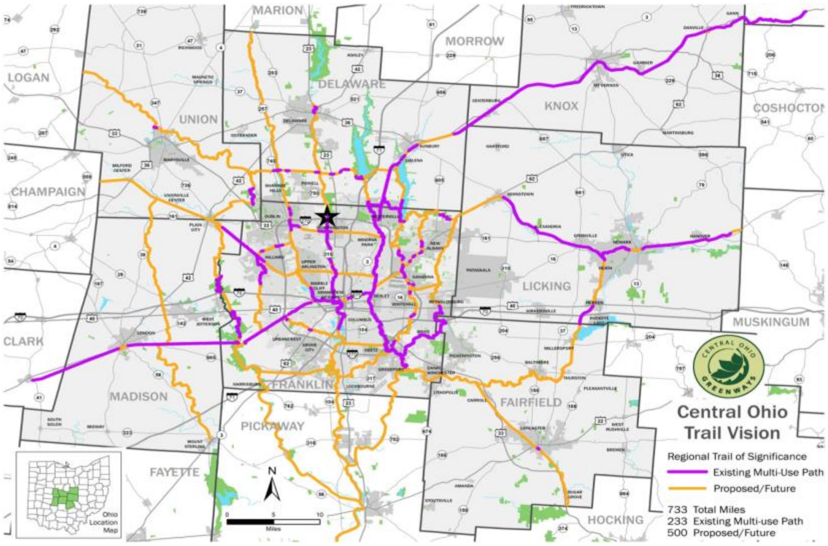


Figure 2- Map of current and proposed trails provided by COG.

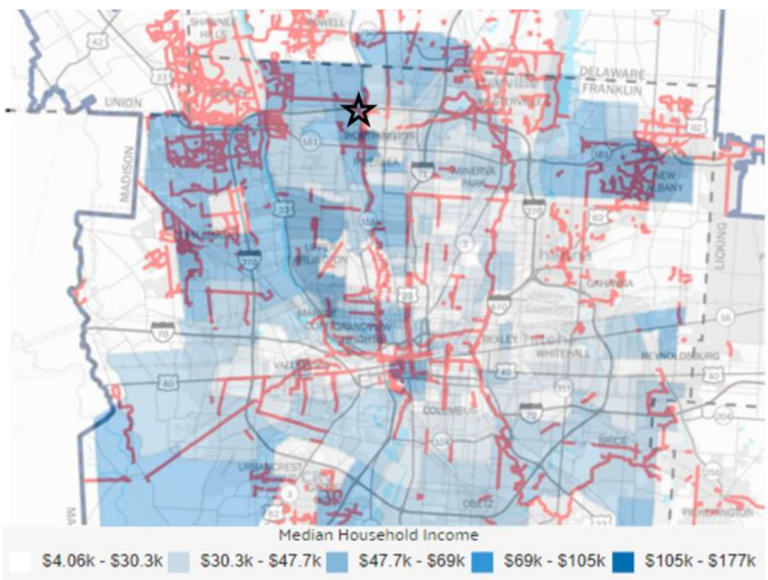
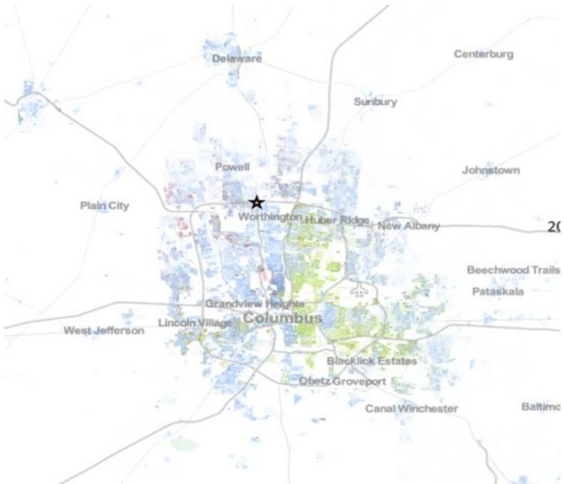
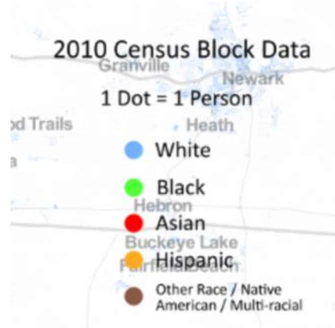


Figure 3 -Median household income and current trail map (MORPC & DataUSA, 2020). This map and legend are a breakdown of median household incomes and current trails in Columbus.

Figure 4 & 5- This map and legend uses data from the 2010 Census to illustrate racial demographics in the Columbus area.





The maps above illustrate the equity issues associated with the Columbus bike path trails. Figure 2 is a map of current and proposed trails in central Ohio, figure 3 is a breakdown of median household income with a map of current trails throughout it, and figures 4 & 5 are a visual map and legend that uses Census data to illustrate racial demographics throughout Columbus. By using the visual point (the star), as point of reference, you can easily compare the maps and see which communities have a disparage in equity in terms of trail access.

Recommendations:

Given our uniformly positive findings regarding community return on investment when building out a multi-use trail infrastructure, we strongly recommend increased development of bike paths in Central Ohio as well as other communities. In terms of securing funding, our team recommends using the excel toolkit developed in tandem with this paper to show potential public or private funding entities. Past examples such as the "Pay for Success" model mentioned previously in our report show great promise for using a bond issuance to fund initial costs and the return on investment to repay the creditors as economic improvements in the area are achieved.

Specific economic recommendations are based upon adding the largest value possible. In order to gain the greatest economic advantage, it is essential to plan with the other bike path networks in mind, while also planning for inclusivity. This allows for a greater network of riders and spending across different communities.

For health, it's important to ensure that the route is optimized for commuters traveling from residential areas to the business districts of Columbus. Maximizing health benefits means constructing paths to encourage more bike miles, by increasing the viability of bicycling as a transportation mode. Gotschi (2011) noted that several studies show bicyclists enjoy "safety with numbers", which posits the more riders, the safer it is to ride. He pointed to Portland, which saw a 50% decrease in fatalities and crashes between 1991 and 2006 with additional bike paths and advocacy programs (p. 55).

To create a healthy environment surrounding a bike path, the design and planning phase is of utmost importance. The factors mentioned in the environmental section and the toolkit should be carefully considered to prevent disturbance and pollution. Locations should be chosen to remediate existing polluted areas when possible. The addition of trees and plants along the bike path mitigate air pollution, sequester carbon, and create wildlife habitat. A healthy environment surrounding a bike path can be used as an education resource for public outreach.

In terms of equity, recommendations are to further explore Columbus data, and expand on the analysis. An overall recommendation is to select expansions that will best bridge the gap in equity and grant access to bike trails to all community members.

The goal of this project and report is to help communities more easily show funding partners that the project has high potential for a strong return on investment. We hope that this research and methodology allows future bike paths to be built in order to benefit those in the community.

Conclusion:

The findings of our research show that we expect for most bike paths to make positive returns to their respective communities across each of our four categories. Oftentimes economic and dollar returns can be the only factor considered, however, our research highlights the many other ways that bike paths can positively impact communities. Not only do they provide positive economic returns but also healthier citizens with more equal access to transportation and natural environments. Bike paths present an excellent opportunity for communities to provide greater opportunities to citizens and improve quality of life. There will continually be new data and research on this topic and certainly different assumptions will need to be made for different communities in different areas. We hope this new research can help support users with a breadth of different data points that support different situations.

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