



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

RECOMMENDATIONS FOR IMPROVING RESIDENTS' HEALTH



Photo by Kelly Conforti Rupp / UW-Madison

POPULATION HEALTH 740: HEALTH IMPACT ASSESSMENT OF GLOBAL ENVIRONMENTAL CHANGE

SPRING 2017





HEALTH IMPACT ASSESSMENT (HIA)

The City of Monona Lake-viewing Park Renovation Plan

2017

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Executive Summary

Around the United States, seniors and people with disabilities have difficulty accessing public spaces which has implications on the health of these vulnerable groups. Having an older population and a relatively modest number of people with disabilities in their community, the city of Monona have requested a Health Impact Assessment on their lake viewing parks. The City of Monona has 10 parks with lakeviews that are underutilized and residents have reported that many of them are difficult to access for individuals with disabilities and the elderly. Making improvements to accessibility of the parks and the waterfront as well as the viewing shed of the parks can reap a myriad of health benefits for residents. Upon analysis of the literature on this subject, it was determined that benefits from this policy change could include improvements in mental health, physical health, social capital, and safe accessibility.

This Health Impact Assessment is intended to be used as a guide to inform the City of Monona in their decisions regarding investment in and improvement of the accessibility of their waterfront parks for seniors and those with disabilities, and any other improvements that would increase the utilization of these sites. What improvements will be made, when they will be started, and how to fund them are decisions that the City of Monona will be making in the years to come, and the following information can be used to evaluate their options. In conclusion, these results can be extrapolated and used to improve other city's lake-viewing parks around the United States.

Background

The City of Monona is a metropolitan suburb in South Central Wisconsin surrounded by the City of Madison that was incorporated in 1938, and houses just under 8000 people². The city has 17 parks, 10 of which are located on the Yahara River or Lake Monona, which we refer to as lake-viewing parks. These parks vary in size and accessibility. We will be focusing on the following 6 lake-viewing parks: Graham Park, Lottes Park and Boat Launch, Wyldhaven Park, Frost Woods Park, Stone Bridge Park, and Schluter Beach (Figure 1).

Each of the parks at Monona are broken down and classified into a type of park. This classification system is used to serve as a planning guide. Each of the lake viewing park fits into one of the categories of parks as defined by classification system used by the city of Monona which are: Neighborhood park, Community park, and Area park. A Neighborhood park is

defined as an area for intense recreational activities such as field games, court games, crafts, playground apparatus area, skating, picnicking, wading, pools, etc. and serve a neighborhood of up to 5,000. Some desirable characteristics are that it should be easily accessible to neighborhood population-geographically centered with safe walking and bike access. A Community park is an area of diverse environmental quality. It may include areas suited for intense recreational facilities, such as athletic complexes and large swimming pools. It may be an area of natural quality for outdoor recreation, such as walking, viewing, sitting, picnicking. It may be used for any combination of what was listed previously and is dependent upon the site suitability and community need. Some desirable characteristics that it may have include natural features such as water bodies, and areas suited for intense development. It would also be desirable if it was easily accessible to neighborhoods. An Area park is an area for recreational pursuits of all types. It serves as a neighborhood park for surrounding homes, as a city park for more structured events offered to the community as well as a central location for area festivals and events. Some desirable characteristics of Area parks is that it should be suitable for several simultaneous large group activities or lake access for a large number of boats. It may include natural features such as water bodies and area suited for intense development and is easily accessible to the community.

Lottes Park is an Area park designated for boat access and launch. It is approximately 3.30 acres. It is located between the Yahara River widespread which is right off West Broadway. This park features a boat ramp for launch and landing, fish cleaning station, canoe and kayak rack, a permanent restroom facility and is near a newly built apartment complex that features a restaurant and is also close to many restaurants, fast food facilities and shopping. Some issues with this park is balancing the need for parking and green space and not having an ADA accessible kayak launch.

Graham park is a Neighborhood park that is 0.4 acres. It is a pocket park in between two residential homes. This park is flat and features an open green space on the shoreline of Lake Monona. Some issues with this park may be accessibility since there is not a path that leads from the entrance to the lake viewing area.

Wylldhaven is also a Neighborhood pocket park that is 0.25 acre in size. Wylldhaven sits on a high hill. It features an open green space, picnic table, bench, and stair access straight down to the

lake. Some issues is the safe stair access for the elderly as is built with gravel and hard to access. It could use an accessible path to from the entrance to the shoreline for elderly and disabled folks. In addition this park could use some shoreline restoration and landscaping improvements

Frost Beach park is a Community park that is also a pocket park. It is 0.8 acres in size. This park features a parking lot, open green space, access to the lake, canoe and kayak rack, picnic table and bench. Some issues with this park is its inaccessibility as there is a steep gravelly hill into the entrance of the park which could be an issue for the elderly and disabled folks. It could use an accessible path from the entrance to the shoreline for elderly and disabled folks. In addition, this park could use some shoreline and landscape restoration.

Stone Bridge park is a Community pocket park. It is 0.6 acres in size. This park features an open green space, is a bit hilly, has a pier, bench and a historical pagoda landmark. Some issues with this park is the storm sewer that opens up in the middle of the park. It could also use an accessible path from the entrance to the shoreline for elderly and disabled folks. This park could also use some shoreline and landscape restoration.

Schluter park is Neighborhood park that is 1.8 acres in size. This park has recently undergone some major improvements and landscaping. This park features a parking lot, ADA accessible path, pour and play playground, mini beach, pier, picnic tables, grills, benches, permanent restroom facilities, and a gazebo. The issues that were at this park have been addressed from their study. Schuller has now become one of their most attractive parks and is a great community meeting space.

Figures of Parks

Lottes Park



Graham park



Wyldhaven park



Frost park



Stone Bridge park



Schulter park



Screening

After viewing the 6 of the 10 lake-viewing park locations and consulting with Missy Kedzorski, the Recreation Supervisor/Aquatic Director for the City of Monona's Parks and Recreation Department, our HIA committee determined that renovations to Graham Park, Frost Woods Beach, Wyldhaven Park, and Stone Bridge Park could potentially increase their utilization and accessibility. Two of the lake-viewing parks we looked at, Schluter Beach and Lottes Park and Boat Launch, have already been renovated to include ADA compliant components that help provide greater access to these parks, but may also benefit from additional accessibility. Since some of their other parks are due for renovations in the coming years, this HIA could be used to guide future decisions, primarily with health in mind. The city of Monona has a larger older population as well as a percentage of the population who are under the age of 65 living with a disability¹ (Figure 2).

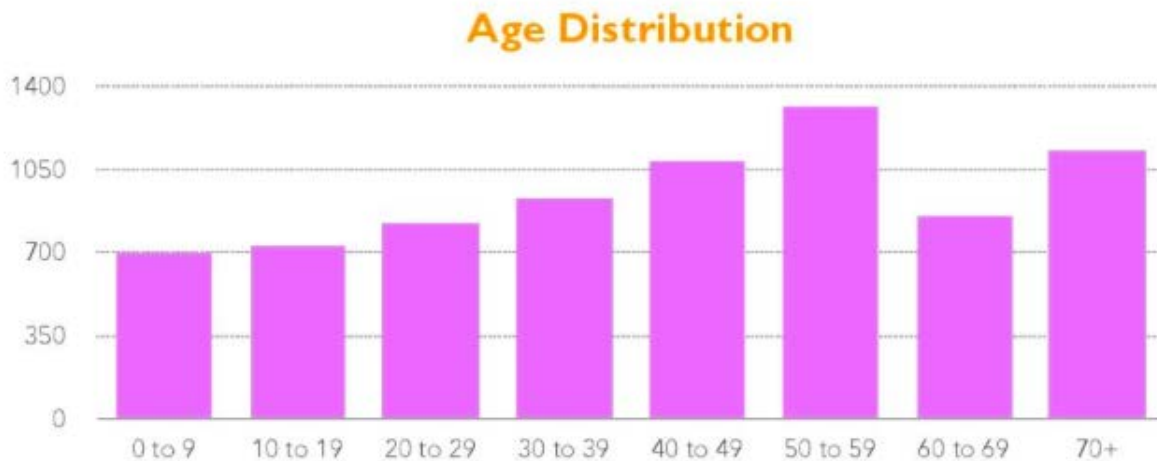


Figure 2. Age Distribution of the City of Monona (2010 Census Bureau)

A parks survey was given evaluating the parks in Monona to get a sense of what the citizens of Monona thought about their current parks and park system. Of those who filled it out, 33% ranged from the age of 36-45 (Figure 3). This is a disproportionate representation of those residing in the city of Monona currently, but those who filled out the park survey will be the new aging population in the future and were the ones who care the most about parks, so it is important to take into consideration that there should be a representative evaluation of the City of Monona's park and what is needed. This underrepresentation is problematic as the seniors in Monona are not being represented in what they want to see in the parks and what improvements should be made. Getting input from senior citizens on would provide the city with a more accurate portrayal of the community's needs and desires.

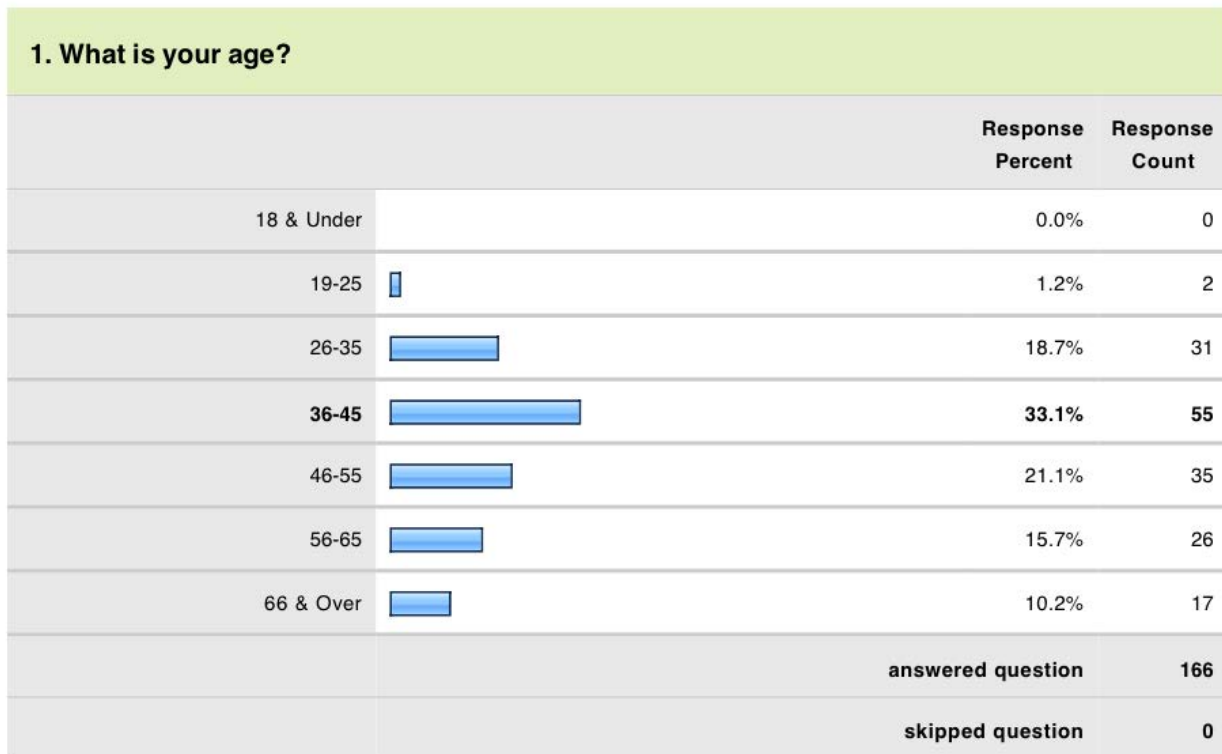


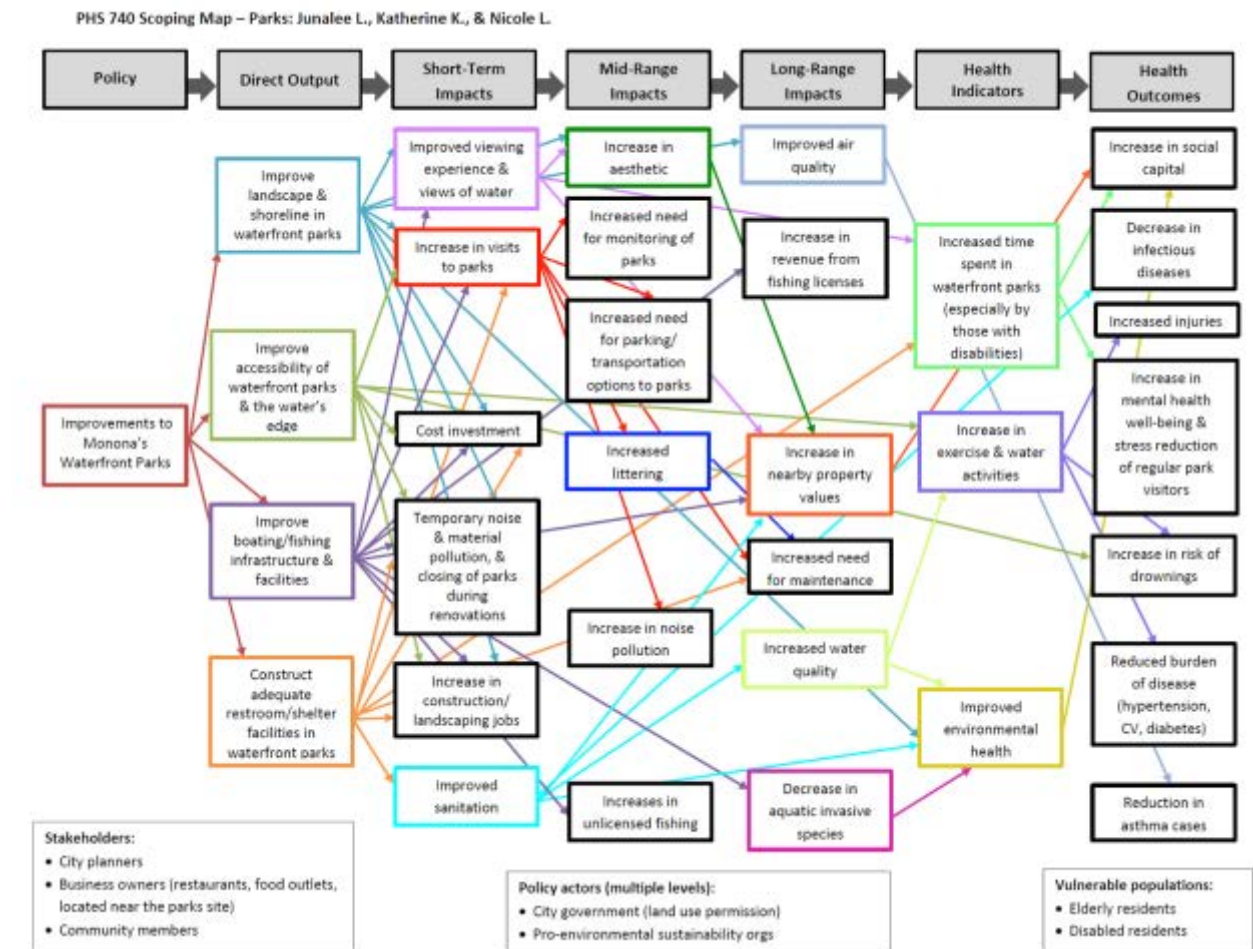
Figure 3. Age distribution of those who filled out the Parks and Open Space Survey for the City of Monona

Other comments made on the park's survey had many suggestions from the residents of Monona that included improvements of their lake viewing parks and improving the connection to the lake. Many people care about access to the lake according to the survey. Our focus is to convey the health benefits of lake viewing parks and how making improvements and increasing accessibility by installing ADA accessible paths can be beneficial, especially for the older generation at Monona for their mental, physical and social capital by providing a third community space to meet others in the neighborhood.

Scoping

In the figure below, we have outlined all possible outputs of the potential renovations to these lake-viewing parks. Seniors and people with disabilities were identified as the most vulnerable populations during this phase of this project. With 19.5% of the city of Monona's population over the age of 65, and 7.3% of the population under age 65 living with a disability (2015 ACS, 5-year estimates), we saw the potential for improvements to have an impact on the health of these residents, particularly in mental well-being¹. The improvements that we will focus on include improving landscape and the shoreline in lake-viewing parks and increasing

amenities, as well as improving the accessibility to the parks for residents with mobility issues.



Assessment

Assessment: Green and Blue Spaces

The effects our environment has on our physical and mental health has been studied in depth. The positive relationship between time spent in natural environments and personal health is so well established that medical professionals have begun giving patients prescriptions that require them to do some sort of physical activity in natural settings⁶. Even though research shows that spending time in green and blue spaces has positive effects on personal health, a study was done and it was revealed that daily contact with our natural environment is becoming more and more rare⁴. The desirability and high value of land has contributed to an increase in development and the built environment, and a loss of more natural settings. Because of this, access to nearby green space is often limited.

Green space is a term used to describe a natural environment, usually containing very few elements of the built environment. Parks, nature preserves, and open, undeveloped land are all considered greenspace. In urban and suburban areas, parks are often the only green spaces

available; they can provide safe spaces for people to relax, play, and exercise away from busy streets and commercial zones¹. Parks offer opportunities for improving physical, mental, and social health, so making them inviting, easy to access, and safe is imperative^{1,7}.

Blue spaces include waterfront parks, harbors, ports, marinas, rivers, open air streams, canals, lakes, ponds and fountains. Historically, water has been associated with healing, spirituality, and fertility, and is recognized as a symbol of life¹⁸. Studies have found that landscapes with a water element have almost universal appeal across cultures⁶. We predominantly experience water through our senses – we see it's color and motion; we feel it when we immerse ourselves in it; and we hear it when it moves, but it's relationship to our state of mind is not completely understood. Although the correlation between time spent in parks/greenspace and both physical and mental health benefits is well established, more recent research has shown that the presence of bluespace increases these benefits^{4,7}, especially for mental well-being. This increase in benefits does vary depending on the type and amount of bluespace.

We know that natural settings generate greater benefits for mental and physical health than the built environment¹⁷, and this is no different for bluespace. Aquatic elements have potential benefits in both natural and built environments⁹, but the potential may be greater when these elements are a part of a natural environment. In a study where participants rated scenes of aquatic, green, and built environments, researchers found that, while an increase in the amount of water in natural scenes resulted in greater preference, an increase in the amount of water in built environments containing an aquatic element showed no increase in preference. Their study suggests that green spaces with large bodies of water may be optimal for generating more positive perceptions¹⁹, and the lake viewing parks in Monona fit this description excellently.

Assessment: Accessibility

For certain populations, including seniors and persons with disabilities, accessibility and safety are of great importance. Completely natural environments (those without any elements of the built environment) rarely meet their needs for accessibility. This includes elements like the slope of the ground, presence of handrails for stairs, and the minimum width of access paths for wheelchairs. People with mobility issues often see the absence of these elements and others as barriers to accessing public spaces.

Because people with disabilities and seniors often have difficulties accessing blue and green spaces, making these spaces safe and accessible should be a priority. According to the World Health Organization, seniors and persons with disabilities tend to be at higher risk of mental illness, therefore these populations will likely receive the greatest benefits from an increase in safe accessibility to a restorative environment.

Accessibility not only includes access inside the park, but also how residents get to the park. In the City of Monona there is a lack of sidewalks, which could make getting to the parks in the neighborhood a difficult task. There are many parks within Monona's residential neighborhoods, and the proximity of these parks to residents' homes is an advantage¹³, but getting to them could be an issue for some. Decreasing the obstacles to get to a destination and

building sidewalks into neighborhoods could increase attraction and perceived safety in accessing the parks so that residents have the opportunity to enjoy them.

Assessment: Physical Health

Parks are an easy and low cost method to provide physical activity¹³. This is becoming increasingly important with the rising cost of health care and increasing population of aging folks. So reconceptualizing health and evaluating different methods for improving health, like taking advantage of low cost neighborhood parks, can help deliver a low-cost way of improving physical health.

Parks provide a space for physical activity, and can be a promising means to satisfy physical activity requirements. It is known that regular physical activity has been shown to reduce morbidity and mortality by decreasing heart disease, diabetes, high blood pressure, colon cancer, feelings of depression/anxiety, and weight while building and maintaining healthy bones, muscles, and joints^{3,7}. There are associations between physical activity and psychological health. As exercising reduces depression and the restorative effects of nature would also improve mental health. So parks provide a great environment to facilitate both improved physical and mental wellbeing.

A study was done by Bedimo-Rung et al. where they examined parks using a conceptual model. They researched and examined park features, conditions, access, aesthetics, safety, policy, neighborhood limitations, and access, and found that these features can help with the utilization of parks for physical activity, allowing the community to garner the health benefits parks have to offer³. They recommended evaluations be carried out to assess the association between physical activity and specific park characteristics by evaluating the aesthetics and the condition/maintenance of parks, and the relationship to park based physical activity³. Location is also important since there is an association between walking distance to a park and health and those who lived within walking distance to a park were in better health than those without a park nearby^{6,7}, and many Monona's lake viewing parks are in an optimal location for residents.

Assessment: Mental Health

Restorative environments are those that reduce the fatigue caused by directed attention¹². While the built environment has provided us with convenience and comfort, it also requires more of our cognitive energy when compared to green spaces⁶, thus reducing any restorative benefits of the environment. It is important to note that in a study by Bedimo-Rung et. al, minimal features of the built environment, like restroom facilities and trash receptacles, were found to have a slightly positive effect on the perceived restorativeness of parks⁶, likely because they contribute to the cleanliness and comfort of the space. When designing new open spaces, planners and landscape architects should consider these facts, being sure to incorporate elements of nature as often as possible in order to provide those that use the space with the restorative benefits of nature that work to counteract the effects of built features in the space.

The restorative effects of nature were proved in a study that assessed recovery times of surgery patients. One group of patients who were recovering from surgery had a view of a brick wall out

the window of their hospital room, while others had a view of some trees. Those with a view of trees had a shorter postoperative hospital stay and had lower scores for postsurgical complications, which suggests that natural scenes provide an environment that can help the body heal faster and has therapeutic and restorative influences¹⁶.

Natural spaces have also been found to reduce stress levels^{5,11,12}, as well as stress-related illnesses^{10,15}. High levels of stress have been known to cause both physical illness and mental distress, and may also affect our attitudes and behaviors. According to Kaplan, contact with nature even has the potential to reduce aggression and violence among individuals¹².

Improved mental wellbeing has been shown to restore self-esteem and improve community involvement¹⁴. Physical barriers that prevent these populations from accessing public spaces can prevent them from engaging with the community. Improving mental health outcomes could eliminate additional personal/mental barriers that prevent these vulnerable populations from engaging with the community.

Assessment: Social Capital

Parks can serve as a space for community members to socialize and participate in community life, and making these parks more useable would allow for more of these social interactions. People can use the parks as a place to meet their neighbors which builds a sense of community and increases an individual's social capital¹⁰. Social capital is defined as a network of people in a society that enable that society to function effectively^{5,8,10}. The elderly are the most at risk for social isolation and loneliness, which can lead to mental health consequences like depression^{10,14}. Common spaces, like a park, can disrupt the feeling of isolation by allowing people to converse in an open public space.

Key Findings

Our major findings from this review fall into four main categories: safe accessibility, mental health, physical health, and social capital.

1. **Safe Accessibility:** Safe accessibility is a prerequisite to observe the health benefits we have mentioned. In order to observe the benefits listed below, the parks must be accessible, specifically for the elderly and people with disabilities. Perceived safety can be measured in surveys and help a community determine what factors are limiting people from utilizing the parks. Once those concerns are addressed, usability increases which has been observed in other park improvement plans.
2. **Mental Health:** The effect of blue and green spaces on mental health primarily are associated with decreases in depression, decreases in cortisol levels (a stress hormone), and increase in restoration of cognition. There are also benefits from interacting in social situations such as decreases in loneliness.
3. **Physical Health:** The act of walking around a park and being able to access the water for activities such as kayaking are important, especially for the elderly and people with disabilities who may have limited mobility. Health benefits of physical activity includes decreases in obesity, increases in cardiovascular function, and decreases in diabetes.
4. **Social Capital:** Providing accessibility to the elderly and people with disabilities allows for a space where the whole community can be integrated. These benefits aren't only

associated with mental health observed through decreases in loneliness, but it is also can result in an interconnectedness in the community.

Recommendations

In order see the benefits of increasing accessibility and view sheds, there are a few measures that we recommend be taken in order to improve the city of Monona's lake viewing parks. Various improvements are listed below.

- Installing an ADA accessible Kayak Launch
- Improving view sheds (view shed: the geographic area that is visible from a location / the area of the lake you can see)
- Constructing ADA accessible paths into the parks
- Creating more seating and shaded areas
- Start collecting data of pocket parks to assess residents wants and needs

Things to Keep in Mind:

When deciding on a ADA accessible path for the lake-viewing parks, one should consider the cost benefits of different types of pathways. Semi-permeable pathways would be beneficial with regards to maintenance but has a higher cost than concrete. The installation of a boardwalk made with composite decking material would allow vegetation to grow underneath the path to preserve the landscape. To improve the view shed, trees and brush that obstruct the view of the lake or accessible pathways should be removed. Furthermore, other natural vegetation should be preserved to the fullest extent and additional beautification measures should be taken, such as planting perennials in the parks. These decisions should be made keeping in mind the needs and desire of the community, as well as cost.

Recommendation	Benefit	Parks
Start collecting data of neighborhood/community parks	Will provide quantitative data to assess residents wants/ needs, and analyze the benefit of renovations	All parks
Installing ADA accessible Kayak Launch	Increasing physical activity and access to the water for residents with mobility issues	Lottes Park -OR- Graham Park -OR- Frostwoods Beach
Improving view sheds	Increase mental health benefits and calming effects of the park	Wyldhaven Park, Stone Park
Constructing ADA accessible paths into the parks	Allows people to access the park and reap the health benefits described above	Frost Park, Graham Park, Stone Park, Wyldhaven Park
Creating more seating	Encourages people to stay at the park	Frostwoods Beach, Graham Park, Stone Park, Wyldhaven Park

Reporting

The findings of this assessment were reported to Dr. Jonathan Patz's and the students of the Spring 2017 PHS 740 class, and Missy Kedzorski of the City of Monona's Parks and Recreation Department.

Monitoring/ Evaluation

For further assessment of these lake viewing parks, there should be continual monitoring and evaluation of the benefits of any renovations to these sites. To measure the effectiveness of renovations, we recommend surveys be given to residents before and after the renovations take place. The survey questions should include: feelings about the park improvements, their utilization of the parks, overall loneliness, mental health and physical health of the citizens, and desire for further improvements of these sites.

To further evaluate the success of these parks and examine if improvements have increased use there should be park visitation monitoring to record the number of people at the park and peak user times before and after the renovations. This can be facilitated by neighbors of the park or community leaders.

As addressed above, the opinions of the seniors in Monona are being underrepresented so by targeting this age population and getting their direct feedback about what they want to see in the parks and what improvements they see that could be done. By assessing the needs of a large proportion of the city of Monona's population, this will better represent the needs of the city of Monona and cater to the needs of the age demographic of the city.

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A HEALTH IMPACT ASSESSMENT OF WINNEQUAH PARK, MONONA:



***Interconnectivity of Park Space as Means for Improved
Accessibility and Positive Health Outcomes***

Jennifer Breen, Haley Briel, Karly Christensen, Omar Jarrett
PHS 740, Spring 2017
UniverCity Project

Acknowledgements

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Lastly, we would like to recognize the Landscape Architecture 451 course for permission to use their draft plans for redesign of Winnequah Park—their graphic design expertise allowed us to see a clear vision of how our HIA could be implemented as a site plan. Thank you.

About this project

We are a four member graduate student group participating in the Spring 2017 section of Population Health Sciences 740: Health Impacts of Global Environmental Change. Within the scope of this course is a semester long project collaborating with the nearby community Monona, Wisconsin, in order to evaluate the current state of their housing, parks system, and transportation. We were tasked with assessing the potential health impacts of increased connectivity within Monona's largest park, Winnequah Park. In order to complete this assessment, we conducted a review of existing literature describing health impacts of accessible parks nationwide and engaged with members of the Monona Parks and Recreation department to ensure that our project complemented pre-existing community goals within a broader national context.

The health impact assessment of Winnequah Park is part of a larger University of Wisconsin program called the UniverCity year. The expressed goal of the UniverCity alliance is to bring together students, faculty, and research centers from across the University of Wisconsin-Madison in order to engage with the city of Monona in city-initiated projects. In this way, Monona benefits from a variety of disciplines including urban planning, landscape architecture, and public health, while the students gain valuable experience in cross community collaboration.

We are pleased to offer this document to the city of Monona, and hope that it will enhance the livability and health of its community members through improvements to Winnequah Park.



UniverCity Alliance
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Executive Summary

A team of four University of Wisconsin graduate students spent the Spring 2017 semester assessing the health impacts of increasing internal pathways within Winnequah Park in Monona, Wisconsin. Built in 1963, Winnequah Park is the flagship park of Monona, boasting 45 acres that is host to a variety of both large and small events for the community. Winnequah is mainly comprised of large lawn spaces that are useful for sporting events and concerts that may require space for many attendees. However, the current layout of the park is inaccessible to those who may have difficulty traveling across unpaved areas. As Monona's population shifts to include more of the aging population, it is essential that the city address the needs of those with limited physical mobility. Furthermore, Monona hopes to attract young families that may require stroller use for access. Therefore, we have proposed that Winnequah be redesigned to include a sidewalk system that circles its main lagoon, with a bridge across to the less accessed northwestern side of the park. In conducting our HIA, we considered both benefits and potential concerns of this sidewalk system. Research indicates that sidewalks in parks can increase usage by the community, which improves public health outcomes. Most Americans do not partake in the recommended amount of physical activity they need to avoid negative health impacts such as obesity, heart disease and diabetes. Sidewalks can remove some obstacles to individuals who seek to increase their activity levels. However, there may be side effects involved, such as increasing impervious surfacing that can lead to increased stormwater runoff, more litter associated with increased foot traffic, and the costs associated with both building and maintaining such sidewalks. However, our research concludes that the positive aspects of the sidewalk system outweigh the negatives, and we recommend that Monona proceed with this project. In the future, we believe that adding lighting, trashcans, and emergency buttons will enhance the pathways by making them safer and less likely to be littered. Ultimately, Winnequah Park will be able to engage a larger portion of its constituents and will see positive outcomes from their local community.

Introduction

The City of Monona

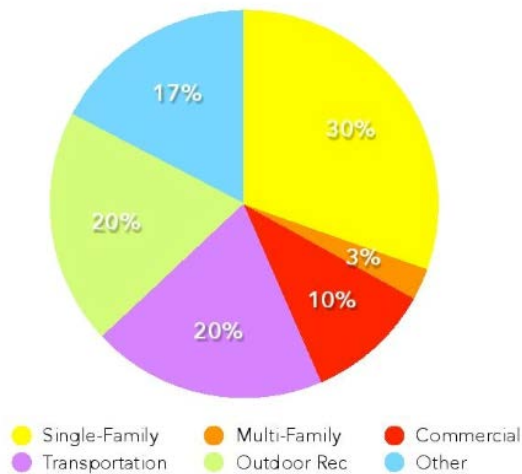
Dane County has long been hailed as an avid proponent of diverse outdoor activity within the state of Wisconsin. Hosting over 100 miles of bike, equestrian, and cross-country skiing trails, 25 recreational parks, and 4 major lakes, Dane County is a haven for outdoor enthusiasts of all ages and backgrounds. The Dane County Parks system as a whole welcomes 2.5 million visitors annually (Dane County, 2017). The city of Monona, founded in 1938 and centrally located within Dane County, contributes to this outdoor tradition. Although it is only 3.35 miles squared in total area, its location between the Wisconsin capitol city of Madison and Lake Monona provides a host of appealing attractions such as lakefront properties, quality schools, and access to the employment opportunities and cultural resources of UW-Madison and the State Capitol. Monona's 4 miles of Lake Monona shoreline serves as a staging point for many recreational outdoor activities such as fishing, boating, and swimming.



Figure 1. Map of Monona, illustrating proximity to Lake Monona and Madison (Google Maps, 2017)

Monona is unique in that it is limited in spatial growth by Lake Monona to the northwest and the city of Madison on land. Because of these constraints, if Monona wishes to develop or undergo new construction, it is limited to infill development and retrofitting existing structures. This can often be more costly or complicated than simply acquiring new outlying parcels. Therefore, it is vital that development within these restrictions is conducted efficiently and with long-term community goals in mind.

Land Use



Although Monona is a growth restricted community, it has made its priorities clear through its land use. This small city is host to over 120 acres of parks. In fact, a full 20% of the city's area is dedicated to outdoor recreation (see Figure 2).

It is clear the Monona has made green space a key priority—one of the greatest examples of this is the very popular Winnequah Park.

Winnequah Park

A large portion of the most popular Monona events are staged at its largest park, Winnequah. Built in 1963, Winnequah Park is considered the “crown jewel” of their

park system, with 45 acres of land and a beautiful lagoon and waterway that ultimately connects to Lake Monona. Winnequah is ideally located within a two mile radius of eight different schools, including Winnequah Elementary School, Nuestro Mundo Community School, and La Follette High School. This provides ample opportunities for programming that caters to school groups. Although Monona has no opportunity for physical expansion beyond its current borders, the community's commitment to providing ample natural space in the heart of downtown is clear in its preservation of this resource. Winnequah Park is primarily dominated by large empty lawn spaces, ideal for big events such as concerts, sports games and organized practices for area leagues. Over the past several years, Monona Parks and Rec has worked diligently to construct new playgrounds and shelters as well as maintaining and renovating existing infrastructure.

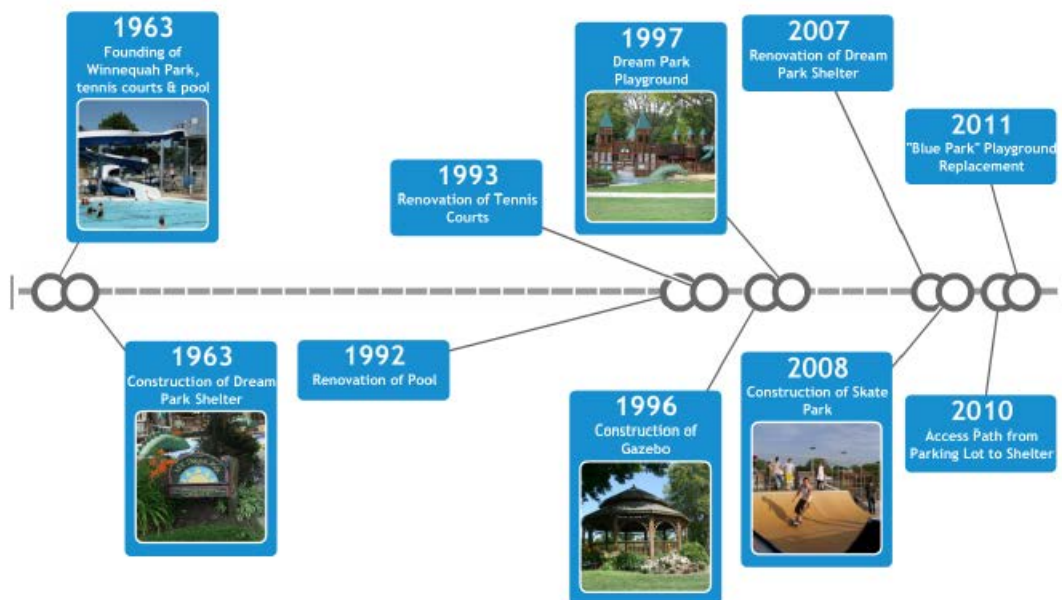


Figure 3. Timeline of Winnequah Park and other outdoor recreation developments (Source: Briel, 2017)

Not only has Monona increased physical amenities for use by the greater public, community events have also increased in both size and popularity. The active Parks and Recreation department is host to dozens of both small and large events throughout the year, from an annual Easter Egg Hunt to a Lake Monona 5k and 20k race, which attracts approximately 3500 participants each year.



Figure 4. Bulletin board advertising park events (Source: Briel, 2017)

Such events not only benefit neighborhood cohesion and pride, but also contribute tangibly to the public health outcomes experienced in Monona. This has spurred efforts by city officials to increase accessibility to all residents, from young families to the aging population.

According to 2016 data, Monona has a population of 7,836 individuals, a 4% increase from the 2010 census data. This is slightly less than the 5.6% increase seen in Dane County as a whole over the same time period. As overall population size stays relatively stable and the elderly are likely to age in place, their largest demographic of 50-59 year old individuals will be a large priority to municipal officials to provide adequate amenities for continued quality of life into the coming years. Indeed, the average age in Monona is a decade older than Dane County as a whole: 44.8 years versus 34.8 (US Census, 2010).



Figure 5. Current and projected demographics in Monona, Wisconsin. (Source: Monona City website)

It is paramount that the community continues to reflect the needs of its citizens through this demographic change, including in its ability to provide programming and parks that are physically navigable by those with limited mobility. If certain spaces in Monona are to be prioritized for renovation, Winnequah Park is an obvious choice.

Although the large spaces of Winnequah can be very useful, they also create barriers to access for less mobile visitors, such as those with wheelchairs or strollers. For day to day use, a greater system of sidewalk networks through the park would be beneficial for those constituents. However, it would also break up available land for special events. Therefore, we propose that Monona increase connectivity within the park largely around its perimeter and also create a bridge between the northern and southern ends of the park to enhance potential use of its sometimes-neglected northern side. This compromise would promote usability without increasing impermeable surfacing dramatically or inhibiting large scale events.



Figure 6. Photo of an isolated park bench in Winnequah Park that would benefit from greater accessibility. (Source: Briel, 2017)

It is our belief that building a sidewalk loop and pedestrian bridge around the Winnequah Park lagoon, particularly between the existing park benches, would be beneficial to community members of varying activity abilities and needs, ultimately resulting in positive health outcomes for the city of Monona.



The Health Impact Assessment Process

A health impact assessment (HIA), according to the World Health Organization, is “a means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques” (WHO, 2017). Unlike previously existing assessments that are similar, such as environmental impact assessments (EIA), the HIA views new projects, programs, and policies from a targeted health focus. Using health as a metric of success and sustainability is one that is increasing in popularity. While some topics become politically charged and controversial, such as the environment, health for children, families, and the elderly is a priority for most decision makers. Health outcomes in and of themselves are desirable, but are often associated with other positive outcomes for communities and individuals. The HIA identifies potential health effects that the proposed program or policy may have on the community prior to the project beginning; this is important because it allows the program planners to assess the usefulness, the impact and the financial needs of the program or policies (CDC, 2013). HIAs do not focus solely on individual physical health, but have the ability to assess various aspects of health like the psychosocial environment, physical environment, personal behaviors, and public policy that the new program or policy will affect. This is important because it ensures that health impact assessments are not only interdisciplinary, but that a variety of different models and methods can be used to conduct the HIA (Lock, 2000). Health impacts are both directly and indirectly related to other impacts, such as decreased expense of medical bills or increased patronage of community businesses when citizens are compelled to explore on foot.

Another crucial component of an HIA is that it takes into account the importance of equity, democracy, and social justice. Negative health outcomes tend to burden poor and underserved communities at a far higher rate. In order to produce policies that are truly health conscious, they must also be socially just and incorporate values and priorities from all affected stakeholders—not just the most influential. For this reason, we recommend that Monona continue to incorporate robust participatory strategies in future park developments. Surveys and well-advertised community meetings

offered in a variety of locations and on a variety of days/times can increase input from residents as to their specific needs and wants in order to ensure outcomes that have widespread support and long-term sustainability.

The key sections of an HIA are: **Screening, Scoping, Assessment, Reporting, and Evaluation**. The **Screening** stage provides the rationale behind why an HIA is necessary for a particular project—in this case, why we believe that increased interconnectivity in Winnequah Park is a worthwhile investment for Monona, and why we believe the health aspect of this project is substantial enough to warrant an HIA. **Scoping**, including a scoping map, seeks to thoroughly evaluate all of the potential qualitative benefits as well as drawbacks of the project. The **Assessment** portion of this document seeks to take these benefits and challenges and quantify them, particularly to determine financial costs of either implementing or not implementing our recommendations. In **Reporting**, we describe how our general recommendations actually fit into designs produced by students in another UniverCity class, Landscape Architecture 451. Their plans complement ours in providing explicit site designs to help Monona visualize the final product we hope to see. Finally, the **Evaluation** section explains how we believe Monona can track the success of the project after it is constructed, so that they can learn from it and determine how to design similar projects in the future. We also provide recommendations for how the proposed pathways can be even further improved in years to come.

It is important that communities implement HIAs as a way to clearly prioritize healthful outcomes for their citizens. Health is a keystone of life quality—if it is the overarching framework of a project, many direct and indirect benefits (to be described within the text of this document) are certain to follow.

Screening

As obesity and low activity related disease rates climb nationwide, the need for robust local park systems has never been greater. Parks are associated with a wide array of both direct and indirect physical health, mental health, and social benefits. A definitive report published by the US Surgeon General in 1996, supported by dozens of public health officials from the Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, and other national organizations indicated that regular physical activity reduces the risk of heart disease, hypertension, and type 2 diabetes, among other common ailments (CDC, 1996). Exposure to nature and green space has also been strongly correlated with improved mental health, including relief of anxiety and depression symptoms. Researchers in the Netherlands found that people residing in the lowest green space neighborhoods were diagnosed with anxiety disorders at a 44% higher rate than those living in the greenest residential areas (NRPA Report, 2010).

Parks do not only benefit individuals, but also boost the sense of community that residents feel within their town or neighborhood. These central gathering places provide the opportunity for increased social interaction in which neighbors can get to know one another and form more distinct social networks (IFPRA, 2013). These green spaces also indirectly support community health by reducing impervious surfaces within a municipality, promoting stormwater infiltration and limiting the volume of damaging flood waters. Additionally, trails allow community members to utilize non-motorized methods of transportation, which contributes to an increase of physical activity and a decrease in carbon emissions from vehicles (NPS, 2008).

Not only are parks and trails vital to the health of the community, but parks and trails that are ADA accessible promote inclusivity within the community along with physical and mental health benefits for a wider set of community members. Trails within parks allow a larger proportion of the community to utilize the park, including the elderly, the disabled, and parents of children who use strollers. However, parks and trails are a relatively large financial investment for a city, so ensuring that the park or trail will not only be used, but also used frequently enough to promote these described benefits is essential (CDC, 2013).

The Monona Parks and Recreation department has highlighted areas of Winnequah Park that they intend on improving in the coming years. This HIA specifically addresses the creation of additions to the pedestrian path system which will increase the interconnectedness of the park. By constructing paths that go around the lagoon, including a pedestrian bridge, we will improve the walkability of the park. However, constructing paths throughout the park will also have potential consequences. There will likely be a decrease in green space and an increase in traffic throughout the park, which may disrupt neighboring homes. Additionally, constructing paths throughout Winnequah Park will require a financial investment in the initial construction as well as upkeep of the paved paths. A full description of associated project costs can be found in the *Assessment* portion of this document.

Because there are potential drawbacks to this project, a Health Impact Assessment is appropriate to allow the city to determine the feasibility of the proposed path and the positive and negative impacts the path will have on the community before it is constructed.

Survey Results

Public opinion in Monona appears to be in support of trail building. The 2014 Parks and Open Space Survey was distributed to the City of Monona residents to determine the community's wants, needs, and characteristics. Among other metrics, the survey gathered information on demographics and usage frequency of park space and facilities. The results found that 47.8% of survey participants believe that there are not enough walking paths within the city of Monona as a whole. This was evident when speaking with the City of Monona's Park and Recreation department. The survey also found that 59.5% of Monona residents would like to see more walking paths installed within Winnequah Park specifically. Additionally, 57% of Monona residents believe the existing walking paths in Winnequah Park should be improved. These statistics demonstrate stakeholder buy in within the Monona community to carry out path infrastructure projects. Winnequah Park has ample green space for events and multiple playgrounds throughout the park, but many of them inaccessible for the physically disabled. The popularity of the park demonstrates the need to improve accessibility so that all of Monona's community members may enjoy the park.

This survey would be further supported by an additional survey concerning physical activity. The City of Monona's Parks and Recreation department should use the System for the Observing Play and Recreation in Communities (SOPARC) to analyze the level of activity in Winnequah Park before the construction of paths (McKenzie, 2016). SOPARC provides counts of park users stratified by age, gender, and race, and measures physical activity levels (Cohen et al., 2007; Reed, Price, Grost, Mantinan, 2011). By surveying park users before and after the construction of paths, Winnequah Park staff can assess the impact of the paths on physical activity levels and park visitation. This would

demonstrate to stakeholders in the future that the infrastructure investment was worthwhile, and would allow staff to quantify health benefits more tangibly.

American Disability Association Standards

Public parks play a vital role in facilitating physical activity, and they also play an active role in reducing sedentary behavior (Cohen, et. al., 2007). A study done by Kaczynski, Potwarka & Saelens found that the number of facilities and amenities like wooded areas, unpaved and in particular paved trails within a park had the most significant impact on the odds of increased physical activity for community members using the parks (Kaczynski, Potwarka & Saelens, 2008).

In 2010, Standards for Accessible Design were established in the ADA. These standards ensured that state and local government facilities, public accommodations and commercial facilities are easily accessible for individuals who are physically disabled (DOJ, 2010). Winnequah Park was created prior to these established Standards to the ADA, so many of these design elements are currently lacking. The walking paths proposed within this document would be constructed in accordance to the newly established Standards for Accessible Design, which would make the park accessible for all. Specifics of the expected costs to adhering to these standards are expounded upon in the *Assessment* section of this document.

After establishing a clear rationale that both the park staff and local citizens have interest in increased Winnequah Park pathways, a full assessment of potential benefits was created based on evidence from previous studies and literature reviews.

Scoping

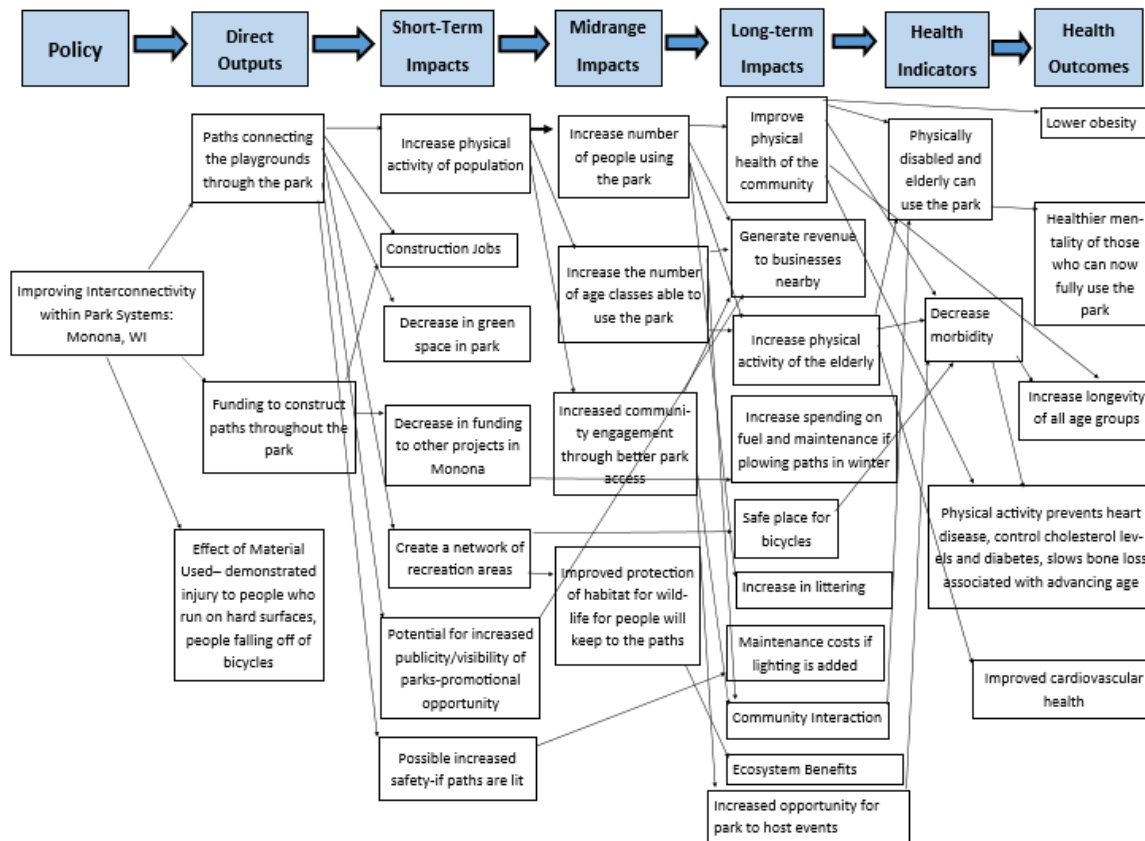


Figure 7. Scoping Map of short and long term effects associated with improved path systems in Winnequah Park.

A scoping map, as seen above, allows our HIA team to more clearly elaborate on the many potential impacts of new pathways in Winnequah Park. Scoping maps seek to not only demonstrate immediate consequences of a project, but also to suggest effects that are likely to be seen in coming months and years. It also serves as a first step for determining how we can evaluate the success of the project post completion.

As identified in this scoping map, the major beneficial aspects of pathway development in Winnequah are:

- (1) Improved health of senior citizens and the disabled
- (2) Improved health of young children and families
- (3) Increased social cohesion and community pride, and
- (4) Indirect economic impacts of increased patronage of surrounding local businesses.

Considerations that may present obstacles to success are:

- (1) Expense of construction and maintenance,
- (2) Safety concerns
- (3) Increased litter associated with more use, and

- (4) increase of impervious surface that can increase harmful stormwater runoff.

Identified Benefits

Increased accessibility of parks can increase the physical fitness levels of elderly and disabled individuals who live in Monona. Kerr and colleagues found that when elderly individuals exercise outdoors, they often exercise for longer periods of time than they would indoors (Kerr et al., 2012). By increasing the number of places that elderly individuals can exercise, Monona city officials can increase the level of physical fitness in Monona's elderly population. Brownson and colleagues found an association between the presence of walking trails and the physical activity levels in the community, and noted that regardless of sex or income group study individuals noticed the presence of sidewalks (Brownson, Baker, Housemann, Brennan, & Back, 2001). An increase in physical activity in the elderly and disabled population can lead to better health outcomes (Cauwenberg et al., 2012).

Besides elderly and disabled individuals, children and adults will also see improved health outcomes from the completion of an interconnected network of sidewalks in Winnequah Park. The linking of recreation facilities will make the park easier to navigate for parents and children. The improvement of park accessibility may facilitate the formation of a neighborhood community of parents that encourage safe and healthy physical activities for children. Franzini and colleagues found that policies and interventions that aim to reduce childhood obesity should consider neighborhood social factors as well as features in the built environment (Franzini et al., 2009). By linking recreational facilities in Winnequah Park, park officials can foster social cohesion, and increase associated child health (Franzini et al., 2009). Brownson and colleagues found that access to walking paths can increase levels of physical activity in populations at high risk for inactivity, including women and people of lower socioeconomic status (Brownson et al., 2001). The mobilization of women and low socioeconomic status individuals can lower the levels of obesity in the population (Franzini et al., 2009).

By increasing Winnequah park's accessibility and interconnectedness, park officials can improve the Monona economy. The project of constructing new paths will create jobs for Monona construction workers. The increased visitation that the park experiences due to improved accessibility can also bring consumers to retail establishments and restaurants near to Winnequah Park. A study in Nebraska estimated the economic impact of bike and pedestrian trails by estimating the cost of the project and finding the difference between medical cost savings and project costs (Wang, Macera, Scudder-Soucie, & Schmid, 2004). Wang and colleagues concluded that developing trails may be a cost-effective means to promote physical activity (Wang et al., 2004). However, Wang and colleagues also found that construction budgets need to be evaluated thoroughly before trail building proceeds. Officials should consider the number of users, trail surface type, length, and features such as bridges (Wang et al., 2004). Another economic consideration is the opportunity cost of the project. To fund the construction of new sidewalks, policy makers must consider that the project will use funds that could otherwise enable the completion of other projects aimed at benefiting the health of the Monona community.

The creation of additional sidewalks in Monona may also increase the social connectedness of the community by providing a more integrated built environment (McCormack et al., 2012). Franzini et al. found that neighborhood social cohesion can lead to increased social exchanges and encourage a culture of fitness (Franzini et al., 2009). By creating a space where all members of the community can come together to walk, interact, and exercise, the completion of a network of recreation areas in

Winnequah park can increase the sense of community in Monona. Social interconnectedness of communities can lead to better mental health, physical health, and longevity (Orsega-Smith, Mowen, Payne, & Godbey, 2004; Brownson et al., 2001). The facilitation of a neighborhood culture of fitness could have major benefits to the health of the Monona community.

Identified Challenges

With increased park usage come some associated challenges that park staff must consider before approving path construction. Research has evaluated whether urban trail systems see a higher rate of crime as more individuals encounter one another, particularly in the late evening hours. Tammy Tracy and Hugh Morris in their article *Rail-Trails and Safe Communities: The Experience on 372 Trails* interviewed trail managers and law enforcement officials in charge of rural, suburban, and urban trails across the United States. They found that the crime rates in all cases were lower on trail systems than the overall rate in the larger region surrounding the system. However, they also found that 17% of suburban trails experienced graffiti on signage, which would be an expense to the city (Tracy & Morris, 1998).

Even if actual crime rates are unlikely to increase, the perception of increased crime risk could dissuade residents from using the park. To combat this issue, we have suggested the addition of lighting structures to the sidewalks of Winnequah Park as a potential next step of this project. Safety will see an improvement through the creation of lighted paths in Winnequah Park. Cauwenberg and colleagues found that street lighting helped individuals to identify fall hazards during nighttime walks (Cauwenberg et al., 2012). Lighted paths enable nighttime exercise, biking, and jogging. The availability of level, connected sidewalks will increase biking safety during the daytime and can increase the feasibility and attractiveness of biking (Wang 549). One health consideration that may affect the scope of the health impact of the construction of additional paths is that the presence of more hard surfaces in the park may put park users at an increased risk of injury in the case that they fall down. The increased fall risk can be assessed through the Parks and Open Space Survey used in park evaluation.

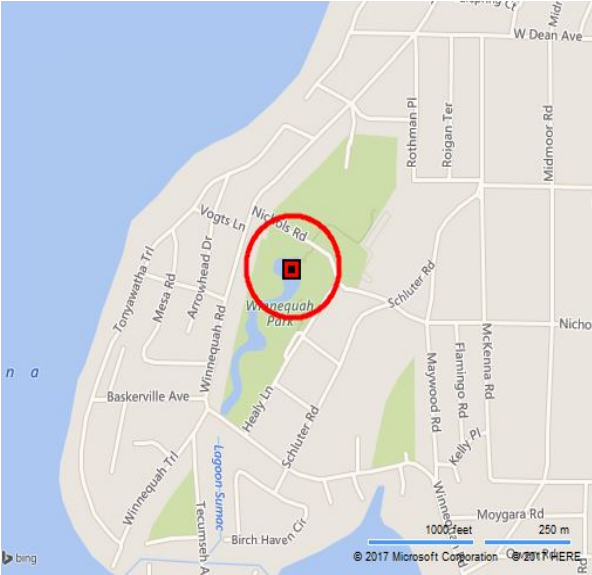
Stormwater Considerations

Each year, 10 trillion gallons of stormwater run off of buildings, parking lots, and roads (EPA, 2017). As it flows, it picks up car oil, lawn fertilizers and pesticides, road salt, and other waste that flows into our waterways. This is associated not only with negative health outcomes for wildlife and vegetation, but for humans. While it can be difficult to quantify the exact numbers of water borne illness cases annually due to lack of reporting, it is estimated by the CDC that there are between 4 and 32 million cases of gastrointestinal illness each year in the United States. This includes notorious diseases such as cryptosporidium, *E. coli*, and Hepatitis A. The CDC further estimated that water borne illnesses cost the national health care system as much as \$539 million annually, often a burden on already economically and socially vulnerable communities (CDC, 2010).

However, many of the negative effects of these illnesses can be prevented by limiting the amount of impervious pavement that a community has. Impervious pavement such as traditional concrete doesn't allow water to naturally infiltrate into the ground and underlying water table, but directs it into storm drains. While the roots of vegetation have incredible abilities to filter many of our worst

toxins, treatment at a water treatment facility is a huge national expense, and many facilities are not equipped to treat for all substances such as road salt (a highly water soluble compound) . By increasing traditional gray infrastructure, a community could subject itself to increased runoff and consequently increased disease incidence. In our recommendations to Monona to increase sidewalks, which are typically made of impervious material, we must ensure that this option does not lead to enhanced risk of disease.

The EPA's National Stormwater Calculator (SWC) allows communities to evaluate how much runoff would be associated with increases in impervious pavement or, alternatively, green infrastructure such as bioswales or rain gardens. This user friendly tool takes into account local soil type, topography, and precipitation/evaporation rates to determine percentage of infiltration versus runoff in a given land area. Our chosen area of interest is shown below:



One limitation of the tool is that area can only be taken in a circular radius. However, the above area does include the area we have proposed to add sidewalks and a bridge, so it is sufficient for analysis.

Below are the results of the SWC for the current scenario as opposed to a 10% increase in impervious surface:

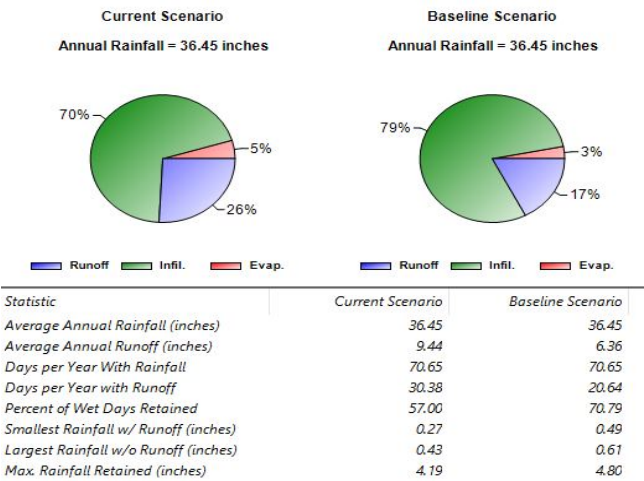


Figure 8. Results from SWC tool comparing baseline to proposed pathway additions (Briel, 2017)

The baseline scenario is that which exists in Monona today, whereas additional sidewalks are shown under “current scenario”. This indicates that with 10% additional impervious pavement, average runoff increases by 3.08 inches-- 26% of total precipitation as compared to 17% previously. This is a modest increase, as Monona is fortunate to have relatively flat topography and moderate draining soils. It also benefits from a lack of local agriculture, which is typically high in fertilizer intensity. Still, the city should be cognizant of preserving green space into the future as high intensity storm events are anticipated to increase with climate change.

To account for some of these adverse effects, our recommendation is to either use impervious pavement for these sidewalks (which may be cost prohibitive), or to ensure that a wide enough green buffer is left between the sidewalk and the lagoon. If this buffer is maintained with appropriate vegetation, much of the potential sidewalk runoff can be captured before it enters the lagoon.

Identification of Stakeholders

Due to the far reaching impacts of the creation of additional paths in Monona, stakeholders for the project come from many different segments of society. Families, Monona citizens, individuals who visit Monona for major events (such as the Easter Egg Hunt, 5k, 20k, and concerts), elderly individuals, soccer, baseball, and softball teams that use Winnequah park for games, and parks and recreation workers all have a stake in the outcome of the project to construct additional paths. The stakeholders for this project, may experience additional engagement with the park or may receive health benefits directly or indirectly from the construction of paths to increase park interconnectedness.

In conclusion, the creation of an interconnected network of paths in Monona's Winnequah park can impact health outcomes positively, directly and indirectly, across different demographic groups. The creation of paths can increase accessibility for elderly and disabled individuals, increase the physical activity levels of Monona individuals who use the park, benefit the Monona economy through increased visitation of the park, and yield a safer, more interconnected community. The full scope of the populations impacted by the creation of additional paths in Winnequah park includes individuals who visit Monona to enjoy Winnequah park and surrounding retail shops and restaurants. Policy makers should consider all the alternative projects that seek to improve health outcomes in Monona before deciding that the funding should go to this project above other pending projects.

Assessment

Urban residents and low income women in general have reported low participation in leisure-time exercise, according to Jackson (2003). Only 25 percent of American adults engage in the recommended levels of physical activity, and 29 percent engage in no leisure-time physical activity, according to the Centers for Disease Control (CDC), as cited by Erica Gies (2006). In 2013, the CDC reported that the percentage of adults who reported no leisure-time physical activity was at 25 percent (CDC 2013). Unfortunately, 80 percent of adolescents in the United States at the time of the CDC survey in 2013 did not achieve the minimum physical activity time per day as recommended by the Centers for Disease Control and Prevention (CDC 2013). In the 1960s, obesity rates for children 6 to 11 years old were around 4 percent and by 2010, the obesity rates had increased to 18 percent (CDC 2013). In 2010, more than 69 percent of the United States adult population was overweight (CDC 2013). Obesity in adults increases the risk of many illnesses including diabetes, which itself often leads to kidney failure, heart disease, blindness, and amputations (Jackson 2003). The Center of Disease Control has reported that physical inactivity accounts for as much as 23% of all U.S. deaths from major chronic diseases (Jackson 2003). In the early 2000s, the national financial burden of health care costs for obesity and physical inactivity is estimated to be more than \$100 billion annually (in USD) according to Jackson (2003). Beginning in the 1990s and continuing to today, there have been epidemics of obesity, heart disease, adult-onset diabetes (and has been diagnosed in children), depression, and other exercise-related illnesses (Jackson 2003). In 2013, the American Diabetes Association estimated that the total

costs of diagnosed diabetes have risen to \$245 billion in 2012 from \$174 billion in 2007 (diabetes.org). People with diabetes incur average medical expenditures of about \$13,700 per year of which about \$7,900 is attributed to diabetes (American Diabetes Association, diabetes.org). In a study done by Hussey et al, they found that the mean monthly costs of medications for chronic heart failure was \$438 in the early 2000s (2002). Patients with class II and class III chronic health failure had costs of \$541 and \$514, respectively (Hussey et al 2002). According to AARP, the annual costs of Crestor, a cholesterol drug, rose from \$981 in 2005 to \$2,169 in 2013 (P. Janet 2015). Between 2002 and 2013, the cost of digoxin, a heart drug, rose by 637% (P. Janet, 2015, AARP).

Fortunately, evidence shows that when people have access to parks, they are more likely to exercise, which can reduce obesity, its associated problems, and its costs (Gies 2006). In a report cited by Laura E. Jackson, that neighborhood opportunities for walking to accomplish routine activities such as shopping and going to work are as effective in losing weight as structured aerobic exercise (2003). The presence of sidewalks, enjoyable scenery, and hills can promote walking for exercise according to a survey done by Jackson (2003). It has also been noted by Jackson that pedestrian paths adjacent to streets and winding through mixed land uses are used often (2003). Gies cited in her paper the American Journal of Preventive Medicine which stated, “‘creation of or enhanced access to places for physical activity combined with informational outreach’ produced 48.4% increase in the frequency of physical activity” (2006). This journal also demonstrated that easy access to a place to exercise leads to an increase in aerobic capacity, weight loss, improvements in flexibility, and an increase in perceived energy (Gies 2006). Physical activity can also prevent heart disease, help control cholesterol levels, slow bone loss associated with advancing age, lowers the risk of certain cancers, and helps reduce anxiety and depression (Rails to Trails Conservancy). The effects of physical activity is especially pronounced for older adults (Rails to Trails Conservancy). In Denmark, a 2000 study found that leisure-time activity improved longevity across genders and age groups (Rails to Trails Conservancy)

A survey was done in 2014 to investigate the average costs per inpatient day across the United States. On average in the United States at a state/local government hospital it costs a patient \$1,974 per day to stay in the hospital; for non-profit hospitals was \$2,346; and for-profit hospitals was \$1,798 (Ellison, 2016, Becker's Hospital CFO). When broken down by state, the survey showed that in Wisconsin a state/local government hospital visit would cost someone \$2,108 per day; \$2,138 per day for a nonprofit hospital; and \$2,309 for a for-profit hospital (Ellison, 2016, Becker's Hospital CFO). According to a NBC news report from 2016, from 2009 to 2013 total cost sharing associated with hospitalizations grew by more than 37 percent from \$738 to \$1,013 (M. Fox). The cost of treating a heart attack was \$1,586, having a baby cost \$259, and treating appendicitis cost \$1,509 (M. Fox, 2016, NBCnews). In 2012, patients aged 45-64 and 65-84 had the highest mean hospital costs (Agency for Healthcare Research and Quality). According to healthcare.gov the average cost of a 3-day hospital stay is around \$30,000.

Growth in mean hospital costs by type of hospital stay, patient age, and primary payer, 2003–2012
Table 1 presents mean hospital costs per stay in 2003, 2008, and 2012 by type of hospital stay, patient age group, and expected primary payer. The average annual percentage change from 2003 to 2008 and from 2008 to 2012 also is provided. All costs are inflation adjusted and expressed in 2012 dollars.

Table 1. Inflation-adjusted mean hospital costs per stay, 2003, 2008, and 2012

Characteristic	Mean hospital costs per stay (inflation-adjusted), \$			Average annual change, %	
	2003	2008	2012	2003–2008	2008–2012
All stays	8,800	9,600	10,400	1.8	1.8
Type of stay					
Surgical	17,300	19,100	21,200	2.0	2.6
Medical	7,500	8,100	8,500	1.7	1.2
Maternal and neonatal	3,500	3,700	4,300	1.0	3.8
Patient age group, years					
<1	3,600	3,800	5,000	1.3	6.7
1–17	6,500	7,700	9,900	3.6	6.4
18–44	6,700	7,100	7,600	1.3	1.8
45–64	11,300	12,300	12,900	1.7	1.2
65–84	11,500	12,400	13,000	1.6	1.1
85+	9,200	9,900	10,200	1.5	0.8
Primary payer					
Medicare	11,000	11,800	12,200	1.4	0.9
Medicaid	6,900	7,300	8,100	1.3	2.5
Private insurance	7,600	8,800	9,700	2.9	2.4
Uninsured	7,500	7,700	8,800	0.5	3.5

Note: Data from 2008 were used as end points in both the 2003–2008 and 2008–2012 analyses.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2003, 2008, and 2012

Figure 9. Average hospital cost per stay for different age groups. (Source: Agency for Healthcare Research and Quality).

One way to incorporate exercise into daily activity is to walk or bike for errands near your home (Gies 2006). In her paper, Gies cites a national study in 1997 in which it was found that 83% of trips are taken for short, non-work purposes and 14% of these trips are within one-half mile and 27% are within one mile of home which are considered walkable distances (2006). It was found that 63% were within five miles which is considered reachable by bicycle (Gies 2006). Erica Gies then cites the Center for Disease Control which estimates that a 20-minute walk every day (which equals to about 100 calories per person per day) could eliminate the nation's obesity problem (2006). For all weight levels, physical activity alone can improve health outcomes.

Poor lighting, excessive noise, heavy traffic, and lack of public transit are associated with a loss of physical function in adults over 55 years of age (Jackson 2003). These environmental features discourages neighborhood excursions by this age group (Jackson 2003). Children, the elderly, and the disabled are affected by vehicular hazards to pedestrians, which can isolate these populations (Jackson 2003). Potential health hazards include traffic volume and street widths (Jackson 2003). During 1997–1998, the elderly (persons aged 65 years or older) comprised 13% of the US population, (in 2014 they represented 14.5% of the U.S. population and is expected to continue to rise (U.S. Department of Health and Human Services)), yet, they accounted for 22% of pedestrian traffic fatalities (Jackson 2003). Parks and trails could help reduce vehicle-pedestrian accidents, which accounted for 6,000 deaths and 110,000 injuries in the U.S. in the early 2000s (Gies 2006). In 2014, 4,884 people were killed in pedestrian/motor vehicle crashes and there were 65,000 reported pedestrian injuries in 2014 (pedbikeinfo.org). In 2015, 5,376 pedestrians and 818 bicyclists were killed in crashes with motor vehicles (National Highway Traffic Safety Administration, pedbikeinfo.org). According to Erica Gies, low-

density, automobile-dependent patterns of development can discourage physical activity, such as walking to school or work or to run errands (2006). By incorporating parks or greenways into communities, Gies believe this can support increased exercise and promote healthier lifestyles (2006). Parks and trails can make transportation corridors to libraries, schools, and offices more attractive and pedestrian friendly (Gies 2006). Parks and trails ranging in length from a few blocks to many miles can link larger parks, schools, offices, and stores (Gies 2006). Trails and paths connect neighborhoods and schools so children can walk or cycle home. The trails in Winnequah Park would be located away from the road so children wouldn't have to ride their bicycles or walk right next to the road. Also, the path in the park would lead directly to the school. In Denver, Colorado, the Weir Gulch Trail is a safe neighborhood route and its primary users are elementary-aged children (Rails to Trails Conservancy). Several communities throughout the U.S. have partnered with the Safe Routes to School program to improve safety on walking and bicycling routes to school and to encourage children and families to travel between home and school. It provides children with walking and biking zones that are completely separate from auto traffic to help teach children good attitudes toward exercise.

Parks offer various opportunities to fulfill individual, social, economic, and environmental benefits. The opportunities can benefit the entire community, not just the park visitors. Parks and trails can improve health in several ways including walkable access to appropriate sites motivates people to participate in physical activity and to do so more frequently, stress reduction, reducing air and water pollution, protect hazard areas (e.g., flood plains, unstable slopes) from inappropriate development, and mitigate urban heat islands, providing meeting places for neighbors, and to provide safe spaces for people to play and exercise, away from busy streets and commercial zones (CDC 2013). Parks that are conveniently located (as perceived by community members), have been associated with vigorous physical activity among both adults and children (Bedimo-Rung et al 2005). According to Gies, several studies have shown that trails and pathways in a community has been shown to increase regular physical activity or people who live nearby (2006). Gies cites two studies in her paper, one from Missouri and the other from Indiana, of which they reported that people were expressing that they were exercising more when the trails were built in their states (2006). A study conducted in North Carolina found that 72 percent of respondents indicated it was likely that trail would provide a place for them to exercise and would likely exercise more if trails were created (Rails to Trails Conservancy). Other factors that have been positively associated with physical activity, as seen by Bedimo-Rung et al include the presence of enjoyable scenery, frequency of seeing others exercise, and access to, as well as satisfaction with recreational facilities (2005). This could be very influential with the addition of the pathways in Winnequah Park since it is located in a community surrounded by homes.

The use of parks has also been related to improved psychological health, including stress (Bedimo-Rung et al 2005; Orsega-Smith et al 2004). Bedimo-Rung et al cite a study that was done about older adult park users who participated in light to moderate aerobic activity, and it was found that half of those who visited the park were in a better mood after leaving the park (2005). In another study cited by Bedimo-Rung et al, park users reported lower levels of anxiety and sadness after visiting the parks (2005). It was found that the longer visitors stayed in the park, the less stress they reported (Bedimo-Rung et al 2005). In a study cited by Orsega-Smith et al, respondents to a survey said they felt less calm and more anxious at home than at a park (2004). Orsega-Smith et al also found a direct relationship between reported leisure benefits and lower blood pressure (2004). Orsega-Smith et al suggest that parks are important in promoting the well-being of citizens because they provide opportunities for self-restoration for being in nature facilitates in what they call a "clearing of the mind"

and/or “clearing the head and re-energizing” (2004). In another study cited by Bedimo-Rung et al, exposure to green common spaces by inner-city elderly individuals is positively correlated with social integration (2005). Social interaction could also increase among other age groups. According to the Rails to Trails Conservancy, parks serve as a place where people can see and interact with other people exercising. A lack of this type of social support is often a barrier to participation in exercise (Rails to Trails Conservancy). Many forms of park activity (both sedentary and active) have a positive influence on mental health and stress. It should be noted though that if the physical environment is crowded, dangerous, and noisy, this may inhibit the formation of social ties (Bedimo-Rung et al 2005).

Park use studies have demonstrated a continuous growth in the prevalence of outdoor recreation participation (Bedimo-Rung et al 2005). When Bedimo-Rung et al’s survey was being completed, 95% of the U.S. population reported that they had participated in an outdoor recreation activity before the survey; 68% reported trail/street/road activity, and 22% cited participation in sports from 1994-1995 (2005). Many of the parks included federal, state, and local parks. In this study, walking was the most frequently cited activity followed by more sedentary forms of activity including viewing scenery or family picnics/gatherings (Bedimo-Rung et al 2005). Though parks offer opportunities for both sedentary and active forms of leisure (as Winnequah Park does), according to Bedimo-Rung et al, many studies have demonstrated that the majority of park visitors are more likely to engage in sedentary recreation activity (2005).

Bedimo-Rung et al advise that a park is more than just the sum of its parts and that it is necessary to consider an overall impression and meaning ascribed to the park as a whole to be able to appeal to users of all ages and disabilities (2005). Parks can contain a wide variety of features that lend themselves to different types of usage so everyone can use them. Some park characteristics that may influence park use are the physical components of a park. According to Bedimo-Rung et al, people are attracted to parks in which they can partake in specific behaviors or realize certain benefits, and the presence or absence of a park attribute can be an important determinant of a park’s ability to promote physically active leisure behavior (2005). It is important to consider if the park is adhering to everyone’s needs and capabilities so as to not leave out any demographic group. Amenities and the condition of the amenities and the park itself are among the important features influencing people’s use of local parks. People are more likely to visit a park where the features are maintained on a regular basis.

Construction Materials

Since people have different park needs, physical abilities, and are influenced by a park’s physical components, it is important for a local or state government to consider what materials to use for the trails and what equipment or amenities to include in the park. Even though parks can be health-promoting components of communities, they can also create community concerns (CDC 2013). Parks could be viewed as a place for crime or illegal activity; there may be concerns about injuries at the park or by people traveling to the park; or there may be competing development interests (CDC 2013). All of these issues are important to consider when creating a park or providing improvements to a park.

When choosing a surface for the trails and pathways, several elements need to be considered including user acceptance and satisfaction, accessibility, cost to purchase and install materials, cost of maintaining the surface, the life expectancy of the material, and the availability of the material (Rails to Trails Conservancy). To build quality trails proper drainage, proper sub-grade compaction, adequate

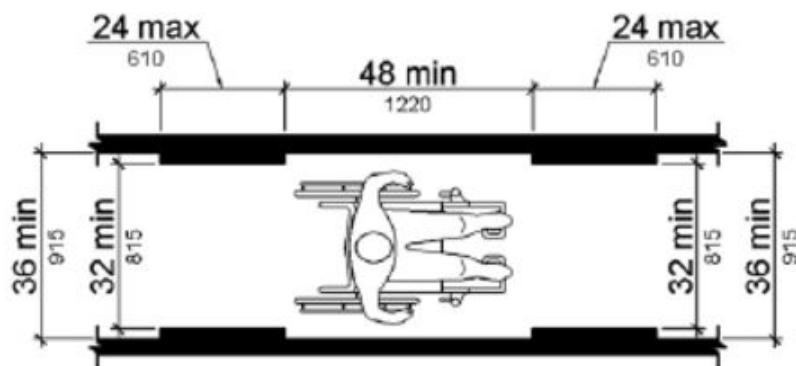


Figure 10. Diagram demonstrating the required regulations by the ADA to create universal accessible trails and pathways. (Source: ADA)

thickness, and adequate compaction all need to be considered. Trail types depend on their intended use, the setting, the budget, and the available materials. The pros and cons of hard surfaces and soft surfaces must also be considered as well. Hard-surfaces may be more accommodating, require less maintenance, and can withstand frequent use, however, they are more expensive to install (Rails to Trails Conservancy). Soft-surface materials cost less, but do not hold up well under heavy use or varying weather

conditions (Rails to Trails Conservancy). To create universal accessible trails, the Americans with Disabilities Act Accessibility Guidelines state that ground and floor surfaces should be firm, stable, and slip-resistant. As stated by the Americans with Disabilities Act Accessibility Guidelines, “A stable surface is one that remains unchanged by contaminants or applied force, so that when the contaminant or force is removed, the surface returns to its original condition. A firm surface resists deformation by either indentations or particles moving on its surface. A slip-resistant surface provides sufficient frictional counterforce to the forces exerted in walking to permit safe ambulation” (2010). The slope of walking surfaces can not be steeper than 1:20, the clear width of walking surfaces shall be 36 inches, and where a route makes a 180 degree turn the clear width should be 48 inches (ADAAG 2010). These regulations are used to define a trail or pathway that is easily traveled by individuals using canes, walkers, crutches, wheelchairs, or other mobility aids, which this health impact assessment is trying to accommodate.

Concrete is the longest lasting of hard-surface materials, but it is also one of the most expensive to install. Concrete that is well-maintained can last 25 years or even longer (Rails to Trails Conservancy). It is a good option for areas that have climate swings (similar to the constant thawing and freezing in WI) and that are susceptible to flooding (Rails to Trails Conservancy). Unfortunately, the hard service takes a toll on runners’ lower limbs and usually avoided by this user group (Rails to Trails Conservancy). Concrete paving includes forming and placing concrete for walkways, patios, sidewalks, aprons, etc. (DeIPico 2012). Concrete paving involves calculating the cubic yard of concrete necessary, plus a small percentage for waste resulting from spillage (DeIPico 2012). Placement and finishing is priced by the square footage of the surface area finished and this varies on the type of finish required (DeIPico 2012). Reinforcement for concrete walkways is the form of welded wire fabric is calculated by the square foot and rebar is calculated by weight and extended to tons for pricing (DeIPico 2012). Curing compounds are priced by the square foot of the surface area (DeIPico 2012). There is a lot of work involved with concrete paving including formwork for cast-in-place concrete and it requires finishing at the surface (DeIPico 2012). One must also consider how thick the concrete must be when it is laid into a sidewalk or driveway. Sidewalks must be at least 4” in thickness (Ford Asphalt Company). Residential driveways are at least 6” thick (Ford Asphalt Company). If the parks department should have to use vehicles in the park at all, then the concrete slabs need to be at least 6” thick. This needs to be considered when designing where to put trails and paths into Winnequah Park and what type of trails should be put in.

Wingra Stone Company, a local company in southern Wisconsin, has estimated prices for different materials to be put into roadways, paths, and sidewalks. Their prices are included in the following table. Materials include crushed stone, concrete, sand; materials that can be used for paths and trails.

Year 2017 Aggregate Pricing (January 1, 2017)	
Small Contractor Material Prices	PRICE @PIT PER TON LOADED
1/4" Screenings	\$ 9.00
1" and 1 1/2" Crushed Stone & Breaker Run	\$ 11.25
1" Clear	\$ 13.25
3" Clear & 5" Clear	\$ 12.00
Fill Sand	\$ 9.00
Quarry Stone	\$ 50.00
#1 & #2 Washed Stone	\$ 21.50
Pea Gravel	\$18.00
Washed Sand	\$18.00
Mason Sand	\$ 25.00
Concrete & Asphalt Dumping	\$ 3.00 per Ton with \$25.00 minimum
Note: Delivery charges are \$4.75/Ton for the first five miles and \$0.80 per/Ton for each additional mile. State & Local sales tax will be added to these prices @ 5.5%	

Figure 11. Wingra Stone Company cost estimates for material that could be used for trails and paths. (Source: Wingra Stone)

CONCRETE SIDEWALK COSTS	ZIP CODE	SQ. FT.	
	53716	100	Update
	Basic	Better	Best
Concrete Sidewalk – Material Prices	\$130.00 - \$155.00	\$160.00 - \$165.00	\$170.00 - \$175.00
Concrete Sidewalk – Installation Cost	\$325.00 - \$335.00	\$350.00 - \$365.00	\$370.00 - \$390.00
Concrete Sidewalk – Total	\$455.00 - \$490.00	\$510.00 - \$530.00	\$540.00 - \$565.00
Concrete Sidewalk – Total Average Cost per square foot	\$4.72	\$5.20	\$5.53

Figure 12. Estimated costs for installing only 100 sq. ft. of concrete. It is important to plan how long a trail should be and how many trails should be created using this material. This tool can also be used for asphalt and crushed stone. (Source: RemodelingExpense.com)

Concrete is not the only material to be considered for trails and pathways. Crushed stone (crusher fine) also provides a user-friendly, all-season surface for visitors including strollers, wheelchairs, and bicycles. Finely crushed compacted rock is also a popular trail surface improvement. Crushed stone should have a range of particle sizes from a fine dust to a 3/8" maximum particle size (Boone, American Trails). Lois Bachensky of the Forest Service believes that with a proper subgrade preparation and drainage, the crusher fine trails should remain stable for years in many weather



Figure 13. A crusher fines trail at Bluff Lake Nature Center in Denver, CO. (Source: American Trails)

conditions (American Trails). A crusher fine material gives the feeling of being a more natural surface trail that is durable. It can be used as an alternative for medium to high trails, for bike paths and for running trails (Bachensky, American Trails). Rock must be crushed into irregular and angular particles to allow interlocking into a tight matrix (Bachensky, American Trails). Pea gravel or decomposed granite never lock together (Bachensky, American Trails). There must be adequate fines and some natural binders in order to cement the particles together after the fines are moistened, compacted, and allowed to dry (Bachensky, American Trails). Issues for crusher fine trails include water, drainage, existing soil types, and the types of usage are the primary considerations for constructing crusher fine trails/pathways

(Bachensky, American Trails). They are susceptible to washouts from running water, particularly if the finer material becomes saturated from spring snowmelt (Bachensky, American Trails). Also, crusher fines are available in various stone types and sizes, but not all are suitable for trails (Bachensky, American Trails). If trying to comply with the requirements of a fully accessible trail, crusher fines are not always smooth enough or hard enough (Bachensky, American Trails). Lime or another stabilizing agent may be added so that it will set up harder and remain that way for longer periods of time (Bachensky, American Trails). Crushed stone trails should be laid at grades less than 8% to promote accessible use (Boone, American Trails). Crusher fines should be laid to a depth of 4-5" (Bachensky, American Trails). The crusher fines should be spread to a depth necessary to meet the desired compacted thickness (Bachensky, American Trails). Certain soils may need a geotextile to prevent the stone from mixing with the soft soils below and to help control damage from vegetation (Bachensky, American Trails).

Another material to consider to use for trails and pathways in Winnequah Park is asphalt. Asphalt works well for bicycle commuters, which is a reason why it is often used in urban areas (Rails to Trails Conservancy). It does require regular, minor maintenance such as the patching of cracks, but can have a life expectancy of 7-15 years (Rails to Trails Conservancy). Asphalt is a flexible surface that will last longer with heavy use (Rails to Trails Conservancy). Installing asphalt, though, could cause the possibility of environmental contamination during construction (Rails to Trails Conservancy). Not all hot mix asphalt is the same, and the type used for a highway is not an appropriate mix for a trail or path. Asphalt should provide adequate strength and durability. Asphalt paving mixtures should have a cost-

effective blend of aggregates and asphalt that yields a mix having sufficient asphalt to provide durability, adequate stability to resist distortion and displacement, sufficient voids to provide for expansion and contraction due to temperature fluctuations, sufficient workability to allow proper field compaction to resist moisture damage and minimize segregation, and proper aggregate texture and hardness to provide sufficient skid resistance (West, American Trails). Bike paths and trails are not subjected to heavy loading. Many of these paths are constructed in terrain difficult for large construction equipment to access, thus, the hot mix asphalt should be mixed with a high asphalt cement content (West, American Trails). This will provide durability and allow for ease of placement and compaction (West, American Trails). Pavements need to be designed to support wheel loads from vehicles that will have access to them (West, American Trails). The load carrying characteristics of the soil should be determined (West, American Trails). The pavement thickness is dependent on the loading that will be applied to the pavement, the asphalt mix, and the ability of the underlying soil to support the loads (West, American Trails). Depending on the existing soil's ability to support the loads, an aggregate base and/or a geo-textile may be used to improve the stability and load carrying capability of the soil (West, American

<i>Relative Quality of Trail Bed Soil</i>	<i>Loading</i>	<i>Asphalt Pavement Thickness (inches)</i>
High Quality	Heavy	3.5 to 4.0
	Medium	3.0 to 3.5
	Light	2.5 to 3.0
Good	Heavy	4.5 to 5.0
	Medium	3.5 to 4.6
	Light	3.0 to 3.5
Weak	Heavy	5.0 to 5.5
	Medium	4.5 to 5.0
	Light	4.0 to 4.5
Poor Quality	Heavy	6.0 to 6.5
	Medium	5.5 to 6.0
	Light	5.0 to 5.5

Figure 14. Guidelines for Thickness of Asphalt Paved Trails.
(Source: National Asphalt Pavement Association)

Trails). It is recommended that a minimum of 3" of hot mix asphalt be used for bike paths and trails where loading from vehicles will not be used (West, American Trails).

When choosing a material to be used for the pavement, it is important to consider to the opinion of those who will be using the trail or user preference. For this case, this will be the elderly and those with a physical mobility. Asphalt provides a softer surface and is preferred by joggers and walkers (Peterson, American Trails). As found by the National Trails Partnership, an increasing number of users including roller-bladers, cyclists, handicap users, and parents pushing baby strollers prefer the smooth join-free asphalt (Peterson, American Trails). The construction cost of an

asphalt trail is significantly less than a concrete trail (Peterson, American Trails). However, there has been a history of higher maintenance costs for asphalt (Peterson, American Trails). The service life of a trail is a function of the quality of materials used, the quality of construction, and the quality of the design and investment level. Equivalent designs must be compared. Proper drainage entails efficient removal of excess water from the trail. Surface water runoff should be handled using swales, ditches and sheet flow. Catch basins, drain inlets, culverts and underground piping may also be necessary. These structures should be located off of the pavement structure. Soil, crushed stone, or a finer material should be placed along impervious surfaces to reduce impact of runoff. Also, these aren't the only materials that can be used either. These are three of the most commonly used material for trails and pathways. Other materials include soil cement, resin-based stabilized material, boardwalk, or recycled materials. Below are the cost estimates of materials near Madison, WI.

Material	Estimated Costs
Concrete Sidewalk or Walkway Installation in Madison, WI	\$6.09/sq. ft. (4" reinforced slabs; Range: \$5.75-6.42)
Concrete Slab Leveling or Mudjacking in Madison, WI	\$4.90/sq. ft. (Range: \$4.40-\$5.40)
Concrete Delivery in Madison, WI	\$101.42/cubic yard (Range: \$95.70-\$107.14)
Loose Gravel or Stone Paving in Madison, WI	\$1.20 per square foot (4 inch thick gravel or crushed stone) (Range: \$0.85 - \$1.54)
Asphalt Paving Installation in Madison, WI	\$2.00 per square foot (Range: \$1.50 - \$2.50)
Asphalt Paving Repair in Madison, WI	\$3.50 per square foot (to patch) (Range: \$3.00 - \$4.00)
Asphalt Sealing in Madison, WI	\$0.32 per square foot - residential (driveways) (Range: \$0.21 - \$0.43)

Figure 15. Materials and their estimated costs for Madison, WI (Source: ProMatcher)

Material	Pros	Cons
Concrete	<ul style="list-style-type: none"> • Long Term, last 20+ yrs • Lasting consistency of surface • Steel in concrete keeps it from deflecting, preventing tripping hazards or barriers for wheelchairs • Cleaner surface after rain • Don't have to replace after every rain • Can be submerged multiple times 	<ul style="list-style-type: none"> • More expensive • Hard on joints • Less natural looking • Impervious surface • Heavy equipment may not work well on field, could cause soil compaction • Labor and equipment costs
Gravel	<ul style="list-style-type: none"> • More natural looking • Good for flat areas • Softer on joints • Cheaper initial installation cost • Readily available • Drains better than impervious surface • Strong base material for foundations 	<ul style="list-style-type: none"> • Ongoing maintenance costs • Difficult to maintain consistent surface quality • Gravel erosion • Difficult to use in winter (soft, wet) • Gravel migrates on steep slopes • Difficult to ride bikes on steeper slopes • Can be difficult to meet ADA standards • Gravel buildup in natural areas
Asphalt	<ul style="list-style-type: none"> • Best initial surface • Cheaper than concrete in initial installation costs • Often preferred by bikers, runners, walkers, parents with strollers • pliable 	<ul style="list-style-type: none"> • Cracks with vegetation • Constant crack filling and sealing • Must be overlayed every 8-10yrs • Needs rock base • Impervious surface

Figure 16. Pros and Cons list for the three materials described in this section. Some information provided by the Columbia Parks and Recreation of Missouri (Source: Breen, 2017)

To appeal to an even greater number of residents and to comply with the regulations of the Americans with Disabilities Act, there are several options that can be done at Winnequah Park to accommodate the majority of their residents. With the proposed additions of trails and pathways, this health impact assessment also proposes increasing amenities that would accommodate more visitors to the park and visitors of different needs. At Winnequah Park right now, there are limited areas for wheelchairs and for people who have mobility disabilities. There are very little picnic tables that meet ADA requirements. Currently, Winnequah Park does not meet a large portion of Monona's population's needs. Along the proposed pathways, near the playground, and near the shelter this health impact assessment suggests adding benches, picnic tables, water fountains, and accessible restrooms to accommodate a large demographic of Monona's community.

Amenity	Examples	Cost
Picnic Table		There are so many styles and colors to choose from. Range: \$754-\$1,176. Some do cost more.
Drinking Fountain		There are so many styles and colors to choose from. Range: \$2,200-\$4,300
Restrooms		\$2,278

Figure 17. ADA amenities that can be added to Winnequah Park to accommodate the elderly and those with physical disabilities. Given are a few examples of each amenity and the ranges of prices for these products. (Source: Information given by Belson Outdoors and the Bench Factory)

Each of the options here are things to consider for when creating pathways in Winnequah Park. It is important to consider who you want to accommodate or appeal to when crating these paths. With this health impact assessment, we are trying to figure out the best options for the elderly who represent a majority of the population of Monona. With these materials and amenities we propose in this HIA, we can actually accommodate a wider demographic including the physically disabled and families with children. The materials, pathways, and amenities proposed will be able to accommodate a wider variety of physical activity and those who are participating in the physical activity. Whether choosing to go with one material or a combination of all three, and including the amenities, there should be a more diverse demographic of people using Winnequah Park. Where to put the pathways and what new attractions to include in Winnequah Park has been answered by a Landscape Architecture class at the University of Wisconsin-Madison led by Travis Flohr. Five designs have been created that go along with the recommendations provided in this health impact assessment.

Reporting

Students of the Landscape Architecture class, LA 451, who were also a part of the UniverCity project, also had the same concept of designing a series of pathways in Winnequah Park. This group of students were able to come up with five different plans as to where they think the paths should go and what amenities should be added to Winnequah Park. This class has also presented these ideas to the City of Monona to the Parks Department. Here we present examples of their plans and how it relates to how we were thinking of improving health for the elderly and the physically disabled. We do not take credit for their plans at all, they are used as a visual aid to simply convey our message and idea as to how Winnequah Park could be improved to maximize use by all citizens of Monona. All credit goes to the students of LA 451 and their professors, Travis Flohr and Sam Dennis Jr. with the help from their T.A. Lily Mank.

The class of LA 451 has designed several excellent plans to increase the connectivity in Winnequah Park, each unique in their own design and concept. One design in particular, really caught our attention in relating to what we had in mind for the connectivity in the park. To the right is a concept plan designed by Anne-Eliese Scott, Jaryd Schmitz, and Zach Meyer. What stood out to us is the concept of a hierarchy of pathways within and to the park. They have created a trail that is an all use trail that is capable of to hold and be used by vehicles. For their plan, this trail would go down through the center of the park which we had thought about as well. The “backbone” of the park is a necessary addition to connect the north and south side of the park as well as a pathway for children traveling to and from school. This central, multi-use path is also ideally located near the most used areas of the park during Monona’s summer concerts, Easter egg hunt, 5k runs, and numerous other events. This will allow the elderly and physically disabled people to partake in the events or to interact with everyone during these events, possibly reducing social isolation and to increase physical activity. This plan also included various bicycle and pedestrian paths as well as pedestrian only paths scattered throughout the park. This creates several walking opportunities as well as the ability to travel all over the park especially into areas that have not been



Winnequah Park Concept Plan | City of Monona, Wisconsin | Anne-Eliese Scott, Jaryd Schmitz, Zach Meyer | LA 451 Urban Open Space, Design, Photo, Plant | March 15, 2017 Conceptual Plan Phase

Above: Figure 19. The concept plan for Winnequah Park designed by Anna-Eliese Scott, Jaryd Schmitz, and Zach Meyer. This shows a number of areas where trails can be installed as well as what amenities can be included to improve the park for people of all demographic groups of Monona.

previously utilized to their fullest. Either one material could be used for all the paths or a variety of material could be used for all the proposed trails since they designate the use of each trail. Using a variety of materials can also vary the costs, instead of using one material that may have expensive initial installation costs. The pathways from this plan go across the creek to the other side of the lagoon, which is an area that is very under-utilized. An outdoor educational area was also added on this side of the lagoon too. This is a great idea to be able to spread the knowledge of the environment to every age group. This plan also includes more restrooms to the park and reading areas which could attract people of the older demographic. The plan also suggests reinforced turf as an option for a parking lot. Reinforced turf helps with natural water filtration and drainage, which would be beneficial for Winnequah Park since it is generally a flat area with little slope. These pathways could provide the elderly and the physically disabled a safer option to go for walks (one of their main exercise activities), to provide contact with green space and the natural environment, and a way to escape social isolation. These have all be shown to be beneficial for the health of this demographic. The proposed central path and the surrounding paths also provide additional options for children to walk to and from the school. A few of the paths go directly into the adjacent neighborhoods, which could provide a more direct route for children to walk to school and to walk home after school. This concept plan by Scott, Schmitz, and Meyer is a great representation of the idea to connect all part of Winnequah Park and to allow exploration to areas of the park that are not often utilized enough.

Nearly all plans had a central trail that goes from the north side of the park to the south side, through the southern part of the park to Winnequah Road. This central trail would be beneficial for people with disabilities to go from one side of the park to the other without having to use the sidewalks located on the perimeter of the park. Another common aspect of these concept plans was that they all included paths to go on the west side of the lagoon, an area that is usually not being utilized very well. Many have included a path that is parallel with the water's edge. This is also critical to increase the area that can be used by everyone and to increase the number of physical activities people can do, including walking, running, and biking. Below are a couple of other examples that the class came up with that increase pathways in the Winnequah Park. These plans should be available to the City of Monona through UniverCity and through the professors of this course, Travis Flohr and Sam Dennis Jr.



Figure 20. Two more examples from the LA 451 class of their interpretations of where pathways could be placed in the parks and what amenities could be included. These are examples of how Winnequah Park could be improved to benefit the health of the citizens of Monona. Source: Amelia Switz, Jarley Bolz, Sarah Letarski, Brandi Backus, and Saige Henkel.



Figure 21. A close-up of a path addition and shelter extension next to the current shelter. This idea was produced by Karley Bolz. This shows one of the current paths widened, a bridge to across the lagoon, and additional amenities added to the park.

storm water management, universal access for all users, and access for large vehicles and maintenance. The paths could be paved with grasscrete to allow draining of water and to reduce runoff. The shelter extension includes space for movable chairs, electric plugs, and a green roof to minimize the hardscape. Extra features include a universal access ramp from the concrete pad of the existing shelter to provide access to the waterfront for all users. Additional features include prairie plantings instead of lawn to provide a storm water buffer to filter runoff and to keep the runoff from polluting the water. The universal access ramp is needed to allow access to the water by all people in Monona's population.

Many of the students in the LA 451 class developed a concept for an educational center. An education center can be used by everyone of all ages. At every age, a person can learn something. To the right is an example of this concept developed by Saige Henkel. She added an education building with a green roof, a living and learning garden, educational signage, an overlook, and an area next to the water that is ADA accessible. This allows a user of all ability and at all ages to be able to be near and interact with the water and avoiding social isolation. A garden can provide texture and color which can promote mental stimulation. A garden is also something that can be used by everyone. Henkel's goal behind the education center is to promote environmental education and learning activities that can benefit both the general public and the adjacent elementary school. The intention of this area of the park is to create a variety of experiences thought accessible pathway connections.



Figure 22. An example of a proposed education center on the western side of the lagoon, in the area that is not utilized as often. There is an outdoor classroom, a learning garden, an overlook onto the lagoon, an education center with a green roof, and ADA access to the water. This idea was developed by Saige Henkel.

Some students divided the green space into two event areas, one of which would be for smaller events. To the right is an example of this is by Sarah Letarski, of which she designed a smaller event area southwest of the existing shelter. With this event area, she added pathways that go all the way around the area so people can access the area on all sides with wheelchairs. This would allow people with physical disabilities to attend more events and avoid social isolation. She also added another picnic area in this smaller event area which can allow for more tables that are ADA approved and follow universal design. Fishing nodes have been added along the stream that provide seating with benches and additional space for users. This adds another recreational activity the park can provide to meet the needs and wants of its citizens.



Figure 23. This design concept demonstrates the addition of pathways through the middle of the park and scattered throughout the park. This student added an additional smaller event space, a redesigned parking lot, and another set of permanent bathrooms. Design Credit: Sarah Letarski

These three examples of added pathways, facilities, and amenities are just a few examples of the many possibilities that can be done to improve the quality of the park and quality of health for the elderly and the physically disabled. Parks can be very beneficial to all its residents by accommodating the needs of nearly all its residents. The proposed pathways can be another area for residents to exercise, a safe area for people to exercise, to walk to and from school, and to walk to nearby businesses. They can provide more connectivity within the park itself. With the added facilities, Winnequah Park could attract even more users to events all year long and attract more users to the park in general. More seating areas and seating options can accommodate even more people who have a mobility issue. A park with these qualities will be an attractive feature for new residents and appeal to new residents. With the new pathways and facilities, there comes the possibility of adding even more to the park in the future such as lighting, emergency lights, outdoor exercise equipment, new events, etc. There are several options to choose from to appeal to the neighborhood and to improve quality of health to its residents.

Outreach

If a plan is chosen and there are plans to implement these ideas, there are several ways to appeal to the nearby residents and to the public. Town meetings should be held to let the residents know what will be added or changed to the park, especially the residents who live next to the park. Flyers or brochures could be passed out at town hall meetings with the proposed design, how it will look at the end of the project, projected costs, contact information, and estimated time of how long the project will last. The benefits and possible impacts to residents of the new design should also be included with the information to be passed out to residents. A big Grand Reopening event could be held with a day full of activities to welcome the new changes to the park. This would introduce people to the new changes in a fun setting to let them become accustomed to the new changes. An email or newsletter could be sent around to the nearby universities to advertise to students or professors about getting away from campus or Madison for a day. The new facilities and pathways could create new research opportunities for the

humanities or social sciences. The addition of prairies, gardens, and shore restoration can provide new educational opportunities for the elementary school. This could also create partnerships with organizations who team up with schools and towns to do restoration projects or garden projects. The addition of pathways and facilities produces new opportunities to bring new publicity to the park and to Monona.

Evaluation

To determine the impact of this Health Impact Assessment (HIA) and the construction of additional paths in Winnequah park, parks and recreation workers should evaluate the project after its completion. In order to evaluate the project, Winnequah park workers will need to measure Winnequah park's volume of visitors before the construction, using SOPARC as described in the screening section of this HIA, and monitor park volume after construction of the paths. Although park workers may find it difficult to determine causative relationships between the construction of additional sidewalks and disease rates in the community, park workers can evaluate the changes in park use and physical activity due to the construction of additional paths and a bridge in Winnequah Park.

To analyze the economic impact of the construction of additional paths, officials must consider the costs and benefits of the project. The costs of constructing and maintaining the paths should be considered (Wang et al., 2004). The number of park users should be considered, as well as the economic benefit of physical activity increases. To estimate project costs, Winnequah park officials must calculate construction and maintenance costs over a specified period of time, and must consider the number of park occupants to find per capita costs of the project (Wang et al., 2004). After estimating project costs and park occupancy, park officials can estimate medical cost savings by estimating the reduction in medical costs due to physical inactivity (Wang et al., 2004).

To evaluate the success of path construction on physical activity levels, the parks and recreation team may use the System of Observing Play and Recreation in Communities (SOPARC), a system developed to measure levels of activity in a community (McKenzie, 2016). This system helps to provide counts of park users stratified by demographic groups and document physical activity levels (Cohen et al., 2007, Reed et al., 2011) Using the SOPARC, Winnequah park officials can determine if the construction of additional park paths increases the number of individuals that visit the park. The SOPARC also enables the analysis of changes in physical activity levels due to the construction of additional paths. Winnequah parks workers must assess the baseline condition before constructing the sidewalks to determine the impact of the project.

In combination with the use of SOPARC, a revised Parks and Open Space Survey for comparison with data collected in the 2014 Parks and Open Space Survey will work well to evaluate the impact of the additional pathways on park behaviors and quality of life changes. The survey can determine how often park goers utilize the new pathways, if they have children and take them to the park, if they consider themselves part of a community at the park, and how they would rate their own health quality (Tucker, Gililand, Irwin, 2007). Winnequah Park workers have used the Parks and Open Space Survey in the past to assess how park goers feel about the park's offerings, safety, cleanliness, and potential to improve the community. Park workers can use the Parks and Open Space Survey to

determine if people feel an improvement in health, if people are using the paths and bridge to exercise, and if park goers use the newly constructed paths to navigate between recreational areas.

Next steps for Winnequah Park include the improvement of existing sidewalks, and the addition of benches, emergency call boxes, lighting structures, and exercise equipment to the path. Cauwenberg and colleagues found that individuals “said they liked sidewalks that were well-maintained and even, and judged as hazardous and thus disliked cracked or uneven sidewalks” (Cauwenberg et al., 2012). By repairing the sidewalk, park officials can increase the safety and accessibility of the park. The presence of walking loops and long stretches of sidewalk have been shown to improve population health and physical activity (Cohen et al., 2016). The addition of benches along the pathways would allow park visitors to rest along the path when they feel the need. For the addition of benches, Winnequah park officials should carry out an independent HIA to determine the potential health impact of increasing the number of benches in Winnequah park. Park benches may enable visitors to the park to spend more time appreciating the natural space, and they may increase the sense of community by increasing the suitability of the park as a gathering space (Franzini et al., 2009). Emergency call boxes kiosks can enable fast emergency responses, deter criminals, and improve the perceived safety in the park (Zugazaga, Werner, Clifford, Weaver, Ware, 2016). Exercise equipment exists in various parks and can allow park visitors to engage with a higher intensity level of physical activity during their time at the park (Powell, Slater, Chaloupka, Harper, 2006).

In conclusion, we recommend that Winnequah parks officials take various steps to evaluate the success of the HIA in the construction of additional sidewalks in Winnequah park. By evaluating park visitation volumes, physical activity levels, and self-reported health, park officials can measure part of the impact of the intervention. By monitoring the prevalence of diabetes, obesity, and cardiovascular disease, of individuals in Monona, park officials can start to analyze the far reaching impacts of the construction of additional sidewalks in Winnequah park. Besides the evaluation of the impact of the sidewalk, next steps for Winnequah park include the addition of benches along paths to facilitate and support the use of paths for exercise for park users.

Conclusion

This HIA has been conducted to inform the Parks and Recreation Department of the City of Monona on the benefits and consequences of installing a walking trail in Winnequah Park. We found that there are numerous physical and mental health benefits to constructing a path through Winnequah Park. Constructing the walking path would also create more opportunities for the community member, particularly the elderly population, to use the park. The increased use of the park would likely increase revenue for local businesses and it would create a sense of community cohesiveness that would also contribute to improved mental/emotional health.

Constructing a walking path would have some potential consequences as well. Some of the more likely consequences of installing a walking path includes decrease in green space, more impermeable surfaces that would create more runoff into the lagoon, increased cost to build and maintain the walking path, and an increased risk of falls. We’ve determined that the benefits of building the walking path outweigh the costs, and it would be in the best interest of the City of Monona and the

Parks and Recreation department to install a walking path around the lagoon with a pedestrian bridge connecting the two sides of Winnequah Park.

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Going For Silver, Monona: Health Impact Assessment

For Jonathan Patz' PHS 740: Health Impact of Global Environmental
Change
At University of Wisconsin-Madison
Spring 2017

By Maria Castillo, Yanika Davis, Lauren Peretz, Edward Westerband,
and Kerry Zimdars

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1. Executive Summary

The city of Monona, located near the capitol of Wisconsin, is one of many places that is striving to build a better community for its residents through active transport initiatives. One of the ways that they would like to improve the community is by making the city more accessible to bicycling. According to the League of American Bicyclists, the city of Monona currently has a bronze rating for their criteria of being a Bicycle Friendly Community (*Figure 1*). The *Going For Silver* provides multiple recommendations as to how Monona can improve the bikeability of their city (UW-Madison, 2016). However, these proposals were made without a recognition of their potential impacts on health. To supplement that, the report that follows is a Health Impact Assessment (HIA) to determine whether the *Going For Silver* recommendations will be beneficial or harmful to health, in which we provide scientific findings as evidence for the effects of each “E” of the *Going For Silver* report. In general, we found overall positive health effects from the recommendations made by this prior report, with the exception of the Complete Streets Policy and bike boxes, whose results were uncertain or mixed. Although policy is typically weighted as most influential under the hierarchy of controls, the inclusion of residential survey results in this analysis demonstrates to us that Monona currently lacks sufficient bicycle infrastructure to make an effort based in policy change effective in safely increasing the bikeability of the city. Thus, we recommend that Monona make the E of engineering their first priority, with enforcement, education, and encouragement following as supportive measures. We also recommend utilizing the previously recommended the Bicycle Advisory Committee as the basis of Monona’s communication plan as well as implementing continuing evaluation efforts to ensure they are achieving success.

2. Statement of the Problem

Around the 1950s, people began to move out of the cities and into suburbs in larger numbers. One aspect that allowed for this sprawl to occur was affordable and easily accessible cars, after which the suburbs were designed. The grid system in many of these suburban neighborhoods was engineered for cars, and therefore houses, businesses, and community hubs were spread out in a way that the most practical transport to them was by car. This led to a decline in active transport, like biking and walking, that is still present today in many neighborhoods. Along with the habits of car usage came a decline in physical activity and an increase in diseases related to a lack of activity including diabetes, obesity, and more. In addition to these health problems, pollution from cars also causes many deleterious health impacts as well as harm to the environment (Frumkin, 2002). With these additive health impacts surmounting and the increasing awareness of global climate change, many communities are looking for ways to promote active transport.

The city of Monona, located near the capitol of Wisconsin, is one of the many places that is striving to build a better community for its residents through active transport initiatives. One of the ways that they would like to improve the community is by making the city more accessible to bicycling. According to the League of American Bicyclists, the city of Monona currently has a bronze rating for their criteria of being a Bicycle Friendly Community (*Figure 1*). Upon receiving this, the city of Monona realized that active transport within the community was in need of improvement and therefore they are trying to advance their rating from Bronze to Silver.



Figure 1: League of American Bicyclists Bike Friendly Community rating of Monona, WI (Source: League of American Bicyclist, 2015)

Currently about 90 percent of people in Monona drive to work, while only two percent walk and another two percent bike (U.S. Census Bureau, 2015). Part of the reason why many people in Monona may not be using active transport is because there are currently many barriers that making it difficult. One of the largest barriers to increasing bike ridership, is the weather, since Monona is geographically located in an area with long, cold, snowy winters. The Active Transportation Summer Outreach Project, collected survey information from 229 people in Monona including some people that live in the surrounding area (Castillo, 2016). Of those participants, over half (139) said that the main reason keeping them from using active transport was the weather and seasons (Castillo, 2016). However, this is a difficult, if not impossible, barrier to completely remove. Additionally, over half of the respondents (139) recorded that the commute time was another factor keeping them from using active transport. The need to transport children was expressed as a barrier (80), along with the lack of connecting bike lanes or

sidewalks on the routes that respondents would want to use (64) (Castillo, 2016). These last three barriers are all interrelated to issues of safety and infrastructure and present actionable points of intervention.

Additionally, it is evident that the citizens of Monona want to have access to active transport options. A survey was conducted in 2013 with over 500 Monona participants, which found that many of the residents want more bike lanes and sidewalks (City of Monona, 2013). Both “City Sidewalk Systems” and “Bike and Pedestrian Accommodations” were in the top 5 services that had the biggest gap between perceived importance and perceived quality (*Figure 2*). There was also considerable concern about the community being more sustainable. As one resident said: “We would be a more environmentally friendly city if we had more sidewalks and ways to walk or bike to stores and restaurants” (City of Monona, 2013). Therefore, there is not only a desire by the city to increase their status as a bike friendly community, but also a desire from residents to have more amenities that allow for active transport and a cleaner city.



Figure 2: 2013 Monona resident survey results (Source: City of Monona, 2013)

The *Going For Silver* provides multiple recommendations as to how Monona can improve the bikeability of their city (UW-Madison, 2016). However, these proposals were made without a recognition of their potential impacts on health. To supplement that, the report that follows is a Health Impact Assessment (HIA) to determine whether the *Going For Silver*

recommendations will be beneficial or harmful to health, in which we provide scientific findings as evidence for the effects of each “E” of the *Going For Silver* report. These two documents should be used in conjunction going forward. Through this analysis, we aim to assist the City of Monona in determining the best course of action forward in improving the walkability and bikeability of their city, as the two often go together.

3. Identification of Stakeholders

Some of the main stakeholders that will directly contribute and work with the City of Monona to improve the walkability and safety of cyclists are: city council members that determine budgets and funding, city planners that would decide on the exact engineering of the final plan, the members of the Monona Parks and Recreation Department due to the many parks located along the potential path routes, community members that may advocate for or against biking and walking related projects, homeowners and business owners along potential routes, and the Monona Police Department as they play a central role in enforcement and safety practices. Additionally, a side-effect of this report is attracting and engaging new partnerships and strengthening current ones, with the purpose of building a more aware community in regard to active transportation as well as a bicycle and pedestrian friendly environment.

4. Broad Health Effects of Biking/Physical Activity

4a. Chronic Diseases

Lack of physical activity is a major risk factor for many chronic diseases, including heart disease, cancer, type 2 diabetes, hypertension, and stroke (CDC, 2014; Booth, 2012). Chronic disease are the leading causes of death and disability in the US, accounting for 7 out of 10 deaths each year and 86% of our nation’s health care costs (CDC, 2016b). They are among the most common, costly, and preventable of all health problems (CDC, 2016b). Obesity is a common

predecessor to future chronic diseases, termed obesity-related conditions, which include heart disease, stroke, type 2 diabetes, and certain types of cancer (CDC, 2016a). Furthermore, many of these chronic diseases are unevenly distributed among our population. For example, Non-Hispanic blacks have the highest age-adjusted rates of obesity (48.1%), followed by Hispanics (42.5%), non-Hispanic whites (34.5%), and non-Hispanic Asians (11.7%). Obesity is higher among adults aged 40-59% (40.2%) and adults aged 60 and over (37.0%) (CDC, 2016a). Roughly 12.7 million (17%) children and adolescents aged 2-19 were obese in 2014 (CDC, 2017). Regular, moderate-intensity exercise, defined as 150-300 minutes per week, is part of both recommended treatment steps and steps to prevent becoming overweight and obese (Mayo Clinic, 2015). This includes fast walking and biking. Exercise can also help reduce blood pressure and one's levels of LDL ("bad") cholesterol levels (Myers, 2003).

Multiple reports have shown that more active or fit individuals tend to develop less coronary heart disease (CHD) than their sedentary counterparts (Myers, 2003). If CHD does develop in active individuals, it occurs at a later age and tends to be less severe (Myers, 2003). The greatest gains in terms of mortality risk reduction are seen when an individual goes from being sedentary to moderately active (Myers, 2003). Active transport, which includes getting around by walking and/or bicycling, has been documented as a means to increase physical activity and, through that activity, reduce morbidity and mortality rates from cardiovascular disease (CVD), hypertension, obesity, diabetes, and certain cancers (Xu, 2013). A recent study from 2017 in the United Kingdom, found that commuting by bicycle reduces the risk of cardiovascular disease, cancer, and all-cause mortality (Celis-Morales et al., 2017). Similarly, walking was associated with reduced risks of CVD. However, bicycling was associated with the lowest risk, with a dose dependent correlation, while mixed transportation (active paired with

non-active) was associated with only some benefits (Celis-Morales et al., 2017). Habitual bicycling has also been associated with 20% decreased risk of developing type 2 diabetes, even for those who start bicycling later in life (Panter, 2016).

A randomized clinical trial found that regular walking and cycling for a one-way average of about 30 minutes while commuting to work improved aerobic fitness, decreased cardiovascular strain in submaximal standard work, increased the use of fats as energy source in physical activity, and caused slight favorable changes in blood HDL (“good”) cholesterol in healthy young to middle-aged adults of low-to-moderate physical fitness. Cycling, as it is practiced at higher relative intensity, was more effective than walking in improving fitness (Oja, 1998). A systematic review conducted in 2013 (Xu) of active transport research found that active transport to school or work was significantly associated with improved cardiovascular health and lower body weight.

There is an extremely small risk of having a cardiac event, such as a heart attack, or complication during physical activity (Myers, 2013). For adults with no existing heart disease, the risk is 1 in 400,000-800,000 hours of exercise, 1 in 62,000 hours of exercise for adults with existing heart disease (Myers, 2013). The risk of a cardiac event is significantly lower among regular exercisers (Myers, 2013).

4b. Mental Health and Social Well-Being

Sturm and Cohen (2004) stated that environments in which people spend more time driving alone in cars have fewer opportunities for face-to-face interactions that are casual and informal, and that lead to a higher social capital. Physical activity has the potential to reduce the duration as well as the severity of existing depression, in addition to its incidence (Ball et al., 2009; Mead et al., 2008). Similarly, an earlier study by Paffenbarger et al (1994) found that

individuals who undertook regular physical activity, such as walking and cycling, presented fewer episodes of doctor-diagnosed depression than those who did not do regular physical activity.

In Carlson et al. (2012), walkability attributes were expected to affect the psychosocial variables that influence walking as a means of transportation. The same study found that access to parks and recreation sites and infrastructure were expected to influence the psychosocial variables that influence walking for leisure. Walkability and social support are related to physical activity and walking as a means of transportation. Particularly for older adults, pairing walkability with social support benefits walking for transportation (Carlson et al, 2012). In other words, it is possible that the spaces where physical activity is limited represent fewer opportunities for social activities and support.

Research done on the relationship between walking, walkability, and the social environment has found that the frequency of walking is associated with unintended interactions with neighbors, which help create and develop relationships with others (Lund, 2002). Similarly, there is a correlation between the perception of a neighborhood as being safe and a higher sense of community (Lund, 2002). In addition to physical activity being related to social support (Ball et al., 2007), it also increases social networks (Berkman & Glass, 2000), and helps to build ties within the community, which ultimately improves mental health (DHAC, 2000).

In order to understand community members' perspective on their sense of community, it is important to identify and understand those factors that contribute to walking for leisure (Wood et al., 2010). Due to the fact that mental health is a major cause of burden of disease (Ustün, 1999), it is crucial to understand how we can protect mental health and incorporate the potential mental health benefits that a higher sense of community brings to a city.

4c. Air and Noise Pollution

The combustion of transportation fuels, such as gasoline and diesel, create on-road pollution that pose adverse impacts on human health by triggering or exacerbating respiratory and cardiovascular conditions, certain cancers, and possibly diabetes; which lead to premature mortality (Beelen et al., 2014; Hoek et al., 2013; Raaschou-Nielsen et al., 2013). It is known that air pollution is one of the leading environmental risk factors for human health worldwide (Tainio et al., 2016). In fact, the Royal Colleges of Physicians and of Pediatrics and Child Health reported that air pollution is associated with 40,000 early deaths every year in the United Kingdom. Similarly, in the United States, the mortality risk from particulate matter (PM) is comparable to that for obesity grades 1 and 2 (Pope et al., 2002).

Physical activity amplifies respiratory intake and accumulation of air pollutants in the lungs due to higher minute ventilation (Giles and Kohele 2014; Strak et al. 2010). For example, reduced lung function has been demonstrated to be caused by walking on a busy street (McCreanor et al. 2007; Zhang et al. 2009); running near a heavy traffic (Rundell et al. 2008); cycling during rush hour (Strak et al. 2010); and hiking on high air pollution days (Korrick et al. 1998). While driving more is associated with decreased physical activity, physical inactivity and urban air pollution are amongst the top 15 causes of health impairment globally (Hill et al., 2003). As stated by Marshall et al. (2009), many factors like ozone (O₃), vehicle exhaust, and other air pollutants associated to traffic are related to negative health outcomes, including cardiopulmonary mortality, atherosclerosis, impaired lung development in children, asthma and asthma exacerbations, reduced lung function, cardiac arrhythmia, and preterm and low-birth-weight babies.

Another aspect less studied, compared to air quality in traffic environments, but well known, is noise pollution due to vehicles on the road. In 2013, the American Thoracic Society (ATS) (2013) reported that noise pollution may increase a person's risk of developing cardiovascular disease and subclinical atherosclerosis. The European Society of Cardiology (ESC) found that adults living in the most polluted areas of the cities (night time noise levels of 50 decibels), had a 6% increase in developing high blood pressure (hypertension) compared to those living in less noisy places (night time noise levels of 40 decibels) (Fuks, 2016). Another study by the London School of Hygiene & Tropical Medicine (Halonen et al. 2015), concluded that deaths and strokes were 4% and 5% more common, respectively, among adults in areas with daytime road traffic noise of more than 60 decibels due to cardiovascular disease, sleep problems and stress. Therefore, it can be said that increasing active transportation, paired with reducing vehicle commute, will aid significantly in decreasing air and noise pollution and positively impacting public health, especially of those living in higher traffic areas.

4d. Injury

Bicyclists face a higher risk of crash-related injury and death than occupants of a motor vehicle, even though only 1% of all trips taken in the U.S. are by bicycle (Pucher *et. al.*, 2011; Beck *et. al.*, 2007). In 2013, over 900 bicyclists were killed and there were an estimated 494,000 emergency department visits due to bicycle-related injuries (CDC, 2016). Data from 2010 show that fatal and non-fatal crash-related injuries to bicyclists in the U.S. resulted in lifetime medical costs and productivity losses of \$10 billion (CDC, 2016). Adolescents and young adults aged 15 to 19 years old along with adults aged 40 and above have the highest rates of bicycle death (CDC, 2016). Children aged 1-14 years old, adolescents, and young adults aged 15-24 years old have the highest rates of nonfatal bicycle-related injuries, accounting for one-third of all bicycle-

related injuries seen in U.S. emergency departments (CDC, 2016). Males are more likely to be killed or injured on bicycles than are females (CDC, 2016). And most bicycle deaths occur in urban areas and at non-intersectional locations (NHTSA, 2015a). Of those admitted to the emergency room for a bicycle-related injury in 2009 in the U.S., bruising was the most common injury while intracranial head injury was the most common injury for emergency room patients that were then admitted to the hospital (Stranges, 2012). In 2009, 10% of all bicycle injury-related emergency room visits also involved a motor vehicle (Stranges, 2012). Yet, it is important to note that effective preventative efforts exist. These safety measures can be on the level of individual action—such as wearing a properly fitting helmet or attaching active lighting devices to one’s bicycle—or the level of local government—such as implementing and enforcing helmet laws for children and adults or ensuring that proper roadway engineering measures be taken, such as the installation of separated and well-defined bike lanes (NHTSA, 2015b).

5. Key Determinants and a Framework for Health

5a. Social Determinants of Health & Social Ecological Model of Health

The social determinants of health refer to the places that people live, grow, work, and play as well as the forces and systems that shape daily life (WHO, 2017). This means that our health is not only determined by our health behaviors and access to care but also our built environment, our community and social supports, the quality of our educational system, and our economic opportunities (ODPHP, 2017). These factors have been further elucidated by the County Health Rankings Model (*Figure 3*), which estimates the influence on our health exerted by clinical care, social and economic factors, health behaviors, and the built environment. Transit is specifically placed under the category of the built environment in this model, but various factors related to this issue can be found in other categories—exercise as a health behavior and

community safety and education as a social and economic factor. Thus, we mainly focus on the built environment as a relevant determinant of health in relation to active transport in this assessment, but we also incorporate connections to health behaviors and social and economic factors. These determinants have been translated into the social ecological model of health (Figure 4), a systems model that emphasizes the interconnected and inseparable relationship between these factors, re-categorizing them as factors at the individual level, intrapersonal level, organizational or institutional level, community level, and policy level. The recognition of the policy level is especially important when assessing a city-wide program proposal.

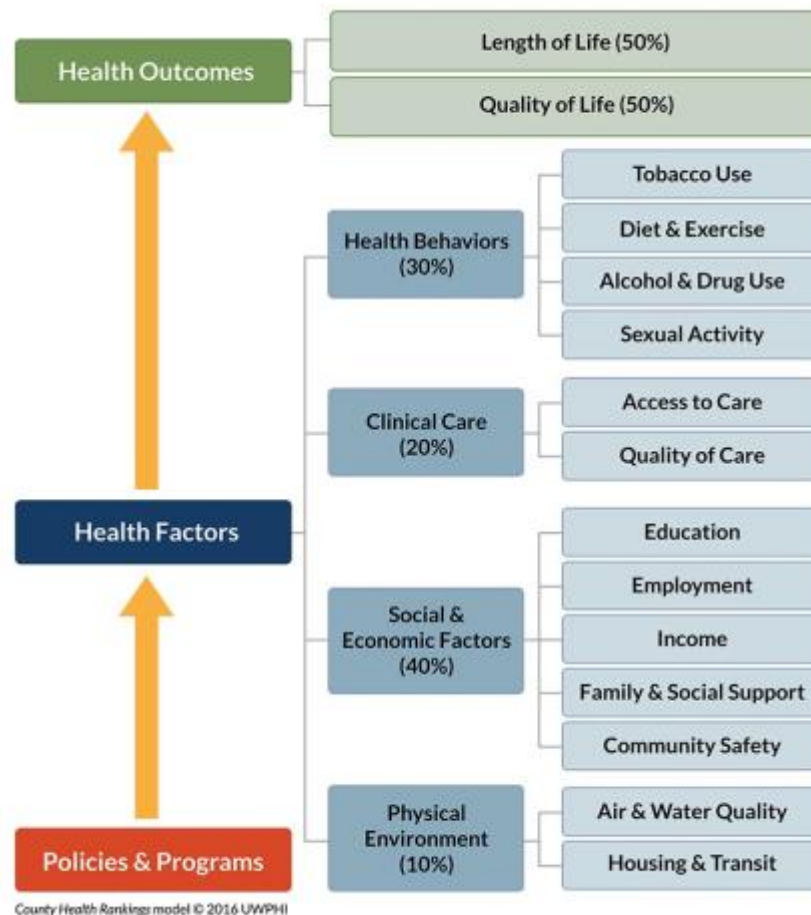


Figure 3: County Health Rankings Model (Source: County Health Rankings)



A Social Ecological Model for Physical Activity - Adapted from Heise, L., Ellsberg, M., & Gottemoeller, M. (1999)

Figure 4: Social Ecological Model (Adopted from Heise, Ellsberg, and Gottemoeller (1999))

6. Health Impact Analysis of the Going For Silver Proposal

6a. Education

According to the *Going For Silver* report, Monona's recent educational programs for bicyclists include the Bike Rodeo, teaching Safe Bicycling, Monona's Traveling Tween Camp, and Safe Routes to School. Other available resources in the greater Madison area include Rideshare Etc. and event bicycle parking. However, in the audit summary performed by University of Wisconsin - Madison students in Spring of 2016, it was found that Monona residents used bicycle lanes, sidewalks, and street lanes incorrectly; that bicyclists did not always wear a helmet; and that they did not always know how to cross difficult intersections. Likewise, Monona currently only receives 3 out of 10 stars by the League of American Bicycles for bike education, as can be seen in *Figure 1*. This means that there is space for educational activities for bicyclists and pedestrians in Monona. Thus, the Going for Silver report recommended bicycle safety and education to be more accessible to all ages, genders, races and classes; to expand

existing programs; distribute bicycle maps; and create a report to educate developers to help incorporate the needs of bicyclists into new projects.

Health Impact of Recommendations

Pucher et al. (2010) reviewed the few studies that have been done on the Safe Routes to School (SRTS) educational program. Even though there are not many studies that measure the effects of SRT on bicycling, one study in Marin County, CA, found an increase of 114% in the number of students bicycling to school (Staunton et al., 2003). Most SRTS interventions have been focused on walking to school, and one study on projects at 10 California schools found an increase in walking, but not on bicycling (Boarnet et al., 2005).

There have been few studies on education/training programs, which are intended to increase bicycling skills and knowledge of bicycle laws. However, there is evidence that these programs increase skills and confidence. One evaluation of a program by the Central Sydney Area Health Service resulted in 56% of participants bicycling with higher frequency only two months after the program was implemented (Telfer et al., 2006). Additionally, even though SRTS programs focus on children, improving infrastructure near schools could also help influence adult behavior (Watson and Dannenberg, 2008).

Cities that have greatly increased the number of bicyclists since the year 2000 in the United States, such as Portland, Oregon, and in Europe, such as Amsterdam (Netherlands), Copenhagen (Denmark), and Berlin (Germany), have established mandatory bicycling education for all schoolchildren and/or educational and marketing events year-round and have made available bicycle maps for free (Pucher et al., 2010).

Although results from studies on general bicycle education and helmet show different (positive or neutral) results on behavior and effectiveness, Britt et al. (1998) stated that education

significantly helps promote helmet use in parents and children. Rezendes (2006) puts emphasis on providing education from the time a child is young, with crucial help from the parents who can teach the children the importance of the role of helmets and the potential to save their lives. Lemieux and Godin (2009) studied how cognitive and environmental variables predict commuting. Their findings showed that cognitive variables play a larger role in predicting active commuting than environmental variables do, indicating an important direction for intervention. Fulton et al. (2009) defined education on the benefits of physical activity as one of the components that could help address the prevalence of the impacts of an inactive lifestyle, such as childhood obesity.

6b. Encouragement

As can be seen in *Figure 1*, the city of Monona currently only receives 2 out of 10 stars available for bicycling encouragement according to the League of American Bicyclists rating for a bicycle friendly community. Therefore, if Monona would like to achieve the silver rating, increasing the efforts to encourage residents to bike is essential. Additionally, encouragement programs will likely result in more biking which will have many health benefits to the residents of Monona. In order to encourage the people of Monona to bike it is important to create a strong cycling culture. According to the League of American Bicyclist, this means that Monona needs to work on “mainstreaming bicycling culture” (UW-Madison, 2016) There were several recommendations given in the *Going For Silver* report to help create this culture change including events, programs, and campaigns, all that attempt to create a supportive environment to encourage bicycling. Encouragement of bicycling not only results in increased physical activity but it can also result in bringing the community together thereby creating more social capital, both of which are good for health. In order to understand the ability of these recommendations to

produce significant health outcomes, it is first essential to look at how effective they would be at promoting active transport to assess how much of an impact on health they would have.

Health Impact of Recommendations

One of the recommendations was to encourage participation in mass community events such as the Annual CycloFemme Ride. Additionally, they suggest other non-continuous large events such as parades or mini-race events (UW-Madison, 2016). The idea of having these kind of events is often that they increase awareness about biking and allow for more social interactions and encouragement by fellow residents. Unfortunately, the impacts of these events are rarely evaluated especially in the long term, making it difficult to assess whether or not they have effects on long-term, sustained biking trends (Aldred, 2013; Bauman, 2009; Bowles, 2006; Claus, 2012; Kazhamiakin, 2015; Lorenc, 2008; Mayer, 1982; Murphy, 2007; Ogilvie, 2004; Yang, 2010). The feeling of social cohesion after mass health promoting community events has greater documentation. Studies have shown that after large scale community events people feel more social cohesion and community pride (Aldred, 2010; Aldred, 2013; Millonig, 2016; Ogilvie, 2004; Sayers, 2012; Thomas, 2009; Yang, 2010). Therefore, a potentially greater health effect that results from mass community events may be social cohesion and creation of social capital, which has impacts on mental health as was previously discussed. Another impact of these events may be that they increase confidence in bicycle riding skills. One study in Australia found that of those that attended a large community cycling event, there was a 40% increase in participants who reported a high cycling ability (Telfer, 2006). This confidence in the ability to ride a bike is very important for encouragement as people may not want to bike if they do not have the confidence to do so. The same study also saw a 10% increase one month later in the number of people that had a high physical activity level, showing that even one mass event can

have possible lasting results, but as mentioned previously others found no effect, making this data unclear (Telfer, 2006). Therefore, since the effect that mass community events have on active transport levels is unclear, the potential for physical health impacts is also not certain. The potential for increases in social capital, which had more consistent results, may be of great benefit to the mental health of residents, especially Monona's elderly population.

Bike-to-Work days is another common approach to encouraging cycling that was recommended by the *Going For Silver* report. One study found that unlike the mass community event mentioned previously, bike-to-work (or walk-to-work) day studies have been carried out to monitor more long-term results, although the results do not appear to be consistent (Millonig, 2016; Piatkowski, 2015; Wunsch, 2016). A program called "Walk in to Work Out" that promoted both biking and walking to work showed that while the program in the short term increased biking to work, in the long-term it had no effect on the number of people biking to work regularly (Mutrie, 2002). On the other hand, it did see both a short-term and long-term increase in the number of people walking to work (Mutrie, 2002).

Overall, it appears that one-time efforts alone may not produce significant increases in the number of people using active transport, but there is potential for these types of events to work if they are often and used in conjunction as a community campaign. One community program called Cycling Connecting Communities, which combines bike-to-work days, community bicycle ride events, and free cycling classes, found that their campaign increased awareness, increased the use of bike paths, increased the number of beginner riders and the average number of minutes biked per week by the affected population (Rissel, 2010). Unfortunately, although the number of minutes biked increased, the frequency of the overall population biking did not, nor did the overall activity levels of the population (Rissel, 2010).

This may be due to the fact that these types of programs often attract people that are already cycling and encourage them to cycle more. Therefore, in order to make these populations more effective for the entire population equity of access needs to be considered.

6c. Enforcement

Enforcement is a critical aspect to making any program or project impactful and useful for the community. As defined in the 2016 *Going For Silver* report, enforcement refers to the laws, regulations, and overall role that the law enforcement community can play to support healthy, active commuting initiatives of the city of Monona. The city of Monona currently receives only 3 out of 10 stars for bicycle-related enforcement efforts according to the League of American Bicyclists rating for a bicycle friendly community, as can be seen in *Figure 1*.

Current policies and programs related to bicycle safety that in are place in Monona include mixed-use zoning that allows for greater connectivity and access by active transportation users in conjunction with connectivity standards, on-street bicycle facility maintenance to address snow/ice removal and potholes, bicycle safety education in schools provided by the Monona Police Department and the Parks and Recreation Department, tracking of bike-related safety data by the Monona Police Department, and a non-mandatory bicycle registration system (UW-Madison, 2016).

Though, according to the Monona Police Department, only 3 bicycle crashes were reported in 2016, 1 of which was taken to the emergency department, Monona residents have expressed concerns and desires for greater bicycle-related enforcement, as demonstrated by a survey conducted in the summer of 2016. Safety was expressed as the main motivating factor for seeking out streets and routes that have sidewalks or bike lanes (Castillo, 2016). A general agreement of dissatisfaction was seen among respondents over the fact that Winnequah Road is

shared by drivers, bicyclists, pedestrians, parked cars, and snow and dirt during the winter. Overall, it was described by residents as very dangerous with a high potential for crashes and fatalities by these Monona residents. Monona Drive was the road commented on second most, with complaints made that it is too busy and the traffic speed is too fast, ultimately discouraging bicycling (Castillo, 2016). Two of the improvements designated as ‘very important’ by respondents were increased bike parking at crowded events and bike racks at main destinations (Castillo, 2016). Other improvements expressed as desirable included enforcing laws governing bicyclists’ behaviors, better pavement in the winter, and covered bicycle parking to protect from the rain (Castillo, 2016).

Health Impact of Recommendations

In the *Going For Silver* report, various recommendations are made to improve enforcement efforts in terms of bicycle safety. These include: bicycle anti-harassment regulations, to outlaw parking or driving in bicycle lanes, end-of-trip facilities for bicyclists such as locker rooms and showers, standards of bicycle parking, and to create a Bicycle Advisory Committee that includes at least one police officer among other stakeholders and residents.

Separation from traffic, as would be aided by restrictions on parking and driving in bike lanes, is positively associated with increased rates of cycling (Fraser, 2011). Bike parking and shower and locker facilities at work are associated with increased rates of commuting by bicycle (Buehler, 2012). For active transport such as bicycling to gain widespread acceptance, low crash risks are not sufficient. Active transport needs to feel safe as well (RWJF, 2016). The common principle of “safety in numbers” holds true for bicycle travel—studies have shown that locations with higher levels of bicycling have greater bicycling safety and that bicycling injury rates fall as levels of bicycling increases; the same is true for walking (Jacobsen, 2003). An individual’s risk

of motor vehicle collision while walking or biking in a community with twice as much walking or biking is reduced to 66% of the original risk, indicating that policies that increase the number of people walking and biking are an effective route to improving their safety (Jacobsen, 2003). The fear of cycling on roads with motorized vehicles is greater among inexperienced cyclist, women, and younger cyclists (Buehler, 2015). Both more cycling and greater safety, are observed in environments with more and better infrastructure as well as pro-walking/bicycling policies and programs (Jacobsen *et. al.*, 2015). Moreover, a direct correlation has been found between feelings of personal safety and the number of weekly trips taken by bicycle (Inavero, 2009). Though the impacts on biking rates and health of Bicycle Advisory Committees has not been studied, they present an opportunity to promote transparency and bring together stakeholders to share diverse perspectives when carefully crafted. Community engagement in public health initiatives has been found to have a positive effect on social and health inequities (O'Mara-Eves, 2015). Thus, enforcement efforts could be an effective means to increase bicyclists' perception of safety along with their level of safety in reality and ultimately increase bicycling rates in Monona.

6d. Engineering

As can be seen in *Figure 1*, Monona was awarded only 2 out of 10 stars for their engineering infrastructure for a bike friendly community. *Figure 5* shows the six main corridors or streets in the City of Monona (red), and key areas where re-pavement (green), crosswalks (light blue), sidewalks (yellow), and bike lanes (dark blue) are needed. These areas are particularly important as they have the potential to receive high traffic of cyclists and pedestrians due to the Lake Loop location around Lake Monona. Even though no official bicycle infrastructure is utilized, this is a designated bicycle route. Thus, recommendations from this

section would directly improve these routes and increase the connectivity and environment for active transportation along the streets in Monona's Lake Loop, potentially impacting the entire Lake Loop around Lake Monona.

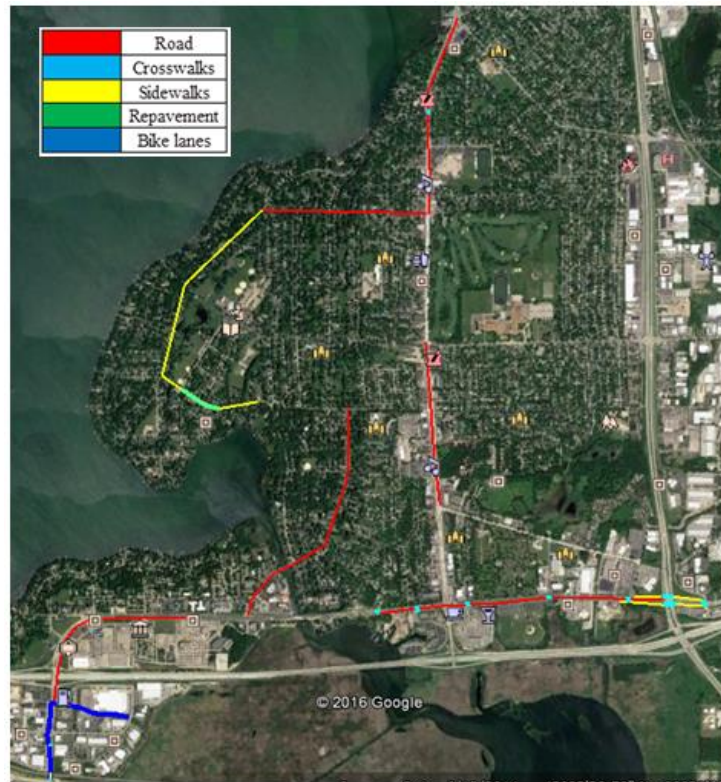


Figure 5: City of Monona main six corridors and needed improvements (Adapted from the 2016 *Going For Silver* report)

Health Impact of Recommendations

Corridors and street quality improvement

Many studies have shown that pavement quality and the presence of debris on paths and in lanes could influence bicycling decisions and safety. For example, the Transport for London report (2004) showed that when a path in London was resurfaced, the number of cyclists doubled. Similarly, one revealed preference (RP) survey found a correlation between their overall rating of the quality of bicycle facilities with the frequency of bicycle commuting (Sener et al., 2009).

Separated and protected bicycle facilities

In Monona, cyclists often must ride next to traffic to travel to destinations in Monona or to leave the city on a commute to the City of Madison. Cycle tracks, also called side paths, are physically separated from motor vehicles lanes. One study performed in Copenhagen, Denmark, found a 20% increase in bicycle traffic and a 10% decrease in vehicle traffic after the installation of new cycle tracks (Jensen et al., 2008). Similarly, in a study in London (Transport for London, 2005) a two-way bike lane decreased the number of bicycling crashes and, in the course of 3.5 years, an increase of 58% was seen in the number of cyclists (Transport for London report, 2004).

Some RP studies have found that cyclists often go out of their way in order to use bike lanes or paths (Dill, 2009; Dill and Gliebe, 2008; Howard and Burns, 2001; Krizek et al., 2007), and several studies on before-and-after counts in North American cities and in London have found that the installation of bike lanes increases the number of cyclists (City of San Francisco, 2004; City of Toronto, 2001; City of Vancouver, 1999; Sallaberry, 2000; San Francisco Department of Parking and Traffic, 2001; Transport for London, 2004a). Similarly, one stated preference (SP) study found that about 40% of cyclists would rather take a longer route where there is a path than a shorter route that consists of a lane next to vehicle traffic (Shafizadeh and Niemeier, 1997).

Traffic calming devices

Traffic calming devices include speed bumps, diverters, and traffic circles. These discourage vehicles to accelerate. Studies have shown a doubling in bicycling rates in a small town in Buxehude, Germany (Doldissen and Draeger, 1990), while the Commission of the

European Communities (1989) reported a 50% increase in bicycle use in the Berlin-Moabit area following the use of such devices (Commission of the European Communities, 1989).

City of Monona's Complete Streets Policy

The Complete Streets policy theory is to direct community transportation planners and engineers to routinely design and operate the entire right of way to enable safe access for all users, regardless of age, ability, or mode of transportation. Specific policies and infrastructure initiatives can be shaped to the community's need and thus vary geographically, but the ultimate goal is to make transport of all forms (active and inactive) accessible and safe for all users, regardless of age or mobility. Potential efforts include adding sidewalks, adding marked crosswalks, and increasing accessibility for wheelchair users (National Complete Streets Coalition, 2017).

Pucher et al. (2010) indicates that the United States Congress has considered a federal complete streets policy and that the number of projects built according to this principle is growing. However, the report states that no studies on the impact of this concept on bicycling levels are publicly available at this time (Pucher et al., 2010).

Lowering vehicles traffic speed limit to 20 miles per hour (mph)

Reducing vehicle speed limits is a form of traffic calming that has the potential to increase bicycling in two ways. First, it helps increase the speed of bicycling relative to the speed of driving. Second, it increases the safety of bicycling (Pucher et al., 2010). Sammer (1997) demonstrated that reducing the speed limit to 20 mph in Graz, Austria, reduced bicyclist accidents by 4%. Speed limits throughout the city of Berlin increased bicycling significantly (Bauman et al., 2008).

Road diets

The U.S. Department of Transportation (DoT) - Federal Highway Administration (FHWA) (2016) estimated a reduction of vehicles crash in the range of 19% - 47%, as well as that pedestrian crash risks are reduced when pedestrians crossed two- and three-lane roads, compared to roads with four or more lanes. There are few to no studies reporting an increase in active transportation due to “dieting” the roads.

Bike boxes

Also called advanced stop lines, bike boxes are marked areas at a signalized intersection where cyclists stop and wait for a red light to turn green. They are usually in front of the motor vehicle lane, and they are intended to make cyclists more visible to motor vehicles (Pucher et al., 2010). One study performed in London stated that advanced stop lines did not have a significant positive or negative effect on cyclist safety (Transport for London, 2005). However, three studies that were based on surveys to cyclists indicated that the majority of respondents felt safer with bike boxes (Newman, 2002; Rodgers, 2005; Wall et al., 2003). Conversely, one study found that cyclists did not understand the purpose of the bike box intervention (Hunter, 2000).

6di. Policy Alternatives

Beyond the final engineering recommendations that are stated in the *Going For Silver* report, we have included an analysis of additional options at the request of the client.

Adding Sidewalks

Studies have found that increasing one’s moderate daily exercise, by taking an additional two or three 10-minute walking trips, could help reduce one’s energy imbalance by 100-165 kcal/day. This change in behavior could prevent average weight gain by about 1 kg per year (Hill

et al. 2003; Wang et al. 2006). These trips could easily be accomplished by walking to a bus stop, running errands, or getting groceries.

Low walkability encourages the use of vehicles, which increases the levels of driving and vehicle emissions per person. On the other hand, walkable streets have the potential to reduce per-capita vehicle use and levels of emissions (Frank and Engelke 2005; Frank, 2006). Lack of sidewalks can make walking unsafe, while greater connectedness of streets encourages people to incorporate walking to their daily routines (Frank et al. 2005; Moudon et al. 2007). Thus, sidewalks present an opportunity for increasing the safety conditions and connectedness of one's built environment.

Improving infrastructure to recreational sites

Physical attributes of the built environment in the form of accessible destinations such as parks and open spaces are characteristics that, along with connectivity, are associated with the walking attributes of neighborhoods (Wood et al., 2010). Saelens et al. (2003) showed that the Geographical Information Systems (GIS) determinants of planning that are relevant to walking and cycling for active transportation include spatial features of the topography, land use, infrastructure, and recreation and residence attributes. Parks are an example of a physical environment that may be related to recreational physical activity and active transportation.

Several studies have found that the built environment attributes that include walkability and parks availability are related to older adults' physical activity (Frank et al., 2010a; Yen et al., 2009; Hall and McAuley, 2010; Clarke and Nieuwenhuijsen, 2009; van Cauwenberg et al., 2010). This may be because older adults tend to be more susceptible to the amenities of the built environment as they prefer shorter walking distances, demand safer pedestrian facilities, and, generally speaking, have more available time to travel to parks and spend there (Carlson et al.,

2012). Similarly, Booth et al. (2000) found that older adults are more likely to be sufficiently physically active if local facilities are available and accessible to them. Accessibility includes the presence of parks and of safe walk-paths.

Grow et al. (2008) concluded that there is a strong correlation between children and adolescents' use of recreational sites for physical activity and active transport to the site. Youth are more likely to go to the recreational site, such as a park, and be physically active if they have the option to bike or walk to the site (Grow et al., 2008). This included indoor recreational sites and open spaces, small and large public parks, basketball courts, walking/running and playground public spaces. This means that if youth are not able to walk or bike to sites where they can be physically active, they are being deprived of the dual benefit of commuting actively to the site and being physically active at the site. In addition to proximity to the site, perceived traffic and road safety and transport infrastructure, such as sidewalks and controlled intersections, have been related to physical activity at individual sites for children (Davison and Lawson, 2006).

Bicycle Sharing Programs

Bicycle sharing programs have shown increases in bicycle ridership when paired with improvements in bicycling facilities. For example, studies in Europe show that following the implementation of such programs, cycle mode share increased from 0.75% in 2005 to 1.76% in 2007 in Barcelona (Romero, 2008); from 1.0% in 2001 to 2.5% in 2007 in Paris (Nadal, 2007; City of Paris, 2007); and from 0.5% in 1995 to 2% in 2006 with a 75% increase in bicycle counts from 2005 to 2007 in Lyon (Bonnette, 2007; Velo'v, 2009). In London, users reported shifting from driving (6%) and from transit (34%), while 23% said they would not have taken an extra trip via active transport anyway (Noland and Ishaque, 2006). A study performed in London in

2011-2012 found that cycle hire bicycles have shown fewer fatalities and injuries compared to those expected, concluding that the health benefits from the or bike share program substantially outweighed harms (Woodcock et al., 2011).

Stop signs at intersections

Grow et al. (2008) stated that pedestrian and bike facilities, including sidewalks, bike lanes, and stops signs at intersections, create a more walkable and bikeable neighborhood. Overall pedestrian infrastructure and traffic safety are linked to youth active transport to recreational sites by facilitating access to the sites and promoting physical activity (Grow et al. 2008).

Conclusion

The scientific literature presented here has widely demonstrated that multiple engineering interventions have the great potential to improve biking and walking in (sub)urban areas. This, in turn, will increase the physical activity of its community members and give them the opportunity to take advantage of the multiple health co-benefits.

6e. Equity

Though not one of the original E's in the *Going For Silver* report, we have added this E at the request of the client and due to the important role it plays in health. In order to fairly implement the recommendations analyzed, it is essential to consider inequities that exist in Monona already and inequities that could be created or exacerbated by initiatives if not properly implemented. When encouraging more people to use active transport it is important to realize that it is likely that a portion of the population will be more inclined to attend than other portions. Additionally, it is important to acknowledge that throughout the entire U.S. there are many health inequities based on factors such as race and income (CDC, 2013). One study of a mass

cycling event in Manchester found that 92% of people that participated in their community event were white and already active (Murphy, 2007). Therefore, programs such as this one that do not reach a broad audience will not have as significant health impacts if the participants are those that are already cycling regularly. This points out a crucial component to implementation, which is that populations that would not normally consider cycling need to be directly targeted for promotional efforts and equality of access to the event must also take priority. Without having equal access and targeted promotion, the health benefits from such event will not be as great and will contribute to health disparities within your community. A study that focused on bike-to-work days found that social determinants were most predictive of participation and continued cycling to work (Piatkowski, 2015). They found that more men, those with higher incomes, smaller households, and younger populations were all more likely to participate in bike-to-work days (Piatkowski, 2015). Therefore, events should take into consideration barriers that may prevent women, families, and older individuals from participating in bicycling events and have events specifically designed for these populations. While Monona is almost 94% white and relatively well off, when you break down income by race there are significant income inequalities, which have been shown to be linked to cycling rates (U.S. Census Bureau, 2015; Piatkowski, 2015). Additionally, The Race to Equity report conducted in Dane County shows that there are numerous health disparities between blacks and whites (Race to Equity, 2013). For example, blacks are 3.2 times more likely to die from diabetes than whites in Dane County, a disease that could be partially combated by increasing active transport (Race to Equity, 2013). Therefore, Monona needs to be sure to target their own minority and low-income communities, as the failure to do so could exacerbate demonstrated health disparities. A study that analyzed approaches to lifestyle-changing campaigns found that the best way to create a more equitable

campaign is to use communication methods between stakeholders, ensuring that all demographics of the population are present in this process (Bouman, 2010). In addition, 19.6% of Monona's population was over the age of 65 in 2015 (U.S Census Bureau, 2015). Therefore, there should be programs that specifically target the elderly and provide active transport infrastructure that makes active transport easier for elders that may have physical impairments. Including accessibility and promotion specifically for the aging population will have numerous health benefits, increasing overall health for these populations as they progress through life and aiding in decreasing health disparities that arise from activity levels in different age groups (Alder, 2010; French, 2003).

7. Cost-Benefit Analysis for a Health Perspective

As should be evident from the analysis provided here, there are an overwhelming list of beneficial health effects from increased bicycling and walking, whether it be as a form of active commuting, physical activity, or leisure. And with the proper infrastructure and community support, these benefits can be maximized while minimizing potential hazards. Needless to say, an important factor in implementing such a project is the financial element. When evaluating the cost of projects, especially those relating to health, it is often more useful to utilize a cost-benefit framework. A cost-benefit analysis of the development of seamless walking and cycling track networks in three Norwegian cities (Hokksund, Hamar and Trondheim) estimated that the benefits of investments in cycle networks were 4-5 times the cost (Saelensminde, 2004). This analysis took into account the benefits of reduced insecurity and improved fitness and the reduced external costs (air and noise pollution) that accompany a change from travel by motorized vehicle to cycling or walking (Saelensminde, 2004). A 2012 study conducted at the University of Wisconsin-Madison found complementary results. By replacing 50% of short car

trips, defined as less than 8km (5mi) roundtrip, with bicycle trips, substantial saving could be achieved through avoided mortality and reduced healthcare costs due to improved air quality and physical fitness (Grabow, 2012). In suburban Madison, individual savings were estimated at \$2,291 per cyclist per year. Community-wide, average savings were estimated to be \$65 million per year, along with 12 lives saved and 19,010 individuals benefiting from this change (Grabow, 2012).

Furthermore, for a cost-benefit analysis in terms positive and negative health impacts, a literature review conducted by Johan de Hartog *et al.* (2010) analyzed studies from across the globe that considered a wide range of health effects of bicycling. The researchers recognized the beneficial health effects due to decreased air pollution emissions, decreased greenhouse gas emissions, and increased physical activity of switching from travel by car to bicycle, along with potential adverse health effects due to higher exposure to air pollution and the risk of injury (Johan de Hartog *et al.*, 2010). They concluded that, the estimated health benefits of cycling were substantially larger than the health risks for individuals transitioning to transit via bicycle (Johan de Hartog *et al.*, 2010). A study done in King County Washington found that a 5% increase in walkability was associated with a per capita 32.1% increase in time spent in physically active travel, a 0.23-point reduction in body mass index, 6.5% fewer vehicle miles traveled, 5.6% fewer grams of oxides of nitrogen (NO_x) emitted, and 5.5% fewer grams of volatile organic compounds (VOC) emitted (Frank et. al., 2006).

8. Barriers and Opportunities for Success

In addition to weighing the costs and benefits of bicycling intervention, we should also consider the barriers that may make implementing our recommendations difficult. One barrier may be getting over the initial hurdle of encouraging people to change their current lifestyles to

incorporate active transport. One study found that the more walkable and bikeable a community was, the easier it was to overcome difficulties with encouragement (Maibach, 2009). Therefore, the more initiatives that Monona puts into place, the easier it will be to overcome this barrier. Another barrier that was of concern to our client was potential push back from homeowners that would not want sidewalks in front of their house or would not want removal of parking to build bike lanes and sidewalks. Although these challenges will likely arise, a survey done in 2013 in Monona indicates that many people do want to use active transport more, but the existing infrastructure and policy do not make it possible to do so safely (City of Monona, 2013). Since the data shows that the desire for a more active transport friendly city is great, this presents an opportunity to successfully provide much needed services to your community. Lastly, the cost of the project may be a barrier, especially to stakeholders, but as was previously discussed, the benefits from increased health and decreased air pollution will far outweigh the costs in the long term, making this intervention an opportunity to successfully reduce overall costs.

9. Recommendations

9a. Policy Priorities

Although policy is typically weighted as most influential under the hierarchy of controls, the inclusion of residential survey results in this analysis demonstrates to us that Monona currently lacks sufficient bicycle infrastructure to make an effort based in policy change effective in safely increasing the bikeability of the city. Thus, we recommend that Monona make the E of engineering their first priority. With the exception of the Complete Streets policy, whose effect remains to be determined, and bike boxes, all recommendations had an overall positive health impact, though to varying degrees. We recommend emphasis be placed on creating separate walking and bicycle facilities, such as bike paths and sidewalks, as the potential increases in

ridership and safety offered by this option are significant. While Monona currently has segments of bike paths and sidewalks, the lack of connectivity between them—forcing bicyclists to merge with motor vehicle traffic in between each fragment—has been expressed as a major barrier to biking by the residents of Monona while also likely negatively impacting health and safety (Castillo, 2016). Increasing the availability of space dedicated to pedestrian traffic, specifically those indicated in *Figure 5*, and to connect the city’s current bike infrastructure, including the lake loop as it is a highly traveled route, is likely to provide the greatest return in investment by reducing barriers and having a positive impact on health. We also recommend a high priority not be placed on bike boxes due to the mixed results of their impact.

Engineering efforts should then be supported by enforcement strategies as they are critical to promoting both safe conditions and a perception of safety within the community. Enforcement of policy should focus not only on the actions of motor vehicle drivers but also the actions of bicyclists, ensuring that they too abide by appropriate regulations to maintain safety. Doing so also requires proper educational efforts for bicyclists. A critical component of the enforcement efforts will be the development of a Bicycle Advisory Committee, which will bring law enforcement and community members together on the issue. This committee should be formed before infrastructure improvement plans are finalized so the members can provide additional insights and increase recognition of issues of equity.

While we place education and encouragement, jointly, as the third tier of our modified hierarchy of controls, they are still essential components needed to increase active transport. We have combined these E’s are interrelated and are likely to be most effective when utilized in conjunction. Therefore, we recommend that the city of Monona initiate a long-term campaign strategy to boost awareness and confidence in active transport after the recommended

engineering efforts have been completed. This should include mass community encouragement events as well as educational components implemented over the course of, at a minimum, 1 year. A potential example for the city of Monona to follow would be the “Cycling Connecting Communities” campaign that was implemented in Sydney Australia (Rissel, 2010). Over the course of 24 months, this program used a combination of frequent and consistent, organized bike rides, mass community events, cycling skill courses, distribution of bike path maps, and advertisement in local media. This concerted effort resulted in increased cycling frequency, physical activity levels, and social cohesion, which likely had significant impacts on health (Rissel, 2010). Equity and the recognition of disparities must be taken into account throughout each priority.

9b. Reporting and Communication Plan

Reporting the progress of the city’s efforts toward increasing active transport is a critical step, both to prompt community awareness and maintain community involvement. We recommend utilizing the Bicycle Advisory Committee as the means to share updates and progress reports with the community. The Committee should meet monthly, providing detailed meeting notes to be posted on the City of Monona website. The committee should also be tasked with posting signage in high-visibility areas around the community, such as schools and parks, to provide information regarding upcoming developments. This could include using lawn signage placed along locations of upcoming paths to draw attention to them.

9c. Evaluation

Evaluation is the final critical step of this iterative process. To determine whether the recommendations made here have their intended effect within the community, we suggest the following evaluative steps be taken. Visual bike counters, installations that count the number of

bicyclists that pass by, should be installed along bike paths to measure bicycling rates. Ideally, these would be installed before initiation of infrastructure expansion efforts to obtain pre-improvement data. Care should also be taken to place at least a quarter of these counters along newly-developed paths or newly-connected areas. This quantitative data should be complemented with survey data. Surveys should be conducted at both 6 months and 1 year post completion of infrastructure improvement plans, providing opportunities to compare responses to both 2013 and 2016 community survey data. These surveys also provide the opportunity to make adjustments where possible or acknowledge any remaining issues. Surveys should also be conducted both before and after educational/encouragement events to determine their impact and make improvements. While a more costly option, better response rates are generally seen from mail surveys as opposed to electronic surveys, thus the prior is recommended (Shannon, 2002). If response rates are low or concern remains that they will be, incentives have been found to be useful. Small monetary incentives (e.g. including \$2 with each survey) have proven to be more effective than coupon incentives or the promise of larger future incentives (e.g. \$20 provided after submission of the survey) (Dykema, 2012; James, 1992).

10. Conclusion

Given that Monona already has a base of bike infrastructure to build off of and considerable community support for biking improvement efforts according to survey data, these recommendations are made with the hope that they enable Monona to not only advance from a bronze bikeability level to a silver level, but that they ensure the protection and maximization of the community's health while doing so. While initial investments will be required, we hope the extensive scientific evidence presented here demonstrates that the health benefits and financial returns exceed the costs. Beyond the factors central to this report, these recommendations are

also likely to provide a broad range of long term benefits to the City of Monona. Improved walkability and bikeability of the city has the potential to make it a more attractive destination to residents of surrounding communities, especially bikers of Madison. This presents an opportunity for increased tourism, an increased desire to live and/or work in Monona, and a positive impact on the local economy. Overall, we believe the recommendations made here are beneficial to both the active transport and health needs of the Monona community.

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UNIVERCITY HEALTH IMPACT ASSESSMENT ON HOUSING FOR THE CITY OF MONONA

Abbey Hargreaves, Miranda McElligott, Ian Ryan

The connection between health and the dwelling of the population is one of the most important that exists”

-Florence Nightingale

Background Details

Monona, Wisconsin is located on the opposite side of Lake Monona from downtown Madison. The town hosts nearly 8,000 residents, but has experienced a slow decline in population in recent decades. Compared to the rest of Dane county, Monona’s population is significantly older. In 2016, an estimated 38% of Monona’s residents were 55 or older and 19.3% were 65 or older. Monona is by far the oldest city in Dane county according to median age and this is expected to increase in the next decade.

In terms of housing, the 2010 Census reported that 59.5% of housing in Monona was owner-occupied. In 2013, the proportion of owner-occupied housing dropped to nearly 53%, but bounced back up to 61% in 2015. Of all cities in Dane county, Monona has the lowest percentage of households with children, and the highest percentage of single households and homes with residents age 65 and older. The price of housing in Monona may also pose a problem. Households spending more than 30% of their income on housing are considered cost-burdened and those spending more than 50% are considered extremely cost-burdened. Currently, the median home price in Monona is \$213,100 and the median income is \$52,204. This presents a significant financial burden to many residents. Monona has the third-highest percentage of cost-burdened owners in Dane county and the highest percentage of elderly cost-burdened and extremely cost-burdened households.

The demographics of and price of housing within Monona creates a difficult situation for many low-income and elderly residents. Younger residents may also have difficulty purchasing

homes in Monona due to large amounts of student debt and difficulties acquiring a mortgage. Simply building new, affordable housing is not an option, unfortunately. Monona has a limited ability to construct new housing due to geographic barriers, mainly Madison and Lake Monona. Therefore, the best strategy to cope with changing housing needs is to rehabilitate multi-family, single, and low-income housing.

Multi-Family Rehabilitation

The 2016 City of Monona Comprehensive Plan identified several areas of the city that would benefit from being rehabilitated, updated, and/or converted into different housing stock. One site is Anthony Place, a multi-family residence area ripe for redevelopment. It is located on the Southern part of the city between retail businesses and single-family homes. Pirate Island Drive is another area that has long-term redevelopment potential due to the rundown nature of the neighborhood. Pirate Island is a multi-family residence district located on the waterfront. A potential conflict for the Pirate Island area is the sewage system. The Pirate Island Road outfall was identified as a top 10 priority storm-water outfall to fix. After the area is cleaned up, it could provide an excellent site for low-income housing of all ages.

Housing Proposal

The amount of undeveloped land in Monona is limited because of Lake Monona and surrounding towns. Therefore, “new” housing is usually in the form of redeveloping older, single-family homes. Redeveloping is often more expensive than building new housing on an empty lot, however, Monona’s location and high quality of life makes it a desirable place to live and invest in housing rehabilitation and redevelopment. In addition, the demand for low-income, elderly-friendly, multi-unit housing in Monona will rise in the coming years. Therefore, redeveloping Anthony Place and Pirate Island into low-income, elderly-friendly housing is the

best option to meet Monona's projected housing needs. There are several funding opportunities available to the city of Monona to aid in this process.

Monona has a long history of responsible use of tax increment financing (TIF) to facilitate the redevelopment of commercial sites and to fund public improvements in the TIF districts. The resulting development pays for the initial expenditures over time through dedicated property tax revenues. Monona currently has seven operating TIF districts focused on redevelopment efforts along Monona Drive and Broadway. However, this program might be better utilized redeveloping residential areas in Monona, instead of commercial.

Renew Monona is a revolving loan program funded by TIF revenues that focuses on housing redevelopment. Renew Monona provides zero-interest loans of up to \$10,000 for home improvements. As of March 2014, seventeen applications had been submitted to the program and thirteen of them were completed. The city expects to provide substantial funding to the program when TID No. 2 is retired, allowing additional homeowners to benefit from the program and the increased tax values in the city's commercial districts. In order to take full advantage of the revitalized commercial sections of Monona, the city should utilize Renew Monona and TIF to develop low-income housing that will both suit the needs of their current residents and create the opportunity for increasing Monona's population in the future.

The last option discussed here is a Department of Housing and Urban Development (HUD) program known as Section 202: Supportive Housing for the Elderly. This program provides supportive housing for very low-income persons age 62 and older. It emphasizes helping residents with independent living, while still providing support for daily activities like cooking, cleaning, and transportation. Section 202 is particularly relevant to the city of Monona because of the older age demographic. By emphasizing the quality of elderly housing, this

program has the potential to improve older residents' health. Currently, there is only one Section 202 property in Monona, the Monona Meadows Apartments, and the city may want to take advantage of this program in the future.

Health Impact of Housing Rehabilitation

The link between housing and public health is well documented. Housing quality, community, affordability, and location all play a role. The most important, relevant factors for the city of Monona are housing stability and food security. Stable housing is one of the best indicators of resident health because it correlates with health care access, health care utilization, stress, and mental disorders (Breysse, 2016: 9). The older residents of Monona are at high risk for housing instability because they are on fixed incomes, housing prices in the city of Monona are out of their price range, and existing housing solutions impede independence. Another important consequence of expensive housing is food insecurity. Spending large amounts of money on housing leaves less money for fresh fruits and vegetables. It also leaves less money for medical/dental services and prescription drugs, two problems that disproportionately affect the elderly. When considering different housing redevelopment options, it is important for the City of Monona to assess the health impacts.

Goals

The overarching goal of this project is to understand the impact of both the decline in owner-occupied housing units and the rehabilitation of older units into multi-family housing on the city of Monona. The HIA team will examine the health impacts of renovating buildings built in the 1960s to modernize the housing units, expand the pool of multi-family housing options, and increase affordable housing options. A wide variety of health impacts must be considered, ranging from socioeconomic changes to environmental exposures. The health implications will

be considered for the community as it exists now and for new members of the community brought in through the rehabilitation project.

Methods

What is a Health Assessment?

A Health Impact Assessment (HIA) is a tool through which a proposed plan or project is evaluated for potential and likely health impacts, both positive and negative. HIAs are useful because they allow those who may be otherwise unfamiliar with how health is affected by policy to take health into account prior to implementing a public policy. HIAs are intended to both inform decision-making in policy and to identify or predict health consequences of various implementation options. The health outcomes and determinants reviewed during an HIA should be all-encompassing. They include physical health, environmental health, and social determinants of health. The process of conducting an HIA is generally structured, but can be tailored to the particular project in question. HIAs are most useful when evaluating policies in which health effect is not the primary objective of the proposal. Stakeholder involvement is crucial in conducting an HIA. Policymakers, economic stakeholders, and community members should be involved in designing the HIA and reviewing the findings. A Rapid Health Impact Assessment (RHIA) is an HIA that is conducted in a shortened timeframe - usually weeks or months. RHIA's tend to have a more narrow focus and reviews a smaller number of health factors and policy options. RHIA's should still maintain a high level of stakeholder engagement in order for the process to be truly useful for decision-makers and the community.

In addition to stakeholder engagement, equity is a core value of the HIA process. Health inequalities are intrinsically linked to social and economic factors and policies. It is important for HIAs to consider the impact of the policies being evaluated on vulnerable populations in the

community. This is especially important in assessing housing policies. Health inequalities are the disparate or unjust outcomes that result from varying levels of power and access to opportunities within a population. To effectively consider equity and vulnerable populations within the HIA process, the HIA team should be careful to include equity measures in their assessment and to engage stakeholders with established relationships in marginalized communities. Within the framework of housing policy, equity can be addressed by considering the impact of housing on low-income and minority members of the community and evaluating how housing policies can be used to improve social factors that lead to poor health outcomes.

To conduct an HIA, the general steps are screening, scoping, assessment, recommendations, reporting, evaluating, and monitoring. Screening and scoping are used to determine if an HIA is appropriate and what approach the HIA will take. During the scoping step, the HIA team works with stakeholders to identify which potential health impacts will be considered and how they will be assessed. This includes deciding on the specific measurements for health impacts and choosing what policy options will be evaluated. In the assessment stage, the team conducts the analyses decided upon during scoping. The goal of this stage is to identify existing conditions, the changes resulting from policy implementation, and the impact on health. Importantly, the distribution of these health impacts throughout various populations within the community is also assessed at this time. The assessment stage includes reviewing existing literature on the links between health determinants and outcomes, evaluating existing data on housing and socioeconomic conditions in the area, collecting any necessary new data, and completing an impact analysis. The recommendations and reporting steps of the HIA are used to compile health-focused policy implementation recommendations and to disseminate those recommendations to stakeholders and policymakers. The recommendations should include ways

to minimize negative health impacts and to magnify any potential positive impacts of the project on health. Lastly, monitoring and evaluation occur after the delivery of the HIA and throughout the policy implementation process. Stakeholders must evaluate the findings of the HIA and determine if and what the impact will be on the decision-making process (NCHH, 2016).

Screening

An important aspect of any HIA is determining if an HIA is appropriate for the project under consideration. To determine if an HIA is appropriate for a given project, the project must first be feasible and it must be able to assist in any decision-making process—this occurs in a process known as ‘Screening’ (WPHA, n.d. a). For this particular project, screening will assist in determining if proposed renovations of the buildings located at Anthony Place and Pirate Island meet the criteria outlined in HIA guidelines. Ultimately, HIAs are not indicated if health effects have already been identified and clearly defined, are not significant and if there is no chance that the HIA recommendations will impact the process of decision-making (WPHA, n.d. a).

The projects at hand, the potential rehabilitation of the units at Anthony Place and Pirate Island, involve several key housing concerns previously outlined in the ‘Community Development Annual Summary – 2015’ for Monona, Wisconsin, including increasing the need to address an aging Monona population, as well as interventions to address the impact of older housing and potential to mitigate the decline in owner-occupied housing in Monona (Reichert, n.d.).

A rehabilitation effort for the aforementioned properties meets all of the necessary criteria to conduct an HIA. A spectrum of health impacts, both positive and negative, are able to be identified utilizing the HIA process and these impacts of rehabilitation of these multi-family

units have not hitherto been formally examined prior to this HIA. As the City of Monona has not only identified this particular project as a key concern in its 2015 Summary alongside the desire to participate in the UniverCity project, there is considerable ability for this analysis to impact future decision-making in Monona. Finally, the impact of rehabilitating older housing as well as impacting the demographic makeup of Monona itself has the potential for significant health impacts. Given the above, an HIA was deemed to be appropriate for this project.

The following scoping section seeks to formally consider potential positive and negative health impacts of rehabilitation of these multi-family housing units.

Scoping

The second step of an HIA to thoroughly assess the content of the project through scoping, wherein key issues associated with the project as well as key stakeholders and participants are identified (WPHA, n.d. b). Outcomes of particular interest to the identified stakeholders are outlined, thus giving broad guidance of future directions for decision-makers and other stakeholders. Stakeholders for this project have been identified as the population of the city of Monona as well as the steering groups identified in the Comprehensive Plan in Appendix C (Monona Common Council, 2016).

This HIA includes immediate population health concerns that are impacted by the social, physical and built environment as well as mid- and long-term future health impacts of rehabilitation or renovation of these multi-family residential housing units. These broad areas of concern include: housing location, potential environmental exposures, impact of revitalization, financial impact and the impact on the population of Monona itself.

Location

The first area of concern is the effects of a rehabilitated unit's location on community and individual health outcomes. This HIA will be considering the sites proposed by the city of Monona: Anthony Place and Pirate Island. These two locations have been proposed for potential rehabilitation of older multi-family residential living in Monona and are located at approximately 43°3'18.27"N, 89°19'42.08"W and 43°2'54.94"N, 89°20'01.17"W respectively (Google, 2017). Anthony Place is located in central Monona while Pirate Island is located on Monona's south side near U.S. Highway 18 and is circumscribed by the Yahara River (Google, 2017). As Monona is landlocked, it has limited ability for the community to expand via new development, which includes construction of new multi-family housing units. This concern is somewhat alleviated by the current existence of older multi-family residential units throughout the city. As multi-family housing already exists as approximately 3% of current land-use in Monona, including the two locations under review for this HIA, the particular location is unlikely to impact the health of current Monona residents but may have significant health impacts on populations moving to these locations, especially if the new populations are moving from areas with a different level of access to health-impacting services proximate to the two sites (ex. bike paths, bus routes and parks, etc.). For ease of visualization, Figure 1 has been included to show approximate locations of both sites and surroundings. A thumbtack marks each of the locations of interest, and a yellow line has been drawn to indicate 400-meter distance from each location to indicate relative 5-minute walkability of each neighborhood (Calgary Regional Partnership, n.d.). Satellite images and nearby location data were drawn from Google Earth (2017).

Figure 1a. Location of Anthony Place, Monona, WI

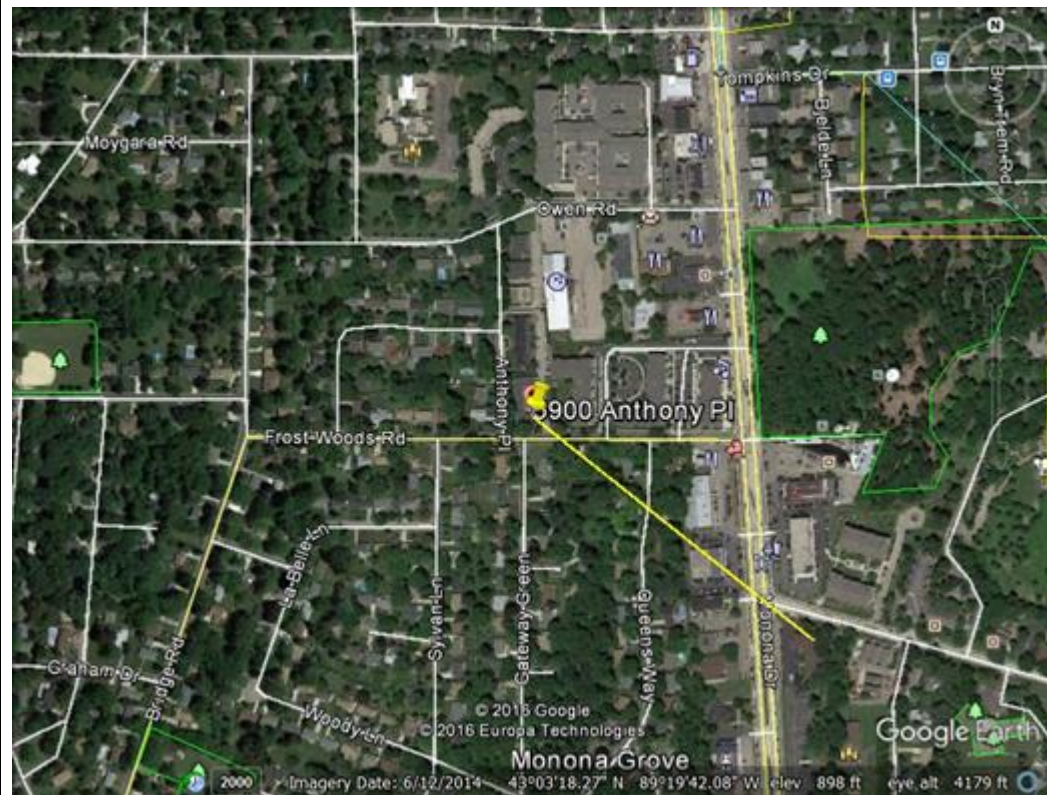
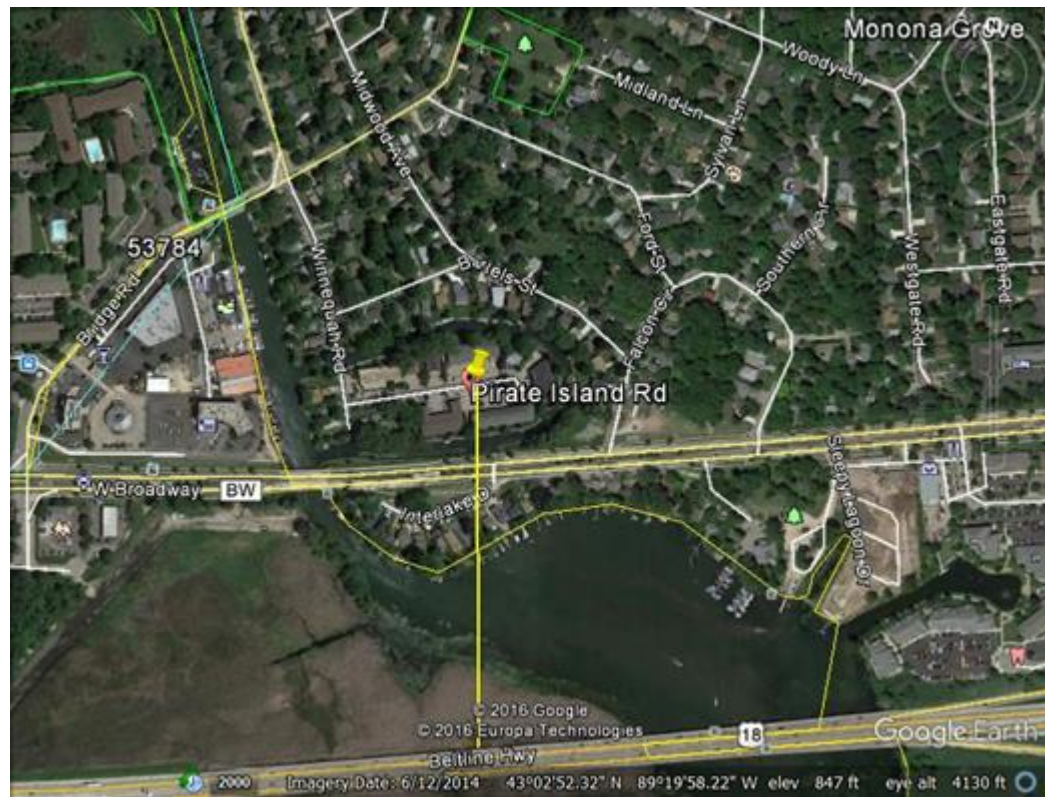


Figure 1b. Location of Pirate Island, Monona, WI



Thus, while location might serve as a potential source of health concerns for new construction, this concern is alleviated through the use of rehabilitated housing in existing multi-use housing structures although location should be taken into consideration during future urban-planning discussions.

Environmental Exposures

In addition to concerns of the location of the proposed rehabilitation and its impact on individual and community health, the two areas under review both have the added complication of being older housing units created sometime around the 1960s. Housing has increasingly become identified as a determinant of health and health concerns associated with older housing include a wide variety of concerns, including the condition of the building materials, the choice of materials themselves and other associated concerns (Krieger & Higgins, 2002).

Housing material as a potential negative health exposure is especially relevant in the context of maintenance and upkeep well as the hazards of natural degradation associated with aging (Krieger & Higgins, 2002). Due to this, older housing has been identified with a wide variety of environmental exposures, with a variety of associated health outcomes, both acute and chronic in nature. Chronic conditions associated with older housing and poor maintenance include asthma secondary to unaddressed issues of moisture in housing, use of older housing materials (ex. older carpeting) and poor pest control (Krieger & Higgins, 2002).

Other examples of toxic exposures that are of concern in older housing include asbestos and lead, both materials that were used widely in construction in the last century and both of which are associated with significant negative health impacts and risk for environmental persistence (Haley & Talbot, 2004; Tong, von Schirnding & Prapamontol, 2000, DuFresne et al., 2009). Lead in particular has been noted to persist in soils, especially associated with industrial sites and in locations proximate to highways, since it was used extensively as a fuel additive in the last century (Abelsohn & Sanborn, 2010; Tong, von Schirnding & Prapamontol, 2000). In addition to transportation and industrial uses, lead and asbestos were used extensively in residential settings, including in the construction of older housing units. Examples include the use of lead pipes in plumbing and in older house paint, and thus are of increased concern when performing demolitions, but remediation of these materials in older housing units can prove costly, as evidenced by the use of federal and state financial assistance in the remediation of lead (Krieger & Higgins, 2002; Advisory Committee for Childhood Lead Poisoning Prevention (ACCLPP), 2012: 79).

In addition to individual exposures, there can be a concern of a cascading effects, as poor upkeep or maintenance of locations that utilized these older materials can result in an increased

rate of degradation, thus increasing the levels of human exposure. For example, poor ventilation in housing units can result in radon exposure and effects can be intensified when combining poor construction with poor maintenance, resulting ultimately in an increased risk of lung cancer (Krieger & Higgins, 2002).

Equally as concerning is the fact that these exposures and their health sequelae have been long known to be concentrated in more vulnerable populations, such as the socioeconomically disadvantaged and children (Haley & Talbot, 2004; Abelson & Sanborn, 2010; ACCLPP, 2012). Lead has been noted to have significant and irreversible health effects even at low levels in at-risk populations, most notably children, where behavioral and biological processes increase the risk of negative sequelae resulting in long-term developmental delays and behavioral concerns (Abelson & Sanborn, 2010; ACCLPP, 2012). Although there is always risk of new environmental exposures with any renovation, there remains greater potential for net positive health outcomes through the processes of remediation and construction on sites where environmental contaminants exist, including immediate impacts of a reduction in individual and community-level exposure to lead, asbestos and radon.

So, it is worth noting that while remediation of unsafe aspects of older housing has great potential to improve the health and safety of the housing units, the potential exists for negative health impacts as well, including exposure to dust and allergens as well as increased risk of asthma (Krieger & Higgins, 2002). Thus, any project proposing to rehabilitate Anthony Place and Pirate Island housing units should take a full account of projected risks against projected benefits prior to initiation of any new construction or rehabilitation.

Potential for Revitalization of Anthony Place and Pirate Island

In addition to negative individual and community-level health impacts associated with potential environmental exposures, there is the possibility that renovation of existing structures can serve to revitalize older neighborhoods with modern urban-planning methods, with an ultimate aim towards maximizing individual and community health outcomes. In an examination comparing data concerning rehabilitation of existing structures against new construction for multi-family housing units, a recent working paper noted that rehabilitation of existing units proved overall more economically viable than new construction (Brennan, et al., 2013). This would allow for funding resources that would be otherwise delegated towards housing construction be used for other community projects. With the increasing focus globally on sustainable development, an eye towards the future has the potential for great benefits for the surrounding community, and can be guided by local and state policy (Barber, 2007).

Schwartz, et al. (2006) found evidence that subsidized revitalization of areas with poor quality housing experienced marked benefits from the correction of these deficiencies, which resulted in a ‘spillover effect’ in the surrounding community exceeding the initial subsidies. Renovation of older construction alleviates not only health concerns associated with the physical environment, such as lead, asbestos, radon and mold remediation, but also can yield substantial positive social health impacts commonly associated with poorly-maintained neighborhoods, such as a reduction in crime and greater sense of community, both associated with greater levels of health and well-being (Krieger & Higgs, 2002).

Impact on housing affordability and taxes

There is additional concern of the potential impacts of rehabilitation of these multifamily residential housing units on housing affordability in the City of Monona. Currently, median rent in Monona is valued at \$808 per month and median housing values of owner-occupied units is

\$227,000 (U.S. Census Bureau, 2015a). This is much higher than the state rental median of \$792 per month and housing value of \$169,000, and higher cost housing stock has the potential to depress the ability of younger families and populations from entering into the community (U.S. Census, 2015b; Wisconsin Realtors Association, 2017; Barber, 2007). While increasing availability of affordable and safe multi-family residential housing units in Monona has the potential to widen the tax base for the City of Monona through a higher population density, there is a possibility that multi-family residential housing might result in lower overall property taxes collected for the local government, although the benefits of rehabilitated units might overcome any perceived negative impact of multi-family residential units on the tax base (Capital Area Regional Planning Commission, 2015).

Rehabilitation of housing in neighborhoods has been noted in the literature to be associated with higher property values for areas immediately surrounding the rehabilitated or redeveloped areas in the literature (Ding, Simons & Baku, 2000; Schwartz, 2006). Interestingly, the impact on property values is more pronounced for new construction than for rehabilitation of existing structures, except in cases of wealthier areas (Ding, Simons & Baku, 2000). As median property values in Monona are higher than for the state of Wisconsin (\$227,700 vs \$168,300) while median income is lower (\$51,721 vs \$55,638), it is unclear of how this might finding might impact rehabilitation of existing properties in Monona (Hidalgo & Landry, 2016).

Impact on the Population of Monona

Finally, rehabilitation of multi-residential housing units will have a direct impact on the population of the City of Monona itself. There are a few related concerns regarding the impact at a population-level on the city of Monona, namely that Monona might experience a change in its population makeup, especially along lines of age and income. In other publications, the city of

Monona has expressed its concerns regarding its aging population (Monona Common Council, 2016). According to U.S. Census Bureau information, the median age of a resident of Monona is 44.8 years, as opposed to the state of Wisconsin as a whole (39 years) or nearby city Madison (30.9) (U.S. Census Bureau, 2015). With a population that is aging into retirement, there is a risk of a net diminished tax revenue for the city, as older populations are often associated with lower spending habits in addition to the reduction in earnings that is associated with retirement (Felix & Watkins, 2013). In addition to previously described health benefits, rehabilitation has the added benefits of decreased age and economic segregation in the immediate community. By increasing the number of safe and affordable multi-family residential housing units in Monona, there is the potential of economic desegregation as new populations enter into the established community of Monona.

Plan for completion of this HIA

Our plan for completing this HIA is to evaluate available recommendations after conducting a literature review and develop tailored interventions to address the health needs of the community during this rehabilitation effort. Our primary concern is to address the variety of health impacts associated with rehabilitation of older housing upon the individuals and communities exposed.

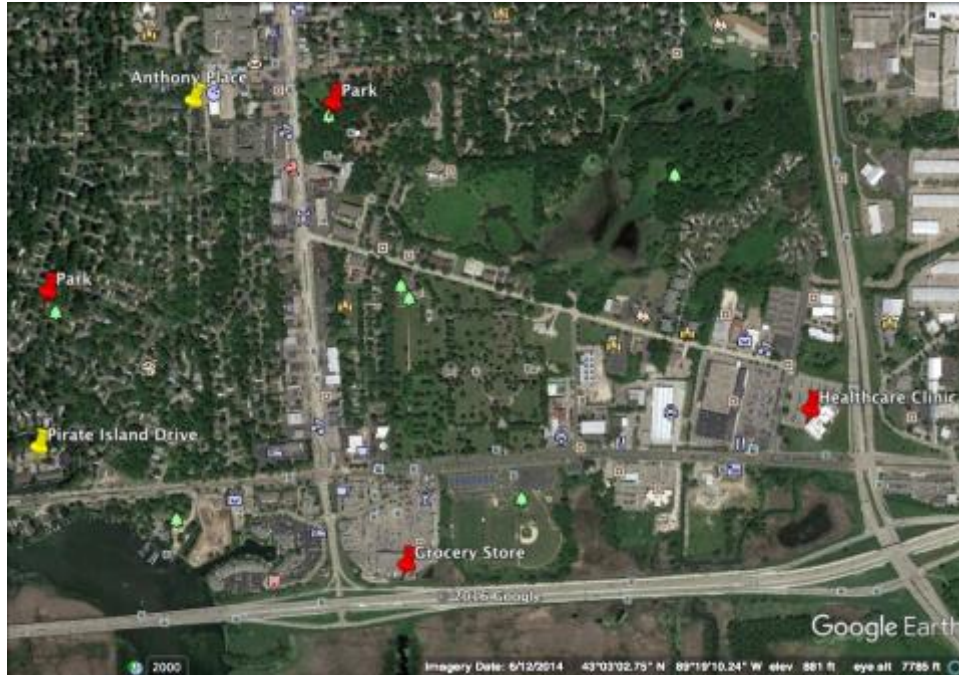
Assessment

The City of Monona has outlined goals, objectives, and potential policies to address housing needs in the “City of Monona Comprehensive Plan: 2016 - 2036,” which was adopted by the city on April 4, 2016. There are a number of potential housing policies included in the plan. This assessment focuses on the rehabilitation and renovation of Anthony Place and Pirate Island Drive. Each policy option will be assessed on criteria outlined during the scoping process:

location, environmental toxins, revitalization potential, cultural impacts, impacts on housing affordability, and population effects. The proposed plan to renovate housing units in the Anthony Place and Pirate Island Drive locations would increase the number of affordable units in multi-family buildings. This project involves renovating existing housing stock in these areas to bring older buildings up to current standards.

Location of housing has a significant impact on health. From safety to access to food, a neighborhood's location is an important factor for the health of the population. Anthony Place and Pirate Island Drive are both located one mile from the nearest major grocery store, providing access to healthy foods. Both streets are primarily residential and have sidewalks, which make them walking-friendly areas to live. Both housing developments are under 0.5 miles from at least one park, providing access to green space and recreation. Anthony Place and Pirate Island Drive are 1.2 and 1.7 miles respectively from the closest healthcare clinic. Figure 2 shows the locations of both streets (yellow thumbtacks) as well as the locations of these features and services (red thumbtacks). Given these factors, these locations have the potential to benefit the health of residents.

Figure 2. Locations of Parks, Clinic, and Grocery Store Near Renovation Sites



Environmental toxins are present in many older homes. Given the age of the housing stock in Monona, it is likely that the units to be renovated contain lead and asbestos. Exposure to these toxins during renovation presents a risk both to residents of the area and to those performing the renovations. However, these risks can be minimized through the use of safe renovation practices established by the Environmental Protection Agency (EPA). Additionally, it is likely that the renovation of these properties will decrease future exposure risks for a population that is generally more at-risk from environmental toxins found in housing. With the inclusion of affordable housing and housing for seniors in these multi-family units, this population will have more access to new, safe housing. There is evidence that low-income people are more likely to be exposed to environmental hazards. In Wisconsin, the Department of Health Services (DHS) found that low-income children were at a higher risk of lead exposure (Christensen et al., 2016). Renovating affordable housing reduces this risk by replacing hazardous building materials with modern materials.

The revitalization potential in this renovation proposal will positively impact the health of the population. There is a direct link between housing conditions, neighborhood conditions, and health. Physical and mental health are both impacted by the quality of housing and neighborhoods. Currently, both Anthony Place and Pirate Island Drive are not well-maintained areas. Deteriorating neighborhoods have a proven association with increased stress and depressive symptoms (Kruger et al., 2007). Additionally, studies show that even when controlling for socioeconomic factors such as poverty, residents of deteriorating neighborhoods have high rates of negative health outcomes including cardiovascular disease, homicide, and premature death in general (RAND Health, 2005). Revitalization of these areas through renovating housing units and investing in neighborhood fixtures such as sidewalks and greenery has the potential to improve a variety of health outcomes.

The sociocultural impacts of rehabilitating the housing units on these streets have the potential to be both positive and negative. Traditionally, there is concern that low-income housing could have negative impacts including increased crime. However, research shows that low-income areas that undergo renovation project see both a decrease in criminal activity and an increase in diversity. Areas with high rates of violent crime tend to have similar characteristics. These areas tend to be disadvantaged and segregated. Additionally, neighborhood cohesion and social networks play a role in crime (Sackett, 2016). A study conducted at Stanford Graduate School of Business found that development in low income neighborhoods using the Low Income Housing Tax Credit (LIHTC) reduced crime rates, increased racial and income diversity, and increased home values in the development areas by 6.5% (Diamond and McQuade, 2016). Renovation and rehabilitation provides an opportunity to decrease the segregation and lack of neighborhood resources that can cause neighborhoods to be unsafe.

In addition to social changes, there are other cultural concerns related to renovating older housing units. Homes and architecture often hold historical and cultural significance. There is concern that in renovating existing housing stock, some of the “character” and features associated with old buildings will be lost. However, this is not a major concern in these housing units. The multi-family units Anthony Place and Pirate Island Drive were built in 1961 and 1966 respectively. Neither development of buildings is historically significant. Thus, renovations can be made without negatively impacting the historical culture of Monona.

This policy poses a great potential to impact housing affordability. A critical part of this project is to include low-income and senior housing within the multi-family housing units. As a city, Monona currently has 376 federally funded housing units; 300 of these are low-income housing and 76 are low-income senior housing. The low number of federally funded Supportive Housing for the Elderly units available is detrimental due to the aging population in Monona. Access to affordable housing has clear link with health outcomes. Money spent on rent cannot be spent on other goods, including healthy behaviors and health care. Increasing access to low-income housing for the elderly and for families is crucial in improving health for those living in poverty, as this increases the proportion of income that is available for health-related expenses. It also has positive impacts on mental health by lowering the burden of stress associated with high costs of living for low-income people.

Recommendations

Redeveloping Anthony Place and Pirate Island into low-income, elderly-friendly housing is the best option to meet Monona’s projected housing needs while simultaneously providing the opportunity for population growth. After reviewing the many potential impacts on the health of

the population of Monona, it is apparent that this renovation project has the ability to have a number of positive effects.

Importantly, the multi-family housing units redeveloped in this project should include affordable housing and low-income senior housing. The short and long term health benefits of increasing access to affordable housing are numerous. There are two important funding sources to be considered in order to efficiently renovate low-income housing units. The first is TIF funding, which is already in use in Monona through the Renew Monona Housing Loan Program. However, currently these zero interest loans are only available for owner-occupied housing. To incentivize revitalization and increase the magnitude of positive health impacts from neighborhood renovation, Monona should consider expanding these housing loans to multi-family units. They should also prioritize funding loans for homes in areas in need of revitalization, in particular in the neighborhoods surrounding Anthony Place and Pirate Island Drive. The second funding source available for this project is the various federal housing grants meant to fund low-income and senior housing. In particular, using Section 202 grants for Supportive Housing for the Elderly would expand the number of units available to very low-income senior citizens. Additionally, there are federal funds available through the Home Investment Partnerships (HOME) program meant to help local governments invest in affordable housing. By subsidizing housing using federal grants, the city of Monona would offset costs both to residents and to the city itself.

In order to avoid negative health outcomes associated with renovation, it is important that established safety protocols when handling hazardous building materials. This includes the removal of asbestos, replacement of lead pipes, and removal of lead paint. To do this, trained and licensed experts in the removal of these materials should be engaged throughout the renovation

process. Housing units must be evaluated for the presence of lead and asbestos, as well as any ventilation issues that could cause radon buildup and other contaminants that impact health. In addition to safely removing old materials, it is important that these renovations make investments in quality, energy efficient, and sustainable housing materials.

Lastly, to reap the positive health benefits associated with neighborhood revitalization, the project must take care to include the characteristics associated with healthy neighborhoods. Walkability is key to promoting positive health outcomes through housing policy. To make a neighborhood more walkable, the city should consider installing sidewalks. The city of Monona should focus on improving the community's access to healthy foods and safe green spaces within walking distance. This can be done by providing incentives for new businesses to move into these neighborhoods and by investing in parks and shared community spaces.

Improving access to low-income housing for families and seniors has the potential to improve health for the Monona community-at-large. Safe, affordable, quality housing has the ability to improve the socioeconomic status of the community residents. By investing in the revitalization of the Anthony Place and Pirate Island Drive neighborhoods, Monona will improve the long-term health outcomes of its citizens.

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ABOUT THE UNIVERCITY YEAR

UniverCity Year is a year-long partnership between UW-Madison and one community in Wisconsin. The community partner identifies sustainability and livability projects that would benefit from UW-Madison expertise. Faculty from across the university incorporate these projects into their courses with graduate students and upper-level undergraduate students. UniverCity Year staff provide administrative support to faculty, students and the partner community to ensure the collaboration's success. The result is on-the-ground impact and momentum for a community working toward a more sustainable and livable future.

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