

# Oregon Avenue Protected Bicycle Lane:

A Case Study of a Health &  
Transportation Partnership in  
Klamath Falls, Oregon.



# Introduction

In Oregon and the rest of the United States, most of the primary causes of poor health and premature death are chronic diseases. Chronic diseases are long-term conditions that people live with for many years. They reduce people's quality of life. They can be managed but rarely have a cure. Helping people eat better, move more, be tobacco-free, and drink less alcohol is crucial to preventing chronic diseases, managing existing chronic conditions, and improving the day-to-day experience of people living with chronic disease. Increases in chronic disease rates in recent years have also been a primary contributor to the ever-increasing costs of medical care that continue to burden Oregon households and communities. Today, more than half of Oregon adults live with one or more chronic diseases.

Physical inactivity is one of the primary contributors to multiple chronic diseases, including heart disease, stroke, diabetes, obesity, cancer, arthritis, depression, and others. While many factors contribute to whether a person gets regular physical activity, research has demonstrated that when people have access to safe and convenient opportunities for walking and biking, they are more likely to be physically active. Regular physical activity can help people control weight, reduce their risk of cardiovascular disease, reduce risk of type 2 diabetes and metabolic syndrome, reduce risk of some cancers, strengthen bones and muscles, and improve mental health and mood (CDC 2018). Lack of physical activity drives the incidence of preventable chronic diseases like heart disease, stroke, diabetes and some forms of cancers. In the U.S. over 200,000 premature deaths are associated with physical inactivity (Murray et al 2013). Additionally they are costing the nation and our states billions each year

in unnecessary health care costs (Cawley and Meyerhoefer 2009).

When healthcare providers from Sky Lakes Medical Center in Klamath Falls identified hot spots of chronic diseases in their community and began looking for ways to address this challenge, they decided that the most effective intervention would be to improve the local environment to increase opportunities for physical activity through active transportation. Accordingly, they began collaborating with their local transportation planners and community members to generate ideas that would reimagine mobility in the downtown area and think about redesigning the street to make the corridor safer and more convenient for people to use active transportation. This initial effort set off a nearly five year effort to build what would later become known as the Oregon Avenue Protected Bike Lane Project in Klamath Falls, Oregon. The purpose of this project was to combat high rates of chronic diseases by addressing a key social determinant of health and to serve as an economic growth engine for the area, attracting additional commercial activity to an emerging downtown business district.

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Health care leaders are increasingly aware of the role that social determinants of health, like active transportation, play in improving individual and community health. The following case study documents the planning process initiated by healthcare providers in Klamath Falls to construct a high quality bicycling facility with an aim to get more people active and healthy and drive increased economic activity in the area. Using information gathered through interviews, reports and research literature, this case study intends to be a road map outlining how other communities in Oregon can replicate the Klamath Falls experience and leverage resources across silos to construct infrastructure to better suit the needs of their community.

This case study starts by telling the story of the protected bicycle lane and focuses on the project's origin, public process and

outcome. The next section provides more detailed information about the community of Klamath Falls and some of the people and organizations involved in this project, as well as the intersection of those people with local organizations committed to the care and well-being of the community. In the third section a roadmap is presented that summarizes the key players, actions and concepts that made this work a success. The fourth section summarizes research literature that has evaluated the role of physical activity in reducing risk of chronic disease, the role bicycle and pedestrian infrastructure play in getting more people to be physically active and improve their health. Additional evidence is summarized that have examined the connection between walk-able and bike-friendly communities as well as the economic benefits derived from that active transportation.



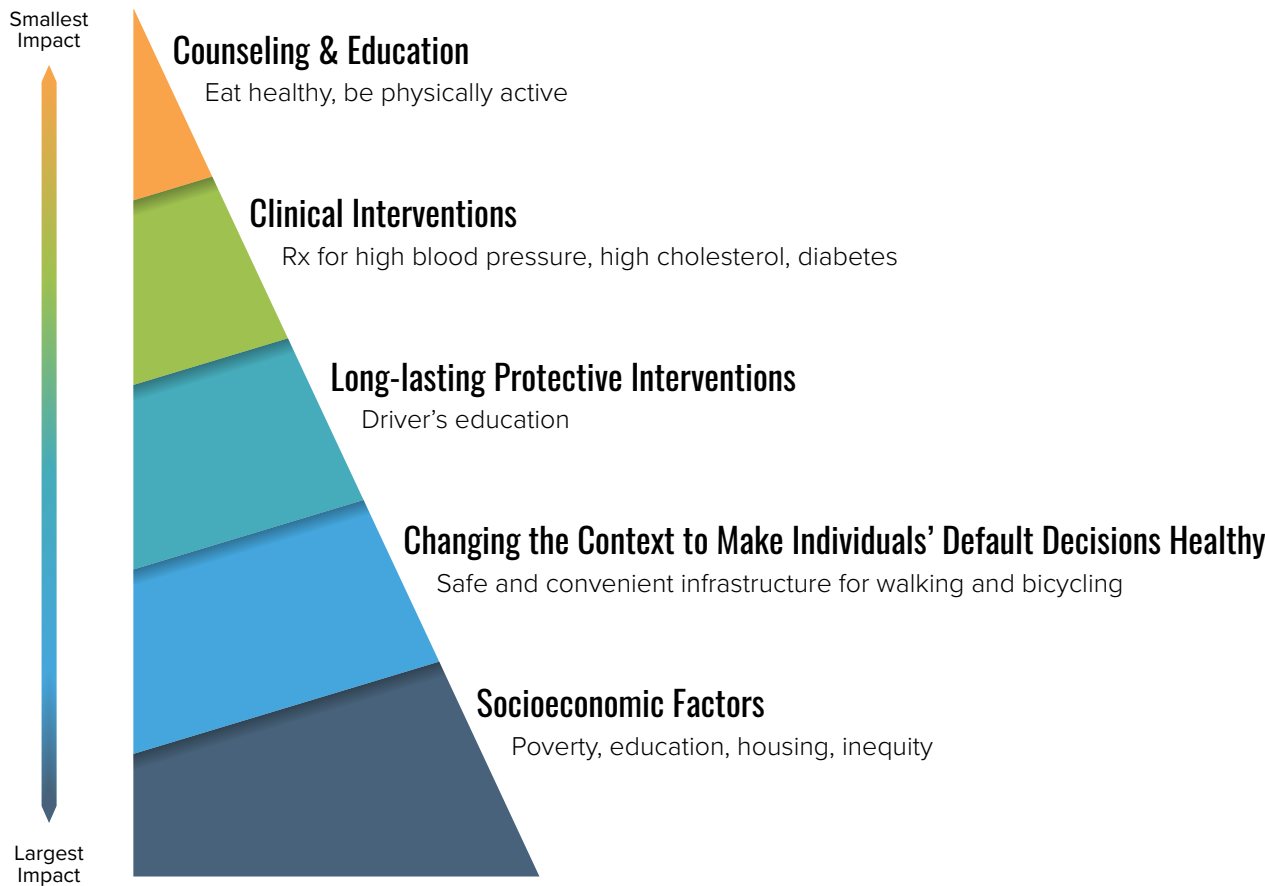
*Clearly marked bicycle lanes*

# The Story

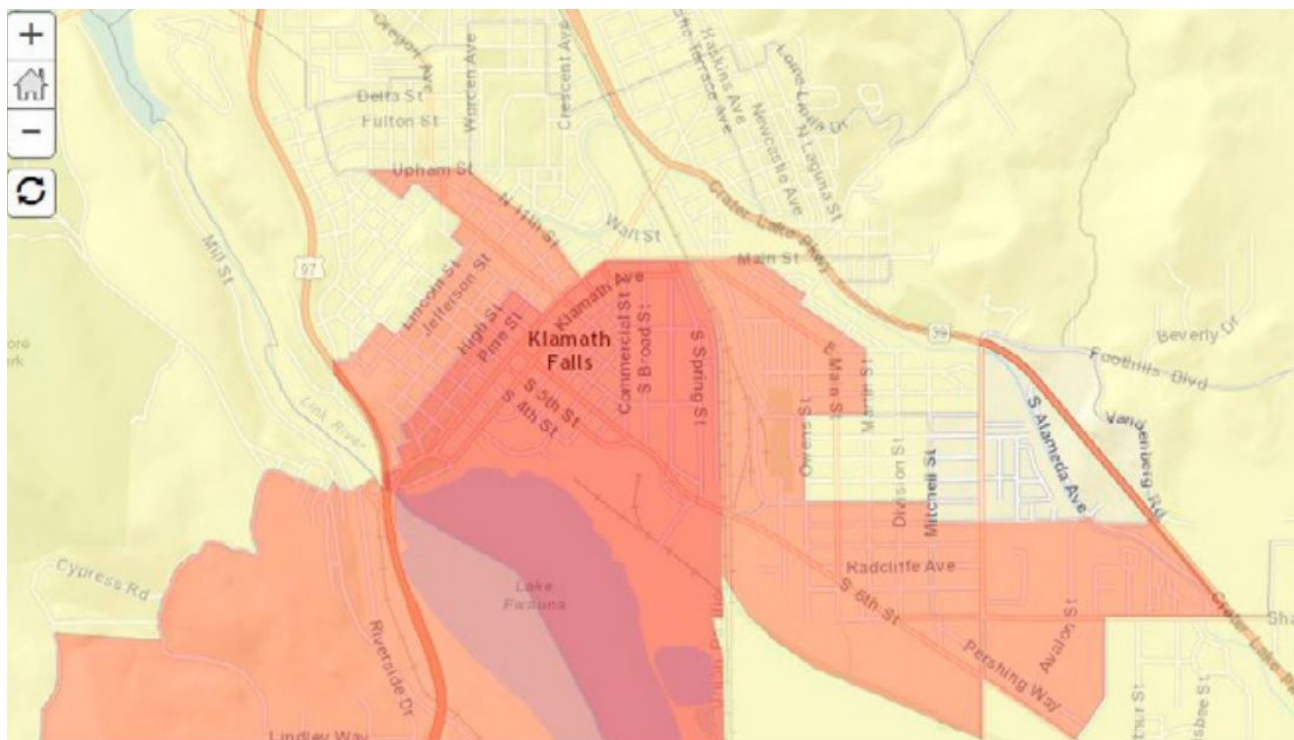
Dr. Stephanie Van Dyke and Katherine Pope met while finishing their Master of Public Health degrees at John Hopkins Bloomberg School of Public Health. Stephanie, a primary care physician, and Katherine, a registered nurse, left Maryland and headed out west. They pitched the idea of a wellness center focused on community-based chronic disease prevention, management, and reversal to Sky Lakes Medical Center in

Klamath Falls, and were hired to launch the Live Young Sky Lakes Wellness Center. Recognizing that many chronic diseases have their roots in community conditions, Stephanie and Katherine applied for and received funding from Cambia Health Solutions to create maps using geographic information systems (GIS) identifying hot spots of chronic diseases—specific areas within Klamath Falls whose population has relatively

## Factors that Affect Health



Factors that Affect Health – Adapted from Centers for Disease Control and Prevention



*Hot Spot Analysis for Obesity Within Census Block Groups in Klamath Falls, OR.*

high rates of chronic diseases related to physical inactivity. Initial work led them to partner with Dr. John Ritter, the director of the GIS Service Center at Oregon Institute of Technology, to map incidences of chronic disease diagnoses and walkability. This research examined walkability in Klamath Falls as well as key hotspots of chronic disease diagnoses

goods and services. Oregon Avenue - an underserved neighborhood that links the largest city park to downtown- demonstrated some of the worst health outcomes in the city. It was the ideal spot, from a public health standpoint, to construct a protected bike lane.

Stephanie and Katherine then evaluated potential evidence-based treatments that would provide a lasting benefit to the community. Working with experts in active transportation planning and public health, they selected a protected bike lane as the best public health intervention. Evidence shows that protected bike lanes improve ridership, prompting more physical activity; improve the economy; and improve connectivity and access to health supportive resources such as parks, schools, jobs, and essential everyday

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Elevated by an ongoing Blue Zones initiative, public support for the protected bike lane project grew as input was gathered from local residents. At public outreach meetings, staff heard that slowing vehicle speeds and making the proposed corridor safer for people to walk and ride a bicycle was important. Like any planning project, some people were opposed and worried that on street parking would be affected. After a parking utilization study found an oversupply of parking in this corridor, it was determined that some parking could be removed without significant impact on businesses or residents. Next, Sky Lakes Wellness Center staff partnered with the City of Klamath Falls, Klamath Falls Downtown Association, Integrated Youth Services, and a local building supply firm to construct a temporary version of the proposed protected bicycle facility. This temporary facility showed the community and its leaders what a final project might look like and how it could improve their streets.

As awareness for the protected bicycle lane project concept grew through public workshops, door to door outreach and posts on social media, members of the public organized and appeared before City Council to show support for one of the design alternatives, chosen through an extensive public input process. The selected design would travel along Oregon Avenue, a primary arterial in



*Protected Bicycle Lane Demonstration Project*

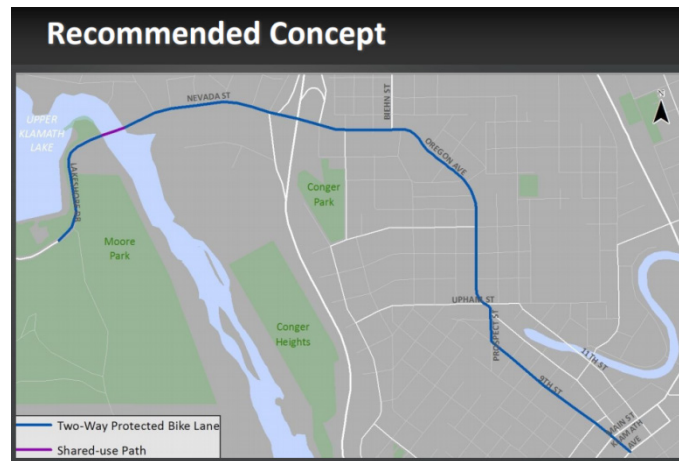
downtown Klamath Falls, and bring users out to Biehn Street with a second phase ultimately connecting the downtown with the Moore Park and the trail system.

Once the project details were settled, including the route and design, funding was still uncertain. The City of Klamath Falls had limited budget for new design projects and after searching for funding, Stephanie and Katherine successfully applied for and received a \$209,000 grant from the local coordinated care organization (CCO), Cascade Health Alliance. CCOs are novel organizations in Oregon and were established in



*Public Meeting for Klamath Falls Protected Bicycle Lane Project*

2009 with Oregon House Bill 2009, as a prelude to additional healthcare transformation brought on by the Affordable Care Act which passed in 2010. CCOs organize health care providers that serve Oregon Health Plan (Medicaid) members with a greater emphasis on prevention of health problems. This increased emphasis on prevention coupled with the ability to more flexibly spend Oregon Health Plan dollars has allowed CCOs like Cascade Health Alliance to assist providing grants for projects like the protected bicycle lane in Klamath Falls.



*Selected Corridor for Protected Bicycle Lane in Klamath Falls*

With public support confirmed, funding secured, and design challenges overcome, construction of the project will begin in spring of 2018 along with a concurrent resurfacing project along the corridor. Research shows that infrastructure availability is correlated with more physical activity. In a thorough meta-analysis, Buehler and Dill (2015) reviewed 20 years of research on the impact of bicycle network improvements on bicycle activity and concluded that bicycling activity increased with the presence of bicycling infrastructure. The public health research is also unequivocal with numerous studies showing the ability for physical activity to reduce the risk of most chronic diseases. According to the Community Preventive Services Task Force (CPSTF), engineering the built environment to include safe and convenient walking and biking facilities is an effective strategy for increasing levels of physical activity among community members, particularly when paired with education, encouragement, and enforcement efforts.<sup>1</sup>

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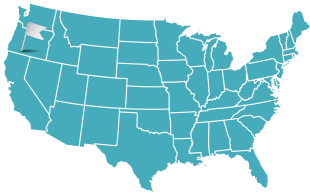
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<sup>1</sup> The [Community Preventive Services Task Force \(CPSTF\)](#) is an independent, nonfederal panel of public health and prevention experts that provides evidence-based findings and recommendations about community preventive services, programs, and other interventions aimed at improving population health. Its members represent a broad range of research, practice, and policy expertise in community preventive services, public health, health promotion, and disease prevention.

# The People and the Place

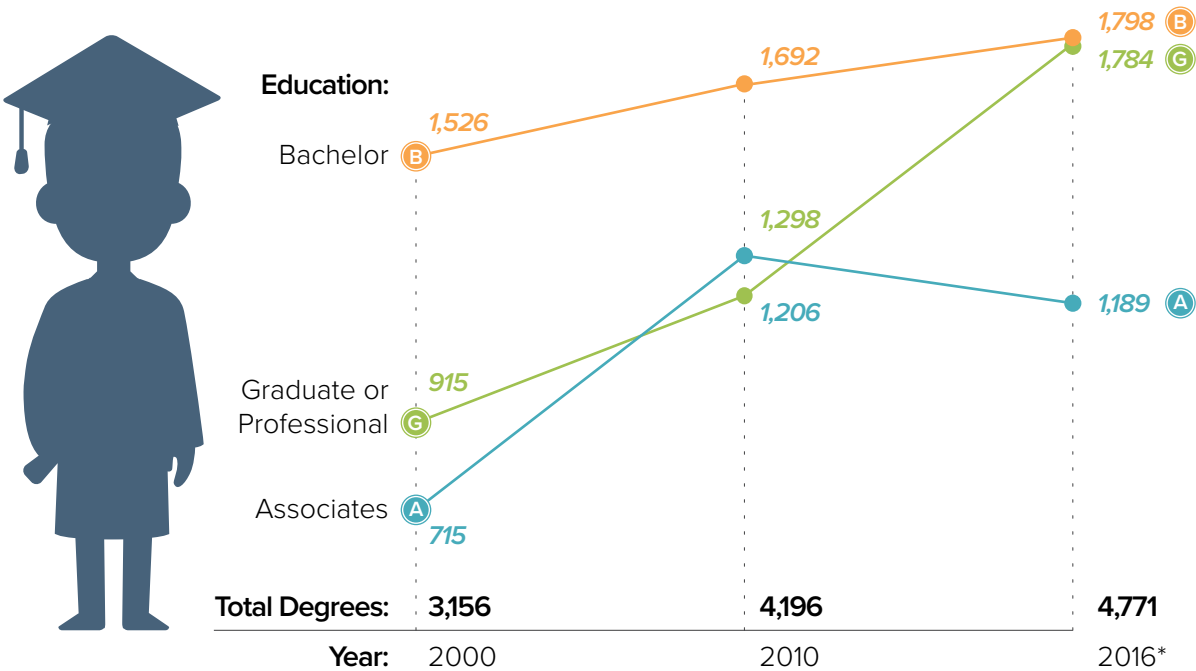
The city of Klamath Falls is a small urban area of about 21,000 residents located in the southern part of central Oregon. Like many communities in Oregon that have a long history with the timber industry, Klamath Falls is currently undergoing an economic transition. The effects of the 2008 financial collapse were compounded by a major wood-products manufacturer headquarters relocation in addition to a drought that has created increased tensions over regional water rights issues. As traditional sources of economic activity have

diminished, the community has looked to new sources of jobs like tourism and professional services. Klamath Falls is less than two-hour drive from Crater Lake National Park among other nearby outdoor recreational activities making this an increasingly important economic sector. In addition to tourism, Sky Lakes Medical Center is now the biggest private employer in the region with a staff of over 1,400, which follows a trend found throughout the state



Klamath Falls, Oregon

## Klamath Falls Population 25 and Older with College Degree



\*Margin of error not displayed

Source: U.S. Census and American Community Survey




where healthcare and social assistance employment makes up a larger share of the labor market. The number of people living in Klamath Falls with some kind of higher education has increased, too, with over a fifth of the adult population holding a college degree. The area is home to the Oregon Institute of Technology with a student population of about 5,500 up from about 3,500 in 2010. These economic and demographic changes are not necessarily unique to Klamath Falls but may have a role to play in greater acceptance of infrastructure that promotes active lifestyles.

The work done by Sky Lakes Medical Center staff has been aided by a constellation of other local and state organizations and efforts to make the community a healthier place to live including Cascade Health Alliance, Healthy Klamath, and the Blue Zones Project. Cascade Health Alliance is the region's Coordinated Care Organization (CCO), which is a community-governed organization that brings together physical, behavioral and dental health providers to coordinate care for people on the Oregon Health Plan (Medicaid). There are 15 CCOs across the state, managing care for over one million Oregonians. CCOs, which started in 2012, also have the flexibility to address their members' health needs outside traditional medical services. This model has allowed CCOs to "think outside the box" by supporting, investing in and collaborating with partners on social determinants of health (like transportation, food access, and education). With a focus on upstream health impacts, CCOs are contributing to initiatives like the Oregon Avenue Protected Bicycle Lane with funding support. The future of CCOs in Oregon is likely to see an even greater emphasis on improving the built environment and socioeconomic factors of patients instead of solely focusing on clinical care.

The Healthy Klamath Coalition represents a partnership between Sky Lakes, Klamath County Public Health, Klamath Open Door Family Practice, Cascade Comprehensive Care, and multiple other agencies who work together to enhance health in all sectors. The Blue Zones Project-Klamath Falls has been another important actor working in the region since 2015. These initiatives grew out of National Geographic researcher, Dan Buettner, who examined and described certain communities throughout the world where residents enjoyed longer and healthier lives due to lifestyle and environmental factors. These communities were coined Blue Zones and now initiatives across the world have set about to reproduce positive outcomes by changing the way people live, work and play.

These combined efforts have helped to foster an awareness that health is not just in the clinical field, but is largely affected by our environment and policies. This has fostered interest in a wide variety of players, which has made the installation of a world class facility for people to bicycle a possibility in this small urban area in Central Oregon.



***Cascade Health Alliance is the region's Coordinated Care Organization (CCO), which is a community-governed organization that brings together physical, behavioral and dental health providers to coordinate care for people on the Oregon Health Plan.***

# The Funding

The entire effort was first seeded by a grant that Stephanie and Katherine applied for from Cambia Health Foundation, the charitable arm of the Cambia Health System. Many health organizations, such as Robert Wood Johnson Foundation, Northwest Health Foundation, and Meyer Memorial Trust, are interested in funding partners to improve pedestrian and bicycle safety, non-medical transportation, and the built environment. With new funding in hand and a partnership with Dr. John Ritter from OIT's Geomatics lab, a local assessment of chronic disease clusters was completed in order to identify "hot spots" of chronic disease. After consultation with experts in addressing chronic disease prevention through changes to the built environment, it was decided that a protected bike lane would be an ideal project to explore. Once a thorough public vetting process was completed on the proposed protected bicycle lane treatment, construction funding was needed since the traditional sources from the city and state were limited.

Cascade Health Alliance decided to fund the construction after a grant was made available to the project. Cascade Health Alliance is a Coordinated Care Organization, or CCO, which is a community-based health network of providers that serve people who receive care through the Oregon Health Plan, or Medicaid. These organizations are unique to Oregon and are working to improve health and reduce costs of medical care. CCOs have flexibility in their budgets to cover non-medical services that improve health for an individual or across the community, which is how Cascade Health Alliance was able to fund the construction of this project. An innovative strategy that CCOs are beginning to employ seeks

to mitigate health problems before they become chronic and harder to treat by looking upstream to impact areas where people live, work, learn and play. Examples include providing individuals with transit passes or taxi fares in order to get to a medical appointment, giving out bicycles or bicycle helmets, supporting Safe Routes to School programs, and neighborhood investments like improved path lighting or a new park in an area of high need. The use of these funds toward the construction of the Oregon Avenue Protected Bicycle Lane represents continued innovation of the use of these funds.

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# A Road Map

The case study above documents the collaborative work done by public health, health care and transportation partners to achieve the installation of a world class bicycle facility in Klamath Falls, Oregon with the aim of reducing chronic disease and revitalizing the economy of the community. Though no community in Oregon is identical, the challenges the project champions faced are common to many communities, and the strategies they employed to address these challenges would likely succeed in other communities as well.

If organizations have staff with some flexibility to work outside their immediate field and reach across silos, either from the

transportation sector to the health sector, or vice-a-versa, and start a conversation about goals and needs, a seed can be planted that can grow to more substantial outcomes. Achieving healthier populations is a goal most people will rally behind and doing or bringing in existing community assessments of health and highlighting the role transportation plays can be a coalition building tool. Funding is always a challenge for active transportation projects but the health sector is starting to be asked to evaluate the impact that health-related funding may have on upstream health impacts. This new reality may be an opportunity for communities to utilize new funding opportunities.





# The Evidence

An exhaustive review of research related to health, the economy, and bicycle activity is not a part of this case study but the following section reviews a select number of studies and meta-analyses that document the evidence relating physical activity to positive health benefits and can serve as a helpful primer for practitioners looking for information on these related topics.

## Health Impacts and Physical Activity

In 1996 the US Surgeon General's report, *Physical Activity and Health* summarized evidence from a variety of studies to conclude that many chronic diseases and related health problems are associated with a lack of physical activity (CDC 1996). Since then, a significant amount of research has been done documenting the

role physical activity can play in reducing the risk of developing, breast cancer (Monninkhof et al. 2007), colon cancer (Wolin et al. 2009), neurodegenerative disease (Hamer and Chida 2009), depression (Paffenbarger et al. 1994), as well as cardiovascular (Hamer and Chida 2008) and heart disease (Sattelmair et al. 2011). In a meta-analysis of data from seven studies, Kelly et al. (2015) found that if the recommendation of 100 minutes per week of moderate-intensity aerobic physical activity is met through bicycling, all-cause mortality is reduced by 10 percent.

## Health and Active Travel

A number of studies have looked at the role of active commuting on health. In Mueller et al. (2015) 30 studies looking at the health impact of shifting driving trips to walking and bicycle trips finding that in 27 of those studies the benefits of increased physical



activity outweighed the increased risks of traffic safety and air pollution exposure. In a recent study of over 250,000 people in the United Kingdom, researchers followed participants for up to 5 years and found that people who bicycled or bicycled and walked to work had lower risks of cardiovascular disease and cancer (Celis-Morales et al. 2017). In another study researchers looked at the relationship between the percentage of workers that walk and bike to work and the percentage of adults that are obese or have diabetes. Findings from the study showed that for cities and states with higher proportion of active commuters also exhibited lower instances of obesity and diabetes.

## Bicycle Infrastructure and Bicycle Activity

There is now considerable evidence supporting the relationship between the provision of bicycle infrastructure and the use of bicycle facilities at both the aggregate and disaggregate level, culminating in an apparent ‘if you build it,


they will come’ principle. Multiple studies have demonstrated that countries and cities with high levels of observed bicycle activity also have larger networks of separated bicycle facilities with accompanying low-stress streets that are more comfortable for people to ride a bicycle (Fraser and Lock 2011; Furth 2012; Pucher et al. 2010; Pucher et al. 1999). Several other studies determined a positive association between bicycling levels and the overall supply of bicycle network (Includes both on and off-street facility types) (Buehler 2012; Bueler and Pucher 2012; Dill and Car 2003; Nelson and Allen 1997). One study showed that for each additional mile of bike lanes per square mile saw an increase in the percentage of people that bike to work by 1 percent. Research looking at the bicycle ridership changes of specific protected bicycle lanes has shown an increase in usage following construction (Goodno et al. 2013; Monsere et al 2014; Snizek et al 2013). An extensive synthesis of the research can be found in Buehler and Dill (2016) where the authors summarize findings from 67 research articles and reports that evaluate the impact of infrastructure on bicycle activity.



## Economic Impacts of Bicycling Activity

The economic benefits derived from the provision of infrastructure for people to walk and bicycle can be categorized as direct and indirect and have been quantified by a number of academic research articles, government reports, and consultant and not-for profit documents. Direct economic impacts of infrastructure investments include measures like property values, consumer spending, sales tax revenue and job growth while indirect impacts are benefits that accrue to society at large and include items like health care cost savings (from improved health through more physical activity), reduced congestion from mode shift and travel time savings, and environmental benefits. Research to date has found that properties in walkable areas (Bliesner 2010; Cortright 2009; Leinberger 2013; Leinberger and Alfonzo 2012; Pivo and Fisher 2011; Sohn et al. 2012) and properties closer in proximity to active transportation infrastructure (Karadeniz 2008; Poindexter et al. 2007; Racca and Dhanju 2006) have higher values. Research looking at consumer spending has found that after reallocating street space for bicycle parking and dedicated bicycle lanes and pedestrian infrastructure business revenues were not negatively impacted. (Lee and March 2010; McCann et al. 2012; Rowe 2013). In a study of customers in Portland, Clifton et al. (2013) found that people arriving by bike outspent those arriving by car at restaurants and drinking establishments. Studies that examined the impact on tax revenue found a positive association with bicycle and pedestrian infrastructure investments with one study in Los Angeles measuring a 26% increase in sales tax revenue following the implementation of a complete streets redesign (Kornas et al. 2017). Other studies examined job creation finding state-level employment increases associated with active transportation investments. One study compared road,

pedestrian and trail investments and found that bicycle infrastructure generated the most jobs per million dollars invested (McCann et al. 2012). Though many gaps persist in the literature evaluating the economic impact of active transportation investments, indicative evidence exists showing potential returns in both the short term and long term.



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The evidence reviewed above highlights a pathway for populations to get healthier through invests in active transportation infrastructure. The established knowledge evaluating the role physical activity plays in people's health is provided, followed by a summary of what is known regarding the role active transportation interventions can achieve in reducing chronic disease. Finally a review of research showing how the provision of bicycle infrastructure can induce bicycle activity is arranged to connect the potential these investments can play in people's health outcomes. The last element of research literature review focuses on the important economic impacts that bicycle activity can have on communities. Taken together these research findings substantiate the work that's being done in Klamath Falls to improve transportation options with the construction of the Oregon Avenue protected bicycle lane.



# References

- Akar, G., & Clifton, K. J. (2009). Influence of individual perceptions and bicycle infrastructure on decision to bike. *Transportation Research Record: Journal of the Transportation Research Board*, 2140, 165–172. doi:10.3141/2140-18
- Aultman-Hall, L., Hall, F. L., & Baetz, B. (1998). Analysis of bicycle commuter routes using geographic information systems: Implications for bicycle planning. *Transportation Research Record: Journal of the Transportation Research Board*, 1578, 102–110. doi:10.3141/1578-13
- Bliesner, J., Bouton, S., & Schultz, B. Walkable neighborhoods: An economic development strategy. San Diego, CA: JB&F Consulting. 2010.
- Buehler, R. and Dill, J. (2016). Bikeway Networks: A Review of Effects on Cycling. *Transport Reviews*, 2016. 34(1), pp 9-27.
- Buehler, R. (2012). Determinants of bicycle commuting in the Washington, DC region: The role of bicycle parking, cyclist showers, and free car parking at work. *Transportation Research Part D: Transport and Environment*, 2012, 17(7), 525–531. doi:10.1016/j.trd.2012.06.003
- Buehler, R., & Pucher, J. Cycling to work in 90 large American cities: New evidence on the role of bike paths and lanes. *Transportation*, 2012, 39(2), 409–432. doi:10.1007/s11116-011-9355-8
- Centers for Disease Control and Prevention. Physical activity and health: the benefits of physical activity. Atlanta (GA): CDC.gov. Available from URL: <https://www.cdc.gov/physicalactivity/basics/pa-health/index.htm>
- Celis-Morales, C.A., D.M. Lyall., P. Welsh, J. Anderson, L. Steell, Y. Guo, R. Maldonado, D.F. Mackay, J.P. Pell, N. Sattar, J.M.R. Gill. Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *BMJ*. 2017. <https://www.bmj.com/content/357/bmj.j1456>
- Clifton, K., Muhs, C., Morrissey, S., Morrissey, T., Currans, K., & Ritter, C. Examining consumer behavior and travel choices (OTREC-RR-12-15). Portland, Oregon: *Transportation Research & Education Consortium*. 2013.
- Cortright, J. Walking the walk: How walkability raises home values in U.S. cities. 2009.
- Dill, J., & Carr, T. (2003). Bicycle commuting and facilities in major U.S. cities: If you build them, commuters will use them. *Transportation Research Record: Journal of the Transportation Research Board*, 2003, 1828,116–123.
- Fraser, S. D. S., & Lock, K. (2011). Cycling for transport and public health: A systematic review of the effect of the environment on cycling. *The European Journal of Public Health*, 2011. 21(6), 738–743. doi:10.1093/eurpub/ckq145
- Furth, P. (2012). Bicycling infrastructure for mass cycling. In J. Pucher & R. Buehler (Eds.), *City cycling* (pp. 105–140). Cambridge, MA: MIT Press.
- Goodno, M., McNeil, N., Parks, J., & Dock, S. (2013). Evaluation of innovative bicycle facilities in Washington, DC Pennsylvania avenue median lanes and 15th street cycle track. *Transportation Research Record: Journal of the Transportation Research Board*, 2387, 139–148. doi:10.3141/2387-16

- Hamer M, Chida Y (2008) Walking and primary prevention: a meta-analysis of prospective cohort studies. *Br J Sports Med* 42: 238–243.
- Hamer M, Chida Y (2008) Active commuting and cardiovascular risk: A metaanalytic review. *Preventive Medicine* 46: 9–13.
- Hamer M, Chida Y (2009) Physical activity and risk of neurodegenerative disease: a systematic review of prospective evidence. *Psychol Med* 39: 3–11.
- Jeon CY, Lokken RP, Hu FB, van Dam RM (2007) Physical activity of moderate intensity and risk of type 2 diabetes: a systematic review. *Diabetes Care* 30: 744–752.
- Karadeniz, D. (2008). The impact of the little Miami scenic trail on single family residential property values. Cincinnati, OH: Izmir Institute of Technology.
- Kelly, P., S. Kahlmeier, T. Gotschi, N. Orsini, J. Richards, N. Roberts, P. Scarborough, and C. Foster. Systemic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship. 2014. *International Journal of Behavioral Nutrition and Physical Activity* 11:132.
- Kornas, K., C. Bornbaum, C. Bushey, and L. Rosella. Exploring active transportation investments and associated benefits for municipal budgets: a scoping review. *Transport Reviews*. 2017. Vol. 37. No. 4 pp 465-487.
- Lee, A., & March, A. (2010). Recognising the economic role of bikes: Sharing parking in Lygon Street, Carlton. *Australian Planner*, 47(2), 85–93.
- Leinberger, C. (2013). The walkup wake-up call: Atlanta. Atlanta, GA: Center for Real Estate and Urban Analysis, The George Washington University.
- Leinberger, C., & Alfonzo, M. (2012). Walk this way: The economic promise of walkable places in metropolitan Washington, DC. Washington, DC: The Brookings Institution.
- McCann, B., Meyer, A., Woods, J., & Morfas, C. (2012). It's a safe decision: Complete streets in California. CA Washington, DC: National Complete Streets Coalition.
- Monninkhof EM, Elias SG, Vlems FA, van der Tweel I, Schuit AJ, et al. (2007) Physical activity and breast cancer: a systematic review. *Epidemiology* 18: 137–157.
- Monsere, C., Dill, J., McNeil, N., Clifton, K., Foster, N., Goddard, T., Parks, J. (2014). Lessons from the green lanes: Evaluating protected bike lanes in the U.S. Retrieved from [https://trec.pdx.edu/research/project/583/Lessons\\_from\\_the\\_Green\\_Lanes:\\_Evaluating\\_Protected\\_Bike\\_Lanes\\_in\\_the\\_U.S.](https://trec.pdx.edu/research/project/583/Lessons_from_the_Green_Lanes:_Evaluating_Protected_Bike_Lanes_in_the_U.S.)
- Nelson, A., & Allen, D. (1997). If you build them, commuters will use them: Association between bicycle facilities and bicycle commuting. *Transportation Research Record*, 1578, 79–83. doi:10.3141/1578-10
- Paffenbarger RS, Jr., Lee IM, Leung R (1994) Physical activity and personal characteristics associated with depression and suicide in American college men. *Acta Psychiatr Scand Suppl* 377: 16–22.
- Pivo, G., & Fisher, J. (2011). The walkability premium in commercial real estate investments. *Real Estate Economics*, 39(2), 185–219.

- Poindexter, G., Krizek, K., Barnes, G., & Thompson, K. (2007). Guidelines for benefit-cost analysis of bicycle facilities: Refining methods for estimating the effect of bicycle infrastructure on use and property values (MRUTC 06-07). Madison, WI: Midwest Regional University Transportation Center, Department of Civil and Environmental Engineering, University of Wisconsin.
- Pucher, J., Dill, J., & Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: An international review. *Preventive Medicine*, 50(Suppl. 1), S106–125. doi:S0091-7435(09)00434-4 [pii] 10.1016/j.ypmed.2009.07.028
- Pucher, J., Komanoff, C., & Schimek, P. (1999). Bicycling renaissance in North America? Recent trends and alternative policies to promote bicycling. *Transportation Research Part A: Policy and Practice*, 33(7–8), 625–654. doi:10.1016/S0965-8564(99)00010-5
- Rietveld, P., & Daniel, V. (2004). Determinants of bicycle
- Racca, D., & Dhanju, A. (2006). Property value/desirability effects of bike paths adjacent to residential areas. Newark, DE: Center for Applied Demography & Survey Research, University of Delaware.
- Rowe, K. (2013). *Bikenomics: Measuring the economic impact of bicycle facilities on neighbourhood business districts*. College of Built Environments, Seattle: University of Washington.
- Sattelmair J, Pertman J, Ding EL, Kohl HW, Haskell W, et al. (2011) Dose Response Between Physical Activity and Risk of Coronary Heart Disease/Clinical Perspective. *Circulation* 124: 789–795.
- Snizek, B., Nielsen, T. A. S., & Skov-Petersen, H. (2013). Mapping bicyclists' experiences in Copenhagen. *Journal of Transport Geography*, 30, 227–233. doi:10.1016/j.jtrangeo.2013.02.001
- Sohn, D., Moudon, A., & Lee, J. (2012). The economic value of walkable neighbourhoods. *Urban Design International*, 17(2), 115–128.
- US Burden of Disease Collaborators, "The state of US health, 1990–2010: burden of diseases, injuries, and risk factors," *Journal of the American Medical Association*, vol. 310, no. 6, pp. 591–606, 2013.
- Wolin KY, Yan Y, Colditz GA, Lee IM (2009) Physical activity and colon cancer prevention: a meta-analysis. *Br J Cancer* 100: 611–616.
- Woodcock J, Franco OH, Orsini N, Roberts I (2010) Non-vigorous physical activity and all-cause mortality: systematic review and meta-analysis of cohort studies. *Int J Epidemiol* doi: 10.1093/ije/dyq104.



# Acknowledgments

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Kristen Konkel, *Bike/Ped traffic data, Oregon Institute of Technology*  
John Ritter, *OIT Professor in Geomatics, Oregon Institute of Technology*  
Nick Foster, *Outreach, Engineering and Design, Kittelson and Associates*  
Drew Honzel, *Board Secretary, Klamath Trails Alliance*  
Jessica Deboss, *Blue Zones Staff, Blue Zones*  
Courtney Vanbragt, *Public Health Director, Klamath County Public Health*

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