

2014

# Pioneer Square Health Impact Assessment



Editors (in alphabetical order):

Grant Gibson

Sam Hatzenbeler

Wren McNally

Ryan Miller

Christie Santos-Livengood

University of Washington

16 June 2014

## Acknowledgements

---

### **The University of Washington Health Impact Assessment authors:**

Joey Daifuku, Mateo Espinosa, Grant Gibson, Gabrielle Glass, Jenn Hagedorn, Sam Hatzenbeler, Kali Hollenhorst, Alyssa Iwamoto, Meenakshi Kushwaha, Ichiko Lisbin Wren McNally, Ryan Miller, Kelsey Pullar, Christie Santos-Livengood, Hee Yon Sohng, Sophia Trinh, Julia Walker

**We would also like to thank the following people and organizations for their encouragement, advice, leadership, and generosity over the past ten weeks:**

#### **Andrew L. Dannenberg, MD, MPH**

*Affiliate Professor, Dept. of Environmental and Occupational Health Sciences, School of Public Health, and Dept. of Urban Design and Planning, College of the Built Environments, University of Washington*

*Former Team Lead, Healthy Community Design Initiative, National Center for Environmental Health, Centers for Disease Control and Prevention*

#### **Fritz Wagner, PhD**

*Dean Emeritus, University of New Orleans College of Urban and Public Affairs Research*

*Professor, Dept. of Urban Design and Planning, UW College of the Built Environments*

*Managing Director, Northwest Center for Livable Communities*

#### **Edmund Seto, PhD, MS**

*Associate Professor, Dept. of Environmental and Occupational Health Sciences, UW School of Public Health*

#### **Leslie Smith**

*Executive Director, Alliance for Pioneer Square*

#### **David Yeaworth**

*Deputy Director, Alliance for Pioneer Square*

This paper is a student product generated from a 10-week Health Impact Assessment (HIA) graduate class at the University of Washington School of Public Health and College of Built Environments during Spring Quarter 2014. It uses readily available existing information, incorporates minimal community engagement, and is subject to a number of study limitations.

## Table of Contents

---

EXECUTIVE SUMMARY.....	4
CHAPTER 1: INTRODUCTION.....	8
CHAPTER 2: ACCESS TO SOCIAL & COMMUNITY SERVICES .....	12
ACCESS TO HEALTH CARE .....	12
ACCESS TO FOOD .....	16
ACCESS TO PUBLIC RESTROOMS .....	17
CHAPTER 3: SOCIAL AND ECONOMIC ISSUES .....	19
ECONOMIC REVITALIZATION.....	19
CRIME AND SAFETY .....	22
HOUSING .....	27
SOCIAL COHESION .....	30
CHAPTER 4: MOBILITY .....	32
TRAFFIC-RELATED INJURIES.....	32
WALKABILITY AND BIKEABILITY.....	34
MASS TRANSPORTATION .....	38
ALASKAN WAY REPLACEMENT .....	40
CHAPTER 5: ENVIRONMENTAL HEALTH .....	45
AIR AND WATER POLLUTION .....	45
COMMUNITY NOISE .....	49
OUTDOOR LIGHTING .....	51
EXISTING AND FUTURE BUILDING DEVELOPMENT .....	54
PUBLIC SPACE AND GREENSPACE.....	56
OVERALL RECOMMENDATIONS .....	60
CONCLUSION .....	62
REFERENCES .....	64

## List of Figures

---

Figure 1: HIA Steps. Image Source: Health Impact Project .....	4
Figure 2: Pioneer Square Neighborhood Boundary. ....	9
Figure 3: Map of total major reported crimes in the Seattle Area. ....	22
Figure 4: Diagram depicting “collective efficacy” (the ability of a neighborhood to work together to meet common goals) in relationship to neighborhood violence and how it affects the mental health of the community. ....	23
Figure 5: Diagram depicting how mental health is potentially impacted by the proposed amendment to the Vacant Buildings Ordinance. ....	24
Figure 6: Flow diagram of market rate housing’s effects on health .....	28
Figure 7: Impacts of physical and mental barriers in the built environment. Adapted from Melnick et al, 2010. ....	35
Figure 8: Alaskan Way Viaduct and surrounding areas .....	41
Figure 9: Flex Lanes Section at Main Street. Source: Alaskan Way and Elliot Way Design .....	42
Figure 10: Section at Columbia Street. Source: Alaskan Way and Elliot Way Design.....	42
Figure 11: Sources of air pollution in Puget Sound. Source: Puget Sound Clean Air Agency (2014).....	46
Figure 12: Approximate maximum sound levels from transportation sources. Source: Miller, N. (2005) .....	50
Figure 13: Occidental Park .....	52
Figure 14: Occidental Avenue .....	53
Figure 15: How Outdoor Lighting Translates into Light Pollution. Source: Chepesuik R. Environmental Health Perspectives (2009) .....	53
Figure 16: Percentage of Rent Paid in Pioneer Square by Amount .....	55



# EXECUTIVE SUMMARY

## Introduction

The design of the built environment has a substantial influence on individual and community health. Collaboration between urban planners and public health professionals has helped foster healthy living conditions. The Health Impact Assessment (HIA) has emerged as a useful tool to assess the potential health impacts of plans, policies, and projects and provide decision makers with actionable recommendations. This HIA has been developed by a University of Washington graduate course on the Health Impact Assessment tool. This HIA assesses the health implication of the existing *Pioneer Square 2015, A Strategy for Seattle's First Neighborhood* plan developed in 2010. The HIA seeks to provide the Alliance for Pioneer Square with recommendations that may be included into the next version of the neighborhood's plan, which is expected to be developed in the coming year.

## About Pioneer Square

Pioneer Square is a historic district in Seattle. Currently located just south of Downtown Seattle, Pioneer Square was established in 1852 as the City's original downtown. The neighborhood is designated as both a National historic district and a local preservation district. City ordinances and design guidelines seek to protect the district's unique architectural and historic character, encourage residential development for all income levels, and support an economically vibrant community. The Alliance for Pioneer Square developed the *Pioneer Square 2015, A Strategy for Seattle's First Neighborhood* plan in 2010 in collaboration with the City to simultaneously protect the historic role of the district within Seattle and foster robust economic development in the neighborhood.

## HIA Steps

The HIA process involves a series of six steps. Figure 1 at right has been developed from the Health Impact Project.

1. Screening: During this stage, researchers evaluate potential projects and select an appropriate project.



Figure 1: HIA Steps. Image Source: Health Impact Project

2. **Scoping:** At this stage of the process, the HIA plan is developed, including methods and areas of health to assess.
3. **Assessment:** This stage includes the bulk of the research including baseline data and assessments of potential health outcomes from the proposed plan.
4. **Recommendations:** Based on the assessments, researchers develop recommendations for mitigating potential negative impacts and enhancing potential positive impacts into the proposal.
5. **Reporting:** This stage involves presenting findings to communities and decision makers.
6. **Monitoring and Evaluation:** During this final stage, health outcomes of the proposal and implemented recommendations are monitored and the process of the HIA as a whole is evaluated

### *Screening*

The screening process utilized a local professional network to identify possible projects. The Pioneer Square neighborhood emerged as the best match. In collaboration with the Alliance for Pioneer Square, the project was defined by several criteria: the project decision-maker and/or stakeholder group is willing and able to interact with the students to provide key information and review the final product; the project is outside of the health sector but has potential health impacts; a local site enables student visits; the HIA, exclusive of monitoring and evaluation, can be completed during the academic quarter; the project will provide timely recommendations that may be beneficial to the decision-making process.

### *Scoping*

The scoping process identified four key issue areas: access to social and community services; social and economic issues; mobility; and environmental health. Each issue area is analyzed in detail in subsequent chapters. The *Access to Social & Community Services* chapter assesses the vulnerable populations in the district and their access to social services. The *Social and Economic Issues* chapter focuses economic revitalization, crime and safety, housing, and social cohesion. The *Mobility* chapter addresses traffic-related injury, walkability and bike-ability, mass transit, and the Alaskan Way replacement within and immediately adjacent to Pioneer Square in four areas. The *Environmental Health* chapter assesses the potential health impacts from air and water quality, noise and lighting, affordable housing and day lighting, and green and public spaces.

### **Key Findings**

A large percentage of the City's vulnerable populations reside and use public spaces in the Pioneer Square neighborhood. Vulnerable populations in Pioneer Square include individuals who are mentally ill, homeless, and disabled. Pioneer Square's homeless population is especially at risk for chronic illness, communicable diseases, substance abuse, and psychiatric or physical disability. While the causes of homelessness are complex, homelessness is directly linked to poor health outcomes. In the section of the Strategy for Seattle's First Neighborhood called "Ensure an Environment of Public Safety and Civility," the Alliance for Pioneer Square discusses a goal for the city to establish and uphold a moratorium on funding or expanding human services. This

moratorium could have an adverse impact on vulnerable populations' level of access to social services. Efforts to increase access to care and address barriers to care can improve health outcomes among vulnerable populations.

Physical and social structures that encourage healthy behaviors can support social cohesion among Pioneer Square's residents. Research assessing the connections between vacant buildings and mental health has found city ordinances that address unused and dilapidated buildings can benefit mental health and support perceptions of safety. A neighborhood's perception of crime and safety can also be improved by using vacant lands to build community gardens, which increase community inclusion and the sense of community engagement. Crime Prevention Through Environmental Design (CPTED) considers security and crime prevention during the preliminary stages of design thus saving money, time, and effort by avoiding ongoing security measures. CPTED can reduce fear and stress about potential issues such as theft, fraud, vandalism, work place violence, and assault.

The health benefits of a highly walkable and bike friendly neighborhood range from individual to social and environmental. Creating an environment more suitable for walking and biking in a neighborhood revitalization plan can play a determinant role for constructing and strengthening social capital. The potential positive health outcomes resulting from strengthened community cohesion in Pioneer Square may not be distributed equally and may even further increase the health disparities among residents. The plan identifies several approaches to enhance the quality of the pedestrian environment through design improvements.

The current and anticipated construction activities in the neighborhood may increase air and water pollution and threaten health in the short-term. The concentration of major arterials and thoroughfares, transit stations, and construction activities likely contribute to noise pollution in the neighborhood. Residential development may adversely affect socio-economic residential diversity by reducing the supply of housing for low and median income residents. Building renovations can support healthy indoor environments by using low toxic building materials and increasing access to natural light. The quality green and public spaces have demonstrated positive influences on mental, physical, and social health. The Alliance's existing efforts to improve the quality of public spaces through maintenance, renovation, and public events can create an activated and vibrant public environment. Initiatives to expand the amount of green space in the neighborhood, while underrepresented, can occur in tandem with public space activation efforts and may provide additional health benefits.

### **Key Recommendations**

The Alliance *should consider* the following recommendations, outlined below by issue area:

#### **Access to Social and Community Services**

1. Working with their stakeholders, King County Public Health and Harborview Medical Center to review the needs of healthcare access for homeless populations

in Pioneer Square and establish primary prevention to protect homeless people and residents of Pioneer Square.

2. Recruiting an appropriate grocery store using the Nutrition Environment Measures Survey in Stores tool (NEMS-S).
3. Working with stakeholders to provide a public toilet in the heart of Pioneer Square.

### **Social and Economic Issues**

1. Proactively supporting the implementation and further development of living-wage policies and legislation.
2. Advocating for the use of Crime Prevention Through Environmental Design (CPTED) in the construction of new and existing buildings and alleys in Pioneer Square.<sup>1</sup>
3. Encouraging developers to include affordable housing units in all new developments in the neighborhood.

### **Mobility**

1. Working with the City and DOT to make crosswalk lights longer and install more pedestrian crossing lights.
2. Continue the expansion of bike lanes and pedestrian sidewalks in coordination with SDOT *Way to Go* programs.
3. Working with the City of Seattle, SDOT, and King County Metro to install various signs as way finding tools for current and potential transit users.

### **Environmental Health**

1. Incorporating green infrastructure or landscaping designs into the proposed plan that maximize the use of trees, shrubs, grass, and hanging plants in outdoor spaces to detoxify and sequester pollutants in air and water.
2. Encouraging developers to incorporate noise-dampening features such as noise-insulating windows, exterior doors and walls and to design housing units with interior courtyards and patios that open to acoustically protected and shielded areas.
3. Work with developers to advocate for the use of healthy building materials.



# CHAPTER 1: INTRODUCTION

---

## Introduction

This Health Impact Assessment (HIA) was conducted as the Alliance for Pioneer Square prepares to update Pioneer Square 2015: A Strategy for Seattle’s First Neighborhood developed in 2010. HIA, defined by the National Research Council is, “A combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, or project on the health of a population and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects.”<sup>2</sup> This voluntary HIA was conducted by the University of Washington (UW) whose invitation to collaborate on the HIA was accepted by the Alliance for Pioneer Square, Pioneer Square’s functioning Chamber of Commerce. This report explores the ways in which health would be impacted by the implementation of the 2015 plan for Pioneer Square, and offers recommendations for updating that plan to encourage the Alliance to implement health-promoting goals and strategies and ways to mitigate goals and strategies that may have adverse health effects on the Pioneer Square community. This report offers measurable, concrete recommendations to elicit action on each item and support health in Pioneer Square. This HIA was completed by the UW HIA Graduate class, which is composed of 17 students of various disciplines and backgrounds, contributing to the robustness and rigor of the document.

## Characteristics

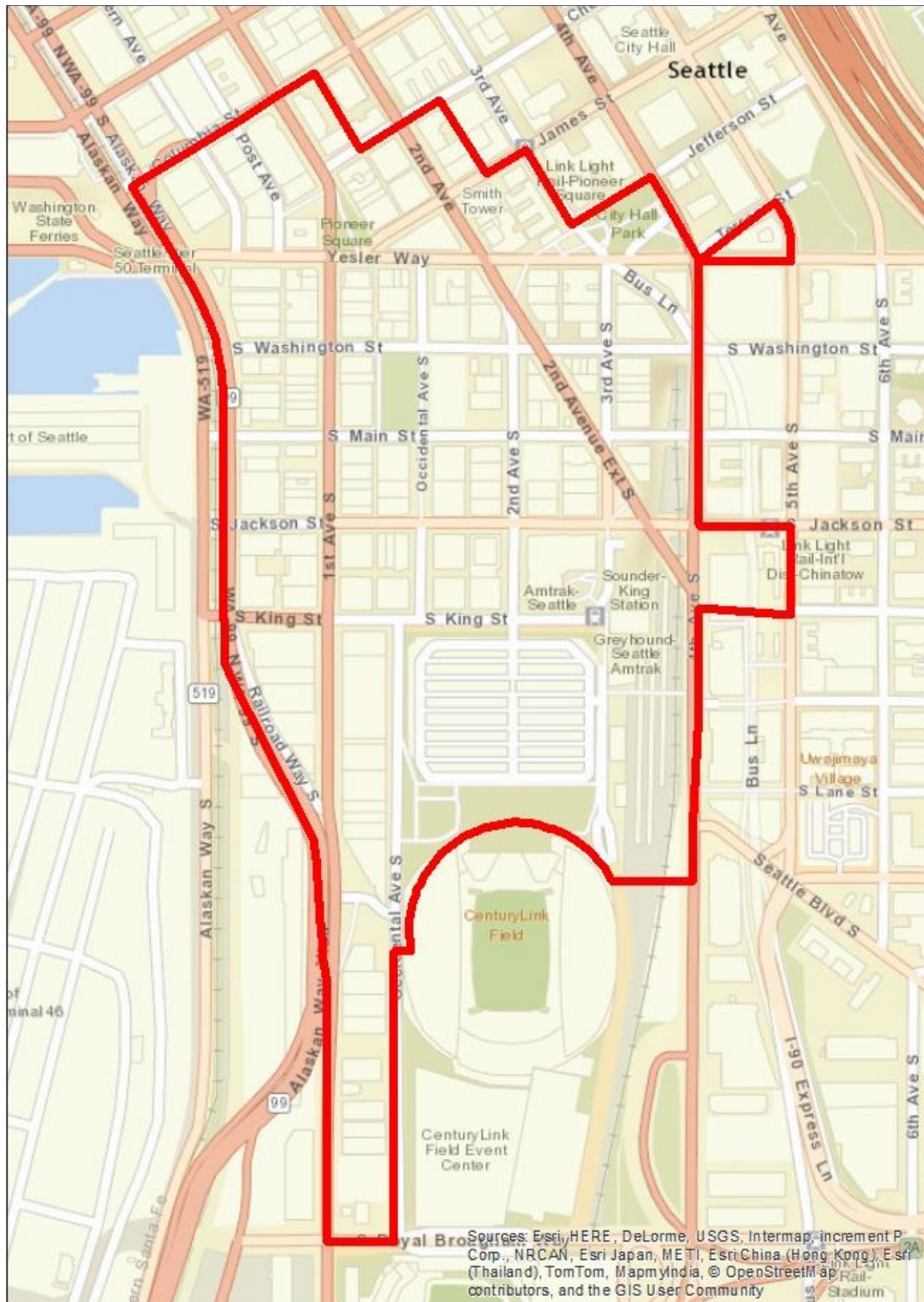
Pioneer Square is the location of Seattle’s first downtown and was founded in 1852. The landmark is defined by its rich history—the “architecturally significant”<sup>3</sup> cultural treasure became a national historic place in 1970<sup>4</sup>—and cultural significance, both nationally and locally. It is located just south of downtown. See figure \_ for a more detailed map showing the neighborhood boundaries as defined by the City of Seattle.

According to the 2005-2009 American Community Survey, Pioneer Square had a median area income of \$20,927, which is one of the lowest of all Seattle neighborhoods.<sup>5</sup> The majority of the residents of Pioneer Square identify as White (69.5%), followed by those who identify as Black (7.9%), Asian or Pacific Islander (14.2%), Hispanic (6.6%) and American Indian (0.8%). Most residents are adults (84.6%) and 10.8% of those adults are over 65 years of age.<sup>6</sup> It is important to identify that Pioneer Square is composed of largely renters, which is indicative that the residents of Pioneer Square are low-income, thus designating it as a neighborhood of vulnerable populations, sensitive to adverse health outcomes. The future of the neighborhood and the direction in where it is going may be impacted greatly by the Plan for Pioneer Square. Thus it is important to consider all health outcomes and the Alliance for Pioneer Square should be applauded for their interest in the health of Pioneer Square’s rich and diverse community.

## Methods

The HIA authors used a variety of methods to complete this report including existing quantitative data, qualitative interviews, email conversations, consultations with the Alliance for Pioneer Square and a visit to Pioneer Square. Peer reviewed literature was extensively referenced and all data used is from rigorous sources.

Figure 2: Pioneer Square Neighborhood Boundary.



**Legend**

 Pioneer Square Neighborhood Boundary

0 375 750 1,500 Feet



As in most HIAs, the class followed the steps<sup>7</sup> to complete this HIA:

1. *Screening—Identifying the need and value of the HIA.* Because of time constraints, Dr. Andrew Dannenberg completed the scoping piece of our project. Several projects were identified and evaluated with the Pioneer Square neighborhood emerging as the best match. In collaboration with the Alliance for Pioneer Square, the project was defined by several criteria: the project decision-maker and/or stakeholder group is willing and able to interact with the students to provide key information and review the final product; the project is outside of the health sector but has potential health impacts; a local site enables student visits; the HIA, exclusive of monitoring and evaluation, can be completed during the academic quarter; the project will provide timely recommendations that may be beneficial to the decision-making process.
2. *Scoping—Identifying the topics to explore, methods, and designing a work plan.* On the second week of the project, we began the scoping piece of our project. With the support from the Alliance for Pioneer Square and Professors Dannenberg, Seto, and Wagner, our group engaged in a lively discussion exploring potential health issues of any project, and then focused specifically on potential issues of the Plan for Pioneer Square. The scoping process identified four key issue areas: access to social and community services; social and economic issues; mobility; and environmental health. The class was divided into small groups based on interest in each issue of concern.

Based on these issue areas, the authors made the decision to use existing quantitative data and qualitative interviews with key stakeholders to explore baseline data (existing information about each key issue in Pioneer Square); potential health outcomes of each issue; assessment of each issue as it related to the plan; and generate recommendations for health-promoting strategies and mitigation of potentially health damaging decisions.

3. *Assessment—Executing research on current conditions and exploring effects of the implementation of the Plan for Pioneer Square.* Quantitative data was sourced from public health and urban planning databases; “gray literature” sources such as the Centers for Disease Control and Prevention; and United States Census tracts. Qualitative data was sourced from interviews and email conversations with key stakeholders in Pioneer Square. In addition, the HIA group toured Pioneer Square with David Yeaworth, of the Alliance for Pioneer Square. We noted key features of Pioneer Square and documented sights and sounds of Pioneer Square with notes and photographs. Photographs from this visit are featured in this report.
4. *Recommendations—Tangible, measurable recommendations to address health-promoting and adverse health effects of the Plan.* After the assessment process was complete, we convened to develop recommendations. It was essential to take develop and strengthen each recommendation to ensure it is tangible, measurable and realistic in nature. Recommendations were explicitly tied to results of the Assessment step.
5. *Reporting—Compiling a report based on the above listed steps.* The report was compiled in 10 weeks based on the previous 4 steps and was presented to the Alliance for Pioneer Square on June 5, 2014. The document will be publicly available on the University of Washington School of Public Health website, <http://deohs.washington.edu/built-environment-and-public-health>

6. *Monitoring—Tracking the implementation of recommendations offered by the HIA.* Due to the short timeline of our project, we are unable to complete the monitoring portion of the HIA, making it valuable for the Alliance for Pioneer Square and their partners to continue the work of seeking evaluation of their proposals as they are implemented. This HIA can help offer guidance to the Alliance for Pioneer Square as it moves forward in updating their “Strategy for Seattle’s First Neighborhood” and as they make changes for the betterment of the conditions in Pioneer Square.

## CHAPTER 2: ACCESS TO SOCIAL & COMMUNITY SERVICES

---

### **Abstract**

Pioneer Square has over time become known as a home for some of the city of Seattle's most vulnerable populations. For these vulnerable populations equal access to social services can be their one connection to healthy mental and physical outcomes. Our particular population of interest was Pioneer Square's homeless population. Due to their circumstances they are especially at risk for chronic illness, communicable diseases, substance abuse, and psychiatric or physical disability. Through our assessment process we focused on three vital categories within social services: health care, food access, and access to public restrooms. Our strongest findings have pointed towards the provision of quality designed restrooms, a full service supermarket, increased coverage of communicable disease screening, and expansion of Housing First programs.

### **ACCESS TO HEALTH CARE**

#### **Introduction**

Health care access is an important element to maintain individuals' wellbeing, both mentally and physically. The accessibility of health care involves not only travel distance and time, but also other factors. The transportation system, logistics of accessing care, the health insurance system and general health knowledge all influence individuals' abilities to obtain healthcare.<sup>8</sup>

#### **Baseline data**

Using projections from 2012 based on 2010 U.S. Census data (Esri BAO 2014), the population of the Pioneer Square neighborhood is more racially diverse than Seattle as a whole. Residents identify as 61% White, 20% African American, 7% Asian and 4% American Indian or Alaskan Native. The remaining percent identify as a member of another ethnicity, or representing two or more racial or ethnic groups. The Diversity Index, which measures the probability that two people from the same area will be from different race/ethnic groups, is 64.5 for Pioneer Square. Seattle has a Diversity Index of 56.6.

The Pioneer square neighborhood is less affluent than Seattle in its entirety. Projections for 2012 report the median household income for the neighborhood as \$29,286. By contrast, the median household income for Seattle was \$54,341 for the same period. Based on the U.S. 2010 Census and 2005-2009 American Community Survey, of the approximately 1,090 households in the Pioneer Square neighborhood, over 34 percent are classified as living below the poverty level.

Based on the U.S. 2010 census, most residents (46.9%) in the Pioneer Square neighborhood are living in non-family households (1,154). Additionally, approximately one third of residents (36.4%) live in group quarters (897), with the majority of this population being non-institutionalized. About 41% of residents have attained a high school education or less (ACS 2005-2009).



Pioneer Square residents also tend to be slightly older than those in Seattle as a whole. The vast majority of residents (more than 90 percent) are age 20 or older, with a median age for the area of 44.0 (U.S. Census Bureau 2010).

The U.S. Department of Housing and Urban Development's (HUD) estimate that in the homeless population for Seattle/King County in 2013 was 9,106. This number placed Seattle third when compared to other major U.S. cities. According to HUD, five cities account for 1 in 5 homeless people in the United States: New York City (9.0 percent), Los Angeles (6.7 percent), San Diego (1.6 percent), Seattle (1.4 percent), and Las Vegas (1.4 percent). Seattle does serve a high proportion of Washington State's homeless population. However, the same report found that when compared to the total state population, the homeless population in Washington made up a much smaller percentage. It should be noted that these estimates were based on counts performed on a single night in January 2013.

### **Health Outcomes**

Health care accessibility affects hospitalization rates. Lower rate of health care accessibility causes higher rates of hospitalization for chronic illnesses, such as diabetes and congestive heart failure.<sup>9</sup> Travel time and costs affect individuals' ability to visit physicians for follow up acute and chronic medical conditions.<sup>10</sup> Distance is also related to individuals' clinic visits. Those who live far from clinics tend to obtain less health care than those individuals who live closer.<sup>11</sup> The type of transportation that an individual uses, such as a private vehicle or public transportation, also affects the ability for individuals to access care.<sup>12</sup>

For vulnerable populations, accessing primary care can be difficult due to competing needs and priorities, socioeconomics, and other circumstances.<sup>13</sup> This may lead to lack of treatment, thus, making already vulnerable patient populations susceptible to poor health outcomes and an over-reliance on emergency department-based care. Many individuals in the homeless population are additionally burdened with mental illness, disabilities, or chemical dependence. Chronic illness is common and many homeless people have hypertension, diabetes, peripheral vascular disease, respiratory problems, liver disease, renal disease and skin diseases. Other concerning health issues include lice infestations, tuberculosis, HIV/AIDS, poor nutrition, and influenza. Additionally, and not surprisingly, the homeless population has a higher mortality rate.<sup>14</sup> Stress from being homeless, mental illness, psychological effects, and difficulty accessing health treatment and government benefits are other issues that can affect the health of the homeless population. Further, many in this population have dual diagnoses of mental illness and chemical dependence.<sup>15</sup> This makes homeless persons an especially challenging population to treat.

The homeless population in Seattle is a diverse one in terms of the variety of needs, issues, and circumstances. For example, some in the population may be chronically homeless, while others may have recently become unemployed and only need a place to stay for a short period of time.<sup>16</sup> Those individuals in the population who are able to be staying in a shelter tend to be more stable than those in the cohort who are living on the street, which is recognized to more stressful, both mentally and physically.<sup>17</sup>

## Assessment

The Pioneer Square 2015 Plan includes several items that would dramatically alter the ways in which social services, are provided within the neighborhood boundaries. These include formally establishing a moratorium on funding or expanding human services; developing standards for social service agency responsibility regarding clients outside their buildings and in the neighborhood; and convening Pioneer Square's human services to assess needs, issues, and gaps.

These inclusions are indicative that the Neighborhood is aware of the concentration of social service providers, and, thus their clients in Pioneer Square. It is also indicative that the homeless and transient populations, who are readily apparent in the district, are viewed as a significant adverse factor on both commercial activity and market rate residential development in the district.

It is undeniable that there is a concentration of social service providers in Pioneer Square. However, many of these service providers have been located in the neighborhood long before any of the existing businesses in Pioneer Square; many own their own buildings and it is not likely that they will relocate. Two other institutions are located within walking distance of Pioneer Square and are unlikely to relocate: Harborview Medical Center and King County Jail. These facilities serve the entire population of King County, and also serve as a 'source' of new people coming into the neighborhood, although the exact numbers are unknown.

An evaluation of national and citywide trends in the homeless population, combined with demographic data from the 2010 Census clearly demonstrates that Pioneer Square has a large vulnerable population who relies heavily on the public spaces, social services, and resources located in the Pioneer Square Neighborhood.

Health care accessibility is convenient for the Pioneer Square residents; travel time and costs are minimal. There are multiple clinics around the Pioneer Square Neighborhood including the Pioneer Square Clinic, The Department of Veteran Affairs, Health Care for the Homeless Network, The Sobriety Center, Chief Seattle Club, Downtown Emergency Service Center (DESC), St. Martin's Shelter, Pike Market Clinic, International District Medical and Dental Clinic, and Seattle Indian Health Board.<sup>18</sup> DESC is the largest provider of mental health services for the homeless population in the area. Pioneer Square Clinic is located within neighborhood boundaries. In addition to the treatment of acute care and mental health, Pioneer Square provides multiple services to meet the needs of vulnerable population, such as pharmacies, access to social workers, nutrition consults, and education resources.

A host of other services exist within a two-mile radius of the neighborhood, including the Central Area Dental Clinic, Harborview Medical Center, and additional pharmacies. Additionally, some of the shelters, like the Union Gospel Mission, provide emergency and long-term medical care for individuals. There are several shelters in the Neighborhood and within a 0.5-mile radius of the neighborhood. These shelters offer

meals, a place to sleep, education programs, legal services, career development, and other services to the homeless population. According to the Union Gospel Mission's website ([www.ugm.org](http://www.ugm.org)), more than 1,500 people come to the shelter for a meal every day and 175 sleep in the emergency shelter every night.

There are many services located in Pioneer Square and the area surrounding it that both vulnerable population and community at large can access. However, the challenging demographics of the Pioneer Square Neighborhood make it likely that a large percentage of the population is being underserved. Many individuals in the large homeless population have a disproportionately high risk for chronic illnesses and communicable diseases, have chemical dependence issues, are physically or mentally disabled, or are veterans. Most homeless persons are uninsured. Our review of the literature suggests that populations that are homeless or have psychiatric disabilities may underutilize health services. In spite of the ubiquity of physicians, Pioneer Square residents may be more vulnerable to health concerns. That said, there is not a simple solution to the healthcare needs of Pioneer Square residents. Providing more services does not mean that the population that needs them will use them. Heather Barr, a King County Public Health nurse, pointed out in a personal communication on May 29, 2014, that the homeless population “is not geographically bound to one area, many are mobile, and also get care in various places around the city and county.”

Some believe that Pioneer Square has its “fair share” of social services, formally establishing a moratorium on funding or expanding human services would negatively affect the level of access that an already marginalized and at risk population has to social services. Establishing a moratorium may prevent future social services from locating in the Neighborhood, who may bring innovative solutions or perspectives to a very complicated and persistent issue.

Developing standards for social service agency responsibility regarding clients outside of their buildings and in the neighborhood may not be successful for the population or service providers. Being homeless is not a crime and the sidewalks are public.

### **Recommendations**

1. The Alliance should consider engaging neighborhood stakeholders with a series of focus groups aimed at determining strengths, weaknesses, opportunities and actions for the future of Pioneer Square.
2. The Alliance should consider requesting the City of Seattle to extend their Medicaid coverage enrollment to homeless populations.
3. The Alliance should consider petitioning the City of Seattle to offer affordable housing in addition to shelters.
4. The Alliance should consider working with their stakeholders, King County Public Health and Harborview Medical Center to review the needs of healthcare access for homeless populations in Pioneer Square and establish primary prevention to protect homeless people and residents of Pioneer Square.

## ACCESS TO FOOD

### Introduction

While one cannot classify Seattle's Pioneer Square neighborhood as a food desert, it is recognized as a neighborhood whose vulnerable populations are struggling with food security. Food security is defined by the World Food Summit of 1996 as "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life."<sup>19</sup> The USDA has also formally addressed the matter, stating that low food security embodies a reduction in the quality, variation, and appeal of one's diet with possible decreases in total intake. This public health problem is inherently bound to social and economic factors. Among the most at risk to qualify as food insecure are those experiencing homelessness.

### Baseline Data

As it stands, Seattle's historic Pioneer Square has no full service supermarket within its general boundaries. This can be compared to other downtown neighborhoods which have close access to Whole Foods, Uwajimaya, IGA, Pike Place Market, or even City Target to obtain fresh fruit and vegetables. There are a number of convenience stores in the area, but unfortunately this does not guarantee access to fresh fruits and vegetables. The number of food insecure individuals in Western Washington has been estimated to be about 682,710 by Feeding America.<sup>20</sup> Though numbers may be decreasing in King County, many in Pioneer Square continue to go hungry.

### Health Outcomes

A 2008 study found that when stores are located within one block of one's home an increase in consumption of vegetables occurs.<sup>21</sup> Lack of access to these foods and low consumption is also linked to chronic diseases such as cardiovascular disease, diabetes, and hypertension. A study focusing on obesity and urban food environments showed that having a grocery store decreased rates of obesity within about a 2.24 mile range.<sup>22</sup> In addition to directly affecting health it is important to mention that this would increase property values in the area.

Gardens are another pathway to providing food security and positive health outcomes. This could take form in a personal or community garden. By providing a direct food source food security is increased. Another benefit is the alleviation of stress or more serious conditions including depression and dementia.<sup>23</sup> Various studies have linked gardening as an act of therapy for mental strain.<sup>24</sup> This may be beneficial for the homeless population of Pioneer Square who is especially at risks for these conditions.

### Assessment

Food and nutrition is a vital part of maintaining all life. The Pioneer Square Neighborhood Plan does not directly address nutrition or food insecurity. This plan does however promote economic development and economic capacity of the food and beverage businesses. In order to evaluate the current situation a Nutrition Environment Measures Survey in Stores tool (NEMS-S) may be administered. The NEMS-S tool uses 11 food categories or items as measures to assess the pricing differences between and general availability of healthier and less healthy food options in stores. This survey has

been studied in central city New Orleans and was found to have one of the highest reliability rates.<sup>25</sup> These results could serve as the basis for advocating for a suitable supermarket chain and/or independent grocery businesses.

Part of the Pioneer Square Neighborhood Plan is to advocate for the activation of public spaces. Community gardens are one option to do this. Developments following this would accordingly be done in a manner mindful of Pioneer Square's building regulations and historic status. This is a potential "viable strategy to tap into [...] social processes by fostering connections among community members and, importantly, connections between people and food-producing landscapes."<sup>26</sup> Besides building strong community relations the development of homes and businesses with gardens promotes food security.<sup>27</sup> This quality that promotes food security also increases fresh fruit and vegetable consumption.<sup>28</sup> Pioneer Square recently recruited a Pike Place Express Market, a farmers market that runs from June to October. Farmers markets are essential to Seattle's history and present day image, attracting locals and tourists alike.

### **Recommendations**

1. The Alliance for Pioneer Square should consider recruiting an appropriate grocery store using the Nutrition Environment Measures Survey in Stores tool (NEMS-S).
2. The Alliance for Pioneer Square should consider working with the Washington State Farmers Market Association to ensure that vendors of the Pike Place Express Market accept WIC and SNAP.
3. The Alliance for Pioneer Square should consider promoting the existing Pike Place Express Market in Occidental Park explicitly as part of their 2015 strategy plan to increase economic development.
4. The Pioneer Square Revitalization Committee should consider encouraging neighborhood businesses and residences to create and maintain rooftop or ground level community gardens that would be conducive to creating pleasing aesthetics while promoting food security for Pioneer Square residents.

## **ACCESS TO PUBLIC RESTROOMS**

### **Introduction**

The lack of public restrooms in the Pioneer Square has been an issue for over 100 years. Concerns related to crime such as drug and alcohol involvements, prostitution, and other crimes surround the issue.<sup>29</sup> Reasons given to encourage public restrooms have included supporting local business, tourists and visitors in the area, and the homeless population. In 2004, five automated public toilets were placed in different locations.<sup>30</sup> However, within one year, three of them were closed for misuse and a homicide.<sup>31</sup> By 2008, the project, which cost an estimated 5 million dollars, ended unsuccessfully.<sup>32</sup>

### **Baseline Data**

There are not enough public bathrooms to meet the needs of the 384,000 people<sup>33</sup> who



pass through Pioneer Square every day. Additionally, there are not enough facilities to meet the needs of the homeless population. There are four facilities that provide for the needs of the homeless population, but three of them are operated only during certain hours. There is only one public access restroom in this area located in the Klondike Gold Rush Museum. Access to public restrooms is available inside the ferry terminal and on Alaskan Way.

### **Health Outcomes**

Individuals with certain medical conditions, such as irritable bowel syndrome, Crohn's disease, and those who have ileostomy and colostomy bags need to use the restroom frequently. Irritable bowel syndrome and Crohn's disease cause diarrhea and multiple bowel movements and it is necessary to empty ileostomy and Colostomy bags multiple times a day; those who are pregnant also need consistent bathroom access for frequent urination. These illustrate the necessity of bathroom access in Pioneer Square.

### **Assessment**

The State Law, Restroom Access Act, requires that stores allow customers with certain medical conditions to use their employee restrooms. Lack of knowledge of this act may influence the availability of restrooms for these populations. The current public access bathrooms located on the Westside of Pioneer Square, are not convenient for those visiting or passing through the center of this district, particularly elders, younger children and other vulnerable populations.

### **Recommendations**

1. The Alliance should consider collaborating with the Seattle Public Utility to implement portable restrooms that are open for visitors and residents of Pioneer Square.
2. The Alliance should consider working with stakeholders to provide a public toilet in the heart of Pioneer Square.

## CHAPTER 3: SOCIAL AND ECONOMIC ISSUES

---

### **Abstract**

The social and economic impacts of the Pioneer Square’s Revitalization Goals are critical to the way that these changes will be felt by the neighborhood. The key areas examined are economic revitalization, crime and safety, housing, and social cohesion. Economic revitalization has the potential to improve health outcomes through increased job opportunities and income, but this benefit can be maximized by ensuring that the jobs that are created are living wage jobs. Through advocacy for living wage policies on the city level and attracting sectors of employment that will pay living wages, this revitalization can benefit more individuals. According to 2012 crime statistic provided by the Seattle Police Department, Pioneer Square has a high crime density compared to most of Seattle. Crime and safety can be most effective by using the built environment to increase perception of safety. The focus on reducing and monitoring the prevalence of vacant lots and buildings is key to this effort. The social and economic environment is also shaped by the affordability of housing, and to ensure that this neighborhood continues to thrive, it is not only the vacant building that must be examined, but also the types of housing. Urban density can be beneficial to health, but it is critical that this development be done in a way that will not create increased rents and poorer living conditions for individuals who are already struggling financially. Finally, the social cohesion of Pioneer Square, which has a heritage to be proud of, can be supported through both physical and social structures that encourage healthy behaviors. By staying rooted in its history through Trail to Treasures, while also designing social marketing that graciously includes all Pioneer Square residents, the strength of the community can be built upon. These social and economic recommendations for health can be utilized to build on the strengths of the Alliance’s goals, and mitigate the potential harms that come from change.

## **ECONOMIC REVITALIZATION**

### **Introduction**

A major portion of plans for Pioneer Square involve the expansion of employment and economic opportunity in the neighborhood. There is a strong connection (detailed below) between income and positive health effects, so any effort to expand employment generally will likely provide some positive health outcomes. However, care must be taken to ensure these effects benefit residents of Pioneer Square.

### **Baseline Data**

According to data drawn from the Bureau of Labor Statistics, the Pioneer Square area employs over 15,500 people.<sup>34</sup> Four sectors comprise over 60% of the employment in Pioneer Square, detailed below in Table 1.

**Table 1: Major areas of employment in Pioneer Square.**

<b>Sector (by NAICS Code)</b>	<b>Number of Employees</b>	<b>Percent of Total</b>
Professional, Scientific, and Tech Services	2,666	17.1
Public Administration	3,999	25.6
Arts, Entertainment, Recreation	1,658	10.6
Accommodation and Food Services	1,347	8.6

An analysis of available data shows that employment in Pioneer Square is growing. Anecdotally, this growth is focused in two sectors, technology and food service.<sup>35</sup> According to the Bureau of Labor Statistics, average incomes for these sectors in the Seattle area are as follows:

<b>Sector</b>	<b>Mean Hourly Wage</b>	<b>Annual Earnings</b>
Technology Services	\$44.95	\$93,000
Food Preparation/Serving	\$12.47	\$25,937

While generalized employment growth helps alleviate the negative health outcomes associated with unemployment, the positive benefits of employment are tempered by the fact that a large portion of the jobs created are below a “living wage” for the City of Seattle. As defined by MIT, a living wage is the amount a person must earn (working full time) to support her/himself and a child. For Seattle, that wage is calculated as \$20.53/hour.

### **Health Outcomes**

Income is one of the strongest and most consistent predictors of health and disease in public health research literature. The strong relationship between income and health is not limited to a single illness or disease. The adoption of a living wage is associated with: a decrease in premature death from all causes for working adults; improved educational outcomes and a reduced risk of early childbirth among the children of low-wage workers;<sup>36</sup> better health, improved nutrition, and lower mortality.<sup>37</sup> Unemployment, conversely, is associated with premature mortality,<sup>38</sup> cardiovascular disease, hypertension, depression, and suicide.<sup>39</sup>

Jobs that do not include health insurance contribute to poor health outcomes. Families with at least one full-time, full-year worker are more than twice as likely to have health insurance coverage, compared to families whose wage earners work as part-time employees (less than 35 hours per week), as contingent labor (e.g., on a seasonal or temporary basis, as employees of contractors, self-employed), or in which there is no wage earner.<sup>40</sup> People without health insurance forego timely health care, suffer more severe illness, and are more likely to die a premature death than their insured counterparts.<sup>41</sup> Annually nationwide, 18,000 premature deaths are attributable to lack of health coverage.<sup>42</sup>

Although there is an individual mandate for health coverage with the passage of the Affordable Care Act, many currently uninsured individuals have not signed up for

insurance through the newly established healthcare exchanges. Additionally, the overwhelming majority of people already insured retain employer-provided health insurance.

### **Assessment**

While job and employment growth has positive health effects, careful consideration must be made with regard to potential distributional issues created by uneven economic growth. While employment in a growing technology sector will provide people with a comfortable life, with its associated positive health outcomes, these jobs are only open to a select few with the advanced training needed for them. Most programming and software development positions require a four-year degree in a relevant field, which automatically disqualifies the 75% of the population without a college degree. Given the low educational attainment of current residents, it is unlikely that tech-sector growth will provide much relief for many of the current residents of Pioneer Square. Instead, job growth in this sector is likely to provide the most benefit to surrounding areas with higher educational attainment and median incomes.

In the long term, sustained employment growth in these sectors (combined with an increase in housing supply) may incentivize residential migration to Pioneer Square, localizing these health benefits.

Growth in the food and hospitality service sectors on the other hand, provides a lower direct health benefit, but is much more accessible to the current population of Pioneer Square.

### **Recommendations**

1. The Alliance should consider proactively supporting the implementation and further development of living-wage policies and legislation.
2. The Alliance should consider encouraging the expansion of housing in Pioneer Square to entice tech workers to live where they work, localizing the health benefits of increased tech-sector employment.
3. The Alliance should consider supporting the expansion of businesses that do not require advanced degrees for employment, provided that these jobs pay a living wage.
4. The Alliance should consider advocating to stakeholders and service providers to support the expansion of worker training programs to increase access to higher paying work.
5. The Alliance should consider advocating for building construction and retrofit programs, as they increase demand for living wage jobs that do not require advanced degrees.

## CRIME AND SAFETY

### Introduction

Major crimes are considered by the Seattle Police Department (SPD) to be: homicide, rape, robbery, aggravated assault, burglary, larceny theft, and vehicle theft.<sup>43</sup> Numerous scientific studies have shown that fear of crime is associated with reduced mental health, reduced physical functioning, and lower quality of life. Moreover, fear of crime can be stressed by neighborhood violence, leading to anxiety, and depression.<sup>44</sup> Thus it is prudent to emphasize that one's perception of safety can influence one's overall well-being when addressing the crime and safety of a neighborhood.<sup>45</sup> In order to increase the perception of public safety in Pioneer Square, we recommend that the Pioneer Square Revitalization Committee continue to reduce and monitor the number of vacant buildings and follow Crime Prevention Through Environmental Design (CPTED) standards for new infrastructure and the remodeling of old buildings.

### Baseline Data

As Seattle's First Alcohol Impact Area (<http://www.seattle.gov/neighborhoods/aia/>), Pioneer Square has become a leader in reducing the negative impacts of public inebriation and in turn increasing neighborhood safety (an AIA designates a specific geographic area within a city and allows the local jurisdiction to implement actions such as restricting sales of high alcohol content, low cost products and restricting the hours during which businesses within the AIA can sell alcoholic products for consumption off-premises).<sup>46</sup> However, given the history of crime and high density of social services in Pioneer Square, which has attracted a large homeless population, Pioneer Square has created a "perception" of public unsafety. Though it is important to note that the homeless are "often not the ones committing the crimes, rather are often victims of it."<sup>47</sup> Moreover, according to 2012 crime statistics provided by the Seattle Police Department, Pioneer Square has a high crime density when compared to many other areas in Seattle (See Figure 3).<sup>48</sup>

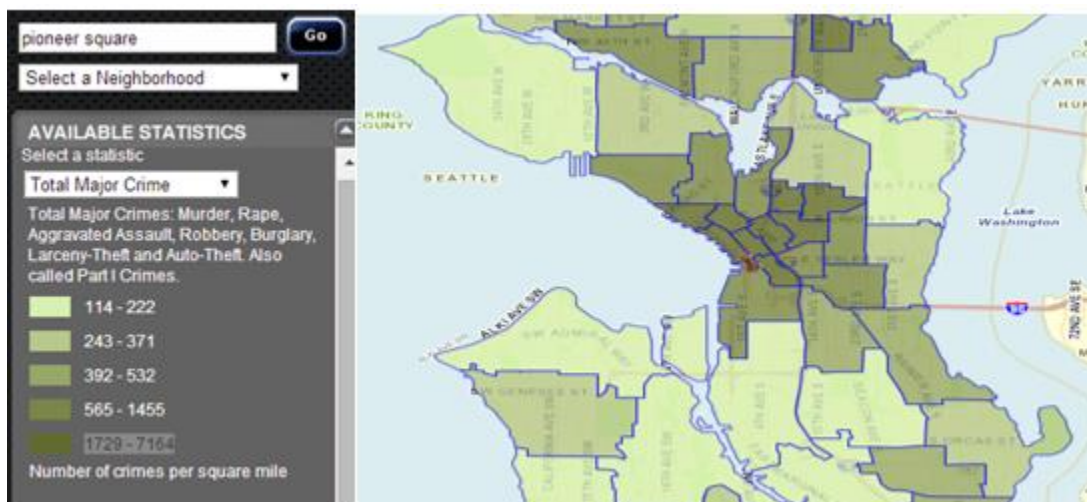
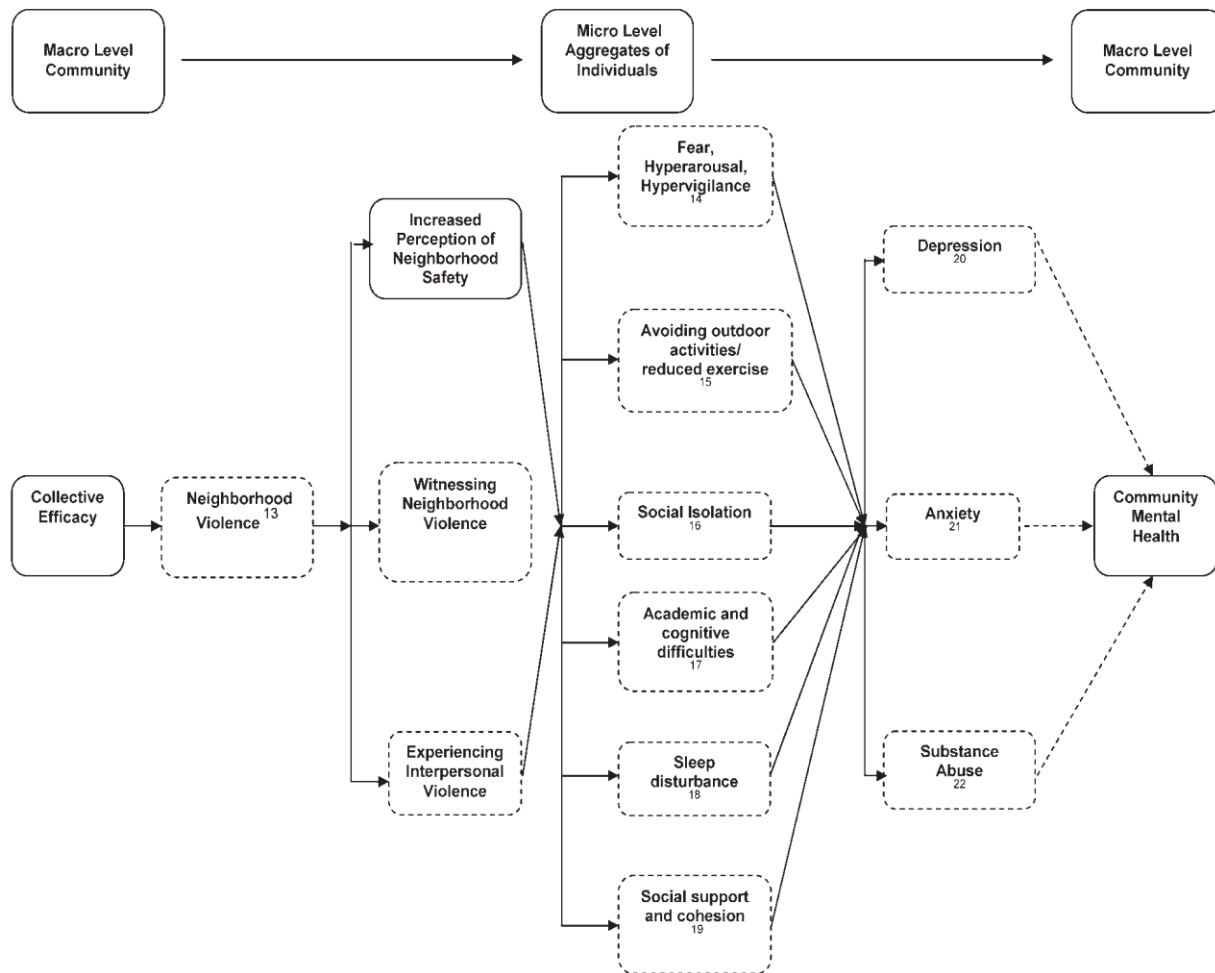


Figure 3: Map of total major reported crimes in the Seattle Area. Note: SPD cautions against using crime and/or other police data to make decisions/comparison regarding safety in a neighborhood due to reporting methods not reflecting an accurate geography of where the crime was reported. Source: Seattle Police Department



## Health Outcomes

In a study with a 73% response rate that explored the association between fear and crime, mental health and physical function, found that fear of crime could lead to social isolation and mistrust of others, restriction of outdoor activities, increase anxiety, stress, and like hood of heavy drinking.<sup>49</sup> This unsafe perception caused by neighborhood violence, panhandling, drug use, and other crimes, can provoke mental anxiety for the neighborhood community and as a result the overall well-being of community mental health (See Figure 4).<sup>50</sup>



**Figure 4: Diagram depicting “collective efficacy” (the ability of a neighborhood to work together to meet common goals) in relationship to neighborhood violence and how it affects the mental health of the community. Note: this diagram was taken from the Mental Health Impact Assessment. 17 studies contributed to this diagraph hence the footnotes). Source: “Mental health impact assessment: population mental health in Englewood”**

In order to combat fear of crime and increase the perception of public safety in Pioneer Square, we examined a plethora of studies showing that vacant buildings are often used as sites for criminal activity and are a hindrance to crime prevention because they serve as convenient locations for illegal activity such as the sales of drugs, commercial sex work, and violent crime.<sup>51</sup> Moreover, the physical appearance of vacant buildings especially those with broken windows can signify disorder and can cause a snowball

effect for more vandalism.<sup>52</sup> While the Department of Planning and Development in Seattle has strict codes concerning vacant buildings, they are not always reported, or violate building ordinances related to graffiti, rodents, criminal activity, and squatting.<sup>53</sup> In the pilot Mental Health Impact Assessment by the Institute on Social Exclusion, researchers looked at the mental health effects of Chicago’s Vacant Building Ordinance on the community’s health (See Figure 5). The study found that passing such an ordinance was beneficial to the mental health of the community.<sup>54</sup> In addition, a recent study indicated that the duration of vacancy and the impact on crime are directly related, and that foreclosure alone has no effect on crime. Violent crime increases by more than 15% once the foreclosed home becomes vacant.<sup>55</sup> Moreover, studies have shown that vacant land transformed using urban design such as orchards and community gardens can improve a neighborhood’s perception of crime and safety through increased community inclusion and engagement.<sup>56</sup>

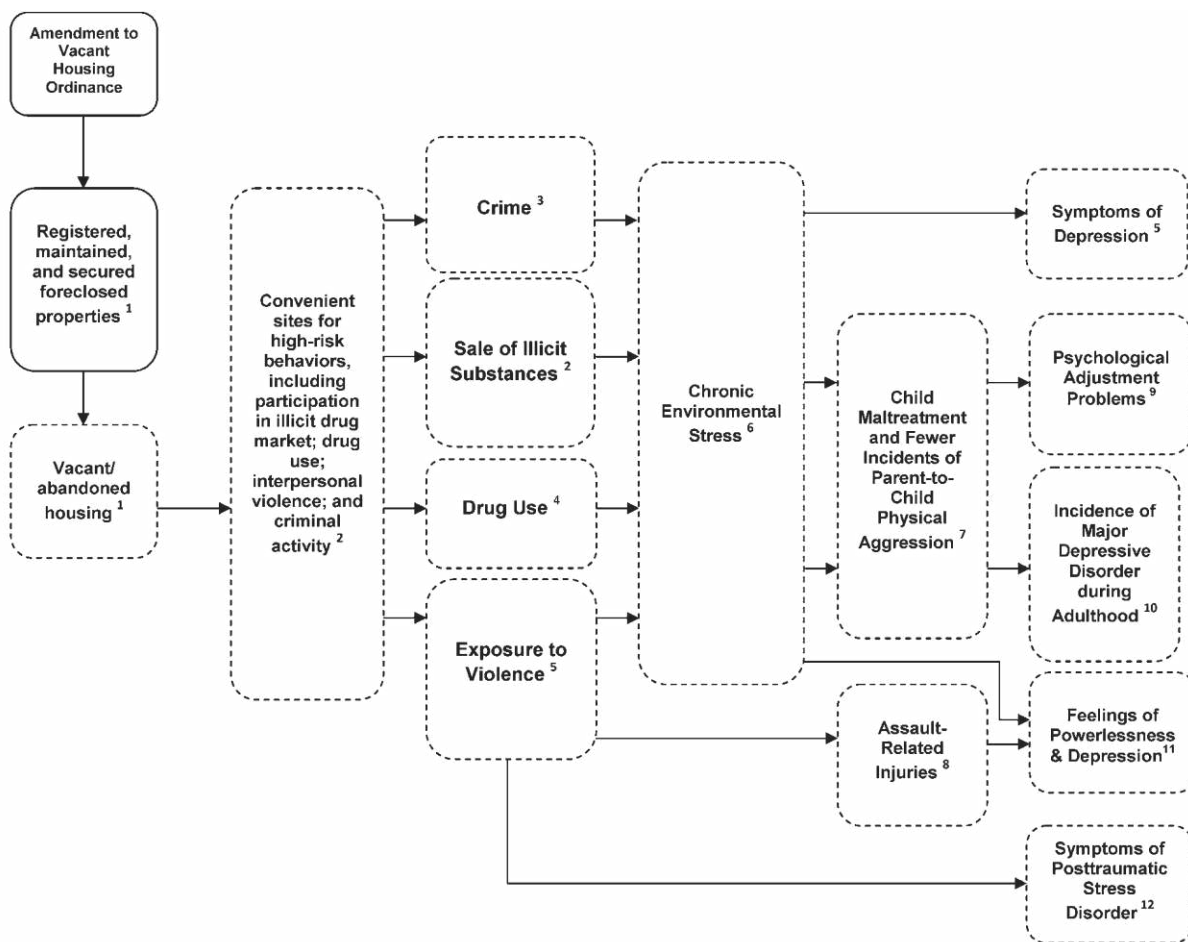
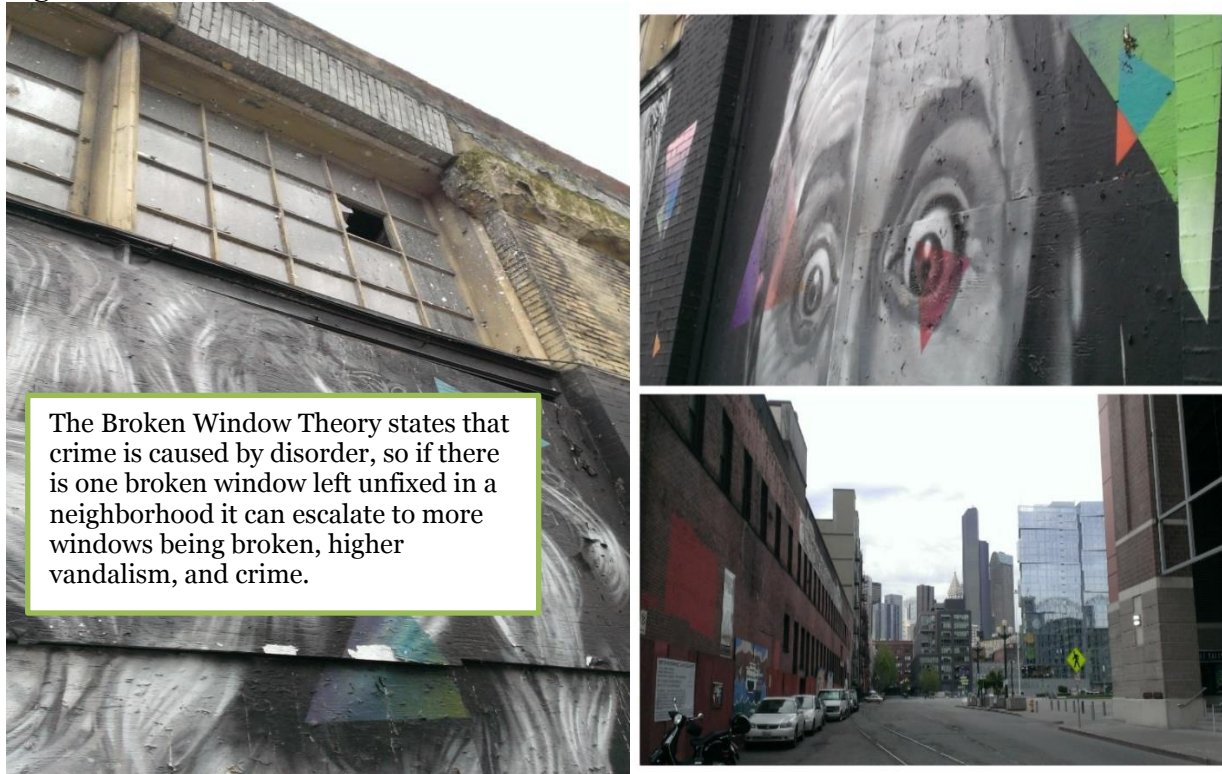


Figure 5: Diagram depicting how mental health is potentially impacted by the proposed amendment to the Vacant Buildings Ordinance. Note: this diagram was taken from the Mental Health Impact Assessment. 12 studies contributed to this diagram hence the footnotes. Source: “Mental health impact assessment: population mental health in Englewood”

The Broken Window Theory states that crime is caused by disorder. As such, one broken window left unfixed in a neighborhood can escalate to more windows being broken, higher vandalism, and crime.

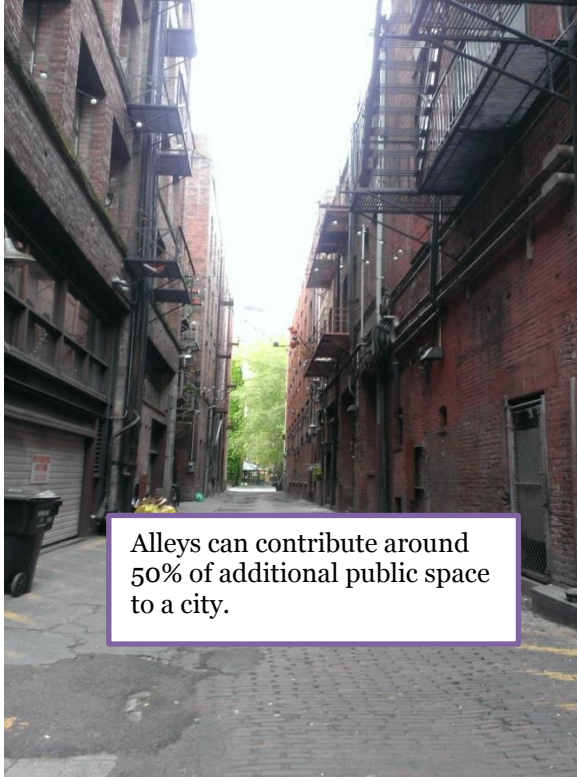


Our literature review found that Crime Prevention through Environmental Design (CPTED) was successful in reducing city crime against people and property.<sup>57 58</sup> CPTED considers security and crime prevention during the preliminary stages of design thus saving money, time, and effort by avoiding ongoing security measures in the long run.<sup>59</sup> While crime prevention has not been traditionally considered as a part of the building process, CPTED methods are becoming more popular.<sup>60</sup> CPTED can reduce a building's occupants' fear and stress about potential issues such as theft, fraud, vandalism, work place violence, and assault, thus increasing the overall health of the community.<sup>61</sup>

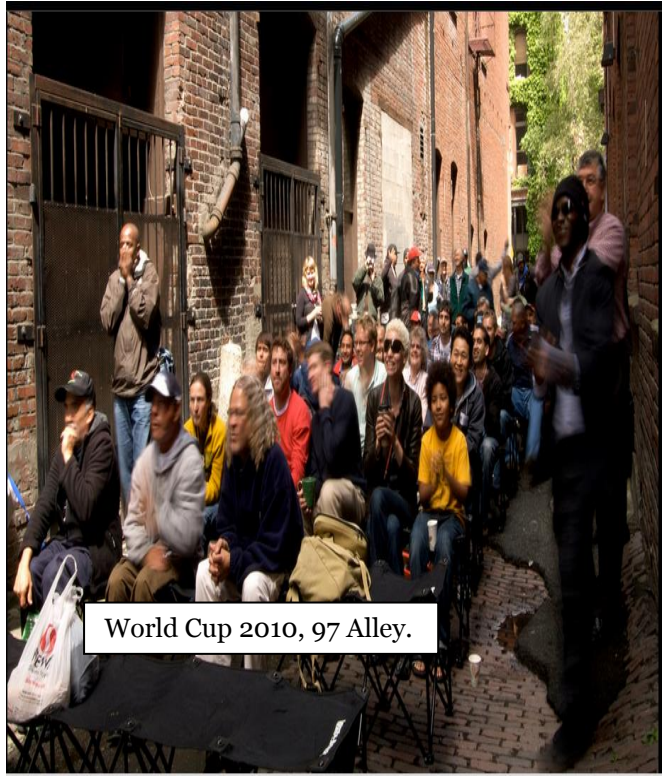
### Assessment

One of Pioneer Square's Revitalization Plan's goals is to increase the community's perceptions of public safety.<sup>62</sup> We applaud the Pioneer Square Revitalization Committee and hope that they will continue as crime prevention measures in Pioneer Square. Moreover, while the original plan did not mention the use of alleyways, we are happy that the 2013 updated plan is working with the Alley Network Projects to revitalize alleyways in Pioneer Square. Alleys can contribute around 50% of additional public space to a city and we hope the utilization of Pioneer alleyways become "green lungs" of the city as described in the Seattle Integrated Alleyway Handbook.<sup>63</sup>





Alleys can contribute around 50% of additional public space to a city.



World Cup 2010, 97 Alley.

64

### Recommendations:

1. The Alliance for Pioneer Square should consider working with the Seattle Department of Planning and Development to continue auditing and activate vacant buildings through lighting and green design.
2. The Alliance should consider the implementation of community gardens as an effective measure to reduce crime in Pioneer Square by working with the Seattle Department of Neighborhoods.<sup>65</sup>
3. The Alliance for Pioneer Square continue to “conduct CPTED in areas of greatest need to deter drug dealing and other illegal activity” and consider the six key principles of the CPTED guidelines in the construction of new buildings as well renovation of old ones.<sup>66</sup>

## HOUSING

### Introduction

Affordable housing is one of Seattle's most pressing issues. Low wages, limited employment opportunities, inaccessible housing prices for both renters and potential owners, and the high cost of building affordable housing units are all barriers to finding and keeping affordable housing. Pioneer Square faces difficulties of a lack of affordable housing and offers a disproportionate amount of Seattle's social services and homeless shelters. Many unstably housed and temporarily or long-term homeless individuals receive services in Pioneer Square. It is important to consider these individuals when making plans for the future of the neighborhood.<sup>67</sup>

### Baseline Data

According to the 2005-2009 American Community Survey, Pioneer Square had a median area income of \$20,927, one of the lowest of all Seattle neighborhoods.<sup>68</sup> In 2012, 79.5% of housing were rental units, and so this data indicates a large portion of the population in that area. The average monthly rent in Pioneer Square is predominantly very low. ESRI Estimates from 2004-2009 reported monthly rent between \$150 and \$199 for 18.2% of renters and between \$100 and \$149 for 12.3% of renters. These are the two largest rent categories and characterize the low-rents that are the current norm in Pioneer Square.

### Health Outcomes

Based on the current economic conditions of the Pioneer Square area, increased residential density and gentrification are two likely outcomes of any revitalization effort. There are both positive and negative health outcomes that result from these phenomena and addressing them in the planning and implementation stages can create a better Pioneer Square for all.

Residential density, which is created through intentional urban planning design, has many benefits to the health of the residents. Urban sprawl, or lower density cities, has a direct effect on the motor vehicle reliance of the population. Increased motor vehicle traffic and pollution and lead to increased rates of asthma and other respiratory conditions, and can constitute a higher percentage (up to 68% in some cities) of the carbon emissions. Motor vehicle crashes also increase and affect the accidental injury morbidity and mortality. Urban density also has a relationship to the way that land is used. People who live in high-density areas with walkable cities are more likely to have physical activity incorporated into their daily lives. Urban sprawl can also have a negative impact on the quality and quantity of clean water that is available, because the space that development takes up often encroaches on watersheds that cities rely upon for their drinking water.<sup>69</sup> All of these are health impacts that emphasize the importance of encouraging the full development of city neighborhoods rather than allowing expansion of the city into less developed areas.



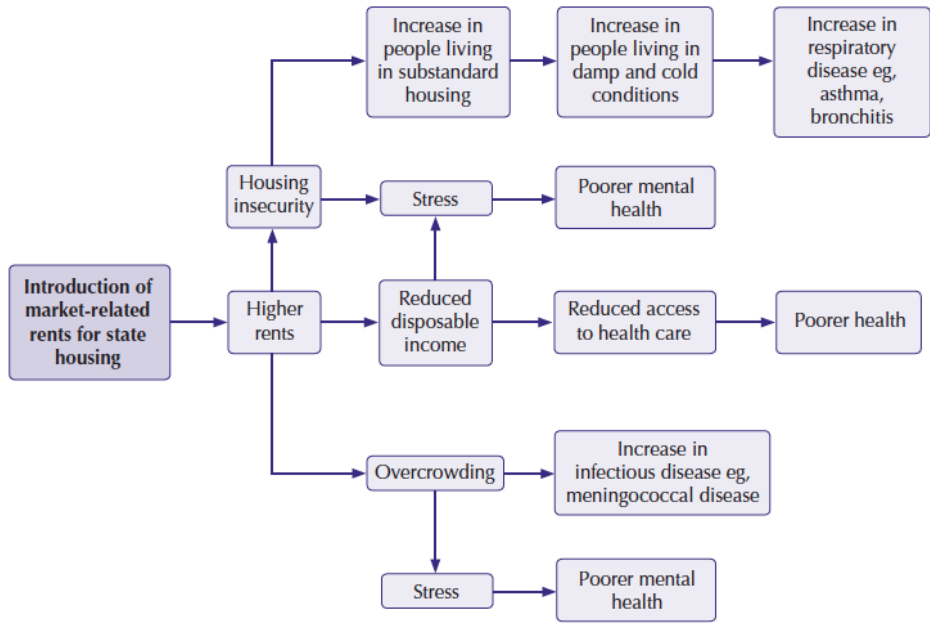


Figure 6: Flow diagram of market rate housing’s effects on health

Image source: (Public Health Advisory Committee 2004) <sup>70</sup>

Increased rents, which are associated with the development or revitalization of areas, can cause a variety of stressors on the individuals who are living in that area already (See Figure 6). Families will have less disposable income, so those that are already struggling financially will have to make tough choices about what can be eliminated from their budgets. For many families this will be cutting out expenses that are keeping them healthy, like medications or nutrition-rich foods. For other families this will mean decreased access to medical services that have too high of deductible payment. Some individuals will try to get second or third jobs in order to make ends meet and this will cause increased stress and less time to spend with families. Even for families that are financially stable, higher rates of chronic stress are associated with rent increases.<sup>71</sup> Development of an area increases the housing costs and can force individuals to have to move to lower income areas. In this way, “increased housing costs could displace households into cheaper, lower quality, or more crowded housing, with increased risk for injuries, rodent infestation, infectious diseases, and stress or mental illness.”<sup>72</sup> This displacement and crowding for the residents who remain puts strains or breaks in the social networks that otherwise serve as protective factors for community health. Barriers that prevent social cohesion can foster isolation and serve as an increased burden on those who are already suffering from poor living conditions.<sup>73</sup>

The negative effect of increased rent and displacement is disproportionately felt by low-income residents and therefore, it is important to ensure that any policy or programs that are implemented will ensure special protections for those more vulnerable populations.<sup>74</sup> Our recommendations are created with a focus on creating equitable revitalization that limits the disproportionate impact on low-income residents.

## Assessment

The proposal put forward by the Alliance for Pioneer Square’s “Strategy for Seattle’s First Neighborhood” calls for changes to the housing landscape in the neighborhood.

The Alliance suggests increasing market rate housing to balance out the imbalance of unstably housed individuals who receive services in the neighborhood.

Economic revitalization is often accompanied by a process of gentrification, which, in short, means low-income residents may be replaced with higher-income residents.

Gentrification generally involves physical improvements of housing stock, changes to the character of a neighborhood, and a shift in culture. However, regardless of housing and business changes in the neighborhood, it is not likely that the homeless shelters and regulated affordable housing that exist now will change, due to their long-term leases or outright ownership of their buildings.<sup>75</sup> While it is unclear how much the neighborhood will be able to attract developers due to the historic district’s unique zoning restrictions, if more market-rate housing does grow in the neighborhood, the benefit of increased middle-income housing will likely be received by middle to high-income residents. The increase in middle-income housing could result in less housing for low-income residents, which may result in displacement of low-income people. Therefore, it is crucial for the Alliance to take action to encourage development that includes the full spectrum of affordable housing.

In order to mediate the potential displacement of low-income individuals, it is a realistic and appropriate target to incorporate 12-15% of square feet in new units so they are affordable to those at the 30-50% area median income (AMI) level and an additional 15% square feet for those at 50-80% AMI level. Without provision for affordable housing that is available to those under 80% AMI, the neighborhood changes may result in a disproportionate benefit to middle and high income residents if the neighborhood is able to attract more market rate housing. The provision for affordable housing units is crucial in the development of the neighborhood in order to limit disproportionate

benefits for economically advantaged people.<sup>67</sup> above<sup>76</sup>

Developers can be incentivized to increase housing that is affordable to low-income residents through incentives such as a residential bonus or the multifamily property tax exemption (MFTE). The residential bonus is: “Extra floor area above the base height limit may be achieved for residential developments in exchange for affordable housing.”

<sup>77</sup> The MFTE program in Seattle allows tax breaks to developers who are making improvements on multifamily projects “in exchange for setting aside 20% of the units for moderate-wage workers.” **Error! Bookmark not defined.** Other cities have addressed this challenge in unique ways. The Inclusionary Zoning program in Montgomery County, Maryland for example, “requires 12.5-15 percent of new housing developments of 35 or more units to be affordable for households in the lowest one-third of the county’s income bracket. Between 1976 and 2003, over 11,000 affordable housing units were developed throughout the county.”<sup>78</sup> A local organization called the Puget Sound Regional Council offers an excellent toolkit for developers that can be utilized when strategizing for building affordable housing units. The toolkit can be accessed on their website (<http://www.psrc.org/growth/hip/alltools/mfte/>). Advocating

for the maintenance, improvement, and activation of Public Spaces is key to ensuring the sustained comfort of current and future residents and visitors. While this is an important part of ensuring that residents are comfortable in their environment, attention must be paid to the population that will benefit from these changes and the populations that will not. This will further the process of gentrification and has the potential to make some low-income residents feel less comfortable in public spaces. In making the neighborhood improvements that will address underused buildings and activate public space, planners should be intentional about making sure that all residents will feel welcome to use those public spaces.

### **Recommendations**

1. The Alliances should consider encouraging developers to include affordable housing units in all new developments in the neighborhood.
2. The Alliance should consider maximizing affordable housing in the area by encouraging developers to take advantage of incentives zoning policies.
3. The Alliance should consider recommending that service providers be consulted by the Alliance in the early planning stages of renovated public spaces through outreach letters, email updates, and public engagement through multiple open community meetings.

## **SOCIAL COHESION**

### **Introduction**

Social cohesion is a feature of the social environment of communities. Kawachi and Berkman define social cohesion as both, “the absence of latent social conflict and the presence of strong social bonds.”<sup>79</sup> There are a myriad of ways in which social cohesion can influence health. In particular, social ties and relationships can influence health through encouragement to engage in healthy behaviors; supporting access to important health promoting services and resources; and through pro-social activities and events.<sup>1</sup> Both physical and social structures can contribute to social cohesion.

### **Baseline Data**

The key piece of social cohesion existing under social and economic issues in Pioneer Square is the Trail to Treasure program—“an exploration of Seattle’s early history in the neighborhood where it all began.”<sup>80</sup> This currently contributes to social cohesion because it provides historical meaning, builds self-esteem in those who participate, and supports economic prosperity within the community.<sup>81</sup>

### **Health Outcomes**

The health impacts of physical and social structures within a community that contribute to social cohesion are well documented.<sup>82</sup> One study found that individuals living in communities with green space reported feeling less lonely and having more social support than those with less green space. Another discovered that green spaces such as parks may increase physical activity, can increase social cohesion when done with others.<sup>5</sup> Health can also be influenced by social structures that promote social cohesion. Social networks contribute to health by creating ties with others.<sup>83</sup> These ties can be

leveraged in times of need, ameliorating stress and reducing its associated physiological impacts. Social ties can also decrease isolation and have been associated with reducing all-cause mortality. Social cohesion is an important aspect of the social and physical structures in a neighborhood; green space, social ties and housing all support social cohesion, and thereby health.

### **Assessment**

Two key features in the Plan for Pioneer Square that influence social cohesion and health are the Trail to Treasures and the social marketing and communication piece, respectively. Trail to Treasure will continue to contribute to social cohesion because it will continue to provide historical meaning, building self-esteem in those who participate and support economic prosperity within the community.<sup>84</sup> The social marketing and communication strategy may decrease social cohesion because it does not include input from a wide range of residents of Pioneer Square.<sup>85</sup> The marketing and communication strategy is intended to represent the interests of Pioneer Square—those who reside in and visit—so multiple representatives of Pioneer Square should be engaged in making this important strategy decision. Excluding community participants has the potential for negative health outcomes including increased human suffering<sup>86</sup>, symptoms of tonic immobility<sup>87</sup>, and increased risk-taking behaviors, particularly among vulnerable populations.<sup>88</sup>

### **Recommendations**

1. The Alliance for Pioneer Square should continue to support the Trail to Treasure program by establishing a relationship between the Alliance and the National Park Service. The Alliance should consider holding bi-annual receptions to thank the National Park Service rangers and representatives for their work protecting the Trail to Treasure.
2. The Alliance for Pioneer Square should consider inviting community stakeholders and residents who endorse the plan to provide input on making a collective community decision regarding a comprehensive and inclusive marketing and communication strategy for Pioneer Square.

## CHAPTER 4: MOBILITY

---

### Abstract

In this chapter, we will address the issues of mobility and multi-modal transportation access within and immediately adjacent to Pioneer Square. After the scoping process, we focused our analysis on four areas within the umbrella of mobility: traffic-related injury, walkability and bike-ability, mass transit, and the Alaskan Way replacement. With the concurrent issues of the demolition and replacement of the Alaskan Way viaduct, bordering Pioneer Square to the west, and the increasing number of commuters using the King Street Station to the east, all four of the above areas proved to be especially salient at this time. By reviewing data from sources such as the City of Seattle and King County Metro, consulting the literature relevant to these issues, and analyzing the results of our inquiries, we will offer recommendations that provide the most beneficial potential health outcomes for mobility and transportation within the Pioneer Square neighborhood.

### TRAFFIC-RELATED INJURIES

#### Introduction

Traffic-related injuries are a significant area of public concern. Public health research shows that parking design and road infrastructure, including biking and walking conditions, all have strong connections to health outcomes. Prioritizing cyclists and pedestrians in city and neighborhood design can reduce injuries and fatalities. The Alliance for Pioneer Square has a unique opportunity to advocate for strong safety measures and evidence-based street infrastructure planning as the Alliance engages with the Department of Transportation and the City of Seattle.

#### Baseline Data

Between 80,000 and 120,000 pedestrians are injured each year in motor vehicle crashes in the U.S. This results in roughly 4,750 deaths annually and accounts for 11% of all motor vehicle deaths in the U.S. For cities over 1 million, like Seattle, this figure climbs to 35%.<sup>89</sup> According to the International Sustainability Institute's (ISI) Active Streets report, pedestrian-car collisions occur with highest frequency in Pioneer Square at 1<sup>st</sup> Ave S, 2<sup>nd</sup> Ave extension, and 4<sup>th</sup> Ave S, mapping onto high-traffic streets. Bicycle-vehicle collisions occur most often on 1<sup>st</sup> Ave S, S Jackson St, 2<sup>nd</sup> Ave extension, and Alaskan Way.<sup>90</sup> See Figure 2 for a detailed map of the Pioneer Square area.

#### Health Outcomes

The Alliance for Pioneer Square plan includes several elements positioned to enhance and others that detract from pedestrian and bicyclist safety. First, the plan to use Alaskan Way mitigation money for parking has potentially negative unintended consequences related to injury risk. Because parked cars obscure drivers' view of pedestrian and vice versa, there is increased risk of collision near dense parking areas. One study found an eightfold risk of child pedestrian injury near dense curb parking (95% CI: 3.32, 19.90).<sup>91</sup> Since a large focus of Pioneer Square revitalization is to attract more middle-income earners (and likely families) into the neighborhood, ensuring the safety of pedestrians of all ages will be an increasingly salient goal.



Another aspect of the plan includes partnering with the Alley Network to create more pedestrian-friendly greenways. Such commitment and ensuing action will play a large role in creating safe environments for walking (and hopefully cycling, too). By separating vehicles and pedestrians, all involved parties' safety is increased. Public health literature underscores the importance of physical barriers between pedestrians and motor vehicles and sidewalks, which result in safer walking conditions.<sup>92</sup>

The Alliance's plan to spend \$80,000 in mitigation funding to install bike racks and repaint crosswalks will also contribute positively to pedestrian and bicyclist safety. However, crosswalks actually have higher pedestrian injury rates<sup>93</sup>, so it is possible that diverting some of that money toward repainting stop lines further back from crosswalks, as mentioned above, could more effectively address decreasing pedestrian injury rates.

The Alliance's partnership with ISI and commitment to improving curbs and streets will play a large role in increasing pedestrian safety and particularly in granting access to people of various physical abilities. While bicycle racks will help draw in more active transport users, increasing their visibility through higher numbers and therefore their safety on the roads, perhaps a better return on investment would be gained from diverting some funds to repainting driver stop lines or installing pedestrian-specific signals. Also, ISI's recommendation to create a pedestrian/bicycle friendly path and detour route during the construction phase could have a strong impact in reducing potential traffic-related injuries.

The plan mentions the expected 2014 completion of the streetcar. A recent study on infrastructure associated with bicycle injuries identified train tracks as one of most significant predictors of bicycle crash and injury.<sup>94</sup> Due to this, mitigation for the added risks posed to bicyclists, perhaps through signage alerting riders to approaching track crossings, can increase safety in the neighborhood.

The Seattle waterfront plan to replace the Alaskan Way Viaduct with a 7-lane (101 foot-wide) surface road has important implications for the walkability and pedestrian/bicyclist safety in Pioneer Square. Increased street traffic leads to more pedestrian injuries and fatalities<sup>95</sup>, and careful placement and characteristics of crossings will be vital to ensure pedestrian and bicyclist safety.

### **Assessment**

Public health literature indicates that built environment modifications are much more effective than pedestrian education in reducing pedestrian-motor vehicle injuries and fatalities.<sup>96</sup> With this in mind, we offer the following suggestions for slight modifications to the plan.

The review of literature found that physically separating pedestrians from vehicles; installing more traffic signals; adequately timed red and yellow signals to allow pedestrian crossing; and visibility of pedestrians all improve pedestrian and bicyclist safety.<sup>97</sup> The ISI publication also recommended lengthening pedestrian signal crossing.

From a public health standpoint, it would be beneficial to limit additional parking, and where there is parking, to implement angled rather than parallel parking so pedestrians are not entering roadways from behind cars and have better visibility. Also, locating driver stop lines further back from crosswalks has been shown to increase pedestrian safety.<sup>98</sup>

In order to obtain more accurate measurements, ISI's recommendation to collect more data on pedestrian and bicyclist collisions and injury to facilitate more robust analysis of problem areas and potential countermeasures would serve the neighborhood well. Furthermore, setting a benchmark for pedestrian and bicyclist safety so that future progress can be monitored against explicit safety goals will be important to reduce injuries and fatalities in the neighborhood as growth continues.

### **Recommendations**

1. The Alliance should consider advocating for the City and DOT to divert funding from parking to repainting stop lines and crosswalks.
2. The Alliance should consider working with the city and DOT to change existing parking to back-in angle parking to increase all users' safety.
3. The Alliance should consider working with the City and DOT to make crosswalk lights longer and install more pedestrian crossing lights.
4. The Alliance should consider aiding the ISI's efforts to thoroughly track pedestrian and bicyclist injuries and contribute to benchmark safety goal setting.

## **WALKABILITY AND BIKEABILITY**

### **Introduction**

Public health research shows a clear association between pedestrian-focused neighborhood infrastructure and positive health impacts.<sup>99</sup> The benefits of a highly walkable and bike-friendly neighborhood include individual, social, and environmental factors. However, the positive health outcomes associated with neighborhood design that prioritizes pedestrians may not be distributed equally, and in some cases, may even deepen existing health inequities.

### **Health Outcomes**

Pedestrian-focused neighborhood design can impact health at the individual, social, and environmental levels. At the individual level, prioritizing public space for pedestrians and cyclists in a neighborhood increases levels of daily physical activity for resident and visitor populations.<sup>100</sup> At the social level, pedestrian-focused infrastructure can increase perceived safety, improve social cohesion, and reduce risk factors for poor mental health. A study in King County provides evidence that there is a protective association between neighborhood walkability and depression.<sup>101</sup> Finally, at the environmental level, pedestrian-focused infrastructure can have impacts such as reducing air and noise pollution. As the image below demonstrates, the built environment has far-reaching

public health impacts that have little to do with individual control or choice (See Figure 7). When the built environment is not supportive of physical activity or space for social interaction, health impacts can be pervasive and significant, such as obesity and overweight, social isolation, crime, and depression.

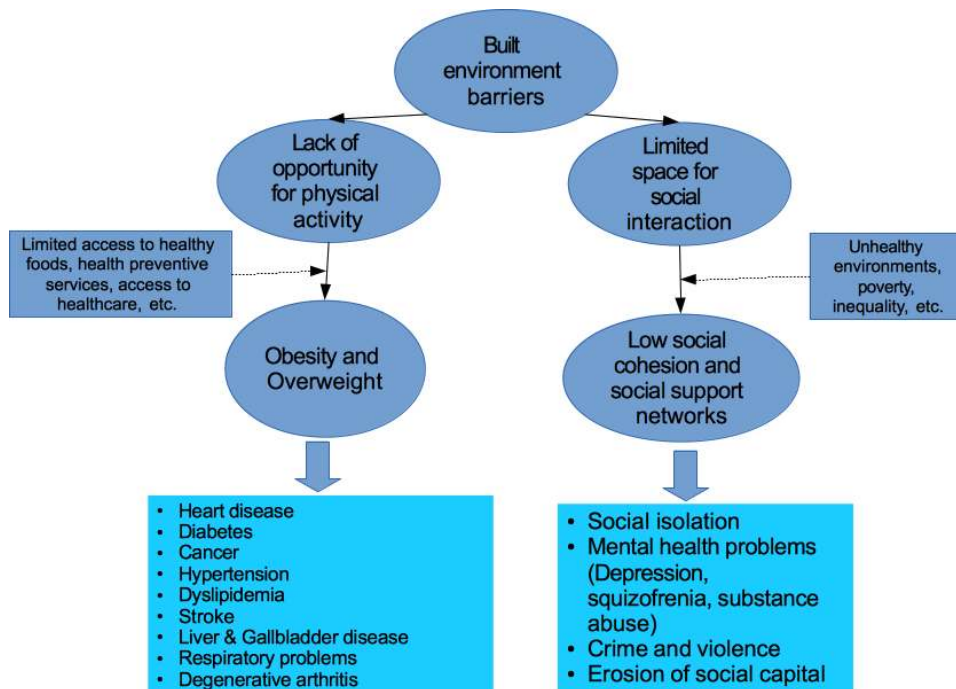


Figure 7: Impacts of physical and mental barriers in the built environment. Adapted from Melnick et al, 2010.

### Assessment

The plan demonstrates a commitment to improving streets and sidewalks, reducing congestion, and facilitating walking and bicycling by creating a safe, interconnected system that links neighborhoods with key destinations. The plan also recognizes the importance of improving accessible ramps for people with disabilities and strollers, along with the creation of attractive destinations for pedestrians

When addressing the street infrastructure, the plan shows a commitment to improving safety for cyclists and pedestrians through road space reallocation and segregation of modes of transportation. Improving cyclist comfort has been evidenced to encourage new or novice bikers to take to the streets. For planning on-street bicycle lanes, bicyclists' comfort level can be determined by identifying discontinuities to bike circulation such as curbs, crossing intersections, parking spaces. Elements that contribute to higher levels of discomfort also reduce perceived safety as well as increase the risk for injuries.<sup>102</sup>

Accessibility, destination variety, and aesthetic attributes are associated with increased transportation-related physical activity.<sup>103</sup> Removal or re-design of parking lots located

in central destination areas (such as Occidental Park or 1<sup>st</sup> Avenue), alleys, and the historic underground space in Pioneer Square are examples of locations where an intervention to improve accessibility and aesthetics may prove useful in the interest of increasing walkability. The recreational and interpretative trail (Trail to Treasure Program) and other “specialty walks”, provide an important opportunity for developing walking destinations throughout the neighborhood.

To further attract visitors, residents, and businesses, more emphasis should be placed on creating a broader variety of facilities for current residents, and improving street aesthetics. Improving walkability and bikeability can attract residents and businesses and enhance the visitor experience. Perceptions of walkability have been associated with neighborhood convenience and attractiveness. In addition, when footpaths are perceived as safe and accessible, participants are more likely to be active.<sup>104</sup> All of these factors improve the desirability of a neighborhood, thereby increasing new residential and business growth potential.

Public transportation is an important part of a comprehensive street infrastructure plan. Accessible public transportation can increase the number of visitors, increase walking scores and bikeability. This can aid social inclusion and equity of opportunities, especially for those with disabilities, elderly populations, and those whose preference is to walk or cycle.<sup>105</sup>

In addition to public transportation usage, bike sharing can provide a low cost transportation option for low-income communities with low automobile ownership rates, high dependency on transit, and low mobility to other neighborhoods.<sup>106</sup> Bike sharing also offers an opportunity for additional specialty cycling routes for visitors. The Seattle bike-sharing program is scheduled to launch in September 2014, and Pioneer Square Alliance can take advantage of this opportunity by advocating for bike sharing stations in the neighborhood. A recreational cycling route through temporary street closures, also known as a *ciclovia*, is a popular and effective method that can empower local cyclists and pedestrians, as well as enhance opportunities for tourists and non-resident visitors. The implementation of *ciclovias* has been shown to encourage physical activity and increase perception of social cohesion.<sup>107</sup>

<b>Proposed action</b>	<b>Health Determinant</b>	<b>Direction</b>	<b>Magnitude</b>	<b>Likelihood</b>	<b>Distribution of Effect</b>
Street space reallocation and separation of modes of transportation	Reduction of injuries to pedestrians and cyclists	positive	high	likely	equal
Maintenance of streets and public spaces	Increased physical activity: cardiovascular prevention, mental health protection	positive	medium	possible	equal
Active streets strategy					
Perceived walking/biking safety and attractiveness					
Improved ADA accessibility	Increased activity, safety, independence and inclusion of people living with disabilities	positive	high	likely	elderly and disabled populations
Walking and biking interconnections of neighborhoods and destinations	Increased income to local businesses: more visitors and improved PS image to residents and visitors	positive	high	likely	direct benefit to business owners, indirect benefit to local residents
Car-oriented visitor infrastructure (land use permits for parking lots, parking validation, low-rate parking)	Increased noise and air pollution	negative	medium	likely	equal
	Reduced pedestrian and biker comfort and perceived safety	negative	medium	possible	pedestrians, cyclists, street businesses
	Increased income to local businesses	positive	medium	possible	benefit to high income-targeted businesses
Overall increase in walkability and bikeability	Increased social cohesion and construction of social capital	positive	high	likely	people of higher social scale (possible exclusion of homeless population, people with mental health problems, drug users)



## Recommendations

1. The Alliance should consider advocating for the continuation of the expansion of bike lanes and pedestrian sidewalks in coordination with SDOT *Way to Go* programs.
2. The Alliance should consider working with the city to include interconnections for walking and bike destinations with existing and proposed public transportation.
3. The Alliance should consider increase the variety of destinations as well as street aesthetics through a variety of interventions. Examples include:
  - a. Redesign of parking lots located in central destination areas
  - b. Improve the aesthetics of the street fronts and include activities such as street vending or food trucks.
  - c. Reinforce alley revitalization strategy in coordination with Alley Network Project to promote alleys as attractive destinations.
4. The Alliance should consider improving the visibility of the recreational and interpretive trail and other “specialty walks”, with emphasis in connection to other neighborhoods and destinations such as the International District, Pike Place Market, Downtown, First Hill, Duwamish River and West Seattle, etc.
5. The Alliance should consider coordinating with Seattle's Bike Sharing initiative to increase bike-sharing stations in Pioneer Square.
6. The Alliance should consider implementing recreational *ciclovias* that cross central areas of Pioneer Square and connect with existing bike paths. The Open Streets Guide provides useful implementation guidelines (<http://www.bikewalkalliance.org/resources/reports/open-streets-guide>).

## MASS TRANSPORTATION

### Introduction

Over the last several years, the City of Seattle and King County have added new mass transit networks and have increased the capacity in existing networks to provide their citizens a variety of transportation options throughout the region. As the population increases (especially in the City of Seattle), these systems will play a vital role in moving people between jobs, homes, and other destinations in the Puget Sound region. Pioneer Square is uniquely positioned to benefit from increased transit ridership due to its proximity to major transit systems, sports arenas, and other attractions. Additionally, the Alliance’s desire to increase the number of residents and businesses within the small boundaries of the neighborhood suits the functions of these transit systems well.

## Baseline Data

Pioneer Square is flanked by two major transit hubs: the King Street Station multimodal hub and the Seattle Ferry Terminal at Coleman Dock. King Street Station, along with the neighboring Union Station, acts as a hub for King County Metro, Amtrak, and the Sounder commuter train; the Link Light Rail station in the International District is located near the King Street and Union Stations. Coleman Dock serves as the access point for the Washington State ferry system in Seattle, connecting primarily to communities in Kitsap County. Combined, these systems move tens of thousands of commuters through Pioneer Square every day.<sup>108</sup> Directly south of Pioneer Square are CenturyLink Field and Safeco Field, which act as home to professional football, soccer, and baseball teams and attract thousands of fans every season.

## Health Outcomes

Recent research shows that people walking to and from public transit more often meet the Surgeon General's recommendation of  $\geq 30$  minutes of daily physical activity.<sup>109</sup> Given the previously mentioned proximity to transit, an increased use of transit would be a public health benefit to both current and future residents of and visitors to Pioneer Square. An increase in the use of mass transportation systems along with a decrease in the use of personal automobiles has shown to be linked to a drop in asthma attacks and other respiratory distress in dense, urban areas.<sup>110</sup>

## Assessment

After a walking tour of the neighborhood, we were left with the sense that Pioneer Square suffers from a lack of way finding. Studies have shown that, when provided with adequate signage for navigation, people tend to have better mental health outcomes when they are able to navigate their surroundings by controlling their movements.<sup>111</sup> While King Street and Union Stations border the neighborhood to the east, it is not easy to orient oneself toward the direction of those transit hubs due to a lack of signage. Additionally, the soon-to-open First Hill Street Car will add a new transit system that will likely require additional signage to make residents and visitors aware of its location and full route; the same is true with the proposed Center City Connector line that will likely terminate in Pioneer Square.<sup>112</sup>

Although the Alaskan Way Viaduct demolition and redesign is posed to begin soon, there will nonetheless be large influxes of people toward Pioneer Square for sports games and general tourism of the historic district. It stands to reason that Pioneer Square could benefit from this flow of Seattle residents and visitors by directing their patronage through the neighborhood; the transit systems close by will likely serve as the best conduit for these people.

## Recommendations

1. The Alliance should consider working with the City of Seattle, SDOT, and King County Metro to install various signs as way finding tools for current and potential transit users. These could be locally designed and installed rather quickly, highlighting not only the location of transit hubs but also connections to neighboring communities such as Downtown, the International District, and First Hill.

2. The Alliance should consider advocating for additional signage to not only inform visitors of the transit networks but also their utility in accessing CenturyLink and Safeco Fields from other surrounding areas, e.g. Link Light Rail and First Hill Street Car, could also be beneficial to not only efficiently move large quantities of people through the neighborhood, but also give those people unfamiliar with Pioneer Square a reason to enter the neighborhood and potentially spend their time and money within its borders.

The above recommendations can be implemented relatively inexpensively and quickly and would serve many of the interests of the Alliance’s strategy for Pioneer Square.

## ALASKAN WAY REPLACEMENT

### Introduction

Since the 2001 Nisqually Earthquake, the sustainability and stability of the Alaskan Way Viaduct has been called into question. Opened on April 4<sup>th</sup> 1953, the Alaskan Way Viaduct has acted as a major thoroughfare for the City of Seattle and currently serves 110,000 cars per day. Meanwhile, the safety of the structure continues to deteriorate. After considering numerous proposals to determine the proper course of action, ultimately a four-lane underground tunnel was approved as the successor to the Alaskan Way Viaduct. While the construction of the tunnel is underway and the demolition of the Alaskan Way Viaduct is inevitable, the development of the surface road has yet to be determined (See Figure 8).



Construction along with Alaskan Way Viaduct



The Seattle Waterfront, overlooking Pier 48.



**Figure 8: Alaskan Way Viaduct and surrounding areas**

### **Baseline Data**

The current proposal for the surface road calls for a seven-lane road from King Street to Yesler Way. According to the proposal, the purpose of each lane will change depending on the time of day (See Figure 9). The seven-lane roadway is wedged between Pioneer Square and the Seattle Waterfront. See Figure 2 for a detailed map of the Pioneer Square area. The geography of the Seattle waterfront is complex. As one travels South of Jackson Street, the port industry looms large. Between Jackson Street and Yesler Way, Pier 48 is an undeveloped lot currently owned by the Washington State Department of Transportation (WSDOT). From Yesler Way to Spring Street, the seven-lane roadway shrinks to a four-lane road (See Figure 10). Ferry terminals dominate the waterfront in this area.

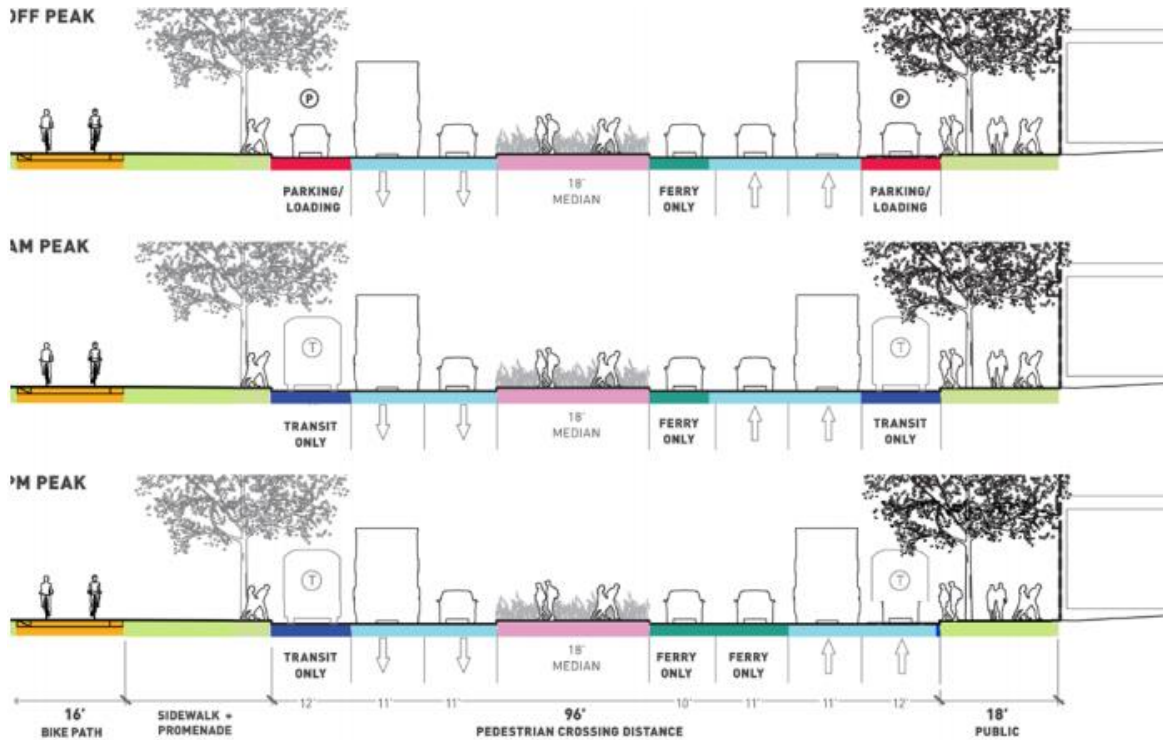


Figure 9: Flex Lanes Section at Main Street. Source: Alaskan Way and Elliot Way Design

SECTION AT COLUMBIA STREET

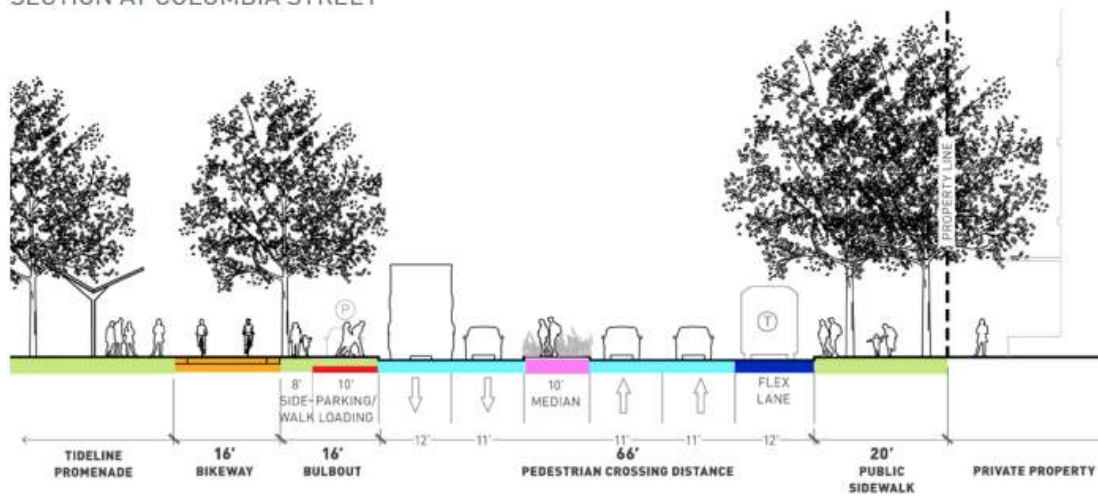


Figure 10: Section at Columbia Street. Source: Alaskan Way and Elliot Way Design

**Health Outcomes**

There are considerable negative health outcomes that may be expected from the roadway as it is currently proposed. Increased traffic can impact mental health resulting from increased noise, pedestrian injuries from increased motor vehicle traffic, and respiratory conditions associated with poor air quality.



- The proposed seven-lane roadway will produce a considerable amount of noise. Noise levels above 45 dBA can result in difficulties sleeping and noise levels above 65 dBA can have adverse effects on mental health.<sup>113</sup>
- Pedestrian injuries can also be a significant issue with roadways as locals and tourists alike may want to travel between Pioneer Square and the Seattle Waterfront. Pioneer Square is home to older populations, causing a stronger burden of injuries in the neighborhood than other neighborhoods in Seattle. Currently there are about 120 nonfatal vehicle related accidents in the United States per 100,000 people each year for people who are the age 65 or older.<sup>114</sup> For fatal accidents, approximately twice as many elderly people die each year than any other age group proportionately.<sup>115</sup> Increasing motor vehicle traffic in a disproportionately older neighborhood can have disastrous effects on the injury rate for the area.
- Air pollution is a prominent issue with all roadways, especially considering the proximity of the proposed roadways to residential areas and businesses. Numerous studies demonstrate an association between diseases such as asthma and bronchitis with living within 100 meters of major roads.<sup>116</sup> However, less obvious health effects also can occur. A study performed in the Seattle region demonstrated that living within 150 meters of an arterial road lead to 21% lower Natural Killer cell cytotoxicity, ultimately resulting in a suppressed immune system.<sup>117</sup>

### Assessment

The following assessments address the connections to health for the proposed seven-lane roadway to replace the Alaskan Way Viaduct:

- Noise from a comparable eight-lane roadway measures a noise level of 73.7 to 80.7 dBA during the peak morning traffic.<sup>118</sup> Considering the conditions and circumstances of the proposed seven-lane road, it is not unreasonable to assume that it may be a little quieter. This level of noise would certainly be above 45 dBA, which can lead to difficulty sleeping, and would likely be around the 65 dBA level, which can provoke significant mental stress.<sup>119</sup>
- Crossing streets in urban areas can be daunting, but a seven-lane highway can be downright dangerous. The stress and anxiety caused by crossing a large roadway is poor for one's mental health. The current design for the inclusion of large medians and wide sidewalks can help mitigate these potentially harmful impacts.
- From an economic perspective, as Seattle's waterfront becomes further developed, it is advisable for sections of the waterfront to be allocated towards residential buildings rather than commercial buildings, as residential buildings pay a larger premium for waterfront property than commercial buildings. However, the health impacts of living with 150 meters can be detrimental towards one health, calling the economic benefits into question.<sup>120</sup>

### Recommendations

Considering the baseline data, connections to health and assessments of the proposal put forward by the Alliance for Pioneer Square, we offer the following recommendations:



1. The Alliance should consider working with WSDOT to increase pedestrian safety through the inclusion of wide sidewalks (10 feet or greater), prohibition of street parking, and promotion of active streets with shops and events.<sup>121</sup>
2. The Alliance should consider working with WSDOT to reduce the amount of lanes of the seven-lane highway, possibly through additional use of lane alternating.

## CHAPTER 5: ENVIRONMENTAL HEALTH

---

### **Abstract**

This section addresses the potential health impacts of air and water quality, noise and lighting, affordable and healthy housing, daylighting, and green and public spaces. The current and anticipated construction activities in Pioneer Square may increase air and water pollution and threaten health in the short-term. Mitigation efforts that reduce air pollution from vehicles and construction, reduce water contamination, and encourage mixed-use development can lessen the health consequences. The concentration of major arterials and thoroughfares, transit stations, and construction activities likely contribute to noise pollution in the neighborhood. Traffic calming techniques, building materials and designs, and enforcement of municipal noise limit regulations could moderate noise pollution. Street lighting may exacerbate light pollution. Efforts to increase lighting in the neighborhood will benefit from techniques that minimize glare and restrict lighting at certain times during the night. Increasing the amount of low and market rate housing in the neighborhood may support housing security among district residents and foster socio-economic residential diversity. Building renovations can support healthy indoor environments by using low toxic building materials and increasing access to natural light. Exposure to adequate daylight in building interiors may provide health benefits ranging from increased levels of vitamin D to reduced severity of seasonal affective disorder. Access to quality green and public spaces has documented positive influences on mental, physical, and social health. Efforts to enhance existing public spaces may positively influence social and physical health in the community. Additional health benefits may be realized through innovative approaches to increasing the green space in the neighborhood.

### **AIR AND WATER POLLUTION**

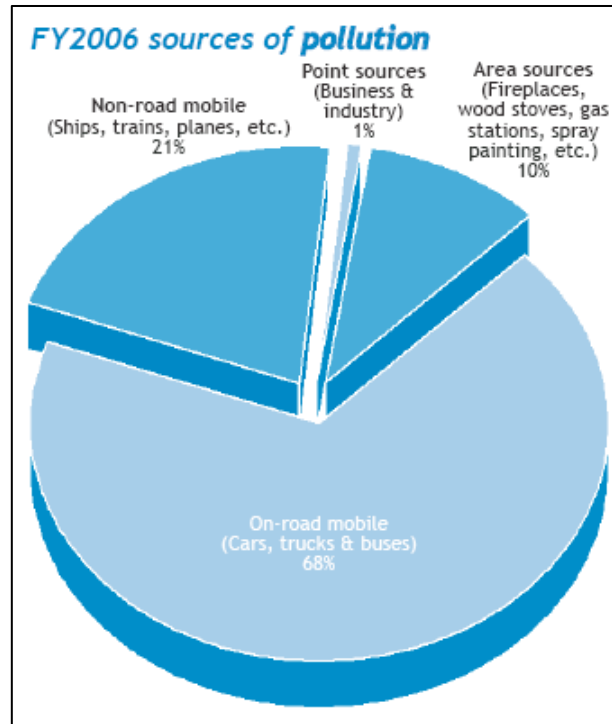
#### **Introduction**

Considering the high frequency and duration of construction activities proposed by the Pioneer Square 2015 Plan, short-term impacts on ambient air quality and surface water runoff contamination are expected. It is noteworthy, however, that some negative impacts can be avoided if proper mitigation techniques are applied.

#### **Baseline Data**

##### *Air Quality*

In the Puget Sound region, diesel particulate matter is the greatest source of air pollution (Figure 11).<sup>122</sup> Diesel exhaust (DE) is classified as a human carcinogen (cancer-causing agent) by the International Agency for Research on Cancer, and long-term exposure to DE emissions may increase the risk of lung cancer by up to 43%.<sup>123</sup> Vulnerable populations, such as children, pregnant women, the elderly and people living with preexisting heart conditions, allergies, or asthma, are most susceptible to the negative health effects of elevated air pollution. As Pioneer Square is home to an aging population (many of which are low-income or homeless and suffering from various health conditions), a significant proportion of the population will suffer greater impacts of any reduction in air quality resulting from the proposed plan.



**Figure 11: Sources of air pollution in Puget Sound.** Source: Puget Sound Clean Air Agency (2014)

### *Water Quality*

Surface water runoff results when impermeable surfaces prevent water from infiltrating into the ground. In urban areas, the vast impermeability (roads, sidewalks, rooftops, parking lots) combined with inadequate storm water management can lead to flooding, erosion, and increases in sediment and temperature in downstream aquatic ecosystems.<sup>124</sup> The water quality of Elliott Bay is monitored by the Washington State Department of Ecology (DOE) who report that 14 million pounds of pollutants flow in to Puget Sound each year, including petroleum hydrocarbons, pesticides, and fertilizers from surface water runoff.<sup>125</sup> The latest water quality report published by the DOE in 2011 concluded surface water runoff contributes the greatest source of pollution loading to Puget Sound’s urban bays. Monitoring data reveals that while urbanized coastal areas are generally more polluted than undeveloped coastlines, the health of Elliott Bay is beginning to show signs of improvement.<sup>126</sup> To reduce source production of polycyclic aromatic hydrocarbons (PAHs), the DOE recommends prioritizing programs that reduce vehicle exhaust emissions.<sup>127</sup>

### **Health Outcomes**

#### *Air Pollution*

The Environmental Protection Agency’s (EPA) National-Scale Air Toxics Assessment (NATA) from 2012 reports that “those living in urban areas of the US are in the top 5th percentile of the country for potential health (cancer) risk from air toxics.”<sup>128</sup>

Development activities generate large amounts of vehicle emissions and dust, putting workers and the public at risk of short-term exposure to elevated levels of particulate

matter (PM), diesel exhaust, and ozone. Short-term exposure to elevated levels of PM or DE is associated with increased onset of asthma, inhibited lung function (decreased ability to inhale fully), increased blood pressure and risk of cardiovascular disease. Short-term exposure to ozone can cause lung and throat irritation, lung inflammation, wheezing, and difficulty breathing.<sup>129</sup> If elevated traffic volumes and other point source emissions of PM (e.g. wood-smoke from residential fireplaces) persisted beyond the construction phase, long-term exposure to PM and DE would increase resident's risk of cardiopulmonary diseases and death.<sup>130</sup> Hence mitigation strategies are recommended for the protection of resident and vulnerable populations.

### *Surface Water Contamination*

Surface water runoff from Pioneer Square has severe consequences for the marine life in Elliott Bay as well as public health. Without effective mitigation and management techniques, Elliott Bay would receive increased loads of contaminated sediment produced by the development and construction activities. According to the EPA, surface water runoff contaminants include: pesticides, fertilizers, viruses, bacteria, road salts, heavy metals, and the oil, grease, and toxic chemicals from vehicle emissions. Concerning public health, the impact of runoff on water quality is linked to chronic and acute illnesses from exposure through recreation, drinking water, and seafood consumption.<sup>131</sup> Furthermore, impermeable surfaces cause storm water to pool, creating breeding areas for mosquitoes that may carry diseases such as dengue hemorrhagic fever or West Nile virus. Reducing the volume of surface water runoff and the sources of contamination would be the most cost-effective strategy for protecting public health.

### **Assessment**

Demolition and construction activities pose the highest risk of adverse health impacts from short-term inhalation of harmful pollutants. Hazardous air pollutants (both gaseous and particulate matter) may be generated during the demolition and construction of buildings and infrastructure. Considering most existing structures in Pioneer Square were built over 50 years ago, it is likely that the soil and building materials contain dangerous levels of lead and/or asbestos. Inhalation exposure to contaminants in soil dust and building material would be plausible during demolition and construction activities, resulting in acute and chronic health effects for workers and the general public. Under OSHA regulations, employers are required to assess and monitor worker's exposure to harmful building materials and by-products.<sup>132</sup> Protecting worker and public health requires stringent dust and emission controls, as well as secure closure of all hazardous construction sites to avoid civilian exposure. The homeless population would be at high risk of exposure to asbestos or lead if access was available to them during non-working hours. Developers and contractors using best practices would apply control measures to protect the most susceptible populations that frequent Pioneer Square. It is in the City's best interest that all hazardous waste or dangerous materials be disposed of as required by the Washington State Department of Ecology.

Widening Alaskan Way and reducing traffic flow along the shoreline will increase pedestrian exposure to vehicle exhaust emissions and inflict elevated levels of contamination on Elliott Bay's ecosystem. High volumes of vehicles idling on the proposed "stop-and-go" roadway will likely increase the concentration ground

contamination and the quantity that is washed into the Bay with surface runoff. It is expected that increasing the traffic capacity of Alaskan Way will increase the vehicle miles traveled relative to the baseline conditions. Once the Waterfront Development Project is complete, Alaskan Way will lie between Pioneer Square and a desirable waterfront and Ferry terminal. With pedestrian crossing expected to be high, the proposed seven lanes pose a major barrier to pedestrian access. Requiring pedestrians to wait curbside for the time it takes to cross eight lanes will impose unnecessary exposures to exhaust fumes. Exposure to vehicle emissions is most severe during vehicle ignition and idling time. The most effective ways to reduce vehicle emissions will be to design roadways and intersections that minimize the time vehicles spend idling and minimize the number of vehicle startups. The latter would be best accomplished by maximizing the use of public transportation (especially electric buses) and car-share services. Allowing traffic to move fluidly will limit emissions by reducing vehicle idling time and traffic congestion, although long timing on walk lights to make pedestrian crossings safer competes with this objective. Suggesting attractive and well-designed sky bridges is one solution for reducing pedestrian exposure to vehicle exhaust, preventing accidents, and promoting access to the waterfront.

Infill development and high density can reduce vehicle emission sources of air, water and noise pollution. Increasing density and mixed-use zoning has been shown to decrease vehicle use.<sup>133</sup> The 1994 report from the Washington State Department of Transportation suggests that densities of 125-175 employees or 9-13 residents per acre must be achieved in order to significantly reduce the vehicle emission sources of air, water, and noise pollution. Reducing or removing the known sources of air and water pollution (vehicle emissions and residential wood smoke) will improve air quality in Pioneer Square. To further improve air quality, it is advisable that the Alliance recommends residential building that prohibits wood-burning fireplaces in new residential construction and renovation. Residential wood smoke is the second highest contributor to Seattle's air pollution (~13% of the PM<sub>2.5</sub> source in Puget Sound). Reducing the amount of wood smoke generated would produce local and downwind benefits.<sup>134</sup>

The lack of strategic planting of tree and shrub species throughout Pioneer Square is an opportunity missed to effectively sequester and detoxify air and water pollutants in areas of high traffic or geologic depressions.<sup>135</sup> The Plan does not explicitly include a desired landscaping goal, however, green infrastructure is a common strategy for attracting new patrons and residents. Including a green infrastructure component to the Plan would not only support the marketing and revitalization of Pioneer Square through aesthetics, it would be a cost-effective and sustainable solution for protecting air and water quality while reducing the risk of flooding from storm water run-off, especially near roadways.

Subsidized parking will increase the number of Single Occupancy Vehicle (SOV) trips and increase on-road sources of air and surface water contamination. Providing an incentive to drive to and from Pioneer Square instead of using public transportation is expected to cause more vehicle use and increased traffic in Pioneer Square. Air quality would suffer as a result of the increased amount of vehicle emissions. In addition,



parking lots are collecting grounds for vehicle exhaust drippings. Heavy particulate matter, oils and contaminated vehicle condensation deposit on the surface of parking lots and streets, contaminating the surface water runoff during rain and storm events.

Signature bike racks and improved bicycle lanes would encourage non-motorized transit and reduce long-term air and surface water pollution. Secure and sufficient bicycle parking encourages use of non-motorized transportation. The ratio of bike to car parking spaces should be compared to the desired population density so that biking or public transportation is a favorable choice. Safe and convenient bicycle and walking routes connecting to secure bike racks in desirable areas will encourage active use.

### **Recommendations**

1. The Alliance should consider specifying the need for population density to increase to 125 employees and 9 residents per acre to reduce vehicle emission sources of air, water, and noise pollution by 60-80%.
2. The Alliance should consider incorporating green infrastructure or landscaping designs into the proposed plan that maximize the use of trees, shrubs, grass, and hanging plants in outdoor spaces to detoxify and sequester pollutants in air and water.
3. The Alliance should consider collaborating with partners to prioritize roadway designs and transit options that minimize opportunities for diesel exhaust emissions, vehicle startup, idling and traffic congestion, while simultaneously protecting pedestrian safety.

## **COMMUNITY NOISE**

### **Introduction**

The WHO defines community noise as all noise that does not originate from an industrial workplace. Noise is one of the most common environmental exposures in the U.S. and is one of the most important quality of life measures for city dwellers. The main sources of outdoor community noise include air, land, and rail traffic and construction. Vehicle noise comes from running engines, but also from horns, alarms, engine acceleration, and tire/road contact. Chronic exposure to noise has been linked to several adverse health outcomes including hearing loss, cardiovascular disease such as hypertension, sleep disturbance, and stress.

### **Baseline Data**

Noise is measured in decibels, where a whisper generates 30-40 dBA, a typical conversation measures around 60 dBA, traffic ranges from 70-80 dBA, and a plane taking off registers at 140 dBA. The noise from traffic varies a great deal on the type of vehicle, as described below. Most urban residential neighborhoods in the US have noise levels between 55 dB and 70 dB, still at a level that is not expected to cause hearing loss at a time-weighted average of <70 dBA. However, in 2013, over 100 million individuals are exposed to annual noise levels that exceed an average continuous exposure limit of >70 dBA.<sup>136</sup>

We are not aware of any urban noise assessments done in Seattle, as is the case for most US cities. Estimated traffic noise levels are likely in excess of 70 dBA, given the

concentration of mass transit and vehicle traffic, and will likely increase along the future Alaskan Way highway, which will serve as a thoroughfare for city buses, diesel trucks, and other traffic related to the surrounding rail and ferry services. To get a sense of the relative contribution of each type of vehicle to community noise, we use the Traffic Noise Model (TNM) developed by the Federal Highway Administration. The TNM estimates that one city bus is equivalent to the noise of 12 automobiles, a medium truck is equal to 9 automobiles, and a heavy truck is equal to 22 automobiles.<sup>137</sup> Based on the projections in the table below, we estimate that the area approximately 50 feet from Alaskan Way experiences at least 72-83 dBA of roadway noise throughout the day (See Figure 12). As those projections are based on a single vehicle, actual noise levels are likely higher.

Source Type	Estimated Speed/ Operating Condition	Approximate Maximum A-Weighted Sound Level, dB(A)	Distance, feet
<b>Aircraft</b>			
Commercial jet	Takeoff	85	1,000
Commercial jet	High Altitude Cruise	85	1,000
Corporate jet	Takeoff	85	1,000
Propeller aircraft	Takeoff	70-80	1,000
Helicopter	Cruise	70	1,000
<b>Roadway Vehicles</b>			
Heavy truck	50 mph	83	50
Medium truck	50 mph	79	50
Automobile	50 mph	72	50
<b>Rail Vehicles</b>			
Diesel locomotive	50 mph	88	50
Rail cars	50 mph	80	50
Locomotive horns	-	96-110	50

dB(A) = A-weighted decibels, a summation of sound levels across frequencies.

**Figure 12: Approximate maximum sound levels from transportation sources. Source: Miller, N. (2005)**

### Health Outcomes

Noise-induced hearing loss affects nearly 30 million Americans, with approximately 10 million cases that are attributed to non-occupational noise.<sup>138</sup> Noise directly damages nerve cells in our inner ear and often leads to irreversible hearing loss. Hearing loss negatively impacts interpersonal community, quality of life, and increases stress and reduces productivity.

Noise also has many non-auditory health effects and these usually occur in people without any signs or symptoms of hearing loss and at much lower noise levels. Chronic noise is associated with higher blood pressure and cardiovascular disease.<sup>139</sup> It also has negative effects on our psychological health as people exposed to continuous noise have increased activation of the “flight or fight” response with higher levels of circulating catecholamine and cortisol. This leads to disturbed sleep patterns, stress, mental health issues, and annoyance. While annoyance is a subjective measurement, several multinational studies have demonstrated that there is a well-established dose-response relationship between annoyance and community noise. Lastly, noise also has a significant impact on child health. Children in noisy environments are more likely to

perform poorly in school with decreased reading comprehension and difficulty concentrating.<sup>140</sup>

### **Assessment**

Many parts of Pioneer Square likely exceed the recommended safe threshold of community noise. Roadway noise is the chief contributor to chronic noise in Pioneer Square and this will likely get worse with the new seven-lane highway on Alaskan Way. Common roadway noise abatement strategies such as constructing sound barriers or berms are not feasible in Pioneer Square. We recommend a multi-pronged approach toward noise control that addresses: source control, land use planning and control, and receiver control.

### **Recommendations**

1. The Alliance should consider encouraging developers to incorporate noise-dampening features such as noise-insulating windows, exterior doors and walls and to design housing units with interior courtyards and patios that open to acoustically protected and shielded areas.
2. The Alliance should consider working with WSDOT to advocate for the use of “quiet pavement” such as open-graded friction course (OGFC) on new roadways to minimize tire/road contact noise.
3. The Alliance should consider discussing measures with WSDOT and Metro King County to limit truck traffic or implementation of traffic calming measures around Alaskan Way to reduce transit-related community noise.
4. The Alliance should consider requesting estimates of anticipated noise levels from SDOT or WSDOT to gain accurate estimates of increased noise pollution from the Alaskan Way highway.
5. Alternatively, the Alliance should consider contracting an engineering firm to perform a multimodal noise study using noise-measuring devices, traffic counts, and GIS mapping to characterize noise pollution in greater Pioneer Square. If noise levels exceed 67 dBA during the loudest hour of a day in a residential neighborhood, Pioneer Square could qualify for noise abatement funding.

## **OUTDOOR LIGHTING**

### **Introduction**

Outdoor lighting improves the safety of drivers and pedestrians, adds to the security of neighborhoods, encourages economic development, and helps create a sense of community. Thoughtful use of lighting can transform a space that was dark and underutilized into one that is warm, inviting, and a place of gathering. In Pioneer Square, safety remains a major concern for community members. The Pioneer Square Active Streets Strategy recommends improvements to street and alley lighting in order to increase walkability and a feeling of safety in the neighborhood.

Effective outdoor lighting should provide a constant and uniform level of light that avoids bright spots and shadows. Also, it should deliver the appropriate illuminance, or intensity of light falling on a surface. Illuminance can be measured vertically, where the effects of downward shining light are desired, and in horizontal planes where it can lead to glare. Glare is one form of light pollution, along with over-illumination (illuminance

in excess of what is needed for a given activity), light trespass (unwanted light that spills into unintended areas), and sky glow (the bright halo that surrounds an urban area at night). The National Park Service estimates that 50% of light from an average unshielded light fixture is wasted and shines upward.<sup>141</sup>

### **Baseline Data**

The City of Seattle is converting street lighting from high-pressure sodium lights (HPS) to LED (light emitting diodes) lights. They estimate that energy consumption will decrease by 48-62% and result in lower maintenance costs.<sup>142</sup> LEDs are expected to have a field life that is 3-4 times that of HPS lights and are less susceptible to malfunction due to vibration. This will reduce greenhouse gas emissions (manufacturing, electricity to illuminate LEDs, and fewer service trips) and save the City \$2.4 million a year in energy and maintenance costs.

Pioneer Square is in the midst of a transition from HPS to LED fixtures. The photo below shows Occidental Park at night where approximately half of the luminaires are LED (evidence by the cool white glow) and half are still HPS (yellow glow) (See Figure 13). The three-globe Chief Seattle bronze base light fixture is the approved standard light fixture in Pioneer Square. While the Chief Seattle luminaire has clear aesthetic appeal, globe lighting distributes light poorly and produces a significant amount of glare and unwanted light directed upward and in horizontal planes (See Figures 14 and 15).



**Figure 13: Occidental Park**

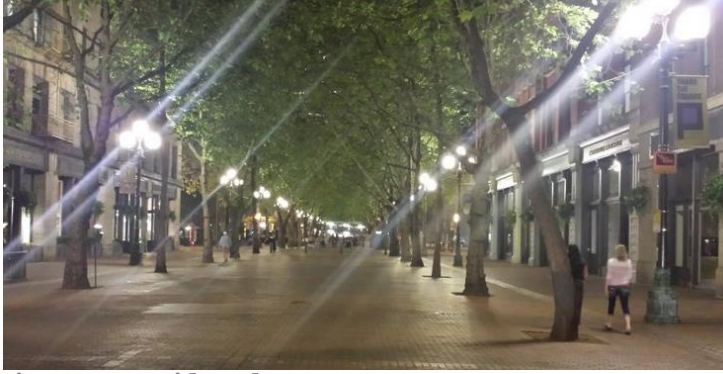


Figure 14: Occidental Avenue

Another key priority of the Active Streets Strategy includes activation of the neighborhood’s history alleyways. The Alley Corridor Project will transform alleys from dark, unpleasant, and dumpster-filled passageways into appealing pedestrian spaces using a number of mechanisms, including resurfacing of the alleys and making significant low-impact lighting improvements. These spaces will be equipped with overhead LED string lighting, LED strip or Tivoli lighting, and wall-mounted shielded accent lighting.

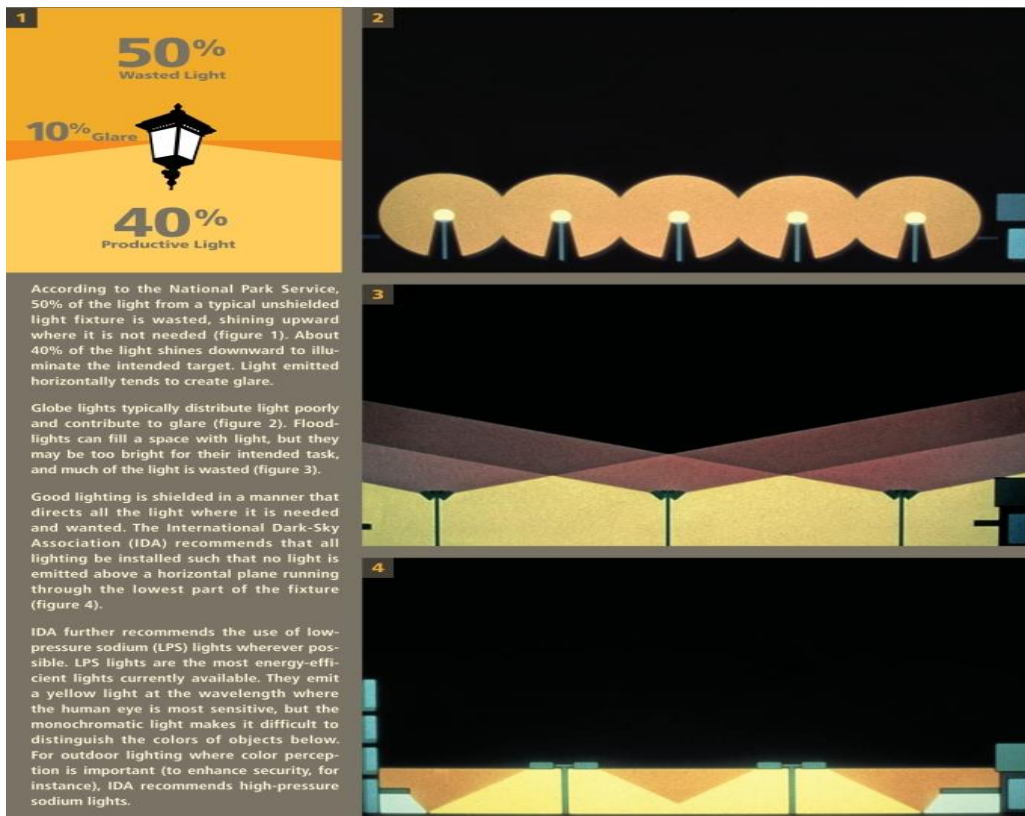


Figure 15: How Outdoor Lighting Translates into Light Pollution. Source: Chepesuik R. Environmental Health Perspectives (2009)

1. Distribution of a typical unshielded light fixture. 2. Unwanted light from globe lighting. 3. Floodlights can create uniform light, but it may be too bright and wastes light that escapes upward. 4. Example of good lighting that is shielded so that light is not emitted above the horizontal plane of the light fixture.



## Health Outcomes

Much of the research on adverse health effects has focused on indoor nighttime artificial light, typically in night shift workers. In 2007, the International Agency for Research on Cancer declared that night shift work was a “probable human carcinogen.”<sup>143</sup> The evidence on the health effects of *outdoor* light pollution is scant. We know that circadian rhythms are primarily regulated by light, or optical radiation. Circadian rhythms are most sensitive to short-wave blue light, and disruptions in circadian rhythm can lead to neuroendocrine, psychological, and other physiological effects.<sup>144</sup> It is still unclear if there is a cause-effect relationship between nighttime outdoor light and disease, or what role light plays relative to other risk factors (stress, obesity, diet, etc.) on human health. Street lighting also has indirect human health effects as it consumes electricity and energy generation produces greenhouse gases with known adverse health effects such as respiratory and cardiovascular disease.

## Assessment

Optimizing outdoor street lighting is a priority for Pioneer Square and can be associated with an increased sense of safety and community. However, street lighting is just one component of a multifaceted approach to neighborhood safety. Studies linking increased street lighting in isolation with crime rate reduction are inconclusive. More lighting is not necessarily better as this can be a costly intervention and increase outdoor light pollution, an exposure whose potential adverse health effects are not well understood. Rather, we recommend the judicious use of street lamps that maximize light uniformity and illuminate their intended target at the appropriate intensity. Unfortunately, the signature globe lighting that is characteristic to Pioneer Square is also a major source of glare and light trespass in the neighborhood. Also, Pioneer Square is in the middle of converting all of its globe lighting from the high-pressure sodium bulbs it has used for decades to new LED fixtures with different photometric behavior.

## Recommendations

1. The Alliance should consider collaborating with the Pioneer Square Preservation Board to ensure that new, approved lighting fixtures are shielded downward to reduce glare and minimizes upward, wasted light.
2. The Alliance should consider working with storeowners to maximize street-level lighting by encouraging businesses to keep their storefronts lit to draw in pedestrians. Consider working with owners to establish a curfew for when street-level business lighting should turn off.
3. The Alliance should consider working with Seattle City Light streetlight engineers or DKS Associates (consulting firm that performed the pilot LED streetlight assessment) to perform field photometric performance evaluations to optimize illuminance and uniformity in along 1<sup>st</sup> Avenue, Occidental Avenue, and in Occidental Park.

## EXISTING AND FUTURE BUILDING DEVELOPMENT

### Introduction

The Pioneer Square Revitalization Committee’s strategy for Pioneer Square includes some improvements to the building development within the neighborhood. These recommendations include a variety of scales from increasing residential development

through encouraging small infill projects, engaging property owners to improve the appearance and upkeep of buildings within the neighborhood and to restore covered clearstory windows.

### Baseline Data

Currently 90% of the housing located within Pioneer Square is occupied, leaving only 10% of the available housing vacant, and only 4% of the housing is available for rent. Much of the rental housing in Pioneer Square is targeted towards the formerly homeless or people living off of a small salary. Of the existing stock of rental housing, 31.6% of it is rented for \$0-\$199 (See Figure 16). The second largest group, making up 14.8% of rental units, is rented for \$200-\$399.

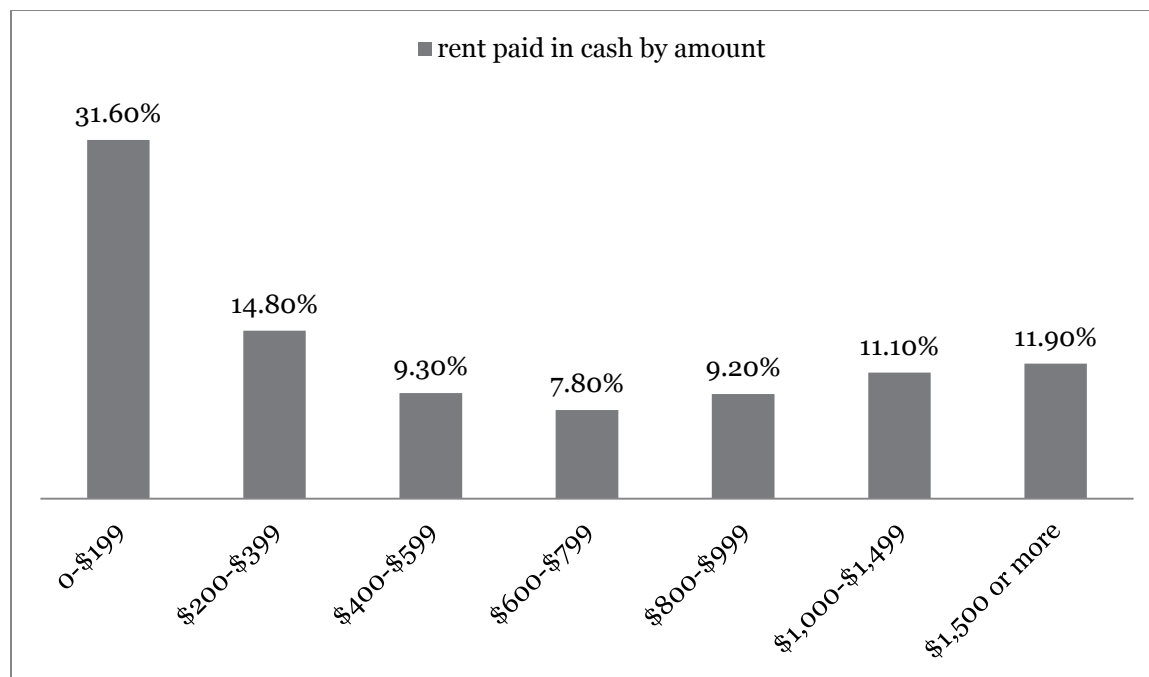


Figure 16: Percentage of Rent Paid in Pioneer Square by Amount

The bulk of the housing stock in Pioneer Square (76.2%) was built in 1939 or earlier. The historic building stock is an attractive asset to the neighborhood. Seventy eight percent of the existing buildings contain over 20 units in each building, leading to a dense neighborhood. Due to the low rate of apartments for rent, new buildings will need to be built in order to provide more housing within Pioneer Square.

### Health Outcomes

Families who spend 50% or more of their salary on housing have less money available to spend, limiting access to other necessities such as health care and healthy food. A study in Boston found that children who grew up in housing without subsidies had a greater chance of having iron deficiencies as compared to those who lived in subsidized and more affordable housing.

The development of vacant lots within the District could potentially bring more housing options into Pioneer Square. It would be beneficial for the Pioneer Square Revitalization Plan to aim to make at least 30% of new units available to residents at the 80% AMI level. This could potentially make it affordable for some current residents to stay within the neighborhood, as well as attracting additional residents. Studies have shown that moving out of impoverished communities can be difficult and have poor health outcomes. These communities have less contact and potential to network with people who have a higher income or are more socially mobile. Being forced to leave a neighborhood can lead to a breakdown in social cohesion within the community.<sup>145</sup> Providing more low income and market rate housing options in Pioneer Square could allow for an opportunity for there to be a greater contact between low and middle income residents. Providing a wider range of housing options in a neighborhood would also allow residents to benefit from the proximity to services that are already present in the neighborhood.<sup>146</sup>

Constructing new buildings in current vacant and parking lots presents an opportunity to construct buildings that are healthy for occupants. The design and conditions of housing has a high correlation with the health of occupants. Toxic substances in building materials can lead to chronic health problems for occupants. Some of the potential substances include volatile organic compounds (VOCs), which can be found in building materials like particle board and which are associated with asthma and sick building syndrome.<sup>147</sup> Ensuring adequate insulation in buildings can have positive health outcomes for occupants. Living in a home that is too cold has a correlation with an increase in asthma rates along with a rise in blood pressure in the elderly.<sup>148</sup>

Within old buildings, exposure to lead from lead paint can lead to neurodevelopmental abnormalities and there is evidence associating lead exposure to hypertension. When exposed to lead in a long term study, children were found to get lower grades in high school than their peers, lower vocabulary and grammatical-reasoning, poorer hand-eye coordination and longer reaction times.<sup>149</sup> Within existing buildings there is also a risk of exposure to asbestos. Deteriorating insulation containing asbestos exposes residents to chemicals within the material. Asbestos has links to causing lung cancer.<sup>150</sup> Potential allergens within historic homes can also include non-built items like pests including mice and cockroaches.<sup>151</sup>

## **Recommendations**

1. The Alliance should work with developers to advocate for the use of healthy building materials. A toolkit can be found at:  
<http://transparency.perkinswill.com/default.cshtml?url=/>

## **PUBLIC SPACE AND GREENSPACE**

### **Introduction**

Access to quality green and public spaces has documented positive influences on mental, physical, and social health. The Pioneer Square neighborhood has a variety of green and public spaces that have the potential to support community health and well-being if well designed and maintained. The proposed plan highlights priorities for enhancing public

spaces in the neighborhood.<sup>152</sup> The Alliance for Pioneer Square has initiated a range of efforts to realize these priorities, which may positively influence social and physical health in the community. Additional health benefits may be realized through innovative approaches to increasing the green space in the neighborhood.

### **Baseline Data**

The study area has five city parks and one pedestrian street: Waterfall Garden park; City Hall Park; Occidental Park; Pioneer Square park; Prefontaine Park; and Occidental Avenue.

### **Health Outcomes**

The quality of accessible green and public spaces provides important mental, physical, and social health benefits. Mental health is defined as “a state in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community.”<sup>153</sup>

Urban environments are replete with stressors that exacerbate mental fatigue, such as traffic, noise, and congestion. Various studies have documented that direct and indirect, short and long-duration contact with nature positively influences mental health by reducing mental fatigue and stress, improving productivity and concentration, decreasing irritability and aggression, and increasing the likelihood of social connections within a community.<sup>154</sup> Contact with nature also provides physiological and emotional benefits by helping to reduce stress as measured by improvements in blood pressure, heart rate, skin conductance, muscle tension, and mood.<sup>155</sup>

Attractive public spaces that accommodate a variety of activities increase social capital, encourage active transport and recreation, and lead to more active public areas.<sup>156</sup> Social capital is defined as “the social networks and interactions that inspire trust and reciprocity among citizens.”<sup>157</sup> Even modest improvements to the built environment, such as exposure to trees and green space, can contribute to a range of positive social and behavioral outcomes, such as greater social cohesion, a sense of safety, a decrease in violence, and an increase in self-discipline.<sup>158</sup> Safe green spaces encourage direct interaction among neighbors and have been shown to improve social connection and a sense of community.<sup>159</sup> A positive emotional connection to a physical place, or place attachment, is a predictor of healthy community.<sup>160</sup> A positive emotional attachment to place, such as neighborhood, increases likelihood of community engagement.

### **Assessment**

The Plan notes a concern for the number of social service clients, homeless, and illicit activity in the neighborhood public spaces. The Plan identifies various needs relating to improving the quality of public spaces within the neighborhood:

- Activate public and unused spaces;
- Enhance the streetscape environment;
- Improve the pedestrian experience;
- Cultivate stewardship for and civil behavior in public spaces.

Progress to date that addresses the needs relating to improving the quality of public spaces within the neighborhood as identified in the Plan include:

- City approval of the Livable South Downtown Plan in 2011;
- Partnerships with various organizations to create more pedestrian friendly and usable green ways in the neighborhood, including the Center City Parks for Occidental Square Park Activation, the Downtown Seattle Association/Metropolitan Improvement District on neighborhood clean and safe activities, and the Alley Network;
- Collaboration with the Seattle Department of Transportation's Public Space Management Program;
- Implementation of the recreational and interpretative Trail to Treasures program that highlights the neighborhood's history.

The proposed plan does not specifically identify the need or existing initiatives to increase the amount of greenspace within the neighborhood. Efforts to improve streetscapes and alleys may result in expanding greenspace. However, the survey of the street and public space environments conducted in 2013 identifies how to activate and enhance the quality of public spaces in the community and may expand the amount of nature in the neighborhood.<sup>161</sup> Of the recommendations outlined in the assessment, several would positively impact the quality of green and public spaces: improve maintenance of streets and public spaces to foster a welcoming and attractive neighborhood; integrate green infrastructure such as trees and vegetation to create inviting streetscapes; continue to expand outdoor cafe seating, particularly in key high-traffic areas; improve building facades to enhance the pedestrian experience and attract visitors; encourage street vending to activate streets; enhance the aesthetics and public activities in alleys.

### Recommendations

The following recommendations focus on continuing efforts to improve and activate public spaces and to introduce innovative approaches to increasing green space throughout the neighborhood to provide additional health benefits.

1. The Alliance should consider implementing the *Pioneer Square Active Living Streets Strategy* recommendation to increase outdoor seating in priority areas: 1<sup>st</sup> Avenue S., south of S. Main Street, around Occidental Park and Occidental Mall, and along S. Jackson Street.
2. The Alliance should consider working with business and property owners to ensure green features, such as landscaping or planters with vegetation, will be included in efforts that increase outdoor seating in the priority areas mentioned above.
3. The Alliance should consider coordinating with Seattle Department of Transportation (SDOT) to complete tree planting and canopy cover along prioritized street networks, as detailed in the *Pioneer Square Active Living Streets Strategy*: on the 1<sup>st</sup> Avenue median between S. King St. and Railroad Way S.; on the Occidental median between S. Washington St. and Yesler Way; on the 1<sup>st</sup> Avenue S. median between Cherry St. and Yesler Way; and on the 2<sup>nd</sup> Avenue Extension between Yesler Way and S. Jackson St.

4. The Alliance should consider prioritizing the transit hubs of King Street Station and Pioneer Square Tunnel, including the primary pedestrian networks to these hubs, as areas to activate public space with landscaping and planting, art, spaces for outdoor seating, and public events.
5. The Alliance should consider continuing to expand and enhance the quality of green and public spaces through existing partnerships with the Center City Parks for Occidental Square Park activation and the Alley Network.
6. In partnership with the Pioneer Square Resident's Council, the Alliance should consider establishing street frontage quality criteria that serve to activate the streetscape through building design features and that increase green space and outdoor seating.
7. The Alliance should consider leading a public space activation working-group with businesses, property owners, and residential developments surrounding the area west of the Century Link Stadium on Occidental Avenue S., between S. King Street and Railroad Way South. The working group could develop an implementation plan with short and long-term strategies to enhance the use of public space through outdoor seating, art, public events, food vendors or farmer's markets, and landscaping.



## OVERALL RECOMMENDATIONS

---

### **Access to Social and Community Services**

1. The Alliance should consider requesting the City of Seattle to extend their Medicaid coverage enrollment to homeless populations.
2. The Alliance should consider working with their stakeholders, King County Public Health and Harborview Medical Center to review the needs of healthcare access for homeless populations in Pioneer Square and establish primary prevention to protect homeless people and residents of Pioneer Square.
3. The Alliance for Pioneer Square should consider may consider recruiting an appropriate grocery store using the Nutrition Environment Measures Survey in Stores tool (NEMS-S).
4. The Alliance for Pioneer Square should consider promoting the existing Pike Place Express Market in Occidental Park explicitly as part of their 2015 strategy plan to increase economic development.
5. The Alliance should consider working with stakeholders to provide a public toilet in the heart of Pioneer Square.

### **Social and Economic Issues**

6. The Alliance should consider proactively supporting the implementation and further development of living-wage policies and legislation.
7. The Alliance should consider advocating to stakeholders and service providers to support the expansion of worker training programs to increase access to higher paying work.
8. The Alliance should consider advocating for the use of CPTED in the construction of new and existing buildings, and alleys in Pioneer Square.
9. The Alliances should consider encouraging developers to include affordable housing units in all new developments in the neighborhood.
10. The Alliance should consider recommending that service providers be consulted by the Alliance in the early planning stages of renovated public spaces through outreach letters, email updates, and public engagement through multiple open community meetings.

### **Mobility**

11. The Alliance should consider improving the visibility of the recreational and interpretive trail and other “specialty walks,” with emphasis on connection to other neighborhoods and destinations such as the International District, Pike Place Market, Downtown, First Hill, Duwamish River and West Seattle, etc.

12. The Alliance should consider coordinating with Seattle's Bike Sharing initiative to increase bike-sharing stations in Pioneer Square.
13. The Alliance should consider continuing the expansion of bike lanes and pedestrian sidewalks in coordination with SDOT *Way to Go* programs. Implementations need to include assessment of pedestrian and bicyclists' comfort level by identifying discontinuities to circulation.
14. The Alliance should consider working with the City of Seattle, SDOT, and King County Metro to install various signs as way finding tools for current and potential transit users.
15. To mitigate potential harmful impacts of the seven-lane roadway and increase pedestrian safety, the Alliance should consider working with WSDOT to build wide sidewalks (10 feet or greater), prohibit street parking, and promote active streets with shops and events along the waterfront.

### **Environmental Health**

16. The Alliance should consider incorporating green infrastructure or landscaping designs into the proposed plan that maximize the use of trees, shrubs, grass, and hanging plants in outdoor spaces to detoxify and sequester pollutants in air and water.
17. The Alliance should consider collaborating with partners to prioritize roadway designs and transit options that minimize opportunities for diesel exhaust emissions, vehicle startup, idling and traffic congestion, while simultaneously protecting pedestrian safety.
18. The Alliance should consider encouraging developers to incorporate noise-dampening features such as noise-insulating windows, exterior doors and walls and to design housing units with interior courtyards and patios that open to acoustically protected and shielded areas.
19. The Alliance should consider discussing measures with WSDOT and Metro King County to limit truck traffic or implementation of traffic calming measures around Alaskan Way to reduce transit-related community noise.
20. The Alliance should work with developers to advocate for the use of healthy building materials.

## CONCLUSION

---

The “Strategy for Seattle’s First Neighborhood” designed by the Alliance for Pioneer Square in 2010 sets forth exciting possibilities for developing Pioneer Square’s assets while maintaining the historic district’s unique features. Placing continued thoughtful attention on the potential impacts of the plan will support the improvement of the health of the neighborhoods’ current and future residents, business owners, and visitors.

As Urban Planning and Public Health Master students at the University of Washington, we bring a unique perspective to evaluate the Strategy and to fill a gap in the research that has already been done by the Alliance and their partners. Conducting this HIA with the Alliance for Pioneer Square has allowed important research to be completed in the areas of: access to social and community services; social and economic issues; mobility and multi-modal transportation access; and environmental health. We have explored the potential changes that may occur in the neighborhood as a result of the proposals put forward in the Alliance for Pioneer Square’s Strategy; looked at the connections of the proposal with health outcomes; and developed recommendations for the Alliance moving forward. Our hope and intention with our recommendations is to enhance the positive health impacts of the proposals while mitigating any potential undesirable outcomes, and to address any inequitable distribution in these potential benefits or negative impacts.

### Limitations

We have spent ten weeks learning the HIA tool from faculty experts and applying our lessons directly to the Strategy put forward by the Alliance. However, there are limitations in our project that must be acknowledged. First, this is the first HIA project that most of us have participated in, which means the HIA is limited by our inexperience with the tool. Further, we have conducted the HIA in a very short time frame, which limits the amount of community involvement and depth of research we have been able to complete. Ideally, more community involvement and feedback at each step of our assessment process would make the project more complete.

### Next Steps

There are additional steps involved in the HIA process that must be considered: monitoring and evaluating the HIA. Monitoring the impacts of an HIA is an important final step in any assessment document itself. Monitoring includes:

- Tracking the effect of the recommendations offered in the HIA on the decision-making process
- Monitoring the implementation of the recommendations going forward
- Assessing the health outcomes of the project, both to evaluate the outcomes specifically resulting from the project itself and to test the validity of the HIA

Evaluation involves looking at the HIA process itself to answer the following questions:

- Were stakeholders engaged in the process?
- Were all of the necessary areas of health explored?
- Did the HIA include both positive and negative impacts of the project?

- Was the research on the baseline data and connections with health both sufficient and high quality?

Due to the short timeline of our project, we are unable to complete the monitoring and evaluating portions of the HIA, making it valuable for the Alliance for Pioneer Square and their partners to continue the work of seeking evaluation of their proposals as they are implemented. This HIA can help offer guidance to the Alliance for Pioneer Square as it moves forward in updating their “Strategy for Seattle’s First Neighborhood” and as they make changes for the betterment of the conditions in Pioneer Square.

## REFERENCES

---

- <sup>1</sup> "Crime Prevention through Environmental Design," (2007):30-38, <http://www.hpw.qld.gov.au/SiteCollectionDocuments/CPTEDPartA.pdf>
- <sup>2</sup> Human Impact Partners. "Primary Menu." Human Impact Partners. Accessed May 29, 2014. <http://www.humanimpact.org/new-to-hia/faq/>.
- <sup>3</sup> The Pioneer Square Revitalization Committee. Pioneer Square 2015: A Strategy for Seattle's First Neighborhood. PDF. Seattle, Washington, June 2010.
- <sup>4</sup> "Historic Districts | Department of Neighborhoods." Historic Districts | Department of Neighborhoods. Accessed May 29, 2014. <http://www.seattle.gov/neighborhoods/preservation/pioneersquare.htm>.
- <sup>5</sup> ESRI 2010; "2011 Downtown Demographics Report: The Changing Face of Downtown Seattle" 2011
- <sup>6</sup> ESRI 2010; "2011 Downtown Demographics Report: The Changing Face of Downtown Seattle" 2011
- <sup>7</sup> Human Impact Partners. "Primary Menu." Human Impact Partners. Accessed May 29, 2014. <http://www.humanimpact.org/new-to-hia/faq/>.
- <sup>8</sup> Zahid Ansari, James N. Laditka, and Sarah B. Laditka, "Access to Health Care and Hospitalization for Ambulatory Care Sensitive Conditions," *Medical Care Research and Review* 63 (2006): 721, doi: 10.1177/1077558706293637.
- <sup>9</sup> Ibid.
- <sup>10</sup> Thomas A Arcury et al. "The Effects of Geography and Spatial Behavior on Health Care Utilization among the Residents of a Rural Region," *Health Services Research* 40(2005): 138, doi: 10.1111/j.1475-6773.2005.00346.x.
- <sup>11</sup> Ibid., 146.
- <sup>12</sup> Ibid., 148-150.
- <sup>13</sup> TP O'Toole et al. Primary Care-Special Populations Treatment Team. "Building Care Systems to Improve Access for High-Risk and Vulnerable Veteran Populations." *Journal of General Internal Medicine* 26 Suppl 2 (2011): 683-8. doi: 10.1007/s11606-011-1818-2
- <sup>14</sup> D. S. Morrison. "Homelessness as an Independent Risk Factor for Mortality: Results from a Retrospective Cohort Study." *International Journal of Epidemiology* 38, no. 3 (2009): 877-83. doi: 10.1093/ije/dyp160
  
- C Zlotnick and S Zerger. "Survey Findings on Characteristics and Health Status of Clients Treated by the Federally Funded (Us) Health Care for the Homeless Programs." *Health Social Care Community* 17, no. 1 (2009): 18-26. doi: 0.1111/j.1365-2524.2008.00793
- <sup>15</sup> A J Lam and R Rosenheck. "Social Support and Service Use among Homeless Persons with Serious Mental Illness." *International Journal of Social Psychiatry* 45, no. 1 (1999): 13-28. doi: 10.1177/002076409904500103
- <sup>16</sup> Barr, Heather. Interview with Ichiko Lisbin. Personal interview. Seattle June 4, 2014.
- <sup>17</sup> Ibid.
- <sup>18</sup> "Crisis Clinic". Accessed May 25, 2014, [www.crisisclinic.org/Brochures.html](http://www.crisisclinic.org/Brochures.html).
- <sup>19</sup> World Food Summit. Rome Declaration on World Food Security. 11-13-1996
- <sup>20</sup> Katherine Ryan, "Map the Meal Gap 2014," *Food Lifeline*, 25 May 2012, <https://foodlifeline.org/blog/201404/21-map-meal-gap-2014>.
- <sup>21</sup> JN Bodor, D Rose, TA Farley, C Saim, and SK Scott. "Neighbourhood fruit and vegetable availability and consumption the role of small food stores in an urban environment," *Public Health Nutrition* 11, (2008): p. 413-420.
- <sup>22</sup> J.N Bodor, et al. "The association between obesity and urban food environments," *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 87(5) (2010), p. 11.
- <sup>23</sup> Y Heath. "Evaluating the effect of therapeutic gardens," *Am J Alzheimers Dis Other Demen.* 19 (2004):239-242.
- <sup>24</sup> M Page, "Gardening as a therapeutic intervention in mental health," *Nurs Times* 104, (2008): 28-30.
- <sup>25</sup> JS Litt, MJ Soobader, MS Turbin, JW Hale, M Buchenau, and JA Marshall. "The influence of social involvement, neighborhood aesthetics, and community garden participation on fruit and vegetable consumption," *American Journal of Public Health* 101 (8) (2011): 1466-73.
- <sup>26</sup> JS Litt, MJ Soobader, MS Turbin, JW Hale, M Buchenau, and JA Marshall. "The influence of social involvement, neighborhood aesthetics, and community garden participation on fruit and vegetable consumption," *American Journal of Public Health.* 101 (8) (2011): 1466-73.

- 
- <sup>27</sup> K Alaimo, E Packnett, RA Miles, and DJ Kruger. "Fruit and vegetable intake among urban community gardeners," *J Nutr Educ Behav.* 40 (2008): 94-101.
- <sup>28</sup> KM Jetter and DL Cassady, "Increasing Fresh Fruit and Vegetable Availability in a Low-Income Neighborhood Convenience Store: A Pilot Study," *Health Promotion Practice.* 11(5) (2009): p. 694-702.
- <sup>29</sup> Chuck Clarke, "Evaluation of Seattle's Automated Toilet (APT) Program" *Memo to Council President Richard Colin*, Last modified March 17, 2008:1-2.  
<https://www.google.com/#q=Evaluation+of+seattle+automated+public+toilet>.
- <sup>30</sup> "Drago, Licata, Conlin Welcome Automated Restrooms." *Seattle City Council* 2004, Accessed May 27, 2014, <http://www.seattle.gov/council/newsdetail.asp?ID=4148&Dept=28>.
- <sup>31</sup> Chuck Clark. "Evaluation of Seattle's Automated Toilet (APT) Program" *Memo to Council President Richard Colin*, Last modified March 17, 2008:1-2  
<https://www.google.com/#q=Evaluation+of+seattle+automated+public+toilet>.
- <sup>32</sup> Noelene Clark. "Seattle's \$5 Million Automated Public Toilets Sold for \$12,000." *The Seattle Times*. Last modified 2008. [http://seattletimes.com/html/localnews/2008117767\\_toilets15mo.html](http://seattletimes.com/html/localnews/2008117767_toilets15mo.html).
- <sup>33</sup> "Seattle's Transit Hub," *Alliance for Pioneer Square*, Information obtained on April 3, 2014.
- <sup>34</sup> ESRI, Economic Data Report, Pioneer Square
- <sup>35</sup> Personal Interview, Peter
- <sup>36</sup> Yen I, and Bhatia R. 2002. How Increasing the Minimum Wage Might Affect the Health Status of San Francisco Residents: A Discussion of the Links Between Income and Health, Working Paper, February 27, 2002.
- <sup>37</sup> National Academy of Sciences. 2006. Genes, Behavior, and the Social Environment: Moving Beyond the Nature/Nurture Debate. LM Hernandez and DG Blazer, eds. The National Academies Press. Accessed at: [http://orsted.nap.edu/openbook.php?record\\_id=11693&page=25](http://orsted.nap.edu/openbook.php?record_id=11693&page=25).
- <sup>38</sup> Cornwall A, Gaventa J. 2001. From Users and Choosers to Makers and Shapers: Repositioning Participation in Social Policy. Working Paper 127 Sussex: Institute of Development Studies.
- <sup>39</sup> Jin RL, Shah CP, Svoboda TJ. 1995 The impact of unemployment on health: a review of the evidence. *The Journal of the Canadian Medical Association* 153:529-540.
- <sup>40</sup> Institute of Medicine. Committee on the Consequences of Uninsurance. Coverage Matters: Insurance and Health Care (2001), Chapter 3, Who Goes Without Health Insurance? Who Is Most Likely to Be Uninsured? Available at: [http://www.nap.edu/html/coverage\\_matters/ch3.html](http://www.nap.edu/html/coverage_matters/ch3.html).
- <sup>41</sup> Institute of Medicine, 2004. Project on the Consequences of Uninsurance: An Overview. <http://www.iom.edu/Object.File/Master/17/736/Fact%20sheet%20overview.pdf>.
- <sup>42</sup> Institute of Medicine, 2004. Project on the Consequences of Uninsurance: An Overview. <http://www.iom.edu/Object.File/Master/17/736/Fact%20sheet%20overview.pdf>.
- <sup>43</sup> "Crime Statistics Frequently Asked Questions," Seattle Police Department, Accessed May 30<sup>th</sup>, 2014: <http://www.seattle.gov/police/crime/faq.htm>
- <sup>44</sup> Mai Stafford, "Association Between Fear of Crime and Mental Health and Physical Function," *American Journal of Public Health* (2007):1, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2040373/pdf/0972076.pdf>
- <sup>45</sup> Lynn C. Todman, Lauren M. Hricisak, Jill E. Fay and J. Sherrod Taylor, "Mental health impact assessment: population mental health in Englewood," *Institute on Social Exclusion, Adler School of Professional Psychology* (2011): 4, <http://www.tandfonline.com/loi/tiap20#.U3rTdstOWUk>
- <sup>46</sup> "Alcohol Impact Area Information and Updates," *Seattle Department of Neighborhoods*, assessed May, 15, 2014: <http://www.seattle.gov/neighborhoods/aia/>

Robert Lipton, Xiaowen Yang, Anthony A. Braga, Jason Goldstick, Manya Newton, and Melissa Rura, "The Geography of Violence, Alcohol Outlets, and Drug Arrests in Boston," *American Journal Of Public Health* (2013) 103, no. 4: 657-664:  
<http://offcampus.lib.washington.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=85525206&site=ehost-live>

Thotnton L. Johnson, Rachel, Caroline M. Fichtenberg, Amerila Greiner, Beth Feingold, Joanthan M. Ellen, Jacky M. Jennings, Madeleine A. Shea, Joseph Schilling, Ralph B. Taylor, David Bishai, Maureen Black, "Zoning For a Healthy Baltimore," *John Hopkins Children's Research Center and Center for Child*



---

and *Community Health Research* (2010): 38-

81, [http://www.hiasociety.org/documents/BaltimoreHIA\\_FullReport.pdf](http://www.hiasociety.org/documents/BaltimoreHIA_FullReport.pdf)

<sup>47</sup> Johnson, Terrie. "Personal Interview." Interviewed by Sophia Trinh, Phone Call, June 4, 2014. Crime Prevention Coordinator. Seattle Police Department Crime Prevention Coordinator.

<sup>48</sup> "My Neighborhood Map," *Seattle Police Department*, accessed May 25, 2014, <http://web6.seattle.gov/mnm/statistics.aspx?tabId=3>

<sup>49</sup> Mai Stafford, "Association Between Fear of Crime and Mental Health and Physical Function," *American Journal of Public Health* (2007):1,

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2040373/pdf/0972076.pdf>

<sup>50</sup> Lynn C. Todman, Lauren M. Hricisak, Jill E. Fay and J. Sherrod Taylor, "Mental health impact assessment: population mental health in Englewood," *Institute on Social Exclusion, Adler School of Professional Psychology* (2011): 5, <http://www.tandfonline.com/loi/tiap20#.U3rTdstOWUk>

"My Neighborhood Map," *Seattle Police Department*, accessed May 25, 2014, <http://web6.seattle.gov/mnm/statistics.aspx?tabId=3>

Mai Stafford, "Association Between Fear of Crime and Mental Health and Physical Function," *American Journal of Public Health* (2007):1-6,

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2040373/pdf/0972076.pdf>

<sup>51</sup> Eugenia C Garvin, Caroln C Cannuscio, Charles C Branas, "Greening Vacant Lots to Reduce Crime," *Injury Prevention* (2012):1-

7 <http://injuryprevention.bmj.com.offcampus.lib.washington.edu/content/19/3/198.full.pdf+html?sid=c60f0fb5-67c5-4cfb-a756-d705534984f1>

John Accordino, and Gary T. Johnson, "Addressing the vacant and abandoned property problem." *Journal Of Urban Affairs* 22, no. 3 (2000):

<sup>52</sup> Ranasinghe, "Jane Jacobs' framing of public disorder and its relation to the 'broken windows' theory," *Theoretical Criminology*. 16 (1) (2012): 63-84,

<http://uwashington.worldcat.org.offcampus.lib.washington.edu/oclc/779958696>

<sup>53</sup> "Vacant Buildings," *Department of Planning and Development*, accessed May 5<sup>th</sup>,

2014, <http://www.seattle.gov/dpd/codesrules/commonquestions/vacantbuildings/default.htm>

<sup>54</sup> Lynn C. Todman, Lauren M. Hricisak, Jill E. Fay and J. Sherrod Taylor, "Mental health impact assessment: population mental health in Englewood," *Institute on Social Exclusion, Adler School of Professional Psychology* (2011): 4, <http://www.tandfonline.com/loi/tiap20#.U3rTdstOWUk>

<sup>55</sup> Lin Cui, "Foreclosure, Vacancy, and Crime," *Department of Economics University Pittsburgh* (2010):1-24, [http://www.ewi-](http://www.ewi-ssl.pitt.edu/econ/files/faculty/wp/Lin_Foreclosure.%20Vacancy%20and%20Crime.pdf)

[ssl.pitt.edu/econ/files/faculty/wp/Lin\\_Foreclosure.%20Vacancy%20and%20Crime.pdf](http://www.ewi-ssl.pitt.edu/econ/files/faculty/wp/Lin_Foreclosure.%20Vacancy%20and%20Crime.pdf)

<sup>56</sup> Bethaney Turner, Joanna Henryks, and David Pearson, "Community gardens: sustainability, health and inclusion in the city," *Local Environment* 16, no. 6 (2011): 489-

492; <http://offcampus.lib.washington.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=63295821&site=ehost-live>

Jeffrey Pickens, "Community Based Participatory Research on Youth Violence Prevention," *Journal Of Multidisciplinary Research (1947-2900)* 3, no. 3 (2011): 14-

15, <http://offcampus.lib.washington.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=71701536&site=ehost-live>

<sup>57</sup> John Byrne, "Designing Safer Cities: CPTED," *Geodate* 23, no. 4 (2010): 6-9:

<http://uwashington.worldcat.org.offcampus.lib.washington.edu/oclc/459406112>

<sup>58</sup> Sherry Plaster Carter, Stanley L. Carter, and Andrew L. Dannenberg, "Zoning Out Crime and Improving Community Health in Sarasota, Florida: Crime Prevention Through Environmental Design," *American Journal Of Public Health* (2003) 93, no. 9: 1442-1445,

<http://offcampus.lib.washington.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=10736848&site=ehost-live>

- 
- <sup>59</sup> Majora Carter, "Greening the Ghetto," *Anglican Theological Review* (2009): 601-605, <http://offcampus.lib.washington.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=47421986&site=ehost-live>
- <sup>60</sup> Simon Hensworth, "Designing to Prevent Crime," *Architecture Australia* 97, no. 2 (2008): 111, <http://offcampus.lib.washington.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=31717730&site=ehost-live>
- <sup>61</sup> Simon Hensworth, "Designing to Prevent Crime," *Architecture Australia* 97, no. 2: 111, <http://web.b.ebscohost.com/offcampus.lib.washington.edu/ehost/detail?sid=edcdcc41-ec55-408b-9cdc-7ee72739f1a6%40sessionmgr112&vid=1&hid=114&bddata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=f5h&AN=31717730>
- <sup>62</sup> "Pioneer Square 2015: A Strategy for Seattle's First Neighborhood," *The Pioneer Square Revitalization Committee* (2010):13, [http://www.seattle.gov/economicdevelopment/pdf\\_files/Pioneer%20Square%202015%20Complete%20Report%206-2010.pdf](http://www.seattle.gov/economicdevelopment/pdf_files/Pioneer%20Square%202015%20Complete%20Report%206-2010.pdf)
- <sup>63</sup> Mary Fialko and Hampton, Jennifer, "Seattle Integrated Alley Handbook," (2011):1-29, [http://greenfutures.washington.edu/pdf/ActivatingAlleys\\_2011.pdf](http://greenfutures.washington.edu/pdf/ActivatingAlleys_2011.pdf)
- <sup>64</sup> "2010 World Cup," *Alley Network Project*, accessed May 31, 2014, <https://www.flickr.com/photos/67269485@N03/7309471834/in/set-72157629986278500/>
- <sup>65</sup> Eugenia C Garvin, Caroln C Cannuscio, Charles C Branas, "Greening Vacant Lots to Reduce Crime," *Injury Prevention* (2012):1-7, <http://injuryprevention.bmj.com.offcampus.lib.washington.edu/content/19/3/198.full.pdf+html?sid=c60f0fb5-67c5-4cfb-a756-d705534984f1>
- Christine Hoehner, Jodi Rois, Christina Gamedia, Sabrina Baldwin, Carolyn Lesorogol, Cheryl Kelly, Gena Gunn McClendon, Donna-Mae Knights, "Page Avenue Health Impact Assessment," 6, <http://www.healthimpactproject.org/resources/document/page-avenue-revitalization.pdf>
- Eric P Baumer, Kevin T. Wolff, and Ashley N. Arnio, "A Multicity Neighborhood Analysis of Foreclosure and Crime A Multicity Neighborhood Analysis of Foreclosure and Crime," *Social Science Quarterly* 93, no. 3 (2012): 577-601,
- <sup>66</sup> "Pioneer Square 2015: A Strategy for Seattle's First Neighborhood," *The Pioneer Square Revitalization Committee* (2010):14, [http://www.seattle.gov/economicdevelopment/pdf\\_files/Pioneer%20Square%202015%20Complete%20Report%206-2010.pdf](http://www.seattle.gov/economicdevelopment/pdf_files/Pioneer%20Square%202015%20Complete%20Report%206-2010.pdf)
- "Crime Prevention through Environmental Design," (2007):30-38, <http://www.hpw.qld.gov.au/SiteCollectionDocuments/CPTEDPartA.pdf>
- <sup>67</sup> City of Seattle Office of Housing. 2014. "Land Use Code Incentives." *Seattle.gov*.
- <sup>68</sup> ESRI. 2010. "Census 2010 Summary Profile." file:///Users/sammanne/Documents/Grad School/Courses/HIA/Pio Sq/HIA\_demographics\_pio sq.pdf.
- <sup>69</sup> Frumkin, Howard. 2002. "Urban Sprawl and Public Health." *Public Health Reports (Washington, D.C. : 1974)* 117 (3): 201-17. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1497432&tool=pmcentrez&rendertype=abstract>.
- <sup>70</sup> Public Health Advisory Committee. 2004. "A Guide to Health Impact Assessment: A Policy Tool for New Zealand."
- <sup>71</sup> Canterbury District Health Board. 2006. "Health Impact Assessment: Greater Christchurch Urban Development Strategy Options". Christchurch.
- <sup>72</sup> Daniell, Bill, Linn Gould, and Jonathan Childers. 2013. "Health Impact Assessment: Proposed Cleanup Plan for the Lower Duwamish Waterway Superfund Site Technical Report."
- <sup>73</sup> Ibid.
- <sup>74</sup> Ibid.
- <sup>75</sup> Seattle.gov. 2014. "Seattle City Council Affordable Workforce Housing." <http://www.seattle.gov/council/issues/affordablehousing/default.html>.

---

Levine, Al. 2014. "Personal Interview."

<sup>76</sup> City of Seattle Office of Housing. 2014. "Land Use Code Incentives." *Seattle.gov*.

Schott-Bressler, Kayla. 2014. "Personal Interview". Housing Development Consortium.

Miksch, Ben. 2014. "Personal Interview". Seattle. Washington Low-Income Housing Alliance.

City of Seattle. 2013. "2014 Income and Rent Limits." *Housing and Urban Development*.

[http://www.seattle.gov/housing/development/limits\\_Multifamily.htm](http://www.seattle.gov/housing/development/limits_Multifamily.htm).

<sup>77</sup> Office of Housing. 2014. "Multifamily Property Tax Exemption (MFTE)." *Seattle.gov*.

<http://www.seattle.gov/housing/incentives/mfte.htm>.

<sup>78</sup> Policy Link. 2003. "Inclusionary Zoning."

[http://www.policylink.org/site/c.lkIXLbMNJrE/b.5137027/k.FF49/Inclusionary\\_Zoning.htm](http://www.policylink.org/site/c.lkIXLbMNJrE/b.5137027/k.FF49/Inclusionary_Zoning.htm).

<sup>79</sup> Cradock, Angie L., Ichiro Kawachi, Graham A. Colditz, Steven L. Gortmaker, and Stephen L. Buka.

"Neighborhood Social Cohesion and Youth Participation in Physical Activity in Chicago." *Social Science & Medicine* 68, no. 3 (2009): 427-35. doi:10.1016/j.socscimed.2008.10.028.

<sup>80</sup> "Trail to Treasure." Trail to Treasure. 2013. Accessed May 20, 2014. <http://www.trail2treasure.org/>.

<sup>81</sup> Serageldin, Ismail, Ephim Shluger, and Joan Martin-Brown. *Historic Cities and Sacred Sites: Cultural Roots for Urban Futures*. Washington, D.C.: World Bank, 2001.

<sup>82</sup> Tieg, Ellen, Joy Amulya, Lisa Bardwell, Michael Buchenau, Julie A. Marshall, and Jill S. Litt. "Collective Efficacy in Denver, Colorado: Strengthening Neighborhoods and Health through Community Gardens." *Health & Place*, October 3, 2007, 1115-122.

Hartig, Terry, Richard Mitchell, Sjerp De Vries, and Howard Frumkin. "Nature and Health." *Annual Review of Public Health* 35, no. 1 (January 2, 2014): 207-28.

Vries, Sjerp De, Sonja M.e. Van Dillen, Peter P. Groenewegen, and Peter Spreeuwenberg. "Streetscape Greenery and Health: Stress, Social Cohesion and Physical Activity as Mediators." *Social Science & Medicine* 94 (2013): 26-33. doi:10.1016/j.socscimed.2013.06.030.

Maas, Jolanda, Sonja M.e. Van Dillen, Robert A. Verheij, and Peter P. Groenewegen. "Social Contacts as a Possible Mechanism behind the Relation between Green Space and Health." *Health & Place* 15, no. 2 (September 16, 2008): 586-95.

<sup>83</sup> Berkman, Lisa F. "Social Support, Social Networks, Social Cohesion and Health." *Social Work in Health Care* 31, no. 2 (2000): 3-14. doi:10.1300/Jo10v31n02\_02.

<sup>84</sup> Serageldin, Ismail, Ephim Shluger, and Joan Martin-Brown. *Historic Cities and Sacred Sites: Cultural Roots for Urban Futures*. Washington, D.C.: World Bank, 2001.

<sup>85</sup> "HIA Student with Question regarding Plan." E-mail to Leslie Smith. May 9, 2014.

<sup>86</sup> Moodie, Rob. "The Way We Treat Each Other." *Medical Journal of Australia* 188, no. 8 (April 21, 2008): 477-80.

<sup>87</sup> Mooren, Nora, and Agnes Van Minnen. "Feeling Psychologically Restrained: The Effect of Social Exclusion on Tonic Immobility." *European Journal of Psychotraumatology*, March 13, 2014.

<sup>88</sup> Falk, Emily B., PhD, Christopher N. Cascio, MA, Matthew Brook O'Donnell, PhD, Joshua Carp, PhD, Francis J. Tinney, Jr., C. Raymond Bingham, PhD, Jean T. Shope, PhD, Marie Claude Ouimet, PhD, Anuj K. Pradhan, PhD, and Bruce G. Simons-Morton. "Neural Responses to Exclusion Predict Susceptibility to Social Influence." *Journal of Adolescent Health*, 2014.

<sup>89</sup> Retting, RA et al., "A review of evidence-based traffic engineering measures designed to reduce pedestrian-motor vehicle crashes," *American Journal of Public Health* 93(2003):9, doi: 10.2105/AJPH.93.9.1456

<sup>90</sup> International Sustainability Institute, "Pioneer Square Active Streets Strategy," 2013. Accessed May 15, 2014, <http://isiseattle.org/files/2013/06/Active-Streets-Report-Final.pdf>.

<sup>91</sup> Roberts, I et al., "Effect of environmental factors on risk of injury of child pedestrians by motor vehicles: A case-control study," *BMJ* 310(1995):91, doi: <http://dx.doi.org/10.1136/bmj.310.6972.91>

- 
- <sup>92</sup> Retting, RA et al., “A review of evidence-based traffic engineering measures designed to reduce pedestrian-motor vehicle crashes,” *American Journal of Public Health* 93(2003):9, doi: 10.2105/AJPH.93.9.1456
- <sup>93</sup> Koepsell, T. et al., “Crosswalk markings and the risk of pedestrian-motor vehicle collisions in older pedestrians,” *JAMA* 288(2002):17, doi: 10.1001/jama.288.17.2136.
- <sup>94</sup> Teschke, K. et al., “Route infrastructure and the risk of injuries to bicyclists: A case-crossover study,” *American Journal of Public Health* 102(2012):12, doi: 10.2105/AJPH.2012.300762.
- <sup>95</sup> Wier, M. et al., “An area-level model of vehicle-pedestrian injury collisions with implications for land use and transportation planning,” *Accident Analysis and Prevention* 41(2009):1, doi: <http://dx.doi.org/10.1016/j.aap.2008.10.001>
- <sup>95</sup><http://www.sciencedirect.com/science/article/pii/S0001457508001930>
- <sup>96</sup> Retting, RA et al., “A review of evidence-based traffic engineering measures designed to reduce pedestrian-motor vehicle crashes,” *American Journal of Public Health* 93(2003):9, doi: 10.2105/AJPH.93.9.1456
- <sup>97</sup> Ibid.
- <sup>98</sup> Ibid.
- <sup>99</sup> Pucher, John, and Ralph Buehler. 2008. “Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany.” *Transport Reviews* 28 (4) (July): 495–528. doi:10.1080/01441640701806612. <http://www.tandfonline.com/doi/abs/10.1080/01441640701806612>.
- <sup>100</sup> Committee on Physical Activity Health Transportation and Land Use. 2005. “Does the Built Environment Influence Physical Activity? Examining the Evidence (Special Report ; 282)”. Washington D.C. <http://onlinepubs.trb.org/onlinepubs/sr/sr282.pdf>.
- <sup>101</sup> Berke, Ethan M, Laura M Gottlieb, Anne Vernez Moudon, and Eric B Larson. 2007. “Protective Association between Neighborhood Walkability and Depression in Older Men.” *Journal of the American Geriatrics Society* 55 (4) (April): 526–33. doi:10.1111/j.1532-5415.2007.01108.x. <http://www.ncbi.nlm.nih.gov/pubmed/17397430>.
- Brownson, Ross C, Christine M Hoehner, Kristen Day, Ann Forsyth, and James F Sallis. 2009. “Measuring the Built Environment for Physical Activity: State of the Science.” *American Journal of Preventive Medicine* 36 (4 Suppl) (April): S99–123.e12. doi:10.1016/j.amepre.2009.01.005. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2844244&tool=pmcentrez&rendertype=abstract>.
- <sup>102</sup> Krizek, Kevin J., and Rio W. Roland. 2005. “What Is at the End of the Road? Understanding Discontinuities of on-Street Bicycle Lanes in Urban Settings.” *Transportation Research Part D: Transport and Environment* 10 (1) (January): 55–68. doi:10.1016/j.trd.2004.09.005. <http://www.sciencedirect.com/science/article/pii/S1361920904000628>.
- <sup>103</sup> Humpel, Nancy, Neville Owen, and Eva Leslie. 2002. “Environmental Factors Associated with Adults’ Participation in Physical Activity: A Review.” *American Journal of Preventive Medicine* 22 (3) (April): 188–99. <http://www.ncbi.nlm.nih.gov/pubmed/11897464>.
- <sup>104</sup> Booth, M L, N Owen, A Bauman, O Clavisi, and E Leslie. 2000. “Social-Cognitive and Perceived Environment Influences Associated with Physical Activity in Older Australians.” *Preventive Medicine* 31 (1) (July): 15–22. doi:10.1006/pmed.2000.0661. <http://www.sciencedirect.com/science/article/pii/S0091743500906613>.
- <sup>105</sup> Mindell, J, L Sheridan, M Joffe, H Samson-Barry, and S Atkinson. 2004. “Health Impact Assessment as an Agent of Policy Change: Improving the Health Impacts of the Mayor of London’s Draft Transport Strategy.” *Journal of Epidemiology and Community Health* 58 (3) (March): 169–74. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1732710&tool=pmcentrez&rendertype=abstract>.
- <sup>106</sup> Hess, Daniel. 2002. “Traditional Neighborhoods and Automobile Ownership.” *Transportation Research Record*.
- <sup>107</sup> Pucher, John, Jennifer Dill, and Susan Handy. 2010. “Infrastructure, Programs, and Policies to Increase Bicycling: An International Review.” *Preventive Medicine* 50 Suppl 1 (January): S106–25. doi:10.1016/j.ypmed.2009.07.028. <http://www.ncbi.nlm.nih.gov/pubmed/19765610>.
- <sup>108</sup> International Sustainability Institute, “Pioneer Square Active Streets Strategy” (April 2014): 5.

- 
- <sup>109</sup> Besser, Lilah M. and Andrew L. Dannenberg. "Walking to Public Transit: Steps to Help Meet Physical Activity Recommendations." *American Journal of Preventative Medicine* 29, no. 4 (2005): 273-280.
- <sup>110</sup> Friedman, Michael S., Kenneth E. Powell, Lori Hutwagner, et al. "Impact of Changes in Transportation and Commuting Behaviors During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma." *Journal of the American Medical Association* 285, no. 7 (February 21, 2001): 897-905.
- <sup>111</sup> Evans, Gary. "The Built Environment and Mental Health." *Journal of Urban Health* 80, no. 4 (2003).
- <sup>112</sup> Seattle Department of Transportation. "Center City Connector: City Council Transportation Committee Briefing." (July 9, 2013).  
<http://www.seattle.gov/transportation/docs/Seattle%20CC%20Transit%20Study%20COUNCIL%20July%2009%20Final.pdf>
- <sup>113</sup> Stoši, Ljiljana, Goran Belojevi, And Suzana Milutinovi. "Effects Of Traffic Noise On Sleep In An Urban Population." *Archives Of Industrial Hygiene & Toxicology / Arhiv Za Higijenu Rada I Toksikologiju* 60, No. 3 (September 2009): 335-342. *Academic Search Complete*, EBSCOhost (Accessed May 14, 2014).
- Torre, Giuseppe La, Umberto Moscato, Fulvio La Torre, Paolo Ballini, Simone Marchi, and Walter Ricciardi. 2007. "Environmental Noise Exposure and Population Health: A Cross-Sectional Study in the Province of Rome." *Zeitschrift Fuer Gesundheitswissenschaften/Journal of Public Health* 15 (5): 339-344. doi:<http://dx.doi.org/10.1007/s10389-007-0144-y>.
- <sup>114</sup> Naumann, Rebecca B., Ann M. Dellinger, Tadesse Haileyesus, and George W. Ryan. 2011. "Older adult pedestrian injuries in the United States: causes and contributing circumstances." *International Journal Of Injury Control & Safety Promotion* 18, no. 1: 65-73. *Academic Search Complete*, EBSCOhost (accessed May 21, 2014).
- <sup>115</sup> Allard, Robert. 1983. "Excess Mortality from Traffic Accidents among Elderly Pedestrians Living in the Inner City." *American Journal Of Public Health* 72, no. 8:853. *Business Source Complete*, EBSCOhost (accessed May 21, 2014).
- <sup>116</sup> Lindgren, Anna, Emilie Stroh, Peter Montnemery, Ulf Nihlen, Kristina Jakobsson, and Anna Axmon. 2009. "Traffic-related air pollution associated with prevalence of asthma and COPD/chronic bronchitis. A cross-sectional study in Southern Sweden." *International Journal of Health Geographics* 8, 1-15. *Academic Search Complete*, EBSCOhost (accessed May 18<sup>th</sup>, 2014).
- <sup>117</sup> Williams, Lori A., Cornelia M. Ulrich, Timothy Larson, Mark H. Wener, Brent Wood, Peter T. Campbell, John D. Potter, Anne McTiernan, and Anneclaire J. De Roos. 2009. "Proximity to Traffic, Inflammation, and Immune Function among Women in the Seattle, Washington, Area." *Environmental Health Perspectives* 117, no. 3: 373-378. *Health Source – Consumer Edition*, EBSCOhost (accessed May 20<sup>th</sup>, 2014).
- <sup>118</sup> Baaj, M. Hadi, Mutassem El-Fadel, Shady M. Shazbak, and Elie Saliby. 2001. "Modeling Noise at Elevated Highways in Urban Areas: A Practical Application." *Journal Of Urban Planning & Development* 127, no. 4: 169. *Academic Search Complete*, EBSCOhost (accessed May 18, 2014).
- <sup>119</sup><sup>119</sup> STOŠIĆ, Ljiljana, Goran BELOJEVIĆ, and Suzana MILUTINOVIĆ. "EFFECTS OF TRAFFIC NOISE ON SLEEP IN AN URBAN POPULATION." *Archives Of Industrial Hygiene & Toxicology / Arhiv Za Higijenu Rada I Toksikologiju* 60, no. 3 (September 2009): 335-342. *Academic Search Complete*, EBSCOhost (accessed May 14, 2014).

Torre, Giuseppe La, Umberto Moscato, Fulvio La Torre, Paolo Ballini, Simone Marchi, and Walter Ricciardi. 2007. "Environmental Noise Exposure and Population Health: A Cross-Sectional Study in the Province of Rome." *Zeitschrift Fuer Gesundheitswissenschaften/Journal of Public Health* 15 (5): 339-344. doi:<http://dx.doi.org/10.1007/s10389-007-0144-y>.

<sup>120</sup> Lindgren, Anna, Emilie Stroh, Peter Montnemery, Ulf Nihlen, Kristina Jakobsson, and Anna Axmon. 2009. "Traffic-related air pollution associated with prevalence of asthma and COPD/chronic bronchitis. A cross-sectional study in Southern Sweden." *International Journal of Health Geographics* 8, 1-15. *Academic Search Complete*, EBSCOhost (accessed May 18<sup>th</sup>, 2014).

Williams, Lori A., Cornelia M. Ulrich, Timothy Larson, Mark H. Wener, Brent Wood, Peter T. Campbell, John D. Potter, Anne McTiernan, and Anneclaire J. De Roos. 2009. "Proximity to Traffic, Inflammation, and Immune Function among Women in the Seattle, Washington, Area." *Environmental Health*

---

*Perspectives* 117, no. 3: 373-378. *Health Source – Consumer Edition*, EBSCOhost (accessed May 20<sup>th</sup>, 2014).

<sup>121</sup> Granié, M.-A., T. Brenac, M.-C. Montel, C. Coquelet, M. Millot, F. Monti, and M. Pannetier. 2013. "Qualitative analysis of pedestrians' perception of the urban environment when crossing streets." *Advances In Transportation Studies* no. 31: 17-34. *Academic Search Complete*, EBSCOhost (accessed May 14, 2014).

<sup>122</sup> Puget Sound Clean Air Agency, *Your Heat, Your Health, Your Choice*, accessed May 29, 2014, <http://www.pscleanair.org/actions/woodstoves/choices.aspx>

<sup>123</sup> AC Olsson, et al., "Exposure to diesel motor exhaust and lung cancer risk in pooled analysis from case-control studies in Europe and Canada," *American Journal of Respiratory and Critical Care Medicine* 138, no. 7 (2011): 941-948.

<sup>124</sup> U.S. Department of Energy, *Energy Efficiency and Renewable Energy. Lighting for Health: LEDs in the New Age of Illumination*, accessed, May 20, 2014.

<sup>125</sup> Department of Ecology State of Washington, *Saving Puget Sound*, last modified 2011, accessed May 28, 2014, [http://www.ecy.wa.gov/puget\\_sound/waterquality.html](http://www.ecy.wa.gov/puget_sound/waterquality.html).

<sup>126</sup> Department of Ecology Environmental Assessment Program, *Focus on Puget Sound's Urban Bays*, last modified September 2009, accessed May 30, 2014, <https://fortress.wa.gov/ecy/publications/publications/0903043.pdf>.

<sup>127</sup> Department of Ecology State of Washington, *Saving Puget Sound*.

<sup>128</sup> U.S. Environmental Protection Agency, *Ground-Level Ozone: Health Effects*, last modified, 2012, accessed May 16, 2014, <http://www.epa.gov/groundlevelozone/health.html>; "Effects of ambient air pollution on symptoms of asthma in Seattle-area children enrolled in the CAMP study," *Environmental Health Perspectives* 108, no. 12 (2000): 1209-1214.

<sup>129</sup> *Ibid.*

<sup>130</sup> *Health Disparities and Inequalities Report*, Centers for Disease Control and Prevention, (Atlanta: Center for Disease Control, 2011).

<sup>131</sup> Stephen Gaffield, Robert Goo, Lynn Richards, and Richard Jackson, "Public Health Effects of Inadequately Managed Stormwater Runoff," *American Journal of Public Health* 93, no. 9 (2003): 1527-33.

<sup>132</sup> U.S. Department of Labor Occupational Safety & Health Administration, *Asbestos Standard for the Construction Industry OSHA 3096*, last modified 2002, accessed May 29, 2014, <https://www.osha.gov/Publications/OSHA3096/3096.html>

<sup>133</sup> L. Frank and G.P. Pivo, *Relationships between land use and travel behavior in the Puget Sound region* (University of Washington, Seattle: Washington State Transportation Center, 1994); U.S. Environmental Protection Agency, *Measuring the Air Quality and Transportation Impacts of Infill Development. 231-R-07-001*, 2007.

<sup>134</sup> Puget Sound Clean Air Agency, *Your Heat, Your Health, Your Choice*.

<sup>135</sup> National Association of Regional Councils, *Green Infrastructure Issue Areas: Air Quality*, last modified 2013, accessed May 29, 2014, <http://narc.org/issueareas/environment/areas-of-interest/green-infrastructure-and-landcare/roadmap/airquality>.

<sup>136</sup> Monica Hammer et al. "Environmental Noise Pollution in the United States: Developing an Effective Public Health Response." *Environmental Health Perspectives* 122(2014):115-119.

<sup>137</sup> Edmund Seto et al. "Spatial distribution of traffic induced noise exposures in a US city: an analytic tool for assessing the health impacts of urban planning decisions." *International Journal of Health Geographics* 6(2007)

<sup>138</sup> Peter Rabinowitz. "Noise-Induced Hearing Loss." *American Family Physician*. 91(2000):2749-2756.

<sup>139</sup> Alexandros Haralabidis et al. "Acute effects of night-time noise exposure on blood pressure in populations living near airports" *European Heart Journal* 29(2008):658-664.

<sup>140</sup> Stansfeld et al. "Aircraft and road traffic noise and children's cognition and health: A cross-national study." *Lancet* 365(2005): 1942-1949; Evans GW, Lercher P, Meis M, Ising H, Kofler WW. "Community noise exposure and stress in children." *Journal of the Acoustic Society of America*. 109(2001):1023-7.

<sup>141</sup> Ron Chepesiuk. "Missing the Dark." *Environmental Health Perspectives* 117(2009): A220-27.

<sup>142</sup> "LED Streetlights." Seattle City Light. Accessed 25 May 2014. <http://www.seattle.gov/light/streetlight/led/>



- 
- <sup>143</sup>“IARC Monographs Programme finds cancer hazards associated with shiftwork, painting, and firefighting.” International Agency for Research on Cancer. Press release. May 5, 2007.
- <sup>144</sup> U.S. Department of Energy. Energy Efficiency and Renewable Energy. Lighting for Health: LEDs in the New Age of Illumination. Solid-State Lighting Technology Fact Sheet. May 2014.
- <sup>145</sup> De Marco, Molly and Allison C. De Marco, “Welcome to the Neighborhood: Does Where you Live Affect the Use of Nutrition, Health, and Welfare Programs?” *Journal of Sociology and Social Welfare* 36 (2009): 156-158.
- <sup>146</sup> Osypuk TL, Tchetgen E, Acevedo-Garcia D, et al., “Differential Mental Health Effects of Neighborhood Relocation Among Youth in Vulnerable Families: Results From a Randomized Trial,” *Archives of General Psychiatry* 69 (2012): 1290-1292, doi:10.1001/archgenpsychiatry.2012.449.
- <sup>147</sup> Krieger, James MD, MPH and Donna L. Higgins, PhD., “Housing and Health: Time Again for Public Health Action,” *American Journal of Public Health* 92 (2002): 759.
- <sup>148</sup> Julie Evans, Sophie Hyndman, Sarah Stewart-Brown, David Smith and Sophie Petersen, “An Epidemiological Study of the Relative Importance of Damp Housing in Relation to Adult Health,” *Journal of Epidemiology and Community Health* 54 (2000): 684, <http://www.jstor.org/stable/25569270>
- <sup>149</sup> Herbert L. Needleman, M.D., Alan Schell, M.A., David Bellinger, Ph.D., Alan Leviton, M.D., and Elizabeth N. Allred, M.S., “The Long-Term Effects of Exposure to Low Doses of Lead in Childhood: An 11-Year Follow-up Report,” *New England Journal of Medicine* 322 (1990): 86-87, DOI: 10.1056/NEJM199001113220203
- <sup>150</sup> Krieger, James MD, MPH and Donna L. Higgins, PhD., “Housing and Health: Time Again for Public Health Action,” *American Journal of Public Health* 92 (2002): 759.
- <sup>151</sup> Wanda Phipatanakul, Peyton A. Eggleston, Elizabeth C. Wright, Robert A. Wood, “Mouse allergen. I. The prevalence of mouse allergen in inner-city homes,” *Journal of Allergy and Clinical Immunology* 106 (2000): 1070-1074, <http://dx.doi.org/10.1067/mai.2000.110796>.
- <sup>152</sup> *Pioneer Square 2015, A Strategy for Seattle’s First Neighborhood*, The Pioneer Square Revitalization Committee (2010).
- <sup>153</sup> CDC (Centers for Disease Control and Prevention), “Mental Health Basics,” Mental Health, last modified October 4, 2013, <http://www.cdc.gov/mentalhealth/basics.htm>.
- <sup>154</sup> Rachel Kaplan, “The nature of the view from home: Psychological benefits,” *Environment & Behavior*, 33 (2001): 507-542; Terry Hartig, Marlis Mang, and Gary Evans, “Restorative Effects of Natural Environment Experiences,” *Environment and Behavior* 23, no. 1 (1991): 3-26; J. Maas, et al., “Morbidity is Related to a Green Living Environment,” *Journal of Epidemiology and Community Health* 63, no. 12 (2009): 967-973; Rita Berto, “Exposure to Restorative Environments Helps Restore Attentional Capacity.” *Journal of Environmental Psychology* 25, no.3 (2005): 249-259; Rachel Kaplan and Stephen Kaplan, “Well-being, Reasonableness, and the Natural Environment,” *Applied Psychology: Health and Well-being*, 3, no. 3 (2011): 304-321; Stephen Kaplan, “The Restorative Benefits of Nature: Toward an Integrative Framework,” *Journal of Environmental Psychology* 15, no.3 (1995): 169-182; Frances E. Kuo, and William C. Sullivan, “Aggression and Violence in the Inner City: Effects of Environment Via Mental Fatigue,” *Environment and Behavior* 33 (2001): 543-571; Roger S. Ulrich, et al., “Stress Recovery during Exposure to Natural and Urban Environments,” *Journal of Environmental Psychology* 11, no. 3 (1991): 201-230; Terry Hartig, “Nature Experience in Transactional Perspective,” *Landscape and Urban Planning* 25, no.1-2 (1993): 17-36; Patrik Grahn and Ulrika K. Stigsdotter, “Landscape Planning and Stress,” *Urban Forestry and Urban Greening* 2 (2003): 1-18; Florian Lederbogen et al., “City Living and Urban Upbringing Affect Neural Social Stress Processing in Humans,” *Nature* 474, no.7352 (2011): 498.
- <sup>155</sup> Ulrich, et al., “Stress Recovery during Exposure to Natural and Urban Environments,”; M. K. Honeyman, “Vegetation and Stress: A Comparison Study of Varying Amounts of Vegetation in Countryside and Urban Scenes,” *The Role of Horticulture in Human Wellbeing and Social Development: A National Symposium* (1992): 143-145; Grahn and Stigsdotter, “Landscape Planning and Stress,”; Agnes E. van den Berg, Terry Hartig, and Henk Staats, “Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability,” *Journal of Social Issues* 63, no. 1 (2007): 79-96; Sjerp de Vries et al., “Streetscape Greenery and Health: Stress, Social Cohesion and Physical Activity as Mediators,” *Social Science and Medicine* 94, no.0 (2013): 26-33.

---

<sup>156</sup>Hollie Lund, "Testing the Claims of New Urbanism," *Journal of the American Planning Association* 69, no. 4 (2003); Kevin M. Leyden, "Social Capital and the Built Environment: The Importance of Walkable Neighborhoods," *American Journal of Public Health* 93, no. 9 (2003): 1546-1551.

<sup>157</sup> Kevin M. Leyden, "Social Capital and the Built Environment: The Importance of Walkable Neighborhoods".

<sup>158</sup>Byoung-Suk Kweon, William C. Sullivan, and Angela Wiley, "Green Common Spaces and the Social Integration of Inner-City Older Adults," *Environment and Behavior* 30, no.6 (1998): 832-858; Andrea Faber Taylor, Frances E. Kuo, and William C. Sullivan. "Views of Nature and Self-Discipline: Evidence from Inner City Children." *Journal of Environmental Psychology* 22, no. 1-2 (2002): 49-63; Terry Hartig et al., "Tracking Restoration in Natural and Urban Field Settings." *Journal of Environmental Psychology* 23, no. 2 (2003): 109-123.

<sup>159</sup>William C. Sullivan, Frances E. Kuo, and Stephen F. DePooter, "The Fruit of Urban Nature." *Environment and Behavior* 36, no. 5 (2004): 678-700.

<sup>160</sup>Irwin Altman and Setha M. Low, *Place Attachment*, (New York: Plenum Press, 1992).

<sup>161</sup> *Pioneer Square Active Living Streets Strategy*, International Sustainability Institute (2013).