UNION HILL

HEALTH IMPACT ASSESSMENT

REPORT

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Worcester Division of Public Health | Derek Brindisi, Director | Worcester, MA | November 30, 2013

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Document Guide

This report is a Health Impact Assessment of a neighborhood revitalization initiative in Worcester, Massachusetts. The document consists of three parts. ***Part One*** provides background on health impact assessment and the Union Hill project. ***Part Two*** presents selected health impacts, including background, methods, and assessment. ***Part Three*** offers recommendations and suggestions for monitoring health impacts of the revitalization initiative going forward.

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Union Hill Health Impact Assessment Executive Summary

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INTRODUCTION

Worcester, Massachusetts is known as a city of neighborhoods. Some of these areas experienced serious disinvestment and decline in the late 20th century. The City has embarked on a revitalization effort to restore these neighborhoods through intensive collaboration among city departments. The approach will be piloted in one area and applied to other neighborhoods over time. Community building will be an important component given limited city resources and the importance of neighborhood self-determination to sustained change.

Official actions and decisions can impact health in unintended ways. Health Impact Assessment (HIA) is a set of tools and methods to examine the potential health effects of a proposed policy, program or project and produce recommendations to strengthen expected positive effects and help avoid predicted negative effects.

Worcester Division of Public Health (WDPH) conducted a rapid HIA of the revitalization initiative in the pilot neighborhood of Union Hill between January and August 2013 with funding and technical assistance from the Massachusetts Department of Public Health (MDPH). Collaborating with other city departments and community partners in a new and unique way, WDPH gathered an unprecedented wealth of data on this one neighborhood. This Executive Summary provides an overview of methods, key findings, and recommendations.

METHODS

From the outset, we applied the key HIA principle of inclusion of multiple players in the multiple phases. In consultation with other city departments and MDPH, we determined through Screening that HIA was appropriate and feasible. During Scoping, we engaged the Union Hill community, created pathway diagrams describing relationships between the revitalization policy and health, and developed research questions. We assessed the potential impact of proposed activities in four strategy areas:

Housing. Increase homeownership and housing quality through down payment and rehabilitation assistance, targeting specific sub-areas and prioritizing current residents.

Code enforcement. Data-based targeting of sweeps, focus on problem properties, faster response, and authority to make emergency repairs.

Infrastructure. Operations/maintenance activities including streetlight repair, pothole fixes and assistance with neighborhood cleanups. Capital improvements such as sidewalks, streets, trees, lighting, and parks, possibly funded through Community Development Block Grants.

Public safety. Community impact officers in the neighborhood, support to the area crime watch group, and increased overall police presence.

During Assessment, we researched connections between the sample actions and six prioritized health factors; compiled existing data, often through collaboration with city departments, Central Massachusetts Regional Planning Commission, and the Massachusetts Department of Public Health; gathered original data through interviews with department staff and collaboration with the community on a resident quality of life survey; and predicted impact of the sample actions on the selected health factors. Our predictions formed the basis for Recommendations. A full report and brief report will be produced as part of Reporting and Communication. The HIA includes a manageable set of indicators, including neighborhood characteristics and the selected health factors, for Monitoring and Evaluation.

Acknowledgements: Funding and technical assistance: Ben Wood, Massachusetts Department of Public Health; Metropolitan Area Planning Council • Technical assistance: Kim Gilhuly, Human Impact Partners • Facilitation assistance: Health Resources in Action • Research assistance: Lavar Thomas, Laura Alves • Census, RMV, and GIS mapping assistance: Central Massachusetts Regional Planning Commission, including Dan Daniska and Yahaira Graxirena • GIS mapping assistance: Mike Cecil and Yuqi Chen, Clark University Student Interns • Scoping and findings session hosting: Worcester Academy • Generous sharing of resident survey data: Oak Hill Community Development Corporation • Generous sharing of data: Worcester Police Department, Department of Inspection Services, Department of Public Works & Parks, Technical Services • Screening and technical review: City of Worcester Executive Office of Economic Development, Department of Inspectional Services, Police Department, Department of Public Works & Parks • iTree expertise: Worcester Tree Initiative • Union Hill HIA Advisory Committee: Ron Cino, Amy Borg, Deb Cary, Merinda Goodrich, George Goodrich, Ana Sequera, Lorraine Laurie, Sue Moynagh, Mullen Sawyer, Matilde Castiel, Tina Hood, Yahaira Graxirena

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KEY FINDINGS

Process. City departments and community partners alike found the process of conducting the HIA positive and illuminating. All expressed satisfaction with the approach of viewing plans through their potential effects on health and with the collaborative spirit developed. The HIA itself provided a forum for the department cross-talk the revitalization initiative will require.

Neighborhood Characteristics. Union Hill is more racially and ethnically diverse than Worcester as a whole. It has a lower rate of homeownership and higher levels of subsidized housing. Household income is lower and percent under poverty higher than for the city. Education attainment is lower and unemployment higher. Worcester adults are more likely to report poorer general health and mental health, higher rates of chronic conditions, and unhealthier behaviors than Massachusetts residents.

Community Violence. Union Hill has higher reported levels of physical disorder, some violent crime, and most notably, domestic violence than the city overall. Perceived safety is higher than might be expected, with most residents reporting they feel safe at most times and in most situations. Community violence could be lowered by increasing homeownership, providing rehabilitation assistance, community policing, and capital improvements that put more eyes on the street such as sidewalk and lighting improvements, trees, street furniture, and other amenities.

Social Cohesion. Level of trust in neighbors, voter turnout and participation in neighborhood improvement and other activities in Union Hill indicate low social cohesion. Yet residents like living in the community and would recommend it as a good place to live. Increasing homeownership, capital improvements that put more eyes on the street, and community policing are expected to help increase social cohesion.

Housing Safety. Housing quality and safety are lower in Union Hill than in Worcester as a whole. Rehabilitation assistance is likely to positively affect housing safety, but sustained impact is uncertain. Code enforcement can have positive impacts on health only if appropriate remediation funding is made available.

Traffic Safety. Union Hill experiences higher crash rates, especially involving pedestrians, and higher rates of pedestrian injury than the city as a whole. Capital improvements that are planned specifically to increase pedestrian and bicycle safety can have positive impact on health but absent of that specificity are unlikely to significantly impact traffic safety. Public safety actions may improve traffic safety if they enforce speed limits and stopping for pedestrians.

Access to Parks. Union Hill has among the lowest city park acreage per capita in the city. There is a greater burden on city parks within a half-mile of Union Hill than other city parks due to population density. Capital improvements may improve park access for Union Hill residents only if targeted to parks within a half-mile or to improve pedestrian or bicyclist safety for Union Hill residents traveling to nearby parks. Greening vacant lots or creating pocket parks within Union Hill may also improve access.

Physical Activity. Union Hill has many destinations within walking distance and good transit access. Residents generally feel safe walking in the area, though sidewalk conditions present some hazards and tree cover is lower than for the city as a whole. Capital improvements targeting walking and bicycling accommodations as well as aesthetics such as tree cover have potential to increase physical activity. Community policing has potential to support more physical activity by making the community feel safer to residents, especially among vulnerable groups.

Collaboration. Interdepartmental collaboration is stronger for current problems than long-term planning, and parallel rather than synergistic efforts among departments may occur. Public input is limited to the Customer Service system and neighborhood watch meetings. The city has community engagement experience, but it lacks community building experience. In Union Hill in particular, there are relatively few community partners, and therefore a greater need for community building to see sustained success of the proposed revitalization.

Based on this HIA, we predict revitalization efforts in Union Hill will have a positive overall effect on health. Positive effects of housing actions on housing safety and of public safety actions on community violence are most likely. Code enforcement and infrastructure actions are less certain to have positive health impact. Social cohesion may be the most important of the health factors studied for long-term sustainability of neighborhood revitalization.

RECOMMENDATIONS

Based on this experience, we recommend the City apply this process to examine future decisions about projects, programs and policies through a public health lens. In doing so, the City can prioritize efforts based on health data specific to a neighborhood and project, predict and mitigate negative impact on health and engage the community in a manner rarely seen throughout the City.

Based on our findings from this specific HIA, we offer the following recommendations to help enhance positive effects and minimize negative effects on health of the city's revitalization initiative:

Housing: Set and publicize targets for percentage of assistance funds available specifically for Union Hill residents who will occupy the home they buy. Monitor indicators of risk for displacement due to neighborhood gentrification. Identify remediation funds to fix housing violations for qualifying homeowners.

Code enforcement: Set measurable goals for annual reductions in housing code violations in Union Hill. Pursue innovative strategies for resident involvement in code enforcement. Strengthen interdepartmental collaboration on Healthy Homes.

Infrastructure: Develop and implement a Complete Streets program to guide street and sidewalk investments. Set objectives for reductions in crash and injury rates in Union Hill.

Public safety: Develop explicit components within the community policing strategy to address domestic violence and traffic enforcement. A domestic violence component may entail working with mental health services providers.

General: Without specific outcomes, goals, and targets, the City is likely to see fewer improvements and will experience a more difficult time collaborating both internally and with the community. Regularly reporting outcomes at least interdepartmentally, similar to the weekly updates from the Police Department, can also help promote collaboration and ensure accountability.

The City should consider conducting rapid HIAs in each neighborhood to be revitalized and strengthen stakeholder engagement in HIAs.

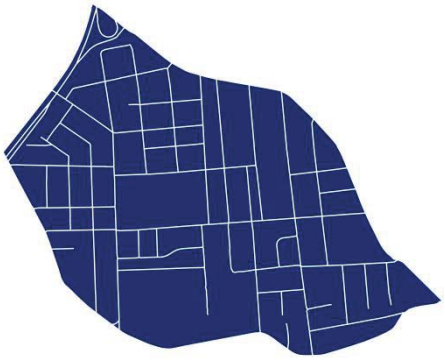
Collaboration

The City needs to specify a community engagement model to move beyond current public input mechanisms to community building in order to see the greatest impact from this project. Establishing and participating in an ongoing neighborhood leaders group is an appropriate first step toward achieving that. The City should gather extensive community input to inform community building objectives and activities, soliciting resident input via existing neighborhood meetings and forums, and using innovative public participation methods to involve residents and business owners unlikely to participate in other forums. One or more community visioning sessions would also provide valuable information to the City moving forward.

Finally, in order to sustain the impact of the revitalization strategies, the City should develop a community building plan with objectives and activities that share responsibility between city and neighborhood, vet the plan with community leaders, and widely publicize it.

CONCLUSIONS

This Health Impact Assessment was a tremendous learning opportunity. While assessing health effects for the pilot revitalization area, we developed a methodology applicable in other neighborhoods. Yet the most important result is the spirit of collaboration developed among departments and between city and neighborhood partners. This project marks the first time such a wide range of data from within and outside city government was assembled for one area and an example of the community helping set the direction of research and receiving results directly. Notably, city partners acknowledged the value of viewing their efforts through a health lens. Worcester Division of Public Health looks forward to working with partners to apply the methodology to future neighborhoods and other policies, projects and programs.



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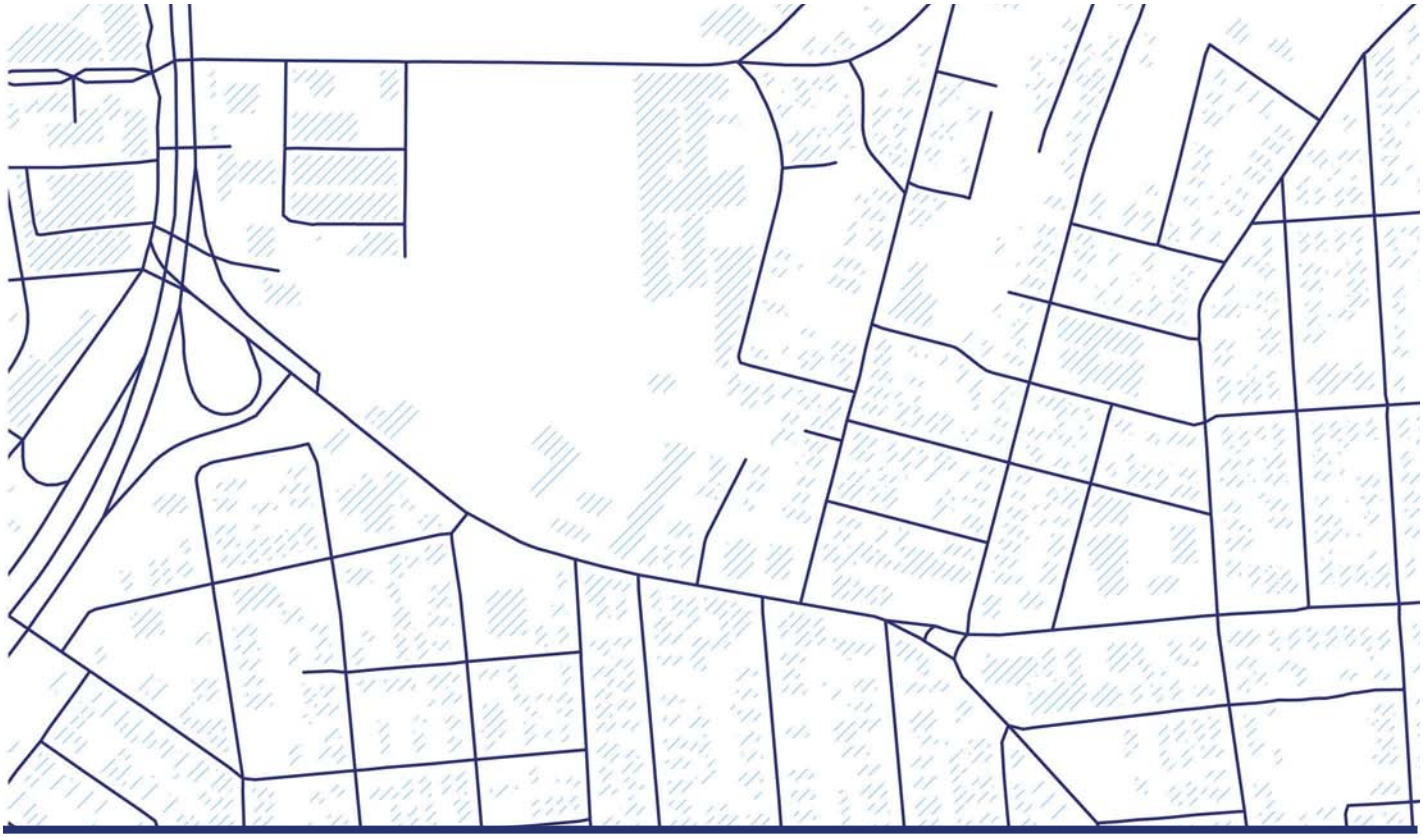


PART 1

BACKGROUND

Worcester, Massachusetts, is a city of 40 square miles and approximately 181,000 residents in Central Massachusetts. One of the state's "Gateway Cities" with a proud history of industrial innovation, it has struggled to reinvent itself in recent years. After a long period of decline the city's population is increasing, largely due to immigrants drawn by lower housing costs than further east and a concentration of social services not available in the small towns surrounding the city.

Worcester is a city of neighborhoods. Unlike cities where the neighborhoods represent political divisions, Worcester's neighborhoods are informal accidents of geography, history and immigration trends. Some of the neighborhoods have experienced sharp decline in recent years with housing disinvestment, increased crime levels and higher need for social services. In response, the City plans a long-term revitalization approach to restore neighborhood vibrancy and desirability. The first neighborhood selected is Union Hill, the most distressed census tract with over 1000 units in the city, and the sixth-most in Massachusetts, according to the Massachusetts Housing Partnership.

Neighborhood revitalization in the US has taken many forms over the years, from the urban renewal strategies of the 1950s to the Obama administration's Neighborhood Revitalization Initiative . Worcester has not received funding specifically for this effort, opting to address conditions on its own. A tenet of the City's revitalization approach is intensive interdepartmental collaboration in one neighborhood. The Worcester Executive Office of Economic Development (EOED) is leading development of this multi-department approach. As proposed by EOED, efforts would encompass neighborhood development including housing redevelopment, public safety, code enforcement, infrastructure, business/workforce, cultural and health strategies. It is anticipated the approach will be refined and subsequently applied in neighborhoods around the city over time.

A wealth of evidence exists on the effect of neighborhoods on human health. To maximize the positive effect of planned actions and mitigate any potential negative impact, Worcester Division of Public Health conducted a rapid Health Impact Assessment of the planned revitalization activities in one neighborhood. The project began in January 2013 and was completed in August 2013. This report summarizes process and results of the effort. This HIA was made possible through funding from the Massachusetts Department of Public Health through the Centers for Disease Control's Healthy Community Design Initiative (Health Impact Assessment to Foster Healthy Community Design Cooperative Agreement), and grant management of the Metropolitan Area Planning Council.

[1] *www.whitehouse.gov/sites/default/files/nri_description.pdf*

Decision Makers and Decision Making Process

The Executive Office of Economic Development is leading this initiative at the direction of the City Manager. All department heads are members of the City Manager's Cabinet, which is the forum for sharing information about the initiative and carrying forward the lessons learned to the subsequent neighborhood revitalizations.

Union Hill HIA Methodology

What is HIA?

Health is shaped by many factors beyond access to health care, such as transportation, land use patterns, employment and education. Official actions and decisions sometimes impact health in unintended ways. HIA is a set of tools and methods to systematically examine the effects on health of a policy, program or project and make recommendations to enhance positive impact and mitigate negative impact. [1]

Figure 1 gives a brief overview of the HIA process, and following is a description of each HIA phase and its application in this project.

Figure 1. Steps of Health Impact Assessments

Steps of HIA

Screening	Determines the need and value of a HIA
Scoping	Determines which health impacts to evaluate, methods for analysis, and a workplan
Assessment	Provides: 1) a profile of existing health conditions 2) evaluation of potential health impacts
Recommendations	Provide strategies to manage identified adverse health impacts and maximize benefits to health
Reporting	Includes: 1) development of the HIA report 2) communication of findings & recommendations
Monitoring	Tracks: 1) impacts on decision-making processes and the decision 2) impacts of the decision on health determinants

Source: Massachusetts Department of Public Health

SCREENING

Screening is the process of determining if a policy, program or project merits examination and whether available resources, including time, permit an assessment. The project was one of three chosen to be completed in spring/summer 2013. The screening process was conducted with the Worcester Executive Office of Economic Development (EOED) and the Massachusetts Department of Public Health (MDPH) from January-March 2013. EOED suggested the revitalization initiative, anticipated to begin summer 2013, for health impact assessment given the city's intention to (1) have departments focus collaborative efforts in one neighborhood and (2) apply the process in subsequent neighborhoods. MDPH determined the policy was appropriate for health impact assessment and that the timeline permitted a rapid HIA.

SCOPING

Scoping is the process of establishing timeline and determining focus of the health impact assessment, including: selecting priority determinants; creating pathways of the hypothesized relationships among the policy, determinants and health outcomes; and writing research questions. Scoping typically begins immediately following the conclusion of screening. Formal scoping activities for this HIA could not begin until after a City Manager's Cabinet Meeting at which the project was formally introduced, which took place on May 15, 2013. The HIA was described at this meeting as part of the public health strategy. This timing resulted in a compressed timeline for the scoping and assessment phases.

We held a scoping session May 23, facilitated by Health Resources in Action and held at Worcester Academy. We invited over 60 stakeholders. Thirty-three people attended representing several city agencies, a range of community organizations (including community development, environmental, social justice, transportation, academic, youth development and social service), and neighborhood residents. The session included education about how social factors (such as education, transportation, employment, access to healthy food and places to be physically active) influence health, the HIA process, breakout groups to generate health factors of greatest concern given the city's plans for Union Hill, and description of the role of the HIA Advisory Committee. Following this session, we analyzed discussion records to establish a preliminary set of health determinants that would be the focus of the HIA. Two determinants (community violence and social cohesion) clearly represented stakeholders' greatest concerns as they considered the city's proposed actions. Four other determinants (housing safety, traffic safety, park access and physical activity) were of lesser concern than the top two but roughly equal to each other. We vetted the selected determinants via a web-based survey sent to all scoping session attendees that also recruited respondents for the Advisory Committee. Seventeen individuals agreed to serve. These individuals provided feedback electronically in June on our pathways and research questions.

ASSESSMENT

The assessment phase of HIA consists of research to establish the literature base supporting connection of the policy with the selected health determinants, as well as profiling existing conditions, and predicting impacts of the policy on the determinants.

Literature review: We conducted thorough although not exhaustive literature reviews, including sources available through grey and academic literature. We searched the databases PubMed, Ovid MEDLINE, PsycINFO, and Google Scholar to identify academic publications. We used Google to search for grey literature such as reports and conference proceedings. We took a conservative approach to judging literature support. Our rationale for this was (1) unstudied factors can affect relationships observed in research between two factors and (2) research showing a relationship between two factors does not prove that changing one factor will have the desired effect on the other. We created a rating system for strength of literature ranging from strong (intervention research) to moderate (observational research), to weak (best practices or recommendations only). Our assessment approach relied on the strength of the literature in predicting impacts, although arguments have been made that there are fewer controlled trials in community work, they may in fact be inappropriate, and it can be necessary to incorporate other sources of evidence into HIAs where intervention studies do not exist [2]. This conservative approach was deemed most appropriate given this was WDPH's first health impact assessment.

Profile existing conditions: We researched potential indicators based on dimensions suggested by the literature. Given that this was a rapid HIA, we focused on gathering easily available secondary data. We also collected primary data, consisting of a resident quality of life survey in collaboration with the area community development corporation and key informant interviews with department contacts to explore collaboration. We used the finest-grained information we could obtain for each determinant, so unit of analysis varies. The data are based on varying definitions of the neighborhood, which relates to the lack of formal boundaries. Strength of data for all determinants was judged to be high based on connection to literature, data available that are specific to the study area, and demonstrating need compared with other areas of the city.

Predictions: Quantitative predictions were not possible with this rapid HIA. We focused our attention on predicting the direction and likelihood of impact, as well as distribution of effects on vulnerable populations, based on the data and literature support. We did not predict magnitude or severity of impact, as many HIAs do; these categories seemed to require too precise an assessment given the limitations of our sample actions approach.

RECOMMENDATIONS

The purpose of HIAs is not to support or oppose the policy, project or program under study, but instead to help improve it by enhancing predicted positive effects or avoiding or mitigating anticipated negative effects. The predictions process often naturally leads to recommendations. In this report we provide general recommendations for each strategy area.

REPORTING AND COMMUNICATION

The HIA process must be thoroughly documented and results communicated to stakeholders and the wider community as appropriate. While a full report with executive summary is nearly always produced, various additional formats may be more appropriate for different audiences, such as brief report or oral presentation. We intend to develop multiple products from the full report.

MONITORING AND EVALUATION

The HIA process ideally yields a manageable set of indicators which can be used to monitor impact of the policy, program or project as it goes forward. Evaluation of the HIA process itself can produce valuable information for future efforts in terms of stakeholder engagement as well as the specific tasks of each phase.

STAKEHOLDER ENGAGEMENT

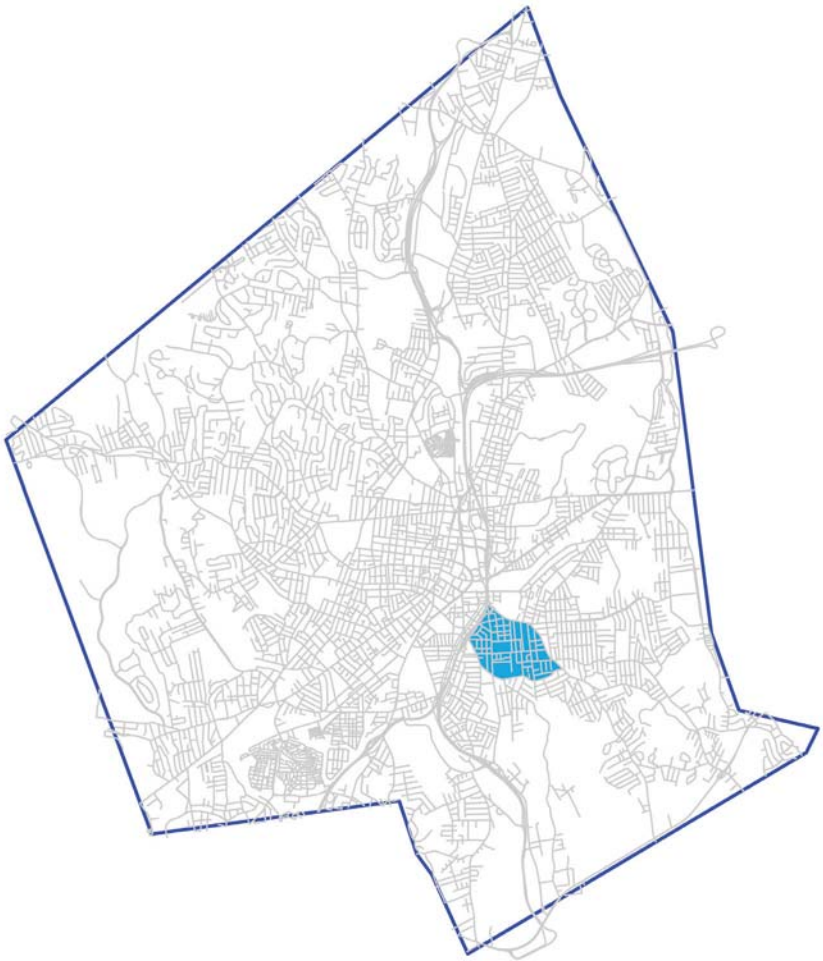
Stakeholder engagement is a critical part of health impact assessment. We planned our stakeholder engagement elements to include participation in scoping, review of preliminary findings and input on recommendations, and review of the draft report. Interaction with stakeholders has been less robust than originally planned, which can be attributed to three causes. First, the compressed timeline for scoping and assessment limited the time available for in-person meetings with the Advisory Committee. Second, the complexity and evolving nature of the revitalization initiative, particularly for our first experience conducting an HIA, meant each phase took WDPH longer than anticipated. Finally, the small number of natural vehicles for connecting with residents and community leaders in the neighborhood limited the avenues available for recruiting stakeholders such as neighborhood residents.

UNION HILL PROFILE

Neighborhood location and physical characteristics

Union Hill is located in the southeast section of Worcester, very close to the center of the city, and corresponds roughly to Census tract 7324. It is a largely residential area with some small businesses. Adjacent to a major interstate (I-290), Union Hill has a grid of local streets bounded by arterials (Vernon, Winthrop, Heywood, Massasoit, Grafton). St. Vincent's Hospital was previously located in the neighborhood, and some medical facilities continue to exist in the remaining properties. Union Hill is in City Council District 3. Nearby neighborhoods include Green Island, the Canal District, Vernon Hill and Grafton Hill. Figure 2 and Figure 3 show the city with study area highlighted and study area detail, respectively.

Figure 2. City of Worcester with Census Tract 7324 Highlighted



Source: Worcester Technical Services

Figure 3: Census Tract 7324

Source: Worcester Technical Services

Current housing data from the American Community Survey and Massachusetts Department of Housing and Community Development demonstrate neighborhood challenges (Table 1). The area has a substantially lower rate of owner-occupied units than the city and state, and levels of subsidized housing are higher. Median gross rent is higher than the city or state (although this does not account for number of bedrooms), and more than half of residents are housing cost-burdened. Percentages living in the same house one year ago show less mobility than might be expected, however.

Table 1: Neighborhood Housing Characteristics

	Union Hill	Worcester	Massachusetts
Population	6,645	180,519	6,512,227
Occupied Housing Units	2,275	70,248	2,522,409
Average Household Size of All Occupied Units	2.82	2.40	2.49
% Owner-Occupied Housing Units	30.6%	46.6%	63.6%
Average Household Size of Renter-Occupied Units	3.11	2.26	2.16
% Vacant Housing Units	12.6%	10.7%	9.9%
Median Gross Rent	$1,089	$886	$1,037
Gross Rent 35% or more of income	54%	41%	40%
Living in Same House 1 year ago	86%	84%	87%

Source: US Census Bureau, American Community Survey (2007-2011)

Neighborhood population characteristics

Demographics

The Union Hill area is more diverse than Worcester or Massachusetts and has accompanying challenges. All of Union Hill is an environmental justice area according to US Census definition based on median household income and percent minority population. Figure 4 shows distribution of environmental justice populations in Worcester. Union Hill is more racially and ethnically diverse than the city as a whole (Table 2). English is the only language spoken at home for a lower percentage of Union Hill residents than for Worcester or Massachusetts (Figure 5). Nearly two-thirds of those who do not speak English well speak Spanish.

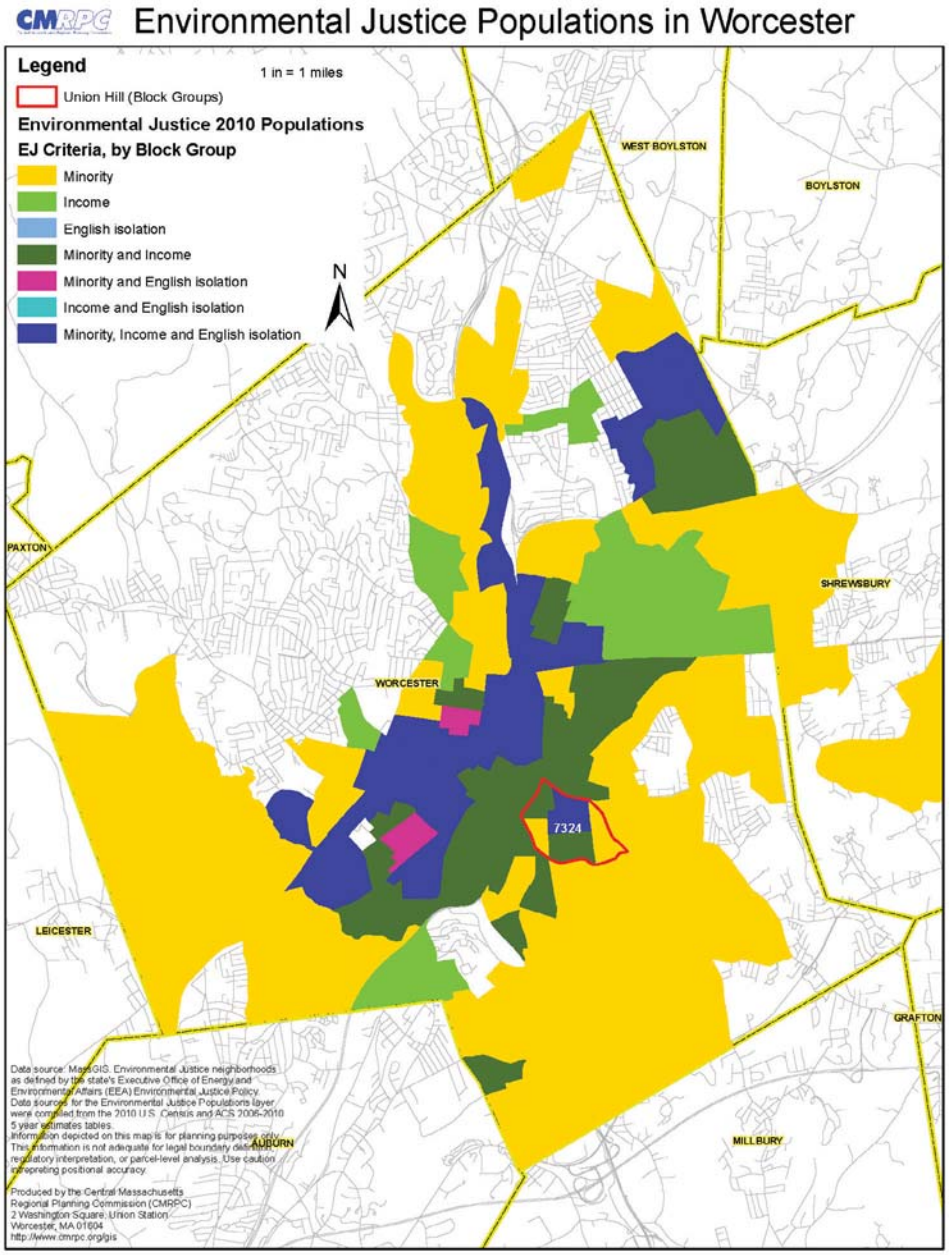
Table 2: Race/Ethnicity for Census Tract 7324, Worcester

	Union Hill	Worcester	Massachusetts
White, Not-Hispanic	38.0%	59.6%	76.1%
Black or African-American , Not-Hispanic	14.8%	10.2%	6.0%
Hispanic or Latino	37.6%	20.9%	9.6%
American Indian and Alaska Native	0.3%	0.2%	0.2%
Asian	4.7%	6.0%	5.3%
Native Hawaiian and Other Pacific Islander	0.2%	0.0%	0.0%
Some Other Race	1.4%	0.7%	0.9%
Two or More Races	3.0%	2.3%	1.9%

Source: US Census Bureau, 2010 Census

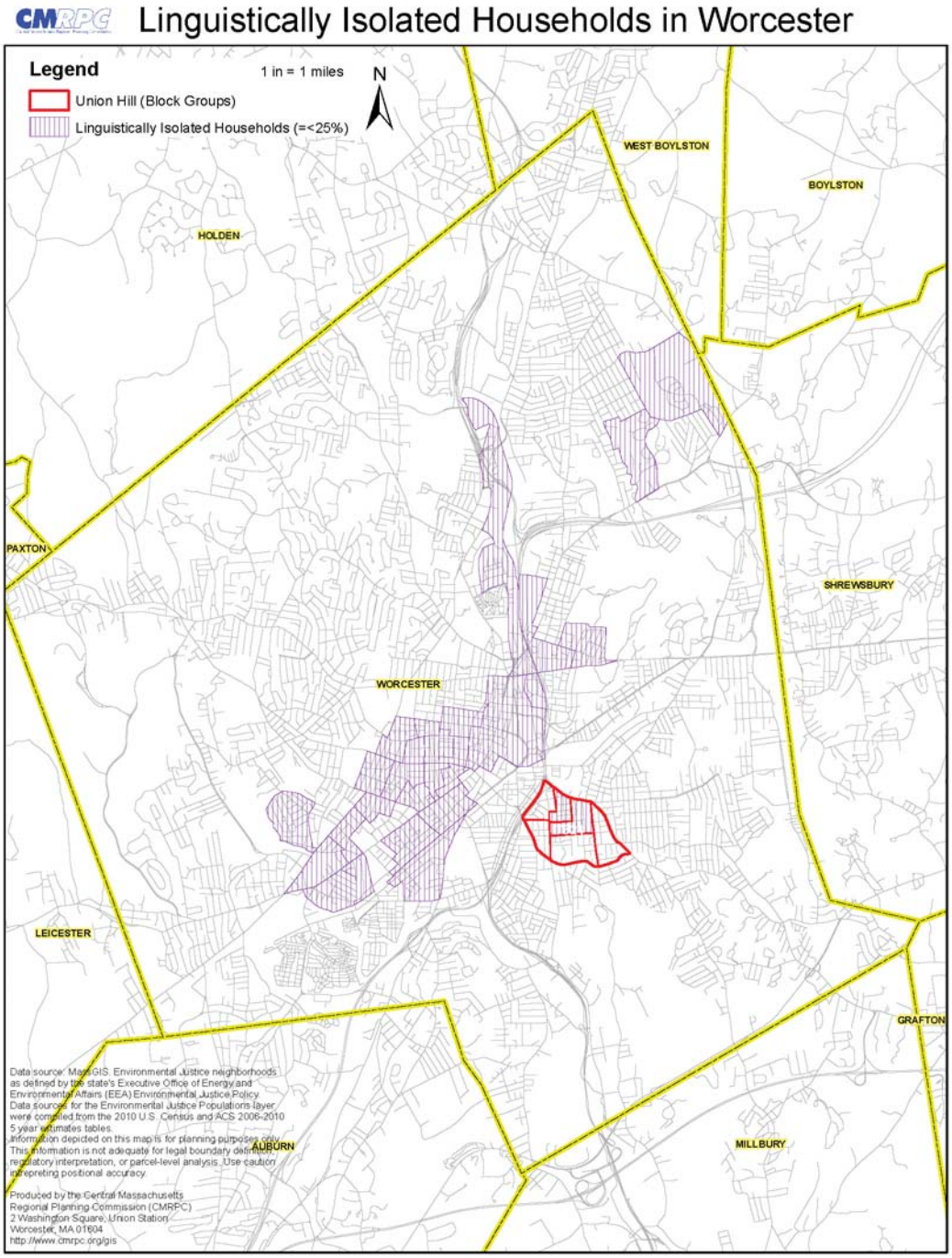
Table 3 shows selected population characteristics. Median household income is substantially lower in the study area than for Worcester and half that of the state, and percent population under poverty level is substantially higher in the study area. Median age is lower for the study area than Worcester or the state. Educational attainment is much lower for the area than Worcester or Massachusetts, with the largest percent of area residents reporting high school diploma or less and a much lower percent reporting bachelor's degree than for the city or state (Table 4). Unemployment and non-participation in the labor force are higher for the study area (Figure 7). Household vehicle access is lower in Union Hill than the city or state (Figure 6).

Figure 4: Environmental Justice Populations in Worcester



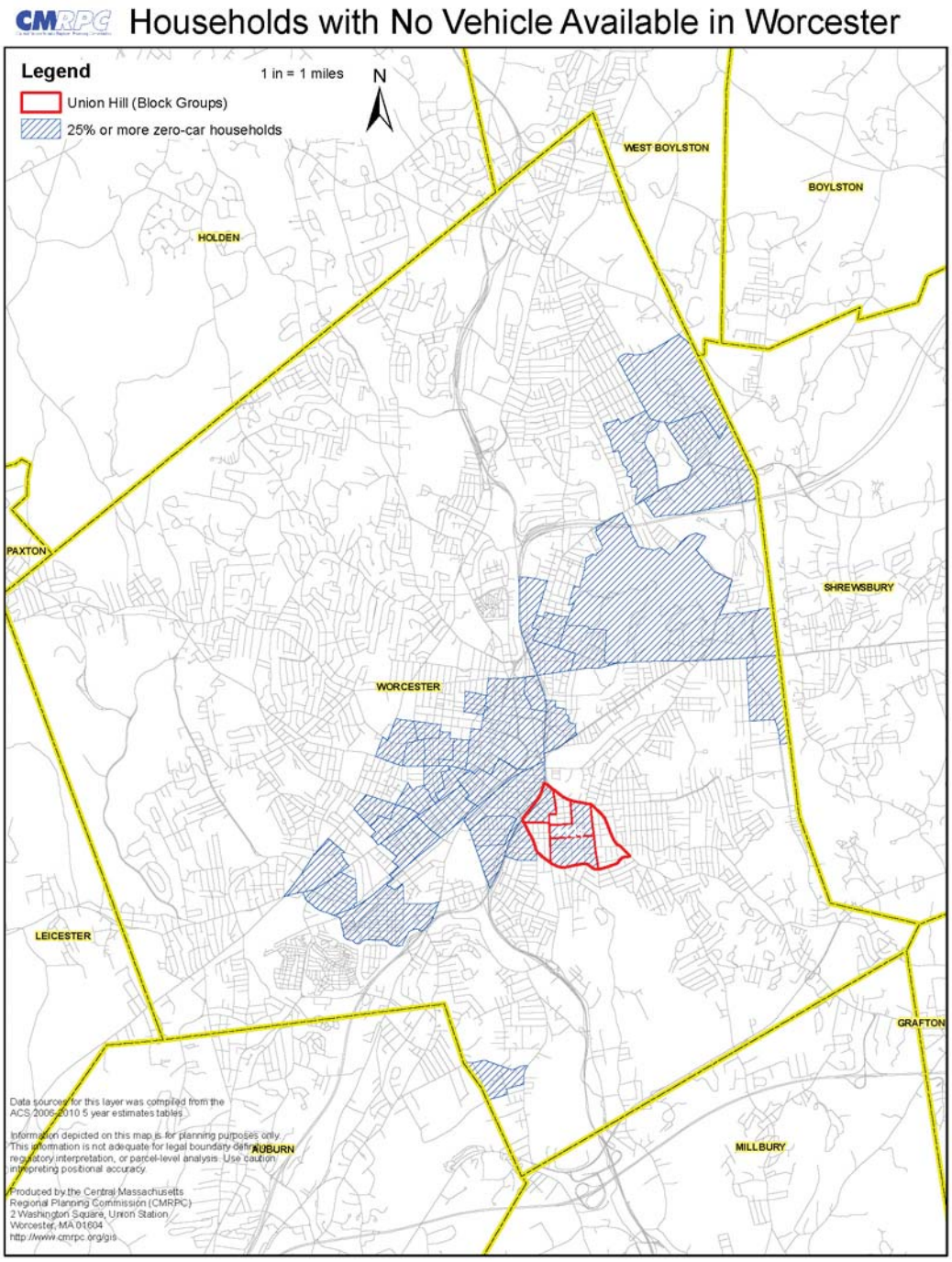
Source: US Census Bureau, 2010 Census.

Figure 5: Linguistically Isolated Populations in Worcester



Source: US Census Bureau, American Community Survey (2007-2011)

Figure 6: Households with No Vehicle Available in Worcester



Source: US Census Bureau, American Community Survey (2007-2011)

Table 3: Selected Population Characteristics for Census Tract 7324, Worcester

	Union Hill	Worcester	Massachusetts
Median Age	29.8 years	34.3 years	38.9 years
% Households with No Vehicle Available	24.6%	16.2%	12.4%
% Population with a Disability	28%	24%	19%
Economic			
Median Household Income	$30,596	$45,846	$65,981
% Below Poverty	30%	19%	11%
% Below 200% Poverty	60%	38%	24%

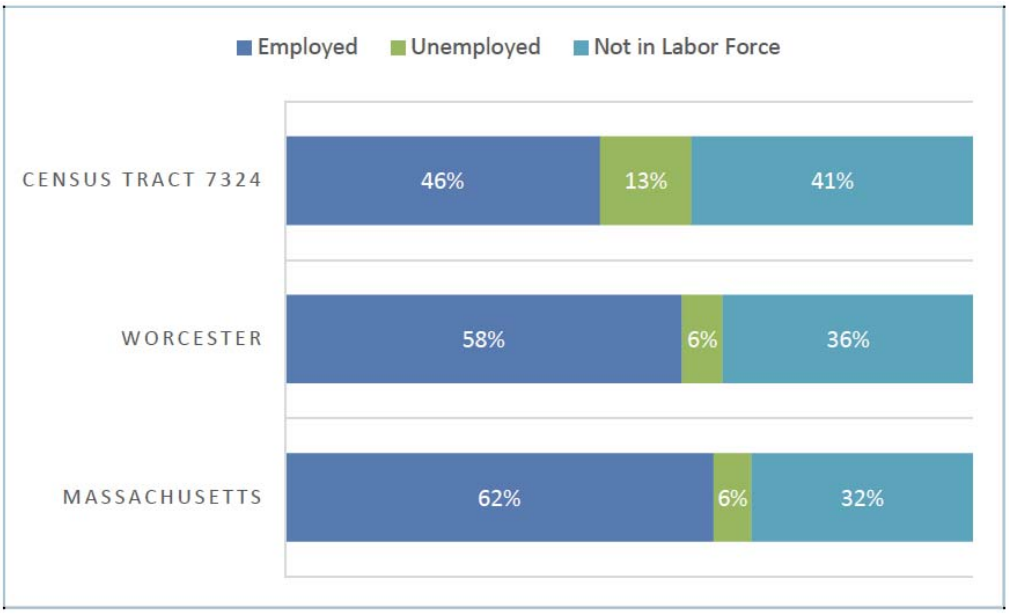
Source: US Census Bureau, American Community Survey (2007-2011)

Table 4: Educational Attainment for Census Tract 7324, Worcester

	Union Hill	Worcester	Massachusetts
Less than High School Diploma	27%	16%	11%
High School Diploma	33%	28%	26%
Some College	28%	26%	24%
Bachelor's Degree	9%	19%	22%
Graduate or Professional Degree	4%	11%	17%

Source: US Census Bureau, American Community Survey (2007-2011)

Figure 7. Employment for Census Tract 7324, Worcester



Source: US Census Bureau, American Community Survey (2007-2011)

Health Profile

Health data are available for Worcester but not the study area. According to data from the Massachusetts Behavioral Risk Factor Surveillance System (BRFSS) (Table 5), Worcester adults are more likely to report poorer general health and mental health and higher rates of overweight/obesity, asthma and diabetes than are Massachusetts residents overall. They are more likely to report smoking and to report lower rates of consumption of fruits and vegetables and regular physical activity. Pediatric asthma prevalence is significantly higher in the local school than nearby schools, the district or the state (Table 6). Injury rates are higher for Worcester than the state, especially for assault-related and motor vehicle-related pedestrian injuries (Table 7). Based on the area's demographic information and the literature, it is reasonable to expect poorer general health and mental health status, worse chronic disease and health behavior rates, and higher injury rates for the study area population than the city as a whole.

Table 5. State BRFSS Data for Worcester, Massachusetts

	Worcester	Massachusetts
General		
Prevalence of fair or poor health	15.7%	11.9%
Number of days in past 30 days physical health not good	10.1 days	8.5 days
Prevalence of having a disability and needing help	8.4%	5.4%
Physical / Disease-related		
Prevalence of coronary heart disease	6.0%	5.9%
Prevalence of ever diagnosed with Stroke among adults (35+)	1.8%	2.0%
Prevalence of asthma	12.7%	10.3%
Prevalence of diabetes	8.6%	7.5%
Prevalence of obesity	25.1%	23.0%
Prevalence of overweight/obesity	61.4%	58.9%
Mental		
Number of days in past 30 days mental health not good*	12.1 days	8.9 days
Prevalence of symptoms of depression in past two weeks	11.0%	7.4%
Behavioral		
Prevalence of consumption of 5 or more fruits and vegetables per day	24.3%	27.4%
Prevalence of regular physical activity**	46.6%	52.2%
Prevalence of current smoker***	23.1%	15.9%

Source: Massachusetts Department of Public Health, Behavioral Risk Factor Surveillance System CY 2008-2011. *CY 2007-2011. **CY 2001, 2003, 2005, 2007, 2009. ***CY 2006-2010.

Table 6. Pediatric Asthma Prevalence in Union Hill Area Schools, 2007-2008

	Prevalence of Asthma
Grafton Street School	16.4% (12.4-20.4)
Vernon Hill School	17.7% (13.7-21.7)
Union Hill School	27.7% (22.6-33.1)
Worcester Average	11.7% (11.2-12.2)
Massachusetts Average	10.8% (10.8-10.9)

Source: MDPH Bureau of Environmental Health, 2007-2008

Table 7. Injury Data for Worcester and Massachusetts

	Worcester		Massachusetts	
	Total	Rate per 100,000	Total	Rate per 100,000
Nonfatal Emergency Department Visits				
Fall-related Injuries	16774	3088.4	557574	2836
Motor-Vehicle Related Occupant Injuries	5971	1099.4	176872	899.6
Motor-Vehicle Related Pedestrian Injuries	439	80.8	9914	50.4
Assault-related Injuries	3922	722.1	4554	377.9
Nonfatal Hospital Stays				
Fall-related Injuries	2818	518.9	95423	485.4
Motor-Vehicle Related Occupant Injuries	241	44.4	8505	43.3
Motor-Vehicle Related Pedestrian Injuries	91	16.8	2078	10.6
Assault-related Injuries	357	65.7	7350	37.4

Source: Massachusetts Department of Public Health, Registry of Vital Records and Statistics, 2009-2011 counts and annual average rates

PART 2

PART TWO: HEALTH IMPACTS

In Part Two, we present the pathways hypothesized to link the general policy of neighborhood revitalization with its immediate effects (department actions), the selected health determinants and health outcomes. Then for each determinant we review the literature connecting the actions and health, profile existing conditions, and predict the impact of the actions on health.

We elected to present information by determinant to emphasize how the city's proposed actions will affect health factors prioritized by stakeholders during scoping. Not all strategy areas interact with each determinant as shown in Table 8. The following key can assist readers in locating information more easily across strategy areas.

Table 8. Readers' Key to Strategy Areas

Strategy Area	Determinant					
	Community Violence	Social Cohesion	Housing Safety	Traffic Safety	Access to Parks	Physical Activity
	pg 23	pg 32	pg 40	pg 45	pg 53	pg 60
Housing	X	X	X			
Code Enforcement	X	X	X			
Infrastructure	X	X		X	X	X
Public Safety	X	X		X		X

PATHWAYS

Assessing the full slate of department efforts would have required more resources than available. Published evidence was used to narrow the focus to four strategy areas in a three-step process. First, while some planned actions have intuitive appeal for their value in building social capital (e.g. public art and connection to cultural opportunities), evidence of health impact (positive or negative) is sparse. Second, HIA is not recommended for initiatives conceived expressly to improve health, as public health requires that its approaches be evidence-based. Third, existing evidence of health impact for some of the strategy areas (e.g. workforce development) is not as strong as the selected areas.

The neighborhood approach was outlined in in the city's Housing Strategy released in fall 2012, but the evolving state of the Union Hill revitalization plan meant that specific activities would not be finalized in time to meet the shorter HIA timeline. To focus the HIA, we applied a "sample actions" approach based on preliminary information articulated by the departments. We confirmed the sample actions during key informant interviews with relevant department contacts. The four focus strategy areas are summarized below.

Housing: The housing sample actions are intended to increase homeownership and quality of housing in the neighborhood, specifically increasing owner-occupied units via purchase assistance and purchase/rehabilitation assistance to first time homebuyers, rehabilitation assistance to existing homeowners, homebuyer counseling, rehabilitation assistance to improve energy efficiency, and lead abatement. The assistance will be targeted to specific sub-areas and will prioritize current Union Hill residents.

Code enforcement: The code enforcement strategy includes proactive identification of problems through data-based targeting of sweeps and focus on problem properties as well as faster response to complaints and authority to make emergency repairs.

Infrastructure: There are two categories of actions: operations and maintenance activities include streetlight repair, pothole fixes and assistance to community groups for neighborhood cleanups; and possible capital improvements include sidewalks, streets, trees, lighting, parks and may be funded through Community Development Block Group funds.

Public safety: The heart of the approach is assignment of community impact officers to the neighborhood, plus support to the area crime watch group and increased overall police presence. Figure 8 shows a map of the Union Hill Community Police District that was established as part of this effort.

Figure 8. Union Hill Community Policing District

Source: Worcester Police Department, 2013

It should be noted the HIA did not evaluate efficacy or effectiveness of the departments' selected actions to meet their own objectives. An assumption of this HIA is that each department developed its strategy based on best practices in that field.

Figure 9 through Figure 12 display for each of the four strategy areas, the hypothesized relationships between the Policy (neighborhood revitalization), Immediate effects (sample actions), Intermediate effects (of the sample actions on the selected determinants) and Long-term effects (health outcomes). We used scoping session records, preliminary literature review, and professional judgment to guide decisions about which determinants corresponded to each strategy. These pathway diagrams form the basis for the research questions, evidence review and predictions of health impact.

Figure 9. Housing Pathway

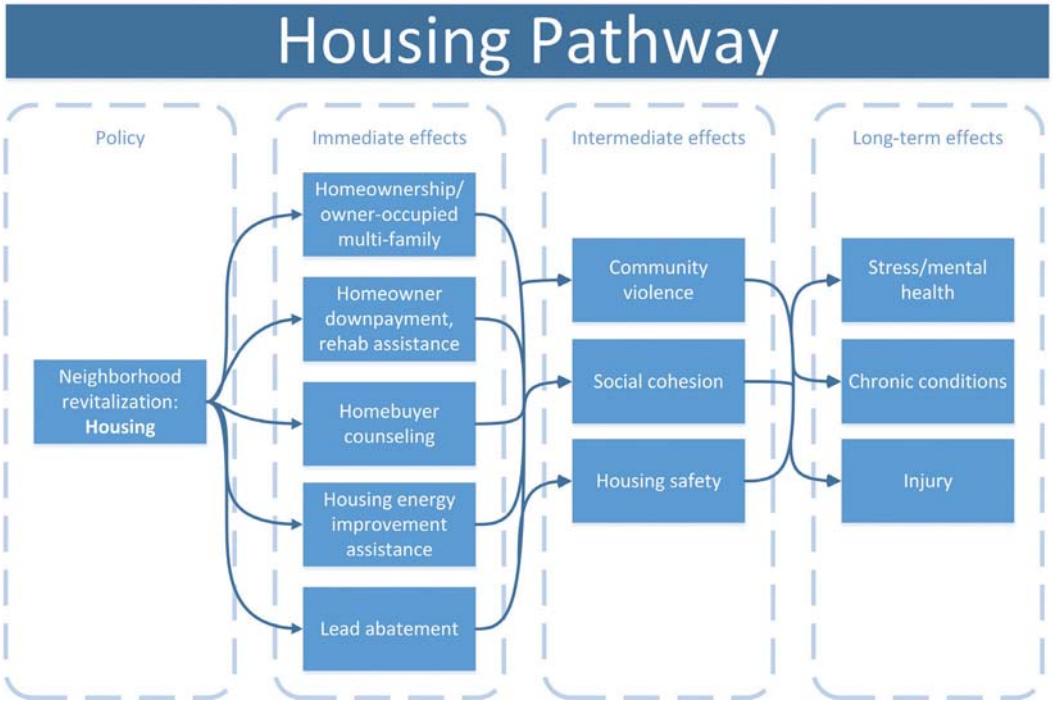


Figure 10. Code Enforcement Pathway

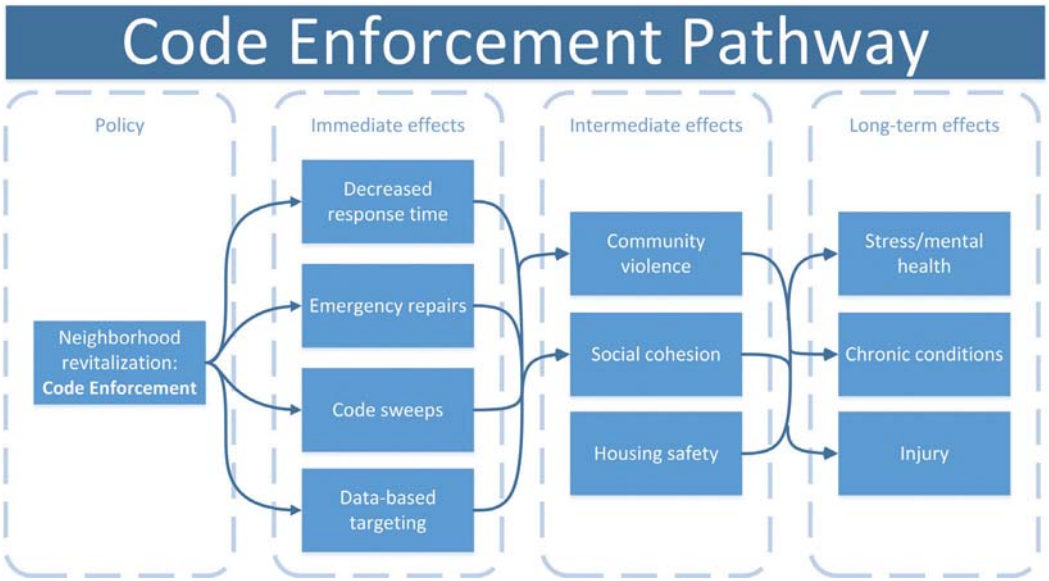


Figure 11. Infrastructure Pathway

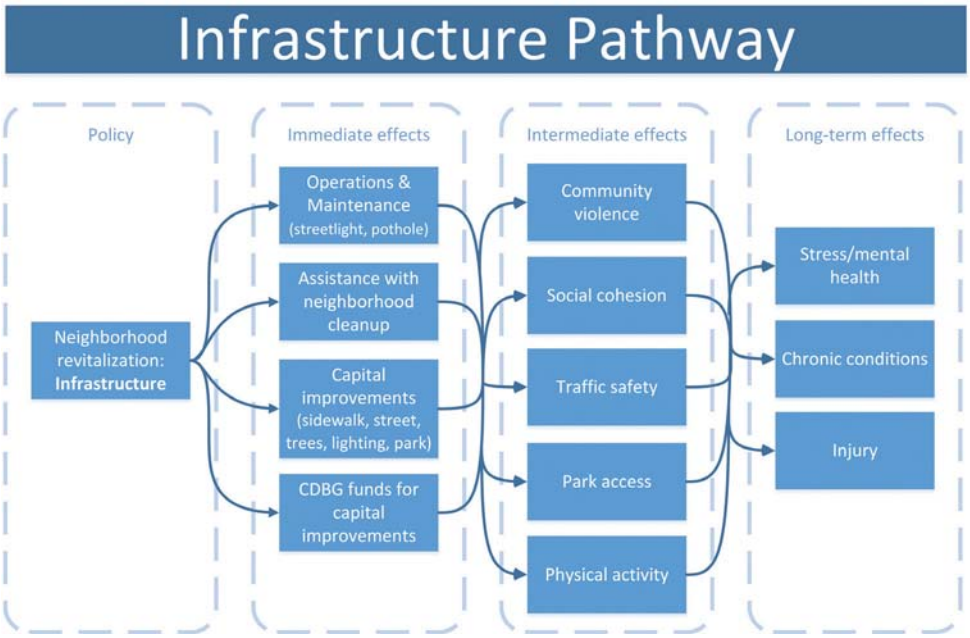


Figure 12. Public Safety Pathway

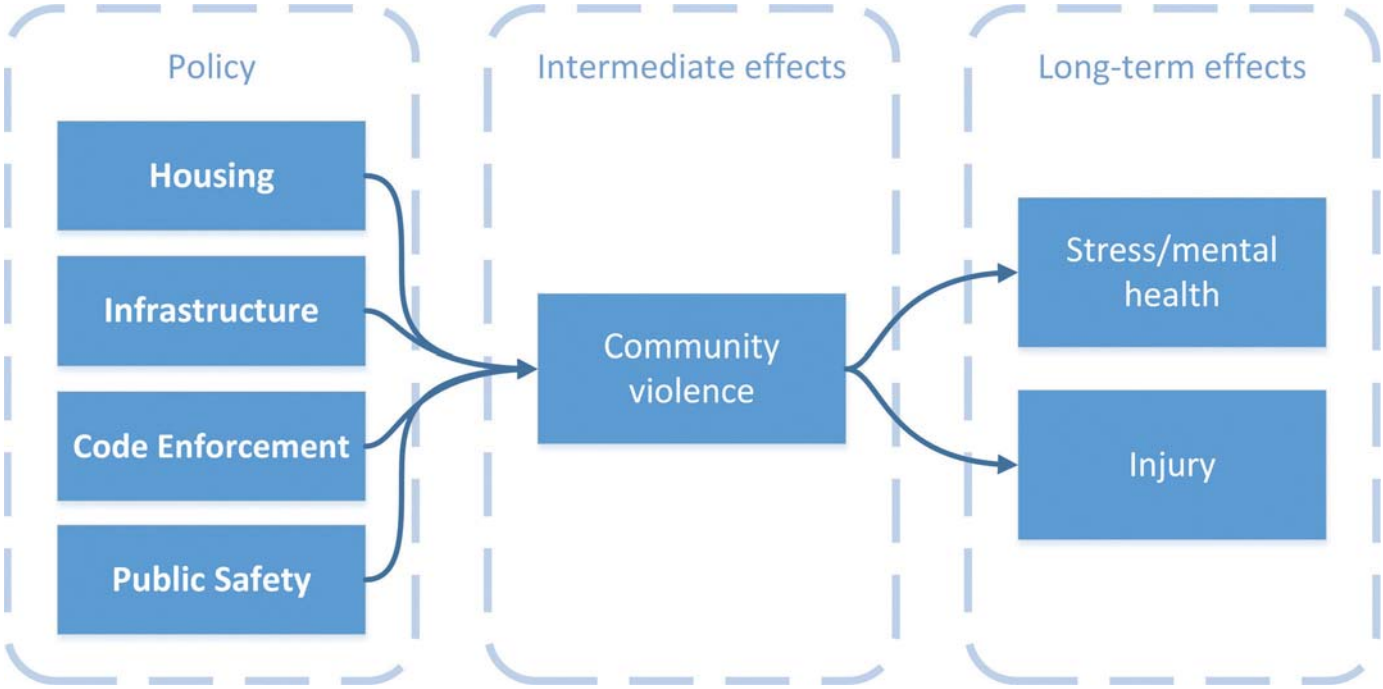
For each determinant we present the following information:

- Background summarizes our literature review, including an assessment of the literature strength for each strategy area and key findings.
- Methods details the primary and secondary data sources we identified based on relevant domains from the literature review and our process for gathering this data.
- Existing conditions presents the indicators in graphic form with brief narrative.
- Assessment predicts the health impact of the sample actions for each relevant strategy area.
- Summary highlights the main points from the literature review, the data and the predictions.

COMMUNITY VIOLENCE

As show in Figure 13, we hypothesized that all four strategy areas would impact community violence: Housing; Code Enforcement; Infrastructure; and Public Safety.

Figure 13. Community Violence Pathway



Background

Violence, including homicide, suicide, assault, domestic violence, sexual assault, child abuse and elder abuse, is a significant public health issue. Worldwide, an estimated 1.6 million people died in 2000 due to violence, a third from homicide [3]. Incidents involving firearms are among the leading causes of death and death from injury in the US [4] [5]. Violence is associated with poorer mental health, and women with mental disorders such as depression, anxiety and post-traumatic stress disorder are three to seven times more likely to be victims of domestic violence [6].

Neighborhood disorder, including incivilities as well as physical disorder, and crime reflect the same underlying problem [7]. Fear of disorder has been linked to depression, chronic conditions and physical health status and feelings of powerlessness and mistrust [8] [9]. Low-income communities are disproportionately affected by violence.

Strength of the literature on violence and crime and the housing sample actions is moderate. As recently as 2003 there had been little study of the impact of homeownership rates on neighborhoods [10]. A frequently cited study found that neighborhood "collective efficacy" level, which was linked to higher levels of homeownership and residential stability, was strongly associated with 3 measures of violence: a lower perception of neighborhood violence (witnessing fight with a weapon, violent argument between neighbors, gang fight, sexual assault or rape, robbery or mugging); 30% lower than expected experience of violent victimization such as mugging, fight or sexual assault; and 40% lower than expected rate

of police-reported homicides [11]. Collective efficacy is defined as a combination of social cohesion (i.e. trust in neighbors, participation in voluntary groups) and informal social control (i.e. willingness to intervene). Collective efficacy level explained findings of another study that low-income homeowners were less likely than renters in the same neighborhoods to report crime as the biggest problem in their neighborhood ("crime" included any responses indicating neighborhood disorder) [8]. A causal analysis of cities (not neighborhoods) found that increased homeownership rates did not reduce aggravated assault rates over time although aggravated assault rates reduced homeownership levels; this phenomenon was more evident in higher-income than lower-income neighborhoods, where residents might have less ability to leave [12]. Childhood lead paint exposure is associated with higher levels of arrests for violent crime in adulthood [13], and current lead abatement programs are predicted to prevent future aggravated assault [14]. Overall crime rates have been shown to decrease long-term in gentrified neighborhoods [15].

We located no literature directly linking violence and the code enforcement sample actions, and literature on crime and the code enforcement sample actions is weak. A qualitative study of strategies to strengthen housing code enforcement as a community-based crime prevention approach in Memphis noted that prevalence of problem properties, characterized in terms of physical neglect, environmental/design characteristics that permit anti-social activity (e.g. stairways out of the way, unlighted walkways), and hotspots for criminal activity, distinguishes less safe from more safe neighborhoods even if all are low-income [16]. The report suggests code enforcement is a tool to enhance neighborhood safety, but it also notes that targeted sweeps are only as effective as the follow-up enforcement and remediation efforts that are simultaneously dedicated.

The literature on violence, crime and the infrastructure sample actions is moderate. No literature was located on the operations and maintenance sample actions and violence. Regarding the effect of assistance to neighborhood groups for cleanups on overall crime, research shows observed physical (and social) disorder does not promote crime, although both stem from the causes [7]. While perception of neighborhood disorder does not necessarily match objective measures [17], perceived disorder and fear of it contribute to the poorer health of residents of disadvantaged neighborhoods [9]. Residents of all races perceive more disorder when their neighborhoods are minority or poor [18]. Increased levels of vacant properties were associated with increased risk of assault [19]. Greening vacant lots, a type of capital improvement, resulted in significant decreases in gun assaults [20] and increased resident perception of safety around the greened lots [21]. Systematic reviews of improved street lighting (vs. fixes) and overall crime found significant decreases of 29% in overall crime in the UK and insignificant decreases of 7% in the US; since night time crime did not decrease more than daytime, the impact of the lighting on increased community pride and informal social control are a more likely explanation for lower crime than increased surveillance [22] [23]. Crime Prevention through Environmental Design (CPTED) the concept of discouraging crime through design of buildings and spaces, has received attention for its potential in multiple settings such as workplaces as well as business and residential areas, but a review concluded it needs formative research before it can be promoted as a viable crime prevention strategy [24].

The literature base on violence and the public safety sample actions is strong. Increased police presence and community policing represent two elements of a geographically focused strategy. There is no single definition of community policing, which has philosophical (broader police function and greater citizen input), strategic (geographic focus, prevention focus, and substantive focus on problems in the community), and programmatic (reorienting police operations to problem-solving and community engagement) dimensions [25]. The Philadelphia foot patrol experiment, in which some officers engaged in community work and others in more crime-oriented activities, found a significant reduction of 22% in violent crime (homicides, aggravated assault, robberies not occurring indoors) within a short distance around the intervention site in areas with a threshold level of pre-intervention violence [26]. Another study found no effect of community policing on violent crime levels [27]. In addition, investigation of policing based on the "broken windows theory" – focus on misdemeanor arrests to prevent escalation to violent offenses – found it does not reduce violent crime [28]. Studies of mandatory arrest for domestic violence have shown mixed results, including increased violence [29]. Community policing has been suggested as a more flexible approach to domestic violence [30]. Other geographically focused approaches include hotspot policing and problem-oriented policing (POP). A problem solving approach can reduce fear of crime, violent and property crime, and some types of disorder (e.g. prostitution and drug dealing) [31]. Research investigating these topics, including systematic reviews of intervention effectiveness in reducing violent crime, demonstrate modest but significant benefit [32] [31] [33] [34] [35]. A residual deterrent effect has been demonstrated [36] [35]. Researchers have examined other potential consequences of a geographically focused strategy, such as crime displacement (i.e. transfer of criminal activity to adjacent areas) and diffusion of crime control benefits (i.e. spillover of deterrent effect to adjacent areas), which can be considered opposite ends of a spectrum. A systematic review of randomized controlled trials and quasi-experimental designs found a trend in favor of diffusion of crime prevention benefit, although it was not conclusive [37].

A systematic review of intervention studies on the effectiveness of neighborhood watch in reducing crime found that the strategy, which grew out of a movement in the late 1960s to promote greater involvement of citizens in crime prevention, achieved a reduction of 12-16% [38]. The review used police-recorded crimes, but the majority of crime studied was residential burglaries with less attention to violent crime. Previous reviews found the strategy ineffective in reducing crime.

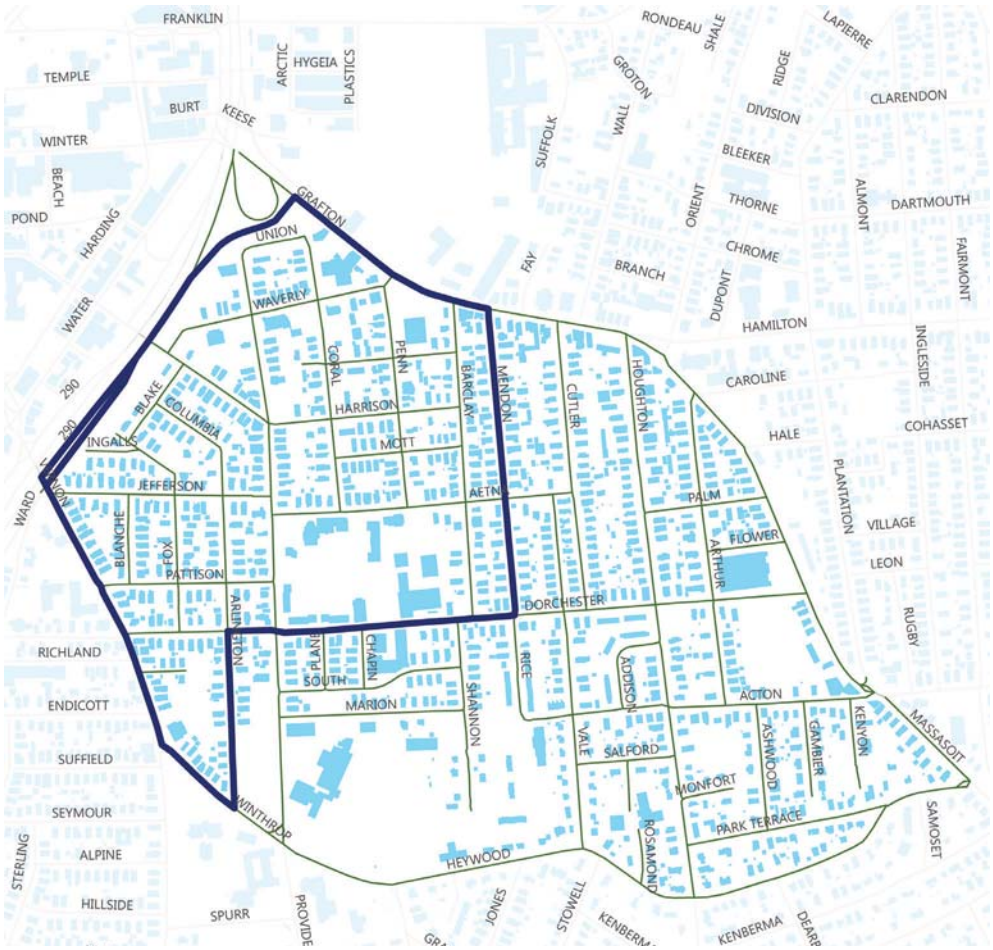
Methods

We assessed both objective and subjective indicators of community violence and safety.

To assess objective indicators, we reviewed incident data from the Worcester Police Department comparing the study area and Worcester for the period July 1, 2012-June 30, 2013. Several points must be noted. First, while the FBI cautions against using Uniform Crime Reports to rank or compare areas based on crime rates without accounting for context, the intent of health impact assessment is to provide rich context. Second, WPD provided data for the Providence Street area, which corresponds approximately but not exactly to the Union Hill Community Policing District (Figure 12). Third, much of the data in this HIA is reported for Census tract 7324, which corresponds approximately but not exactly to the Community Policing District. We also reviewed MDPH data on homicides for Worcester and Massachusetts.

To assess subjective perceptions of violence, we used data from a resident quality of life survey collected in summer 2013. Oak Hill Community Development Corporation is located in the heart of Union Hill. As part of its relationship with NeighborWorks America®, Oak Hill is conducting a 20-item resident quality of life survey during summer 2013 as one component of NeighborWorks' Community Impact Measurement Project (See Appendix A for survey instrument). The other components, field observations of physical conditions at the block and individual property level, were not available in time for this HIA. The resident survey is available in English and Spanish. In addition to permitting us to add a question on trust in neighbors used in the 2010 Boston Indicators Survey, Oak Hill shared the paper surveys collected to date. In return, WDPH provided assistance with in-person data collection using paper surveys during June-August. NeighborWorks America has stringent data collection requirements, including specific selection of residential units for surveying, and Oak Hill was required to collect a minimum of 209 surveys from this sample. Data collection proceeded much more slowly than anticipated, so we present this data mostly in a qualitative light. We entered and analyzed the data using the free software EpiInfo 7 (www.cdc.gov/epiinfo) to produce descriptive statistics. In most cases we collapsed response categories to simplify display. See Figure 14 for a map of the survey area and Table 9 for respondent characteristics. For this determinant we analyzed items on perceived safety in the neighborhood for self, senior citizens, and children and youth playing outside.

Figure 14. Oak Hill CDC Resident Survey Area



Source: Oak Hill CDC, 2013

Table 9. Oak Hill CDC Resident Survey: Respondent Characteristics.

Survey Prompt	Responses
Length of time in the neighborhood	Less than 1 year: 10% 1-5 years: 32% 5-10 years: 23% 10 or more years: 35%
Own or rent home	I rent my home: 61% I own my home: 31% I live with family or friends: 4% Other: 4%
Gender	Male: 39% Female: 61%
Hispanic or Latino	Yes: 31% No: 69%
Race	Black/African-American: 34% Caucasian/White: 55% Asian: 2% Mixed race: 9%
Year of birth	1973 (Median)

Source: Oak Hill CDC Resident Survey, 2013

Comparing survey characteristics available in both the survey and the ACS, the percent owner-occupants, average household size and percent Hispanic/Latino are nearly the same (data not shown).

Last, to assess physical disorder we analyzed selected data from the Worcester Customer Service Response System for the period July 1, 2012-June 30, 2013. We created a "disorder" variable by summing four categories (trash on private property, graffiti on private or public property, illegal dumping and litter) and calculated complaints per 1000 to allow comparison of the Census tract with the city as a whole.

Existing conditions

Police-recorded Crime

Table 10 presents a mixed picture for police-recorded crimes in the Providence Street area compared with the city as a whole. Aggravated assault is slightly higher, although total assaults are not. Rates of domestic violence appear substantially higher, especially domestic assaults and disputes. Violations of public order are slightly higher overall, but the rate of gunshots/illegal carrying in the area is more than twice that for the city as a whole and non-domestic disputes are also higher. Homicide rates are higher in Worcester than in Massachusetts (Figure 15).

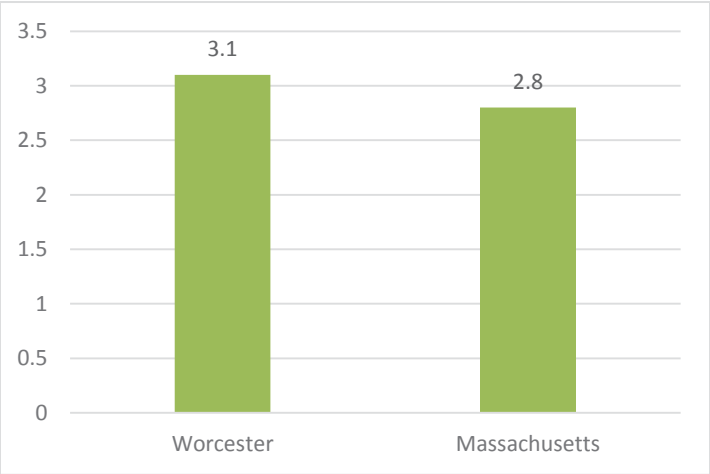
[2] *http://www.successmeasures.org/*

Table 10. Police Incident Data, Providence Street and Citywide

	Study Area		Worcester	
	Total	Rate per 1000	Total	Rate per 1000
TOTAL: Assault and related	129	19.41	4022	22.22
Murder	0	0.00	6	0.03
Aggravated A&B	26	3.91	528	2.92
Simple A&B	11	1.66	651	3.60
Assault	1	0.15	63	0.35
Threatening/Harassment	84	12.64	2504	13.83
Sexual assault	7	1.05	270	1.49
TOTAL: Domestic relations	375	56.43	5485	30.30
Murder	0	0.00	2	0.01
Aggravated A&B	27	4.06	388	2.14
Simple A&B	84	12.64	1155	6.38
Assault	0	0.00	33	0.18
Domestic disputes	243	36.57	3604	19.91
Violation of restraining order	21	3.16	303	1.67
TOTAL: Violations of public order	871	131.08	23460	129.58
Disorderly conduct, fights, trespassing, related	617	92.85	18161	100.31
Gun shots, illegal carrying	43	6.47	538	2.97
Noise-related complaints	115	17.31	2859	15.79
Drugs, prostitution, other vice	40	6.02	942	5.20
Disputes - non-domestic	56	8.43	960	5.30
TOTAL: Robbery	11	1.66	476	2.63
Individual - armed & unarmed	6	0.90	298	1.65
Commercial - armed and unarmed	1	0.15	81	0.45
Attempted armed robbery	2	0.30	31	0.17
Attempted unarmed robbery	1	0.15	23	0.13
Home invasion	1	0.15	43	0.24

Source: Worcester Police Department (7/1/12 - 6/30/13)

Figure 15. Average Annual Homicides per 100,000 (2006-2011)

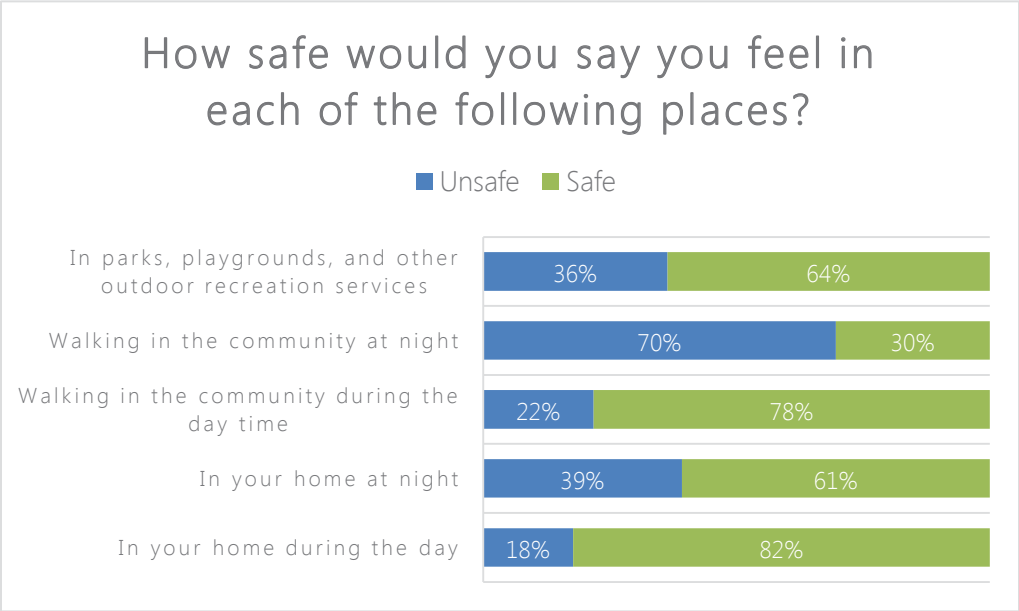


Source: Massachusetts Department of Public Health, Registry of Vital Records and Statistics

Perceived Safety

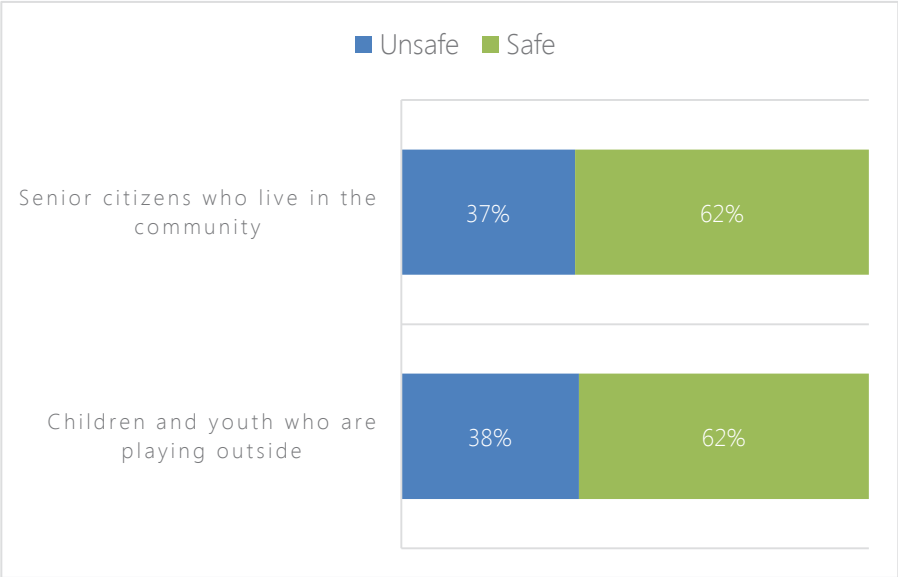
High percentages of residents reported feeling safe in their homes and walking during the day, although fewer reported feeling safe walking at night and in parks, playgrounds and other outdoor recreation areas (Figure 16). The majority reported they feel seniors who live in the community are safe and children playing outside in the neighborhood are safe (Figure 17). WDPH staff who conducted surveys reported that some respondents seemed defensive about their neighborhood given the recent intense focus on it, which may have affected responses.

Figure 16. Perceived Personal Safety in Neighborhood



Source: Oak Hill CDC Resident Survey, 2013

Figure 17. Perceived Safety of Senior Citizens in the Neighborhood and Children/Youth Playing Outside in the Neighborhood



Source: Oak Hill CDC Resident Survey 2013

Disorder

Complaints to the Worcester Customer Service line show more signs of disorder and more streetlight outages in the study area than in the city as a whole (Table 11).

Table 11. Selected Disorder Complaints from Worcester Customer Service Response System

	Census Tract 7324		Worcester	
	Total	Rate per 1000	Total	Rate per 1000
Disorder*	110	16.55	1987	10.98
Street lights Out	57	8.60	1610	3.40

Source: City of Worcester Customer Service Response System (7/1/12 - 6/30/13)

Assessment

Housing: Although the housing actions will directly affect a small number of people, increased neighborhood homeownership level may help increase perceived safety and reduce perception of physical disorder. By increasing neighborhood collective efficacy, increased homeownership may help lower violent and other crime. The mechanisms for rehabilitation assistance to existing homeowners may also reduce perceived disorder by increasing feasibility of repairs that transform properties from eyesores into neighborhood assets. The potential for lead abatement to reduce violence is very long-term but does exist. Benefits of housing sample actions may be concentrated in the investment sub-areas at first, but reduce violence levels around Union Hill over time.

Code enforcement: It is uncertain whether the sample actions will impact violence in the neighborhood or in what direction. Faster response times could reduce disorder if compliance is correspondingly swift. It is important to note that while the City of Worcester Department of Inspectional Services is responsible for issuing citations, remediation resources would come from homeowners, the Office of Housing Development, or other third parties.

Infrastructure: It is uncertain if operations and maintenance actions will have an effect on neighborhood violence. While reducing disorder can help to improve perceived safety, particularly in poorer neighborhoods like Union Hill, it is not clear whether simply assisting neighborhood groups with cleanups rises to that level. Streetlight fixes, vs. improved lighting, are not likely reduce nighttime crime specifically. The impact of capital improvements on violence would be indirect and depend on the type of improvements made. Park improvements, vacant lot greening, improved street lighting and increased pedestrian and bicycle accommodation can put more eyes on the street, increase perceived safety, and increase community pride because of the investments, all of which can help reduce community violence.

Public safety: Community policing is likely to have a strong positive impact in reducing community violence in the neighborhood overall. Impact on domestic violence is uncertain. Crime watch support will likely reduce overall crime, but may reduce property crime more than violent crime.

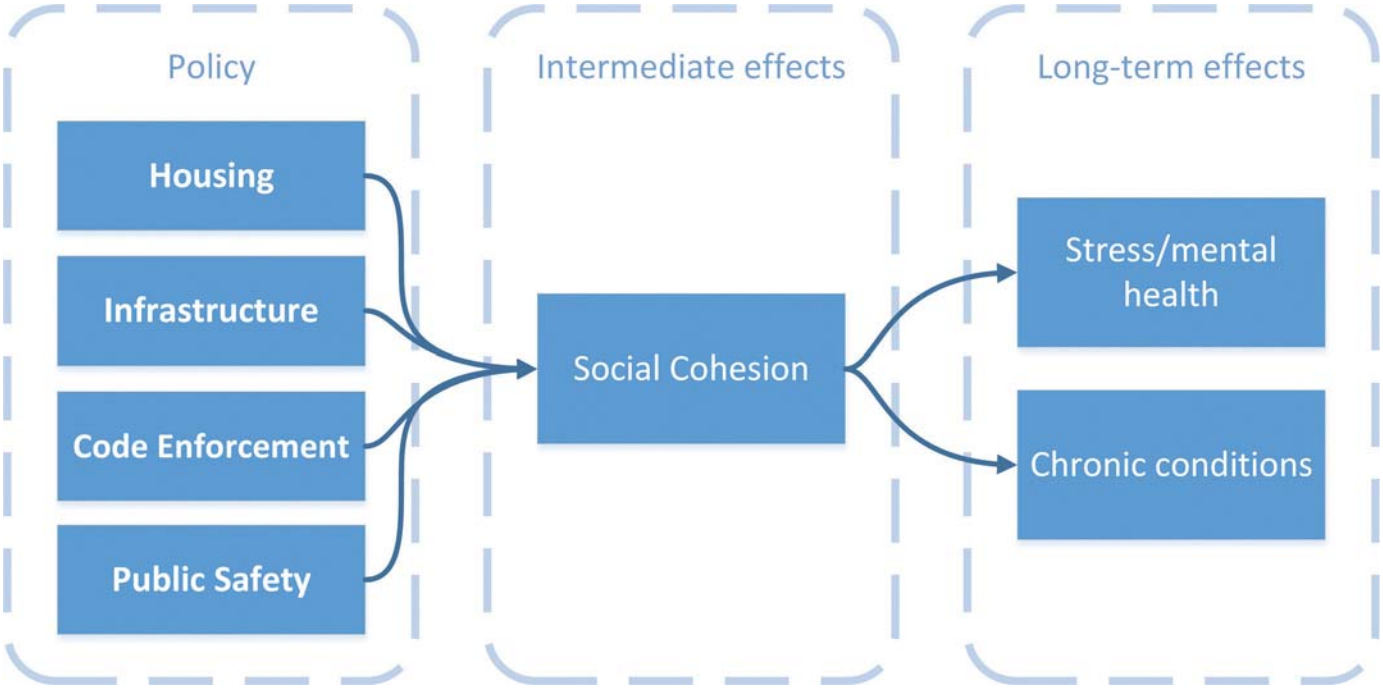
Summary

- ***How does violence affect health?*** Community violence results in higher mortality and injury rates as well as worse mental health status.
- ***What do our data tell us?*** Union Hill has higher reported levels of some violent crime, especially domestic violence, and physical disorder than the city overall. Even so, residents' perceived safety is higher than might be expected.
- ***What do we predict will be the effect of the sample actions?***
    - Increasing homeownership, providing rehabilitation assistance to existing homeowners, capital improvements that put more eyes on the street, and community policing are expected to help lower community violence.
    - It is uncertain if proactive code enforcement and public works operations and maintenance activities will impact violence in the neighborhood.

SOCIAL COHESION

As show in Figure 18, we hypothesized that all four strategy areas would impact social cohesion: Housing; Code Enforcement; Infrastructure; and Public Safety.

Figure 18. Social Cohesion Pathway



Background

Social cohesion and social capital have been linked to better self-rated health [39] as well as lower mortality, better mental health and a range of physical health outcomes [40]. Social cohesion is generally measured as trust in others and participation in voluntary groups. Social capital refers to "the norms and networks that facilitate collective action" [41] and can be broken down into three types [42]. "Bonding social capital" refers to strong ties among family, friends and associates who share demographic characteristics and may also extend to community organizations; even poor communities may be rich in these types of connections. "Bridging social capital" refers to weak ties among groups with different demographic characteristics but similar economic circumstances, such as professional and civic organizations, that provide connections outside the neighborhood. "Linking social capital" refers to ties between individuals and people in positions of influence at formal institutions, and is the type of social capital most important to improving individual and neighborhood economic circumstances. Community building is the deliberate, creative process of strengthening community capacity for self-improvement [43], especially expanding bridging and linking social capital.

Literature on the interaction between social cohesion and the housing sample actions is moderate. Homeownership is linked with longer tenure and less residential mobility [44]. Homeownership and residential stability are associated with collective efficacy, a combination of social cohesion and informal social control (willingness to intervene) which has been in turn associated with 30-40% lower levels of violence than expected in disadvantaged neighborhoods [11]. Homeowners report more trust in neighbors than do renters, although

not trust of others in their neighborhood such as strangers, store owners, coworkers, or police [45]. A longitudinal study found positive long-term effects of homeownership on participation in neighborhood meetings among low-income homebuyers versus renters [46]. Voting rates, a civic engagement indicator used as a proxy for social cohesion, are positively associated with homeownership even in disadvantaged neighborhoods [47]. Homeowners are more likely to participate in formal social groups but not to act more "neighborly" [48]. The benefits of increasing homeownership are not equally distributed, however. Black and Hispanic homeowners do not report the same better health status vs. renters that white homeowners do [49], and segregation was found to be greater among black homeowners than for black renters [50]. A case study in Lawrence, MA, concluded that diversity of housing options would better increase neighborhood stabilization in smaller, post-industrial cities than an exclusive focus on homeownership [51].

The benefits of neighborhood revitalization are also not necessarily equally distributed. Gentrification can be defined as "the process by which higher income households displace lower-income residents of a neighborhood, changing the essential character and flavor of that neighborhood" [52]. The greatest risk of gentrification is involuntary displacement, and the most vulnerable include renters, undocumented immigrants, non-English speakers and lower income households. Although gentrification occurs largely in areas with a tight housing market, neighborhood conditions indicating likelihood of gentrification include a high rate of renters, ease of access to job centers (through highway and transit), metropolitan level of traffic congestion, high architectural value, comparatively low housing values, and higher share of multi-unit (3+) buildings [52] [53]. The recent trend has been to downplay potential harm of displacement associated with it [54], but strong concern remains [55] and watchdogs advocate monitoring of risk indicators [53] [52]. Gentrification has been shown to decrease voter turnout among longtime residents, supporting a "destabilizing" hypothesis [56].

Literature on the link between social cohesion and the code enforcement sample actions to improve housing habitability is weak, consisting of community-based reports and best practice assessment. An analysis of Dallas tools to transform abandoned and blighted properties into community assets includes code enforcement along with criminal nuisance abatement, receivership, and asset forfeiture [57]. Innovative collaboration with the community on code enforcement such as citizen inspector or volunteer housing specialist programs and giving neighborhood groups the right to enforce code provisions [58] [59] [60] [57] have potential to increase social cohesion by creating opportunities for neighbors to visibly improve the neighborhood by working together and increase linking social capital by working closely with city officials. Moving quickly from under-enforcement in a complaint-based system to aggressive enforcement, especially without dedication of resources for remediation, could conceivably result in evictions; increased residential mobility may mean lower social cohesion [16].

Literature on social cohesion and the infrastructure sample actions is moderate. Capital improvements that increase walkability (see Physical Activity) and operations and maintenance actions that decrease disorder (see Community Violence) each have potential to thereby increase informal social contact among residents.

The literature on social cohesion and the public safety sample actions is strong but mixed.

Crime has not often been considered as an outcome in public health research, but higher social cohesiveness has been demonstrated to be associated with lower crime levels [61] even in disadvantaged areas [62]. Reducing fear of crime would allow residents to feel more comfortable outside, where there is greater possibility for socializing with neighbors and strengthening social ties. A systematic review of quasi-experimental interventions concluded that increased police presence has a strong impact on reduction in fear of crime and that community policing demonstrated the strongest impact of the strategies studied [63]. This review also found these strategies led to increased public satisfaction with police. Observational studies have found association between community policing and neighborhood level social capital [64] and, conversely, between lower social capital and higher distrust of local police [65]. A qualitative literature review notes the greater impacts of community policing on interaction between the police and the public than on recorded crime rates [66]. An observational study of resident perceptions of community policing found a positive effect on both satisfaction with police and crime prevention behaviors, although not with fear levels [67].

Public perceptions of the police, specifically trust, can be considered a measure of police effectiveness [68]. A systematic review of experimental and quasi-experimental interventions to improve police legitimacy concluded citizens are more likely to comply with the law and cooperate with police when they view police as legitimate [69]. The researchers suggest procedural justice ("…citizen participation in the proceedings prior to an authority reaching a decision (or voice), perceived neutrality of the authority in making the decision, whether or not the authority showed dignity and respect toward citizens throughout the interaction, and whether or not the authority conveyed trustworthy motives)" is the most common pathway to increase perceptions of legitimacy. Community policing, and avoidance of zero tolerance campaigns, has been suggested to increase trust in police [70]. While public judgment about whether police were profiling was associated with level of public support [71], no evidence was located on associations of increased incidence of racial profiling with increased police presence or community policing. Race and class were found to be important predictors of resident satisfaction with police, but neighborhood-level characteristics such as racial composition, concentrated disadvantage, residential mobility and violent crime rate were more important [72].

Methods

We assessed residential stability by comparing data on selected housing characteristics from the American Community Survey for Census tract 7324 and Worcester. We assessed civic participation using voter turnout data from the Worcester Elections Commission for the years 2010-2012 (the final year was a presidential election). We focused assessment on two precincts central to the study area (4-1 and 6-1), as the other two precincts extend beyond Census tract 7324. We analyzed the resident survey items on satisfaction with living in this community, likelihood of recommending this community as a good place to live, trust in neighbors, neighborhood involvement, willingness to be involved and satisfaction with police response. The first five represent "bridging social capital" and the sixth represents "linking social capital."

Existing conditions

Residential Stability

Neighborhood housing characteristics show mixed evidence on residential stability. Level of owner-occupied housing is substantially lower in the area than in Worcester. Percent living in the same house 1 year ago was similar for the state, city and study area (Table 12), though members of the advisory committee stressed that these data do not account for those whose homes were foreclosed upon, and therefore left the neighborhood without an opportunity for new residents to move in. Based on median year moved in, Union Hill owner-occupants have lived in their homes five years longer than Worcester residents overall. The resident survey showed that 58% of respondents have lived in Union Hill for more than five years.

Table 12. Selected Neighborhood Housing Characteristics for Census Tract 7324, Worcester

	Union Hill	Worcester	Massachusetts
Median Gross Rent	$1,089	$886	$1,037
Gross Rent 35% or more of income	54%	41%	40%
Living in Same House 1 year ago	86%	84%	87%
Subsidized Housing (% of occupied units)*	4%	7%	N/A
Single Householder	29%	22%	16%
Female-Headed Household	20%	17%	12%
Median Year Moved Into Home, Owner-Occupied	1992	1997	1996
Median Year Moved Into Home, Renter-Occupied	2005 or later	2005 or later	2005 or later

Source: US Census Bureau, American Community Survey (2007-2011) and *Massachusetts Department of Housing and Community Development

Civic Participation

Registered voters in the precincts most central to the study area voted at lower rates than the city as a whole (Table 13).

Table 13. Voter Turnout in Union Hill Precincts

	precinct 4-1	precinct 6-1	Tract 7324 Average*	Worcester total
November 2010	34%	27%	31%	46%
November 2011	12%	9%	11%	20%
November 2012	50%	42%	46%	59%

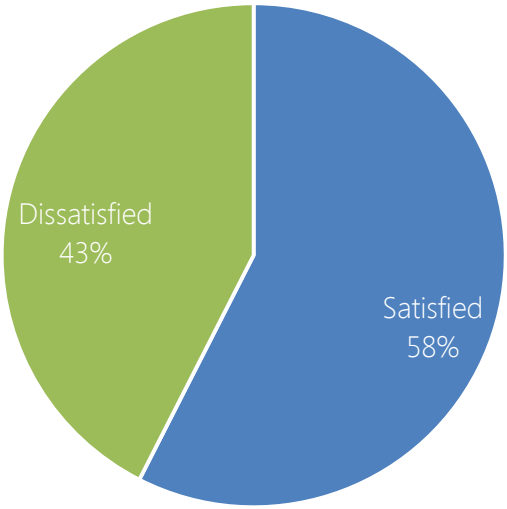
*Covers an area larger than census tract 7324. Calculated by adding total voter turnout of two of the four overlapping precincts of census tract 7324 with the most significant proportion of the population.

Source: Worcester Elections Commission

Perceptions

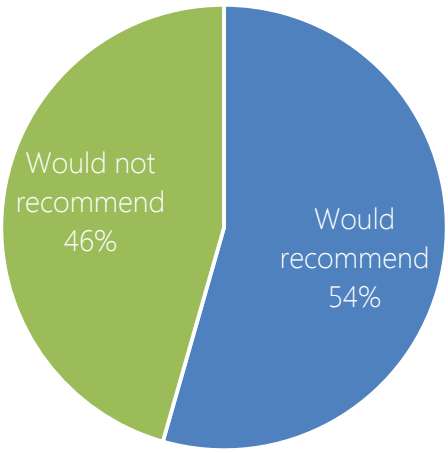
Just over half of respondents reported being satisfied with the community (Figure 19) and would recommend it as a good place to live (Figure 20). Conversely, a larger majority of resident survey respondents reported they do not trust people in their neighborhood (Figure 21). Their rates of personal involvement in the community appear low for multiple types of participation, with the category that includes reporting problems/complaints the highest (Figure 22). They expressed lukewarm interest in getting more involved (Figure 23). Respondents expressed satisfaction with police response, although it should be noted surveying took place after the Worcester Police Department launched the community policing effort (Figure 24).

Figure 19. Satisfaction with Living in this Community



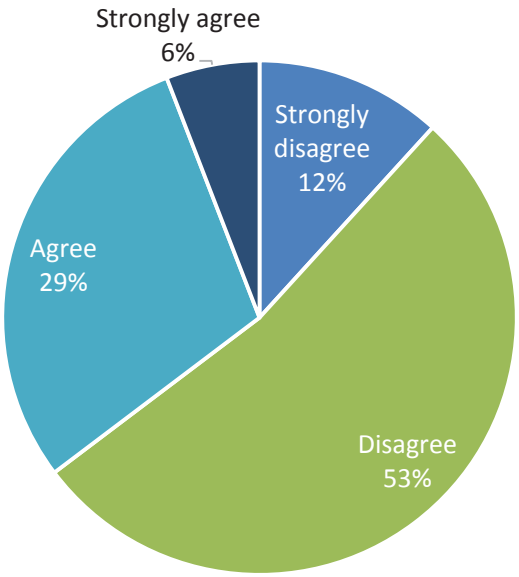
Source: Oak Hill CDC Resident Survey 2013

Figure 20. Likelihood of Recommending Community as Good Place to Live



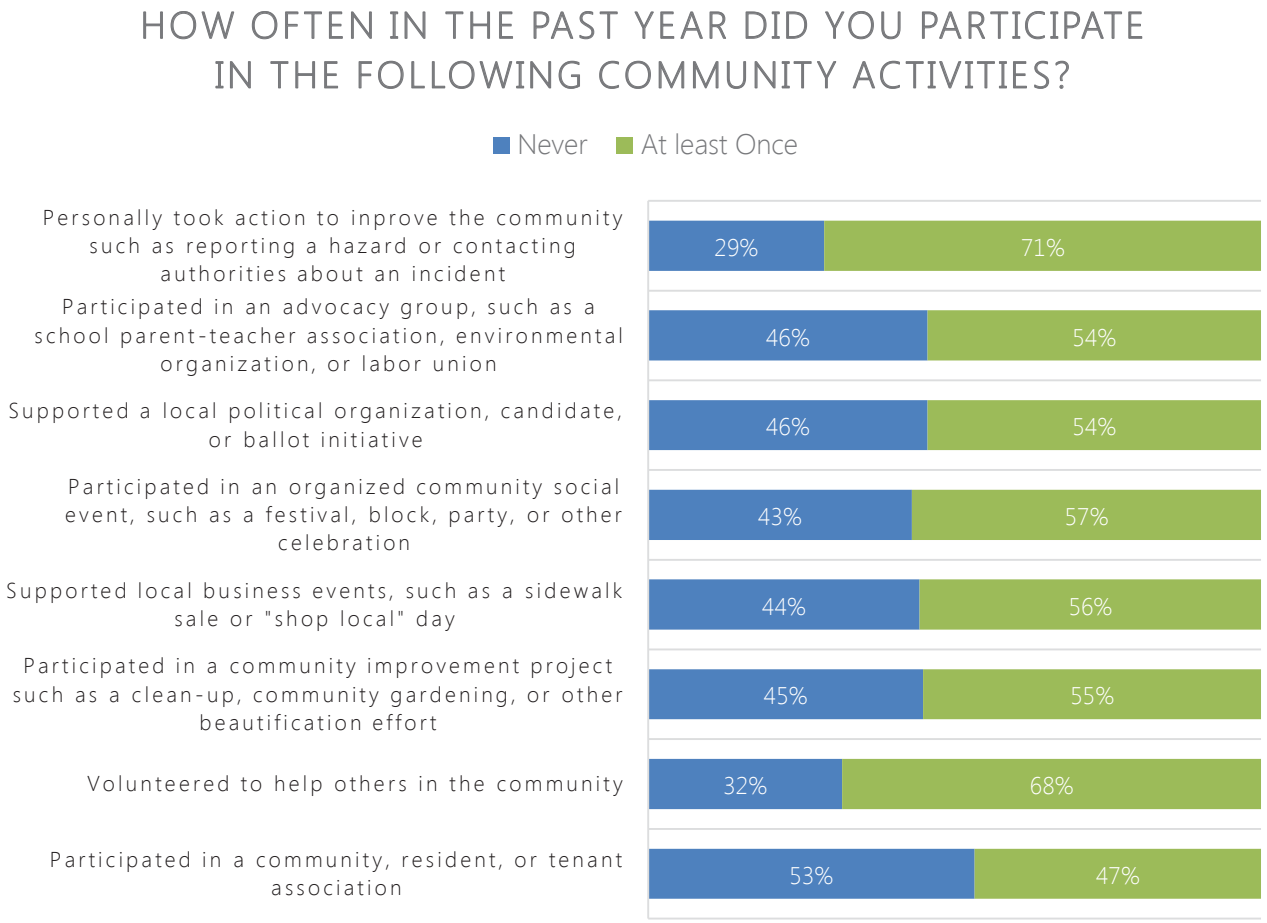
Source: Oak Hill CDC Resident Survey

Figure 21. People in my Neighborhood Can Be Trusted



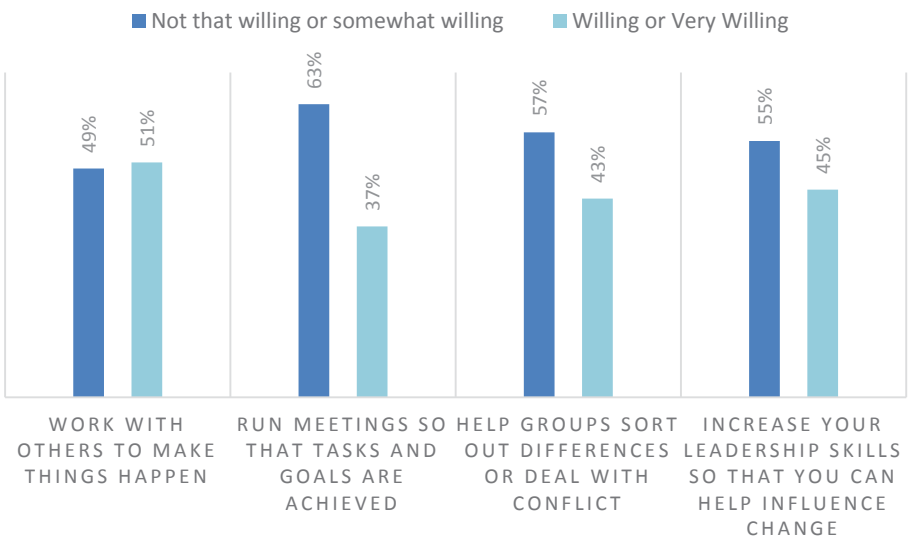
Source: Oak Hill CDC Resident Survey

Figure 22. Neighborhood Involvement



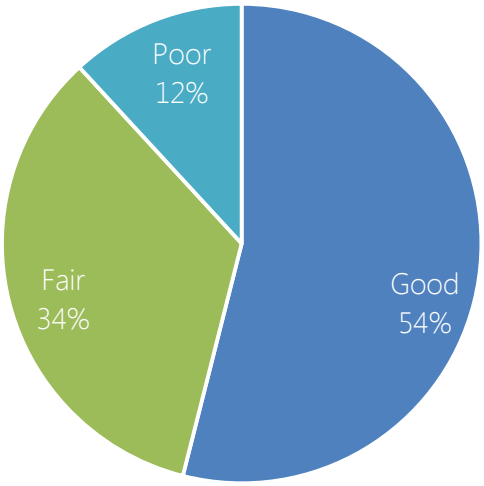
Source: Oak Hill CDC Resident Survey, 2013

Figure 23. Willingness to be Involved in Neighborhood



Source: Oak Hill CDC Resident Survey, 2013

Figure 24. Satisfaction with Police Response



Source: Oak Hill CDC Resident Survey, 2013

Assessment

Housing: Down payment and rehabilitation assistance are likely to have positive impact on social cohesion in the neighborhood, although benefits may not accrue equally to all racial and ethnic groups. Other forms of housing assistance in addition to increasing homeownership may be needed. Increased homeownership may increase trust in neighbors, participation in formal groups, and civic participation, all of which are associated with higher social cohesion.

Code enforcement: Positive impact of the sample actions on neighborhood social cohesion is possible if detection of problems is accompanied by corrective action that reduces

perceivable disorder. This would increase perceived neighborhood safety, encouraging residents to be outside more and facilitating greater informal contact with neighbors. There is potential for negative impact on social cohesion if short term aggressive enforcement under the current complaint-based system without allocation of remediation resources results in evictions of the lowest-income renters.

Infrastructure: Assistance with neighborhood cleanups can positively impact social cohesion by contributing to community pride. Capital improvements to increase walkability, lighting and trees have potential positive impact on social cohesion by increasing neighborhood pride, walking safety, and aesthetics, which could foster more informal social contact among residents. Impact cannot be judged until capital improvements are specified. The effect of improvements also depends on how widespread they are.

Public safety: Community policing is likely to positively impact social cohesion through greater trust in the police and increased perceived safety that can encourage increased social contact among neighbors. Attention should be paid to assessing effects of community policing on racial and ethnic minorities given the importance of trust in the police.

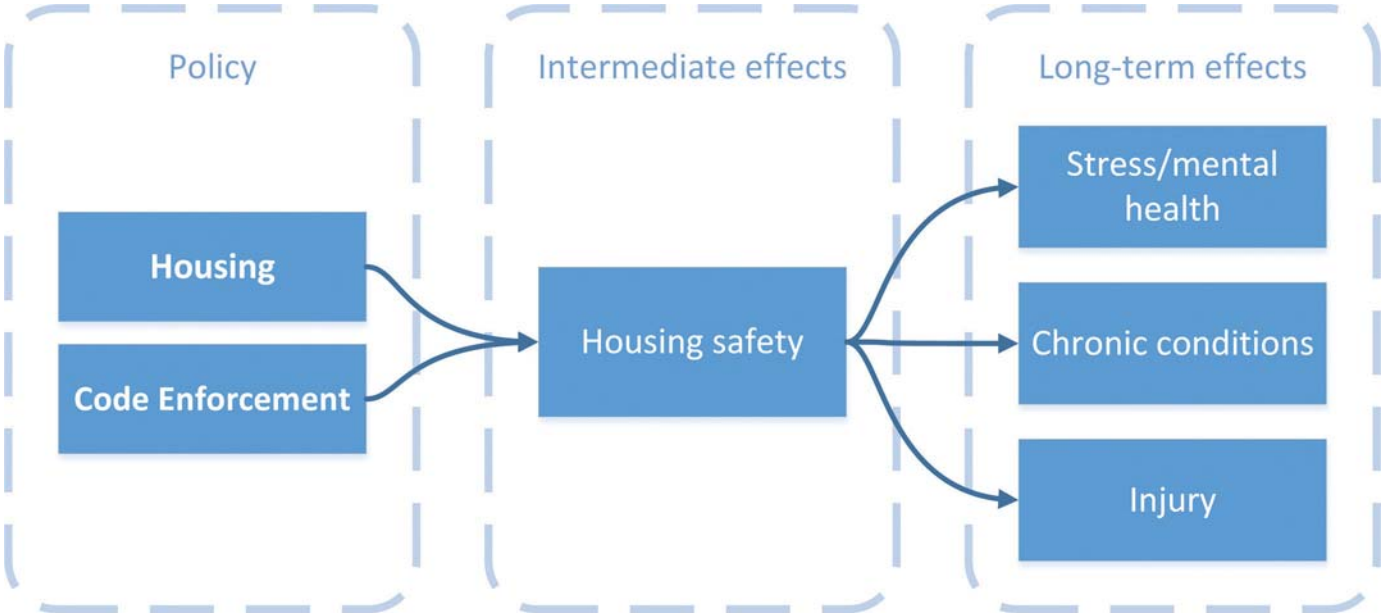
Summary

- ***How does social cohesion affect health?*** Greater social cohesion, i.e. connection among neighbors and civic and voluntary participation in neighborhood groups, improves physical and mental health. Of the three types of social capital, strengthening "linking social capital" has the greatest potential for improving individuals' economic circumstances.
- ***What do our data tell us?*** Union Hill shows mixed results for social cohesion. Indicators such as trust in neighbors, voter turnout and participation in neighborhood improvement and other activities indicate low social cohesion. However, the majority of people like living in the community and would recommend it as a good place to live.
- ***What do we predict will be the effect of the sample actions?***
    - Increasing homeownership, capital improvements that put more eyes on the street, and community policing are expected to help increase social cohesion.
    - Code enforcement actions and public works operations and maintenance activities have only modest potential to increase social cohesion.
    - Two potential risks to social cohesion include: aggressive code enforcement action without remediation resources and the perception of racial profiling.

HOUSING SAFETY

As show in Figure 25, we hypothesized that two strategy areas would impact housing safety: Housing and Code Enforcement.

Figure 25. Housing Safety Pathway



Background

The academic literature on the connection between housing safety and health is robust, and substandard housing is considered a major public health issue [73] [74]. Hundreds of studies have demonstrated association of housing conditions with health in terms of biological, chemical, and physical hazards as well as psychosocial stressors [75]. Health outcomes include morbidity and mortality associated with infectious diseases such as tuberculosis; chronic illnesses such as asthma from exposure to damp, cold and moldy housing, pest infestations, and dirty carpeting, as well as other chronic health problems from exposure to toxic substances (e.g. VOC, CO, radon, asbestos, PVC, pesticides), and poor ventilation and climate control; injuries from falls and fires due to structural defects and lack of safety devices; poor nutrition due to allocation of resources to expensive housing, and mental disorders such as anxiety and depression due to overcrowding, lighting, noise, and housing cost burden [76] [77] [73] [78]. Costs associated with these conditions, in terms of health care and productivity losses, are high [79]. Low-income and minority populations are approximately twice as likely as the general population to live in homes with severe physical problems [80] [73] [76] and more likely to be unable to afford their rent or mortgage. People living in substandard homes are typically also the most energy cost-burdened [76], i.e., paying a substantial percentage of their income to heat, cool and light their homes.

The literature on the housing sample actions and housing safety is strong. Evidence of health impact from improving housing conditions is more limited than that on health effects of substandard housing [81] [82]. Systematic reviews of physical improvements to housing not including lead removal acknowledge that little quantitative synthesis is possible but suggest that warmth/energy efficiency improvements can result in health improvements;

that health impacts of area urban renewal projects focused on housing might be strongest for those most likely to benefit; that few adverse effects have been reported; and that few studies report differential impacts allowing assessment of equity [81] [82] [83]. These authors reviewed the same evidence to identify useful information for conduct of housing health impact assessments and concluded the following improvements could be expected based on intervention research: mental health; children's respiratory symptoms; and social measures such as sense of isolation and fear of crime [2]. They also noted the following improvements should be tracked in an HIA given observational evidence of their effect: indoor air quality; temperature and warmth; housing tenure; housing type and design; moving and relocation; displacement; area effects; and housing costs. A review of a wider range of US housing interventions to improve health (rehousing; changes in physical infrastructure; changes in indoor equipment or furniture; changes in participants' knowledge or behavior; changes in community norms or collective behavior; changes in housing policy and regulatory practices; and changes in health practitioners' behavior related to housing effects on health) found that while over two-thirds had statistically significant results, only about half demonstrated sustained effectiveness and few studies provided detail on content of the interventions [77].. A synthesis of reviews found strong evidence to support interventions on area characteristics (tenant-based rental assistance such as the HUD Moving to Opportunity pilot, urban renewal), weaker evidence for area-level interventions that improve internal housing conditions, and no evidence of interventions to increase homeownership [83]. A systematic review found that urban renewal programs that include housing improvements usually aim to improve the area by bringing in new residents rather than assisting existing residents and may not lead to clear improvements in housing conditions for all the houses in a neighborhood [81].

The housing sample actions also include energy-efficiency upgrades and lead abatement. Two randomized controlled trials, one on insulating existing homes and one on more effective heating, led to significantly warmer, drier environments as well as better self-rated health, half the number of wheezing episodes, half as many school absences, and 20% less energy consumption [84] [85]. A before-after study found improvements in asthma and overall health after "green" rehabilitation (improved ventilation and reduced moisture, mold, pests and radon), as well as reduced fuel costs. Adverse health effects are possible with energy-efficiency projects conducted outside the context of healthy homes, such as increased asthma due to air exchange and disturbing lead paint in the process of increasing insulation [76]. A systematic review of intervention findings concluded there is "sufficient evidence" to recommend lead hazard abatement based on health impact [86]. Forty percent of the housing units in the US have lead-based paint, and 63% of those units have significant hazards such as deteriorated paint and soil and dust contaminated with lead [87]. Lead abatement can prevent lead poisoning as well as reduce blood levels in already exposed children [88].

Literature on housing safety and the code enforcement sample actions is moderate. Most housing codes do not address remediation or maintenance in existing buildings, and smaller US municipalities do not routinely collect housing and health data that would allow for more investigation [73]. A Memphis investigation found that absentee-owned single family homes and duplexes were at least four times more likely to be in violation of the housing code than owner-occupied single family homes, concluding that neighborhood restoration strategies must include attention to substandard housing and problem properties in addition to renovation and sale of affordable units to owner-occupants [16]. The same

investigation noted the need for remediation (including help for elderly and low-income owners, partnership with community development corporations for repairs as well as tools such as eminent domain and receivership to convey property to more responsible ownership) when units remain non-compliant. They advocate development and use of a proactive strategy with criteria to prioritize/target over a complaint-based system. Components of such a strategy include systematic inspection of designated properties, targeted sweeps and geographic demonstration projects, and resident-driven proactive alternatives to the code enforcement process such as civil litigation to address problem properties. Higher rates of housing violations were significantly related to risk of injury for children under five [88] and up to three times the level of allergens present [89]. A study of children living in states with different levels of enforcement of lead poisoning prevention statutes found a fourfold risk of identifying a child with blood lead levels at the threshold set by the US Centers for Disease Control and Prevention for poisoning [90]. African-American children living in poor, urban areas of the Northeast are most likely to be affected [91]. Some experts see code enforcement emerging as a public service as important as police, fire, and EMS [92]. It is advocated as a preventive health strategy [93], although newer findings about the effects of housing on health have overall not been translated into updated housing codes [73]. Healthy Homes initiatives address this gap in some cities with activities such as action plan development and minor repairs by community health workers in conjunction with residents. The Greensboro (NC) Housing Coalition worked with city code inspectors to achieve better compliance with enforcement orders and saw a 77% drop in number of housing units with code violations [93]. Reports advocate collaboration among government agencies and with the community to enhance housing safety [73] [58] [57].

Methods

We analyzed selected data on housing conditions in the housing and building/zoning categories from the Worcester Customer Service Response System for the period July 1, 2012-June 30, 2013. Where possible we reviewed numbers of inspector-initiated actions in addition to complaints.

Existing conditions

The habitability data show substantial differences in complaints and reports between the study area and the city as a whole (Table 14). Rates for general conditions (which include categories such as trash, overgrowth, broken windows, missing screens, mold, mice, cockroaches, bed bugs, water leaks, water damage, damaged floors, doors, walls, ceilings, inoperable mechanics like windows and doors) are double for complaints and triple for inspector-initiated reports. The study area has twice the rate of emergency conditions complaints (which includes fire damage, lack of heat, gas, electricity or water), although there was no difference in inspector-initiated reports.

Table 14. Selected Habitability Complaints from Worcester Customer Service Response System

	Census Tract 7324		Worcester	
	Total	Rate per 1000	Total	Rate per 1000
Complaint-Driven Housing Inspections				
General conditions	136	20.47	1337	7.38
Lead inspection	0	0.00	12	0.07
Emergency conditions	3	0.45	75	0.41
Trash-priv prop	0	0.00	33	0.18
Neighborhood sweep	58	8.73	1120	6.19
Proactive Housing Inspections				
General conditions	217	32.66	2969	16.40
Lead inspection	12	1.81	221	1.22
Emergency conditions	28	4.21	357	1.97
Trash-priv prop	36	5.42	816	4.51
Complaint-Driven Building/Zoning Inspections				
Dangerous bldg	0	0.00	16	0.09
General conditions	13	1.96	396	2.19
Plumbing/gas general	8	1.20	171	0.94
Wiring general	1	0.15	18	0.10
Zoning	1	0.15	41	0.23

Source: Worcester Customer Service Response System (7/1/12-6/30/13)

Assessment

Housing: Rehabilitation assistance to new or existing homeowners in the neighborhood is likely to improve housing quality and safety, although sustainability of the improvements is less certain. Improvements in respiratory symptoms and mental health are among the most likely outcomes. Assistance for energy-efficiency improvements is likely to result in warmer, drier environments that help control mold and other allergens. Care must be taken to avoid unintentionally causing other problems in renovation such as reduced air exchange or disturbance of lead paint if abatement is not part of the rehabilitation. Lead abatement will positively impact housing safety, particularly in preventing poisoning although reducing exposure after poisoning is also likely and particularly among minority populations.

Code enforcement: The code enforcement sample actions will identify safety deficits of dwellings, but it is not certain if they will have positive health impact without allocation of resources for remediation beyond emergency repairs. If such resources are not allocated, the lowest-income renters may face eviction by landlords who are unwilling to commit funds to rehabilitate the property and remove the property from the market.

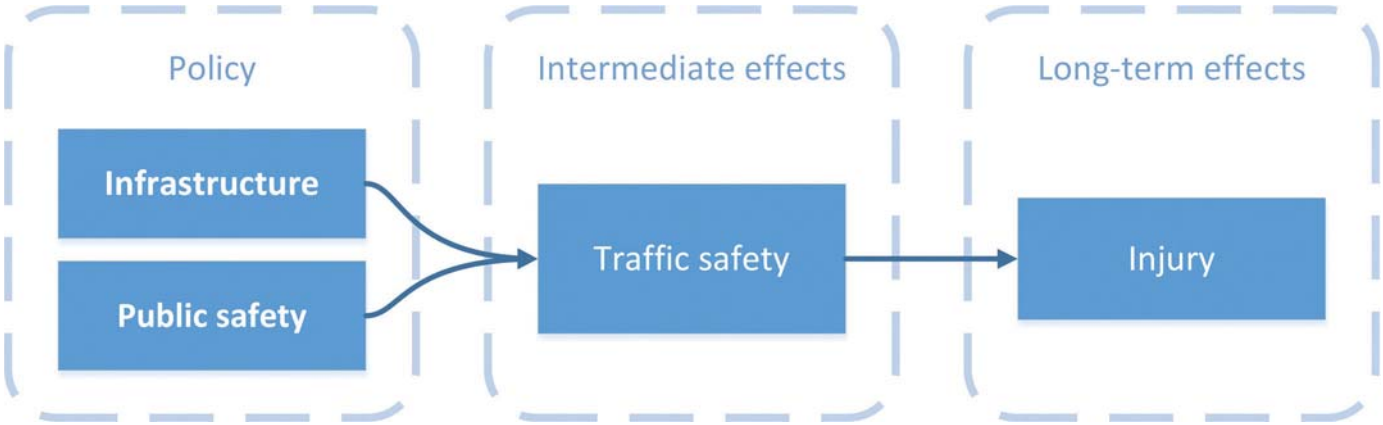
Summary

- ***How does housing safety affect health?*** Substandard housing is associated with higher rates of chronic disease and injuries and worse mental health. Racial minorities are more likely to live in substandard housing.
- ***What do our data tell us?*** Housing quality and safety are lower in the study area than in Worcester as a whole, as measured by higher number of complaints and inspector reports of violations.
- *What do we predict will be the effect of the sample actions?*
    - Rehabilitation assistance, including for energy-efficiency and lead abatement, is likely to positively affect housing safety in Union Hill.
    - The health impact of proactive code enforcement without allocation of remediation resources is uncertain.

TRAFFIC SAFETY

As show in Figure 26, we hypothesized that two strategy areas would impact traffic safety: Infrastructure and Public Safety.

Figure 26. Traffic Safety Pathway



Background

Motor vehicles crashes are one of the top causes of death and death from injury in the US [5] [4]. Pedestrians are more vulnerable than motorists to dying in a crash for each trip they take [94]. Seniors and children are among the most vulnerable populations [94]. Driving rates are dropping among younger Americans, making safety of other travel modes increasingly important [95]. The relationship between traffic safety and chronic diseases and their prevention is only now being established due to interest in improving physical activity rates by increasing walking and bicycling.

Literature on traffic safety and the infrastructure sample actions is strong based on possible capital improvements. No literature was located on the operations and maintenance activities. Infrastructure improvements not specifically intended to promote pedestrian or bicyclist safety do not necessarily have health-enhancing effects; an analysis of traffic injuries and fatalities found that general infrastructure improvements accounted for a smaller share of overall reductions in fatalities than demographic changes (age), increased seat-belt use, reduced alcohol consumption and increases in medical technology [96]. Resurfacing was found not to reduce crashes [97]. A systematic review of engineering countermeasures (focused on speed control, separation of pedestrians from vehicles, and measures that increase visibility and conspicuity of pedestrians) showed that built environments changes can substantially lower risk of pedestrian-vehicle crashes by 25-75% [98]. A systematic review of area-wide traffic calming interventions concluded it is a promising intervention for reducing traffic-related injuries [99]. Traffic calming was demonstrated to reduce total number and inequalities in risk of child pedestrian injuries by up to half [100]. A review of studies on built environment and traffic safety found that improvements such as narrow lanes, traffic-calming measures, and street trees close to the roadway improved roadway safety performance (i.e. reduced crashes) in dense urban areas; the authors surmise such designs give drivers clear information about appropriate operating speeds [101]. Recommendations for intersection safety include installing barriers such as fences or shrubs to discourage pedestrians from crossing at unsafe locations; installing bulb-outs at intersections to reduce pedestrian crossing distance;

providing wide refuge islands and medians; constructing pedestrian overpasses/underpasses; installing raised medians; and reducing corner radii [102]. A review of the safety of bicycle-related transportation infrastructure found on-street bicycle lanes associated with lower risk than riding on sidewalks or multi-use paths [103]. Local streets were shown to have half the risk of bicycle-related injury as major streets, while risks on major streets were lowered by half without parked cars and also with bike lanes [104]. A natural experiment on the installation of bike lanes in New Orleans after Hurricane Katrina found biking in the correct direction increased from 73% to 82% [105].

Traffic volume has been found to affect risk of collision and injury to pedestrians [106]. Pedestrians involved in crashes are more likely to be killed at higher speeds [107], and controlling speed through traffic-calming was found to be more important than reducing traffic volume in an analysis of neighborhood environments where child pedestrians were injured [102]. Qualitative research to develop a Pedestrian Level of Service comparable to the motorist Level of Service (LOS) found that presence of a sidewalk, buffering from traffic (especially parked cars and trees), traffic volume, speed, driveway frequency and volume were the most important factors related to pedestrians' sense of safety [108].

Traffic safety is one of the built environment features found to have beneficial impact on physical activity [109]. Many of the street-scale urban design and land use policies and practices recommended in the Community Guide of the US Community Preventive Services Task Force as strategies to increase physical activity have traffic safety benefit; strategies include infrastructure projects to increase safety of street crossing, use of traffic calming approaches (e.g., speed humps, traffic circles), and enhancing street landscaping [110]. Observational research found traffic speed and volume to be among the neighborhood environment features with the greatest association with youth physical activity [111]. People living in areas with lower traffic speeds reported using parks more [112]. In a study of African American public housing residents, lower traffic speed was linked to more walking for men and women [113]. A review of observational data on physical environment attributes and children's physical activity found that children's physical activity was negatively related to number of roads to cross and traffic density/speed as well as crime [114]. An observational analysis concluded that strategies to increase pedestrian activity (e.g. through land use mix) without engineering countermeasures can result in higher levels of pedestrian injury [115].

Official recommendations on "pedestrian countermeasures" to improve traffic safety fit under the concept of "Complete Streets", acceptance of which has accelerated over the past decade (www.completestreets.org). Cities such as Boston and New York have developed Complete Streets guidelines.

No literature was found specifically linking the public safety sample actions and traffic safety. Applicable public safety interventions include enforcement of moving violations. The literature supporting the relationship between enforcement and traffic safety is moderate. Installation of speed monitors reduces speed, but the effect lasts little beyond deployment [116]. Morning commuters are least likely to respond [117]. Effects of a one-week program of enforcement of yielding to pedestrians at crosswalks were sustained one year after the intervention with minimal enforcement [118]. A combined program of enforcement with traffic engineering changes such as pavement markings and signs produced large and sustained increases in yielding [119].

Methods

Our partner, Central Massachusetts Regional Planning Commission (CMRPC), geocoded crash locations and severity as well as bicycle and pedestrian crash locations and severity for the study area during the period 2007-2009 based on data from the Massachusetts Registry of Motor Vehicles. The maps delineate fatal injury, non-fatal injury, and property damage. We analyzed crash types (single incidents involving pedestrian, single incidents involving bicyclist, motor vehicle clusters) over the same two-year period and calculated crashes per 1000 to enable comparisons. We calculated crash injury rates per 1000 for the study area during the same period. Both crash type and injury data are from the Massachusetts Registry of Motor Vehicles. CMRPC geocoded their own 2009 24-hour traffic count data to assess traffic volume. We reviewed Pavement Condition Index (PCI) data provided by the Department of Public Works and Parks for study area streets. PCI, developed by the US Army Corps of Engineers, indicates general pavement condition based on visual survey. Current DPWP protocol limits work to streets with PCI lower than 80. We conducted informal visual observation for traffic calming elements.

Existing conditions

Crashes

In 2009, the Surface Transportation Policy Project gave the Worcester metro area a pedestrian safety index of 29.8 in its publication Dangerous by Design [120]. The worst score provided for MA was Providence-New Bedford-Fall River at 38.4, the best was Pittsfield at 21.8 (score calculated by dividing the average pedestrian fatality rate by the percentage of residents walking to work).

The study area has a higher number of crashes than the city as a whole, with the greatest difference in single incidents involving pedestrians (Table 15). In addition, the study area shows a rate of non-fatal injury in such crashes involving pedestrians more than five times that of the city as a whole as shown by RMV data (Table 16), though the City's crash data shows a more comparable rate (Table 17). The data used from the RMV and the City of Worcester assess different time periods and slightly different geographies, and capture a similar, but not identical, pool of incidents.

Table 15. Crash Rates for Census Tract 7324 and Worcester

	Census Tract 7324		Worcester	
Crash Type	Total	Rate per 1000	Total	Rate per 1000
Single incidents involving pedestrian	47	7.07	874	4.83
Single incidents involving bicyclist	13	1.96	328	1.81
Motor vehicle clusters	8	1.20	129	0.71
TOTAL	68	10.23	1331	7.35

Source: Massachusetts Registry of Motor Vehicles, 2007-2009

The geocoded crash locations show many but not all crashes occur along arterials (Figure 27 and Figure 28).

Table 16. Crash Injury for Census Tract 7324 and Worcester

	Census Tract 7324		Worcester	
Injury type	Total	Rate per 1000	Total	Rate per 1000
Fatal				
Pedestrian	1	0.15	22	0.12
Cyclist	1	0.15	1	0.01
Motor-Vehicle	1	0.15	16	0.09
Non-fatal				
Pedestrian	32	4.82	162	0.90
Cyclist	8	1.20	199	1.10
Motor-Vehicle	120	18.06	3661	20.23
Property only				
Pedestrian	8	1.20	150	0.83
Cyclist	3	0.45	101	0.56
Motor-Vehicle	294	44.24	8607	47.55
Not reported				
Pedestrian	6	0.90	110	0.61
Cyclist	1	0.15	28	0.15
Motor-Vehicle	135	20.32	2662	14.71

Source: Massachusetts Registry of Motor Vehicles, 2007-2009

Table 17. Crash Injury for Community Policing District and Worcester

	Community Policing District		Worcester	
Injury type	Total	Rate per 1000	Total	Rate per 1000
Fatal				
Pedestrian	0	0.00	7	0.04
Motor-Vehicle	1	0.15	6	0.03
Non-fatal				
Pedestrian	57	2.86	979	5.41
Motor-Vehicle	176	26.49	4911	27.13
Property only				
Property damage	636	95.71	11793	65.15

Source: Worcester Police Department, 2010-2012, 3-year count and rate

Figure 27. Crash locations and Severity, Union Hill Area (2007-2009)

Source: Massachusetts Registry of Motor Vehicles, Produced by CMRPC

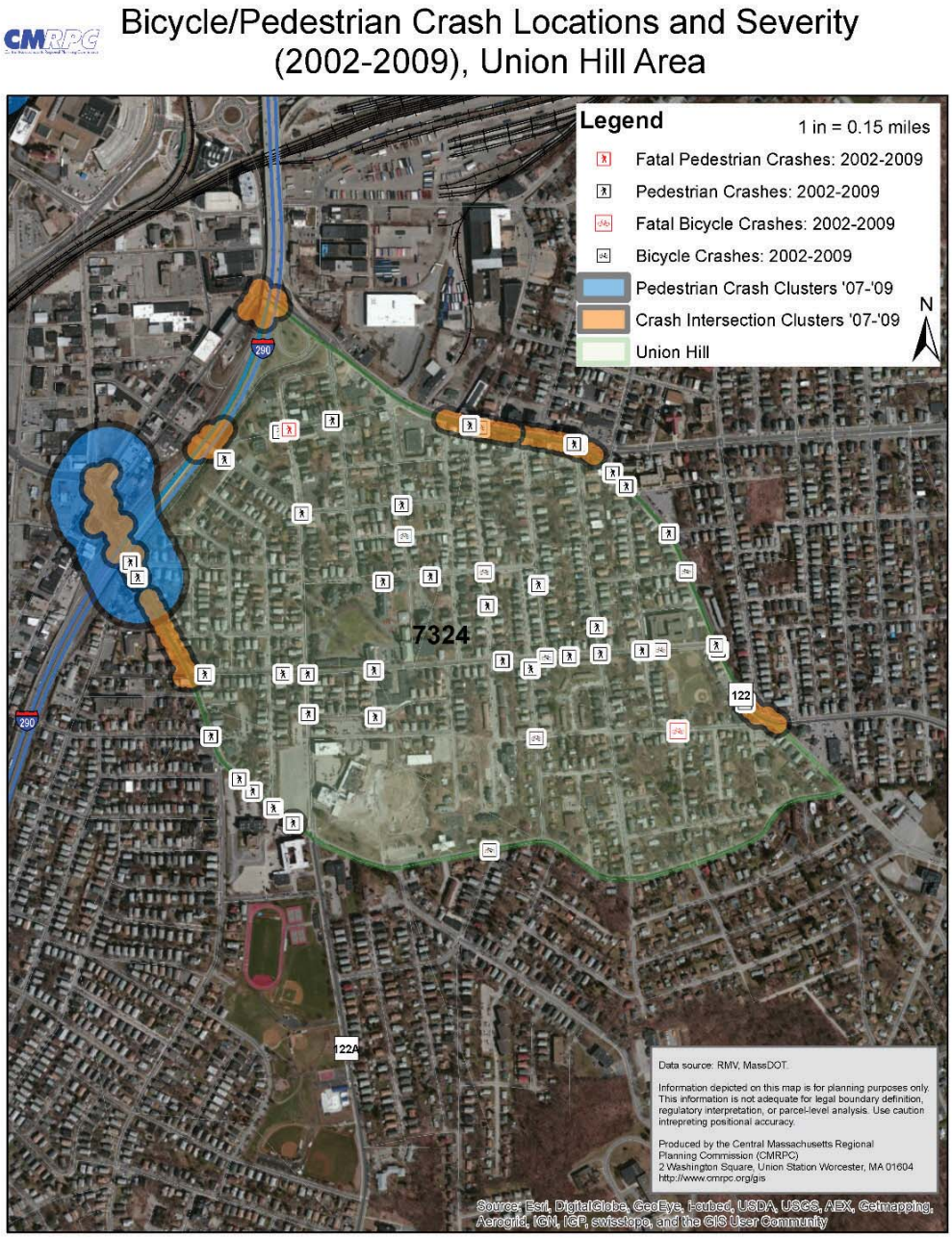
Figure 28. Bicycle/Pedestrian Crash Locations and Severity, Union Hill Area (2002-2009)

Source: Massachusetts Registry of Motor Vehicles, Produced by CMRPC

Traffic volume

The geocoded traffic volume data illustrate that the arterials carry the most traffic, but also that a section of one of the local streets (Dorchester Street) carries higher volume than other local streets (Figure 29).

Figure 29. Average Daily Traffic, Union Hill Area (2009)



Source: Central Massachusetts Regional Planning Commission

Conditions

The average PCI for area streets is 79, with a range of 40 (Mendon Street) to 100 for Cutler Street. 49% of street footage in the area has a PCI below 80. There are no on-street bike accommodations in the study area. No traffic calming elements were observed in the study area, although the project timeline did not permit formal auditing and available audit data cannot be scored.

Assessment

Infrastructure: The public works operations and maintenance activities are unlikely to have any impact on traffic safety. Capital improvements have potential to positively impact traffic safety depending on their nature and intent. If they are planned expressly to improve safety of pedestrians and bicyclists and to take full advantage of best practices from the traffic engineering and public health fields, they can have strong positive impact in reducing speed, all crashes, crashes involving pedestrians, and non-fatal injury in crashes involving pedestrians, and in increasing perceived safety.

Public safety: The impact of the public safety actions on traffic safety is uncertain given the lack of articulated traffic-related sample actions.

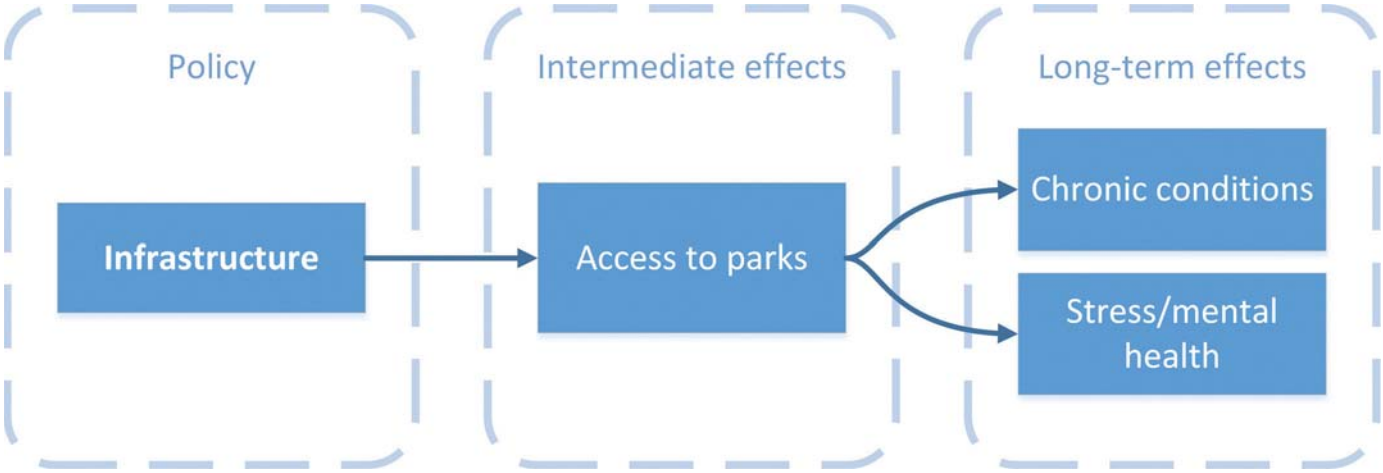
Summary

- ***How does traffic safety affect health?*** Motor vehicle crashes are among the top causes of death and death from injury in the US. Only capital improvements specifically intended to improve pedestrian and bicyclist safety are likely to reduce pedestrian and bicyclist crashes and injuries.
- ***What do our data tell us?*** Compared to the city as a whole, the study area experiences more total crashes, more crashes involving pedestrians, and higher rates of non-fatal injury in crashes involving pedestrians.
- ***What do we predict will be the effect of the sample actions?***
    - Capital improvements have potential to substantially enhance traffic safety, but impact will depend on whether they are planned specifically to increase pedestrian and bicyclist safety such as a Complete Streets approach. Public works operations and maintenance activities are unlikely to have an effect.
    - Public safety sample actions could improve traffic safety if they include traffic enforcement to address speed and yielding to pedestrians.

ACCESS TO PARKS

As show in Figure 30, we hypothesized that one strategy area would impact access to parks: Infrastructure.

Figure 30. Access to Parks Pathway



Background

Parks and green space contribute to physical, mental and social health [121]. A review of the link between urban green space and physical health, mental health and wellbeing found most observational studies show a beneficial effect [122]. Parks in low-income communities generally have smaller green spaces, poorer maintenance, and less programming [123]. Total amount of green space and amount of green space within short distances of where people live was also associated with physical activity [124]. In its recommendations for local government action to address obesity, the Institute of Medicine urges building, maintaining and increasing use of parks in underserved communities [125].

People living within a half mile of a park are more likely to meet physical activity recommendations than those living farther away [126], and park use accounts for significant percentages of physical activity achieved for users living 0.5 and 1 mile away [127]. Neighborhood parks are significantly associated with meeting physical activity recommendations among middle school students [128]. A review found a stronger association between park settings and physical activity for deliberate exercise or transportation than for recreational physical activity and that park use was most associated with walking [129].

Literature on park access and the infrastructure sample actions is moderate. No literature was located on parks and operations and maintenance actions. Natural experiments have shown significant increases in park use after capital improvements to a local neighborhood park (establishment of a fenced leash-free area for dogs; an all-abilities playground; a walking track; a barbecue area; landscaping; and fencing to prevent motor vehicle access to the park) [130] and field renovations [131], although another reported large declines that the researchers attributed to decreased programming [132]. Park size, distance from homes, quality, features, and organized activities are correlated with use [133] [134] [135] [126].

People living in areas with higher street connectivity reported using parks almost twice as much as those with lower connectivity, while those in areas with lower traffic speeds were

one and a half times more likely to report using parks than those in higher speed areas [112]. Neighborhood walkability, assessed using residential density, land use mix, and intersection density, is associated with overall numbers of park users [136].

A study of city structure and obesity found children were underrepresented in areas with access to parks [137]. A review of observational research on neighborhood environment and youth found that proximity to recreation facilities to be among the features with the strongest associations to park use [111]. Less park use has been found in high-poverty neighborhoods, possibly due to lack of programming [126]. Residents of low-income areas who perceived low access were less likely to use parks irrespective of actual proximity [138]. Qualitative research found that perceptions of social cohesion affected individuals' use of green space more than objective quality of the resources [139], and parks have been shown to be associated with collective efficacy [140] (see Social Cohesion).

Research indicates the importance of access to green spaces other than large parks. Greening vacant lots resulted in significant decreases in gun assaults [20] and increased resident perception of safety around the greened lots [141]. Streetscape greenery has been found to similar effects as green areas [142].

Methods

We assessed access to city parks only based on ease of data access. Significant additional open space in Worcester includes land held by the Conservation Commission, Greater Worcester Land Trust, MassAudubon, and other entities. The City has submitted a draft Open Space and Recreation Plan to the state; when this document is final, the GIS layers contained in it will present greater opportunity to map open space access beyond the city parks.

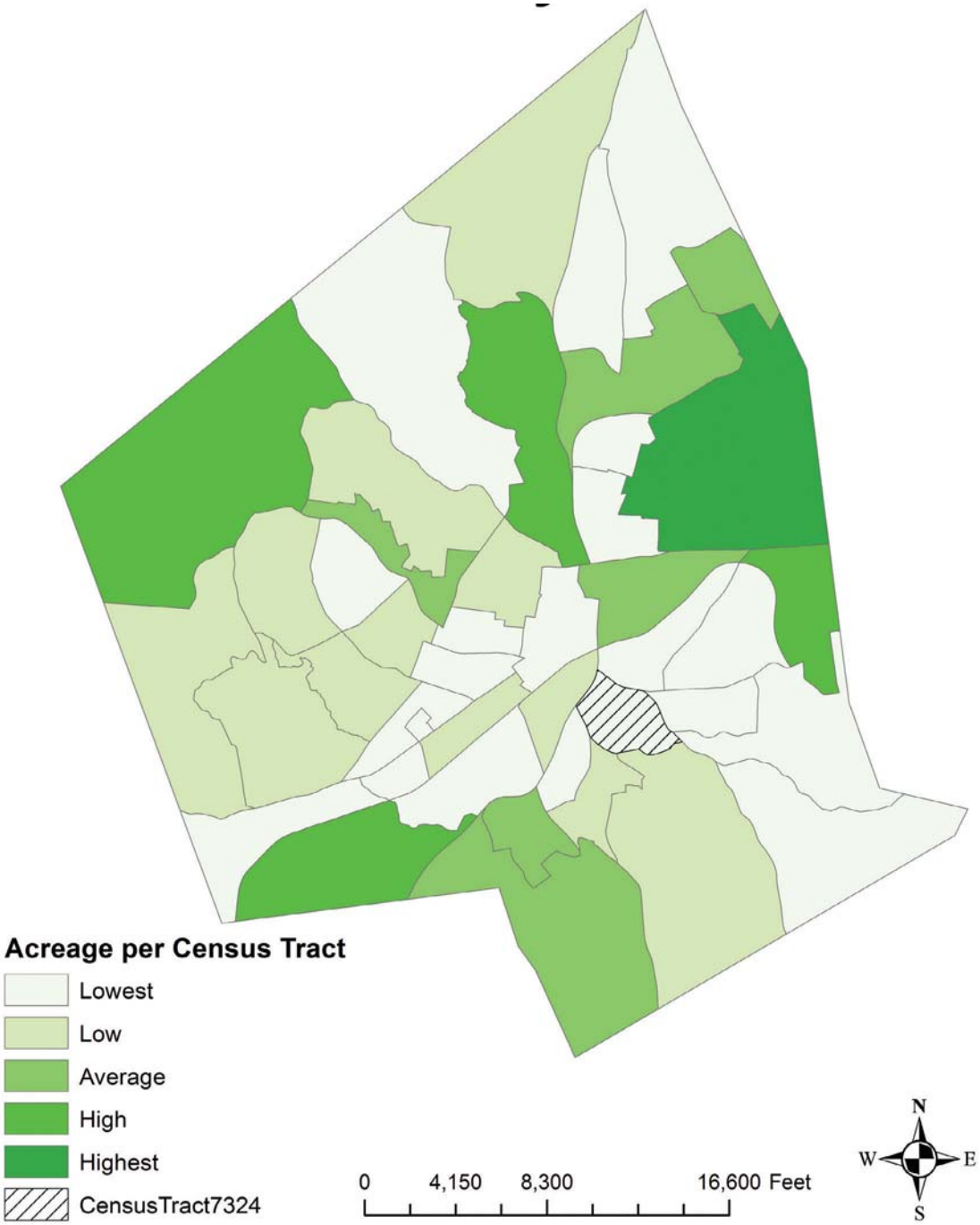
We assessed city park capacity by creating scores for all Worcester Census tracts based on acreage of city parks within their boundaries, comparing the number of Census tracts achieving each score, and geocoding the data. We created two measures of proximity to parks for each Worcester Census tract. The first measure expresses city park availability within one half-mile around the Census tract. The second measure builds on the first by adding a measure of population density, i.e. it expresses the burden on the parks within one-half mile of the Census tract. We assessed perceived safety with the resident survey item on sense of personal safety in parks, playgrounds and other outdoor recreation areas. We reviewed data on conditions in the four parks closest to the study area from an appendix to the city's Open Space and Recreation Plan.

Existing conditions

Capacity

Figure 31 illustrates that the study area has among the lowest city park acreage, although its ranking is similar to many Census tracts across the city.

Figure 31. Worcester City Park Acreage by Census Tract

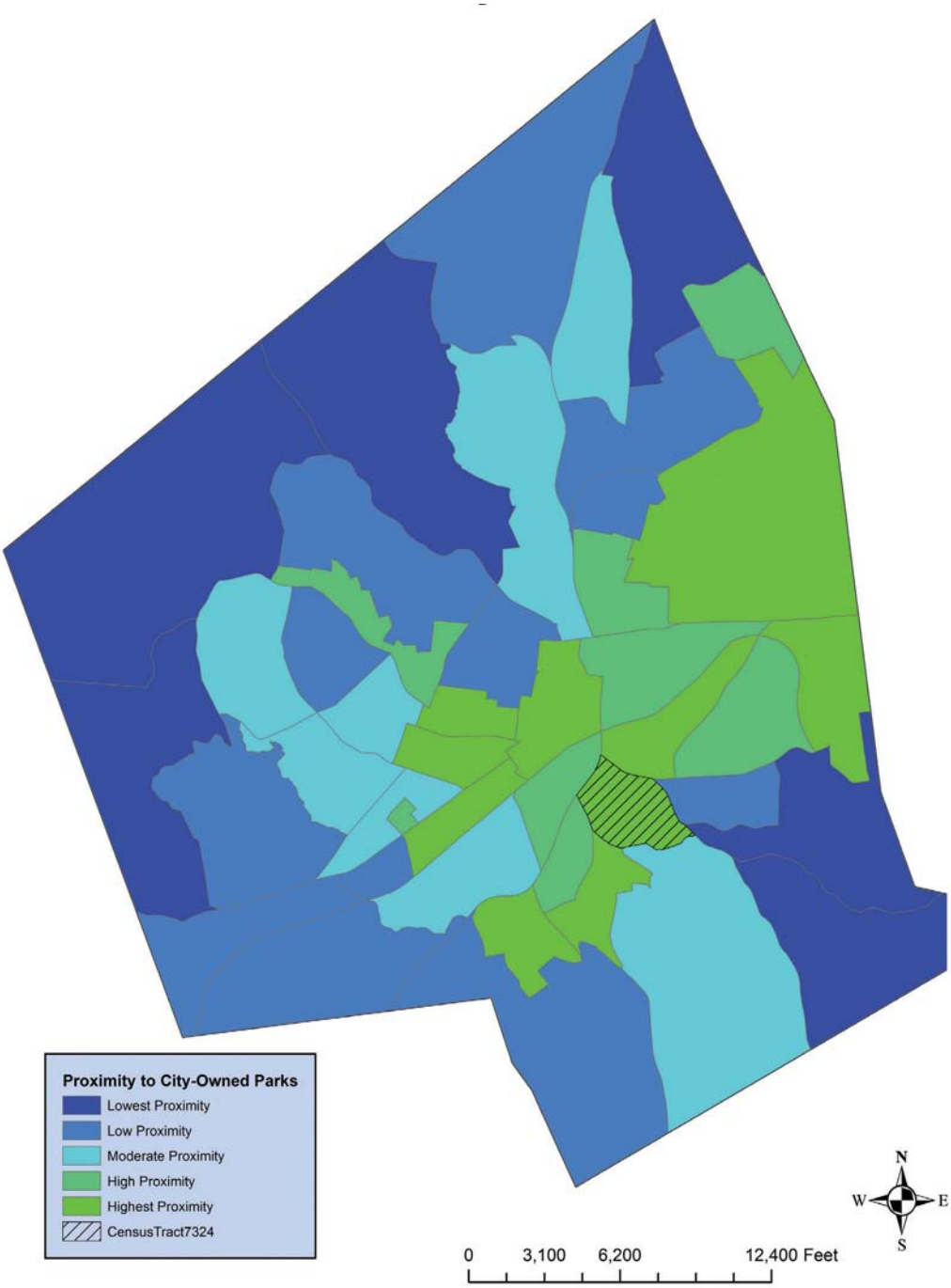


Source: Worcester Division of Public Health, 2013

Proximity

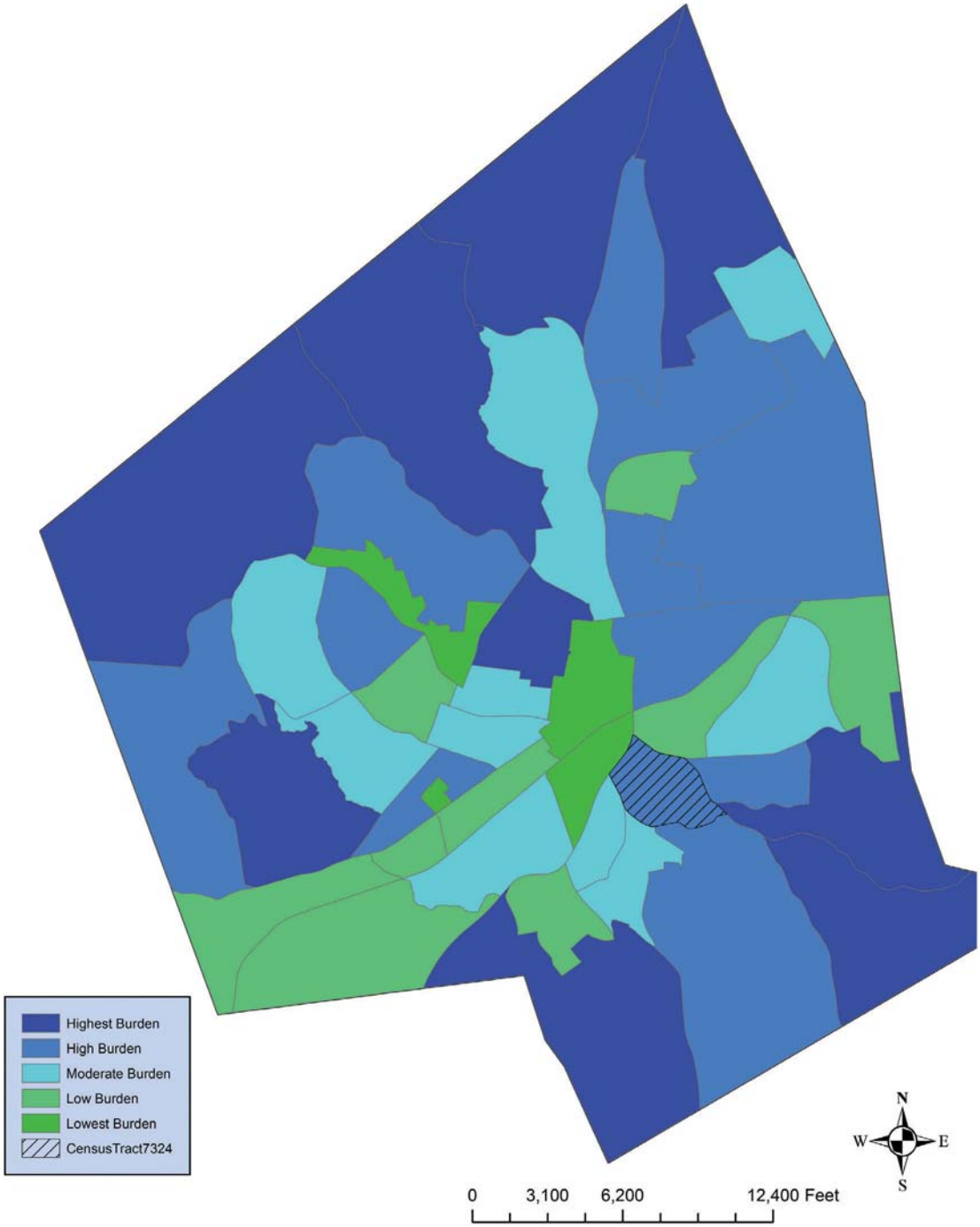
Four city parks are within a half mile of the Census tract: Banis Street Playlot, Mulcahy Field, Providence Street Playground, and Vernon Hill Park. The study area has among the highest ranking of all city Census tracts for availability of parks within a half mile (Figure 32). Addition of a population dimension makes the picture more nuanced; the area drops to second lowest, indicating high density of people "sharing" the parks (Figure 33). Union Hill is also home to three small community gardens with varying levels of access to the public.

Figure 32. Availability of Worcester City Park Within a Half mile



Source: Worcester Division of Public Health, 2013

Figure 33. Availability of Worcester City Park Within a Half Mile, Adjusted for Population

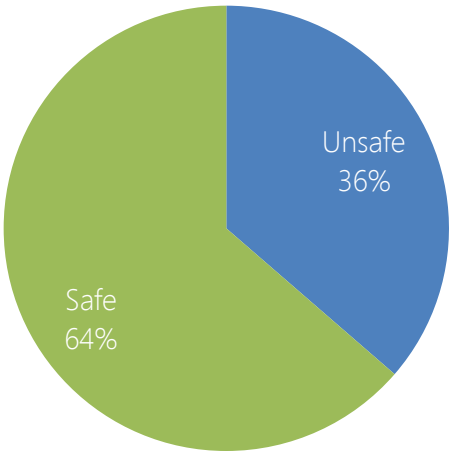


Source: Worcester Division of Public Health, 2013

Perceived Safety

The majority of resident survey respondents reported feeling safe in parks, playgrounds, and other outdoor recreational areas (Figure 34).

Figure 34. Perceived Personal Safety in Parks, Playgrounds, and Other Outdoor Recreational Areas



Source: Oak Hill CDC Resident Survey, 2013

Conditions

The conditions reports available in the Open Space and Recreation Plan were incomplete, but based on the available data we concluded conditions of all four parks to be fair to good.

Programming

The Department of Public Works and Parks has no recreation programming budget. Sports leagues have permits to use the fields for sports such as baseball and softball, soccer and football. Maintenance efforts by these leagues on the facilities they use varies.

Assessment

Impact of the public works operations and maintenance activities on park access is uncertain. Neighborhood cleanups targeted to parks could improve conditions. Capital improvements may impact park access depending on the type of improvements selected. Greening of vacant lots and their designation as "pocket parks" could improve residents' access to green space directly in Union Hill. Such small spaces will likely have greater impact on opportunity for social interaction and mental health than on physical activity. Capital improvements that increase pedestrian or bicyclist safety may improve travel to parks. Park improvements that include facilities for active recreation and walking can increase physical activity. The sample actions do not include recreation programming, which may be more important for underserved populations.

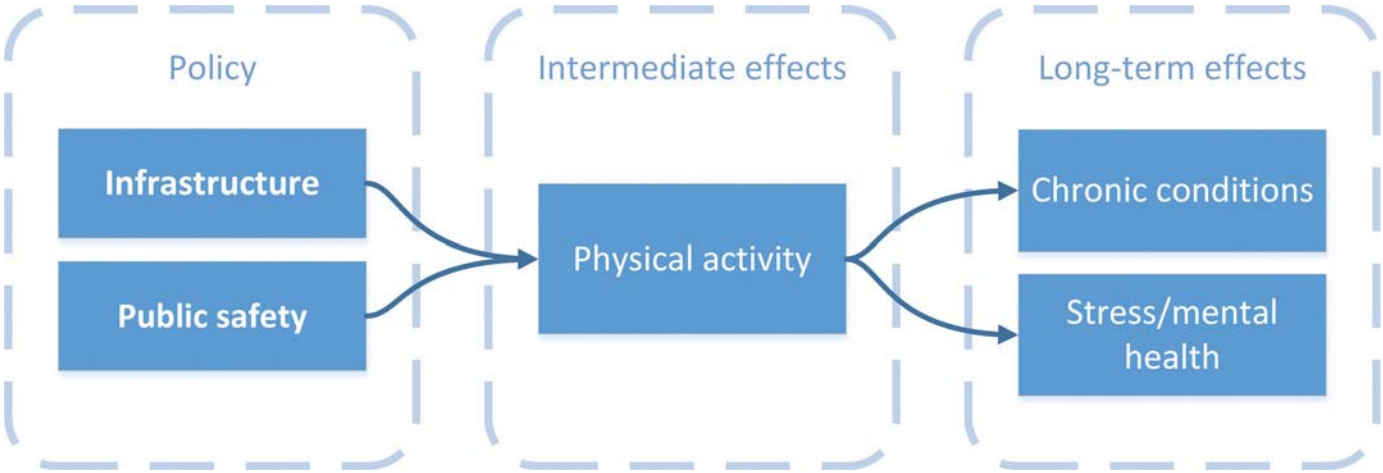
Summary

- ***How does access to parks affect health?*** Access to parks positively affects physical activity, especially among children and youth, as well as mental health. Access to parks encompasses park size, distance from homes, traffic safety between home and park, park facilities, park quality, and programming.
- ***What do our data tell us?*** The study area has among the lowest park acreage per capita in the city. Conditions and facilities vary at the city parks within a half-mile, Union Hill has among the highest access to parks within a half-mile, though there is a greater burden on these nearby parks than other city parks due to the area's population density.
- ***What do we predict will be the effect of the sample actions?***
    - Capital improvements may improve park access if they target improvements at parks within a half-mile of Union Hill, improve pedestrian or bicyclist safety for Union Hill residents traveling to nearby parks, or green vacant lots or create pocket parks within Union Hill.
    - It is uncertain if public works operations and maintenance activities will impact park access.

PHYSICAL ACTIVITY

As shown in Figure 35, we hypothesized that two strategy areas would impact physical activity: Infrastructure and Public Safety.

Figure 35. Physical Activity Pathway



Background

The link between physical activity and health is strong. Physical inactivity accounts for nearly 1 in 10 U.S. deaths [143]. Higher levels of physical activity are associated with better weight control, lower risks of chronic disease, and improved mood [144]. Walking, usually done outdoors, is the most common form of physical activity. [145]

Literature examining the relationship between physical activity and the built environment has moderate strength. Epidemiological evidence on the relationship between built environment features such as parks, sidewalks, trails, recreational facilities, school playgrounds, and traffic safety overwhelmingly shows beneficial effects [109], although observational designs of most of the research allow only limited conclusion that increasing such features would increase physical activity [109] [146]. US health authorities nevertheless found sufficient evidence to recommend community-scale approaches (proximity of residential areas to stores, jobs, schools, and recreation areas; continuity and connectivity of sidewalks and streets; aesthetic and safety aspects of the physical environment) and street-scale approaches (improved street lighting; infrastructure projects to increase safety of street crossing; use of traffic calming elements such as speed humps and traffic circles; and enhancing street landscaping) urban design and land use policies and practices as strategies to increase physical activity [110]. The US Centers for Disease Control and Prevention recommends Complete Streets as a strategy in its community measures to reduce obesity [147].

Literature on operations and maintenance sample actions is moderate. Numerous studies have assessed street lighting and physical activity, but a review found only one (of suburban residents) reported that better street lighting improved physical activity [145]. Studies of disorder and physical activity have reached conflicting conclusions, which may reflect the presence of greater disorder in lower socioeconomic status urban neighborhoods where residents rely on walking for transportation [145]. Studies using objective measures of neighborhood maintenance found no connection with physical activity levels, although some of those using subjective measures did find a relationship. [145]

Traffic calming has been shown to increase pedestrian travel by 20% and improve physical health [148]. A study of city structure and obesity found that populations generally considered vulnerable to obesity such as Latino and African American were substantially more likely to live in walkable neighborhoods (four and eighty-three times more likely, respectively), but crime was highest in such walkable neighborhoods with higher Latino and/or African American populations [137]. The same study found children were underrepresented in highly walkable neighborhoods. Poorer neighborhoods had characteristics that offset their advantages of density and mixed land uses, including fewer street trees and clean streets [149]. A review of observational data on physical environment attributes and children's physical activity found children's physical activity was positively associated with some aspects of presence of sidewalks and signalized intersections, access to destinations and public transportation [114]. A review of observational research on neighborhood environment and youth physical activity found that walkability, traffic speed and volume, and land use mix (i.e. useful destinations nearby) to be among the features with the greatest associations [111]. Middle school students using walk/bike paths were twice as likely to meet physical activity recommendations [128]. A natural experiment on the installation of bike lanes in New Orleans after Hurricane Katrina found biking increased 133% among women and 44% among men [125]. Sidewalk condition and presence of street trees are associated with greater walking [150] [151]. Studies have confirmed both validity of the free tool WalkScore® (www.walkscore.com) to measure neighborhood walkability [152] and its association with utilitarian walking [153].

Development of a Safe Routes to School program is a recommended community measure of the CDC to prevent obesity [147]. Children who walk or bike to school have higher physical activity levels [154], and activity levels have been increased through intervention to change school travel mode [155]. Children who passed Safe Routes to School infrastructure improvements on their way to school reported three times as much walk or bike travel than children not exposed to such improvements [156]. A study found physical environment and safety conditions most affected walking and biking to school for a low-income community, while a higher income population was more affected by personal attitude and walking habit [157].

The literature on physical activity and the public safety sample actions is moderate. We did not locate literature addressing physical activity and the sample actions of increased police presence, community policing, and crime watch support. Qualitative research support exists for the connection between physical activity and safety from crime and theoretical models exist [145] [158], but the limited quantitative data used observational designs. Inconsistent results of the few studies examining physical activity, crime and safety prevent conclusion of whether safety is associated with physical activity [145], but existing data indicate perceived safety most affects vulnerable groups already likely to have greater fear of crime (women, elderly). Fear of crime among residents of disadvantaged neighborhoods did not affect their physical activity [159]; the researchers noted that the typically high residential density of such neighborhoods in the US supports greater socializing on the sidewalk. A study utilizing observation of walking and biking in an urban area found greater activity in areas with more traffic, sidewalk defects, graffiti, and litter and less attractive properties [160], which may reflect the greater reliance on walking for transportation. A recent study of perceived safety and police-recorded measures found independent associations of walking for transportation and "incivilities" (drugs, prostitution, vandalism) though not other police-recorded criminal

offenses [161]. Women were more likely to be affected by perceived safety in that study, and the safety-physical activity connection was strongest in the safest neighborhoods. Fear of crime may affect transit use [162], and researchers have demonstrated higher levels of walking among transit users [163].

Methods

There is no existing inventory of private indoor and outdoor facilities for physical activity in Worcester available to use as an indicator. WDPH is working on an inventory, which will enable expansion of physical activity indicators in future. Given this fact and literature supporting walking as the most common form of physical activity, we focused on active transportation.

We used Google Maps to locate addresses scattered around the Census tract such as Hector Reyes House and Oak Hill CDC, then used the WalkScore® application (www.walkscore.com) to assess proximity of destinations. We analyzed two items from the resident survey for perceived safety, one on safety of daytime walking in the community and one on safety of children and youth going to and from school. CMRPC geocoded Worcester Regional Transit Authority (WRTA) bus stops to gauge transit access. We assessed conditions such as sidewalk trip hazards and tree cover. We calculated percentage of resolved and unresolved sidewalk trip hazards observed during the 2007 ComNET survey in Union Hill sponsored by the Worcester Regional Research Bureau as part of its municipal services benchmarking project. We calculated street tree canopy coverage using i-Tree Tools for Managing Community Forests, an online tool from the USDA Forest Service (www.itreetools.org).

Existing conditions

Complete Streets program

Worcester does not have a Complete Streets program.

Proximity of Destinations

WalkScores from a variety of points around the Union Hill area show a "very walkable" neighborhood in terms of distance to destinations of value such as restaurants, pharmacies, parks, and coffee shops, with locations along the arterials showing higher values than locations more internal to the neighborhood (Table 18). It is important to note that while "groceries" were considered very proximal, all nearby destinations were corner or convenience stores rather than larger supermarkets where more is available and prices are lower.

Table 18. WalkScores for Selected Locations in Union Hill

Address	Location	WalkScore
27 Vernon Street	Between Jefferson & Pattison	85
81 Providence Street	Worcester Academy	74
128 Providence Street	Providence / Winthrop	58
67 Vernon Street	Between Vernon Terrace & Winthrop	72
1 Chapin Street	Union Hill Elementary School	72
12 Coral Street	Coral / Union	88
334 Grafton Street	Grafton / Houghton	82
24 Massasoit Road	Massasoit / Heywood	66
119 Vale Street	Vale / Heywood	62
15 Shannon Street	Shannon / Marion	72
116 Harrison Street	Barclay / Harrison	83
28 Arlington Street	Arlington / Pattison	78
39 Fox Street	Blake / Fox	89

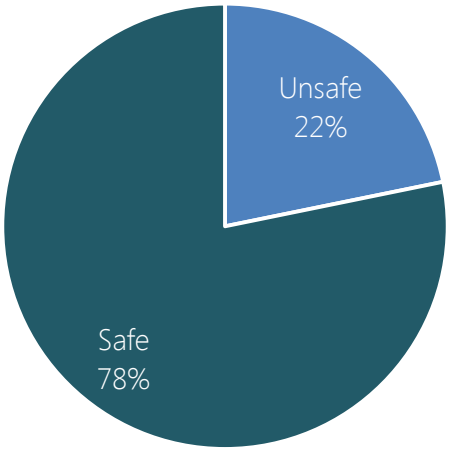
90-100	Walker's paradise – Daily errands do not require a car
70-89	Very walkable – Most errands do not require a car
50-69	Somewhat walkable – Most errands do not require a car
25-49	Car-dependent – Most errands require a car
0-24	Car-dependent – Almost all errands require a car

Source: WalkScore (www.walkscore.com, accessed August 2013)

Perceived Safety

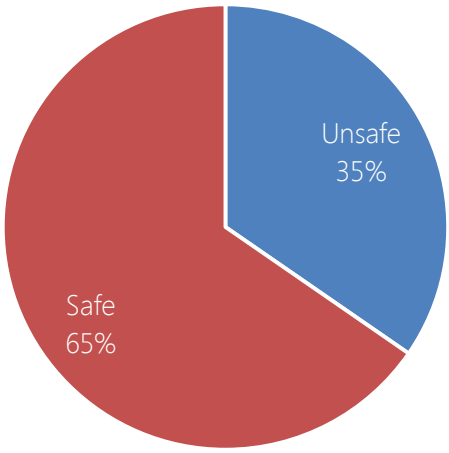
Resident survey respondents reported high levels of perceived safety for themselves walking in the community during the day (Figure 36) and for children and youth traveling to and from school (Figure 37).

Figure 36. Perceived Safety of Daytime Walking in the Community



Source: Oak Hill CDC Resident Survey, 2013

Figure 37. Perceived Safety of Children/Youth Walking to and from School in Neighborhood

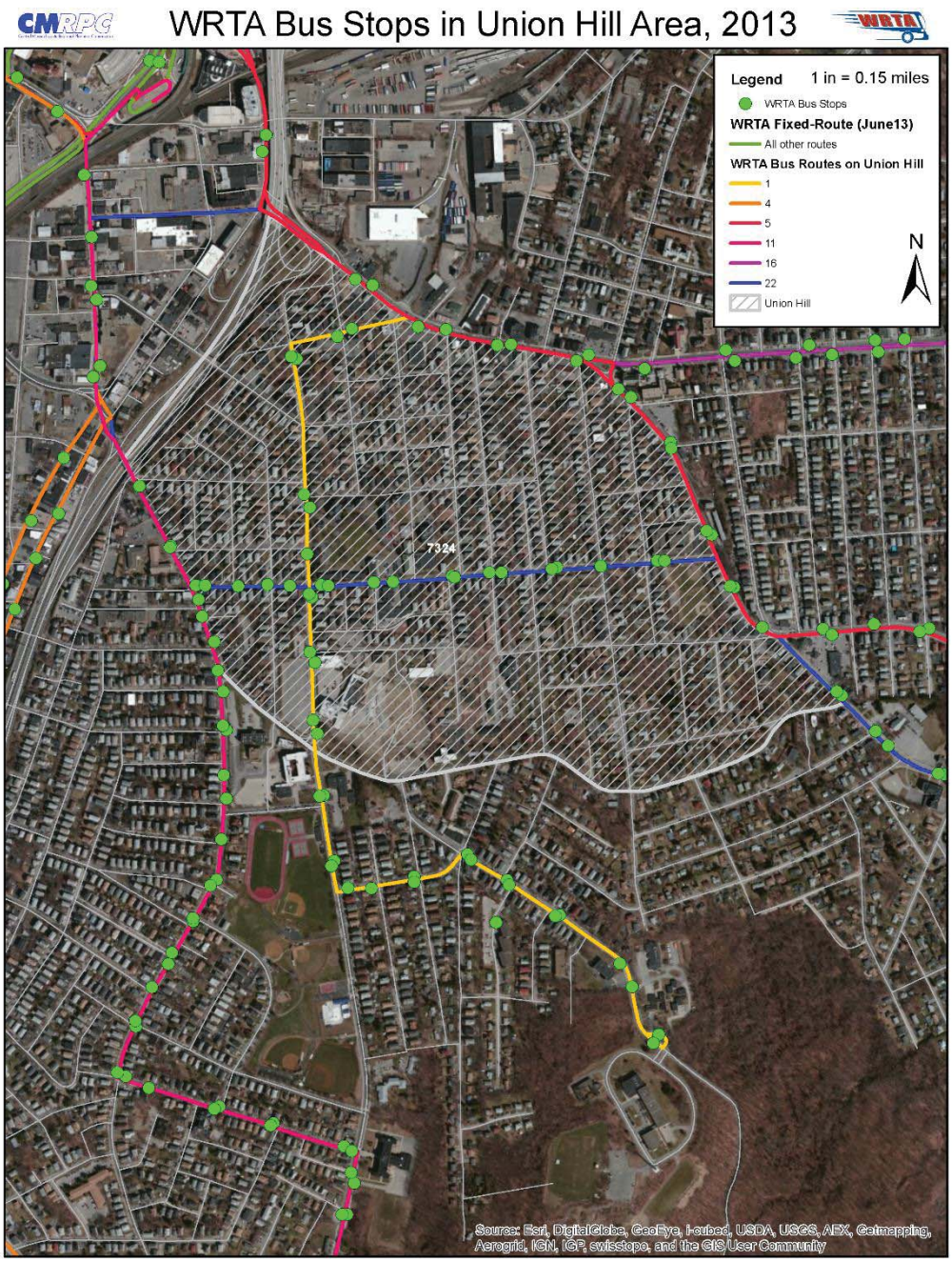


Source: Oak Hill CDC Resident Survey, 2013

Transit Access

The geocoded bus stop data show the neighborhood is served by three bus routes with numerous stops along most of the arterials surrounding the neighborhood and along a street through the neighborhood (Figure 38). Most of the study area is within a quarter mile of a bus stop.

Figure 38. WRTA Bus Stops in Union Hill

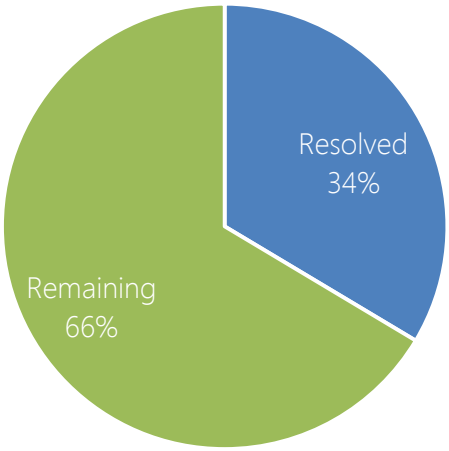


Source: Central Mass Regional Planning Commission, 2013

Conditions

Although the ComNET survey was conducted in 2007, there has been no infusion of resources for sidewalk repair since then. Two-thirds of the sidewalk trip hazards identified in that survey over several years of data collection remained unresolved (Figure 39). Union Hill has smaller tree canopy coverage than Worcester as a whole (Table 19).

Figure 39. Sidewalk Trip Hazards in Union Hill Area



Source: Worcester Regional Research Bureau, 2007

Table 19. Tree Canopy Coverage for Census Tract 7324

Tree canopy coverage	
Census tract 7324	33%
Worcester	43%

Source: i-Tree, USDA Forest Service, 2013 imagery used, accessed July 2013,

Bicycle Lanes

As noted under Traffic Safety, there is no on-street bicycle accommodation in Union Hill.

Physical Activity Facilities

As noted under methods, the lack of comprehensive inventory of outdoor and indoor physical activity facilities prevented use of this type of indicator. It should be noted that Worcester Academy makes its outdoor facilities, including two tracks and a field, available to the community; one track and field combination, recently constructed, is directly in the study area. It is not locked and is open to the community at all times when not in use by the school. A private non-profit facility, Girls Incorporated, has indoor recreation facilities.

Assessment

Infrastructure: It is not certain if public works operations and maintenance sample actions will impact physical activity. Reducing disorder and fixing streetlights may increase

perceived safety and therefore increase walking. Capital improvements have potential to increase walking depending on the type of improvement. While people in disadvantaged neighborhoods are more likely to walk for transportation independent of conditions, sidewalk improvements could make it easier for disabled or elderly people to move about the neighborhood and more pleasurable for anyone to walk for leisure or exercise. Increased tree cover could improve aesthetics. Intersection improvements could encourage more parents and children to walk to and from school. The neighborhood has good proximity to destinations of value, and such improvements could make even utilitarian travel more rewarding. Bicycle accommodations could increase perceived safety and attractiveness of this form of travel, especially for women and children.

Public Safety: Community policing may have a positive impact on physical activity by increasing perceived safety. This can encourage increased walking, especially among children, women and seniors. Reducing fear of crime may also support increased transit use and walking to the bus stop.

Summary

- ***How does physical activity affect health?*** Higher levels of physical activity mean better physical and mental health, and walking is the most common form of physical activity. Built environment improvements can increase physical activity. Safety concerns affect physical activity of groups with heightened fear of crime, such as seniors and women.
- ***What do our data tell us?*** The study area has numerous destinations in walking distance and good transit access. Residents generally feel safe walking in the area. Sidewalk conditions present some hazards, and tree cover is lower than for the city as a whole.
- ***What do we predict will be the effect of the sample actions?***
    - Capital improvements targeting walking and bicycling accommodations as well as aesthetics such as tree cover have potential to increase physical activity.
    - Public safety actions have potential to support more physical activity by increasing perceived safety, especially among vulnerable groups.

COLLABORATION

Background

Collaboration between local government agencies as well as between city and community is considered a best practice for several of the strategy areas under the Union Hill revitalization initiative [164] [57] [60], and such collaboration is also promoted more generally [165].

Methods

We conducted key informant interviews with city and community partners using semi-structured interview guides. We interviewed 2-3 representatives of Worcester city agencies corresponding to the four strategy areas: Executive Office of Economic Development; Department of Inspectional Services (responsible for code enforcement); Police Department; and Department of Public Works and Parks. The guide for city partners explored interdepartmental collaboration, city-community collaboration and performance data (used to inform indicator development). We also interviewed leaders of three community organizations in Union Hill (Worcester Academy, Oak Hill Community Development Corporation, and Hector Reyes House), and with two lifelong Union Hill residents who served on the Advisory Committee. The guide for community partners explored knowledge and attitudes about Union Hill revitalization plans, including perceived possible positive and negative effects as well as missed opportunities, and city-community collaboration. We reviewed all interview data.

Existing conditions

Interdepartmental Collaboration

Key informants expressed strong support for the focused multi-department approach, although no objectives or evaluation plan exists. Key informants reported the recent recession had impacted growing interdepartmental collaboration, as nascent efforts were shelved to focus on core mission. They described several current forms of collaboration among city agencies:

- Property Review Team (PRT): An interdepartmental team of Fire, Police, Housing, Public Health, and Inspectional Services meets monthly to review potential problem properties identified through review of data contained in the City's Property Analysis Database and first hand knowledge of inspectors and officers on the street. The PRT also provides assistance through education to the public under the S.A.V.E. (Stabilize, Assist, Value and Enforce) initiative; launched in 2008 to preserve neighborhoods in the face of foreclosures and increases in problem properties, it offers assistance to homeowners in danger of foreclosure, neighbors concerned about a foreclosed or abandoned property in their neighborhood, and tenants in a property being foreclosed.
- The head of the Department of Public Works and Parks reports monthly to City Council on this initiative, known as Keep Worcester Clean (KWC).
- Property Analysis software: The Property Analysis program, developed in-house by the Technical Services Department, is a "dashboard" that pulls data from all departments' databases simultaneously to show one view for each property. It is more useful for micro-analysis than evaluation of trends over time. It does not capture EOED data on funding recipients (e.g. CDBG, HOME funds). Not all departments fully utilize the program's capabilities.
- Neighborhood/crime watch participation: Representatives from these departments frequently attend these monthly meetings and relay information to departments not in

attendance.

- Joint nuisance inspections: Two nuisance inspectors from Public Works and Parks and one from Inspectional Services conduct enforcement of the City's Nuisance Ordinance proactively in neighborhoods with DPW concentrating on issues in the public way and Inspection Services concentrating on private property issues.
- Public Works and Parks/Engineering Division and EOED meet approximately monthly about capital improvement projects with economic development components.
- Mass in Motion: Although the public health strategies are not part of this HIA, WDPH and EOED have forged a strong working relationship through the Mass in Motion funding from Massachusetts Department of Public Health. The Police Department is also involved in Mass in Motion efforts.

City-Community Collaboration

City departments reported the same few partners for Union Hill and could not offer examples of partners they have in other areas of the city that could be applied in Union Hill. Departments were complimentary about the few community partners named, although some noted the relationships need fostering. Oak Hill Community Development Corporation and Worcester Academy were repeatedly named and praised for their widely different roles efforts in the neighborhood. Several departments expressed willingness to meet with community groups when asked but did not describe proactively seeking public input. The Customer Service Response System and crime watch meetings were the top forms of public input named. Informants see potential for use of information contained in the weekly Community Policing District reports generated as part of the community policing effort that is not of direct use to the police. Discussion is reportedly underway for increasing community engagement to improve neighborhood social cohesion, although no theoretical or best practice model was put forward.

Worcester Academy, a private school for grades 6-12 with boarding and day options, is located on Providence Street in the heart of the Union Hill. Worcester Academy had no interaction with city departments prior to 2010, but established a strong working relationship with the Police Department following a series of violent incidents in the neighborhood in 2010-2011. Over the past year they have developed a relationship with the City Manager's office and EOED as they conduct master planning related to property along Providence Street. Community engagement is an objective in their strategic plan.

Oak Hill Community Development Corporation is located across from Worcester Academy. Oak Hill is involved in affordable housing development and management as well as providing homeowner counseling across Worcester County. Oak Hill receives HUD funding through the city's Community Development Block Grant process. Over the past year the city has undergone HUD audits over the appropriateness of expenditures under this funding, which has caused tension between the CDCs and the city. Oak Hill leadership sees their role changing to be primarily community engagement, with affordable housing development as one strategy. Oak Hill was described by some key informants as a convener, while others expressed lack of understanding of their mission.

Community Knowledge and Attitudes about Union Hill Revitalization Effort

Opinions of the city's revitalization effort were cautiously positive given the early stage.

Assessment

Interdepartmental collaboration occurs through several mechanisms and appears strongest in terms of "boots on the ground" resolving immediate problems rather than long-term planning. Good building blocks for intensive collaboration in one neighborhood exist, but potential also exists for parallel rather than synergistic efforts. The lack of theoretical or best practices model, particularly for community engagement that can sustain any neighborhood improvements, risks not reaping maximum benefit from the approach. There is intention and interest in community building on the city side but no clear expertise. The same is true for articulation of objectives and an evaluation plan. There is a need for a greater number of community entities in Union Hill, and existing groups could work more closely. Managing expectations for the revitalization effort will be important.

Summary

- ***What does the literature tell us?*** Best practices support collaboration among city departments and between city and community to improve the neighborhood.
- ***What do our data tell us?*** Interdepartmental collaboration is currently strongest for current problems and not long-term planning. There are relatively few community partners in Union Hill, although there is mutual respect between city and existing community partners. Forms of public input are currently limited to the Customer Service system and neighborhood watch meetings. The city has some community engagement experience, but not community building experience.
- ***What do we predict will be the effect of the sample actions?***
    - Parallel rather than synergistic efforts by departments may occur.
    - The community building required to sustain revitalization efforts may not occur without incorporation of a theoretical or best practices model and greater technical expertise.

PART 3

Summary of Findings

Table 20 summarizes HIA findings by determinant studied and strategy area. Direction ranged from positive to uncertain or no effect. Likelihood was rated as unlikely, uncertain, possible, or likely. Distribution considered the possibility for differential impact across populations, particularly vulnerable populations. Strength of literature corresponds to the judgment of the literature to be strong, moderate or weak based on study designs.

Based on this HIA, we predict the Union Hill revitalization initiative will have a positive effect on health overall. Of the health factors selected for study, the effect of housing actions on housing safety and public safety on community violence show the strongest likelihood of having positive impact. Data reveal elevated levels of the problems, and literature demonstrates improvements are possible through intervention. Code enforcement and infrastructure actions are less certain to have positive health impact but for differing reasons. To achieve health benefit, problem identification through code enforcement would have to be followed by remediation resources. Infrastructure actions may miss an opportunity to achieve significant health benefits if capital improvements do not target pedestrian and bicycle safety and accommodation. According to this analysis, social cohesion carries the most need for careful monitoring. It is also arguably the most important one of the determinants we studied for long-term sustainability of the neighborhood revitalization effort.

Table 20. Summary of Findings

Health Determinant	Strategy	Direction	Likelihood	Distribution of Impact	Strength of Literature	Uncertainty / Caveats
COMMUNITY VIOLENCE	HOUSING	Positive	Likely	Equal	++	
	CODE	Uncertain	Uncertain	Equal	+	
	INFRASTRUCTURE	O&M: Uncertain	Uncertain	Equal	++++	
		Capital improvements: Positive	Likely	Equal	++++	
	PUBLIC SAFETY	Positive	Likely	Equal	+++++	
SOCIAL COHESION	HOUSING	+ / -	Likely	Minorities	++	Possibility of displacement from gentrification
	CODE	+ / -	Possible	Lowest-income renters	+	Possibility of evictions if remediation resources not available
	INFRASTRUCTURE	Positive	Uncertain	Equal	++	
	PUBLIC SAFETY	+ / -	Likely	Minorities	++++	Possibility of lower trust if racial profiling perceived
HOUSING SAFETY	HOUSING	Positive	Likely	Minorities	+++++	
	CODE	Positive	Possible	Lowest-income renters	++	
TRAFFIC SAFETY	INFRASTRUCTURE	O&M: No effect	Unlikely	Equal	++	Possibility of missed opportunities if roadway capital improvements do not emphasize pedestrian and bicyclist safety
		Capital improvements: + / Ø	Possible	Equal	++	
	PUBLIC SAFETY	Uncertain	Uncertain	Equal	++	
PARK ACCESS	INFRASTRUCTURE	O&M: Uncertain	Possible	Low-income, minorities	++	
		Capital improvements: + / Ø	Possible	Low-income, minorities	++	
PHYSICAL ACTIVITY	INFRASTRUCTURE	O&M: Uncertain	Uncertain	Equal	+++	Possibility of missed opportunities if roadway capital improvements do not emphasize pedestrian and bicyclist accommodation
		Capital improvements: + / Ø	Possible	Women, children, seniors		
	PUBLIC SAFETY	Positive	Possible	Children, seniors, women	+++	
COLLABORATION	ALL	Positive	Likely	Equal	+	

Key
Direction
Positive = Changes that may improve health
Negative = Changes that may detract from health
Uncertain = Unknown how health will be impacted
No effect = No effect on health

Magnitude
Low = Causes impact to no or very few people
Medium = Causes impact to wider number of people
High = Causes impacts to many people
Note this is relative to population size

Severity
Low = Causes impacts that can be quickly and easily managed or do not require treatment
Medium = Causes impacts that necessitate treatment or medical management and are reversible
High = Causes impacts that are chronic, irreversible or fatal

Likelihood
Likely = it is likely that impacts will occur as a result of the proposal
Possible = it is possible that impacts will occur as a result of the proposal
Unlikely = it is unlikely that impacts will occur as a result of the proposal
Uncertain – it is uncertain if impacts will occur as a result of the proposal

Distribution
Name subpopulation(s) impacted more (e.g. low income or elderly) or state "equal impact"

Strength of literature
Strong literature base (intervention)
+++++ Strong intervention evidence (including systematic reviews)
++++ Some intervention evidence
Moderate literature base (observational/associations)
+++ Strong observational evidence (reviews, many associations)
++ Some observational evidence
Weak literature base (no research)
+ Best practices and/or recommendations only

Recommendations

Based on our assessment, we offer the following recommendations organized by strategy area:

General

- Consider conducting rapid HIAs in each neighborhood to be addressed through revitalization. This HIA provides data sources and methodology for conducting such small-scale, rapid HIAs.
- Strengthen stakeholder engagement in HIAs. More targeted and detailed recommendations would result from a fuller discussion with stakeholders.

Housing

- Set and publicize targets for percentage of down payment and down payment/ rehabilitation assistance funds available specifically to current Union Hill residents who will

occupy the home they buy.
- Monitor indicators of risk for displacement due to gentrification of the neighborhood.
- Identify remediation funding sources to rectify housing violations for qualifying homeowners.

Code enforcement
- Set measurable goals for year-on-year reductions in housing code violations in Union Hill.
- Pursue innovative strategies found in the literature for resident involvement in code enforcement.
- Strengthen collaboration among Inspectional Services, Public Health and Housing on Healthy Homes.

Infrastructure
- Develop and implement a Complete Streets program to guide street and sidewalk investments.
- Set objectives for reductions in crash and injury rates in Union Hill.

Police
- Articulate a domestic violence component of the community policing strategy in Union Hill that may entail working with mental health services providers.
- Articulate a traffic enforcement component of the community policing strategy in Union Hill.

Collaboration
- Specify community engagement model that will move the city beyond current public input mechanisms to emphasize proactive community building.
- Establish and participate in an ongoing neighborhood leaders group including at minimum Oak Hill CDC, Worcester Academy, Union Hill School, Worcester East Middle School, North High School, Hector Reyes House, the Worcester Senior Center/Friends of the Senior Center, Girls, Inc. and all city departments involved in the revitalization effort. Charge this group with:
  - recruiting additional neighborhood partners; and
  - developing an evaluation plan for community building.
- Gather extensive community input to inform community building objectives and activities.
  - Solicit resident input via existing neighborhood meetings and forums and partner with neighborhood organizations to recruit residents for focus/discussion groups.
- Hold separate discussions for specific groups, e.g. age, race/ethnicity, immigrants/refugees, speakers of other languages, parents of young children, homeowners vs. renters, renters of subsidized vs. market rate units
- Organizations that can help facilitate these efforts include Worcester Division of Public Health, Executive Office of Economic Development, the Worcester County Prevention Research Center at UMass Worcester, Common Pathways, the Regional Environmental Council, and the Social Justice Roundtable.
  - Use innovative public participation methods, such as techniques developed by WalkBoston for walk-by visioning and merchant interviews, to gather input from residents and business owners unlikely to participate in neighborhood meetings or forums.

- Conduct community visioning session(s).
- Based on all the community input, develop community building plan with objectives, activities, and evaluation plan that share responsibility between city and neighborhood (leaders, residents, business owners). Vet this plan with community leaders and publicize to the neighborhood.

Monitoring

The set of indicators developed for this assessment can serve as tools for monitoring impact of the revitalization initiative. Table 21 and Table 22 contain recommended metrics for monitoring neighborhood characteristics and the determinants studied in this HIA. American Community Survey and other Census data are easily available online. WDPH regularly uses BRFSS and other MDPH data for its work. City department data are accessed regularly by city staff to guide their work. WDPH assisted with administration of the resident survey and could apply the same approach again. WDPH has an excellent working relationship with Central Massachusetts Regional Planning Commission, which produced all traffic-related data. WDPH is also developing in-house GIS capacity that will strengthen development and use of GIS-based indicators. Free online tools such as WalkScore and i-Tree make it simple to update the relevant data.

Table 21. Neighborhood Characteristics Data Sources

Housing and population	
US Census / American Community Survey	Race/ethnicity, educational attainment, employment, housing characteristics, environmental justice, linguistic isolation, vehicle access, median income, percent below poverty
Health	
Behavioral Risk Factor Surveillance System (BRFSS)	Health status: general, mental health
	Chronic disease: coronary heart disease, stroke, asthma, diabetes, overweight/obesity
	Behavioral: fruit/vegetable consumption, physical activity, smoking
Massachusetts Bureau of Environmental Health	Pediatric asthma
Massachusetts Department of Public Health	Non-fatal emergency department visits for fall-related, motor vehicle-related or pedestrian, or assault-related injury
	Non-fatal hospital stays for fall-related, motor vehicle-related or pedestrian, or assault-related injury

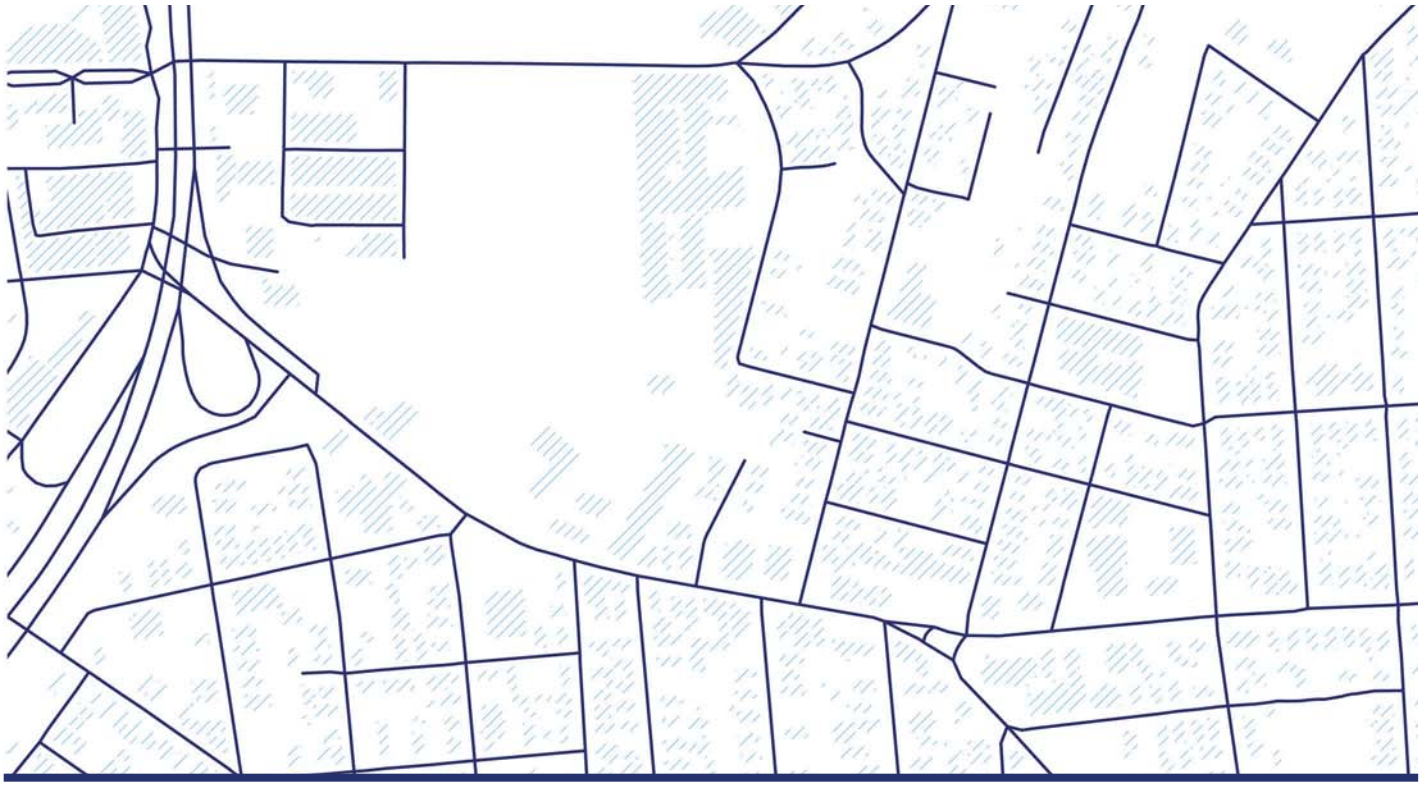
Table 22. Metrics and Data Sources for Selected Determinants

Determinant	Domain and Metric	Source
Community Violence	Police-recorded crime (assault and related; domestic relations; violations of public order; robbery)	Worcester Police Department
	Perceived safety (personal; seniors; children and youth)	Resident survey
	Disorder (trash on private property, graffiti or public or private property, litter, illegal dumping) and streetlights out	Worcester Customer Service Response System
Social Cohesion	Residential stability (selected neighborhood housing characteristics)	US Census / American Community Survey
	Civic participation (voter turnout)	Worcester Election Commision
	Perceptions (satisfaction with living in community, likelihood of recommending community as good place to live, trust in neighbors, neighborhood involvement, willingness to be involved, satisfaction with police response)	Resident survey
Housing Safety	Habitability (complaints and proactive inspections)	Worcester Customer Service Response System
Traffic Safety	Crash locations (all crashes, bicycle/pedestrian crashes)	Registry of Motor Vehicles
	Crash type	Registry of Motor Vehicles
	Injury by type of crash	Registry of Motor Vehicles
	Traffic volume (Average Daily Traffic)	Central Massachusetts Regional Planning Commission
Park Access	Capacity (city park acreage by Census tract)	Worcester Division of Public Health
	Proximity (availability of city park within half mile, availability of city park within half mile combined with population)	Worcester Division of Public Health
	Perceived safety (personal safety in parks, playgrounds and other outdoor recreational areas)	Resident survey
Physical Activity	Proximity of destinations	WalkScore® (www.walkscore.com)
	Perceived safety (daytime walking, children and youth to/from school)	Resident survey
	Transit access	Central Massachusetts Regional Planning Commission
	Conditions (sidewalk trip hazards, tree canopy coverage)	Worcester Customer Service Response System USDA Forest Service, i-Tree Toosl for Managing Community Forests (itreetools.org)

Additionally, WDPH will track how this HIA affects implementation of the actions in the four strategy areas, and it is recommended that this be an explicit component of future HIAs.

Conclusions

In addition to yielding assessment of the anticipated health effects for this pilot neighborhood, a methodology for rapidly assessing health impact of neighborhood revitalization initiatives was developed. The methodology and indicators from this HIA can be applied across subsequent neighborhoods as plans are made for revitalization. This project has built the capacity of WDPH to conduct HIAs of various local policies, programs or projects.



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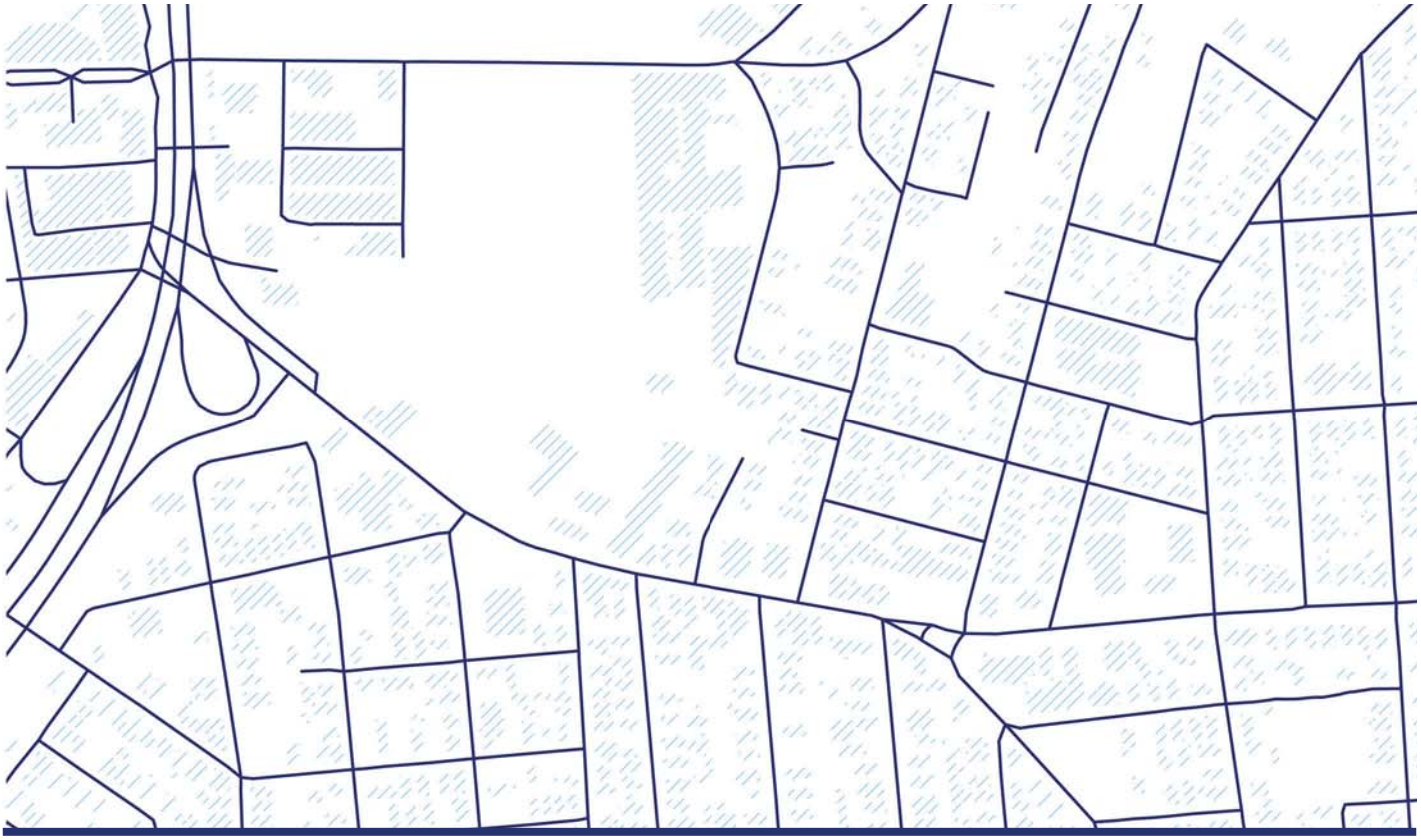

APPENDICES

APPENDICES

APPENDIX A- Oak Hill CDC Resident Survey

Please answer the following questions about the community in which you live. When we use the word "community," we are referring to *[define community]*.

First, we'd like to know your thoughts about living in your community.

1. How long have you lived in this community? _____months _____years

2. Overall, considering everything, how satisfied would you say you are living in this community?
   - ☐ Very satisfied
   - ☐ Somewhat satisfied
   - ☐ Somewhat dissatisfied
   - ☐ Very dissatisfied

   Please describe why you feel this way.

3. Right now, how likely are you to recommend this community to someone else as a good place to live?
   - ☐ Definitely would recommend
   - ☐ Probably would recommend
   - ☐ Probably would not recommend
   - ☐ Definitely would not recommend

   Please describe why you feel this way.

Next, we'd like to know in what ways, if any, you are involved in the community.

4. How often during the past year did you participate in the following community activities?

	Often	Sometimes	Rarely	Never
Participated in a community, resident, or tenant association	☐	☐	☐	☐
Volunteered to help others in the community	☐	☐	☐	☐
Participated in a community improvement project, such as a clean-up, community gardening, or other beautification effort	☐	☐	☐	☐
Supported local business events, such as a sidewalk sale or "shop local" day	☐	☐	☐	☐
Participated in an organized community social event, such as a festival, block party, or other celebration	☐	☐	☐	☐
Supported a local political organization, candidate, or ballot initiative	☐	☐	☐	☐
Participated in an advocacy group, such as a school parent-teacher association, environmental organization, or labor union	☐	☐	☐	☐
Personally took action to improve the community, such as reporting a hazard or contacting authorities about an incident	☐	☐	☐	☐

5. Right now, how willing are you to become involved in the following activities in your community? Would you say you are very willing, willing, somewhat willing, or not that willing?

	Very Willing	Willing	Somewhat willing	Not that willing
Work with others to make things happen	☐	☐	☐	☐
Run meetings so that tasks and goals are achieved	☐	☐	☐	☐
Help groups sort out differences or deal with conflict	☐	☐	☐	☐
Increase your leadership skills so that you can help influence change	☐	☐	☐	☐

6. How much of a positive difference do you feel that you, yourself, can make in your community?
   - ☐ A great deal
   - ☐ A fair amount
   - ☐ Some
   - ☐ A little or none

We are also interested in the ways in which other residents are involved in the community.

7. How likely would you say it is that people in your community would help out if the following occurred?

	Very likely	Somewhat likely	Somewhat unlikely	Very unlikely
I needed a ride somewhere.	☐	☐	☐	☐
A package was delivered when I was not at home and it needed to be accepted.	☐	☐	☐	☐
I needed a favor, such as picking up mail or borrowing a tool.	☐	☐	☐	☐
I needed someone to watch my home when I was away.	☐	☐	☐	☐
An elderly neighbor needed someone to periodically check on him or her.	☐	☐	☐	☐
A neighbor needed someone to take care of a child in an emergency.	☐	☐	☐	☐

Now, please tell us a little about services in the community.

8. How would you rate the following public services in your community?

	Very Good	Good	Fair	Poor	Very Poor	Not applicable
Police response	☐	☐	☐	☐	☐	☐
Fire department response	☐	☐	☐	☐	☐	☐
Ambulance response	☐	☐	☐	☐	☐	☐
Trash collection	☐	☐	☐	☐	☐	☐
Enter other public service (e.g., snow removal, street cleaning)	☐	☐	☐	☐	☐	☐

Please describe why you feel this way.

_____

_____

_____

9. For each of the following services, please indicate (a) whether or not it is convenient for you to get to the service, (b) whether or not that service is located in your community, and (c) how satisfied you are with the quality of the service.

	Convenient to get to?		Is it in your community?		How satisfied are you with the quality of the service?				
	Yes	No	Yes	No	Very satisfied	Somewhat satisfied	Somewhat dissatisfied	Very dissatisfied	Don't use
Public transportation	☐	☐	☐	☐	☐	☐	☐	☐	☐
Main food shopping	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dental care	☐	☐	☐	☐	☐	☐	☐	☐	☐
Medical or health care	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pharmacy	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bank or credit union	☐	☐	☐	☐	☐	☐	☐	☐	☐
Child care	☐	☐	☐	☐	☐	☐	☐	☐	☐
Public library	☐	☐	☐	☐	☐	☐	☐	☐	☐
Enter other service (e.g., gas station, barber)	☐	☐	☐	☐	☐	☐	☐	☐	☐

Next, we have a few questions about safety in the community.

10. How safe would you say you feel in each of the following places?

	Very safe	Somewhat safe	Somewhat unsafe	Very unsafe
In your home during the day	☐	☐	☐	☐
In your home at night	☐	☐	☐	☐
Walking in the community during the day time	☐	☐	☐	☐
Walking in the community at night	☐	☐	☐	☐
In parks, playgrounds, and other outdoor recreational areas	☐	☐	☐	☐

11. How safe do you feel the following groups of people are in your community?

	Very Safe	Somewhat safe	Somewhat unsafe	Very unsafe
Children and youth who are playing outside	☐	☐	☐	☐
Children and youth who are going to and from school	☐	☐	☐	☐
Children and youth in schools	☐	☐	☐	☐
Senior citizens who live in the community	☐	☐	☐	☐
Community residents going about their daily lives	☐	☐	☐	☐

Now, we'd like to know about how you think the community has changed in the past three years.
For the following questions, please compare your community now to how it was three years ago. If you have lived in the community for less than three years, please compare it to how it was when you first moved in.

12. Compared to three years ago, how would you say your community has changed overall?
    - ☐ The community has improved a lot
    - ☐ The community has improved some
    - ☐ The community has stayed about the same
    - ☐ The community has declined some
    - ☐ The community has declined a lot

    Please describe why you feel this way.

Next, please share your thoughts about how you see the future of the community.

13. Thinking about the next three years, how would you say your community is likely to change?
    - ☐ This community will improve a lot
    - ☐ This community will improve some
    - ☐ This community will stay about the same
    - ☐ This community will decline some
    - ☐ This community will decline a lot

    Please describe why you feel this way.

Finally, we'd like to finish up with a few quick questions.

14. Do you currently rent your home or do you own it?
    - ☐ I rent my home.
    - ☐ I own my home.
    - ☐ I live with family or friends.
    - ☐ Other:

15. Including you, how many people 18 years of age or older live in your household? _____

16. How many children under 18 years of age live in your household? _____
    If one or more: What are the ages of those children? _____
    How many of those children are in childcare in your community? _____
    How many of those children attend school in your community? _____
    If one or more: How satisfied are you with the school(s) those children attend?
    - ☐ Very satisfied
    - ☐ Somewhat satisfied
    - ☐ Somewhat dissatisfied
    - ☐ Very dissatisfied

17. In what year were you born? _____

18. What is your gender? □ Male □ Female

19. Do you consider yourself to be Hispanic, Latino, or Latina?
    - ☐ Yes, Hispanic/Latino/Latina
    - ☐ No, not Hispanic/Latino/Latina

20. What is your race?
    - ☐ Black/African American
    - ☐ Caucasian/White
    - ☐ American Indian/Aleut/Eskimo/Alaska Native
    - ☐ Asian

- ☐ Native Hawaiian/Pacific Islander
- ☐ Mixed race

21. Please tell us if you strongly agree, agree, disagree or strongly disagree with the following statement:
People in my neighborhood can be trusted.
- ☐ Strongly agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ Don't know

Thank you for completing this survey.