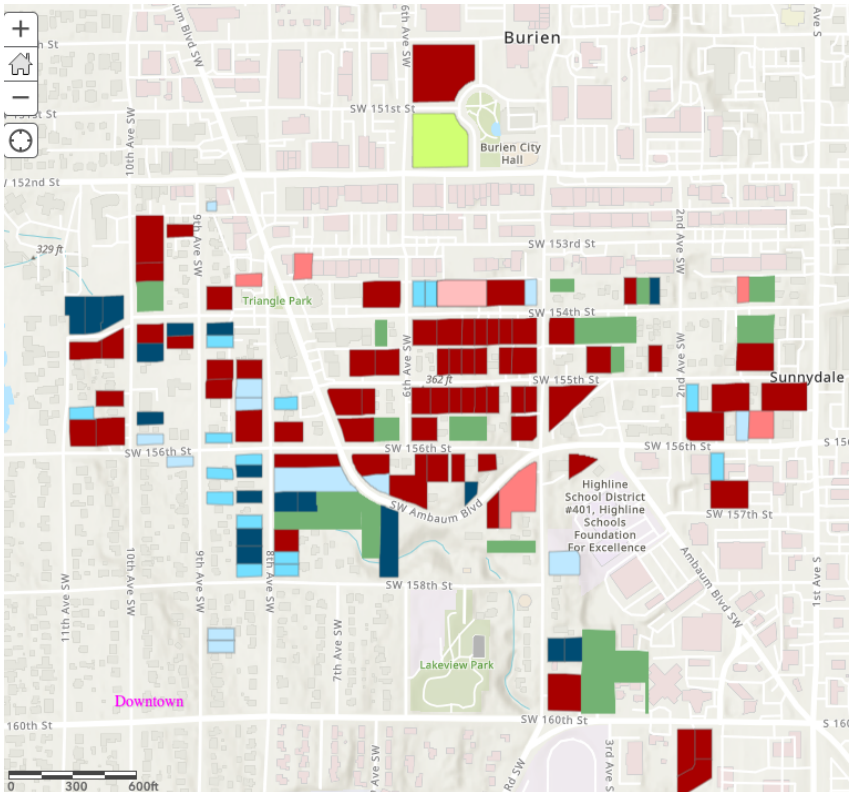
Burien Multi-Family Housing Assessment Project

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Prepared for The City of Burien, Washington

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Abstract

Specific Objectives

This project had two objectives to achieve its goals. The first objective was to provide the city of Burien with an accurate dataset of all the multifamily housing in the city and to use that data as a basis to assess the quality of multi-family housing from the perspective of individual and community health. The second objective was to conduct a qualitative field survey of the physical conditions of all the multi-family housing in the city and present the results with analysis and recommendations.

Setting

The project took place in Burien, WA in December through July of 2020. Work was conducted online via teleconferences with shared documents and project management conducted via email. The field assessments were performed on foot and in a car with two assessors, a student and a city employee, covering all of the multi-family housing properties in the city.

Methodology

In this City-wide, multi-family housing, qualitative assessment project a database of properties was created by data extraction from the county parcel and address data, cleaning the data, and then geocoding it to form a parcel-layer shapefile that was cross-referenced with the city's GIS data. A health-focused, project-specific housing quality assessment tool was developed by literature review to identify eight exterior categories to assess. Existing mobile field applications were modified and embedded the assessment tool, and a field survey was performed with two people walking and driving around the city using the mobile applications.

Results

A total of 513 parcels were identified as multi-family housing for this project. Through the process of direct observation in the field some parcels were merged into one property and other parcels were misidentified and consequently eliminated. A final total of 487 multi-family properties were qualitatively assessed in eight exterior categories for this project. The vast majority (78%) of the city's multi-family housing was in "good" or

"excellent" in their exterior condition and most properties (72%) fared well (rated "good" or "excellent") for cleanliness and landscaping. Nearly all properties had no signs of graffiti (92%). Most properties did not have an area for recreation and play (82%) nor did they have safe pedestrian walkways adjacent to where they lived (71%). Nearly half (46%) of properties could not be assessed for the balcony condition and in over a quarter (28%) of properties the surveyors could not determine outdoor lighting quality. A total of 114 properties were rated "fair" or "poor" in structural soundness and 125 properties were rated "fair" or "poor" in cleanliness.

Conclusions

The results of this project highlight properties of concern pointing to key characteristics of multi-family housing that are doing well or need improvement. The baseline data and assessment results offer many opportunities for further analysis, data visualization, and even solutions to address problems of multi-family housing and its relationship to the health of its residents.

Introduction

Cities across the United States are seeking ways to address the affordable housing crisis. The west coast has been experiencing a rapid increase in a lack of affordable housing, particularly for lower income residents. In King County, Washington, which includes Seattle, 33.8% of the population is considered to be housing cost-burdened, meaning that many households pay over 30% of their monthly income on housing (Washington Tracking Network, 2019. ACS, 2018). As a reaction to increased housing prices, people move away from expensive housing areas to more affordable areas farther away from the urban core, such as South King County. Lower income residents are vulnerable to being more significantly cost-burdened by the very nature of their income limitations. This circumstance affects individuals and communities on multiple levels including the health of all of its residents through chronic stress, crowding, or accepting sub-standard housing. Now, cities in south King County, including Burien, have come together to address the regional housing crisis with grant-funded support from the state of Washington.

The City of Burien is undertaking development of a Housing Action Plan by 2021. To assist in this effort, a complete housing needs assessment is being generated by a consulting firm that will inform and advise the City (along with five others in South King County) on their Housing Action Plan. The report will include individual city and regional recommendations. As part of the original expectations of data collection in the grant from the Washington Department of Commerce, the City of Burien seeks to ensure that their Housing Action Plan is based on the most accurate understanding of their current multifamily housing stock both quantitatively and qualitatively. The goal of this project is to provide information that will assist decision-makers in formulating policies relating to

housing, and the nexus between affordable housing assets, overall housing quality, and how this connects to the health of the community.

The Relationship Between Housing and Health

Health starts long before the onset of illness. It starts in homes, schools, and places of work (RWJF, 2010). It has been known for at least fifty years that access to and quality of healthcare only contributes 10-15% to health and well-being (McGinnis et al., 2002). More powerful contributors to the overall health of communities are social and economic factors such as neighborhood and housing quality, educational attainment, income, social cohesion, and inequality. Inequality in society is associated shorter life expectancy and increases in obesity, mental illness, property crimes, and homicides (Wilkinson & Pickett, 2017). When considering determinants of health, like inequality and housing, it is also worth knowing the reasons why this is important. Community health is important because healthy people contribute to positive characteristics in towns, cities, and states. For example, healthy residents are more likely to reach their full potential in learning and development in childhood and become more productive and have greater longevity in the workforce as adults (Holmes, 2020). As Wilkinson and Pickett (2010) write in their book The Spirit Level, multiple studies over 50 years have shown that in more equal societies, where education, income, and housing also improve, the health of *everyone* in a society benefits. Therefore, communities that want to be safe, vital, stable, and growing must look to ways that support the social contexts and settings, such as housing, that will have the greatest impact on the health and wellness of all its residents.

Housing is one major upstream determinant of individual and community health. Housing can contribute to a variety of health outcomes such as infectious diseases, chronic diseases, injury, and mental health problems. Examples include water leaking into a house leading to damp conditions, which in turn encourages mold growth that can cause respiratory conditions or trigger allergies. Respiratory conditions, such as asthma, are also associated with housing conditions like insect infestations (roaches, dust mites), poor ventilation, and mold. It is worth noting the significant economic burden asthma has on the U.S. economy. In 2013, asthma cost the U.S. of 81.9 billion dollars including healthcare costs, school and work absenteeism, and mortality (Nurmagambetov et al, 2018). When considering health conditions people experience due to sub-standard housing it is important to keep in mind those that are most sensitive to the environment, such as children. Children are particularly vulnerable to health risks in the home because they spend more time at home than adults, they are more likely to ingest toxins (like lead paint), and environmental toxins have a greater effect on smaller bodies. Additionally, a lack of affordable housing, especially for lower incomes, is associated with developmental and nutritional deficits in children (Krieger & Higgins, 2002). This may occur when people make trade-offs in utility bills and food budgets to pay for rent. Scientists have also shown that the chronic stress of a cost-burdened household may be the leading factor in poor health in young children (Krieger & Higgins, 2002; Nobari et al., 2019). Finally, a cost-burdened household may create additional health problems due to non-adherence to medical care or deferred treatment (Pollack et al., 2010). Table 1 provides examples of housing conditions and related health outcomes. Therefore, cities can support community health by maintaining sufficient quantities of high-quality, affordable, housing for all income levels.

Table 1. Examples of Housing Conditions and Related Health Outcomes.

Housing Condition (External Signs)	Related Health Outcomes
Damp, Cold, Moldy Conditions (signs of a breach of exterior such as tarps, broken windows)	Asthma, chronic respiratory symptoms. Hospitable to mites, roaches. Headaches, fever, nausea, vomiting, sore throats.[a] Anxiety, depression.[a]
Old, dirty carpeting: reservoir for dust, allergens, and toxic chemicals	Allergic, respiratory, neurological, hematologic illnesses.[a]
Poor insulation: large deviations in indoor temperatures, heat/cold (Year built, tenant reports)	Lower general health status, increased use of health services. Irritability, social intolerance.[a]
Poor insulation: excessive noise	Insomnia, heart disease, anxiety, depression, increased allostatic load[a]
Toxic Exposure: VOC's, PVC's, NO2, CO2, Lead, Asbestos, Radon	Asthma, High blood pressure, Lung cancer, Neurodevelopmental abnormalities[a.]
Crowding (More vehicles in lots than number of units)	Respiratory illness, Increased transmission of infectious diseases (TB, Covid-19), Psychological distress[a]
Sub-standard housing: Any/all biological, chemical, and physical hazards	Social isolation, chronic stress[a]
Cost-Burdened Households	Childhood Obesity[b]. High Blood Pressure, Arthritis[c]. Inadequate nutrition, especially in children.[a.]

a. Krieger & Higgins, 2002
b. Nobari et al., 2019
c. Pollack et al., 2010

Cities and communities have measured housing quality with increasingly sophisticated data analysis methods. Historically, they have chosen indirect ways to estimate the quality of a neighborhood and housing by equating it to the socioeconomic

status reported in census data or other household surveys. However, these indirect methods have come to be viewed as limited and unable to capture the full depth and breadth of what is really happening "on the ground" (Schaefer-McDaniel et al., 2010; Rollings et al., 2015). One limitation is the fact that census data is collected infrequently (every 10 years) and neighborhood quality that is equated with the socioeconomic status of the residents may not be entirely accurate (Rollings et al., 2015). In addition, census data is not able to predict or report on the cleanliness, social assets, or abandoned properties that may be present in a community (Schaefer-McDaniel et al., 2010). With significant advances in Geographic Information Systems (GIS) technology, researchers have benefited from augmenting census data with information such as access to amenities like grocery stores and pedestrian connections to transit. However, these improvements in data analysis may not meet the needs of every community. For example, they may have characteristics in their neighborhood or housing that would not be captured in an estimate of quality. As a response to this need for community-specific information and assessment, several methods and tools have more recently been developed to allow for direct observation and assessment of neighborhoods and housing, and many include a focus on health.

Cities and communities have developed various tools and checklists to study and measure the quality of their neighborhoods and housing, often to identify problems as well as solutions. For example, realizing that inadequate housing quality in New Zealand contributed to the death of a two-year-old, public health researchers built and tested a tool to assess all of their multi-family housing. This tool, called a Warrant of Fitness (WOF), revealed patterns of problems as well as affordable solutions (safety violations like improperly installed smoke alarms and window security-stays and unsafe water

temperature) that could be rectified for under 70 US dollars and could be implemented on a national scale (Bennett et al., 2016). Researchers in Toronto, Canada conducted a systematic review of the different methods communities have used to measure neighborhood quality, including housing, since 1980 (Schaefer-McDaniel et al., 2009). Direct observation and collection of data of this kind is called Systematic Social Observation (SSO), and many studies in the U.S. use previously known or project-specific checklists that focus on neighborhood and housing qualities related to health. These tools are based on theoretical frameworks such as the "Broken Windows Theory" (an academic theory connecting social incivilities to crime within neighborhoods), previous work found in literature reviews, and oftentimes pilot explorations by the agency involved with attention to physical and social attributes known to affect health. These tools and frameworks have helped communities to measure housing quality and its relationship to human health and using that data to inform policies and programs.

Burien Demographics and Health

Burien is a medium sized city in south King County, Washington. Compared to King County, Burien is more diverse in racial and ethnic representation, less wealthy, and less of its residents have attained a college degree. Of its 51,500 residents: 25% identify as Hispanic, 48% as white, not Hispanic or Latino, 8% identify as Black, and the last portion of the population is comprised of a mixture of Asian (13%), 2 or more races (7%), and American Indian/Alaska Native & Native Hawaiian and Other Pacific Islander (2%)(ACS, 2018). Thirty-seven percent of Burien residents over the age of 5 speak a language other than English at home versus 26.7 percent of King County (King County. 2019). The median household income in 2018 was $62,315 which is 30% less than the King County median

household income of $89,418 (ACS, 2018). Sixty-nine percent of children in Burien are eligible for Free/Reduced Lunch versus 33% of King County residents who qualify (Office of the Superintendent of Public Instruction, 2016-2017). Just over a quarter of adults over 25 years have a bachelor's degree or higher whereas half of King County has a college degree. Figure 1 shows the income distribution of Burien residents with over half living below 80% of the area median income of King County.

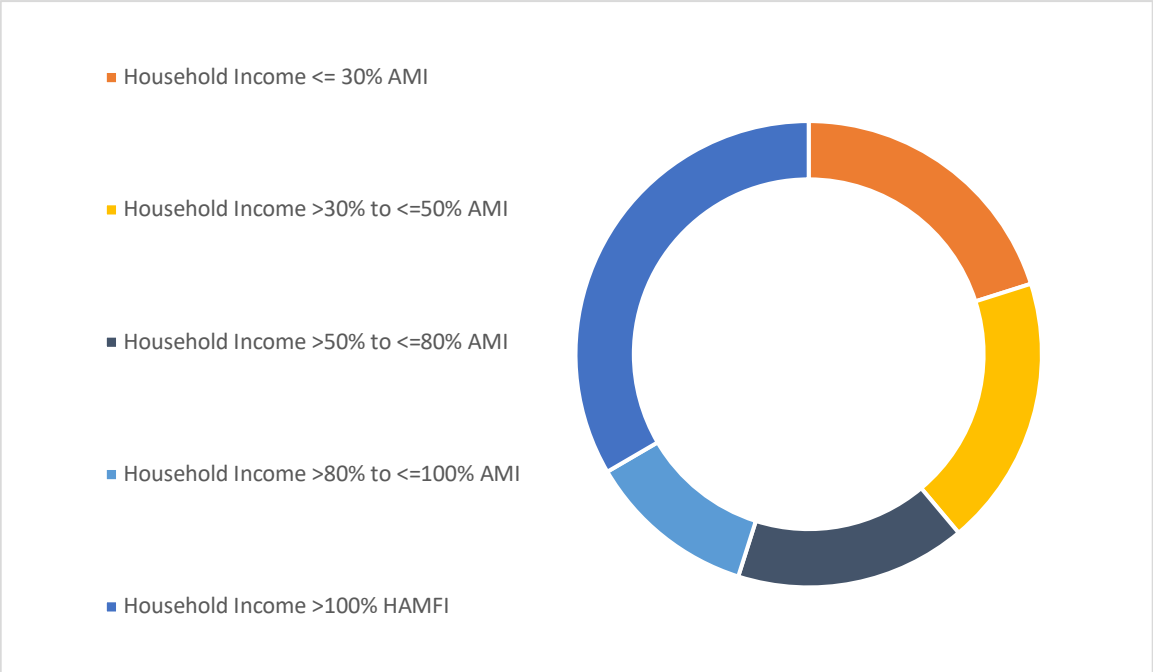


Figure 1. Income Distribution of Residents in Burien, WA.
(HUD. CHAS Five year 2012-2016)

Burien residents share similar health outcomes as other densely populated, less resourced, cities south of Seattle. Noting the demographics listed above, an abundance of research shows that characteristics including lower socioeconomic status (education and income) are strongly associated with poorer health outcomes (Braveman et al., 2010). For example, higher educational attainment is associated with improved health literacy and healthy behaviors as well as providing pathways to employment that lead to higher income

and social standing (Braveman et al., 2010). Additionally, the Washington Health Disparities Map (https://fortress.wa.gov/doh/wtn/WTNIBL/) shows concentrations of health disparities and social vulnerability in most of Burien. According to this data map, Burien ranks an average of 9 out of 10 (10 being the worst) in Environmental Health Disparities Risk and 7.3 out of 10 for Social Vulnerability to Hazards which two measures on housing. Figure 2 shows the distribution of cost-burdened rental households in Burien and Figure 3 compares chronic disease prevalence in Burien to King County.

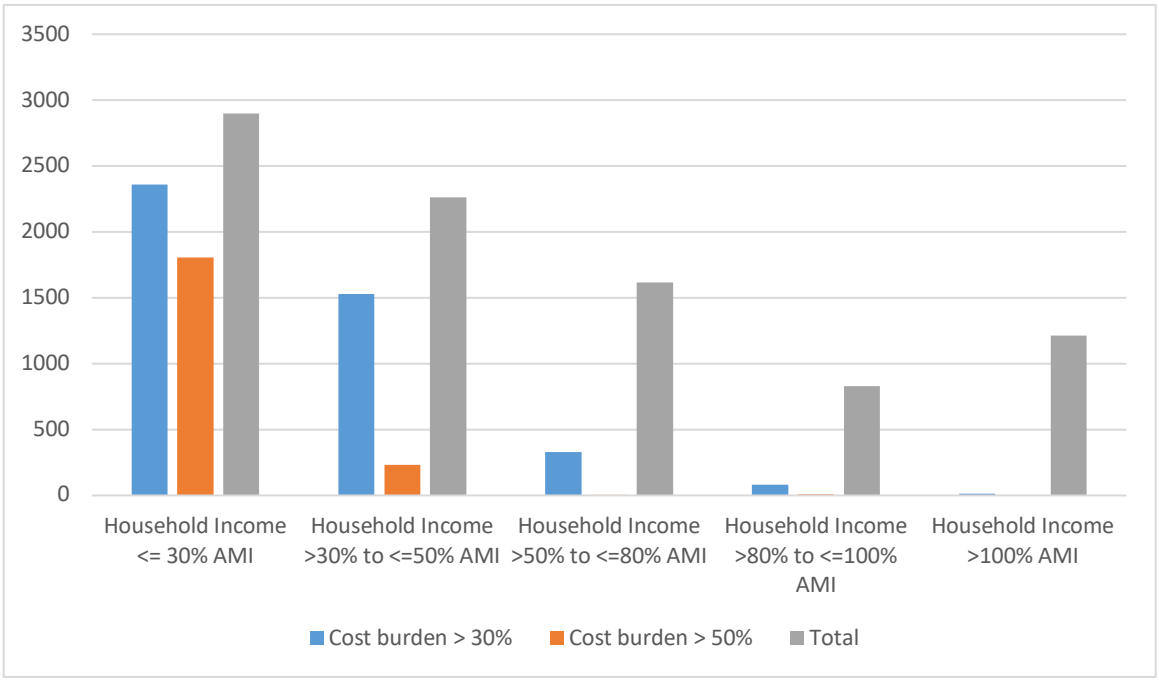


Figure 2. Housing Cost Burden for Renters in Burien, WA.
(HUD. CHAS Five year 2012-2016)

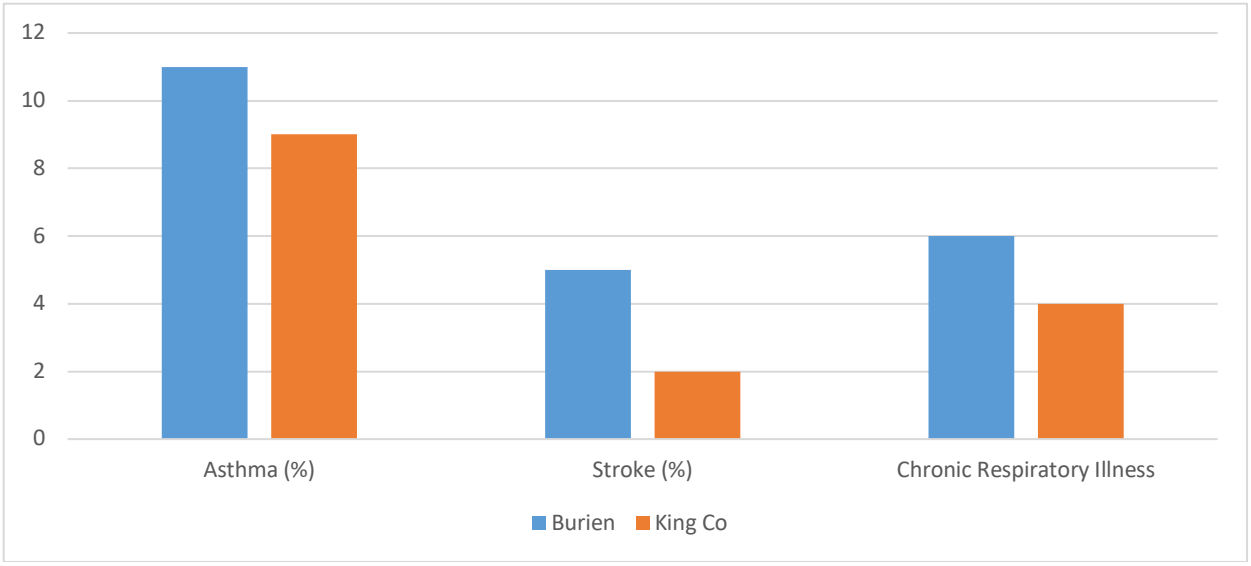


Figure 3. Chronic Disease Prevalence City of Burien Compared to King County, WA. (2011-2015) King County. City Health Profiles (2019) https://kingcounty.gov/depts/health/data/city-health-profiles.aspx

The City of Burien also has many attributes that may mitigate potential health risks. The physical and social environments of a neighborhood such as safety, food and recreational resources, aesthetic quality, and environmental exposures contribute to the physical and mental health of its residents (Diez Roux & Mair, 2010). The City of Burien has 365 acres of parks and open space which encourages recreation in a natural environment. Eighty percent of Burien residents live within a 10-minute walk of a park compared to the national average of 55% (The Trust for Public Land, 2020). The downtown core has a walkability score of 90 out of 100. Within this walkable neighborhood there is a range of multi-family housing options, a public transit HUB, a county library, City Hall, community center, historical museum, a city park that hosts a Farmer's Market and many cultural events, and a main street that is home to a high percentage of locally-owned small businesses. These assets help community members connect to services, and each other, and in doing so positively affect their health.

Local Background

The Growth Management Act (GMA) of 1990 set the framework for policies and programs in Washington State for local governments, like the City of Burien, and the South King County subregion, to have a plan for housing and growth. Now, they have a grant-funded opportunity to develop a comprehensive Housing Action Plan in 2020- 2021 that will "set the stage to evaluate and incorporate appropriate policies, tools and incentives for increasing residential capacity" (SubRegional Housing Plan RFP, 2019).

Originally the aims of the Growth Management Act (GMA) were to preserve rural areas, limit sprawl in Washington State, ensure development occurred where transportation and infrastructure was available, and also require local governments to plan housing for all economic segments of the population. However, since 1990 shrinking housing availability, increasing housing prices, and stagnant wage growth has created an affordable housing crisis.

Over the years Washington communities have found innovative ways to enact the ideals of the GMA. In the Puget Sound area, a four-county policy plan called Vision 2050 has paved the way to guide King, Kitsap, Pierce, and Snohomish counties to manage people, land, and economic development. Additionally, within King County there is a county-focused coalition called the Regional Affordable Housing Task Force that aims to address housing and growth as King County has grown from 1.5 million in 1990 to 2.26 million in 2020 (King County, 2020). The task force is comprised of King County, The City of Seattle, and the Sound Cities Association (Regional Affordable Housing Task Force, 2019). Its primary goal is to recognize and address the problem of affordable housing, offer a range of solutions, and do it through regional cooperation.

Recognizing that South King County cities experience the housing crisis differently than its northern, more resourced, areas another regional coalition was formed called the South King Housing and Homelessness Partners or SKHHP which is comprised of Human Services staff and elected officials. This partnership joins nine cities along with the county to "increase the available options for South King County residents to access affordable housing and to preserve the existing affordable housing stock" (SKHHP, 2020).

In 2019, House Bill 1923 awarded four million dollars to 52 communities (cities or groups of cities) so that they could "develop housing action plans and city code changes to increase urban residential building capacity and streamline development regulations" (Washington State Dept. of Commerce, 2020). Now Burien, along with five other cities in South King County are in the midst of completing a subregional analysis of housing data and trends which will inform development of housing action plans for each of the six cities. The subregional analysis provides a basis for assessing future policy development in the South King County area.

In addition to this important undertaking, the objective of the Burien Housing Assessment project is to add another layer of useful data by conducting a qualitative field survey of all the multi-family housing in the city. The results will be presented to the city with analysis and recommendations from a public health perspective. This unique perspective will contribute an additional lens with which to approach development of housing policies and strategies to address solutions to the housing crisis.

Methodology

Objective One

The first objective of this project was to establish a database of all the multi-family properties in The City of Burien, WA. This database would include variables such as property type, year constructed, number of buildings, units per building, property owner details, and current rent ranges. The database would serve as a starting point for two projects: The Multi-Family Housing Assessment Project (Objective Two) and the Rental Housing Inspection Program which is scheduled for implementation in January 2021. The database was created by extracting existing data, mostly from King County Assessor's parcel level data, which included all of the variables needed (except for rent ranges). The extracted data was then geocoded to create a parcel layer shapefile and cross-referenced with Burien's GIS data. Geocoding is a tool used to spatially display the location of data using information about that data including an address, parcel number, coordinates, or a place name (https://www.arcgis.com).

Building the database was achieved by performing an initial exploration using a website called Landgrid which focuses on parcel-level data in the U.S., presents the data on maps, and offers survey applications (https://www.landgrid.com). All parcels in King County, WA were extracted, and then multi-family properties were further extracted by their use codes. These eight codes are associated with multi-family housing parcels in King County (Table 2). The parcel data for these use codes was downloaded into a spreadsheet and cross-referenced with The City of Burien's GIS Specialist who conducted a similar parcel data extraction using ArcGIS. After sorting the data by adding and eliminating certain

housing types (e.g., eliminated mobile homes), a total of 513 parcels were identified for further analysis. A visual representation of a section of multi-family housing units in Burien, WA is presented in Figure 4.

Table 2. Parcel Use Codes for Multi-Family Housing in King County, WA

Parcel Use Codes:	
3= duplex	16= apartment (mixed use)
4= triplex	18= apartment, subsidized
5= 4 plex	20= condominium (residential)
11= apartment	25= condominium (mixed use)

Source: King County Assessor's Office (http://www5.kingcounty.gov/sdc/FGDCDocs/KCA102_PRESENTUSE_PARCEL_faq.htm)

One data category that was needed for this project but was not provided in the King County parcel database was a reliable unit count for each property. This was needed to better account for the full capacity of multi-family housing. This need was addressed by adding layers of data from other sources like 'addressing' where specific GIS methods were used to count the number of address points that are contained in each property. This, however, did not produce the desired result as addressing data extracted from the county was also inconsistent and incomplete. Consequently, completion of all the data in this category was achieved through a field survey described in Objective Two.

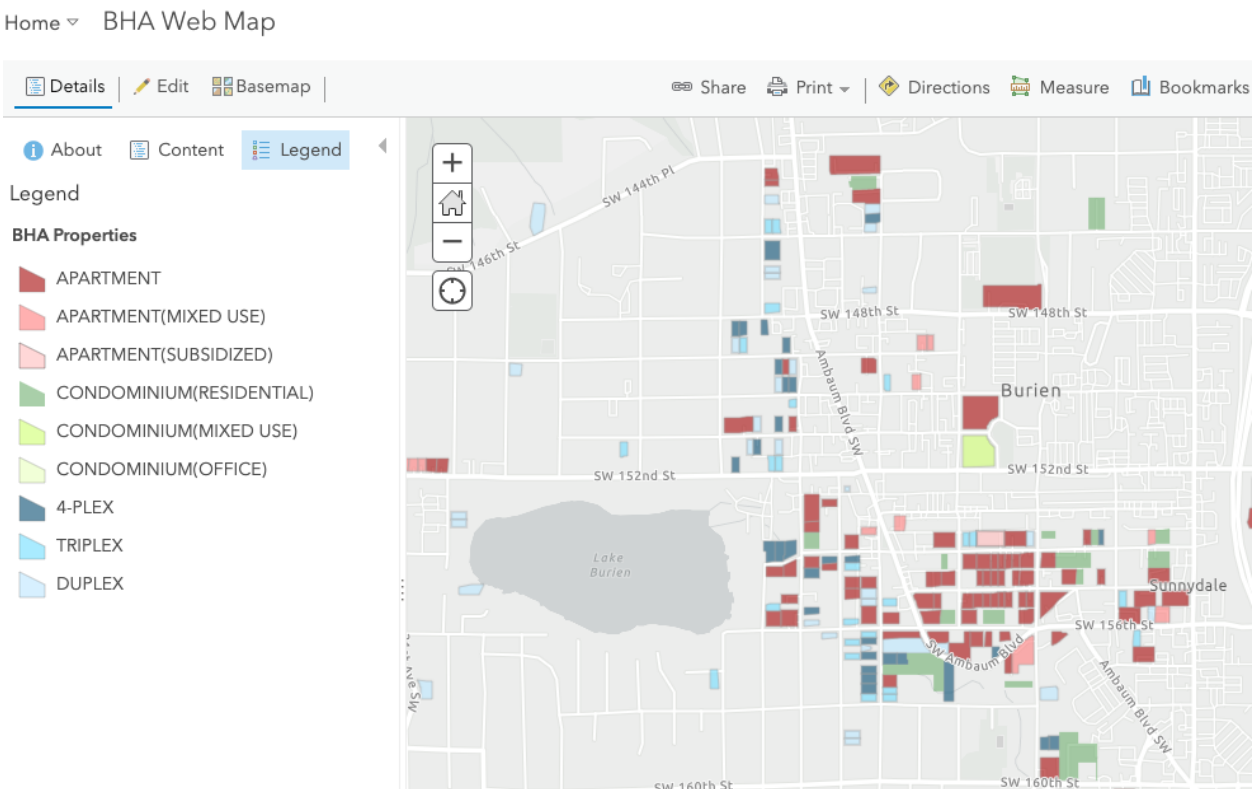


Figure 4. ArcGIS Screenshot of Multi-Family Housing in Burien, WA

Objective Two

Overview

After collecting quantitative data such as unit count, the second objective of the project was to qualitatively assess the exterior of each multi-family housing property in the city. A project-specific assessment tool was developed by reviewing how other communities studied and assessed their housing, or neighborhood, and its relationship to community health. Once the content of the assessment tool was created, that information was applied to the ArcGIS survey applications (Collector and Survey 1-2-3) and tested for a three-week period. Testing involved establishing the correct relationship classes between the property layer and the assessments table, breaking down the workflow across the Collector and Survey 1-2-3 applications, and securing the applications and data. The complete survey of

all multi-family housing properties was conducted over a 1.5-month period from June 2, 2020 to July 13, 2020 with two field workers.

Creating the Assessment Tool

A literature review was conducted on the various tools and methods that have been used in measuring the quality of housing and neighborhoods in the United States. Key community characteristics were identified via pilot studies, duplication from other studies, or creation of new tools. After a presentation of findings and recommendations, it was decided to create a project-specific tool borrowing from a study that focused on assessing housing though a healthcare lens: the *Omaha System for Community-Level Observations* (Ker et al., 2016). This study tested and found that housing and neighborhood quality could be assessed similarly to how a public health nurse would assess a community member. The theory was that observing external, objective, attributes of housing and surrounding activity would function similarly to observing medical 'signs and symptoms' and would provide indicators of the health of residents. Key characteristics identified from this study included: structural soundness, cleanliness, and safe areas for play and exercise. Three additional characteristics (landscaping, presence of graffiti, and balcony condition) were identified from the *Healthy Housing Inspection Manual* from the Centers for Disease Control and Prevention and U.S. Department of Housing and Urban Development (CDC & HUD, 2008). A final two categories (exterior lighting and pedestrian connections) were added by Burien's City Planner for a total of eight categories that were included in the Burien Multi-Family Housing Assessment Tool.

Each of the eight categories in the Burien Multi-Family Housing Assessment Tool included a four-point Likert scale ("poor," "fair," "good," "excellent") with an additional

option (“missing”) if the category could not be observed. (See Appendix A for the full Burien Multi-Family Assessment Tool).

Definitions for a “poor” rating in assessed categories include conditions that contribute to poor health outcomes in people. For example, poor pedestrian connections would be defined as: “disjointed and incomplete sections of sidewalks or no sidewalks or pedestrian paths.” Safe walking paths are needed for connecting residents to services and public transit and the absence of sidewalks can lead to accidents. An example of a “poor” rating for sidewalks can be seen in Figure 5. As another rating example, a rating of “good” for the presence of graffiti is defined as: “graffiti in one location” and “excellent” is defined as “no signs of graffiti.” Figure 6 shows an example of graffiti found on a Burien property during the field assessment, rated “good” for “Graffiti in one location.”



Figure 5. Poor Pedestrian Connections



Figure 6. Graffiti on Burien Property

Building the Field Survey Tool

The project coordinator helped determine that GIS technology would be useful to collect data in the field and visualizing the results of the assessment tool (Graylee et al., 2006). The baseline data was added to ArcGIS to map the distribution of multi-family housing in Burien and two ArcGIS associated applications, Collector (https://www.esri.com/en-us/arcgis/products/arcgis-collector/overview) and Survey 1-2-3 (https://Survey 1-2-3.arcgis.com/surveys), were modified to be used as the data collection tool for the Housing Assessment. Figure 7 shows how the two applications appeared to the surveyors in the field.

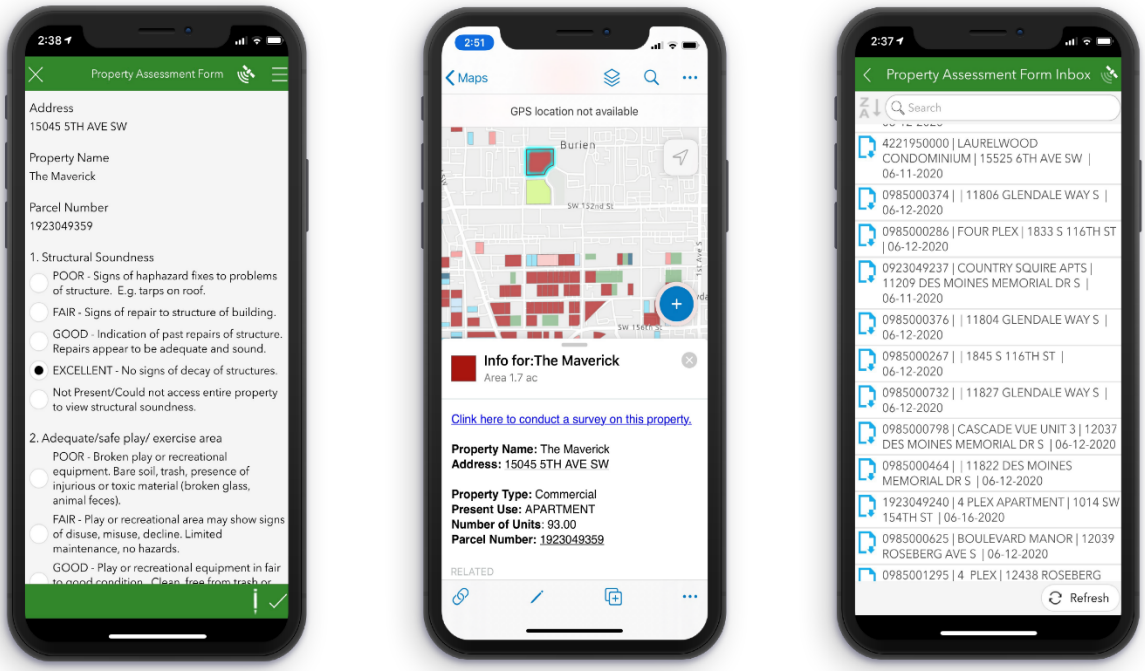


Figure 7. Interfaces of the Collector Application and Survey 123 Application (From left to right: Survey form, Web Map, Completed Survey Inbox)

For more technical information on the building processes within ArcGIS as performed by the City of Burien's GIS Specialist, please refer to Appendix B. Information in this appendix

includes work with the field survey tools in ArcGIS (Collector and Survey 1-2-3) and database maintenance.

Planning and Implementing Field Assessments

To facilitate the field assessment, The City of Burien was divided into eight Focus Areas based on concentrations of multi-family housing and approximately equal number of parcels to be assessed. Survey days were planned by viewing a map of a focus area and systematically walking and driving to properties until the area was complete. Field assessors could double-check to see if a property had already been assessed, and by who, on the Collector application.

The first surveys were piloted by the student on 20 of the properties starting on June 1, 2020. After it was deemed that the two applications worked correctly in updating the database, surveys continued until 135 were completed.

On June 3rd the student trained a Burien employee who was experienced in field work to continue and complete the assessments beginning on June 8th and continuing until July 13th. Both assessors provided continuous feedback to the GIS specialist who was conducting maintenance checks on the data to make sure all the survey data was being submitted correctly and make sure the map service layers were running as intended.

Surveys typically lasted 5-10 minutes and included the following procedure:

1. Selecting the property to be assessed on the map in Collector;
2. Editing fields as necessary in Collector (property name, unit count, property type);
3. Launching the assessment application (Survey 1-2-3) and take a property photo;

4. Walking around the property as was possible and safe to conduct a visual assessment;
5. Rating the eight categories in the assessment app;
6. Add notes if needed such as notable traffic noise or a contact phone number posted;
7. Affirm the time and date and send the data via cell signal which updates the data.

Finally, the GIS specialist would review data quality assurance as data is submitted to the underlying data tables.

To compile and display assessment results, an online dashboard was built as a workaround to a bug from Esri to share data with all the participants in real-time and view assessments as they were being conducted. This was a viable solution that helped track the number of assessments conducted, gave insight into what the users were seeing out in the field, and provided complete results at the end of the study. Figure 9 shows a screenshot of the dashboard as it appeared midway through the assessments.

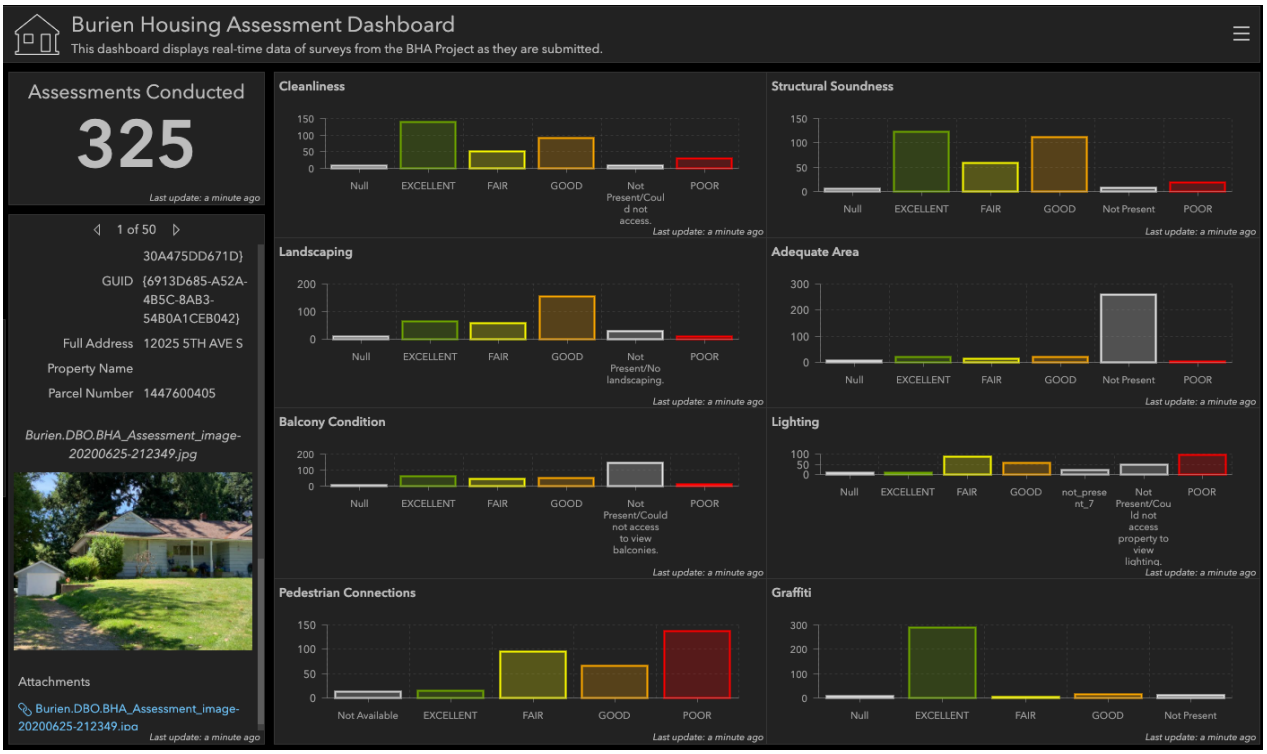


Figure 9. Burien Multi-Family Housing Assessment Dashboard, June 26, 2020.

Results

Objective One: Creating a Database

A total of 487 multi-family *properties* were identified in The City of Burien. Originally, a total of 513 *parcels* were identified as multi-family housing for this project. However, through the process of direct observation in the field some groups of parcels were merged into a single *property* (e.g. one property had 8 parcels associated with it with labels such as 'driveway' or 'vacant') and other parcels were misidentified and consequently eliminated. On the 487 properties, the number of buildings for each property ranged from 1 to 44 and individual units ranged from 2 (Duplex) to 642 (a large apartment complex). In total, this study counted 6,790 total units of multi-family housing. By number of units, apartments

represent the largest proportion of multi-family housing types at 72% with the next most common being condominiums at 18%. The remainder of housing types combined (4-Plexes, Tri-Plexes, and Duplexes) represented 10% of total multi-family units in the city (Table 3).

Table 3. Distribution of Types of Multi-Family Properties in Burien, WA.

Type of Property	Number of Properties	Percent of Total Properties	Number of Units	Percent of Total Multi-Family Housing Units
Apartments, all types	211	43%	4914	72%
4 Plex	64	13%	256	4%
Triplex	36	7%	139	2%
Duplex	133	27%	266	4%
Condominium	43	9%	1215	18%
Total:	487		6790	

Objective Two: Assessing Multi-Family Housing

Seventy-eight percent of multi-family housing in Burien is in good or excellent exterior structural soundness and 72% are rated good or excellent in cleanliness and landscaping. Ninety-six percent of Burien's multi-family housing show no signs of graffiti.

Of all the multi-family housing in Burien, 71% were rated poor or fair in the category of pedestrian connections. This meant that residents leaving their housing would experience pathways in need of significant maintenance or no pathway at all.

A large percent (46%) of balconies could not be observed safely by the assessors, or in some cases there were no balconies. However, when they could be observed, 39% of balconies were in good to excellent condition.

Over 80% of properties did not have an area for play or recreation that could be observed by the surveyor. However, a small proportion (13%) of properties did have some area for recreation that was in good or excellent condition.

The quality of exterior lighting for the properties as all of the assessments were conducted during the day. Twenty-eight percent could not be assessed due to limitations in viewing the entire property safely. Another 47% of the properties were rated fair to poor in lighting based on number, location, and an estimation of quality of light to be less than 50% of travelways lit. Twenty-two percent of properties were rated good which indicated adequate lighting where residents would walk. Table 4 shows the results of the Multi-Family Housing Assessment with percent and number for each rating on each category.

Table 4. Assessment Results of Multi-Family Housing Quality

Category	Excellent % (n)	Good % (n)	Fair % (n)	Poor % (n)	Not Accessed /Null % (n)
Structural Soundness	41% (202)	34% (169)	17% (87)	5% (27)	3% (14)
Cleanliness	42% (210)	30% (148)	16% (78)	9% (47)	3% (16)
Landscaping	17% (86)	55% (274)	15% (76)	3% (15)	10% (48)
Adequate Area, Recreation/Play	6% (31)	7% (34)	4% (20)	1% (5)	82% (409)
Graffiti	92% (457)	4% (22)	1% (4)	0% (0)	3% (16)
Balcony Condition	22% (109)	17% (87)	12% (60)	3% (15)	46% (228)
Pedestrian Walkways	6% (32)	21% (105)	32% (162)	38% (192)	2% (8)
Lighting	3% (15)	22% (108)	28% (138)	21% (103)	28% (139)

Discussion

Apartment buildings and complexes are the main contributors to multi-family housing in Burien. While there are more properties of other types of housing, such as duplexes, triplexes, 4-plexes and condominiums they only contribute to 28% of the total possible multi-family housing stock. Knowing the proportions of housing types will assist city planners and decision-makers develop strategies for their Housing Action Plan.

Viewing the distribution and concentration of multi-family housing on a map helped the city and project members better understand housing assets. Historically, housing was visualized by planners using zoning maps which mirrors the data created for this project but with much less detail. Also, seeing and counting each property within ArcGIS allowed for systematic planning of the field survey by creating zones of concentrated properties with approximately equal amounts of work. The capacity of ArcGIS, along with the specialist who used the program, was instrumental in the success of this first step to the project.

When extracting data to build a database it is not uncommon to find irregularities and missing information. A discrepancy was discovered between what was identified as a property in creating the database of multi-family homes and what was found in the field. When the database was built it was assumed that for each parcel there would be one property associated with it. However, some properties were found to be comprised of multiple parcels, for example, in one instance an apartment complex was made of eight smaller parcels. The object of the database was to identify all the multi-family *properties* in the city and so with taking ownership of the database, the multiple *parcels* were unified under one property when needed. This process reduced the number of properties counted as multi-family housing in Burien. Additionally, some properties that were identified as duplexes were single-family homes and so were eliminated which reduced the count even more. However, with assessors working on the *parcel level* when collecting data there were sometimes multiple assessments conducted for one property. Consequently, the assessment count is higher, at 499, than the final count of properties of 487.

Based on the results of the multi-family housing assessment, the overall the quality of multi-family housing in Burien, Washington is good, with some notable exceptions.

Properties were rated highly on important categories like exterior structural soundness, cleanliness, and landscaping which bodes well for the residents of these properties. However, Burien properties showed deficits in safe pedestrian pathways and very few properties had areas designated for play and recreation.

More specifically, 71% of properties have no sidewalk in front of it and most properties (89%) did not have an area for play or exercise. It is worth considering that if 80% of Burien residents are within a 10-minute walk of a park, and if the path to the park is not safe due to lack of sidewalks or pedestrian paths, then it may be more difficult to access recreation spaces for multi-family housing residents.

This assessment helped The City of Burien identify properties that may be hindering the health of its residents in certain categories like signs of an unsound structure and lack of cleanliness. Overall, there were 114 properties rated as fair or poor in structural soundness. Given the impact of decaying structures can have on residents (such as dampness, entry for pests, or diminished temperature regulation) these poorly rated properties should be prioritized by the City for further investigation. From the field assessor's perspective, properties that were rated fair or poor in structural soundness or cleanliness showed signs of stress beyond that which was measured by the assessment tool. For example, there were multiple residents sitting in apartment doorways, broken and falling window treatments, and multiple abandoned cars. These properties and their assessments will inform next steps in a new program: The Rental Housing Inspection Program, starting in 2021.

Recommendations

This project provided a database of the quantity and location all the multi-family housing within the City of Burien and an external quality assessment of characteristics related to community health. This valuable knowledge of multi-family housing is an important component for their Housing Action Plan and supports decision-makers in their current goals as well as planting seeds for future projects and analysis.

The current data from this project may be further analyzed within ArcGIS to answer more questions and reveal areas and topics for exploration. For example, layers of community assets such as parks or grocers over the multi-family housing data reveal where the community members benefit most and the least. Also, further analysis is recommended to learn as to which property types (e.g. apartments versus duplexes) show differences in outcomes. In particular, the author noted in the field that condominiums were often rated excellent in nearly all categories assessed. Combining this observation with the likelihood that many condominiums are not available to rent, more detail is needed if the City wants to know the true quality of rental housing versus the general descriptor of multi-family housing. It is recommended therefore that further analysis is conducted to report results at the level of property type and will be noted as a limitation until this is resolved. Overall, it is recommended that the City of Burien take full advantage of GIS specialist's skills that may utilize this data visualization tool to answer questions and generate new ones

The original project proposal included a phenomenological approach to investigating the essence of experience for those who are housing cost-burdened in the City of Burien through tenant interviews. Unfortunately, this part of the project was eliminated due to time

and constraints due to the Covid-19 pandemic. To increase understanding of decision-makers of what this condition means, it is recommended that the City pursue a way to resume this qualitative research.

The results of this project should be considered a living document that should be updated, refined, cross-referenced with new data sources, and corrected as additional information, such as new properties, becomes available as the contents may have unexpected uses and usefulness. Before this project was even completed the city had benefited from their efforts in systematically updating contact information on property owners. The verified contacts became useful before the Fourth of July holiday when they were able to reach out to this group of owners to inform them of fireworks laws in the city. The city has also been using this pilot study to work on the task of updating rent ranges for each multi-family housing property which will give a more realistic understanding of how much of the city's multi-family housing is affordable and to whom. This is an important project to complete as rent ranges are difficult to acquire.

Technical recommendations for mobile application building include to standardize the comments field in a survey and reduce the number of applications to 1, not 2. Also, it is recommended to look at the data schema and refine as needed to keep the applications lean. Data design can have a major impact on the efficiency of the front-end users, so it is important to have the foundational data design be vetted and reviewed in order to prevent more work later on. This can be as simple as looking at the number of fields needed for a feature class or table. A final recommendation is to recognize that an important aspect of data collection is deducing what is most important to capture and making that information

the top priority. Essentially, evaluate “needs” vs “wants” in order to come out with a solution that is practical and efficient.

Some project management recommendations are to include in the process clear delineations between testing, piloting, and initiating a project. Timelines should include testing both internally and in the field with a pilot by the GIS team before any use of a data collection tool to begin. These steps will prevent problems that may be difficult to overcome in a more complicated project in the future. With these lessons learned from the successful Housing Assessment Project in mind, the City can easily embark on new surveys to learn more about their housing or other assets they have.

Limitations

As with any project, there were limitations experienced that need telling. This project had limitations such as data discrepancies, restrictions in surveyor access, and caveats as well as major limiting factors like conducting assessments in a pandemic.

First, assessments were conducted during the day and the surveyors only accessed the parts of the property that the surveyor felt safe to do so. In particular, when considering rating the category of lighting, it is important to consider how the results might change if the assessment were done at other times of the day.

Another limitation of the assessments was the short duration and limited access to properties. The assessments were brief (5-10 minutes) and limited to the exterior of the properties. There are important housing factors that contribute to human health that may not be revealed in an exterior assessment such as crowding and affordability.

There is a caveat to the results for total number of units of multi-family housing that were counted as 6,790. Included in this total were the unit counts on 133 condominium properties. When considering the number of multi-family housing units, this count is accurate. However, when the focus is on the *rental* property unit count, it should be noted that many condominiums are owner occupied and associations have limits as to how many units may be rented, sometimes no more than 20%.

The surveys were a snapshot in time and may not reflect the true status of how all of the properties were usually maintained. The field surveys took place during the month of June and July 2020 in King County when the community was experiencing disruptions due to the Covid-19 pandemic. It is likely that regular maintenance and cleaning were not available during that time and improvements might be noted at a later date.

Student Reflection

It has been rewarding to have the opportunity to work with the City of Burien for my Master's in Public Health Capstone project. Not only did I have the chance to offer my expertise to the City in public health knowledge, priorities, and processes but I also was able to learn other skills that are important for a career in public service. Of the many things I learned I am particularly grateful to have had the experience to impart a public health focus to a project that could have prioritized other concerns. It is my belief that being in service to the health of individuals or a whole community is highly important as our people are our greatest asset.

I am also appreciative to those who helped me organize this project in a way that is logical and of a high standard. I hope that this project can serve as an example to other communities of what is possible when asking questions of housing, its quality, and health.

I received an excellent introduction of how to use geospatial Information System (GIS) technology with the GIS team at the City of Burien and I am glad could learn about this vital and growing field of data analysis and visualization. The city has a great asset with this department, and I am excited to see what they do next. Through this project they were able to practice and learn more about conducting field surveys in ArcGIS which will I believe will help in programs they have already underway.

This has been an excellent opportunity to show what I have learned about the important role public health has in all policies and grow in real-world experience. Thank you.

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Appendix A. City of Burien Housing Quality Assessment Tool:

Category Assessed	Poor	Fair	Good	Excellent	Not present
Structural Soundness- relates to health via integrity of the building envelope. Cracks, signs of rot, tarps/makeshift repairs indicate that outside element can affect the inside (pests, water, cold).[a.]	Signs of haphazard fixes to problems of structure. E.g. tarps on roof. Visible: cracks, rotten wood, broken windows	Signs of repair to structure of building	Indication of past repairs of structure. Repairs appear to be adequate and sound.	No signs of decay of structures	
Adequate safe play or exercise area- relates to health & safety of tenants of all ages and abilities.[b.]	Broken play or recreational equipment. Bare soil, trash, presence of injurious or toxic material (broken glass, animal feces)	Play or recreational area may show signs of disuse, misuse, decline. Limited maintenance, no hazards	Play or recreational equipment in fair to good condition. Clean, free from trash or hazardous material	Play or recreational equipment in good /excellent condition. Clean, landscaped, presence people using area for recreation.	
Landscaping an indicator of regular human presence on the grounds surrounding the building. Adds safety to residents and likely to catch/address presence of pests (insects, mice, rats, etc.)[c.]	Vegetation has damaged building. Plants have visibly damaged a component, area, or system of the property or have made them unusable/impassable. Vegetation is extensive and dense; it is difficult to see broken glass, holes, and other hazards. -OR-Vegetation penetrates an unintended surface—buildings; gutters; fences/walls; roofs; heating, ventilation, and air conditioning units (HVAC); etc. -OR-Vegetation is producing excessive moisture that may lead to mold or mildew on nearby exterior building surface -OR-Tree is in danger of falling[c.]	Vegetation is present or contacts building, but no damage: Extensive, dense vegetation obstructs the intended path of walkways or roads, but the path is still passable.[c.]	Vegetation is present or contacts building, but no damage: Vegetation is present but causes no problem.[c.]	Vegetation is present and well maintained. Includes features that enhance property.	
Cleanliness[c.]	Garbage/trash in multiple areas around property. Easily visible from street/near entry. More than 10 trash or litter items.[c]	Garbage/trash in 2-10 areas of building, some visible from street.[c.]	Less than 2 items of garbage or trash on property.[c.]	No Garbage/trash visible from street. Trash receptacle areas free of overflow/tidy.[c.]	

Category Assessed	Poor	Fair	Good	Excellent	Not present
Presence of Graffiti[b,c]	Signs of graffiti in 2-5 locations. No graffiti has been covered/painted over.	Signs of graffiti in 2-5 locations. 50% or more have been covered.	Graffiti in one location	No signs of graffiti	
Balcony Condition[d]	Some Balconies are in need of repair, damaged/broken items present a safety hazard- e.g. broken spindles creating gaps)	Some Balconies in need of repair (not presenting a safety hazard)	Balconies are in good condition. Some excess items stored on balconies (beyond patio furniture)	Balconies are in good shape, of uniform quality and not in need of repair. Residents do not use balcony as storage space.	
Lighting- related to lighting from the Apartment to nearest public transit stop[d]	Lack of lighting or 90% of the existing lighting in disrepair	Majority (50%) or more of paths unlit or needing new lighting maintenance	Adequate lighting along pedestrian paths and travel ways	All adjacent pedestrian paths and travel ways lit	
Pedestrian connections: Presence of pedestrian paths[d]	Disjointed and incomplete sections of sidewalks and/or unimproved sidewalks	Connections to pedestrian paths and sidewalks exist but significant maintenance is needed	Continuous pedestrian and sidewalk connection including bicycle lanes	Well maintained sidewalks and pedestrian connections including bicycle lanes	

a. Bennett, et al., (2016).
b. Kerr et al., (2016).
c. Centers for Disease Control and Prevention and U.S. Department of Housing and Urban Development. Healthy housing inspection manual (2008)
d. City of Burien

Appendix B. Technical Descriptions

Building the Field Survey Tool

One of the most important processes of this workflow was making sure the Collector application could integrate with the Survey 1-2-3 application. Though both applications can be used for field data collection they each have functionality where one excels over the other – Collector is more tailored for users to edit data in real-time when users are in the field while Survey 1-2-3 provides a more intuitive survey form interface for conducting assessments of that data. To get the most out of both applications, Collector was configured and tested to handle data editing of the property layer and Survey 1-2-3 was configured and tested to handle data submission using the assessments table. To configure the integration between the two applications, a relationship class was created between the property layer and the assessments table using a one-to-many relationship type based on the GUID ID fields. A relationship class provided a way to manage associations between features in the properties layer (feature class) and assessments in the assessments table (feature table). GUID is a globally unique identifier which helps identify unique records across tables and datasets. For users to be able to select a property in the Collector application and launch a related assessment in the Survey 1-2-3 application, this relationship class needed to be tested until configured correctly. This allowed for a more streamlined workflow that would automatically pull information, such as property name, address or parcel number, from the properties layer into the related assessment without needing the user to input that information in themselves. For records purposes, data entry and editing tracking was also enabled at the time the relationship class was created.

Prior to publishing the data to ArcGIS Online, the properties feature class and the assessments table were configured to accept attachments. This would enable users to attach photos to their assessments. In order to allow edits to be made to the data, security permissions were configured so that users with access to the layer could read and update data through Collector and Survey 1-2-3. Security also had to be configured at the application level to ensure the survey forms and data were not accidently deleted. A group within ArcGIS Online was created to ensure only members involved in the project had access to the project's data and content including a web map that hosted the feature class for the properties and assessments table, the survey form that hosted the assessment form user's would be viewing out in the field, as well as a dashboard that displayed real-time data of the assessments that were being submitted.

More on Building the Burien Housing Assessment Dashboard

This dashboard was made using ArcGIS Dashboards which works well with the existing ArcGIS content in the Housing Assessment Group. Due to a pair of bugs regarding the Survey 1-2-3 application (#BUG-000126793 and #BUG-000130147 for ArcGIS Survey 1-2-3 version 3.6) assessment results were not able to be shared amongst users and only the survey form owner was able to view the results. Even then, the assessments results displayed had a related bug based on question types which would not display the important data users wanted to visualize. The dashboard was created separately but integrated with the assessments table in order to show data from the assessment categories as users submitted data.

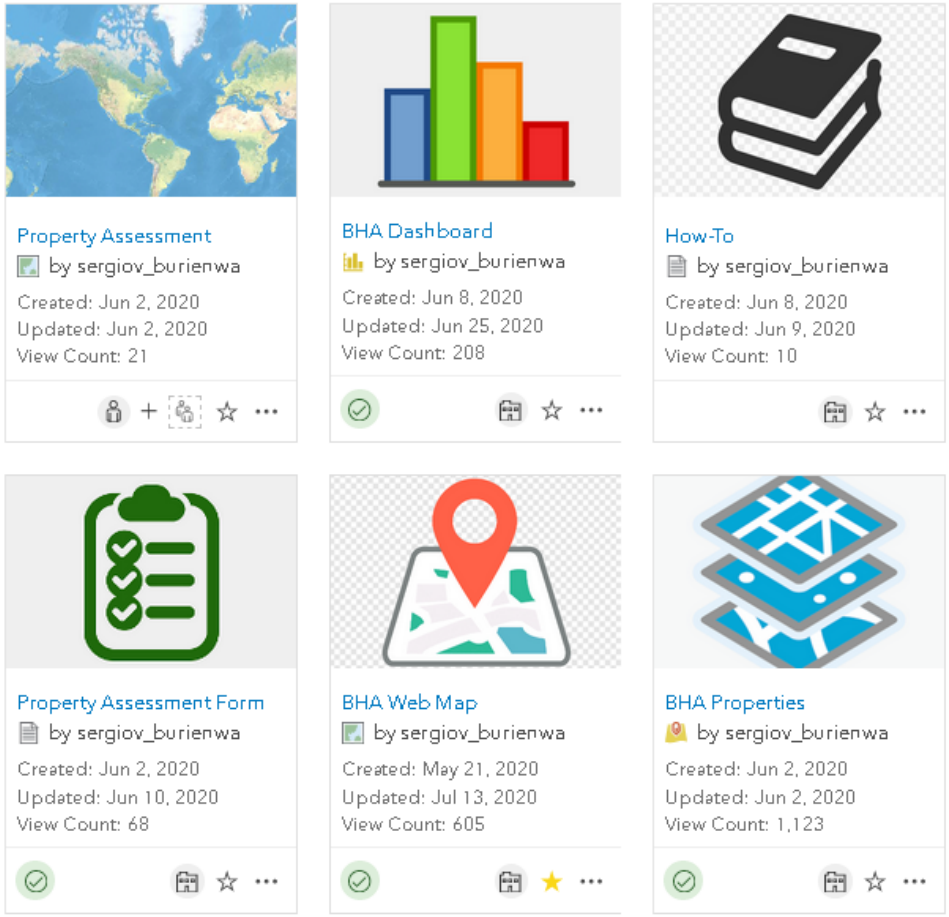


Figure 8: Burien Housing Assessment Group Content
(From left to right: Survey form, Web Map, Completed Survey Inbox)

Multiple rounds of testing of the assessment tool was conducted with a team that consisted of the student/author and Burien's Capital Projects Manager who was an experienced field surveyor. The GIS specialist tested the tool using input given from the student on how they expect the assessment form to work based on the type of questions answered on the assessment itself.

The assessment form was built using Survey 1-2-3 Connect, an XLSForm centric editor that allows for publishing to an ArcGIS Online account. Survey 1-2-3 Connect can take a

published feature service (property feature class) which would then need testing. Testing involved configuring the question types to ensure they flow well out in the field, creating relevant question types to house multiple photo submissions without cluttering the assessment form, ensuring information from the property layer being written to a form on launch, testing the ability to access submitted surveys and managing data quality and assurance once surveys were submitted. The content was sent to a prototyping group and shared to three users outside of the group to test and break. User experience feedback was taken into account which led to changes in functionality as well as security. The editing at the data level was set to a proxy account which serves as a middleman for other users to access the data. The search functionality was added to enable searches on property names or addresses. Geometry edits were disabled to prevent property boundaries from being changed and the ability to delete a property was removed all together. These changes were made, and the content was moved to a staging phase where the student could interact with the applications. The student tested the tool content by walking part of the densely populated Downtown Focus Area with a written copy of assessment categories, taking pictures of various scenarios and conditions observed in multi-family housing properties, and presented to the city with questions and clarifications. Edits of tool content were made and passed on to the GIS specialist who worked on testing the survey applications first with his team and then in the field with the first 20 assessments.