Identification of Opportunity Neighborhoods for the Implementation of the Covenant Homeownership Program in King County, Washington

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Abstract

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This thesis investigates the spatial relationship between neighborhood opportunity and affordability in King County, Washington. The goal is to identify areas that are most suitable for the implementation of the Covenant Homeownership Program - a new, race-conscious down payment assistance program enacted statewide in 2024. The program specifically aims to redress historical discrimination in access to homeownership by supporting first-time homebuyers whose families were impacted by redlining and other exclusionary policies prior to the Fair Housing Act of 1968.

The thesis will employ GIS-based suitability analysis tools to combine variables across five key categories - education, economics and mobility, neighborhood quality, health and environment, and affordability. The process will create a composite index of "opportunity." Separate life-cycle models will aim to reflect the needs of differently structured households.

The findings reveal a substantial spatial mismatch between high-opportunity and affordability, with few areas offering both above-median opportunity and affordability. The life-cycle models indicate that neighborhood suitability does vary significantly depending on

household needs and priorities. These results suggest that while the Covenant Homeownership Program offers a promising framework for equitable homeownership, additional policies or investments may be needed to truly enable access to high-opportunity areas. This research highlights the importance of neighborhood characteristics in determining the efficacy of down payment assistance programs and provides a replicable methodology for local and state governments seeking to promote spatial equity in homeownership.

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Chapter 1: Introduction

Communities across the country are facing affordable housing crises along with the long-lasting impacts of historic discriminatory housing policies. King County, Washington is certainly not immune to these issues and is characterized by the high housing costs of many urban centers and coastal communities. As communities such as King County seek to address both the overall challenges of affordable housing and the specific issues surrounding racial disparities in housing outcomes, various policy initiatives are on the table. Washington state has recently passed the Covenant Homeownership Act which specifically recognizes the state's role in past discriminatory housing policy. The program seeks to offer one pathway to repairing some of the harms perpetuated during the era of redlining - harm that continues to impact our communities today.

The term 'redlining' has been adopted to describe a series of government policies from the 1930s to 1960s that restricted access to mortgage financing for residents of specific neighborhoods. Government agencies created and published color-coded maps using a ranking system, with the lowest-ranked areas colored in red. Neighborhoods were 'redlined' due to the supposed risk of lending money in that area and were identified due to the presence of various physical characteristics of the neighborhood as well as the demographics of the residents. The racial and ethnic makeup of the residents was an explicit factor in determining neighborhood rankings - neighborhoods where people of color resided were ranked lower and therefore not given access to federally-insured mortgages. During a time period when white families were increasingly purchasing single-family homes, residents of color were unable to secure financing to purchase homes in their neighborhoods. Additional policies and practices, such as racially restrictive

covenants, also prohibited non-white households from purchasing homes in the neighborhoods given desirable rankings.

Despite federal and state legislation beginning in the mid-1960s seeking to outlaw redlining and ensure fair consideration for all people in the lending process, cities across the country are left facing the legacy of redlining. The lasting impacts of redlining include inequitable public health outcomes (Ryan et al., 2024; Gao et al., 2022; Egede et al., 2024), disparate access to public services and amenities (Locke et al., 2021; Shaker et al., 2023) and a continued racial gap in homeownership (Reid et al., 2020; Charles and Hurst, 2001; Haurin et al., 2007; The Urban Institute, 2019). The racial gap in homeownership contributes to the broader racial wealth gap as residential property is many families' largest investment and source of wealth. The variety of efforts to ensure fair treatment in the homeownership process have not done enough to reverse the impacts of redlining. Therefore, more targeted and reparative approaches are being considered in some places.

The history of redlining is relevant to this project as it serves as an important backdrop to the Covenant Homeownership program and to broader conversations about housing policy. In current policy and programming, it is vital that we consider who does and does not have access to specific neighborhoods and housing options. Without this thoughtful consideration, we are likely to replicate and/or reinforce the racial segregation and disparate outcomes that we see as a result of past redlining. Policy makers, planners, and elected officials need to work actively to reverse these impacts. The Covenant Homeownership program is one method of addressing past harm and seeking to offer some repair. In order to accomplish its goals, we need to better understand how the program might play out in the local context.

In 2024, Washington state passed the Covenant Homeownership Act creating a race-conscious program to provide qualified residents with down payment assistance. The program aims to address the discriminatory history of access to homeownership that was driven by state action (Washington State Housing Finance Commission, 2024). Through providing down payment and closing cost assistance to eligible first-time homebuyers, the program strives to provide increased access to homeownership for these households and shrink the racial homeownership gap in the state. To qualify, Washington residents must make below the area median income (AMI) and be a first-time home buyer. They must also provide proof that their recent ancestors lived in Washington prior to the passing of the 1968 Fair Housing Act and that this person identified as one of many racial identities that were known to be treated unfairly prior to the 1968 law. While there have been small-scale race-conscious programs in cities, the Covenant Homeownership Program is the first state-wide program of its kind.

The purpose of this research is to begin to understand how the Covenant Homeownership Program might work in practice. The analysis aims to identify neighborhoods that would be optimal for the purchase of a home by program participants. To accomplish this, this paper will identify locations where desirable neighborhood characteristics and supply of affordable housing overlap. The neighborhood characteristics to be included are related to education, economics and mobility, neighborhood quality, health, and affordability. Affordable homes will be defined as homes that could be purchased by participants in the Homeownership Covenant program (households making under 100% AMI) without requiring that more than 30% of that household's annual income go towards housing costs. Throughout this research project, these identified neighborhoods will be referred to as "opportunity neighborhoods."

In order for the Covenant Homeownership program to be successful, it is my belief that participants need to be able to buy homes in neighborhoods that ensure access to public services, healthy lifestyles, employment opportunities, and other amenities. Additionally, in order to successfully utilize the down payment assistance loan, participants need to be able to locate a home that is affordable for a household making at or below 100% of the AMI. If the current housing market in King County does not allow participants to locate affordable homes in high-opportunity neighborhoods, it may work to only reinforce issues of racial segregation and lack of resources in lower-income neighborhoods.

I recognize that this analysis is one small piece in a larger body of research needed to determine the efficacy of a policy such as the Covenant Homeownership program. This analysis is not an attempt to identify specific parcels or homes that are available to program participants, nor is it an attempt to model how the specific structure of the down payment assistance will change individual households' ability to access a mortgage and purchase a home in King County. Both of these projects would be worthwhile research endeavors. This analysis will aim to identify opportunity neighborhoods, at the census tract level, that may be optimal for participants of the Covenant Homeownership Program.

Based on this analysis, it is the goal of this research to map and identify neighborhoods within King County where eligible program participants might begin their housing search. Specifically, the analysis will use differently weighted suitability models to determine opportunity neighborhoods for different households - based on household composition. These neighborhoods will be characterized by the presence of affordable housing stock as well as other desirable neighborhood attributes.

It is my hope that this analysis might reveal strengths or weaknesses in the Covenant Homeownership program and how participants might engage with the program in King County, Washington. The findings could be of interest to individual participants, real estate professionals involved in the program, and policy officials. Additionally, as some research recommends investment strategies tailored to different neighborhood types, the spatial identification of different neighborhood characteristics and types could be of interest to county or state officials. My main hope is that this analysis will shed light on how the new downpayment assistance program might work to increase impacted residents' access to neighborhoods of their choosing.

This research is guided by the following research questions:

- Where are the 'opportunity neighborhoods' in King County, Washington where Covenant Homeownership Program participants might begin their housing searches?
    - What is the current spatial relationship between affordable housing stock and desirable neighborhood characteristics?
- Where are opportunity neighborhoods located that might meet the needs of differently structured households?

In Chapter 2, I will review current literature on the legacy of redlining policies and the role that down payment assistance programs (particularly those that are race-conscious in nature) can play in improving access to homeownership for families historically barred from this form of wealth generation. Chapter 2 will also aim to summarize relevant literature related to suitability modeling methods and the process of creating 'opportunity maps.' Chapter 3 will outline the methods followed for this analysis - including the data sources, data editing, suitability modeling,

and identification of opportunity neighborhoods. Chapter 4 will summarize the findings of the analysis. This chapter will include several key visualizations of the primary suitability model as well as suitability models created for different household compositions. Chapter 5 will be a discussion of the findings, including the implications of these findings for the Covenant Homeownership Program and for future research related to this program and other similar down payment assistance programs. Finally, Chapter 6 will serve as the conclusion, reviewing the high-level lessons learned through this analysis.

Chapter 2: Literature Review

2.1 Legacy of Redlining

Following the Great Depression, the federal government entered into a stage of encouraging homeownership as a method to stimulate the economy and provide stability to families. Several phases of legislation were passed to both standardize long-term mortgages and to insure these mortgages (Rothstein, 2017). As part of this movement, the Federal Housing Administration (FHA) was created in the 1930's to insure residential mortgages. The FHA needed a method to determine the "risk" of potential mortgages, which became the role of the Home Owners Loan Corporation (HOLC).

The HOLC was created in the same time period and created and published city-scale maps used to categorize neighborhoods based on the supposed risk of lending in that area. Neighborhoods that were deemed secure and stable for the purposes of mortgage lending were given either an 'A' or 'B' rating. Neighborhoods viewed as more risky were assigned 'C' and neighborhoods deemed undesirable for mortgage lending were rated 'D.' Within this process of rating neighborhoods, several factors were included - such as age and quality of the housing and

the local demographics. Explicit in many of these ratings were the race of the local residents. Areas with even small numbers of Black, Hispanic, or otherwise non-white residents were quickly downgraded into a ‘C’ or ‘D’ category. The FHA set clear and intentional policies to not insure mortgages in these C and D-rated areas, resulting in little to no access to mortgage financing for the residents living there.

The era of redlining has contributed to a variety of disparities in present-day cities. Areas that were previously redlined are shown to have lower health outcomes, including higher levels of childhood asthma (Ryan et al, 2024), higher rates of severe maternal morbidity (Gao et al, 2022), and higher rates of diabetes (Egede et al, 2024). Formerly redlined areas also face higher environmental risks in the form of less tree canopy (Locke et al, 2021), higher ground temperatures (Wilson, 2020) and increased levels of air pollution (Lane et al, 2022). Crime metrics are often worse in areas previously redlined, shown by higher numbers of firearm incidents (Spitzer et al, 2023) and higher rates of traumatic injuries (Bradford et al, 2024). In addition to these listed effects of redlining, most relevant to this analysis is the racial disparities in homeownership that continue to this day.

2.2 The Racial Homeownership Gap

During the time period discussed above, white households were applying for mortgages and purchasing homes at an increasing rate. However, Black residents, and other residents of color, were barred from the same opportunity to borrow money and purchase a home. Not only were Black residents prohibited from purchasing homes in their current neighborhoods - the neighborhoods that were officially redlined by the HOLC - but they were often barred from purchasing homes in neighborhoods where lending institutions would loan money. Even for Black

households who accumulated enough wealth to purchase a home in an area where banks would loan, practices such as racial zoning (legal until 1917) and racially restrictive covenants (legal until 1948) would prohibit this.

To this day, there is a sizable racial gap in homeownership rates. Almost all minority populations, and particularly Black and Hispanic households, have significantly lower rates of homeownership and significantly lower levels of household/family wealth. The homeownership gap worsened following the 2008 housing crash due to the high rate of predatory mortgages issued to minority homebuyers. The gap between Black and white homeownership peaked around 2014, following the 2008 recession, with a gap of around 29 percentage points (Joint Center for Housing Studies, 2024). The most recent data reported in 2024 shows a 27.4 percentage point gap in Black and white homeownership in the United States. This 2024 data shows that 74.0% of white households own their homes while only 46.6% of Black households do (Joint Center for Housing Studies, 2024). 49.9% of Hispanic households are homeowners, and 59.6% of Asian households own their homes.

The pervasive gap in homeownership rates is also a sign of the broader racial wealth gap. For most households, their home equity is their largest source of wealth. This is even more true for Black households, who are less likely than white households to hold wealth in other forms such as stocks (Kuebler, 2013). However, there is some disagreement about the degree to which equitable homeownership can reduce the racial wealth gap. Markely et al. argue that due to disparities in home value appreciation, even the ability to completely erase the racial homeownership gap would not completely bridge the gap in household wealth (2020). This is largely due to the fact that Black households typically do not see the same level of appreciation in their homes' values as white

households. Therefore, the authors argue that homeownership alone cannot address the racial wealth gap.

Other research shows that reducing the racial gap in homeownership is unlikely to completely erase the racial disparities in factors such as housing quality and neighborhood conditions. In a 2007 study, Van Zandt found that while transitioning to homeownership generally increases measures of housing quality and neighborhood condition, these positive changes were not experienced in equal measure by homebuyers of different races. Increasing homeownership alone cannot solve all of our society's disparities in neighborhood and housing quality or residential segregation. However, if we plan to continue to promote homeownership, it is essential that minority homebuyers have equitable access to high-opportunity neighborhoods and high quality housing options.

The racial gap in homeownership that is seen nationwide is also mirrored in the rates of homeownership in Washington state. Data reported in 2021 shows a 31.1 percentage point gap between Black and white homeownership (Washington State Housing Finance Commission, 2024). Statewide, 68.5% of white households were homeowners while only 37.4% of Black households were. This data follows the national rates fairly closely, although Washington does exhibit slightly lower homeownership rates compared to national averages. The persistence of racial disparities in homeownership lead to the passing of House Bill 1474 in 2023, creating the Covenant Homeownership Program in Washington State (Washington State Housing Finance Commission, 2024). The program seeks to utilize a new source of funding to provide down payment assistance to eligible individuals and households - those whose families were impacted by past discriminatory action and redlining. It is the goal of this analysis to begin to understand how the program will work in allowing eligible households to purchase homes in high-opportunity neighborhoods. The

hope is that increasing access to homeownership in tandem with increasing access to high-opportunity neighborhoods will not only decrease the racial homeownership gap but also make meaningful strides at reducing the broader wealth gap.

2.3 Down Payment Assistance

After analyzing the barriers that renting households face when trying to buy a home, it is easy to see how down payment assistance could be highly effective at increasing homeownership rates. Survey data reported by The Urban Institute, indicates that 53% of renting households cited down payment requirements as a key barrier to homeownership (The Urban Institute, 2017). Down payments require liquid assets, such as a savings account, which many renter households, and particularly those that are low or moderate-income, often lack. Even if a household can manage the monthly mortgage payments, coming up with down payment (and closing cost fees) is often a financial barrier that is difficult to overcome. Traditionally, down payments have been seen as a method to ensure that a homeowner is invested (financially and mentally) in their purchase (Freeman and Harden, 2015). Therefore, theory would hold that households using down payment assistance might be more likely to default on their loans. However, a 2015 study found no difference in the 'mortgage performance' when comparing borrowers using down payment assistance with those who did not (Freeman and Harden, 2015).

There is little research on the overall efficacy of down payment assistance programs and their abilities to increase homeownership among certain populations. However, a 2007 study reported that even low levels of down payment assistance can make big differences in households accessing homeownership (Herbert and Tsen, 2007). The longitudinal study found that the presence of savings between $0 and $1,000 was statistically significant in predicting whether a

renting household transitioned to homeownership (Herbert and Tsen, 2007). This finding appears to suggest that the actual barrier that down payments pose may be relatively small, in terms of dollars needed. Lang and Hurst studied the impact of utilizing down payment assistance on the size and type of mortgage for households in Ohio, Kentucky, and Tennessee (2014). Borrowers who utilized down payment assistance were granted up to $5,000 - still a relatively small amount when discussing home purchases. The study found that using down payment assistance was associated with a higher chance of using conventional loans and was associated with an overall reduction in the mortgage size for borrowers (Lang and Hurst, 2014). These findings, specifically related to conventional mortgage use, are meaningful as they indicate that down payment assistance can be effective at opening up more desirable borrowing opportunities. Conventional mortgages are slightly less expensive for borrowers as they do not require mortgage insurance - an added monthly cost for the homeowner. The ability to qualify for a conventional mortgage is a positive indication for down payment assistance programs.

Just as homeownership alone cannot solve the racial wealth gap, down payment assistance alone cannot make homeownership ubiquitously accessible. Other commonly cited barriers to homeownership include general qualification for a mortgage (33% of survey respondents said they wouldn't be able to qualify) - which could include insufficient monthly income, high levels of non-housing debt, and/or low credit scores (The Urban Institute, 2017). Concerns such as credit score can also disproportionately disadvantage minority households (Reid et al., 2020). Additionally, not all households are interested in buying. In a recent Survey of Household Economics and Decisionmaking, 28% of renting households found that renting was more convenient, 26% said it was cheaper for them to rent, and 21% said they simply preferred to rent

(The Urban Institute, 2017). However, for the many renting households that are interested in homeownership, down payments continue to represent a major barrier.

There are a variety of down payment assistance programs across the United States, and the number of these programs continues to increase. Down payment assistance programs can vary based on the eligibility requirements, funding mechanisms, structure of the monetary assistance provided, and geographic area where the assistance can be utilized. In terms of eligibility, some of the most common requirements are based on household income and first-time homebuyer status. However, it is worth noting that even a program's definition of "first-time homebuyer" can vary. Many programs will stipulate that a household cannot have owned a home in a certain number of years in order to be eligible. Depending on the geographic coverage of the program, the income threshold may be set or can be variable, as it is for the Covenant Homeownership Program where it is based on county. Another key element for down payment assistance programs is the structure of the assistance. Down payment assistance programs can be offered as grants, which do not require repayment; zero-interest loans, which only require repayment when the home is refinanced or sold; or low-interest loans, which operate as a second mortgage but at below market-rate interest rates (Washington State Housing Finance Commission, 2024).

The Washington Covenant Homeownership Program is unique in its eligibility structure, geographic scope, as well as the magnitude of down payment assistance that is available. In reviewing literature on down payment assistance, it is worthwhile to note some of the key features of the Covenant Homeownership Program. To be eligible to participate in the Covenant Homeownership Program, households must be making 100% of the Area Median Income (AMI) or below. (In July of 2025, this threshold will be increased to 120% of the AMI.) AMI is determined at the county level. Participating households must be first-time homebuyers, have a

parent/grandparent/great-grandparent who lived in Washington prior to the enactment of the Fair Housing Act in April 1968, and this individual (the ancestor) must identify/have identified as one of several minority racial identities. The program provides up to 20% of the home's value in downpayment assistance, with a maximum level of assistance of $150,000. The down payment loan is provided as a zero interest loan. For many participants, the loan will need to be repaid when the home is sold or refinanced. Amendments passed in April 2025 will allow all participants making under 80% AMI to qualify for full loan forgiveness if they live in their home for a minimum of five years (Whitaker, 2025). The characteristics of the Covenant Homeownership program make it relatively unique and rather generous in scope. Within the context of the program, questions remain about how participants will go about utilizing the assistance and what outcomes will arise from their housing decisions.

2.4 Neighborhood Choice

A key question in relation to down payment assistance programs is not only does the program allow an increasing number of lower-income and/or minority households to access homeownership, but also does the program improve access to high-opportunity neighborhoods. "Opportunity" neighborhoods can be defined in many different ways. The idea of opportunity neighborhoods is based on research that supports the idea that neighborhoods with higher opportunity produce better life outcomes for residents - specifically for children growing up there. In order for down payment assistance programs to be truly successful, it is our belief that they must both increase the purchasing power of the household and increase the agency that the household has in choosing where to live. Having agency to choose one's neighborhood is vital for achieving truly equitable housing outcomes.

There has been significant attention given to researching the impact of different neighborhood conditions on the educational outcomes of children growing up there. Research in Sweden revealed that both access to socioeconomic resources and demographic stability were predictors of increased educational outcomes (Andersson and Subramanian, 2006). These findings might connect to variables such as unemployment rate, vacancy rate, and change in jobs - included in this analysis. Other research into educational attainment shows that neighborhood characteristics can have similar levels of impact on education as family and school-related factors (Ainsworth, 2002). This evidence also supports the inclusion of many of the economic, mobility, and education variables in this analysis.

Not only can high opportunity neighborhoods support strong educational and economic outcomes for the children and young adults living there, but high opportunity neighborhoods also allow homeowners to reap the full benefits of homeownership. From past research we know that minority homeowners often see lower levels of home value appreciation, compared to similar white homeowners (Markley et al, 2020). If we want to promote equitable housing, it is important to ensure access to high opportunity neighborhoods so that new homeowners can experience the benefits of rising home values and home equity. In 2008, researchers looked at variables related to housing characteristics, neighborhood characteristics, housing costs, and mortgage finance characteristics to determine where racial disparities existed. Findings that stick out include the fact that low-income first time homebuyers were more likely to live in moderately or severely inadequate units, Black and Hispanic households had significantly less square footage per resident, and that low income homebuyers reported lower levels of housing satisfaction (Herbert and Belsky, 2008). These findings support the inclusion of variables such as housing quality as well as other neighborhood quality and health and environment variables - all of which support overall

satisfaction and provide access to various amenities.

There is another body of research that seeks to understand households' housing choices, specifically related to households receiving some form of subsidy or housing assistance. A 2024 study evaluates the housing outcomes for households participating in the Forsyth County Homeownership Program in North Carolina. The study found that participants were consistently moving to neighborhoods with "higher quality neighborhoods more conducive of improved socioeconomic outcomes" compared to the neighborhoods where they had previously been renters (Blizard et al, 2024, 91). To define higher neighborhood quality, the study included variables related to crime, housing tenure, employment, income, education, family stability, and housing vacancy. While the new neighborhoods were still likely to fall below county averages for various socioeconomic factors, the finding that participants were able to improve their living conditions is significant. Another relevant study is out of Seattle, and is still ongoing. The study finds that housing choice voucher recipients provided with additional resources to facilitate their moving to higher opportunity areas are much more likely to do so (Bergman et al, 2024). The resources provided included information about the identified neighborhoods, short-term financial assistance, housing search support, and referrals to landlords. This series of interventions led to 53% of the treatment group relocating to high opportunity neighborhoods, compared to just 15% of the control group (Bergman et al, 2024). While this study is focused on rental assistance, we would expect similar trends to apply in the homeownership market - if comprehensive support, including down payment assistance, could be applied.

The body of research related to 'high opportunity' areas allows us to start building a definition for what high opportunity neighborhoods look like - what characteristics they have, what resources they have access to, and more. In order for a down payment assistance program to

promote more equitable housing outcomes, it is important that it provides support that is sufficient to advance households' ability to choose their neighborhood, and specifically to increase their access to high opportunity areas. This ability to choose high opportunity areas in which to buy a home allow for the household to fully realize the financial benefits of homeownership and other benefits in the form of improved life outcomes.

2.5 Suitability Analysis

In analyzing neighborhoods' levels of 'opportunity,' it is essential to develop a methodology to combine scores from the different included variables in order to compare one area to another. One way to accomplish this is a method known as suitability analysis (also referred to as 'suitability modeling'). Suitability analysis is a process of applying multi-criteria analysis in a spatial manner. The analysis takes into account a number of factors/variables and assigns different weights to different variables, depending on the importance of that variable. The importance and weighting of variables can be determined in a number of ways.

Suitability analysis methods were initially developed for implementation in landscape architecture and planning - to assist in developing resilient landscapes mindful of the current conditions (Yang and Li, 2016). The development of this methodology is credited to landscape architect Ian McHarg and first appeared in his 1969 book *Design with Nature* (Yang and Li, 2016). The applications of suitability analysis have since grown to include topics of agriculture, land use, real estate and more. By layering multiple variables together, suitability analysis has the capacity to account for a variety of factors and their impacts on the suitability of different sites. The method can be applied at most any scale - from evaluating individual parcels to comparing census tracts or larger units of analysis.

The application of suitability analysis to real estate feasibility and projects such as affordable housing development has continued to grow in recent years. There is a contemporary body of research that seeks to map and identify suitable areas for affordable housing development/investment and the use of housing assistance such as Housing Choice Vouchers. These projects typically begin with an attempt to quantify and map “opportunity” in a given geographic area. Opportunity can be defined in a variety of ways, but often includes variables related to education, economic mobility, and safety (Kelly and Ellen, 2023; Wang et al, 2015). A 2023 study sought to identify neighborhoods referred to as “high-opportunity bargain areas” (Kelly and Ellen, 2023). This study recognized that high opportunity areas have the ability to produce improved life outcomes, but they are also more expensive. The study used variables such as school quality, crime rates, and poverty rates to identify high opportunity areas and combined these findings with rental prices. The goal was to identify areas where the rental prices were lower than expected based on the level of opportunity. This project was not applied to any specific housing assistance program, but sought to generally identify these bargain areas that have the capacity to produce strong outcomes at a relatively affordable cost.

In 2015, researchers applied suitability analysis in Duval County, Florida to determine highly suitable locations for the use of Housing Choice Vouchers (HCV) (Wang et al, 2015). The methodology utilized in this project involved a group of "opportunity metrics” related to housing quality, crime, poverty, racial segregation, and school quality. The second group of variables was related to accessibility/transportation - as measured by access to jobs, retail, schools, services, and recreation. Evaluating each category, researchers were able to confirm hypotheses that opportunity and accessibility often oppose each other (Wang et al, 2015). They were also able to combine the two categories and then group neighborhoods into four bands (highly suitable, high

opportunity-low accessibility, low opportunity-high accessibility, and less suitable). The identification of these four bands - specifically the highly suitable areas - provides insight into neighborhoods that both local officials and individual households might target for the use of HCV.

A local application of suitability analysis can be found in the 2012 and 2018 iterations of the Puget Sound Regional Council's (PSRC) Opportunity Mapping project. The project applied a method of suitability analysis to the four-county Puget Sound region with the goal of understanding how access to opportunity is distributed across the space (Puget Sound Regional Council, 2019). The process included variables in five categories - education, economic health, housing and neighborhood quality, mobility and transportation, and health and environment. The five categories were combined in order to create a general "opportunity index." My analysis will closely follow the PSRC's methodology and set of variables. The Opportunity Mapping project has been utilized by a variety of public and private entities to aid in decision making related to infrastructure investments, development projects, and more. Following the 2018 update, the Washington State Housing Trust Fund began including the Opportunity Mapping index in its evaluation of potential Low Income Housing Tax Credit (LIHTC) projects (Puget Sound Regional Council, 2019).

From the existing research utilizing suitability analysis methods, it is clear that the methodology has the capacity to help us understand the distribution of a variety of variables and create a composite index and visualization to identify highly suitable neighborhoods. The method also allows for researchers to manipulate the weighting of different variables to gain insight into the sensitivity of the model to specific variables. This allows researchers to better understand which variables are most impactful on the overall model and final assigned 'scores.' The manipulation of the weights of different variables can also help to model different scenarios and/or

preferences, as I intend to do in modeling different 'life cycles.'

2.6 Life Cycle Housing Needs

While there are many neighborhood characteristics that generally produce improved life outcomes, there are also certain characteristics that individual households may prioritize over others. Many of these decisions can be based on the household's composition and/or stage in life. For example, it is easy to understand how a family with children might have different needs and/or priorities than a single retiree. As part of this project's analysis, separate models will be run for different life stages.

Research investigating the impacts of life cycle stages on housing consumption tends to look at life cycles in a successive manner. This means that a given family is likely to move through the life cycles one after the other. The life cycles that are studied often begin with marriage, as this is seen as the creation of a new household. Successive life cycle stages that are included vary depending on the study, but often include stages such as child-bearing, child-rearing, child-launching, and post-child (Bullard, 1984). Depending on the study, the number of distinct life cycle stages could be anywhere from four to seven. For the purposes of this analysis, the life cycles investigated are rather broad. For example, I do not differentiate between child-rearing and child-bearing, but instead look at one group of 'families with children.' Additionally, some studies might include unique family compositions such as single-parent households. In this analysis, I will include a life cycle stage representing low-income households. I recognize that this stage is more related to household needs than true household composition. Based on the structure of the Covenant Homeownership Program, I think it is worthwhile to consider households on an even more limited income to determine the feasibility of the program providing these households with

equitable access to homeownership in opportunity areas.

Early literature on the impact of life cycle stages on housing consumption and housing demand tends to focus on characteristics of the housing itself - such as square footage and number of bedrooms (Herbert and Belsky, 2008; Doling, 1976). There is also research into the location of housing, often measured as the distance to the central city. As one might expect, as families move through the initial life cycle stages and their household grows in size, they demand larger housing - both in the form of increased square footage and in the number of bedrooms (Doling, 1976). These early life cycles are also associated with an increase in distance from the city center - young, growing families tending to move further away from the city (Doling, 1976). We might assume that these patterns work in tandem, as larger housing is more easily available in less dense neighborhoods further from downtown. Later life stages, as children move away and there is the potential for widowing, are associated with decreases in home size (Doling, 1976; McLeod and Ellis, 1982). Some research points to an association between these later life stages and less distance from the city center (Doling, 1976), while other studies are less conclusive regarding the relationship with location (McLeod and Ellis, 1982). This study will not directly address variables such as home size. This variable may be important to include in future research related to down payment assistance and its ability to give access to equitable homeownership opportunities. While distance to the city center is not directly included in this analysis, other variables have the ability to capture some of the potential influence of location. Additionally, given that this analysis will investigate the spatial patterns of the included variables, there is the chance to evaluate the results spatially and consider location and distance from the city centers.

There is another body of research that seeks to investigate the relationship between life cycle stages and neighborhood/housing satisfaction. Differences in satisfaction from households in

different life stages are often due to differences in the household's expectations. As life cycles change, the household's expectations can evolve, which impacts how the household measures their current living conditions against their expectations (St. John and Crosby, 1995). Particularly, as households age, their expectations for future housing conditions decrease. This serves to lower the bar against which they compare their current housing conditions. Given that satisfaction is highest when current and future housing conditions are close together, this has the potential of increasing current levels of satisfaction for households in later life cycle stages (St. John and Crosby, 1995). I believe that incorporating measures of satisfaction will be increasingly important in future studies that investigate the efficacy of the Covenant Homeownership Program - looking at the satisfaction of program participants in their new chosen neighborhoods.

There is little literature related to the specific neighborhood characteristics that households at different life cycle stages might demand or prefer. In this analysis' look at life cycle stages, many of the decisions regarding changes to variable weighting will be based on theory. For example, we can assume that families with children will prioritize school quality, retirees will prioritize health and recreation, and low-income families will prioritize the affordability metric. While this study will not include an attempt to quantify the preferences of differently structured households, it is our hope that this study can contribute to literature related to household composition and housing demand/preferences.

Chapter 3: Methods

3.1 Data Collection

To begin the data collection process, the data sources utilized in the Puget Sound Regional Council's (PSRC) Opportunity Mapping project were first reviewed. PSRC originally undertook

this Opportunity Mapping project in 2012, and completed an update in 2018. Given the comprehensive nature of their project development and analysis, it is believed that following a similar workflow and utilizing similar data sources will produce results that are accurate and meaningful. Table 1 shows the data sources used in this analysis. For a comparison between data sources used in the PSRC project and this analysis, see Appendix A. Several variables did require alternative data sources due to the fact that I could not access the original data sources, or that the variable was no longer relevant.

Variables that were included in the PSRC's 2012 analysis but not included in the 2018 update were not included in this analysis. Additionally, there were two variables that I opted to not include in this analysis. These variables were the average commute cost and the average commute fare. Given that average commute time is already included, it is believed that average commute cost (at a specific cost per mile) would be highly correlated. It was decided that both variables did not need to be included, and commute time (in minutes) was selected to be included. Average commute fare was eliminated due to the smaller spatial extent of this analysis, as compared to the PSRC's Opportunity Mapping project. Whereas the PSRC includes the four counties that make up the Puget Sound region, this analysis focuses on King County. Given this smaller geographic area, commute fares would be highly consistent across the area and would provide little to no differentiation.

At this point in data collection, the decision was made to combine the 'Economics' and 'Mobility and Transportation' sections, due to the related nature of these variables and the total number of variables in these categories. In addition to the variables from the PSRC project, I also included data from HUD's Comprehensive Housing Affordability Strategy (CHAS) data to represent affordability. This dataset provides data on the number and percent of housing units that

are affordable to different AMI levels. The finalized data dictionary for this analysis can be found in the Appendix.

As data sources and specific datasets were located, the data was downloaded to a project folder. Many datasets were in .csv format while others were in shapefiles. Others needed to be pulled directly from the source websites (for example, Teacher Qualification) and unique .csv files were created with the needed data. Once all variables were identified and downloaded, the data could be uploaded to a project in ArcGIS Pro, where data preparation began.

Table 1: Data Sources by Variable

Category	Variable of Interest	Data Used in this Analysis
Education	Reading Test Scores	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of 4th grade students scoring "on track" or above for ELA *Note: Missing values assigned state average from 2023-2024 school year*
	Math Test Scores	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of 4th grade students scoring "on track" or above for math *Note: Missing values assigned state average from 2023-2024 school year*
	Student Poverty	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of students on free or reduced lunch
	Teacher Qualification	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of teachers who hold a master's degree
	Graduation Rates	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of high school students who graduate within 5 years
Economics and Mobility	Commute Time	2023 American Community Survey 5-year estimates: Table S0801 Average commute time, in minutes
	Percent Change in Jobs	PSRC Covered Employment Estimates Percent change in jobs between 2010-2019 *Note: Missing values were assigned zero change*

	Unemployment Rate	2023 American Community Survey 5-year estimates: Table S2301 Percent of unemployment for population over 16 years of age
	Access to Transit	King County GIS Open Data Transit Stops for King County Metro - 2025 Distance from nearest King County Metro bus stop
	Percent of Walking Commuters	2023 American Community Survey 5-year estimates: Table S0801 Percent of all workers who commute by walking
Neighborhood Quality	Percent of housing units that are vacant	2023 American Community Survey 5-year estimates: Table B52001 Percent of all housing units that are vacant
	Percent of all households in poor condition (lacking complete plumbing)	2023 American Community Survey 5-year estimates: Table S2504 Percent of all housing units lacking complete plumbing facilities
	Crime Index	2024 Crime Index, ESRI Community Analyst
Health and Environment	Distance to nearest park or open space	King County GIS Open Data Parks in King County - 2018 Distance from nearest park location
	Pounds/square foot of toxic release from toxic waste sites within 2 miles	U.S. EPA 3-year RSEI Averages, as reported by Washington Department of Health 2018-2020 Average RSEI score for toxic air releases
	Percent of area within a food desert	ESRI Community Analyst Locations with NAICS code: 4451110 (supermarkets and grocery stores) Distance from nearest grocery store
Affordability	Percent of Affordable Housing	CHAS Data 2016-2020 Percent of housing units affordable to households making under 100% AMI

3.2 Data Preparation

Once data was added to the ArcGIS Pro project, several steps were needed to ensure that all tabular data (data provided in CSV format) was property formatted and ready for spatial analysis. Several of the tables, when updated to ArcGIS, had fields that were coded as ‘text’, despite holding numerical information. To address this, a new field was added with type ‘double’ and the new field

was calculated by applying float() to the original text field. This results in a numeric field that can be analyzed spatially.

Several new fields also needed to be calculated in order to accurately represent the variable in question. For example, the data set from PSRC's Covered Employment Estimates contains the number of jobs in each census tract in different years. In order to analyze the change in jobs, a new field was calculated as follows: $Change\ in\ jobs\ = \frac{(2019\ jobs - 2010\ jobs)}{2010\ jobs} \times 100$

Another variable that required calculation was the percent of households lacking complete plumbing. The dataset provides the total number of housing units in each census tract and the number of housing units per census tract that lack complete plumbing. The calculation is as follows: $Percent\ lacking\ complete\ plumbing\ = \frac{number\ of\ units\ lacking}{total\ number\ of\ units} \times 100$

At this point, all tabular data was formatted and coded as numeric data. The next step was to join this data with the appropriate shapefiles. All education data was joined with the King County school district shapefile. All other variables were joined with the King County census tract shapefile. Now, individual variables could be visualized using the symbology tools in ArcGIS. Figure 1 below shows the symbolized polygon data for average commute time. This figure also shows that some data sets and shapefiles originally extended into bodies of water (i.e. Lake Washington and Lake Sammamish). At this point in the data preparation, bodies of water were clipped out so as to not interfere with later analysis.

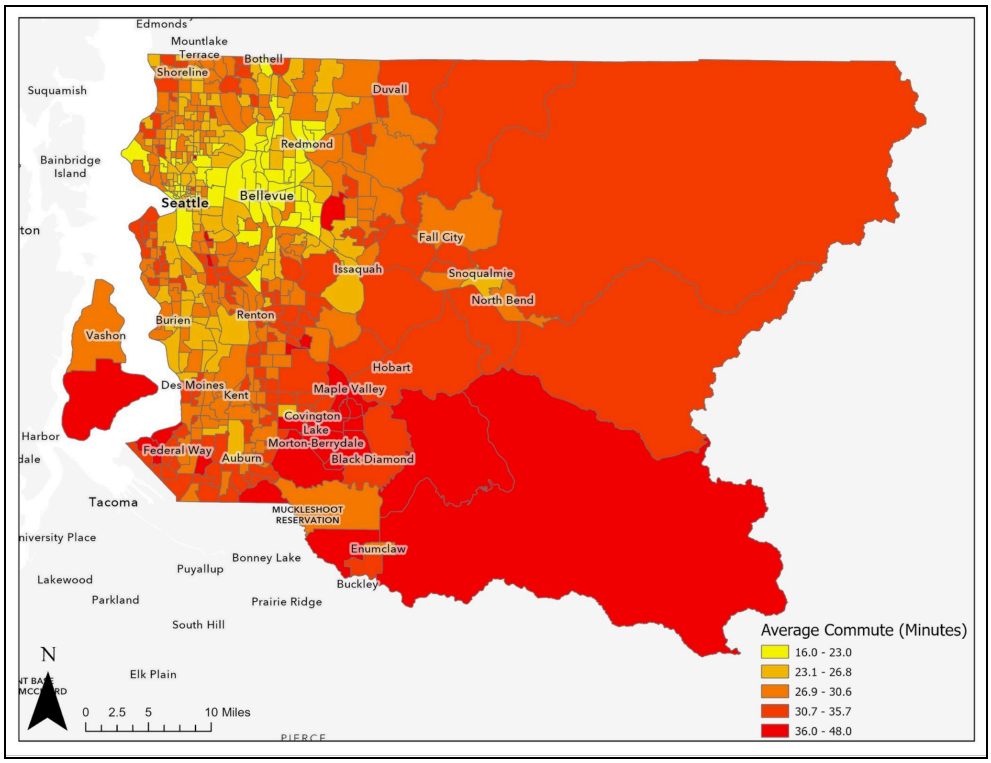

Figure 1: Average Commute Time by Census Tract

Some data was provided in shapefile format. These variables included transit, park space, and grocery stores. The goal with these variables is to analyze the distance to these features - with closer distances being preferred. To do this, each of the variables was run through the Euclidean Distance tool in ArcGIS, which creates a raster dataset representing the distance from the included features. This raster dataset can be included in the suitability modeling. For example, the map showing distance from the nearest grocery stores can help to identify potential food desert areas. Areas in orange and red are far from the nearest grocery store while areas in green have close proximity to a grocery store. Figure 2 below shows the Euclidean Distance result for grocery store locations in King County. Grocery stores were identified based on their assignment of NAICS (North American Industry Classification System) code 4451110, which identifies supermarkets and

grocery stores. Looking at the spatial distribution, there is a clear lack of grocery stores in the rural areas in eastern King County.

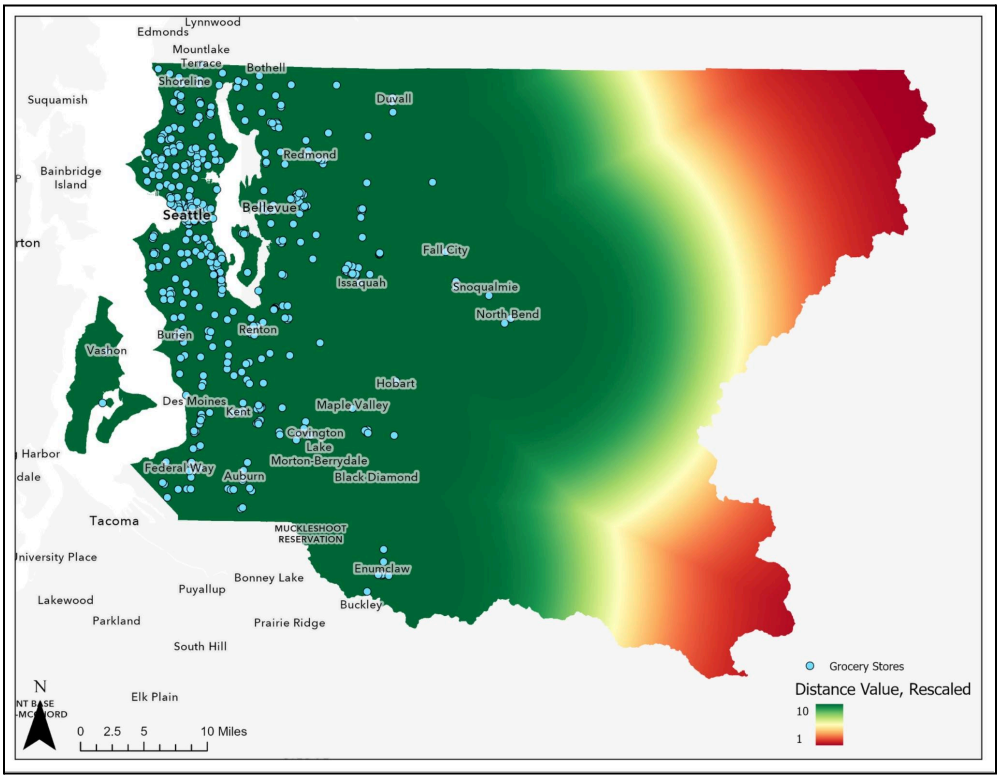

Figure 2: Rescaled Euclidean Distance Raster for Grocery Store Locations

The final step before the suitability modeling process was to rasterize all data. Given that different variables have different units of analysis (and that some were provided as shapefiles), this step was vital in order to be able to compare different areas within the county to others. Rasterizing will allow us to perform suitability analysis across the entire geographic area by layering all of the variables on top of each other and receiving a composite score for each cell in the raster. Variables that were joined to either school district or census tract polygons were rasterized using the 'Polygon to Raster' tool. All variables' rasters (including those created here and those created with the Euclidean Distance tool) were assigned a cell size of 100. This cell size correlates with an area of 10,000 square feet - a somewhat typical lot size in Washington state (Pacheco, 2022). At this

point, all variables, including those analyzed using the Euclidean Distance tool, were rescaled so that all variables' rasters were shown on a scale of 0-10. Finally, there are certain variables where lower values are considered "good." For these variables, the raster scale needed to be inverted. For example, when analyzing crime indexes, low values are "desirable." In contrast, when analyzing teacher qualifications, high levels of masters degree completion are "desirable."

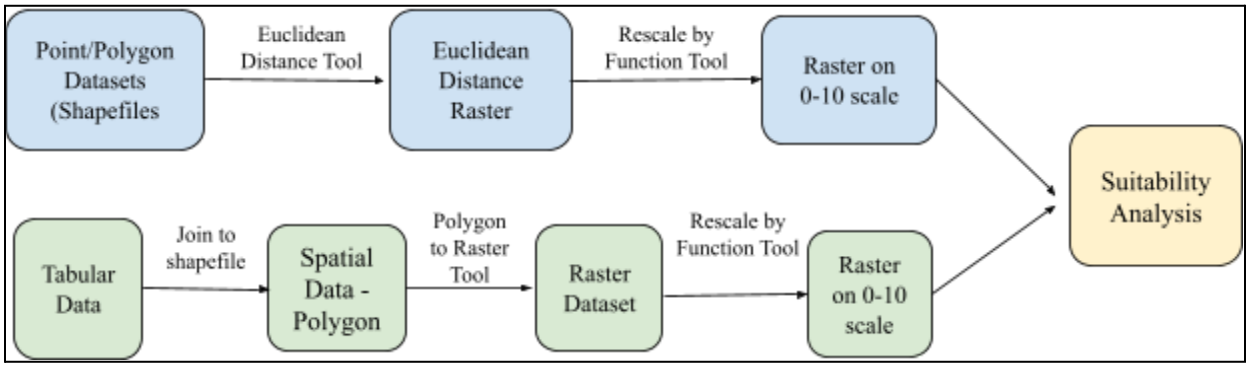

Figure 3: Summary of Data Preparation

3.3 GIS Suitability Modeling

After all variables were prepared through rasterization and rescaling, the process of creating the suitability models could begin. The base model was created by assigning equal weight to each of the five categories. The specific weight assigned to each individual variable depended on the number of variables within the category. Weights assigned to each variable in the base model can be seen in Table 2. The suitability model was run using the Weighted Sum tool in ArcGIS Pro. The result is a raster dataset for the full extent of the geographic area of analysis. Given the individual raster data sets with scales of 0-10 and the assigned weights, the total points possible in the base model is 50. Once the model was run, I was able to visually analyze the distribution of scores and determine the highest opportunity neighborhoods based on the five categories I analyzed.

Table 2: Variable Weighting for the Base Model

Category	Variable	Weight	Category Total Weight
Education	Math Scores	0.2	1
	ELA Scores	0.2	
	Masters Degrees	0.2	
	Graduation Rate	0.2	
	Free/Reduced Lunch	0.2	
Economics/Mobility	Commute Time	0.2	1
	Change in Jobs	0.2	
	Unemployment	0.2	
	Access to Transit	0.2	
	Walking Commuters	0.2	
Neighborhood Quality	Vacancy Rate	0.33	1
	Lacking Complete Plumbing	0.33	
	Crime Index	0.33	
Health and Environment	Access to Park Space	0.33	1
	Toxic Releases	0.33	
	Access to Grocery Store	0.33	
Affordability	Percent of Affordable Units	1	1

3.4 Comparing Opportunity and Affordability

Working with the base model data, I was also interested in visually comparing the distribution of traditional measures of opportunity (the first four categories) and affordability (the final category). To accomplish this, I created a suitability model using the weights shown in Table

2, but excluding affordability. Alongside the affordability raster, we can use this model to compare the distributions of high and low areas of opportunity and high and low areas of affordability.

Additionally, I was interested in investigating the overlap (or lack thereof) of areas of high opportunity and high affordability. I created a 'quadrant' model using median values for opportunity metrics and affordability. Using the zonal statistics tool, I calculated the county-wide mean for the opportunity metrics model, which was 36.31. This value comes from a suitability model itself, so the value has no unit and is only useful in comparisons, but the median value still allows us to determine 'high' and 'low' levels of the opportunity metrics. Using the zonal statistics tool again, I calculated the county-wide median affordability level, which is 14.03 percent affordable units. I applied these median values to each raster dataset to identify areas with 'high' values (given a score of 1), and areas with 'low' values (given a score of 0). Finally, using these binary datasets, I used a raster calculation to assign values to each cell in the raster based on its values for both opportunity and affordability. This quadrant model, and the scores assigned to each category, can be seen in Figure 4 below. The resulting model can be found in Chapter 4.

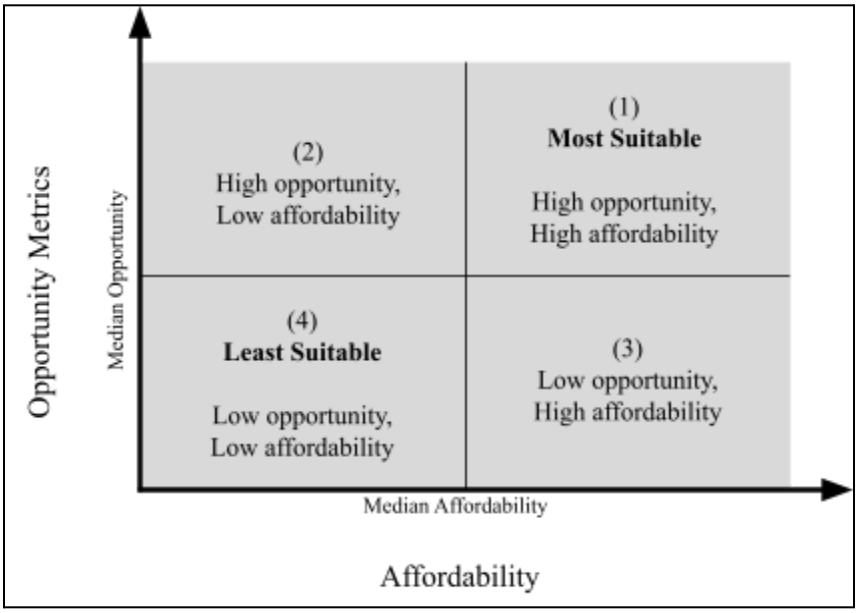

Figure 4: Quadrant Model

3.5 Life Cycle Models

The final stage in the analysis is creating the 'Life Cycle Models.' Each life cycle model represents a new iteration of the base suitability model, created with a specific household composition in mind. With one exception, the individual variables do not change - only the weights assigned to each category. The new weights assigned to each life cycle model can be found below in Table 3. To model opportunity neighborhoods for a couple with no children (also referred to as DINK, Dual-Income, No Kids), the weight was reduced for the Education category as a family with no children would be less concerned about the school quality - at least for the immediate future. For the DINK model, the Economics and Mobility category was doubled in weight as access to employment opportunities would be a primary interest for these households. For families with children, Education and Neighborhood Quality were doubled in weight to prioritize school quality as well as certain metrics of safety. For the retiree life cycle, the Education and Economics and Mobility categories were halved in weight while the health and environment category was doubled. The final Life Cycle Model looks for opportunity neighborhoods for households making below 80% of the AMI. This is the only Life Cycle Model that actually alters the variables included. In this model, the affordability threshold utilized is 80% AMI, as opposed to the threshold of 100% AMI used in all preceding models. The affordability variable is also doubled in weight - placing additional emphasis on the locations with high levels of affordable housing.

Table 3: Weights Assigned for Life Cycle Models

		Base Model Weighting	Couple w/ No Children	Family w/ Children	Retiree	Low-Income
Category	**Variable**	**Category Total Weight**	**Weight Multiplier**	**Weight Multiplier**	**Weight Multiplier**	**Weight Multiplier**
Education	Math Scores	1	**0.5**	**2**	**0.5**	**1**
	ELA Scores					
	Masters Degrees					
	Graduation Rate					
	Free/Reduced Lunch					
Economics/ Mobility	Commute Time	1	**2**	**1**	**0.5**	1
	Change in Jobs					
	Unemployment					
	Access to Transit					
	Walking Commuters					
Neighborhood Quality	Vacancy Rate	1	**1**	**2**	**1**	**1**
	Lacking Complete Plumbing					
	Crime Index					
Health and Environment	Access to Park Space	1	**1**	**1**	**2**	**1**
	Toxic Releases					
	Access to Grocery Store					
Affordability	Percent of Affordable Units	1	**1**	**1**	**1**	**2** *Affordable units for under 80% AMI*

Chapter 4: Findings

4.1 Base Model

Figure 4 below shows the results of the category analyses. Within each category, individual variables were assigned equal weights. These category analyses allow us to determine the spatial

distribution of a variety of "opportunity" themes. Education is analyzed at the school district level and includes the twenty school districts that operate within King County. The neighborhood quality and affordability categories are analyzed at the census tract level, including the 496 census tracts within King County. Economics & mobility and health & environment are analyzed mostly at the census tract level. However, these two categories also include certain variables that are analyzed through Euclidean Distance calculations. Therefore, different areas within the same census tract could have different cumulative scores. This also leads to the gradient/ombre visual effect. In all of the category models, the highest and best scores appear in dark green while the lowest and worst values are colored dark red.

Visually analyzing these category models, we can determine neighborhoods and areas that are 'ideal' based on that category. Looking at the education category, there is a clear cluster of high scores around Redmond, which stretches south/southeast from the northern border of the county through Redmond and onto the Issaquah area. This cluster also includes Mercer Island. The less ideal neighborhoods in terms of education would be south of Seattle in the Kent and Federal Way areas. Additionally, the far northeast corner of the county received low scores for education. However, it is important to note that this school district, Skykomish School District, also had some missing data. The school district is incredibly small, with a total student population of approximately 40 students (US News and World Report, 2022). Therefore, there is a lack of consistent data collection from this school district.

The Economics and Mobility category shows a few clusters of high scores. Parts of Seattle scored well - including areas such as Capitol Hill, South Lake Union, and Fremont. Additionally, there is a small cluster in central King County, around the towns of Snoqualamie and North Bend. The 'eastside,' including the cities of Bellevue and Redmond also scored relatively high in this

category. Areas that scored low for economics and mobility include the southeast corner of the county and pockets in the southwest, including areas around Federal Way.

Looking at the neighborhood quality, the distribution of scores skews higher than the previous two categories. Much of the area in the center of the county scores very high on this category. Areas that score lower include the northeast corner of the county - the area surrounding Skykomish. Additionally, there is a band of moderate values that stretches from north Seattle down past Kent, with the lowest scores in Renton neighborhoods.

In the health and environment category, scores also skew higher, with much of the county represented in green. The far southeast corner of the state is a cluster of low values. Additionally, central Seattle and the northeast corner of the county score in the middle of the range of possible scores.

The final category is affordability, in which overall scores skew relatively low. Most of the northern half of the county scores very low for affordability. Clusters of higher values can be found in the southwest part of the county. Particularly, neighborhoods in and around Renton, Kent, and Federal Way receive high scores for affordability. Important to note is that this category only comprises one variable - the percent of all housing units that are affordable to households making 100% AMI or less.

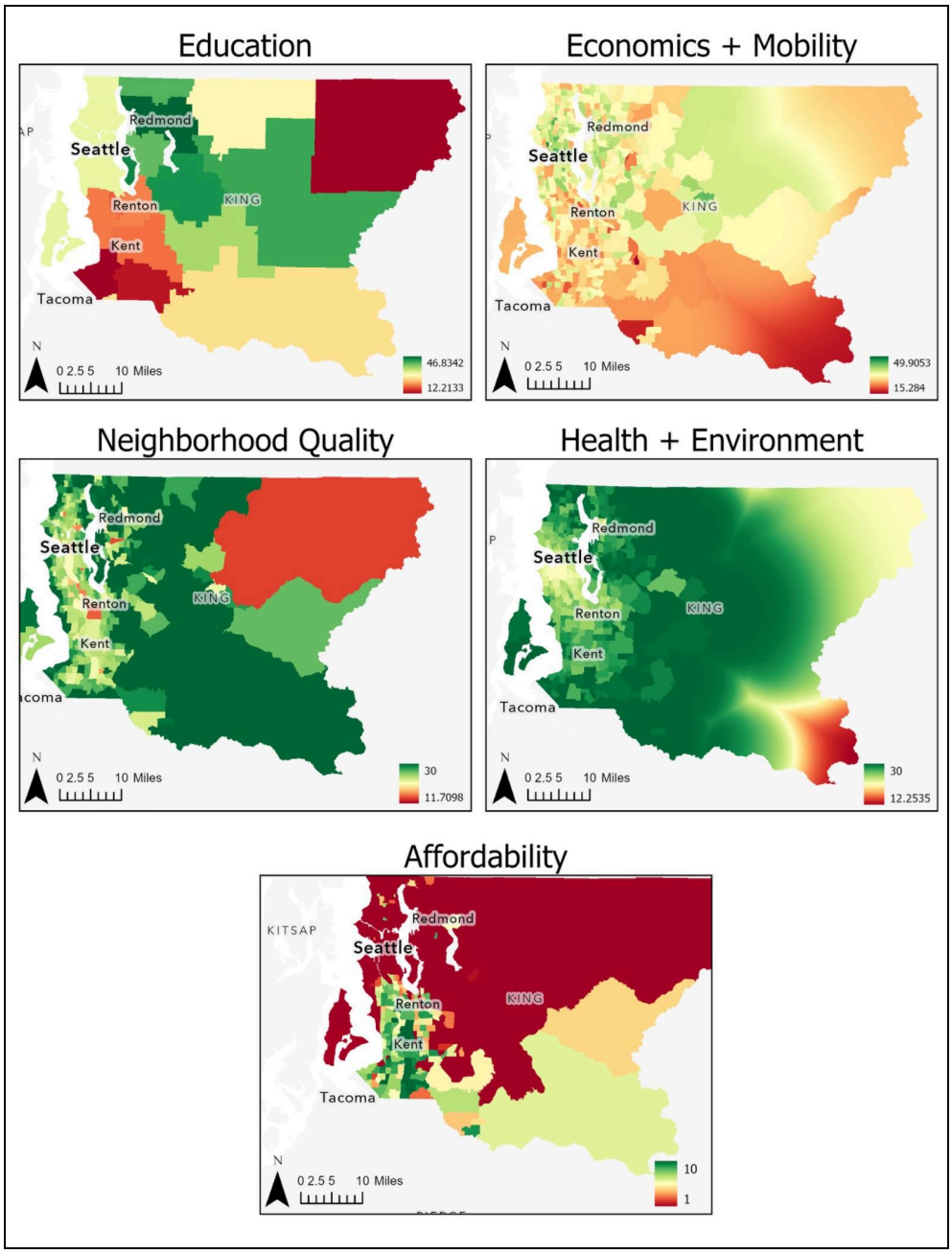

Figure 5: Category Rasters

Similar to the category models, the full base model shows the highest scores in green and lowest scores in red. The theoretical range of values is from 0 to 50. This is a result of each individual variable being scales 0-10, and each of the five categories receiving a total weight of 1. For example, in the education category, there are five variables. Each variable has a maximum

score of 10 and is assigned an individual weight of 0.2, resulting in a total possible score for the category of 10. In reality, the range of values is approximately 17.5 to 43.5.

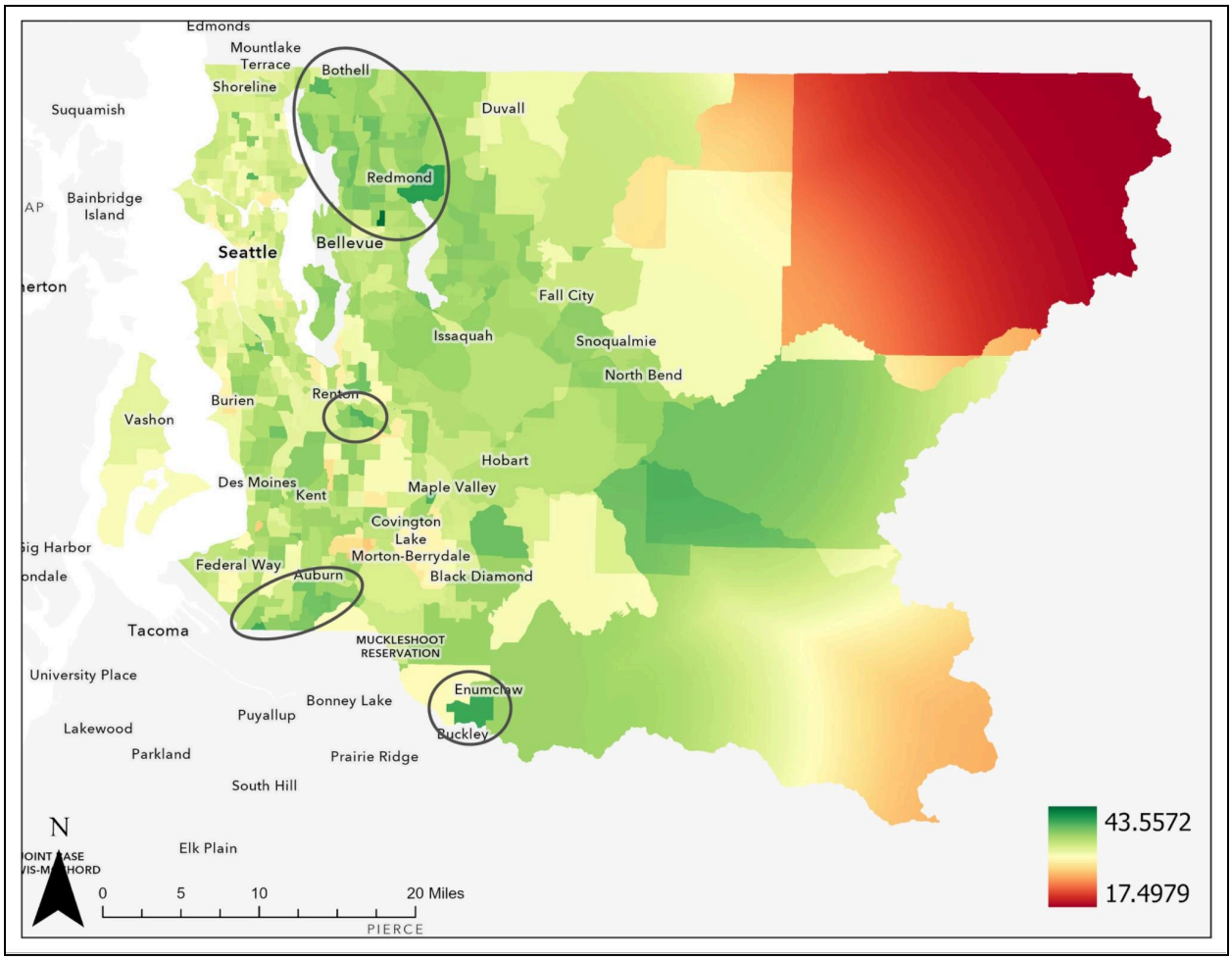

Figure 6: Base Suitability Model with Opportunity Neighborhoods Identified

In the full base model, clusters of higher values can be seen in a few parts of the county. Moving from north to south, the first identified area is the largest in terms of land area and stretches from Bothell to Redmond. The next cluster is located just south of Renton, followed by a cluster near Auburn. The final cluster is a single census tract near Enumclaw. These different clusters appear as moderately dark green in the map, and represent values around 35 to 43.

The main area that appears with low scores is the large census tract in the northeast of the county, surrounding Skykomish. Looking back at Figure 4, we can see that this area received very low scores for education, neighborhood quality, and affordability. Along with moderate scores for economics & mobility and health & environment, the result is a low cumulative score. The area in the southeast corner, colored in orange, received low scores for economics & mobility and health & environment, which impacted its cumulative score.

4.2 Comparing Affordability and Opportunity

The next stage of analysis seeks to understand the current spatial distribution of opportunity metrics (categories 1-4) and affordability (category 5) with a focus on identifying neighborhoods where both opportunity and affordability are present at above-median levels. Comparing the two maps in Figure 7, there appears to be a negative spatial correlation between opportunity metrics and affordability. In areas where opportunity metrics are high (green/yellow), affordability tends to be low (red/orange). This trend is specifically strong in the areas surrounding Kent and Redmond. In the area surrounding Kent (south of Seattle), the opportunity metrics map shows dark orange and red values - representing relatively low scores for education, economics & mobility, neighborhood quality, and health & environment. On the affordability map, the Kent area is one of the few green pockets - representing a high level of affordable housing units. On the other end of the spectrum is the area surrounding Redmond (east/northeast of Seattle). This area shows dark green coloring on the opportunity metrics map - indicating high scores for categories 1-4. However, this area is colored red on the affordability map - representing a low percentage of housing units being affordable to households making under 100% of the AMI.

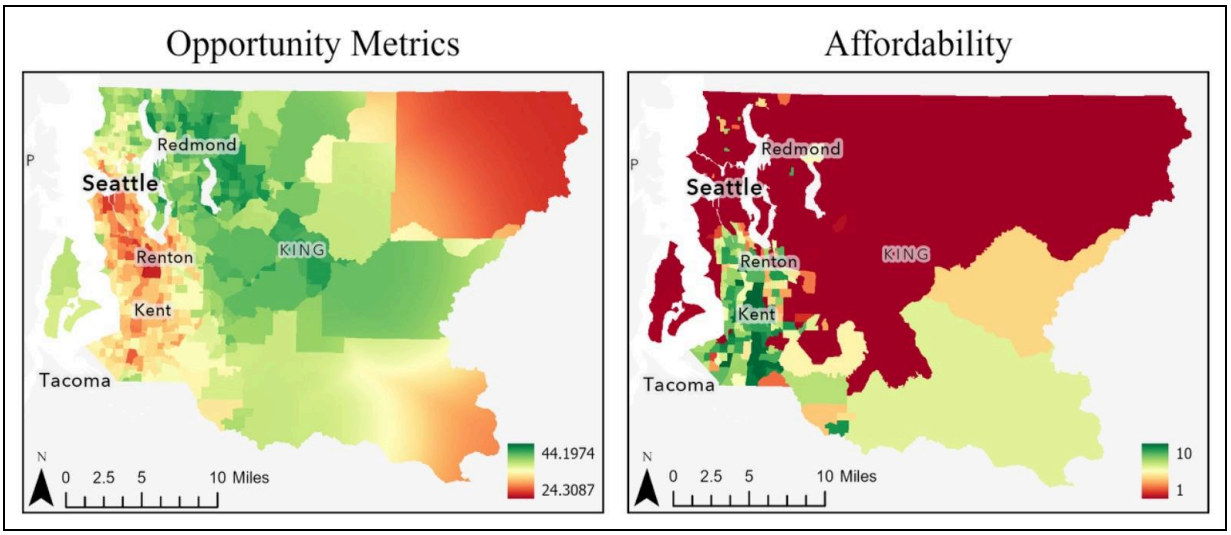

Figure 7: Comparison Between Affordability and Opportunity

To better understand this distribution, I aimed to identify neighborhoods where both opportunity and affordability were above their respective median values. To do this, I recalculated the raster datasets for both opportunity and affordability. I used each dataset's median value to split the map in two. The results are shown in Figure 8, below. Areas in red are above the median values for opportunity metrics and affordability, respectively. Areas in grey are below the median values.

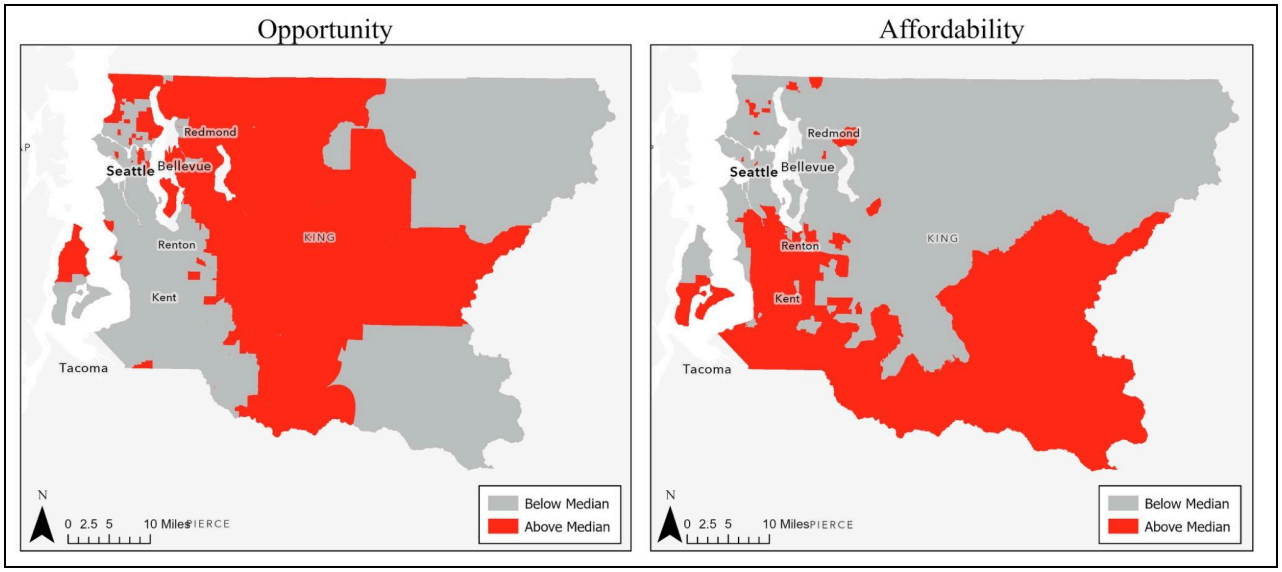

Figure 8: Opportunity and Affordability Median Calculations

Figure 9 shows the classification of neighborhoods based on their values for opportunity and affordability. Of specific interest is the identification of high-high neighborhoods - areas with above-median values for both opportunity and affordability, shown in blue. Shown in green are areas with above-median opportunity but below-median affordability. Orange areas exhibit above-median affordability but below-median opportunity, while areas in red have below-median values for both opportunity and affordability. In general, there are very few high-high neighborhoods. The largest blue area, on the eastern side of the state, would likely not be suitable due to being more rural. There are notable high-high neighborhoods located in areas including Enumclaw, Black Diamond, Maple Valley, East Renton Highlands, Redmond, and Woodinville. More detailed maps identifying these areas are found below in Figures 10 and 11.

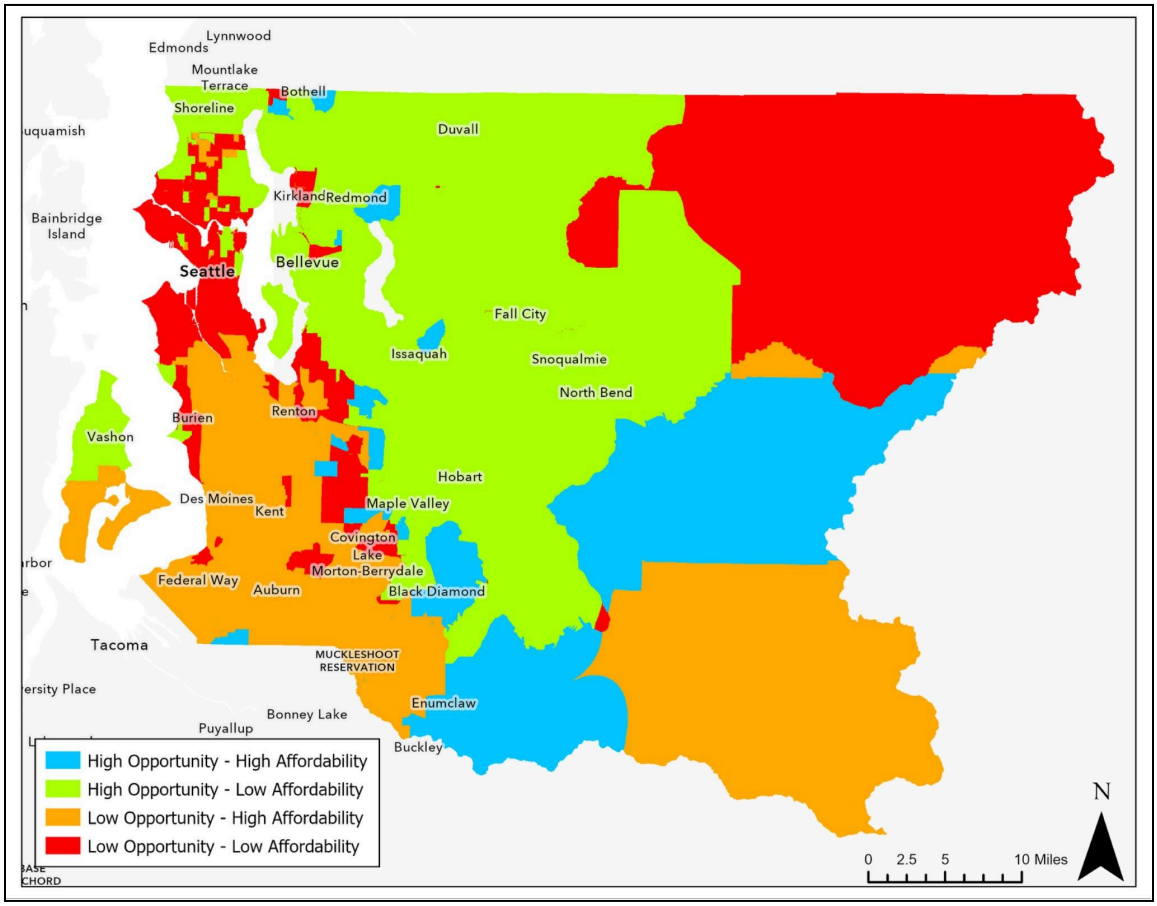

Figure 9: Identification of High-High Neighborhoods

Figure 8 also helps to evaluate how measures of opportunity and affordability are mismatched spatially. Most of the southwest part of the county, centered around Renton, Kent, and Auburn is identified as a low-opportunity, high-affordability area. Most of the center of the county, around Bellevue, Issaquah, and North Bend is characterized as high-opportunity and low-affordability.

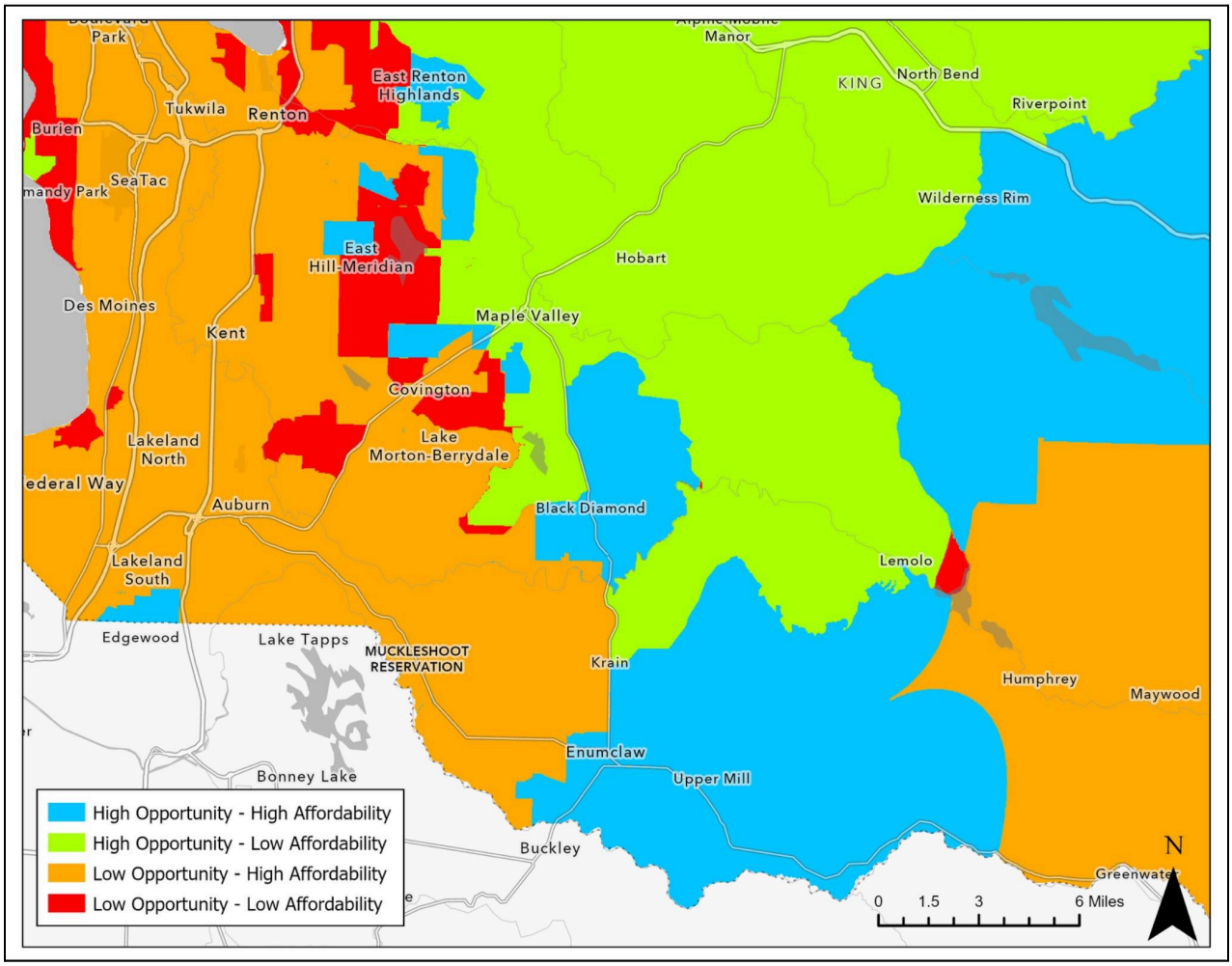

Figure 10: Detailed Map of South-Central King County with High-High Neighborhoods

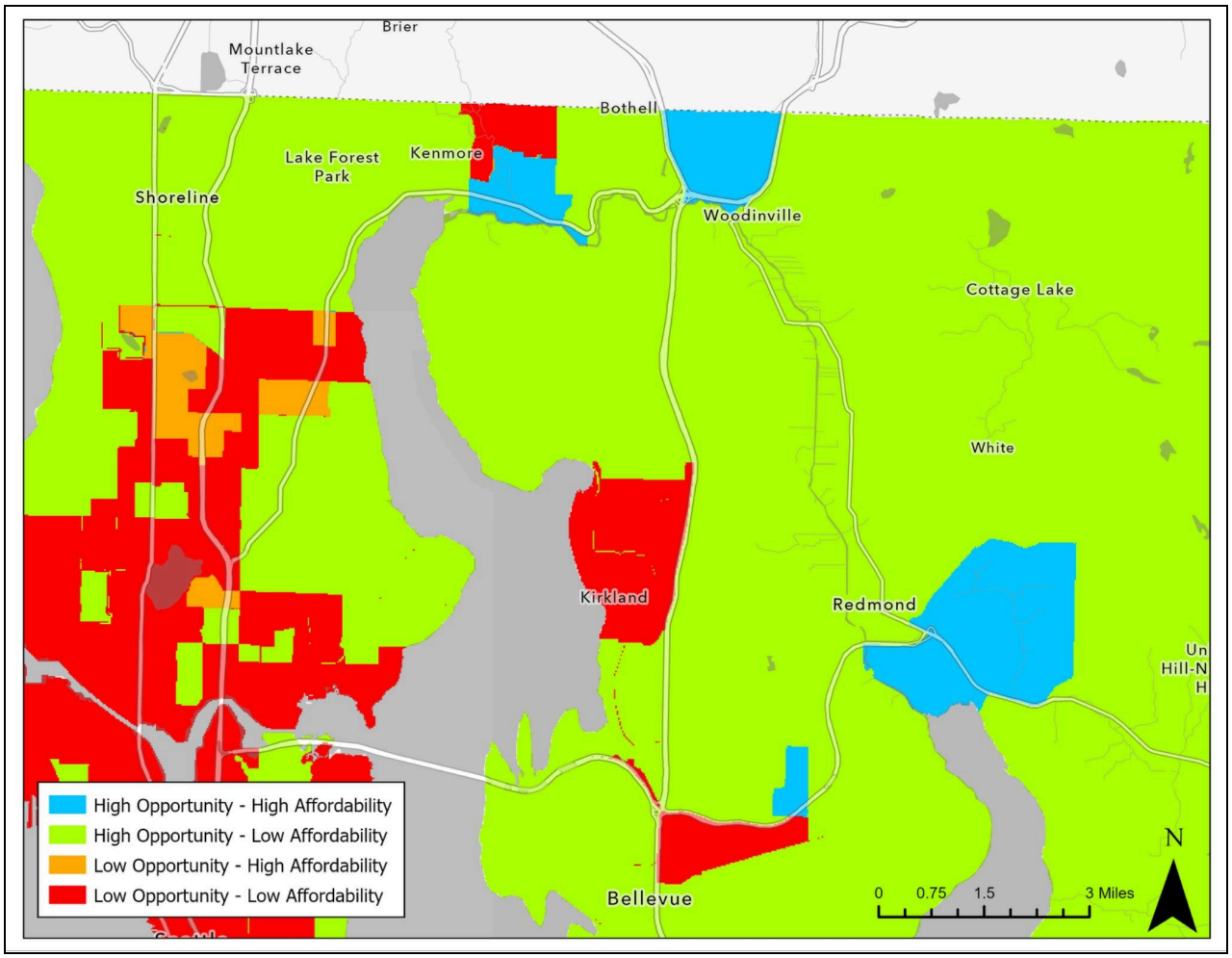

Figure 11: Detailed Map of North-Central King County with High-High Neighborhoods

4.3 Life Cycle Models

The final stage of analysis involves four 'life cycle models,' representing different household compositions and/or preferences. The weighting changes made for each life cycle model can be reviewed in Table 3, above in Chapter 3. With the exception of the low-income model, all variables remain the same, only the weights change. In the low-income model, the affordability variable is changed slightly in order to include only the percentage of housing units affordable under 80% AMI (instead of the 100% AMI level used in the rest of the analysis). Figure 7, above, shows the results for the four life cycle models, in addition to the original base model.

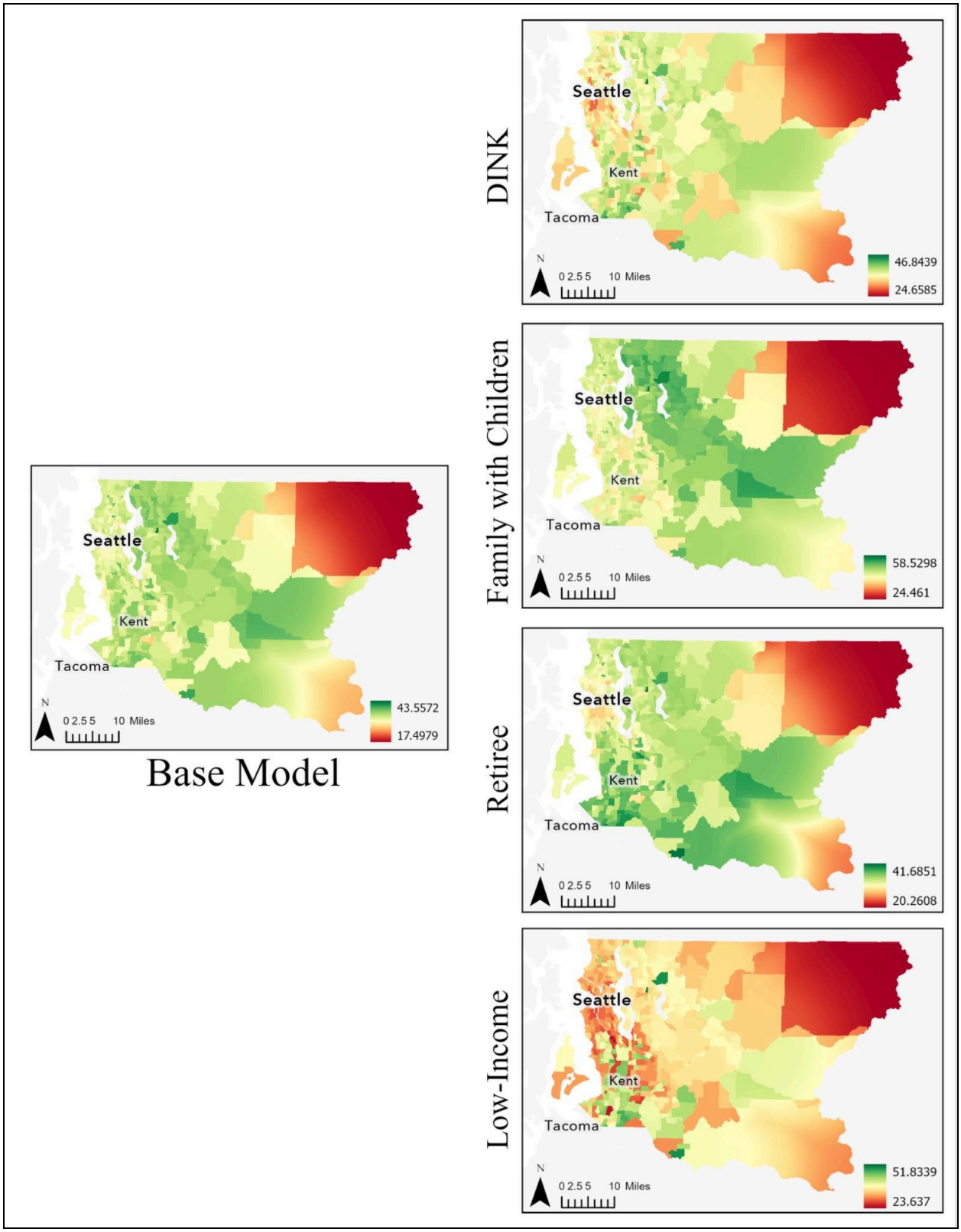

Figure 12: Life Cycle Models

The first life cycle model is known as the 'DINK' model, standing for "dual-income, no kids." This would be a household with a partnered or married couple, likely younger in age, with no children present in the home. Due to the absence of children, the weight for the education category was halved. Given that these DINK households will skew younger, the economics and mobility category was doubled in weight. It is believed that these households may be more career-oriented and focused on job opportunities and growth. The DINK model shows a few meaningful deviations from the original base model. Most notable might be the areas that are revealed as less desirable in the DINK model, including central Seattle and Vashon Island. The lower level of desirability of downtown Seattle is a bit surprising here. Areas in far southwest King County, including around Auburn, continue to be highly desirable in this model.

The second life cycle model represents families with children. In this model, the education category is doubled since these families have school-aged children in the home. Additionally, the neighborhood quality category is doubled given that these families may have an increased focus on neighborhood safety and crime levels. The model for families with children does not deviate from the original base model much. However, we do see the band from Bothell down through North Bend intensify in its desirability. These neighborhoods have high scores for education and neighborhood quality categories, making them even more ideal for families with children. The western side of the county, from Shoreline down through Federal Way, is now a bit more yellow/orange compared to the base model, revealing that these neighborhoods may be less desirable to families with children.

The next life cycle model is the Retiree model. This model represents individuals or couples that are of retirement age. Without children in the home, education/school quality would be a lower priority for these households; therefore, the weight for the education category is halved.

While some of these households may continue working in some fashion, it is believed that they would be less concerned with variables included in the economics and mobility category - which is also halved in weighting. Overall, the Retiree model does not show significant deviation from the original base model. Neighborhoods surrounding Kent see slightly higher levels of desirability while central Seattle's desirability falls a bit.

The final life cycle model is more about household needs and less relevant to household composition. This is the low-income model, which represents households making less than 80% of the King County AMI. In this model, none of the opportunity metric categories are changed. However, the variable in the affordability category is changed to include housing affordable up to 80% AMI and this category is doubled in weight. This represents both an increased importance in affordability for these households as well as a lower level of income available to spend on housing. Given that the Washington Covenant Homeownership Program can be utilized by households making less than 80% AMI, this model may be of interest for program officials. The most desirable areas in this model are neighborhoods around Kent and Auburn as well as small pockets in Redmond and Enumclaw (both of which show up in the base model as well.) The low-income model shows significant deviation from the original base model. Based on the comparison between affordability and opportunity metrics (seen in Figure 7), this is not surprising. The areas with higher affordability in Figure 7 begin to peak through as "optimal" neighborhoods for lower-income households. Additionally, areas with low levels of affordability become even less desirable for low-income households.

Chapter 5: Discussion

5.1 What The Analysis Tells Us

The results of this analysis help us to address our key research questions related to identifying high opportunity neighborhoods for first-time homebuyers, the spatial distribution of opportunity and affordability, and the suitability of different neighborhoods for various household compositions and/or needs.

The base suitability model reveals the location of potential high opportunity neighborhoods within King County. These are neighborhoods that have higher combined values based on the variables of interest. The model allows us to visually identify these neighborhoods and use the suitability scores to compare one location to another. Given the multitude of variables included and the process of rescaling, the final suitability scores have little meaning on their own. For example, the maximum suitability score in the base model is 43.56 - which has no unit attached to it. However, we are able to use this score to compare neighborhoods. By this process we can say that a neighborhood with a score of 43.56 is more suitable for Covenant Homeownership Program participants than a neighborhood with a score of 30. This process of comparison is key to the interpretation of the analysis results.

Figure 7, above, is important in analyzing the spatial mismatch between metrics of opportunity and measures of affordability. The analysis shows that the distribution of 'opportunity' is almost opposite the distribution of 'affordability.' This is an important finding. Not only does it confirm that lower income households may have true challenges in finding affordable housing in high-opportunity neighborhoods, but it reveals that households needing to prioritize affordability will likely be forced to give up certain opportunity metrics. These could be related to school quality, neighborhood safety, or exposure to health and environmental risks. Both sides of this coin

are concerning from a policy perspective. In Figure 9 we can see that there are relatively few neighborhoods that are 'high' in both opportunity and affordability. Some of the areas that meet this criteria (shown in blue on the map) are rather rural, and the blue neighborhoods that do exist are rather sparsely distributed throughout the county.

The final research question that this analysis addresses is related to the 'life cycle models,' shown in Figure 12. These models allow us to consider that different households have different needs and priorities - this could be based on their composition, their demographics, or their lifestyle and preferences. The analysis looks at four different households: a dual-income, no kids (DINK), a family with children, a retiree, and a low-income household (below 80% AMI). These models were run with different weights for the variable categories - based on that household's theorized priorities. This reveals that based on your household needs, the location of suitable/desirable neighborhoods could look quite different. Particularly for the low-income household, the resulting model looks quite different from the base model. This is understandable given the mismatch we uncovered between opportunity and affordability. When a household is forced to prioritize affordability, the neighborhoods that they have access to, and the neighborhoods that have the "best" suitability can be quite different. Gone are the large areas of high suitability on the 'eastside' of Seattle. Instead we see higher suitability in areas such as Kent and Federal Way - which we know measure much lower on the opportunity metrics. This is a clear sign that lower income households are being forced to give up access to certain conditions, amenities, and opportunities in order to acquire housing that is affordable at their income level. This serves as further evidence that there is inequitable access to high opportunity neighborhoods in King County. Households participating in the Covenant Homeownership Program will not have

perfect access to all neighborhoods and will not have equitable opportunity to choose their neighborhood.

5.2 Limitations

There are a couple of notable limitations to this analysis and its methodology. First is the diversity of settings within the King County boundary. Areas on the far eastern side of the county are very rural and sparsely populated. Therefore, they would likely not be suitable for program participants who currently live on the west side of the county. Not only would they be relatively far away but they would be such different settings from a lifestyle perspective. When evaluating educational metrics, for example, Skykomish School District (in the far northeast corner) has such a small student population that they do not report data on all of the metrics that other school districts report. In the model, I used state averages for Skykomish, but if the real values are different than this, that would impact the model. In the full suitability model, this same area around Skykomish scores so low that it has the possibility of skewing other scores and values. We might have seen more visual differences in the color-coding of the model if Skykomish had been left out of our analysis.

Another limitation that is relevant to many analyses of housing policy is how we define affordability. In the case of this project, we used a rather common definition, that affordable housing is housing that can be paid for with 30% or less of a household's monthly income. This comes into play in our use of HUD's CHAS data, which identifies the percent of housing units that are 'affordable' to households making 100% AMI or less. However this is somewhat imperfect for our analysis given that the affordability is determined based on a 96.5% loan-to-value ratio, which only assumes a 3.5% down payment and would also require mortgage insurance (Joice, 2013). For participants in the Covenant Homeownership Program, the assistance should allow them to make a

much more sizable down payment (hopefully a full 20%) which would lessen the monthly payment. This should open up these buyers to a slightly larger set of homes, but that exact calculation of added 'purchasing power' is not included within the scope of this analysis.

5.3 Implications for the Covenant Homeownership Program

Generally speaking, the mismatch between opportunity and affordability metrics in King County could make the implementation of the Covenant Homeownership program more difficult in the local context. Participants will likely have to weigh their priorities and may find it incredibly difficult to locate housing that meets all of their desires. As seen in the life cycle models, there are some neighborhoods that might be desirable for a participant who is a retiree but less desirable for a participant with children. This reinforces the idea that individual households will need to evaluate their priorities in order to determine which neighborhoods would be most suitable for them. Program officials might consider what resources they provide to participants who are beginning their housing searches. Resources on neighborhood characteristics related to safety, schools, health, and amenities are important for potential homebuyers. However, even more important is how we engage in conversation about these neighborhood differences. A neighborhood that scores low on one or more metrics in this analysis could still be desirable to a specific household - for any number of reasons. It is crucial that program officials and real estate professionals who are involved in the implementation of this program are thoughtful in their conversations with households, truly listening to their needs and desires, and providing unbiased information regarding potential neighborhoods.

Additionally, policy officials and real estate professionals will need to consider the fact that the program will give additional purchasing power to participants, potentially making the market for affordable homes for sale even more competitive. At a small scale, there could be a highly

desirable neighborhood with a single affordable unit on the market. Professionals involved in the program will need to consider how they will help potential buyers navigate competitive buying situations. It will also be interesting to see in the coming years whether the injection of new homebuyers into the market will impact the housing market more broadly.

One feature of the program that makes me optimistic about its implementation in King County is how specific the downpayment assistance is to each participant. The amount of financial assistance granted is based on the specific home being purchased (with a cap of $150,000 or 20% of the home's value). This means that a participant purchasing a home in a more expensive neighborhood will be granted a higher amount of assistance. While there are other factors involved in determining how much home a household can afford - the structure of the program is designed to allow for differences in the cost of housing in different areas around the state - and this can also apply to differences within the county.

5.4 Implications for General Policy

Beyond the specific implications for the Covenant Homeownership Program, the findings in this analysis have some broader implications for policy work. Most notable is potential for these findings to be utilized in order to develop targeted investment plans or programs. Some researchers in the planning and policy realm recommend a targeted approach to neighborhood investments and revitalization (Joint Center for Housing Studies of Harvard University, 2017). Using this process, neighborhoods are grouped based on their current conditions (similar to the analysis used to produce Figure 9) and high-level investment strategies are developed based on the needs of that type of neighborhood. For example, an area categorized as high-opportunity, low-affordability may need investment directly targeted at the development of new affordable housing units. However, an

area characterized by low-opportunity, high-affordability may need investments targeted at increasing access to transit or creating new economic opportunities. If policy officials are interested in these types of targeted investment approaches, the findings of this analysis - and the methods more broadly - may be of interest to them.

5.5 Implications for Future Research

The findings of this analysis open up additional questions and paths of inquiry for future research. I believe that an important future research question is related to the increase in purchasing power that the Covenant Homeownership Program provides for participants. It is possible that the added purchasing power would give participants access to a broader spectrum of homes than what is included in this analysis. It would be worthwhile to look at different mortgage financing options to determine what an eligible participant might have been able to afford prior to the program versus what they can afford by participating in the program. Using this information, future researchers could determine the differences in the neighborhoods accessible to these households - those already accessible, and those opened up by participating in the downpayment assistance. This might lend additional insight into the strengths and weaknesses of the program structure. Ideally the program will increase households' access to more neighborhoods and more potential homes. If the research indicates otherwise, it could be a sign that the assistance is insufficient, at least in King County.

Additional future research could look at specific homes for sale and those recently sold to get a better understanding of the real availability. Within the scope of this analysis, I looked at the general level of home prices. However, it would be worthwhile to also investigate available housing. This would require more specific data about individual home prices, how often homes are

turning over, and potentially data on active and recent real estate listings. The data required is not easy to acquire, but could help answer important research questions about whether the housing that program participants might desire is actually available on the market. If all of the affordable homes are being held and not on the market, then the program will have trouble being successful. Similarly, if the affordable housing stock is all being bought up by developers to redevelop and/or rent out, then there might be low levels of affordable housing available to traditional buyers.

Another line of research that will hopefully come to fruition in the coming years is related to the experiences of participants in the Covenant Homeownership Program. There are a variety of research questions that could be explored through qualitative and qualitative methods. I would be interested to know about their general experiences as a participant - how they found out about the program, what resources they used in their housing search, and their level of satisfaction with the program administration. On the financial side, I am also interested in learning whether participants see their monthly housing expenses increase or decrease after buying their home. I am curious as to whether any participants bring some level of down payment savings with them into their purchase. I think a key theme for future research will be the housing outcomes of program participants. This will involve a detailed look at where participants rented before buying their homes and where they live now in their owned homes. It will be important to understand how far people move, what neighborhood characteristics they prioritized in their searches, and what (if any) neighborhood or housing conditions improve after buying their home. Finally, I will be interested to see the long-term impacts of this program. These impacts could be on the broader housing markets and will also be related to the performance of DPA-supported mortgages compared to non-assisted mortgages. Seeing that the Covenant Homeownership Program is the

first DPA program of this scale, there will be vast opportunities for future research on the success of DPA in Washington and how it may impact our communities.

Chapter 6: Conclusions

This thesis seeks to explore how the newly created Covenant Homeownership Program might function in practice by identifying neighborhoods where both affordability and opportunity are high. The research is guided by two central questions. (1) Where are the opportunity neighborhoods in King County where participants might begin their housing searches? (2) How do these opportunity neighborhoods vary based on household composition? Also relevant to this analysis is an investigation of the spatial distribution of both opportunity and affordability and an evaluation of their overlap and/or mismatch. This analysis used GIS-based suitability analysis to assess where program participants might have the best chance to access homeownership in areas that support improved life outcomes.

The findings indicate that there is significant spatial mismatch between opportunity and affordability metrics across King County. High-opportunity neighborhoods, as defined by variables related to education, economics and mobility, neighborhood quality, and health and environment, are often the least affordable areas to low and moderate-income households. This analysis identified relatively few “high-high” neighborhoods. The lack of more robust high-high neighborhoods indicates that there will still be challenges in locating affordable housing in high opportunity areas. The life cycle models further illustrated how different households (based on composition or needs) may face unique spatial constraints - highlighting the need for a flexible and responsive program design.

This analysis reminds us that there are persistent structural challenges in creating equitable housing options and outcomes. Down payment assistance can be an important tool in addressing

some of the persisting barriers. However, it cannot fully address the underlying issue of limited affordable housing stock in high-opportunity neighborhoods. Nor can it address the current state of racial segregation and lack of access to resources and opportunities in some neighborhoods. This work suggests that in order to achieve the broad goals of the Covenant Homeownership Program, it must be paired with investments in affordable housing development. The suitability modeling framework used in this analysis could be replicated by future planners or researchers seeking to align affordability with access to opportunity.

While this thesis offers useful insights, it also has limitations. The analysis does not account for parcel-level housing availability, the ever-evolving conditions in the housing market, or the lived experiences of potential program participants. Future research should build on this work by examining participants' housing outcomes over time, tracking who is able to access the program and where they decide to settle. Participant satisfaction, long-term (even generational) wealth-building, and the process of neighborhood integration are all important areas for continued study.

Ultimately, this research affirms that place matters. Housing policy must always reckon with the spatial distribution of opportunity if it hopes to be reparative and avoid replicating the harms of past policies. As a former educator, I remain deeply motivated by the students I taught and hope that the neighborhoods we play today will offer them, their families, and their peers with the choices and opportunities that they deserve. The Covenant Homeownership Program represents a critical step for the state of Washington. Its success will depend on how the program is implemented, how it evolves to meet changing needs, and how we build a broader movement around the program to support equitable housing and access to opportunity.

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Appendix:

Appendix A: Data Dictionary

Category Name	Variable Name	Data Used in PSRC Analysis	Data Used in this Analysis	Unit of Analysis	Direction
Education	Reading Test Scores	Washington State Report Card, Office of Superintendent of Public Instruction School proficiency on 4th grade reading MSP testing	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of 4th grade students scoring “on track” or above for ELA	School District	Positive
	Math Test Scores	Washington State Report Card, Office of Superintendent of Public Instruction School proficiency on 4th grade math MSP testing	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of 4th grade students scoring “on track” or above for math	School District	Positive
	Student Poverty	Washington State Report Card, Office of Superintendent of Public Instruction Percent of primary students receiving free or reduced meal prices	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of students on free or reduced lunch	School District	Negative
	Teacher Qualification	Washington State Report Card, Office of Superintendent of Public Instruction Percent of primary school teachers who hold a master's degree or higher	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of teachers who hold a master’s degree	School District	Positive
	Graduation Rates	Washington State Report Card, Office of Superintendent of Public Instruction Percent of high school students who graduate on time (5-year)	Washington State Report Card, Office of Superintendent of Public Instruction 2023-2024 school year Percent of high school students who graduate within 5 years	School District	Positive
Economics	Percent of all jobs providing living wage and within 15-minute auto or 30-minute transit commute	MIT Living Wage Calculator PSRC Covered Employment Estimates	2023 American Community Survey 5-year estimates: Table S0801 Average commute time, in minutes	Census Tract	Negative
	Percent change in number of jobs	PSRC Covered Employment Estimates	PSRC Covered Employment Estimates Percent change in jobs between 2010-2019 Note: Missing values were assigned zero change	Census Tract	Positive
	Percent of residents who reported being unemployed	5-year ACS Estimates	2023 American Community Survey 5-year estimates: Table S2301 Percent of unemployment for population over 16 years of age	Census Tract	Negative

Housing and Neighborhood Quality	Percent of housing units that are vacant	5-year ACS	2023 American Community Survey 5-year estimates: Table B52001 Percent of all housing units that are vacant	Census Tract	Negative
	Foreclosure Rates	2012: Neighborhood Stabilization Program (NSP), HUD Was not included in the 2018 update	Not included		N/A
	Percent of high cost loans	2012: NSP, HUD Was not included in the 2018 update	Not included		N/A
	Percent of all households in poor condition (lacking complete plumbing)	5-year ACS	2023 American Community Survey 5-year estimates: Table S2504 Percent of all housing units lacking complete plumbing facilities	Census Tract	Negative
	Crime Index	PCensus Dbx (A purchased dataset)	2024 Crime Index, ESRI Community Analyst	Census Tract	Negative
Mobility and Transportation	Cost of average commute to work at $0.53/mile	Internal calculations/model	Not included		N/A
	Percent of area within ¼ mile of high capacity transit stops	Internal calculations/model	King County GIS Open Data Transit Stops for King County Metro - 2025 Distance from nearest King County Metro bus stop	Point Shapefile	Negative
	Cost of average transit fare	Internal calculations/model	Not included		N/A
	Percent of all commuters who walk to work	5-year ACS data	2023 American Community Survey 5-year estimates: Table S0801 Percent of all workers who commute by walking	Census Tract	Positive
Health and Environment	Distance to nearest park or open space	Internal calculations/model	King County GIS Open Data Parks in King County - 2018 Distance from nearest park location	Polygon Shapefile	Negative
	Pounds/square foot of toxic release from toxic waste sites within 2 miles	EPA	U.S. EPA 3-year RSEI Averages, as reported by Washington Department of Health 2018-2020 Average RSEI score for toxic air releases	Census Tract	Negative
	Percent of area within a food desert	Identifying Food Deserts Access to Healthy Food in the Puget Sound Region, PSRC & University of Washington	ESRI Community Analyst Locations with NAICS code: 4451110 (supermarkets and grocery stores) Distance from nearest grocery store	Point Shapefile	Negative
Affordability		Not included	CHAS Data 2016-2020 Percent of housing units affordable to households making under 100% AMI	Census Tract	Positive

Appendix B: Summary Statistics

Category	Variable	Mean	Median	Minimum	Maximum	Standard Deviation
Education	Math Scores	57.98	62.05	25.5	86.3	17.99
	ELA Scores	57.43	61.9	29.1	89.8	17.85
	Masters Degrees	72.03	77.05	45.5	80.6	7.61
	Graduation Rate *Note: missing value for Skykomish School District is 0*	87.11	91.92	0	96.76	20.81
	Free/Reduced Lunch	40.85	31.3	5	95	28.84
Economics/ Mobility	Commute Time	28.06	27.9	16	48	4.76
	Change in Jobs	30.76	22.28	-55.26	281.92	40.32
	Unemployment	4.61	4	0	21.2	2.93
	Distance to Transit	N/A	N/A	N/A	N/A	N/A
	Walking Commuters	4.34	1.7	0	53.4	7.69
Neighborhood Quality	Vacancy Rate	5.19	4.41	0.83	54.96	3.85
	Lacking Complete Plumbing	0.59	0	0	5.85	1.10
	Crime Index	175.44	114.50	13	949	143.07
Health and Environment	Distance to Park Space	N/A	N/A	N/A	N/A	N/A
	Toxic Releases	7,038.15	4,150.87	297.25	113,581.33	10,017.85
	Distance to Grocery Store	N/A	N/A	N/A	N/A	N/A
Affordability	Percent of Affordable Units	13.94	8.42	0	85.08	15.98