A TYPOLOGY OF SUBURBAN CHANGE
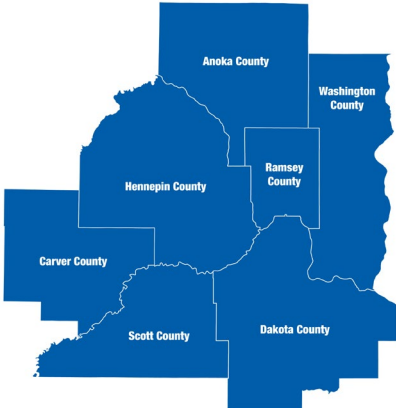
METROPOLITAN COUNCIL

June 2020

The Council's mission is to foster efficient and economic growth for a prosperous metropolitan region

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The Metropolitan Council is the regional planning organization for the seven-county Twin Cities area. The Council operates the regional bus and rail system, collects and treats wastewater, coordinates regional water resources, plans and helps fund regional parks, and administers federal funds that provide housing opportunities for low- and moderate-income individuals and families. The 17-member Council board is appointed by and serves at the pleasure of the governor.

Purpose of the Study

This study examines how the demographic, housing market, and built environment characteristics of small areas in suburban communities changed in the seven-county metropolitan area.[1] It classifies the type of changes these areas experienced between 2000 and 2017 to help inform local planners about the changing needs of various parts of their communities. The study intends to achieve two goals. The first goal is to provide more granular information to planners to help them tailor targeted planning strategies to address the needs of specific parts of their communities. The second one is to identify similar patterns of small area changes across the region to facilitate the sharing of information and best practices among communities.

Background

Our region's suburbs have been changing for quite a while. The changes these communities experience, however, can vary from one small area to another. These areas often differ based on their demographic, housing market, and built environment characteristics. These differences shape the types of change they go through. This project investigates these changes to identify and examine patterns across the suburbs of the seven-county metropolitan area.[2]

The Metropolitan Council offers technical assistance to communities for the preparation of their comprehensive plans to ensure conformance with regional system plans and consistency with the regional development guide. The *Local Planning Handbook* provides requirements and resources to communities in their comprehensive planning process. This study focuses on changes in small areas of suburban communities to offer additional technical assistance to communities within the metro area.

Planning for different types of small areas requires different approaches to achieving locally identified outcomes. While local planners know about issues in their communities, many jurisdictions lack the capacity to collect and analyze extensive data to systematically evaluate the needs of various parts of their communities. This project intends to fill this gap by providing a baseline description of the types of changes taking place in small areas of communities.

Analysis

One needs to first examine the characteristics of census tracts to understand how they change over time. Figuring out the characteristics that most concisely define a tract and capture how it changes over time, however, is not a straightforward task. It requires an investigation of a host of characteristics that describe the multifaceted nature of census tracts in a holistic fashion. It also entails prioritizing the characteristics that are most crucial in differentiating census tracts from one another to make succinct comparisons possible.

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[1] In this study, small area refers to census tracts. The initial goal of this project was to analyze neighborhood-level changes that would be best captured by using census block-group data. However, margins of error at the block-group level are significant enough to potentially undermine the accuracy of the block-group level data. The study refers to census tract boundaries as small areas rather than neighborhoods because the size of census tracts can change significantly from community to community. In less densely populated communities, where census tracts can be as large as an entire city, census tracts are not a good representation of neighborhoods. In most suburban areas, however, census tract-level analysis helps examine the dynamics of areas smaller than cities or townships.

[2] In this study, the seven-county metropolitan area refers to the seven counties within the Metropolitan Council's jurisdiction. These counties are: Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington. The study area includes only the portions of the seven-county metro area that are within the Metropolitan Urban Service Area (MUSA). More specifically, the study area includes all census tracts where at least 30% of the land is within the MUSA. Since this is a study of suburban small area change, the study area excludes the census tracts that are in St. Paul and Minneapolis.

A team of planners, researchers, and policy analysts at the Council explored 23 census tract characteristics and identified 40 variables to measure these characteristics. Data sources included the American Community Survey (ACS), the Metro GIS Regional Parcel dataset, and several Metropolitan Council datasets including the Annual Population and Housing Estimates, the Annual Manufactured Home Park Survey, the Generalized Land Use Inventory, and the Transportation Forecast Model. Team researchers conducted a spatial analysis and used statistical techniques to eliminate the variables that did not distinguish small areas from one another. They used 22 of the 40 variables in the study.

The research team analyzed how census tracts changed between 2000 and 2017 by looking at data from three time points: 2000, 2010 and 2017. The team grouped the types of change census tracts experienced by using a cluster analysis.[3] Researchers traditionally group data (in this case types of change that took place in census tracts) with common characteristics into clusters. In this study, the cluster analysis identified group similarities based on multiple traits and each cluster included a group of census tracts that shared similar types of change.

The team classified the types of change that took place in census tracts by using a longitudinal clustering method. They also conducted additional statistical modeling to identify the variables that were most important in assigning a census tract to one cluster as opposed to another.[4] The clustering analysis revealed that, of the 22 variables that were used in the longitudinal clustering algorithm, eight differentiated the clusters from one another.

These variables were: share of people of color; share of people who are 65 or older; share of people who are 18 or younger; median income; median home value; median gross rent; share of rental units; and share of recently built housing stock.[5] In addition to these eight variables, the team also analyzed four variables that contextualized the nature of change taking place in each cluster. These variables included: education, limited English proficiency, population, and poverty.

The analysis showed that demographic traits such as race, age and income, housing market characteristics such as housing costs and tenure, and built environment qualities such as recent construction activity interact with each other to shape change in census tracts. In different combinations, these variables produce different types of change.

Demographic factors such as race, age, and income impact how census tracts change in several ways. One's race and ethnicity influence the types of census tract they want to live in. For instance, immigrants might want to join specific immigrant communities. The age profile of a census tract also shapes how the tract is likely to change. For instance, the experience of generational transition often

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[3] Each type of change includes a group of census tracts that share similar trends in their demographics, housing markets, and built environment.
[4] See the methodology section below for a detailed explanation of the longitudinal clustering algorithm as well as the statistical modeling conducted by the research team.
[5] The share of recently built housing stock is measured by the share in the total housing stock of housing built in the previous decade. For instance, the share of recently built housing stock in 2000 is the sum of all housing units built between 1990 and 2000 divided by the total housing stock available in 2000. For the year 2017, the share of recently built housing stock is equal to the sum of all housing units built between 2010 and 2017 divided by the total housing stock available in 2017.

has implications for the housing stock and may mean different priorities for census tracts. Finally, one's income impacts who can afford to live in a census tract.

Demographic factors are also relevant to the success of local programs. The success of programs offered by cities depends on recognizing the specific needs of residents. The race and ethnicity of the residents, for instance, might require changes in community outreach methods or in the mix of local recreational facilities. Similarly, the success of housing programs depends on the age and income of the residents because these characteristics affect how much residents can invest in the upkeep of their homes.

Housing costs affect how census tracts change because they determine who can afford to live there. Everything that shapes the perceived value of a census tract (public investments made in a census tract, existing market demand for its location, and the quality and nature of its housing stock) is capitalized into housing prices and rents. Housing costs in a census tract also impact residential tax base, which in turn determines the fiscal capacity of a community to address the changes taking place in its boundaries. The other characteristic of housing markets, housing tenure, shapes housing program priorities in an area.
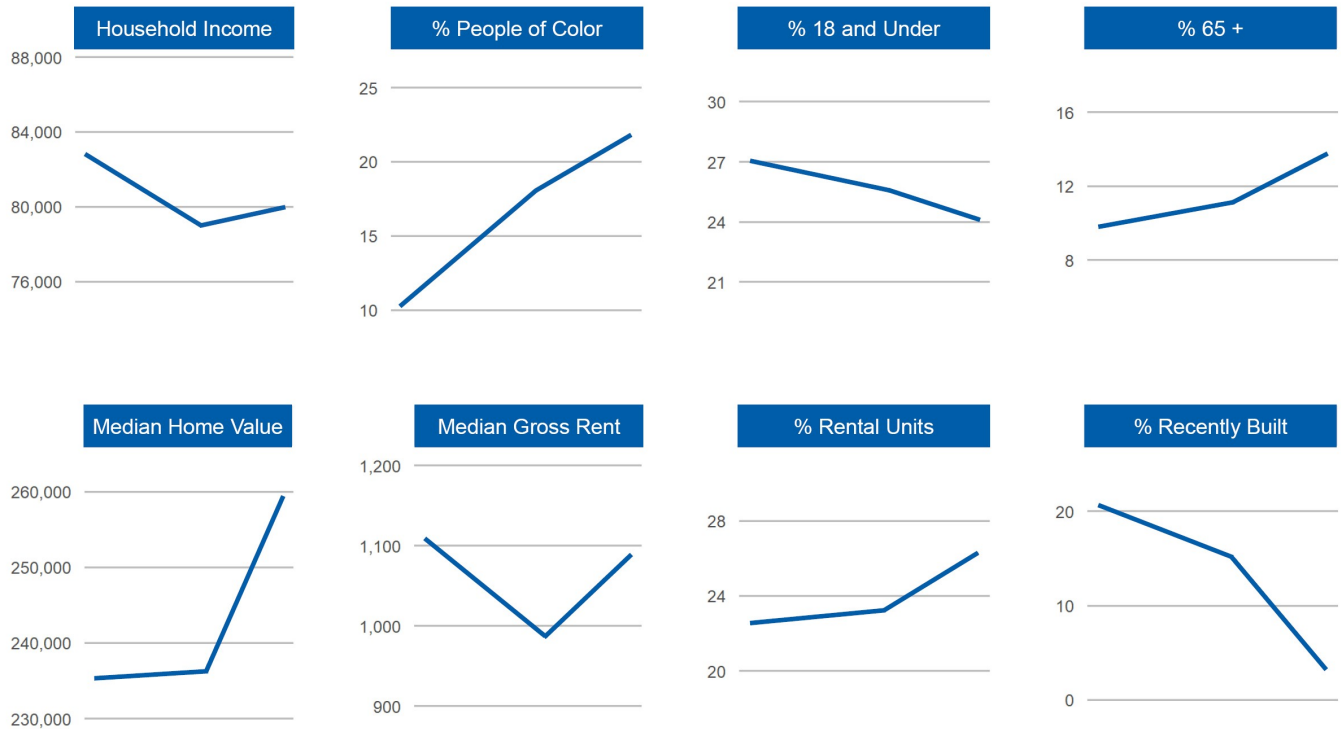
The built environment of a census tract also plays an important role in how it changes over time. For instance, suburban tracts that can accommodate greenfield development deal with different issues than more established census tracts with opportunities for only brownfield or infill development. The recent construction activity variable captures two important aspects of the built environment that directly affect change: the age of a census tract on the development spectrum and the strength of new construction activity in a tract's housing market. Built environment, which impacts the infrastructure needs of a census tract, also influences its investment priorities.

The longitudinal clustering algorithm identified seven different types of change. Council staff named each type with a letter to distinguish them in a way that avoids normative descriptions of the types. They then assigned each census tract to a distinct type, mapped the types, and examined their spatial distribution across the study area. The team then created narratives describing the specific changes each type experienced between 2000 and 2017. Staff also used the contextual variables as part of the cluster analysis to enrich and fine tune these narratives. The narratives focused on the factors that produced the specific types of change in each type and differentiated the types from one another.

The research team held focus groups with the Council's regional planning staff, private housing developers, county and city officials, the Metropolitan Land Use Advisory Committee and the Housing Collaborative Institute members to confirm if the assignment of census tracts to specific types was valid. Based on the regional and local knowledge of these focus group participants, they investigated and verified the degree to which these change patterns aligned with the types to which they were assigned. Staff also gathered information on other types of change observed by the focus group participants and revised the narratives in response to their feedback.

The seven distinct types of change took place within the context of larger trends that shaped the study area. Figure 1 summarizes these trends. Between 2000 and 2017, the share of people of color, the share of residents who are 65 or older, and the share of rental units steadily increased in the study area. In contrast, the share of residents who are 18 or younger and the share of recently built housing stock decreased from 2000 to 2010 and from 2010 to 2017. Meanwhile, after declining from 2000 to 2010, study area median income and median home value picked up between 2010 and 2017. Finally, study area median gross rent, which declined from 2000 to 2010, started going up between 2010 and 2017.

Figure 1: Regional Trends

Household Income
88,000
84,000
80,000
76,000

% People of Color
25
20
15
10

% 18 and Under
30
27
24
21

% 65 +
16
12
8

Median Home Value
260,000
250,000
240,000
230,000

Median Gross Rent
1,200
1,100
1,000
900

% Rental Units
28
24
20

% Recently Built
20
10
0

Types of Change

The narratives summarized below describe in detail how different combinations of demographic, housing market, and built environment factors produced seven distinct types of census tract change. Figure 2 shows the types of change census tracts experienced in different parts of the region.[6] Each narrative emphasizes the factors that produced change and distinguished the types from one other and lays out the opportunities and challenges presented by each type of change.[7]

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[6] A dashboard that includes an interactive version of this map can be found at https://metrocouncil.org/Communities/Planning/Local-Planning-Assistance/Suburban-Change-in-Twin-Cities-Region/SNC.aspx

[7] While there are similarities between types, the cumulative difference of all characteristics is what makes each of them stand apart.

Figure 2: Types of Change

Legend:
- Type A
- Type B
- Type C
- Type D
- Type E
- Type F
- Type G
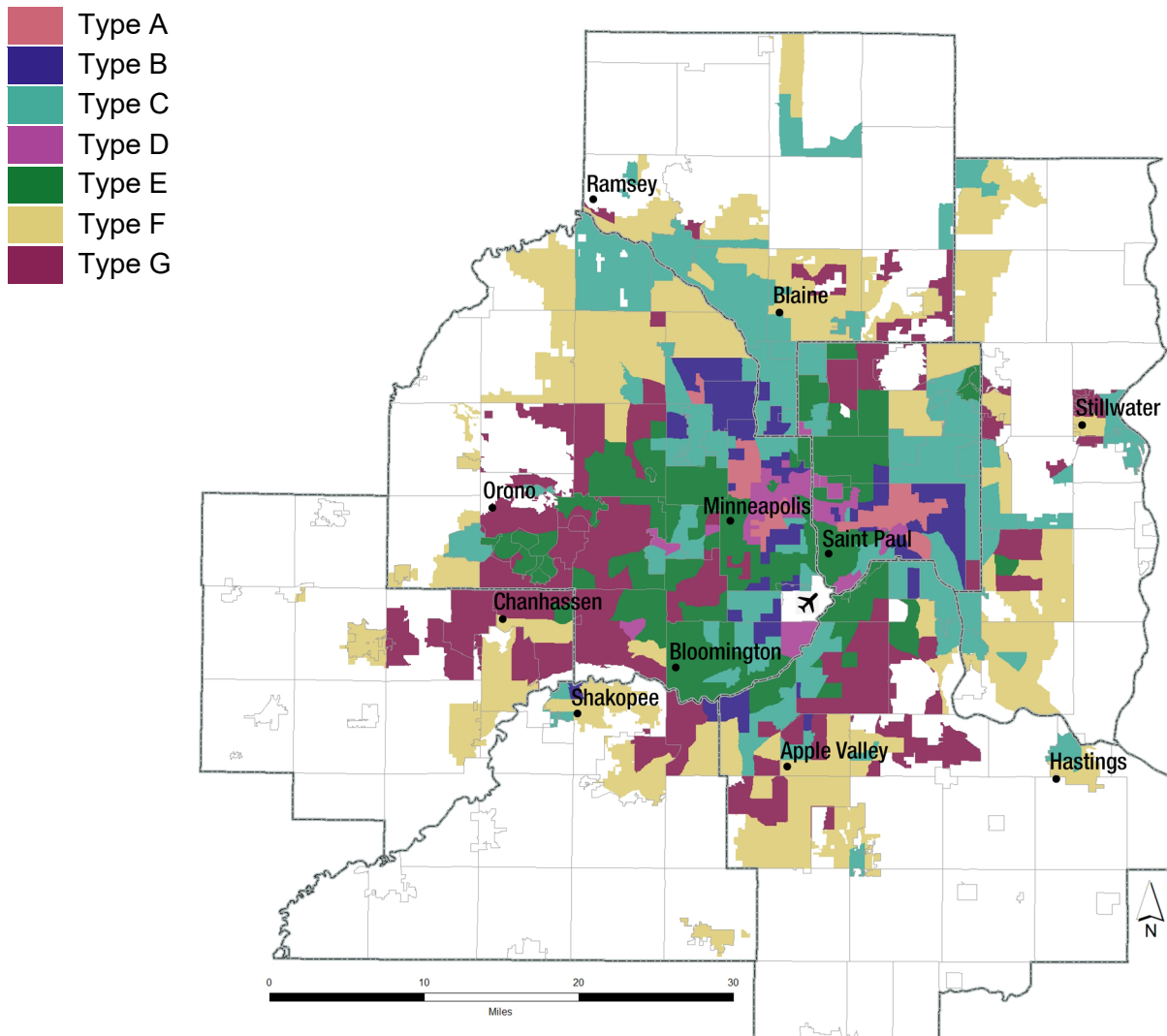
Type A

There were only two suburban census tracts in this type, and both were in the City of Brooklyn Park.[8]

Demographic trends and housing market dynamics set the tone of change in Type A census tracts. Race, age, poverty, and housing tenure in Type A tracts distinguished them from other types.

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[8] All but two of the 53 Type A of tracts in the region were in St. Paul and Minneapolis. Despite being outside the study area, these urban tracts inform the characteristics of Type A tracts as a whole. However, this discussion only focuses on the suburban portion of Type A tracts in Brooklyn Park and highlights the differences between suburban and urban Type A tracts, when such differences exist.

Type A census tracts were established communities of color with the highest shares of people of color in the study area. Unlike the urban Type A tracts, where the shares of people of color remained high and steady, suburban Type A tracts experienced continuous growth in the share of people of color. By 2017, suburban Type A tracts had the highest share of people of color in the study area.

Type A was the only type where generational transition had already happened; in other words, younger families with school-age children replaced older households. The share of senior residents, which was the lowest among all types, remained roughly the same, and the share of school-age children, which was already the highest among all types, continued to increase.


Type A census tracts had the highest rates of poverty among all types. Having spiked during the recession, poverty rates barely declined after the recession. These tracts had the lowest median incomes among all types in all three time points. Median incomes, which declined significantly by the end of the 2000s, remained the same during the 2010s.

The housing stock in Type A tracts continued to have the highest share of rental properties among all types. Median rents, which were the lowest among all types, decreased during the 2000s and started going up during the 2010s.The housing stock of Type A tracts was the most affordable in the study area. Median home values, which declined sharply during the recession, bounced back to some extent—although not to pre-recession levels. Type A tracts had limited construction activity, which took place in the undeveloped parts of Brooklyn Park.

Given the fact that four out of five residents in Type A tracts are persons of color, these communities can take advantage of the opportunities that their unique demographics present. For instance, strategic place-making investments that leverage the cultural assets of the residents can boost private investment in Type A tracts. Similarly, supporting and attracting businesses oriented toward the needs of a more racially diverse clientele might not only enhance the economic standing of these areas, but also appeal to the changing preferences of the residents.

In Type A tracts, where school-age children already make up a third of the population, youth-oriented services can be important for meeting the needs of the growing number of families with school-age children. Youth engagement programs as well as recreational facilities for youth can supplement after-school activities and provide enrichment opportunities for students who might not otherwise have access to these opportunities.

High concentrations of poverty present many challenges in Type A tracts, where half of the residents live in poverty. These tracts can benefit from small area community development plans. Ensuring the vitality of these census tracts might require public subsidies that can help stimulate market demand in these areas. Communities with Type A tracts can also partner with school districts and counties to streamline anti-poverty programs and to provide workforce development and job search assistance services.
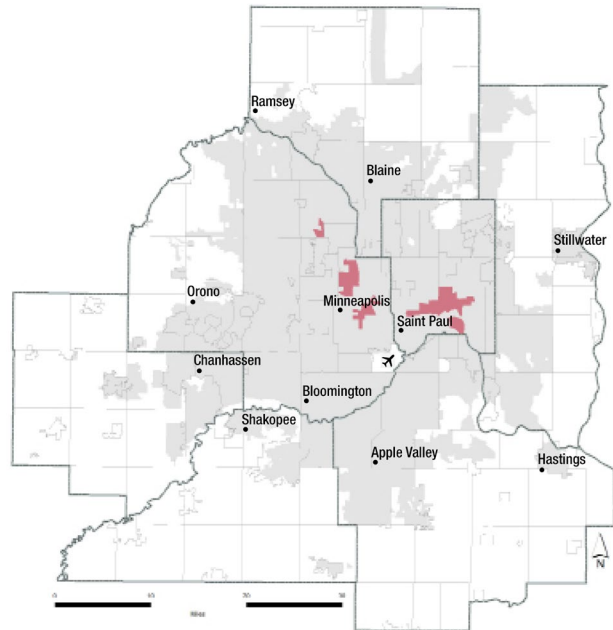
Robust rental inspection programs can help ensure a high-quality rental housing stock in Type A tracts, where rental properties make up nearly four fifths of the housing stock. Since increasing rents have made housing less affordable for renters, residents of Type A tracts can also benefit from affordable housing strategies specifically tailored toward renters. Communities with Type A tracts can also diversify their housing stock through first-time homeowner assistance programs, which can help residents build wealth over time.

Type B

Type B tracts were mostly located in older, inner-ring suburban areas such as Columbia Heights, Fridley, Brooklyn Center, Brooklyn Park, Roseville, Richfield and Bloomington with a few exceptions in outer suburbs such as Shakopee, Savage, Apple Valley, and Eagan.

Demographic trends and housing market dynamics were the main factors that influenced change in Type B census tracts. Race, age, poverty, and median home values were the characteristics that distinguished Type B tracts from others.

Racially, Type B tracts had the second highest share of people of color and this share increased the fastest among all types. The age profile of Type B tracts revealed that they were just beginning to go through generational transition. In these tracts, the share of senior residents stayed roughly the same while the share of school-age children slightly increased.
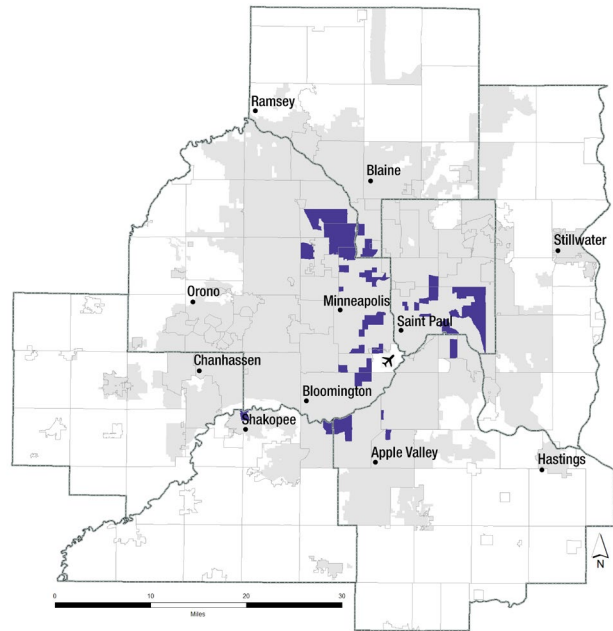
Poverty rates in Type B at all three time points were the second highest in the study area; in 2017, one in three residents lived in poverty. Poverty rates in Type B census tracts increased significantly between 2000 and 2010 and barely declined during the 2010s. Median incomes were the second lowest in the study area at all three time points. Like in most of the study area, median household incomes declined during the recession and did not increase much after the recession.

The trajectory of median home values in Type B tracts stood out. Unlike in many other types of tracts, where home markets either started recovering or already bounced back significantly, in Type B tracts home values were especially slow to recover from the recession. Median home values were the second lowest among all types. Rents in these census tracts declined during the 2000s and started increasing during the 2010s. Type B tracts experienced the slowest construction activity among all types.

Planning needs of Type B census tracts are likely to change as the demographics of their residents change. Growing racial and cultural diversity can present new opportunities for these tracts. For instance, place-making investments, such as public spaces and artist programs, that aim to create culture-specific hubs can capitalize on the cultural assets of these census tracts. Changing preferences and needs of the residents might also require different types of investments. For instance, retooling existing recreational facilities to build soccer fields in addition to baseball diamonds may be one way of meeting resident demand.

If recovery from the recession remains slow, Type B census tracts might face the risk of deterioration. Maintaining the quality of housing is essential for fending off this risk. Since these census tracts are in the middle of generational transition and have modest incomes and high poverty, they might face issues related to deferred maintenance. Housing rehabilitation, maintenance, and weatherization programs might help residents catch up with deferred maintenance and enable home improvements necessary to maintain the quality of housing in Type B tracts. Since increasing rents have made housing less affordable for renters, residents in Type B tracts can also benefit from affordable housing strategies specifically tailored toward renters.

Type C

Type C tracts were historically white, working class areas with an affordable housing stock that was built mostly between World War II and the 1970s.

Housing market dynamics and demographic trends shaped the types of change in Type C tracts. Home values, race, age, and economic characteristics of these tracts distinguished them from other types.

The housing stock of Type C tracts was very affordable: median home values in Type C tracts remained below the study area medians at all time points. However, recovery from the recession had yet to occur. Rents, which remained below the study area medians, started increasing in the 2010s.
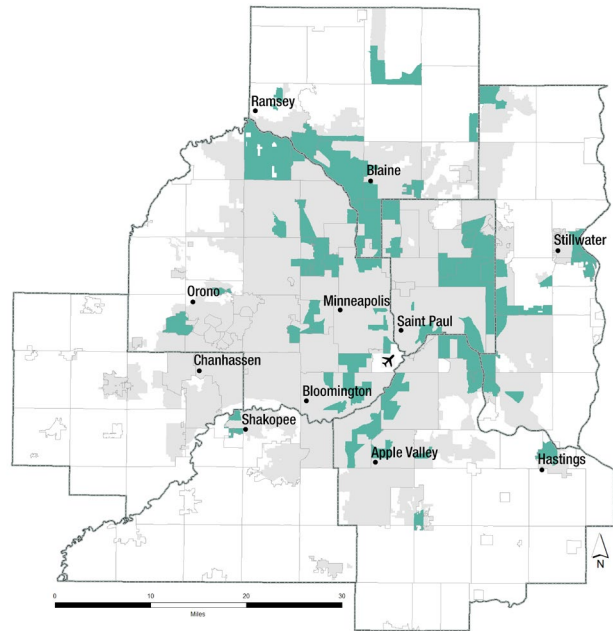
Even though the population of Type C tracts barely grew, its racial composition changed significantly. While Type C tracts remained predominantly white until the 2000s, they experienced a steady inflow of residents of color during the study period. The share of people of color in these tracts reached the study area median by 2017.

The distinct housing stock of these tracts shaped their demographic characteristics to a large extent. Single-story rambler homes made up most of the housing stock in Type C tracts. This type of housing, known for its single-story, age-friendly architecture, was affordable to people on fixed incomes. This allowed senior residents to age in place and delayed generational transition. The share of senior residents in these tracts was very high and continued to increase, while the share of school-age children gradually declined.

The housing stock of Type C tracts also shaped the economic makeup of these tracts. The affordability of the housing stock allowed residents with moderate incomes to live in these tracts. Income trends in Type C tracts mirrored the trends in the study area: median household incomes finally stabilized after a sharp decline during the 2000s.

Type C tracts stood out in terms of their poverty trends. The poverty rates in these tracts continued to increase even as they were declining elsewhere in high-poverty census tracts. Poverty rates increased in other types of tracts as well. Yet, none of these other types faced the rapidly growing concentration of poverty that Type C tracts experienced.

Construction activity in Type C tracts remained slower than the activity taking place in the study area.

Given the older housing stock in these census tracts, maintaining the quality of housing is essential to the recovery of home values. Since these census tracts have modest incomes and growing numbers of fixed-income retirees, they might face issues related to deferred maintenance. Housing rehabilitation, maintenance, and weatherization programs might help residents catch up with deferred maintenance and enable home improvements necessary to maintain the quality of housing in Type C tracts.

The growing share of older adults in these census tracts might require senior housing options that are not limited to single-family residences. Diversifying the stock of senior housing by encouraging senior housing complexes might be a good strategy to meet the needs of older adults who might increasingly be in search of lower-maintenance housing options. Additional senior programming and efforts to create age-friendly communities can also help serve the needs of the growing senior population in Type C tracts.

Planning needs of Type C census tracts are likely to change as these tracts become more racially and ethnically diverse. For instance, the changing racial and ethnic profile of these tracts might require changes in community outreach methods. Alternative methods of outreach can include distribution of city documents in different languages and the provision of interpreters in public meetings to make sure that the opinions of residents whose primary language is not English can be represented adequately in these meetings.

Given the rapidly growing poverty rates in Type C tracts, communities with Type C tracts might benefit from taking proactive measures to curb growing poverty. People-based anti-poverty strategies such as workforce development efforts and job search assistance can improve the employment opportunities of residents and prevent them from falling into poverty. Place-based strategies such as small area revitalization programs might help ensure the vitality of locally owned businesses.

Type D

Type D tracts were in areas such as Bloomington, Eden Prairie, Hopkins, St. Louis Park, St. Anthony, Falcon Heights and Lauderdale.

Housing market characteristics and demographic trends shaped the types of change taking place in Type D census tracts. The rent tenure of these tracts as well as the racial and economic makeup of their residents distinguished Type D tracts from others.

Type D tracts stood out in terms of their exceptionally high percentages of rental units— the second highest in the study area. Median gross rents, which were relatively affordable compared to the rest of the study area, increased more than most types during the 2010s after declining between 2000 and 2010.
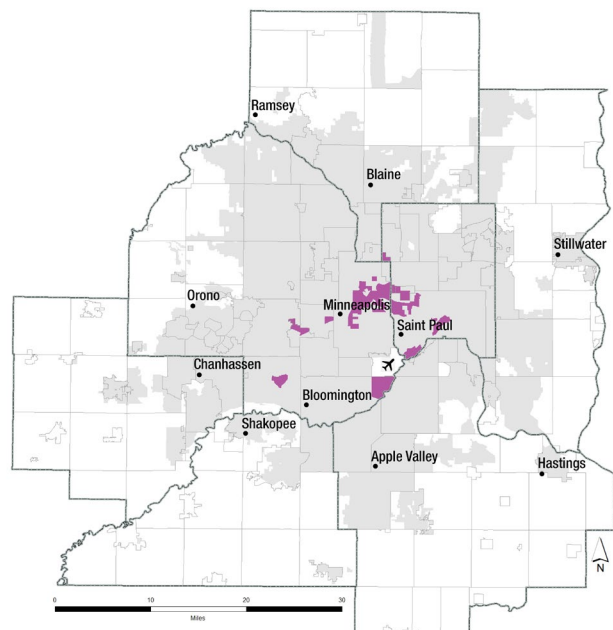
Housing markets in Type D census tracts were the fastest to recover from the recession. Median home values, which remained above the study area medians between 2000 and 2017, bounced back to pre-recession levels, after declining significantly during recession.

The demographics of suburban and urban tracts differed in Type D areas.[9] Suburban Type D tracts had shares of people of color well above the study area medians and they continued to become more racially diverse. The share of people of color increased rapidly, especially in Hopkins, St. Louis Park and Eden Prairie.

Changes in the population of residents with limited English proficiency in Type D tracts suggests that these areas became immigrant hubs within the study area. In these tracts, the share of residents with limited English proficiency was a lot higher than the study area medians at all three time points. Moreover, this increase was the highest among all types in the study area.

Poverty in Type D tracts decreased significantly during the 2010s after increasing during the 2000s. In fact, the decline in poverty rates in these tracts was the largest among all types. Despite this decrease, however, poverty rates in Type D census tracts were still above the study area median in 2017.

Residents of Type D census tracts had median incomes that were lower than the study area medians and the income trends in these tracts were consistent with the rest of the study area: median household incomes in these tracts declined during the 2000s and remained around the same level during the 2010s.

The share of school-age children in Type D tracts, which was the lowest among all types, stayed roughly the same during the study period. In contrast, the share of senior residents started increasing by 2010.

Construction activity in Type D tracts remained limited, yet stronger than in most types during the 2000s. Since 2010, construction declined significantly as it did in the rest of the study area.

Given the high percentage of rental properties in these areas, robust rental inspection programs can help ensure a high-quality rental housing stock. In addition, first-time homeowner assistance programs can help diversify the housing stock in these areas. Facing higher than average increases in rents, residents in Type D tracts can especially benefit from affordable housing strategies tailored toward renters. Fair housing resources and services can help low-income renters avoid housing discrimination.

In Type D tracts, growing racial and cultural diversity can bring changes in the needs of the residents. To meet these needs, communities might, for instance, offer multicultural services and cultural liaisons to facilitate equitable access to city services. Similarly, encouraging more diverse housing types to accommodate the preference of immigrant families for multigenerational living might help meet the unique housing needs of new residents in these immigrant hubs.

The combination of unchanging incomes, high poverty rates, and increasing rents might make housing precarious for many of the residents in Type D tracts. These residents can benefit from housing

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[9] Majority of the Type D tracts were in St. Paul and Minneapolis. Almost all of these urban tracts were places where college students comprised most of the population. In contrast, only two suburban census tracts—Lauderdale and Falcon Heights—had high percentages of college students. Overall, Type D suburban tracts had very different demographics than those dominated by college students.

assistance services that can help them stabilize their living conditions. Workforce development programs and services to support residents in search of employment can also help some of the most vulnerable residents in Type D census tracts.

Type E

Type E tracts were in areas that were near transportation networks and established job centers.

Built environment trends and housing market dynamics impacted the types of change taking place in Type E tracts. Infill development and structure of the housing markets were among the distinctive characteristics of these tracts.

Despite being mostly developed, Type E tracts had noticeable construction activity. Most of the construction took the form of large-scale, high-density infill development and redevelopment, especially in areas with easy access to jobs. For example, Golden Valley and parts of St. Louis Park along the I-394 job corridor and the Southdale area in Edina attracted clusters of large-scale apartment projects. Similarly, Roseville experienced high-density infill development, primarily in the form of senior housing.
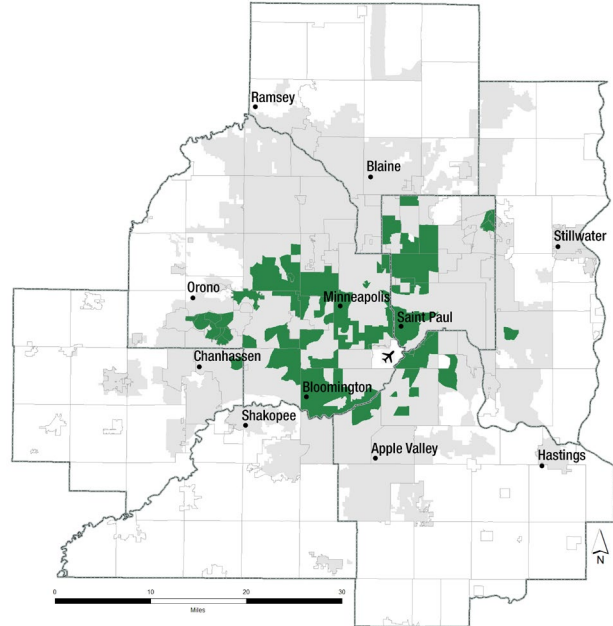
Housing markets in these tracts were distinct. Infill development contributed to a growing rental market since a significant portion of this development involved the construction of expensive high-density apartment complexes. Median home values and gross rents in Type E tracts remained above the study area medians during the study period. While housing markets in these tracts bounced back from the recession, home values had not yet returned to pre-recession levels. Median gross rents, however, started increasing after the recession after a sharp decline during the 2000s.

Type E tracts had the highest and most rapidly increasing share of seniors in the study area and population in these tracts did not change much. These characteristics indicated some degree of aging in place in Type E census tracts. High-density infill development that came in the form of multifamily apartment buildings and senior housing complexes probably provided options for older adults who wanted to remain in their communities.

The share of people of color, which remained below the study area median, continued to increase during the study period. Type E tracts, which already had a highly educated population, experienced an influx of residents with graduate/professional degrees. Economically, incomes remained above the study area medians. In contrast, poverty levels remained below the study area medians at all three time points.

Careful planning of large-scale, high-density infill and redevelopment projects offer multiple opportunities for improving the built environment of these census tracts. Smooth integration of new projects into the existing fabric of these tracts could be occasions for increasing walkability, enriching the streetscape, and ensuring the continuing vitality of Type E census tracts. Integration of new projects

into the existing infrastructure might also introduce some challenges that could be resolved by proactive planning of infrastructure investments in these areas.

The proximity of Type E tracts to established and growing job centers and their high-density development patterns make them good candidates for transit and transit-oriented development (TOD). TOD strategies can not only catalyze further investment in these areas and present new opportunities for stimulating the local economy, but also create places where residents live, work, and play. Such places can also serve the needs of older adults who might want to be less auto dependent.

Given the high and increasing population of senior residents in Type E tracts, there may be demand for senior housing that is not currently served. Housing programs that help make homes physically more accessible to older adults might help meet the needs of older residents who might not want to downsize their living quarters. Programming for older adults including volunteer opportunities could also be useful to meet the changing needs of residents in Type E tracts.

Type F

Type F tracts were in the mostly exurban parts of the study area such as Shakopee, Woodbury, Blaine, Lakeville and Maple Grove.

Built environment dynamics and demographic trends shaped the specific types of change that took place in Type F areas. Their development patterns and age profiles distinguished Type F tracts from other types in the study area.

Type F areas stood out in terms of the high rate of development—the highest in the study area— they experienced since the 1990s. While development activity slowed somewhat during the 2000s, residential construction in these areas remained well above the study area medians in 2000 and 2010. Since Type F tracts were among the most recently developed areas, most of the construction activity took the form of greenfield development.
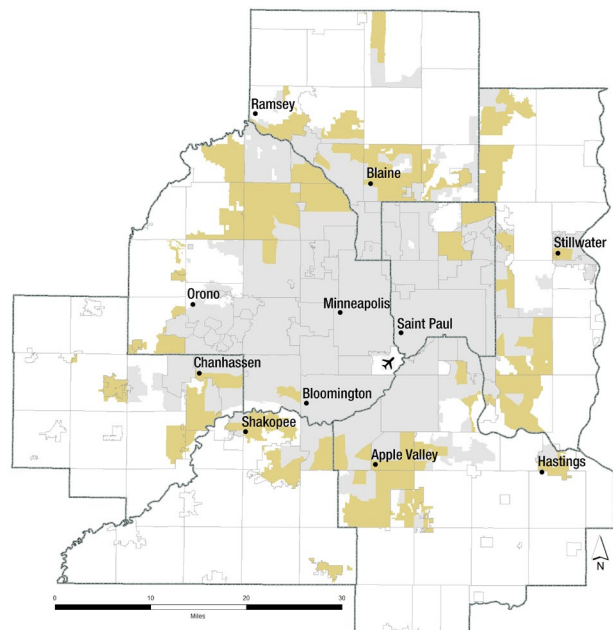
Strong construction activity in Type F tracts went hand in hand with rapid growth in population. These tracts experienced the highest rates of population growth, mostly due to an inflow of families with school-age children. Population in these areas remained on the younger end of the spectrum: Type F tracts continued to have the second highest share of school-age children and the second lowest share of senior residents during the study period.

The share of people of color in Type F tracts remained the second lowest among all types despite some increase in racial and ethnic diversity. Median household incomes in Type F areas stayed above the study area medians and these areas continued to have the second lowest poverty level in the study area.

Median home values, which declined during the 2000s, started increasing during the 2010s but had not yet bounced back to pre-recession levels. Rents, which were the second highest in the study area,

started going up in the post-recession period. Type F tracts had the second lowest share of rental units among all types.

Since Type F tracts experienced the fastest growth in terms of population and home construction, keeping up with the infrastructure needs is likely to be a challenge for them. This is especially the case in areas where growth took the form of greenfield development. These tracts can benefit from strategic and proactive planning of investments in storm water infrastructure, sewer connections, and preservation of natural resources. Planning for active recreational facilities such as practice fields as well as providing youth-oriented programming can help serve the younger population of Type F tracts.

Communication and coordination with school districts regarding the siting of new schools can be a vehicle for shaping future growth in Type F tracts. In rapidly growing, younger communities with abundant opportunities for greenfield development, school sites impact not only the location of new housing developments, but also the traffic patterns within the community. It might also be useful to focus on connecting new subdivisions to the rest of the community to ensure street connectivity.

Since rents in these areas have been high and increasing, it might make sense to encourage the construction of rental properties to keep housing markets affordable for renters. In fact, given the low share of rental units in Type F tracts, communities with these types of tracts could benefit from diversifying their housing stock by allowing higher density developments in order to ensure that residents at all income levels could afford to live in these areas.

Type G

With some exceptions, Type G tracts were mostly outside the I-494 and I-694 ring, in the exurban parts of the study area in communities such as Shoreview, Lino Lakes, Plymouth, Minnetonka, Savage, Shakopee, Prior Lake, Apple Valley, Rosemount, Lake Elmo and Stillwater. Most of these tracts had or were near natural amenities such as lakes, parks and other bodies of water.

Built environment trends and demographic dynamics were the main factors that changed Type G tracts. Their development patterns and their age and income characteristics made them stand out among other types.

Type G tracts experienced strong construction activity and development remained above the study area levels during the 1990s. The share of recently built housing stock was especially high—the second highest in the study area—in 2000, suggesting that most of the construction activity in Type G took place during the 1990s. While this share dipped below the study area median from 2000 to 2010, significant construction activity took place during the 2000s, although at a slower pace than in the 1990s. Between 2010 and 2017, in the post-recession period, construction activity in Type G tracts almost came to a complete halt as it did in the rest of the study area.

The age profile of Type G tracts was closely aligned with the development patterns in these areas. The share of school-age children peaked in 2000 after the big burst of development during the 1990s,
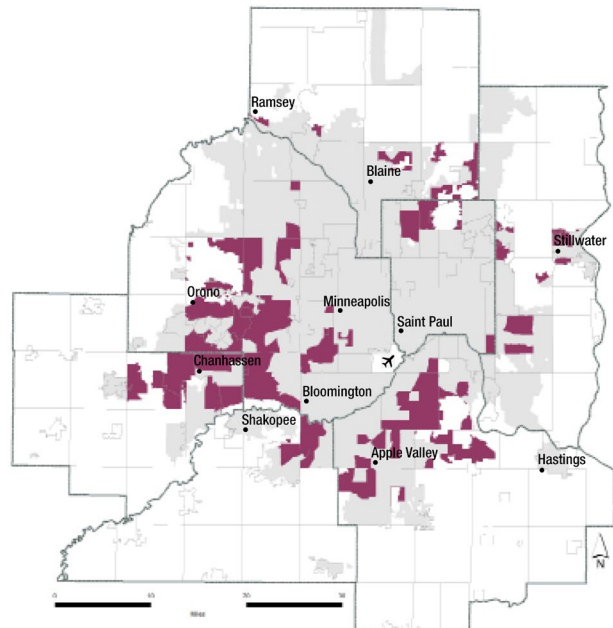
suggesting that most of the population growth during that time came from the inflow of families with school-age children. A similar but somewhat slower pattern of growth occurred during the 2000s: the inflow of families with school-age children fueled growth but at a slower rate. The share of school-age children in Type G tracts continued to decline as development dropped to almost nothing during the 2010s. Despite this overall decline, however, Type G areas continued to have some of the highest shares of school-age children in the study area.

Type G tracts also stood out in terms of their income. Overall, these tracts were the study area's most affluent tracts; their median household incomes remained the highest in the study area at all three time points. Even after the sharp declines in median household incomes during the 2000s, median household incomes in Type G tracts remained well above the study area medians. Racially, Type G tracts remained predominantly white. In fact, these tracts had the lowest percentages of people of color among all types at all three time points. These areas also experienced the smallest increase in racial diversity during the study period.

Type G tracts continued to have the most expensive housing stock throughout the study period. Housing markets fully recovered from the recession; in fact, median home values in 2017 exceeded the pre-recession values. Median gross rents in these areas remained the highest in the study area and rents started increasing after a sharp decline during the recession. These tracts continued to have the lowest share of rental units in the study area.

Since Type G tracts experienced significant growth in terms of population and home construction, meeting the infrastructure needs of these areas might potentially be challenging. This might especially be the case in areas where growth took the form of greenfield development. These tracts can benefit from strategic and proactive planning of investments in storm water infrastructure, sewer connections, and preservation of natural resources. Recreational opportunities that might capitalize on the proximity of these areas to natural amenities might also serve the interests of the residents well in these tracts.

As the share of school children continue to decline and the share of senior residents continue to increase, growing number of empty nesters might explore options for downsizing their homes. If residents choose to downsize in their communities, there may be demand for multifamily housing that is not currently served. Given the low share of rental properties in Type G tracts, these tracts could benefit from diversifying their housing stock to better serve the housing needs of their residents.
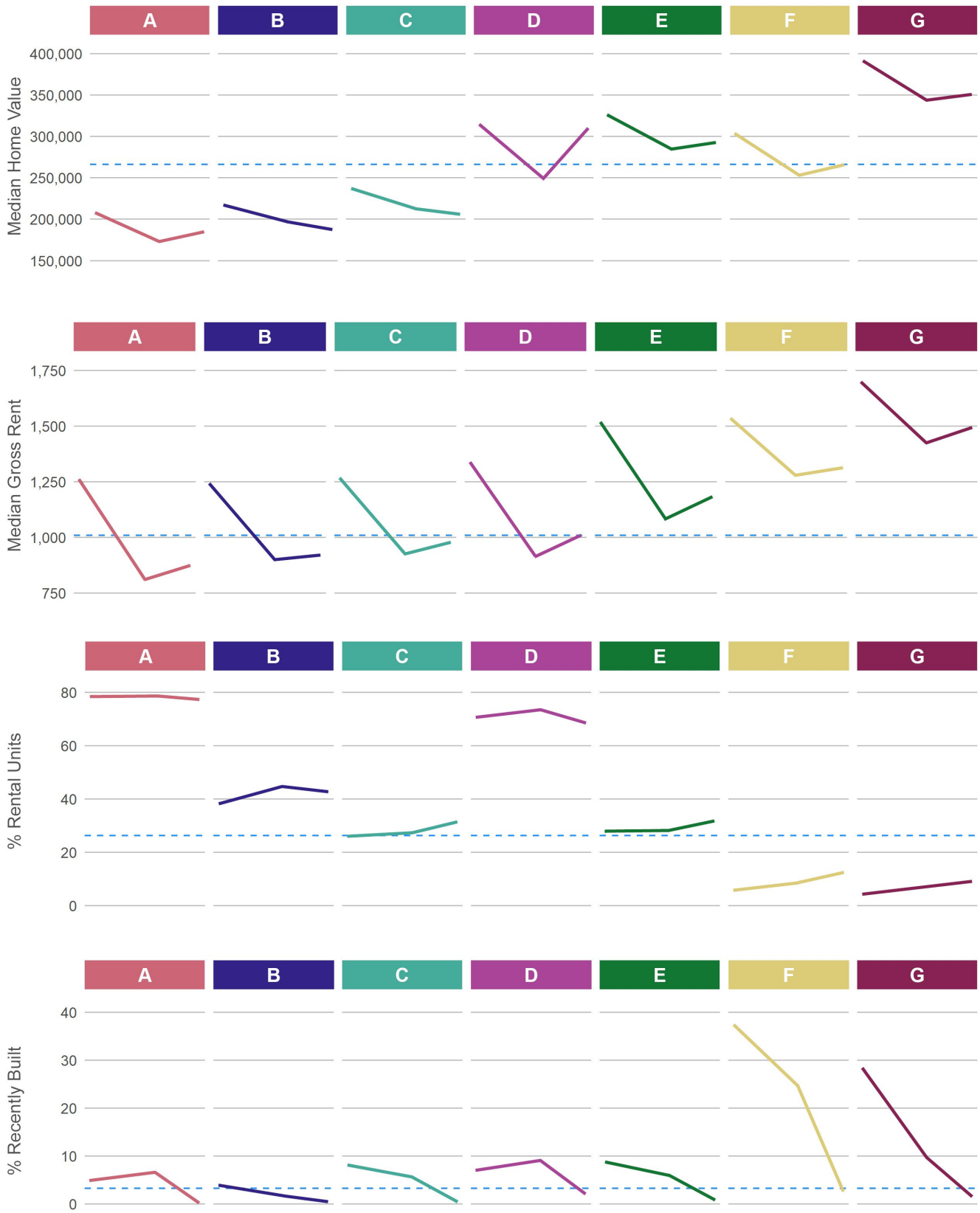
Figure 3 below summarizes how the demographic, housing market, and built environment characteristics of each type changed between 2000 and 2017.

Figure 3: Demographic, Housing Market, and Built Environment Trends by Type
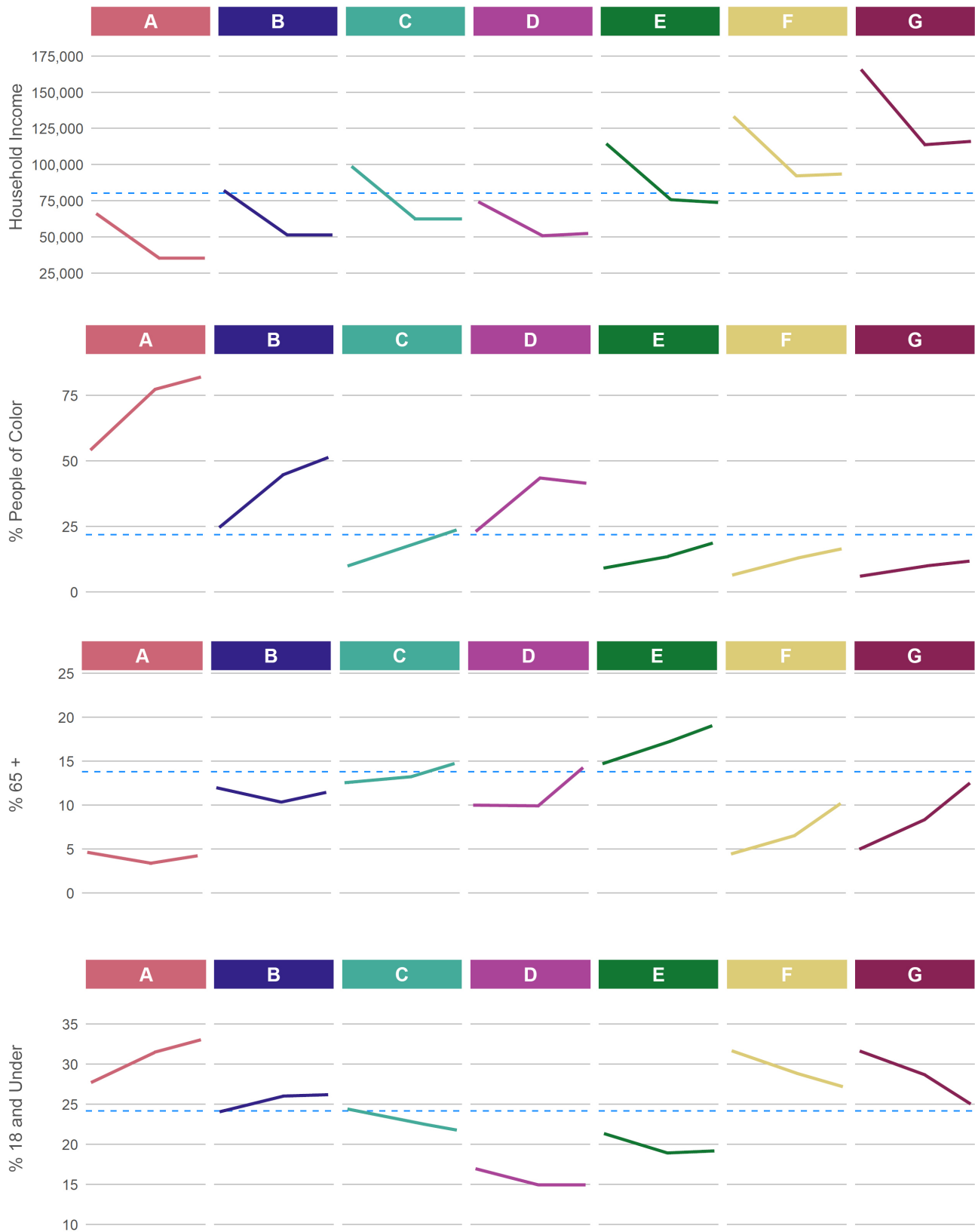
Figure 3 (Continued): Demographic, Housing Market, and Built Environment Trends by Type

Methodology

The goal of this study is to explore changes taking place in small areas in the Twin Cities suburbs. Analyses of small area change have mostly focused on central cities and have been framed within the binary of gentrification versus decline. This study intends to break out of this binary framework to explore the multiple ways small areas in the Twin Cities suburbs changed between 2000 and 2017. It focuses on two types of change: changes in specific small areas and types of small area change across the region.

In this study, small area refers to a census tract. While it would have been much more valuable to planners to investigate changes at a smaller geography, the margins of error at the block-group level are significant enough to make the data unreliable and to undermine the accuracy of the analysis. While using census tract level data makes sense in terms of accuracy, the choice of census tracts as a representation of small areas has some limitations.

The size of census tracts can change significantly from community to community. Census tracts can be as large as a city, and sometimes even larger than one city, especially in the less densely populated parts of the region. When census tracts are this large, they are not good proxies for small areas. Yet, in most cases, census tracts are smaller geographies than cities and they can be a useful unit of analysis while examining the dynamics of areas smaller than cities or townships.

The geographic scope of this study extends to the counties within the Metropolitan Council's jurisdiction: Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington. The study area covers the suburban portions of the seven-county metro area that are within the Metropolitan Urban Service Area (MUSA). It includes all the census tracts where at least 30% of the land is within the MUSA. St. Paul and Minneapolis are outside the scope of this study.

Small area change analysis involved three phases. In the first phase, Council staff identified the traits that define small areas and distinguish them from others. In the second phase, they examined small area changes between 2000 and 2017 by looking at data from three time points (2000, 2010, 2017). Finally, in the third phase, Council staff classified the types of change small areas experienced by using a longitudinal cluster analysis.

The project team for this study included regional planners, policy analysts, researchers, and GIS specialists. Team members collaborated to identify the characteristics that define a census tract and distinguish it from others. Extensive discussions among team members informed by a comprehensive literature review rendered a list of 23 characteristics and 40 measures that captured these characteristics. After collecting data on these 40 measures, team members conducted a spatial analysis and used statistical techniques to eliminate the variables that did not distinguish small areas from one another.[10] The research team used 22 of the 40 variables in the analysis.[11]

In the second phase of the study, the research team prepared the data for analysis across three different time points: 2000, 2010, and 2017. The longitudinal analysis of census tracts required standardization of census tract boundaries over time because some census tract boundaries changed

[10] Data sources included the American Community Survey, the Metro GIS Regional Parcel dataset, and several Metropolitan Council datasets including the Annual Population and Housing Estimates, the Annual Manufactured Home Park Survey, the Generalized Land Use Inventory and the Transportation Forecast Model.
[11] See Table 1 below for a list of these variables.

following the 2010 Census. Since both the 2010 and 2017 data were based on the 2010 census tracts, the team converted the 2000 data to 2010 census tract boundaries.

The team used 2000 Census block group data to convert the 2000 tract boundaries to the 2010 tract boundaries. For 2000 block groups that spanned multiple 2010 tracts, the team apportioned 2000 block groups across 2010 tracts in proportion with the share of the 2000 block group's total population that was inside the 2010 tract boundary. The team determined these shares by using both block-level data from the 2000 Census and the Census Bureau file which converted 2000 tracts to 2010 tracts. Council researchers used these normalized datasets to conduct the cluster analysis.

In the third phase, the team grouped the types of change census tracts experienced by using a cluster analysis. Researchers traditionally use cluster analysis to group data (in this case types of change that took place in census tracts) with common characteristics into clusters. In this study, cluster analysis identified group similarities based on 22 variables and each cluster included a group of census tracts that shared similar types of change.

Since the goal was to classify census tract trajectories over time, the research team used a longitudinal clustering method called KmL3D.[12] This method, which is a version of the K-means method of clustering, is specifically dedicated to clustering joint-trajectories of multiple variables. Research staff conducted the clustering analysis by using an open-source software package called R. The R code used to conduct the clustering analysis is available upon request.

After completing the cluster analysis, research staff identified the variables that were most important in distinguishing the clusters with the help of a Random Forest Model.[13] This process, which involved using all clustering variables to predict cluster assignment, revealed the variables that were most important in assigning a census tract to one cluster as opposed to another.

Of the 22 variables that went into the cluster analysis, eight differentiated the clusters from one another. These variables were: share of people of color; share of total population age 65 or older; share of total population age 18 or younger; median household income; median home value; median gross rent; share of rental units in total non-vacant housing stock; and share of housing units built in the previous decade in the total housing stock.[14] In addition to these eight variables, the team also analyzed four

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[12] See Christopher Genolini et al., "kml and kml3d: R packages to cluster longitudinal data." *Journal of Statistical Software*, vol. 65, issue 4, 2015. (available at https://www.jstatsoft.org/article/view/v065i04). It is important to note that the longitudinal clustering algorithm used St. Paul and Minneapolis tracts as well as the suburban tracts in clustering the types of census tract change. This is the case because dynamics taking place in St. Paul and Minneapolis are spatially interdependent with the changes taking place in the suburbs. Despite being part of the clustering process, however, St. Paul and Minneapolis tracts were removed from the final analysis.

[13] Research staff chose a random forest model not only because of its high accuracy rates in prediction but also because of the ease of extracting the algorithm's probabilistic predictions for each observation.

[14] The share of recently built housing stock is measured by the share in the total housing stock of housing built in the previous decade. For instance, the share of recently built housing stock in 2000 is the sum of all housing units built between 1990 and 2000 divided by the total housing stock available in 2000. For the year 2017, the share of recently built housing stock is equal to the sum of all housing units built between 2010 and 2017 divided by the total housing stock available in 2017.

variables that provided further context for the nature of change taking place in each cluster. These variables included: education, limited English proficiency, population, and poverty.[15]

The data source for all but the population and median home value variables was the 2000 Census data and the American Community Survey (ACS).[16] The 2000 values for these variables came from the 2000 National Historical Geographic Information System (NHGIS) block group data.[17] The values for 2010 and 2017 came from the ACS 2006-2010 and ACS 2013-2017 datasets, respectively. The source of the population data was the Metropolitan Council's Annual Population Estimates and the source of the median home value data was the Metro GIS Regional Parcel Dataset.

The KmL3D longitudinal clustering algorithm produced seven distinct clusters. The research team named each type of change with a letter—Types A through G—to avoid normative descriptions of the types. The team then assigned each census tract to a distinct type and mapped each of these types.

Research staff created a narrative for each type of change based on the trajectories of the eight variables that distinguished clusters from one another. They enriched these narratives by using local knowledge and adding information about the four contextual variables. In addition to reporting the characteristics of change, each narrative includes a description of the unique planning challenges and opportunities presented by each type of change.

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[15] Note that the definition of the poverty variable used in this study corresponds to incomes less than or equal to 185% of the Federal Poverty Threshold.

[16] The research team inflated the 2000 and 2010 median home values to 2017 nominal dollars by using the Case Shiller housing cost index before they compared them with the 2017 values. In contrast, the team inflated the 2000 and 2010 median gross rent values to 2017 nominal dollars by using the Consumer Price Index (CPI) rather than the Case Shiller Index because the purchasing power of a renter is better captured by the CPI that reflects the cost of living for individuals and households. The team also used the CPI to inflate median household income figures in 2000 and 2010 before conducting a longitudinal analysis.

[17] Minnesota Population Center. National Historical Geographic Information System: Version 11.0 [Database]. Minneapolis: University of Minnesota.

Table 1: List of Variables

Demographic Variables

Age: Share of Total Population Age 65 or Older

Age: Share of Total Population Age 18 or Younger

Education: Share of Adults with a Bachelor's Degree

Education: Share of Adults with an Advanced Degree

Income: Median Household Income

Language: Share of Population with Limited English Proficiency

Population: Total Population

Poverty: Share of Residents with Incomes at or Below 185% of the Federal Poverty Level

Race: Share of non-LatinX Asian Residents

Race: Share of non-LatinX Black Residents

1Race: Share of Residents of Color

Race: Share of Residents with Two or More Races

Race: Share of non-LatinX Indigenous and Other Races

Race: Share of non-LatinX White Residents

Race: Share of LatinX Residents

Vehicle Ownership: Share of Households with No Vehicle

Housing Market Variables

Housing Costs: Median Home Value

Housing Costs: Median Gross Rent

Housing Tenure: Share of Rental Units in Total Non-Vacant Housing Stock

Manufactured Housing: Share of Households Residing in Manufactured Housing

Housing: Total Housing Units

Built Environment

Construction Activity: Share of Housing Units Built In the Previous Decade in the Total Housing Stock