November 2014

CHPC
NEW YORK CITY

MAKING NEIGHBORHOODS

Understanding New York City Transitions 2000-2010

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This project has been funded by New York Community Trust

I. INTRODUCTION

One of the central lessons from decades of urban revitalization efforts is that "place matters." Research has repeatedly demonstrated that neighborhood factors such as housing, education, employment, and the physical environment impact the health, safety, and future of residents (Harkness and Newman, 2002, 2003). But the definitions of "neighborhood" we use most often are based not on the traits of the people who comprise a community, but rather on old, and often outdated, geographic and political boundaries.

Government has many good reasons to create neighborhood boundaries. These lines facilitate the collection and organization of information. They help inform how government allocates resources and can reveal inequities and areas of need. However, these boundaries can also distort information, as they may not reflect the ways communities change over time.

The definition of "neighborhood" varies with its context. A neighborhood is more than its geographic boundaries—it also includes the socio-economic and ethnic characteristics of its residents. As summarized by Sampson et al in their extensive review of neighborhood-effects literature, "a neighborhood is a subsection of a larger community—a collection of both people and institutions occupying a spatially defined area influenced by ecological, cultural, and sometimes political forces."[1] As a result, the larger geographic areas often created to establish political representation actually consist of many sub-neighborhoods. Community district lines, for example, may obscure an emerging ethnic community that straddles districts. Yet census tracts, which are often the smallest unit for which data are available, do not encompass a large enough area to provide "neighborhood" indicators.

[1] Sampson et al (2002), p. 445.

A clear understanding of the interplay between demographics and community change at the neighborhood level is critical to policy and planning professionals. Nowhere is this need for clarity more important than in the housing arena, where the stock of units differs by neighborhood, and the attributes of owners and needs of renters can be vastly different. As the NYC Comptroller's report on housing affordability (2014) points out, "Now, with the winding down of one major housing initiative and the launching of another, it is appropriate to take stock of the City's housing circumstances, to evaluate the changes that have taken place in the city's housing ecology, and to outline strategies for future housing investment that are informed by the city's evolving housing landscape."[2]

Neighborhoods have unique demographic, housing, and market histories. This makes the neighborhood level the key unit of analysis in any evaluation of the effects of change. However, geographic boundaries drawn 30, 40, or 50 years ago rarely reflect current settlement patterns or capture the multi-dimensional nature of those neighborhoods. For example, in New York City, the 59 Community Districts created in the 1970s provide the overriding geographic framework for determining community needs. Yet, because these same neighborhoods have changed vastly over the last decades, their current geographic boundaries may not necessarily provide useful guidance for determining neighborhood needs in the second decade of the 21st century.

Since neighborhoods are dynamic entities, neighborhood transition is the norm in cities, particularly in New York. Therefore, understanding change at the neighborhood level is critical for making effective policy decisions. By looking at demographic shifts to better understand neighborhood settlement patterns, we can better identify the neighborhoods that are stable, those undergoing improvement, those at risk of declines in socioeconomic outcomes, and those where current changes signal the need for government attention. Housing displacement, overcrowding, illegal occupancy, increases in code violations, and

[2] The Growing Gap: New York City's Housing Affordability Challenge" (2014), p. 1

severe rent burdens and housing foreclosures are problems that are often associated with neighborhood change. Yet policy makers have done a generally poor job understanding and disseminating information about neighborhood-level change. In addition to housing policy, information about neighborhood change is useful to a host of other policy areas including education, small business development, youth programming, and senior services, to name just a few. Anecdotal information, hypotheses, and preconceived notions about what's happening in a neighborhood context do not form a solid foundation for developing new policy and program interventions. This study aims to lend empirical backing to future housing policy responses as well as provide the basic data for practitioners in other fields.

II. POPULATION CHANGE AT THE NEIGHBORHOOD LEVEL: BACKGROUND, REVIEW OF LITERATURE, AND OBJECTIVES OF THE STUDY

Objectives of the study

The goals of this research project are threefold:

1. Identify how patterns of neighborhood change between 2000 and 2010 translate into neighborhood-level shifts in key socioeconomic attributes:
    - Identify neighborhood-level demographic typologies in New York City.
    - Identify the main housing characteristics of each neighborhood type.
    - Look at shifts of neighborhood settlements and boundaries between 2000 and 2010:
        - expanding neighborhoods;
        - contracting neighborhoods;

- neighborhoods that do not change in size.

  - Create a series of matrices and maps to identify those patterns that represent the most important neighborhood transitions.

2. Provide community stakeholders (elected officials, government agencies, non-profit organizations, business interests, and community residents) with focused information about the demographic trends in NYC's neighborhoods.

3. Disseminate information regarding the analytic model of neighborhood transition to provide other cities and jurisdictions with a replicable model for identifying changes in their communities.

Data sources

The study draws on a number of sources of information about demographics over time. Critical to it is, of course, the U.S. Census. The 2000 and 2010 Censuses are utilized. In addition, because the 2010 Census no longer collected some fields needed for our study, we utilized the 2011 American Community Survey (ACS, also a project of the U.S. Census Bureau) tract-level five-year averages to incorporate the following variables into the study: percent foreign-born persons; percent persons 25 years and older with college degree and more education; median income as percent of borough median; and percent persons living in poverty.[3] Although these variables are considered compatible with the Census at the tract level, the caveat of combining the Census and American Community Survey for the year 2010 is that the one-year enumeration data from the Census are combined with the five-year averages from the ACS, which are based on a population sample.

[3] The official poverty threshold is an income of $10,800 for a single adult or $22,000 for a family of four. In New York City the threshold for a family of four is $21,000.

This research also relies on several municipal databases: Department of Finance Real Property Assessment Data (RPAD), New York City Housing Authority (NYCHA) public housing data, and Department of Housing Preservation and Development (HPD) Violations data.

Background: genesis of this study

In 2008, the New York City Departments of Housing Preservation and Development (HPD) and City Planning (DCP) published a federally funded research project entitled "Utilizing Neighborhood Context to Examine Housing Changes in New York City 1990-2000."[4] The objective of the study was to understand how neighborhood-level housing markets—as represented by housing prices, rent burden, median rent, and crowding—react to the City's changing demographics. The framework of the analysis was established as a series of research questions:

1. In the aggregate, what can we say about the number and types of neighborhoods and of neighborhood transitions that occurred between 1990 and 2000?
2. Among the neighborhoods that transitioned, what were the dominant shifts?
3. What were the characteristics of neighborhoods that transitioned and those that did not?
4. What housing attributes—related to prices, rent burden, median rents, and crowding—distinguish neighborhoods that transitioned from those that did not?

[4]Raisa Bahchieva, Anna Livak, Peter Lobo, Joseph Salvo. "Utilizing neighborhood context to examine housing changes in New York City 1990-2000." Working paper. Office of Preservation Services, New York City Department of Housing Preservation; and Development and Population Division, New York City Department of City Planning. 2008.

In undertaking this study, the authors grappled with the issue of defining the term neighborhood within the context of neighborhood change. They recognized the need to create a new methodology for identifying neighborhood typology and change. In reality, neighborhoods do not necessarily follow statistical or political boundaries such as community districts or census tracts; however, their primary data sets such as the decennial census were naturally census-tract-driven.

The researchers used cluster analysis techniques to identify clusters of census tracts with similar Census-derived demographic and housing characteristics in order to define a new geography of neighborhood type.[5] They then created neighborhood-specific typologies that were examined using a neighborhood transition matrix, and these key neighborhood typologies were then used to describe changes in the housing market conditions such as overcrowding, rent burden, housing prices, and rents. The result of this approach to defining neighborhoods was the creation of a "neighborhood template" that provided a unique perspective and context for examining neighborhood change. The template provided a more accurate portrait of how change occurs because the categories were created using multiple dimensions. By combining a series of attributes that are known to be related to neighborhood settlement and developing a construct that describes important points of intersection for these variables, a better picture of neighborhood shifts was drawn.

As a result, this study identified four overarching themes that governed the patterns of neighborhood transition in New York City over the decade of 1990-2000. These involve: the shift of population away from whites of European heritage;[6] increases in the Hispanic population; stability in black neighborhoods; and the expansion of various types of melting pot areas.

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5 Cluster analysis methodology parses through large data sets to form groups with shared traits. A more detailed discussion of this method follows later in this paper and in the appendix.

6 The large loss among middle class white tracts is consistent with the fact that this group represents the last vestiges of European ethnics, the largely high school-educated group of city residents who were long associated with what were "blue-collar" jobs in a variety of manufacturing industries that waned after 1950.

The study was then able to demonstrate how neighborhoods shifted between these categories. Next, with knowledge of those trends, the study identified patterns related to key housing market outcomes: crowding, median rent, rent burden, and housing prices. While not necessarily causal in nature, the identification of demographic patterns and shifts provides a better understanding of impacts of neighborhood change on housing.

As the data aged, however, the practical application of this study diminished. But employing cluster analysis methods to the census data to create neighborhood typologies continues to provide a useful framework for examining notions of community change. Our study, therefore, employs this methodology to pursue its goals and objectives.

Relevant literature

The recognition of the fact that urban neighborhoods and cities overall are in a continuous state of transition has led to a stream of research looking at both neighborhood-level population changes and the factors that affect dynamics of neighborhoods.

Urban Demographic Characteristics

Several major demographic trends are shaping neighborhoods and housing consumption in US cities: the increase of the minority population fueled by international migration and a high natural increase of Asian, Hispanic, and black population; the aging of the population; and the declining share of households composed of the traditional “nuclear family.”

Studies focused on New York City have looked at the impact of immigration on population growth (Lobo, Salvo, and Virgin 1996) and on race and ethnic

change at the neighborhood level (Alba et al 1995; Rosenbaum and Friedman 2001; Salvo and Lobo 2002). The literature provides ample evidence that immigration has had a diversifying effect on the racial/ethnic composition of New York City's neighborhoods. But this immigration has also occurred in a context of continued racial and ethnic segregation within neighborhoods. Research on residential settlement patterns of Hispanics (Lobo, Flores, and Salvo 2002) has shown that the process of neighborhood change varies for different Hispanic subgroups, with the characteristics of subgroups–race, ethnicity, and socioeconomic status–playing a major role in determining residential settlement. Within the black communities of New York City, for example, nativity and ethnicity are salient factors that make a difference in the patterns of residential settlement (Lobo and Salvo 1999). Schill, Friedman, and Rosenbaum (1998) analyze the housing conditions of immigrants and demonstrate that immigrants' housing experiences vary greatly depending on their country of origin. The findings suggest that some immigrant groups—notably those of African, Caribbean, and Hispanic origin—may be more disadvantaged in the housing market than other groups (such as foreign-born whites and Asians). Among immigrants to New York City, Europeans and Chinese have the highest rates of homeownership (which are statistically no different from the homeownership rate among native-born whites), while Dominicans and Puerto Ricans have the lowest, at just six percent and 12 percent, respectively.

A recent Census-based study by the New York City Department of City Planning (DCP), "NYC 2010: Results from the 2010 Census,"[7] analyzed patterns of major changes in the race and Hispanic composition in the five boroughs of New York City over the decade of 2000-2010. The unit of analysis for this research was geographic unit known as Neighborhood Tabulation Area.[8] Two major growth

[7] NYC 2010: Results from the 2010 Census. Components of Change by Race and Hispanic Origin for New York City Neighborhoods. NYC Department of City Planning Working Paper.
[8] As explained in the report, "Neighborhood Tabulation Areas or NTAs, are aggregations of census tracts that are subsets of New York City's 55 Public Use Microdata Areas (PUMAs).

components are natural increase (difference between births and deaths) and net migration (net gain or loss from migration into and out of the city).

The major themes emerging from the analysis are as follows. The Bronx became majority Hispanic borough-wide as a result of both natural increase and net migration. The aging white population continues to decrease in number throughout the borough. The central focus in Brooklyn is the loss of black population in the north-central neighborhoods, largely through migration. A number of these neighborhoods experienced an inflow of younger, white population, almost totally through domestic migration. Manhattan had the largest loss of black population through net out-migration and an inflow of Asians and whites, especially into lower Manhattan outside of Chinatown. In Queens, the Asian-for-white replacement was most noteworthy, largely a product of new in-migration to northeastern areas. Southeastern Queens experienced Asian and Hispanic population gains and black out-migration. Northwestern Queens remained highly diverse. Staten Island was the only borough to have simultaneous inflows of black, Hispanic, and Asian residents (largely through migration from Brooklyn), making many areas mixed, especially on the North Shore. The white population of Staten Island is aging and experiencing net out-migration, especially on the North Shore and in Mid-Island.

Another recent Census-based study by the NYU Furman Center for Real Estate and Urban Policy, "The Changing Racial and Ethnic Makeup of New York City Neighborhoods"[9] looks at trends in neighborhood diversity during the years 1990-2010 and some associated socio-economic indicators. In this study, neighborhoods are defined as census tracts. The analysis revealed that while the city's white and black residents remain quite concentrated, that concentration is diminishing, while the Asian population becomes more concentrated. The share

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Primarily due to these constraints, NTA boundaries and their associated names may not definitively represent neighborhoods." (p.1)

[9] "The Changing Racial and Ethnic Makeup of New York City Neighborhoods." Furman Center for Real Estate and Urban Policy Working Paper.

of tracts classified as majority white declined, showing some trend towards desegregation, while the share of mixed-minority tracts increased. The mixed-minority tracts show the worst socioeconomic indicators (poverty rate, income, share of population with college degree, and homeownership rate), followed by majority Hispanic, majority Asian, and majority black tracts.

A recent study by Chipman and Wright (2012) developed neighborhood classification system to measure racial diversity in Chicago cross-sectionally and over time. Neighborhoods are defined as census tracts. Demographic data from the 1990, 2000, and 2010 censuses were used. Researchers created maps displaying neighborhood composition in each year, as well as transition matrices tabulating the numbers of tracts that changed from one category to another, or remained unchanged, between any two census years. The dominant trend in Chicago region was "its transformation from a heterogeneous urban core surrounded by low-diversity white neighborhoods, into a network of more diverse sub-regions, some still white-dominated but others being reshaped by newcomers and their descendents."[10]

While focusing on the racial dynamics of neighborhoods, the DCP, NYU, and Chipman and Wright studies rely on geographic boundaries defined by the Census Bureau. However, as noted by Sampson et al, "Although administratively defined units such as census tracts and block groups are reasonably consistent with the notion of overlapping and nested ecological structures, they offer imperfect operational definitions of neighborhoods for research and policy."[11] Census tracts represent areas that are too small compared to a meaningful neighborhood area, while NTAs as aggregations of tracts may not adequately reflect neighborhood boundaries.

Whereas the studies reviewed above focus primarily on racial and ethnic

[10] Chipman and Wright (2012) p. 6.
[11] Sampson et al. (2002), p. 445.

dimension of neighborhoods, other research has applied cluster techniques to the analysis of neighborhoods, allowing the use of a variety of parameters and more meaningful definitions of neighborhoods based on those parameters. For example, some recent research focused on neighborhood classification and neighborhood effects on issues related to health and housing.

Application of cluster techniques to neighborhood analysis

These studies refine the statistical identification of "neighborhoods" by incorporating a diversity of characteristics. Li and Chuang (2008) developed measurements that identify neighborhoods in order to evaluate influence of neighborhoods on individual health outcomes. The study uses neighborhood-level characteristics derived from the 1990 and 2000 Taiwan census data, as well as individual-level data from Taiwan Social Change Surveys conducted in 1990, 1995, and 2000. It suggests a multivariate-structural approach combining factor analysis and cluster analysis. The factor analysis generated three neighborhood dimensions: neighborhood education, age structure, and neighborhood family structure and employment. Based on these dimensions, the cluster analysis generated six types of neighborhoods. To assess the effects of neighborhoods on an individual's health, the authors then employed multilevel binomial regression models.

In another study, Stern and Seifert (2010) identify "cultural clusters" in Philadelphia using a "Cultural Asset Index." Their Index aggregates data on a variety of parameters of cultural engagement. The data are derived from several local sources. The parameters include cultural participants, resident artists, nonprofit cultural organizations, and commercial cultural firms. The data are aggregated at the census block group level. The Index is used to identify census block groups with the highest density of these assets. The study then shows the association between the concentration of cultural assets in Philadelphia in 1997 and improved housing market conditions between 2001 and 2006. The authors

explain the advantage of a quantitative approach versus qualitative methods of analysis in the arts and culture context by stating that a quantitative approach produces data that can be integrated with other quantitative geographic data commonly used by planners. This argument fully applies to our study as well.

Finally, as the 2008 Bahchieva et al. study discusses, there are three broad issues from the socioeconomic literature on neighborhood change that are useful in identifying factors that affect neighborhood transitions: gentrification; neighborhood revitalization; and shifts in urban demographic characteristics.

Gentrification. Gentrification is the term, widely discussed but poorly defined, often used to define the process by which higher income households move into lower income neighborhoods. Early explanations focused either on economic factors such as spatial flows of capital and the "rent-gap" (Smith 1987), or on social and cultural factors such as changing family structures and consumption practices (Ley 1986). Other studies attempted to combine both supply-side and demand-side explanations (London, Lee, and Lipton 1986; Lees 1994).

Gentrification is widely seen as a "double-edged sword" (Kennedy and Leonard 2001, p.14). It can revitalize many declining neighborhoods by increasing tax revenues, improving the income mix, and de-concentrating poverty. But it can also increase median rents and the rent burden for low-income residents. Other studies have discussed the potential of gentrification to displace disadvantaged households. For example, Freeman and Braconi (2002) show that gentrification is associated with slower residential turnover among disadvantaged households, rather than displacement. Because gentrification brings with it improvements that are valued by low-income households, these households make greater efforts to remain in the neighborhood. Although gentrification is typically thought to cause displacement, the results of this study reflect the peculiarity of New York City

rental housing, of which more than 52 percent is rent-regulated.[12] This trait is unique to New York rentals, and leads to a greater degree of residential stability even as neighborhoods change.

The extent to which gentrification in New York City leads to increases in neighborhood rent levels is unclear. As indicated in the NYC Comptroller's report on housing affordability (2014), the sub-borough-level data show a positive correlation between the increase in the number of households earning $100,000 or more and the rate of increase in real average rents between 2000 and 2012. However, even those neighborhoods that experienced a decrease in the number of such households, also had an increase in average rents, ranging from 7 to 40 percent. Therefore, while gentrification may have played a role in rent increases, "there were other factors at work that were putting pressure on rent levels citywide."[13]

Neighborhood revitalization. Revitalization is the process of improving the physical, commercial, and social components of neighborhoods. Examples include maintaining/upgrading the housing stock and streets; creating business and community services; increasing employment; and reducing crime. Revitalization is key in New York City as the housing stock continues to age in many neighborhoods. Van Ryzin and Genn (1999) examine neighborhood changes associated with New York City's Ten Year Plan, which built or rehabilitated 180,000 units of housing between 1986 and 1996. Bram et al. (2003) analyze the pattern of neighborhood revitalization during the 1990s in NYC, with an emphasis on low- and moderate-income neighborhoods. The study shows that New York City's neighborhoods improved in the 1990s as a result of a combination of economic factors and public policy efforts. Some policymakers take revitalization as a panacea, but very important questions

[12] Of the 2,172,634 rental units in New York City, 38,374 (1.8 percent) are rent-controlled; 986,840 (45.4 percent) are rent-stabilized; and 109,508 (5.0 percent) are regulated under Mitchell-Lama or various other HUD regulations (2011 Housing Vacancy Report).
[13] The Growing Gap: New York City's Housing Affordability Challenge" (2014), p. 18.

remain regarding just how revitalization affects the level of crowding, median rents, rent burden, and housing prices.

III. POPULATION AND HOUSING CHANGE IN NEW YORK CITY: 2000—2010

Table 1 displays citywide and borough-level demographic changes that occurred between the census years 2000 and 2010. New York City's population was 8,175,000 in 2010. It increased by 167,000, a 2.1 percent increase—moderate in comparison with the 9.4 percent growth in the prior decade. It is easy to forget that New York City did not simply add 167,000 persons on top of a population that remained in place between 1990 and 2000. More relevant from the standpoint of neighborhood transition is an overview of the amount of moves that occurred between 2000 and 2010. More than 11 percent of the city's population five years of age and over experienced a change in residence between 2000 and 2010—some 937,500 persons. The largest streams of change in residence were within boroughs (510,000) and between boroughs (165,000). The number of persons moving into New York City from outside the city was about 210,000. Though the net change in population is important, it is also critical to know the scope of the shifts in the city's residential patterns as a result of the aggregate movement of people. A dynamic population such as this can reflect a high level of change in the demographic, social, and economic composition of neighborhoods.

Neighborhood template

As the 2008 study[14] recognized, it is important to admit at the outset that designing a neighborhood template to capture the dynamics described above is virtually impossible. No classification scheme can comprehensively capture the settlement or resettlement of nearly one million persons. Why then attempt a

[14] Bahchieva et al. (2008).

Table 1. Demographic Changes in New York City, 2000-2010 (Sources: US Census 2000 and 2010 and American Community Survey 2011)

INDICATORS	New York City		Bronx		Brooklyn		Manhattan		Queens		Stanten Island	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Total Population: Race/Ethnicity	8,008,278	8,175,133	1,332,650	1,385,108	2,465,326	2,504,700	1,537,195	1,585,873	2,229,379	2,230,722	443,728	468,730
White non-Hispanic	35.0%	33.3%	14.5%	10.9%	34.7%	35.7%	45.8%	48.0%	32.9%	27.6%	71.3%	64.0%
Black non_Hispanic	24.5%	22.8%	31.2%	30.1%	34.4%	31.9%	15.3%	12.9%	19.0%	17.7%	8.9%	9.5%
Asian and Pacific Islander non-Hispanic	9.8%	12.6%	2.9%	3.4%	7.5%	10.4%	9.4%	11.2%	17.5%	22.8%	5.6%	7.4%
American Indian and Alaska Native non-Hispanic	0.2%	0.2%	0.3%	0.2%	0.2%	0.2%	0.2%	0.1%	0.3%	0.3%	0.1%	0.1%
Other non-Hispanic	0.7%	0.7%	0.6%	0.6%	0.7%	0.4%	0.4%	0.3%	1.3%	1.4%	0.2%	0.2%
Non-Hispanic of Two or More Races	2.8%	1.8%	2.0%	1.2%	2.8%	1.6%	1.9%	1.9%	4.1%	2.5%	1.8%	1.4%
Hispanic Origin	27.0%	28.6%	48.4%	53.5%	19.8%	19.8%	27.2%	25.4%	25.0%	27.5%	12.1%	17.3%
Total Population: Foreign Born	2,871,032	3,042,315	385,827	475,734	931,769	948,052	452,440	451,770	1,028,339	1,066,262	72,657	100,497
Immigrants as % of population	35.9%	37.2%	29.0%	34.3%	37.8%	37.8%	29.4%	28.5%	46.1%	47.7%	16.4%	21.4%
Total Population: Age	8,008,278	8,175,133	1,332,650	1,385,108	2,465,326	2,504,700	1,537,195	1,585,873	2,229,379	2,230,722	443,728	468,730
Under 18 years	24.2%	21.6%	29.8%	26.6%	26.9%	23.7%	16.8%	14.8%	22.8%	20.7%	25.5%	23.3%
18-34 years	27.1%	27.7%	26.3%	26.4%	26.1%	27.7%	31.7%	32.9%	26.4%	25.8%	22.9%	22.2%
35-64 years	37.0%	38.5%	33.9%	36.5%	35.6%	37.3%	39.3%	38.8%	38.0%	40.4%	40.0%	41.8%
65 years and over	11.7%	12.1%	10.1%	10.5%	11.5%	11.5%	12.2%	13.5%	12.7%	12.8%	11.6%	12.7%
Total Number of Households	3,021,588	3,109,784	463,212	483,449	880,727	916,856	738,644	763,846	782,664	780,117	156,341	165,516
Total Number of Family Households	61.3%	59.5%	68.0%	66.7%	66.3%	62.5%	40.9%	40.4%	68.7%	67.5%	73.0%	71.6%
Total Number of Non-Family Households	38.7%	40.5%	32.0%	33.3%	33.7%	37.5%	59.1%	59.6%	31.3%	32.5%	27.0%	28.4%
Household size												
1-person	31.9%	32.0%	27.4%	28.2%	27.8%	29.0%	48.0%	46.3%	25.6%	25.6%	23.2%	24.2%
2-persons	26.8%	27.6%	24.7%	24.6%	26.5%	27.9%	28.3%	30.1%	26.7%	26.8%	27.4%	27.4%
3-persons	16.1%	16.0%	18.6%	18.1%	17.4%	16.9%	10.8%	11.4%	17.5%	17.6%	18.6%	17.9%
4-persons	12.7%	12.1%	14.4%	14.0%	13.5%	12.4%	6.9%	7.1%	15.1%	14.7%	17.6%	16.8%
5-persons	6.8%	6.4%	8.1%	8.0%	7.6%	6.8%	3.2%	2.9%	8.2%	7.9%	8.6%	8.3%
6+ persons	5.8%	5.9%	6.8%	7.0%	7.1%	7.1%	2.7%	2.2%	7.0%	7.4%	4.6%	5.5%

Persons living in group quarters	182,430	185530	47,235	46710	39,299	35609	59,837	67373	26,873	28000	9,186	7838
Persons in group quarters as % of population	2.3%	2.3%	3.5%	3.4%	1.6%	1.4%	3.9%	4.2%	1.2%	1.3%	2.1%	1.7%
Family Households	1,853,223	1,850,221	315,090	322,604	584,120	573,363	301,970	308,828	537,991	526,875	114,052	118,551
Married-couple family, with related children under 18 years	30.6%	26.6%	25.7%	20.9%	30.7%	27.3%	24.9%	23.8%	34.7%	29.6%	38.7%	33.3%
Married-couple family, no related children under 18 years	30.1%	32.7%	20.5%	21.5%	27.5%	30.8%	36.7%	38.8%	33.5%	36.5%	36.7%	39.5%
Female householder with related children under 18 years	20.4%	15.1%	32.9%	26.5%	22.4%	15.7%	19.4%	12.7%	13.2%	10.0%	11.3%	9.6%
Female householder, no related children under 18 years	10.7%	16.4%	11.7%	20.1%	11.1%	17.2%	11.4%	16.7%	10.0%	14.3%	7.7%	10.8%
Male householder with related children under 18 years	3.7%	3.1%	4.9%	4.4%	3.7%	3.1%	3.1%	2.5%	3.5%	3.0%	2.5%	2.4%
Male householder, no related children under 18 years	4.5%	6.1%	4.3%	6.6%	4.5%	6.0%	4.5%	5.4%	5.0%	6.6%	3.2%	4.4%
Non-Family Households	1,168,365	1,259,563	148,122	160,845	296,607	343,493	436,674	455,018	244,673	253,242	42,289	46,965
Householder living alone	82.4%	79.1%	85.6%	84.9%	82.6%	77.5%	81.1%	77.7%	81.7%	78.8%	85.9%	85.2%
Households with individuals under 18 years	34.0%	30.8%	43.8%	40.4%	38.2%	33.3%	19.7%	18.2%	35.9%	33.4%	38.5%	35.6%
Households with individuals 65 years and over	23.6%	24.6%	21.6%	23.2%	24.4%	24.4%	20.4%	22.4%	26.8%	27.4%	23.5%	26.3%
Educational attainment												
Population 25 years and over:	5,276,946	5,548,124	794,792	857,048	1,552,870	1,649,387	1,125,987	1,171,294	1,509,502	1,554,325	293,795	316,070
Less than 9th grade or no schooling	12.0%	10.8%	15.8%	14.9%	13.1%	11.7%	10.4%	8.0%	11.3%	10.7%	5.6%	5.2%
9th to 12th grade, no diploma	15.7%	9.6%	21.9%	15.9%	18.1%	9.9%	10.9%	6.3%	14.4%	8.9%	11.8%	6.8%
High school graduate	24.4%	25.4%	25.8%	29.0%	26.7%	29.0%	13.5%	13.1%	27.7%	27.5%	33.6%	31.9%
Some college or Associate's degree	20.4%	20.9%	21.8%	23.3%	20.2%	20.8%	15.8%	14.4%	22.3%	23.4%	25.8%	25.4%
College graduate	27.4%	33.3%	14.6%	16.9%	21.8%	28.6%	49.4%	58.2%	24.3%	29.5%	23.2%	30.7%

Median household income	$38,293	$48,743	$27,611	$32,568	$32,135	$42,143	$47,030	$63,832	$42,439	$53,054	$55,039	$70,560
Households Receiving Public Assistance	7.5%	4.4%	14.6%	7.8%	9.2%	4.8%	5.5%	3.0%	4.3%	3.4%	3.3%	3.8%
Household Poverty Rate	21.2%	18.7%	30.7%	29.2%	25.1%	21.5%	20.0%	14.9%	14.6%	13.9%	10.0%	11.9%
Unemployment Rate	9.6%	11.2%	14.3%	15.8%	10.7%	10.9%	8.5%	9.2%	7.7%	11.1%	5.9%	9.1%
Total housing units	3,200,912	3,371,062	490,659	511,896	930,866	1,000,293	798,144	847,090	817,250	835,127	163,993	176,656
Occupied housing units	3,021,588	3,109,784	463,212	483,449	880,727	916,856	738,644	763,846	782,664	780,117	156,341	165,516
% Owner-Occupied Units	30.2%	31.0%	19.5%	19.3%	27.1%	27.7%	20.1%	22.8%	42.8%	43.0%	63.8%	64.1%
Public Housing units	179,726	178,778	45,135	44,549	58,441	58,712	53,991	53,914	17,373	17,119	4,786	4,484
Occupants per room												
Owner Occupied												
1.00 or less	93.3%	95.6%	92.6%	96.2%	92.2%	93.7%	96.2%	97.4%	91.6%	95.5%	97.7%	98.0%
1.01 to 1.50	4.0%	3.2%	4.7%	2.3%	5.0%	4.6%	1.5%	1.4%	4.9%	3.6%	1.7%	1.6%
1.51 to 2.00	2.0%	0.9%	1.8%	0.8%	2.0%	1.3%	1.8%	1.1%	2.5%	0.7%	0.5%	0.3%
more than 2.00	0.8%	0.3%	0.9%	0.7%	0.8%	0.5%	0.4%	0.1%	1.0%	0.1%	0.1%	0.1%
Renter Occupied												
1.00 or less	82.0%	88.7%	77.3%	85.7%	81.7%	86.9%	87.8%	93.1%	77.7%	87.7%	90.4%	91.4%
1.01 to 1.50	8.4%	7.1%	10.9%	9.2%	9.7%	8.6%	5.0%	3.7%	9.5%	7.5%	5.1%	6.8%
1.51 to 2.00	6.1%	3.2%	7.1%	3.9%	5.8%	3.5%	4.9%	2.6%	7.4%	3.3%	3.0%	1.6%
more than 2.00	3.5%	1.0%	4.7%	1.2%	2.8%	1.0%	2.3%	0.5%	5.3%	1.5%	1.6%	0.3%
Unit size												
1 room	8.1%	6.3%	7.4%	4.7%	5.1%	5.0%	15.5%	12.0%	6.1%	4.0%	2.0%	1.8%
2 rooms	12.3%	6.0%	10.4%	2.8%	11.3%	4.5%	18.6%	13.2%	10.1%	3.7%	3.9%	1.1%
3 rooms	23.7%	25.1%	28.5%	30.5%	22.5%	24.3%	27.2%	30.6%	20.8%	20.2%	12.6%	11.5%
4 rooms	22.1%	25.6%	25.6%	29.7%	25.2%	28.1%	21.3%	25.5%	19.1%	22.6%	14.1%	14.2%
5 rooms	14.4%	17.0%	15.2%	18.9%	15.7%	18.1%	10.4%	10.1%	16.1%	21.1%	15.5%	19.0%
6 rooms	9.2%	9.7%	6.6%	7.6%	8.9%	9.5%	3.7%	4.5%	13.7%	13.6%	22.4%	22.2%
7 or more rooms	10.2%	10.3%	6.3%	5.7%	11.4%	10.6%	3.3%	4.1%	14.0%	14.8%	29.6%	30.2%
Median gross rent	705	1129	620	974	672	1079	796	1305	775	1242	742	1141
Gross rent as percent of household income in the specified renter-occupied units												
Less than 30 percent	53.5%	46.5%	50.7%	42.0%	50.6%	44.7%	57.6%	53.9%	54.2%	43.6%	55.1%	43.6%
30 percent or more	40.7%	53.5%	43.2%	58.0%	43.0%	55.2%	37.5%	46.1%	39.8%	56.5%	37.1%	56.3%

neighborhood template? The answer is twofold: 1) a template provides perspective, a context for examining change; and 2) the template provides a better real-world view of how change occurs because it incorporates multiple demographic dimensions to shape its categories. By combining a series of attributes that are known to be related to neighborhood settlement and developing a construct that describes important points of intersection for these variables, a better picture of neighborhood transitions can be drawn.

Creation of a neighborhood template begins with the analysis of distinctions between the different boroughs of New York City. The level of population growth and patterns of migration, the race/ethnic makeup, the socioeconomic characteristics, and the types of housing differ by borough. These borough differences help define neighborhoods in the classification scheme that we create to capture transitions. Further, it would be misleading to use overall city figures as a point of reference, since the city median numbers do such a poor job reflecting the boroughs, given the differences between them. Therefore, the first step in our cluster analysis is to examine the key variables to distinguish the types of neighborhoods at the citywide and borough levels. These variables are derived from the 2000 and the 2010 Census and are divided into four categories: level of population growth; race/ethnic makeup; key socio-economic characteristics; and the type of housing.

Level of population growth (by borough)

The rate of population growth between 2000 and 2010 was highest in Staten Island (5.6 percent). The Bronx and Manhattan population grew by 3.9 and 3.1 percent, respectively. Brooklyn experienced a growth of 1.6 percent, and Queens almost no growth (0.1 percent).

Racial/ethnic makeup

Each borough has a distinct racial/Hispanic composition (Table 1). In relative terms, the Bronx has the highest percentage of population identifying as Hispanic of all the boroughs, more than half of its residents. Black residents comprise slightly more than 30 percent of both Brooklyn and the Bronx population; however, in absolute terms Brooklyn is home to nearly twice as many black residents as the Bronx. Manhattan is distinguished by its large white non-Hispanic population. Although Queens and Staten Island are more economically homogeneous than the other boroughs, with an abundance of middle-income families, that is where their similarity ends. A large portion of Staten Island has a suburban character and is largely (64 percent) white, whereas Queens remains New York City's most diverse borough, with large contingents of every major group: non-Hispanic white (28 percent), Hispanic (28 percent), Asian (23 percent), and black (18 percent).

Key Social and Economic Characteristics

Manhattan is distinguished by having relatively large populations of both the young[15] and the elderly[16] (33 percent and 14 percent, respectively) compared with the other boroughs. Of the Manhattan population, 60 percent live in non-family households[17] and 46 percent of households are one-person. Staten Island has the lowest share of non-families (28 percent), and along with Queens has the largest concentrations of middle-aged[18] population (42 percent and 40 percent, respectively).

As far as family types are concerned, married couples with and without children are prevalent in Staten Island (comprising 73 percent of all families), whereas the

[15] 18 to 34 years old
[16] 65 years and older
[17] This category includes a householder living alone or with nonrelatives only.
[18] 35 to 64 years old

Bronx has the highest proportion of female-headed families among all boroughs. They make up nearly one-half of all Bronx families, with the majority comprised of single mothers.

More than 37 percent of the overall New York City population is foreign-born (Table 1). The largest share of immigrants is located in Queens. With nearly one-half of its population foreign-born, Queens is home to more than one-third of all immigrants in the city. Queens is followed by Brooklyn, which houses nearly one-third of all city immigrants and has a share of foreign-born population that is in sync with the city overall. The share of Bronx residents who are foreign-born (34 percent) is slightly lower than citywide and their absolute number is one-half the Brooklyn immigrant population. Manhattan's proportion of foreign-born population was lower than citywide (29 percent) with larger groups of immigrants living in the southwestern and northern parts of the borough, and much smaller concentrations in other areas. Staten Island has the lowest proportion of immigrants—one fifth of its population—and is home to only three percent of all the city immigrants.

The level of difference in income and education across the boroughs is noteworthy. Median household income is highest in Staten Island ($70,560), followed by Manhattan ($63,832). However, at the far end of the spectrum Manhattan has by far the highest share of households with income exceeding $200,000: this bracket makes up 17 percent of that borough's population, followed by the next highest of only six percent in Staten Island. The Bronx had the lowest median income at just $32,568. Staten Island had the lowest poverty rate, just 12 percent, whereas the Bronx had the highest–more than 29 percent. Educational attainment was highest in Manhattan, where more than 58 percent of the population 25 years and older possesses at least a college degree, compared to the lowest such rate of only 17 percent among Bronx residents.

The Type of Housing

Each of New York City's five boroughs has a distinct housing profile (Tables 1 and 2). Manhattan and the Bronx are characterized by an abundance of housing units in large buildings, which are mostly renter-occupied. Just two percent of units in Manhattan and one-third of units in the Bronx are in buildings with less than five units. Only one-in-five units in each borough were owner-occupied in 2010. In Brooklyn, slightly over one-half of units were in buildings with less than five units, and only 28 percent were owner-occupied. In contrast, Queens and Staten Island consisted predominantly of units in one-to-four-unit houses, most of them owner-occupied. In Queens and Staten Island, 85 and 66 percent of units were in buildings with less than five units, respectively.

Distribution of unit sizes also differs by borough. Among Manhattan units, 56 percent have one to three rooms, and one-quarter have four rooms. In the Bronx and Brooklyn, 79 percent and 70 percent of units, respectively, are in the three-to-five-room range. On the opposite end, one-half of Queens units and 71 percent of units in Staten Island have five or more rooms, and only eight percent and three percent, respectively, have one or two rooms.

The rate of owner occupancy in Staten Island is the highest among the five boroughs (64 percent), followed by Queens (43 percent). About nine percent of units in the Bronx consisted of public housing, the highest of the five boroughs, followed by seven percent in Manhattan and more than six percent of units in Brooklyn.

IV. CREATING NEIGHBORHOOD CATEGORIES: METHODOLOGY

In order to define neighborhoods in the New York City context, cluster analysis techniques were used to identify clusters of census tracts with similar

Table 2. 2000 and 2010 Residential Units Distribution by Dwelling Type in New York City
(Source: Authors' Compilations of the NYC Department of Finance Real Property Assessment Data)

Year 2010	City	Manhatan	Bronx	Brooklyn	Queens	Staten Island
One-family dwellings	316246	1834	22086	60610	155589	76127
Two-family dwellings	493188	3610	58748	192058	181696	57076
Three-family dwellings	218545	4509	33339	107355	70600	2742
Four-family dwellings	65472	3272	7524	38596	14412	1668
Five-or Six-family dwellings	79421	3587	4296	45761	25022	755
Walk-up	203121	98653	36061	36278	30977	1152
Elevator dwellings, over six families	939366	381841	182347	236541	127148	11489
Loft buildings	1842	1388	0	454	0	0
Condominium apartments	187909	95402	16459	40861	24747	10440
Primarily residential, mixed-use dwellings	32816	6086	1705	18136	6577	312
Total Unit	2537926	600182	362565	776650	636768	161761

Year 2010	City	Manhatan	Bronx	Brooklyn	Queens	Staten Island
Total Units	2537926	600182	362565	776650	636768	161761
One-family dwellings	12.5%	0.3%	6.1%	7.8%	24.4%	47.1%
Two-family dwellings	19.4%	0.6%	16.2%	24.7%	28.5%	35.3%
Three-family dwellings	8.6%	0.8%	9.2%	13.8%	11.1%	1.7%
Four-family dwellings	2.6%	0.5%	2.1%	5.0%	2.3%	1.0%
Five-or Six-family dwellings	3.1%	0.6%	1.2%	5.9%	3.9%	0.5%
Walk-up	8.0%	16.4%	9.9%	4.7%	4.9%	0.7%
Elevator dwellings, over six families	37.0%	63.6%	50.3%	30.5%	20.0%	7.1%
Loft buildings	0.1%	0.2%	0.0%	0.1%	0.0%	0.0%
Condominium apartments	7.4%	15.9%	4.5%	5.3%	3.9%	6.5%
Primarily residential, mixed-use dwellings	1.3%	1.0%	0.5%	2.3%	1.0%	0.2%

Year 2000	City	Manhatan	Bronx	Brooklyn	Queens	Staten Island
Total Units	3,065,692	808,494	470,645	879,618	751,614	155,321
One-family dwellings	10.4%	0.2%	5.1%	6.8%	21.8%	45.7%
Two-family dwellings	14.9%	0.4%	11.5%	21.3%	21.8%	31.2%
Three-family dwellings	6.2%	0.4%	5.5%	11.1%	7.9%	1.7%
Four-family dwellings	2.1%	0.3%	1.6%	4.4%	2.0%	1.1%
Five-or Six-family dwellings	2.6%	0.4%	0.9%	5.3%	3.4%	0.5%
Walk-up	19.3%	29.2%	25.3%	16.9%	11.0%	4.4%
Elevator dwellings, over six families	38.3%	59.1%	46.3%	29.4%	27.4%	8.0%
Loft buildings	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%
Condominium apartments	4.3%	9.1%	3.2%	1.4%	2.9%	6.5%
Primarily residential, mixed-use dwellings	1.7%	0.7%	0.7%	3.3%	1.8%	0.8%

demographic characteristics. The process involved two steps. First, a classification for the year 2000 was produced based on a number of demographic and economic characteristics of census tracts, resulting in the identification of 14 distinct neighborhood types. Each type had a set of mean values of the characteristics used in classification. Second, the 2000 cluster means were used to allocate the 2010 tracts to the most similar 2000 clusters. The geographic distribution of cluster types was then compared between the two years. Clusters were also compared based on housing market indicators for 2010–owner-occupancy rate, percent small units, and percent units in buildings of certain sizes. The clustering procedures are described in more detail in Appendix 1.

Selection of Variables and Census Tracts

Table 3 lists the population variables used in cluster analysis. These variables were selected based on their potential to signal important differences between neighborhoods. Tract-level demographic characteristics such as racial composition, age distribution, foreign-born status, household composition, median household income, and poverty rate help distinguish different population types. Percent of tract residents living in public housing units was included to differentiate the effect of public housing on the tract clustering process. Public housing, in general, indicates a very high density of households at lower income levels, so including an indicator of the presence of public housing allows researchers to know what may be driving statistical outcomes in a given area.

The Census-derived race variable provides definitions that appear too broad for the purposes of a study attempting to classify neighborhoods in a multicultural city such as New York. The racial categories included in the census questionnaire generally reflect a social definition of race recognized in this country: White, Black or African American, American Indian or Alaska Native, Asian, and Native Hawaiian or Other Pacific Islander. People who identify their

Table 3. Variables used in tract classification

Label	Source 2000	Source 2010
percent black population	Census 2000	Census 2010
percent Asian population	Census 2000	Census 2010
percent Hispanic population	Census 2000	Census 2010
percent other population	Census 2000	Census 2010
percent population 18 to 34 years old	Census 2000	Census 2010
percent population 35 to 64 years old	Census 2000	Census 2010
percent age 65 and above	Census 2000	Census 2010
percent foreign born	Census 2000	ACS 2011 five-year averages
percent non-family	Census 2000	Census 2010
percent of family household-single parent with child	Census 2000	Census 2010
percent of family household-married parents with child	Census 2000	Census 2010
percent education college and above	Census 2000	ACS 2011 five-year averages
midium income as percent of boro median	Census 2000	ACS 2011 five-year averages
percent poor persons	Census 2000	ACS 2011 five-year averages
percent of non-family households householder living alone	Census 2000	Census 2010
percent of persons living in public housing units	NYCHA administrative records	NYCHA administrative records

origin as Hispanic, Latino, or Spanish may be of any race. After the first step of classifying census tracts using the Census Bureau's race categories, additional work may be needed to look more closely at ethnic breakdowns of some neighborhoods. One reason is that race categories included in the Census are too broad. Secondly, self-identification in the Census can lead to mis-categorization (for example, with Hispanic people who identify as white).[19] Overcoming this limitation to the data in this study may involve qualitative methods, such as focus groups, or primary data collection.

In hierarchical cluster analysis**,** variables with large standard deviations can swamp the effects of variables with smaller standard deviations (Aldenderfer and Blashfield 1984). Because the variables in the dataset did not have equal variance, they were standardized to a mean of zero and standard deviation of 1 prior to clustering. This helped prevent the domination of any single variable through the cluster identification process.

Tracts excluded from the analysis

The number of census tracts in New York City declined from 2,217 in 2000 to 2,168 in 2010. For consistency of the analysis, the 2000 tracts were transformed into 2010 tracts using the Census tract relationship file provided by the Census Bureau. From the 2,168 tracts, we excluded 91 low-population tracts (those with fewer than 100 residents or with fewer than 50 households) and tracts where 40 percent or more of the population lived in group quarters.[20] The final data used for cluster analysis included 2,077 tracts.

[19] Doyle and Kao, 2009.
[20] By the Census Bureau definition, group quarters include military housing, student housing, nursing facilities, and correctional facilities, among other similar types of residences.

V. NEIGHBORHOOD CLASSIFICATION

This section provides the description of the 14 neighborhoods produced by cluster analysis. Appendix 2 contains charts and tables with demographic and housing characteristics of clusters, as well as their geographic layout in 2010. Map 1 shows geographic location of different neighborhoods in 2010. As the cluster labels indicate, the formation of clusters is largely driven by race/Hispanic categories, income levels, and household types. Income levels as part of cluster description are defined as follows:

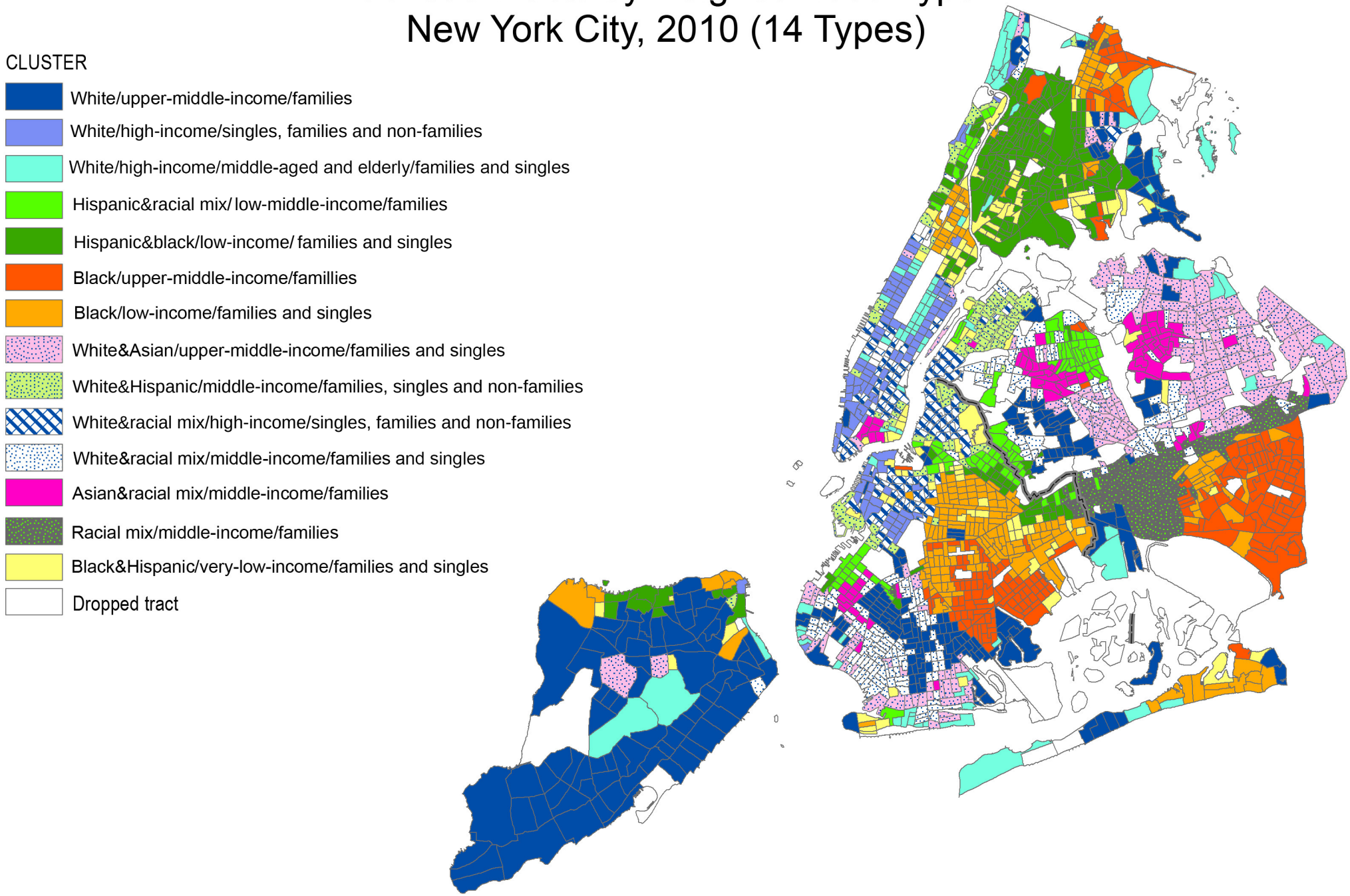
- below 65 percent of the borough median: very low income;
- 65.1 percent -- 80 percent of the borough median: low-income;
- 80.1 percent -- 90 percent of the borough median: low-middle income;
- 90.1 percent -- 110 percent of the borough median: middle-income;
- 110.1 percent -- 140 percent of the borough median: upper-middle income;
- above 140 percent of the borough median: high-income;

Appendix 3 contains borough-level maps of 2010 clusters overlaid with Community Districts for the purpose of illustrating the disparity between “official” boundaries and the demographically defined neighborhoods that are the focus of this paper.

Interpreting mean values of clusters

Readers should treat mean values of variables used in the clustering procedure with some caution. Naturally, no two census tracts are exact mirror images of each other. Although the clustering procedure allocated each tract-level observation to the most similar cluster, some tracts still vary from the cluster mean on some variables. For example, the first cluster, classified as predominantly (more than 75 percent) white, included 209 tracts in 2000, of

Map 1
Census Tracts by Neighborhood Type
New York City, 2010 (14 Types)



which 72 percent indeed had more than 75 percent of white population; 22 percent had 50 percent to 75 percent of white population; four percent had 30 percent to 50 percent of whites, and negligible one percent had below seven percent whites. Therefore, when we talk about the cluster being “predominantly white,” we in fact mean the core of it, which includes the majority of tracts, whereas some tracts are outliers based on one or more cluster variables.

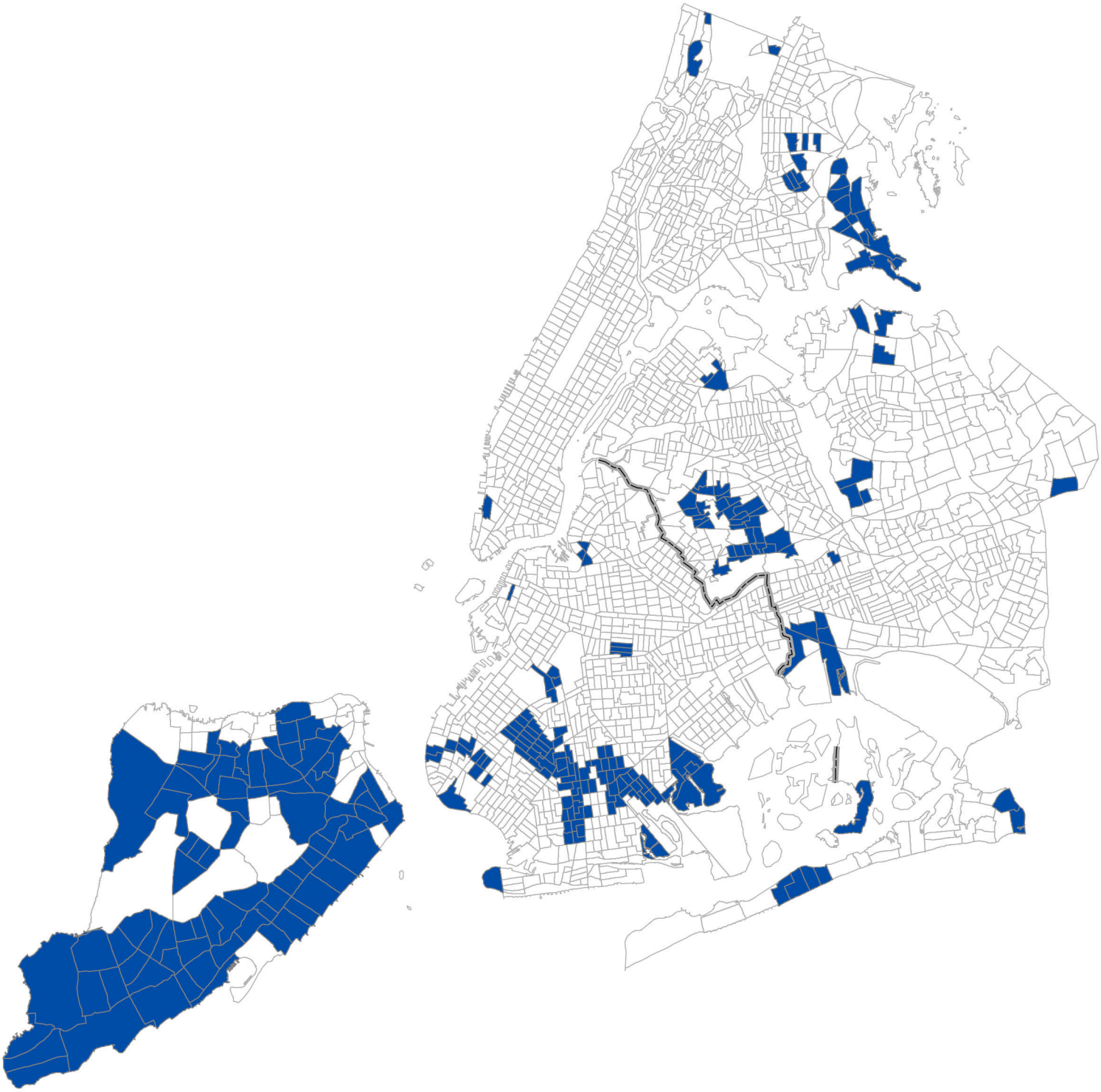
Clusters with Predominantly (75 percent or more) White Non-Hispanic Residents

White/upper-middle income/families (256 tracts, 885,575 people, Map 2): majority families; predominantly young, middle-aged, and children; one-quarter college graduates; majority owner-occupants; predominance of units in one-to-four- family houses.

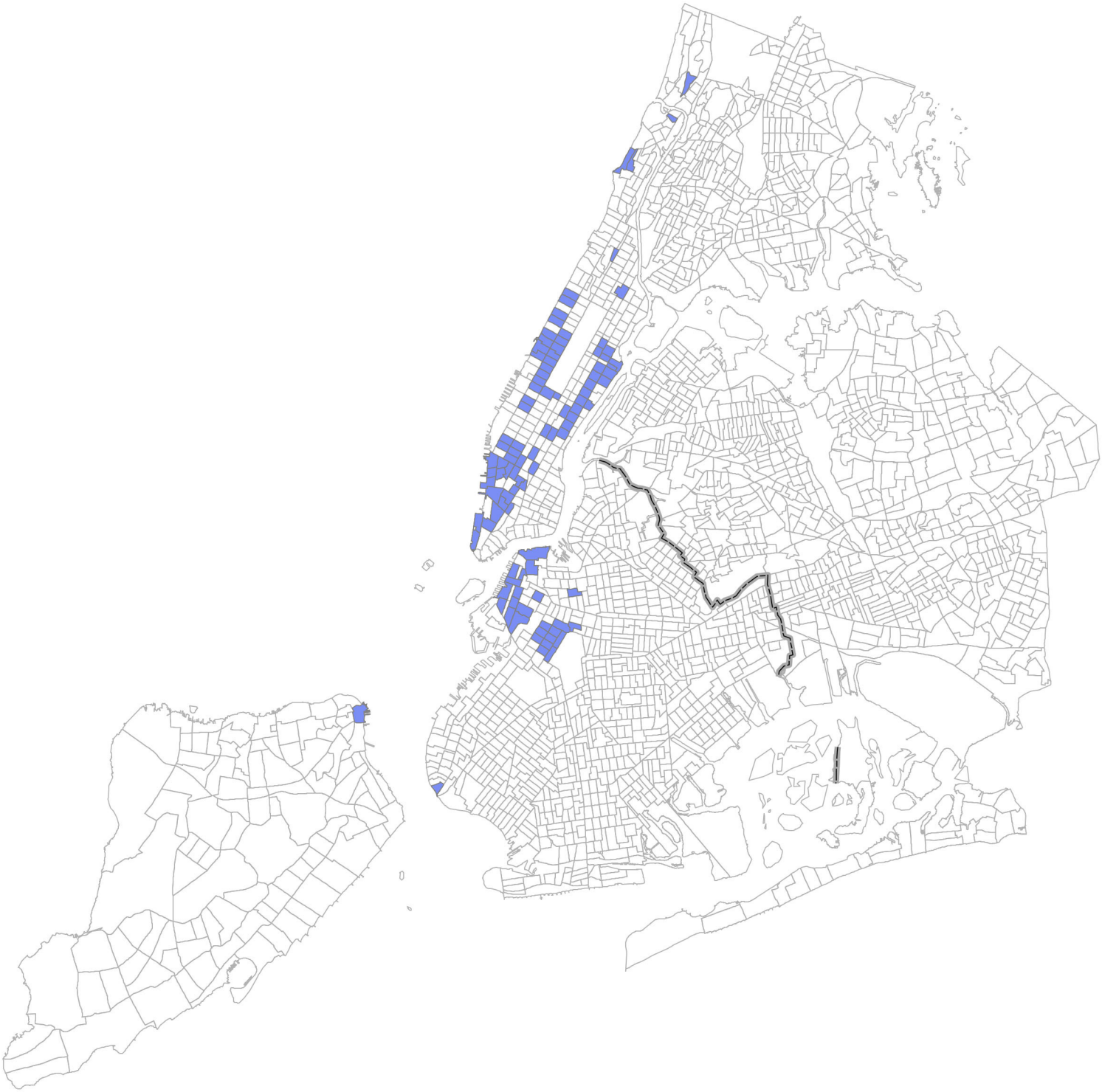
White/high-income/singles, families, and non-families (101 tracts, 577,435 people, Map 3): majority one-person households and 13% shared households; families dominated by couples with no children; predominantly young and middle-aged; majority college graduates; two-third renters; predominantly units in high-density buildings (majority more than 20 units, more than a quarter – 5 to 19 units); highest share of small-size units (25%) among all clusters.

White/high-income/middle-aged and elderly/families and singles (85 tracts, 343,114 people, Map 4): majority families dominated by couples with no children; 41% one-person households; majority middle aged and elderly; nearly 40% college graduates; slight majority renters; predominantly units in high-density buildings (two-thirds – more than 20 units, 15% -- 5 to 19 units).

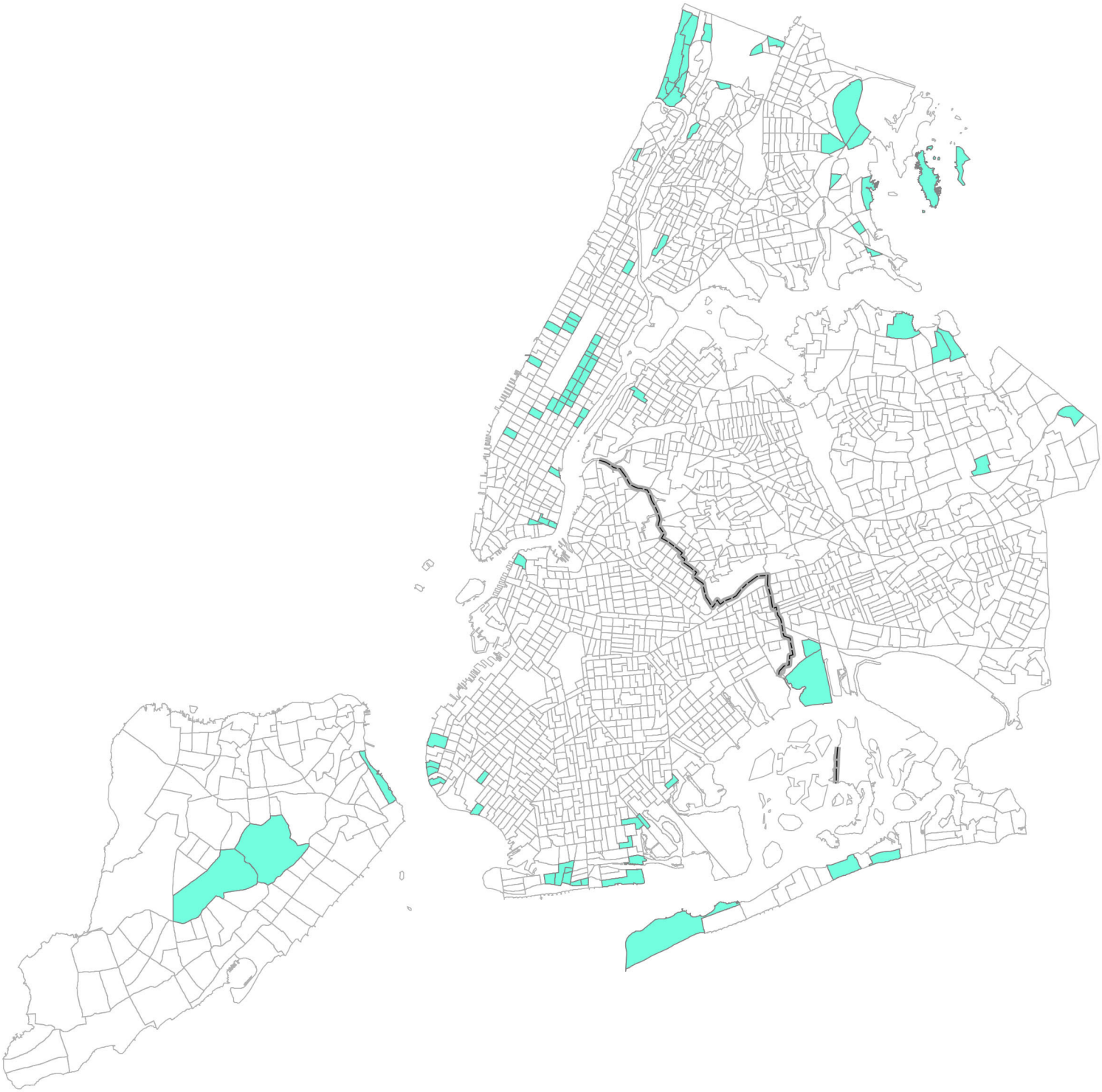
Map 2
White/upper-middle-income/families
New York City, 2010



Map 3
White/high-income/singles, families and non-families
New York City, 2010



Map 4
White/high-income/middle-aged and elderly/families and singles
New York City, 2010



Clusters with Predominantly (75 percent or more) African-American Non-Hispanic Residents

Black/low-income/families and singles (233 tracts, 928,372 people, Map 5): majority families with nearly one-third single-person households; 42% of families -- single mothers; low share of college graduates; nearly one-third immigrants, nearly 30% population in poverty, predominantly renters (20% owners), mix of dwelling types, with one-half units in one-to-four-family buildings; low share of small-size units.

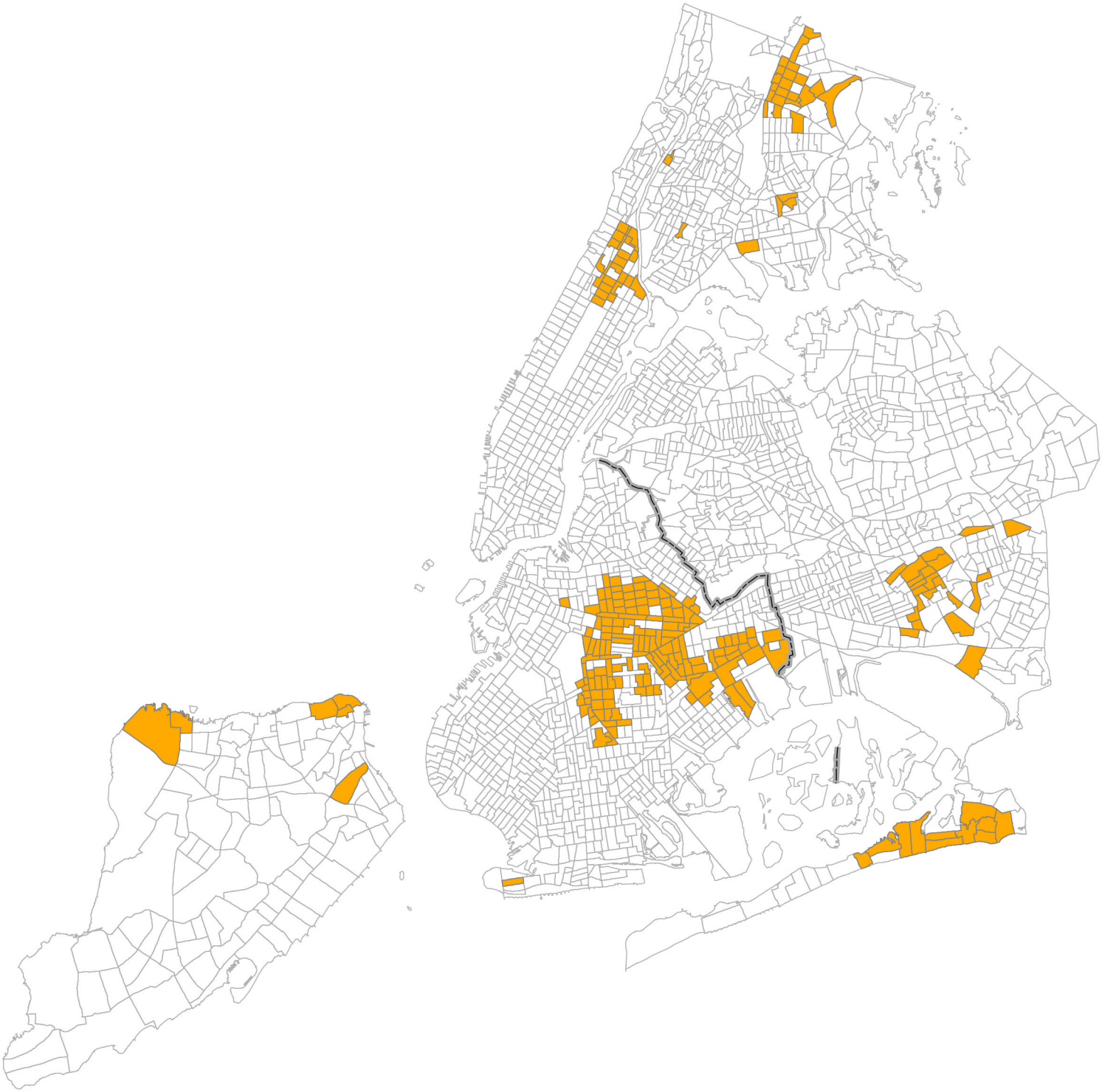
Black/upper-middle-income/families (196 tracts, 506,577 people, Map 6): predominantly families with mix of family types; 19% one-person households; predominantly young, middle-aged, and children; one-fifth college graduates, 40% immigrants; majority homeowners, predominantly units in one-to-four-family dwellings; very low share of small-size units.

Clusters with Majority (50 percent to 74 percent) White Non-Hispanic Residents

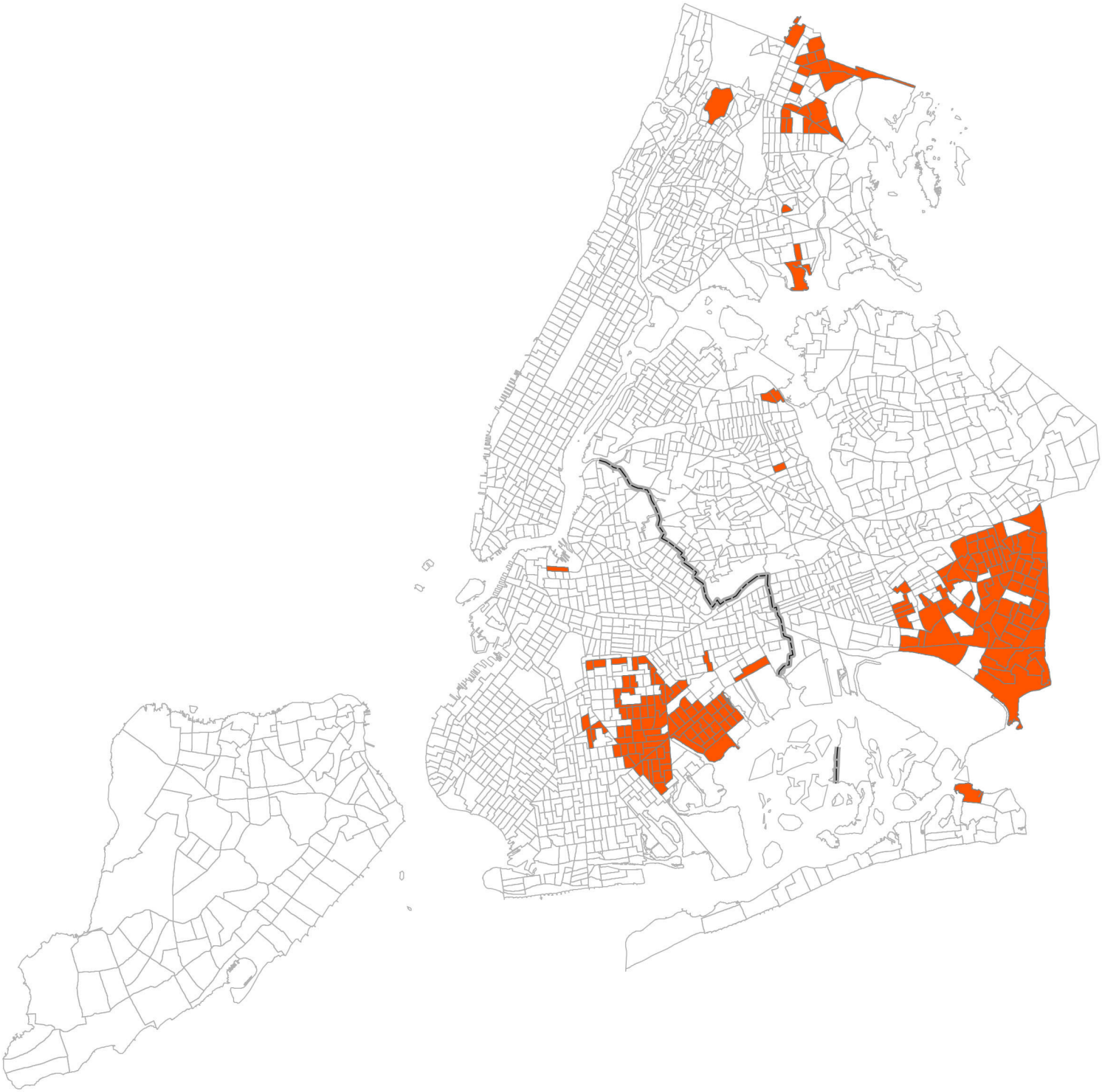
White & racial mix/middle-income/families and singles (191 tracts, 710,399 people, Map 7): majority families with 28% one-person households; age mix; nearly one-half immigrants, one-quarter college graduates; majority renters with 30% owners, mix of dwelling types with slight majority of units in one-to-four-unit buildings.

White&Asian/upper-middle-income/families and singles (159 tracts, 558,479 people, Map 8): majority families with 22% one-person households; age mix, more than 40% immigrants, more than one-third college graduates; more than one-half homeowners; mix of dwelling types with more than one-half units in one-to-four family dwellings.

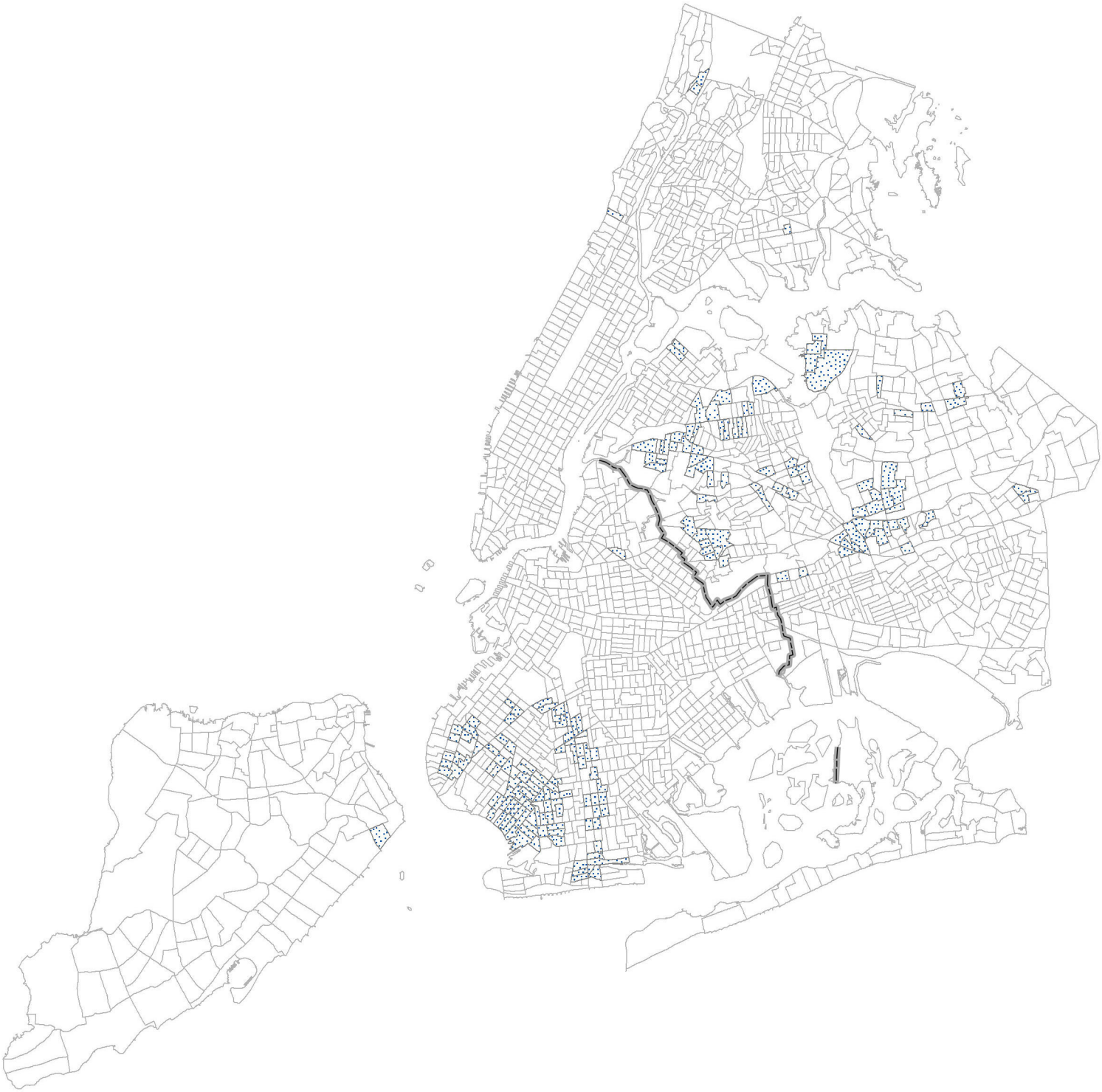
Map 5
Black/low-income/families and singles
New York City, 2010



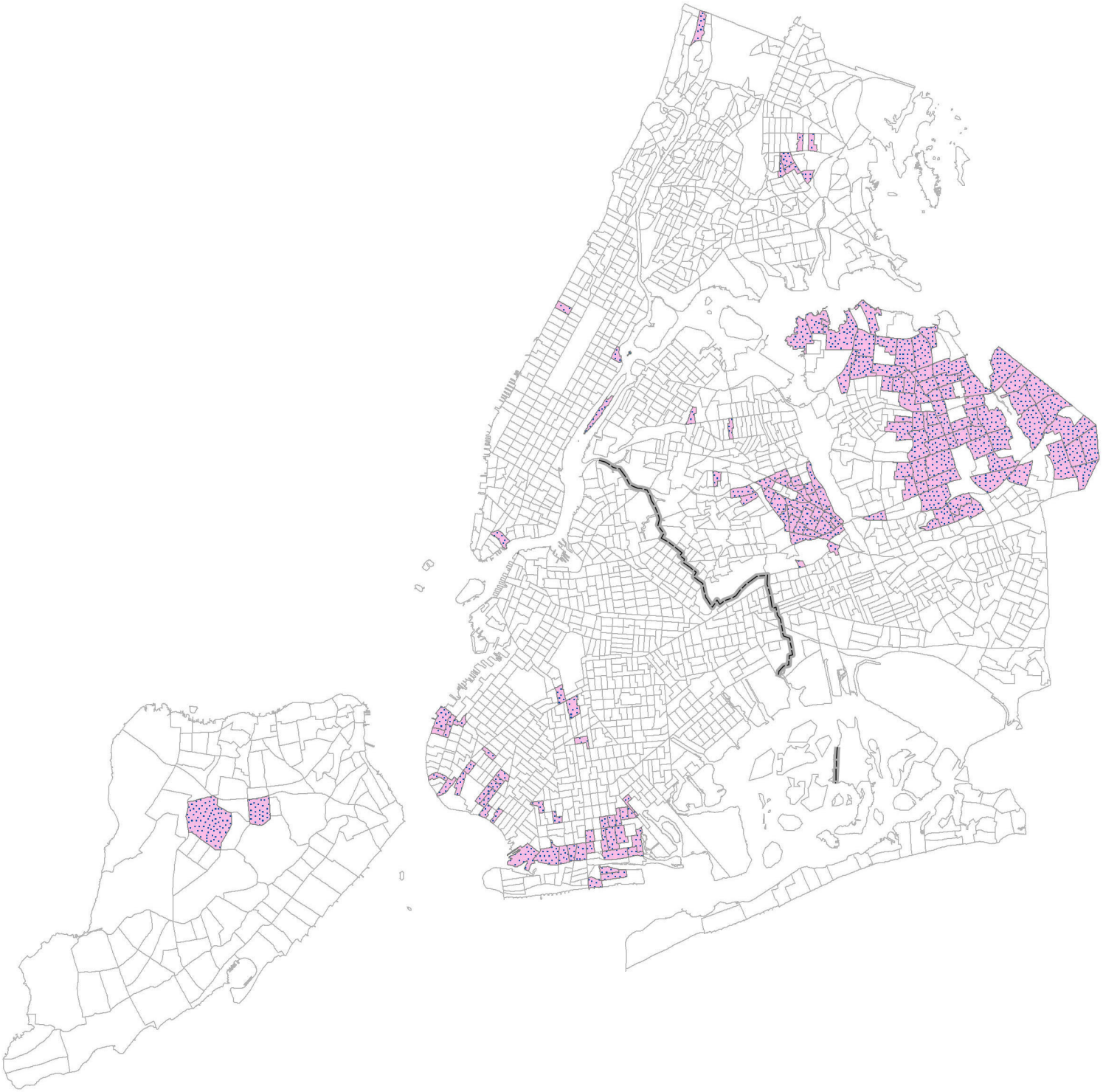
Map 6
Black/upper-middle-income families
New York City, 2010



Map7
White&racial mix/middle-income/families and singles
New York City, 2010



Map 8
White&Asian/upper-middle-income/families and singles
New York City, 2010



White & racial mix/high-income/singles, families, and non-families (119 tracts, 464,950 people, Map 9): plurality (47%) one-person households, one-third families, and 19% shared households; families dominated by couples without children; predominantly young and middle-aged; 60% college graduates, more than one-quarter immigrants; predominantly renters with 21% owners; mix of dwelling types with majority of units in multi-family buildings, second highest share of small-size units (25%).

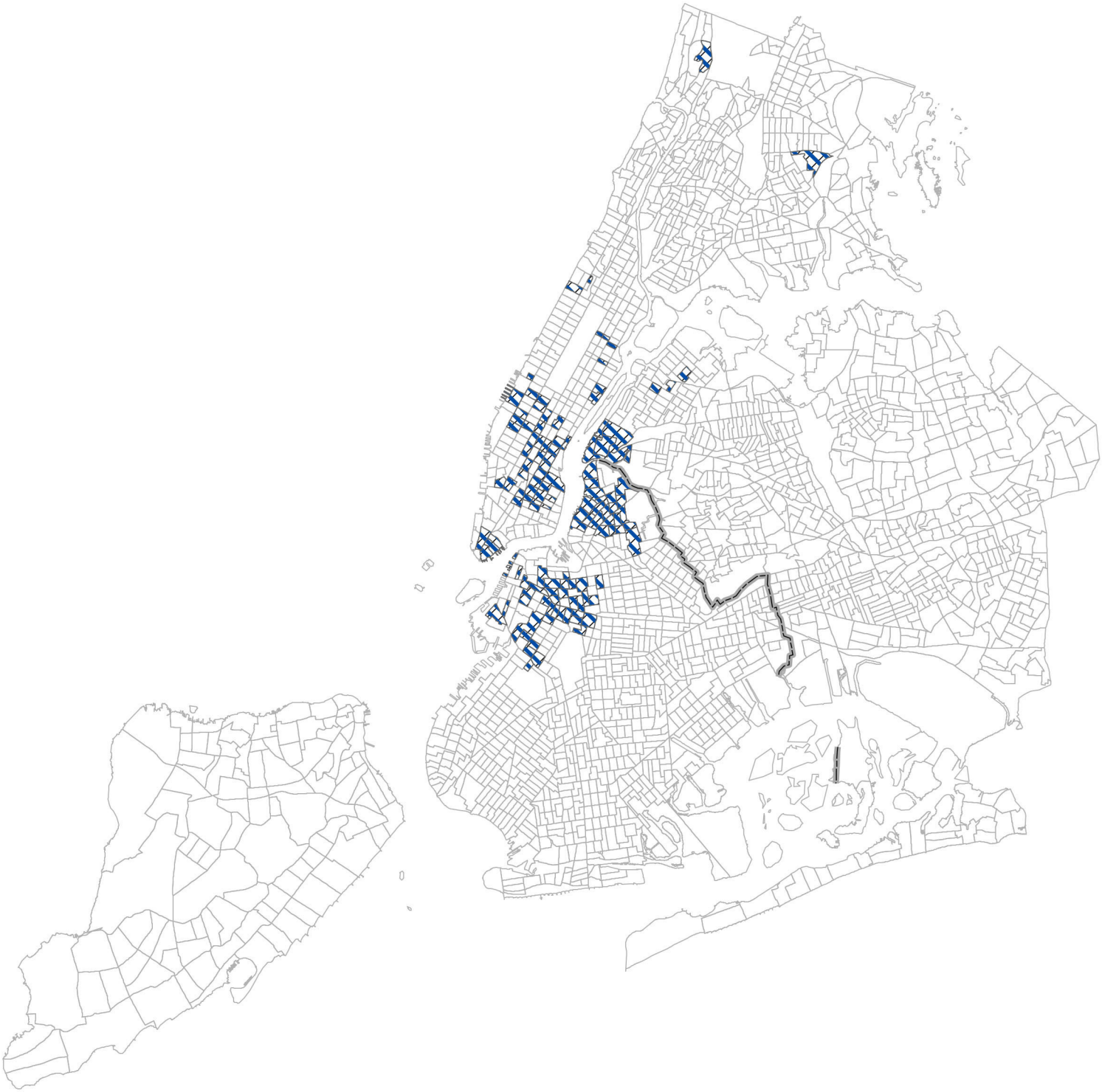
White&Hispanic/middle-income/families, singles and non-families (81 tracts, 293,027 people, Map 10): age and household-type mix, more than one-quarter college graduates, nearly one-half immigrants; predominantly renters with 16% owners, mix of dwelling types with predominant number of units in multifamily buildings.

Clusters with Majority (50 percent to 74 percent) Hispanic Residents

Hispanic&black/low-income/families and singles (250 tracts, 1,089,335 people, Map 11): majority families with 23% one-person households; 44% of families -- single mothers; predominantly young, middle-aged, and children; nearly 40% population living in poverty; very low share (9%) of college graduates; nearly one-third immigrants; predominantly renters, mix of dwelling types; low share of small-size units.

Hispanic&racial mix/low-middle-income/families (102 tracts, 494,791 people, Map 12): predominantly families with mix of family types; 18% one-person households; predominantly young, middle-aged, and children; low share of college graduates; more than one-half immigrants; predominantly renters; majority of units in one-to-four-family dwellings; low share of small-size units.

Map 9
White&racial mix/high-income/singles, families and non-families
New York City, 2010

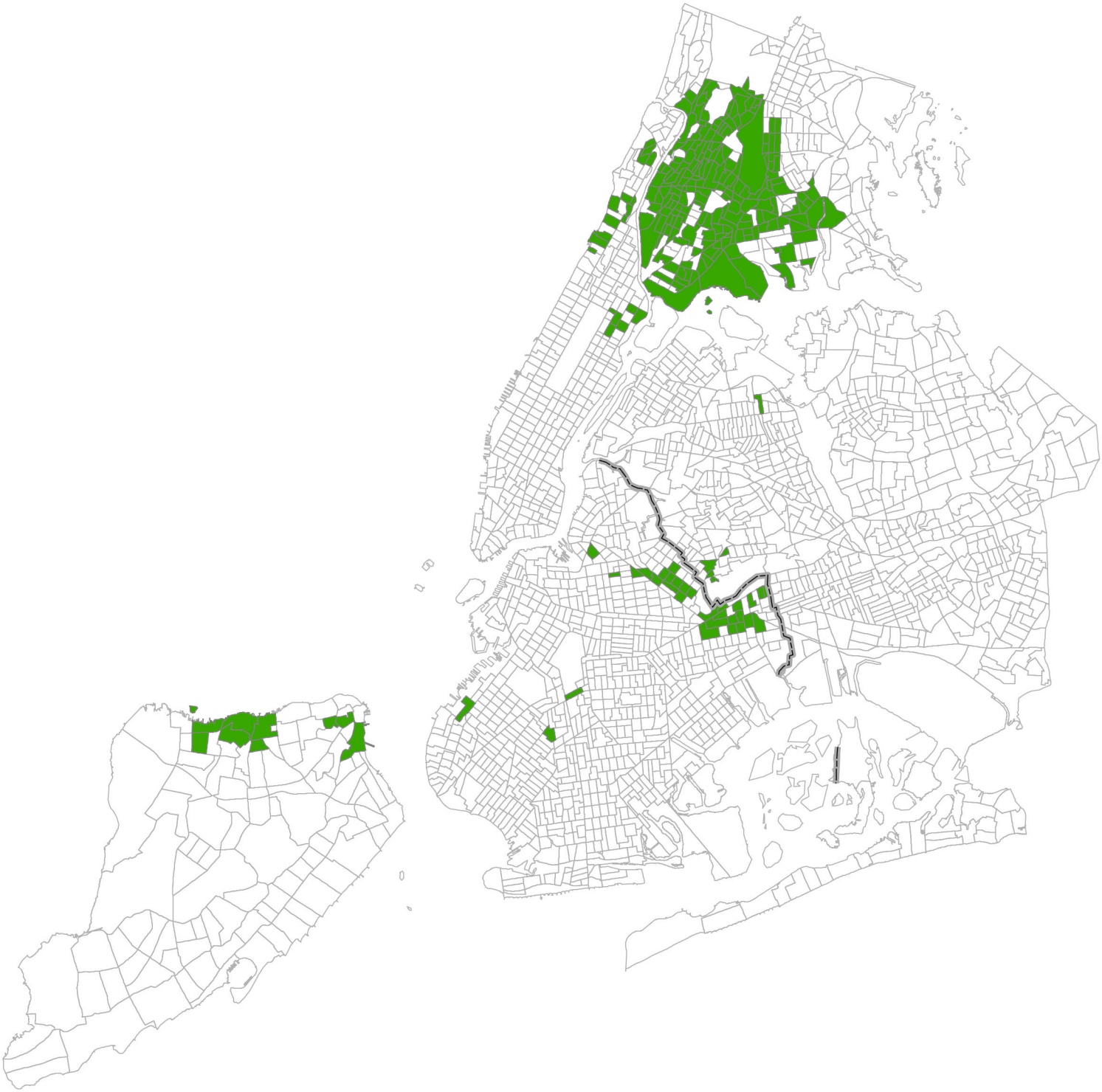


Map10

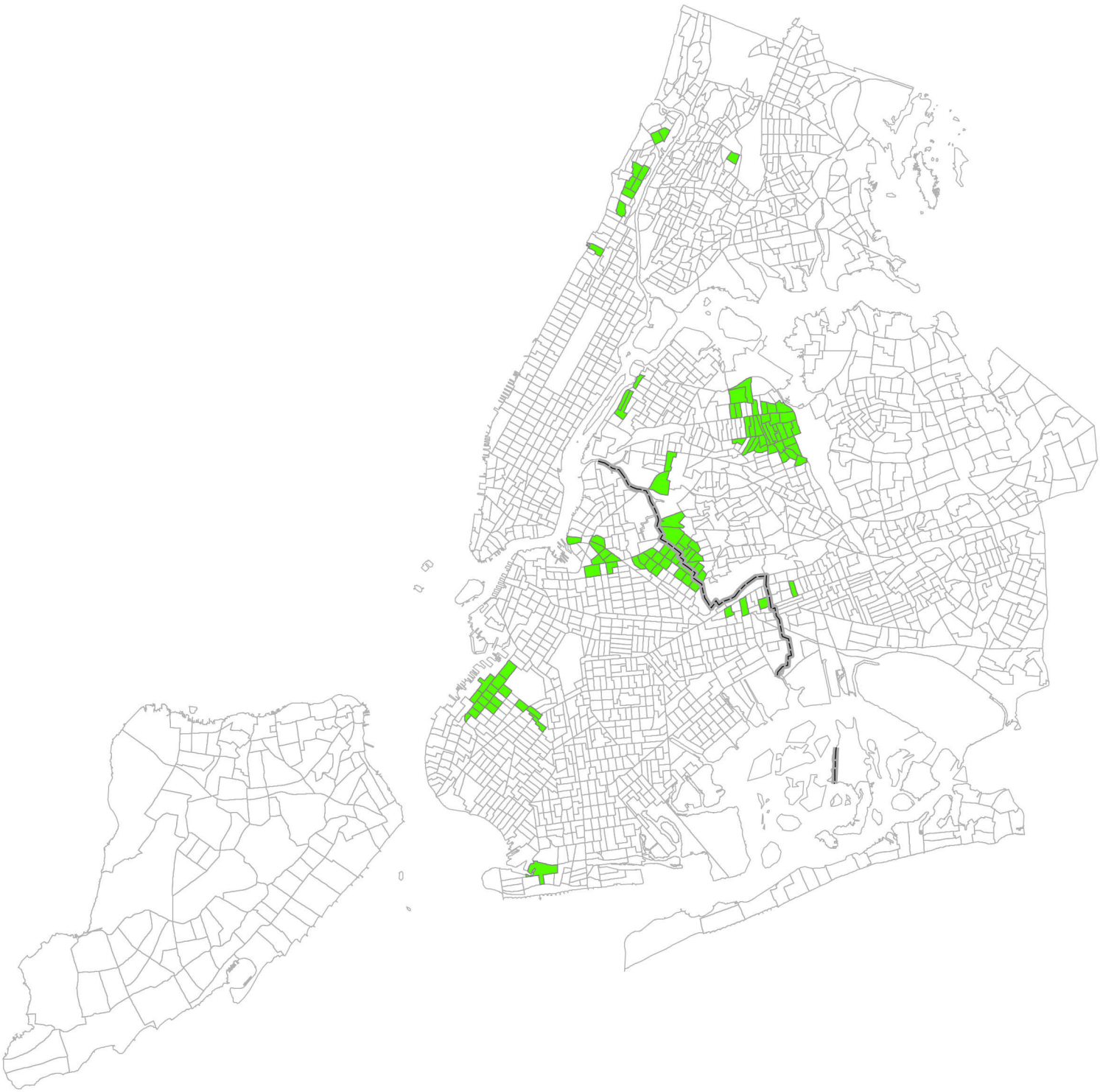
White&Hispanic/middle-income/families, singles and non-families

New York City, 2010

Map 11
Hispanic&black/ low-income/families and singles
New York City, 2010



Map 12
Hispanic&racial mix/low-middle-income/families
New York City, 2010



Cluster with Plurality (47 percent) Asian Residents

Asian&racial mix/ middle-income/families (86 tracts, 380,760 people, Map 13): majority families with 22% one-person households; predominantly young, middle-aged, and children; one-quarter college graduates; nearly two-thirds immigrants; majority renters, mix of dwelling types with majority of units in one-to-four-family homes.

Mixed clusters (no majority race group)

Black&Hispanic/very-low-income/families and singles (110 tracts, 548,493 people, Map 14): majority families with 28% single-person households; one half of families -- single mothers; predominantly young, middle-aged, and children; lowest share of college graduates among all clusters (7%); almost exclusively renters, majority living in public housing; low share of small-size units.

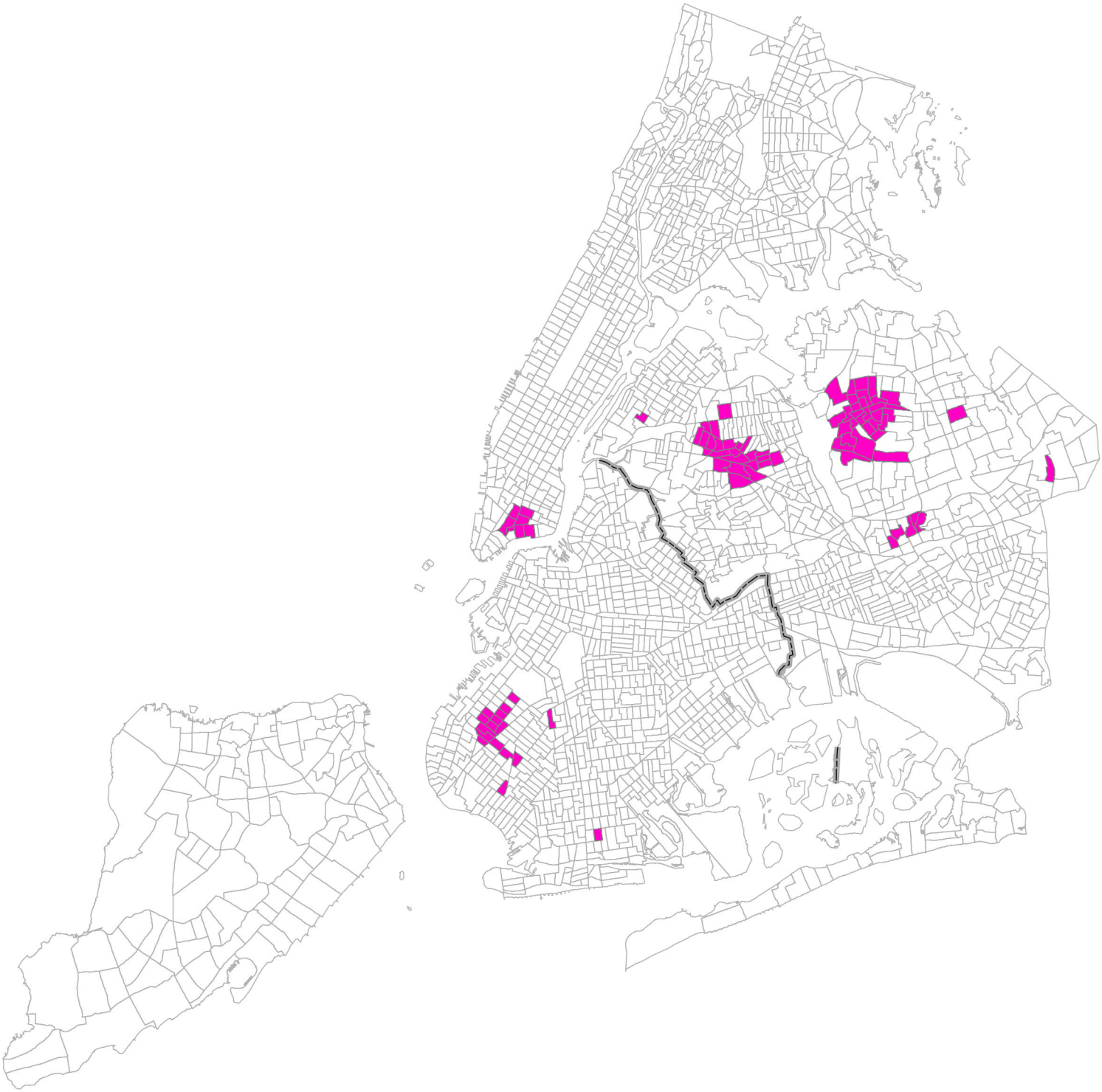
Racial mix/middle-income/families (108 tracts, 323,742 people, Map 15): majority families with 17% single-person households; mix of family types; predominantly young, middle-aged, and children; low share of college graduates; 45% immigrants; more than one-half renters, predominantly units in one-to-four unit dwellings; very low share of small-size units.

VI. NEIGHBORHOOD CHANGES

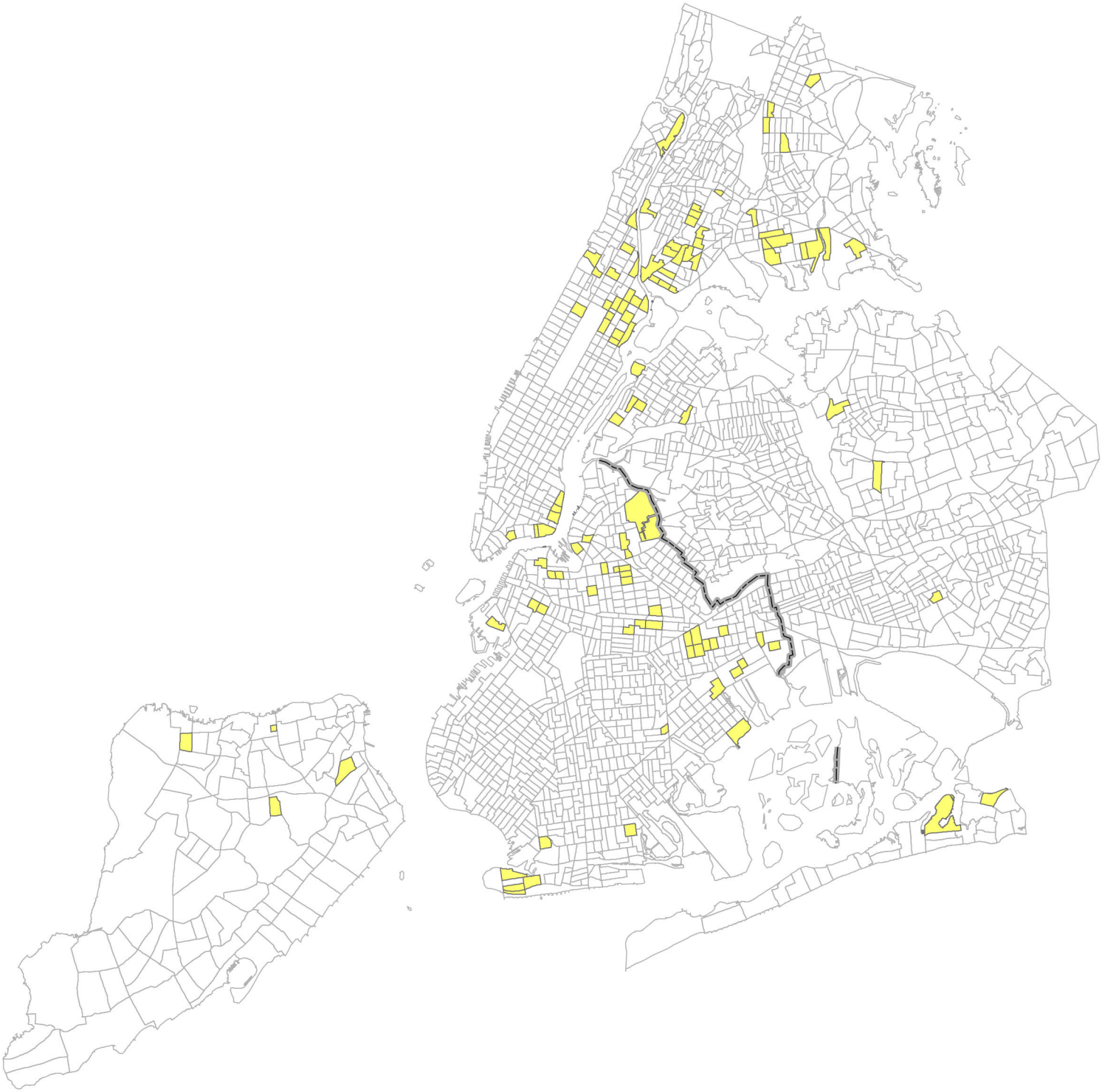
The purpose of this analysis of transitions is to identify how citywide population changes translate into neighborhood-level patterns of shifts in key socioeconomic attributes. These patterns can be used to inform policy-makers, help plan programs, and implement strategies to address specific social needs.

The analysis of transitions helps answer the following questions:

Map13
Asian&racial mix/middle-income/families
New York City, 2010



Map14
Black&Hispanic/very-low-income/families and singles
New York City, 2010



Map 15
Racial mix/middle-income/families
New York City, 2010

1. In the aggregate, what neighborhood types grew, contracted, and didn't change between 2000 and 2010?
2. What were the dominant patterns of neighborhood transition between the two years?
3. Are any housing attributes different between neighborhoods that transitioned and those that did not?

Citywide, 543 tracts transitioned from one neighborhood type (cluster) to another between 2000 and 2010. They represent 26 percent of all tracts used in the analysis. Table 4 displays net gains or losses of census tracts by each cluster, as well as net population changes that resulted from net gains or losses of tracts. The results show the following trends in the changes of size of neighborhood types.

Neighborhood types that grew

Growth of predominantly (more than 75 percent) white clusters

The *White/upper-middle-income/families* cluster experienced a net 22.5 percent growth in the number of tracts and a 29 percent growth of population (second largest percent of increase among all clusters). On the other end of the spectrum, the *White/high-income/middle-aged and elderly/families and singles* and *White/high-income/singles, families and non-families* clusters each saw a moderate reduction in the number of tracts and population. Jointly, their population decreased by 10 percent. The overall net result is a six percent population growth of predominantly white neighborhoods.

Growth of majority (50 to 74 percent percent) white clusters

During the two census years studied, three of the four clusters in which the white

TABLE 4. CLUSTERS THAT GREW, CONTRACTED, AND DID NOT CHANGE IN SIZE

	Number of tracts 2000	Number of tracts 2010	Percent change in the number of tracts	Population 2000	Population 2010	Percent change in population
CLUSTERS THAT GREW						
White&racial mix/high-income/singles, families and nonfamilies	87	119	36.80%	322,643	464,950	44.10%
White/upper-middle-income/families	209	256	22.50%	685,714	885,575	29.10%
Hispanic&black/low-income/families and singles	222	250	12.60%	920,404	1,089,335	18.40%
White&racial mix/middle-income/families and singles	176	191	8.50%	609,014	710,399	16.60%
White&Asian/upper-middle-income/families and singles	140	159	13.60%	497,812	558,479	12.20%
Black/low-income/families and singles	218	233	6.90%	873,108	928,372	6.30%
CLUSTERS THAT CONTRACTED						
Racial mix/middle-income/families	155	108	-30.30%	516,489	323,742	-37.30%
White&Hispanic/middle-income/families, singles, and nonfamilies	118	81	-31.40%	440,729	293,027	-33.50%
Black/upper-middle-income/famillies	226	196	-13.30%	624,917	506,577	-18.90%
White/high-income/middle-aged and elderly/families and singles	107	85	-20.60%	402,581	343,114	-14.80%
Asian&racial mix/middle-income/families	99	86	-13.10%	418,215	380,760	-9.00%
White/high-income/singles, families and non-families	111	101	-9.00%	620,695	577,435	-7.00%
CLUSTERS THAT REMAINED UNCHANGED IN SIZE						
Black&Hispanic/very-low-income/families and singles	109	110	0.90%	523,726	548,493	4.70%
Hispanic&racial mix/low-middle-income/families	100	102	2.00%	488,290	494,791	1.30%

population was between 50 and 74 percent exhibited growth in both the number of tracts and total population. The overall population growth of the *white & Asian* and the two *white/mixed* clusters, was 21 percent. Of those, the *White&racial mix/high-income/singles, families and non-families* cluster also showed the largest growth in the number of tracts (37 percent) and population (44 percent) among all 14 clusters. The increase in the overall size of the four majority white clusters was limited by the net losses of the *White&Hispanic/middle-income/families, singles and non-families* cluster which, unlike the other three majority white clusters, shrank in size between the two census years. This cluster showed the largest net loss of tracts (31 percent) and the second largest loss of population (34 percent). The net result was an eight percent growth of population in the four majority white tracts

Overall growth of majority (50 to 74 percent) Hispanic clusters

The Hispanic&black/low-income/families and singles cluster had the largest population growth among the all 14 clusters. The population of this cluster increased 18 percent over the decade. Correspondingly, the *Hispanic&racial mix/low-middle-income/families cluster* remained consistent as the same number of tracts, slightly over 30, identified with this cluster type transitioned over the two census periods to and from it. The overall net effect is expansion of clusters with majority Hispanic population.

Neighborhood types that contracted

Contraction of racial mix and plurality Asian clusters

The cluster type designated as *Racial mix/middle-income/families* had the largest decrease in population between 2000 and 2010 (37 percent) and second largest decrease in the number of tracts (30 percent).

Likewise, the *Asian&racial mix/middle-income/families* cluster had a moderate decrease of nine percent in population and 13 percent in the number of tracts.

Moderate contraction of predominantly (more than 75 percent) black clusters

While the *Black/low-income/families and singles* cluster exhibited a six percent growth in population, the *Black/upper-middle-income/families* cluster underwent a considerable 19 percent decrease in population over the decade. The net effect is a four percent decrease in population of black clusters.

Neighborhood type that remained relatively unchanged in size

Negligible change of Black&Hispanic/very-low-income/families and singles cluster

The census tracts which comprise the cluster of *Black&Hispanic/very-low-income/families and singles* underwent the smallest demographic change between the two census years. This was due to the fact that nearly 60 percent of this cluster lived in public housing buildings, which of course did not relocate between 2000 and 2010.

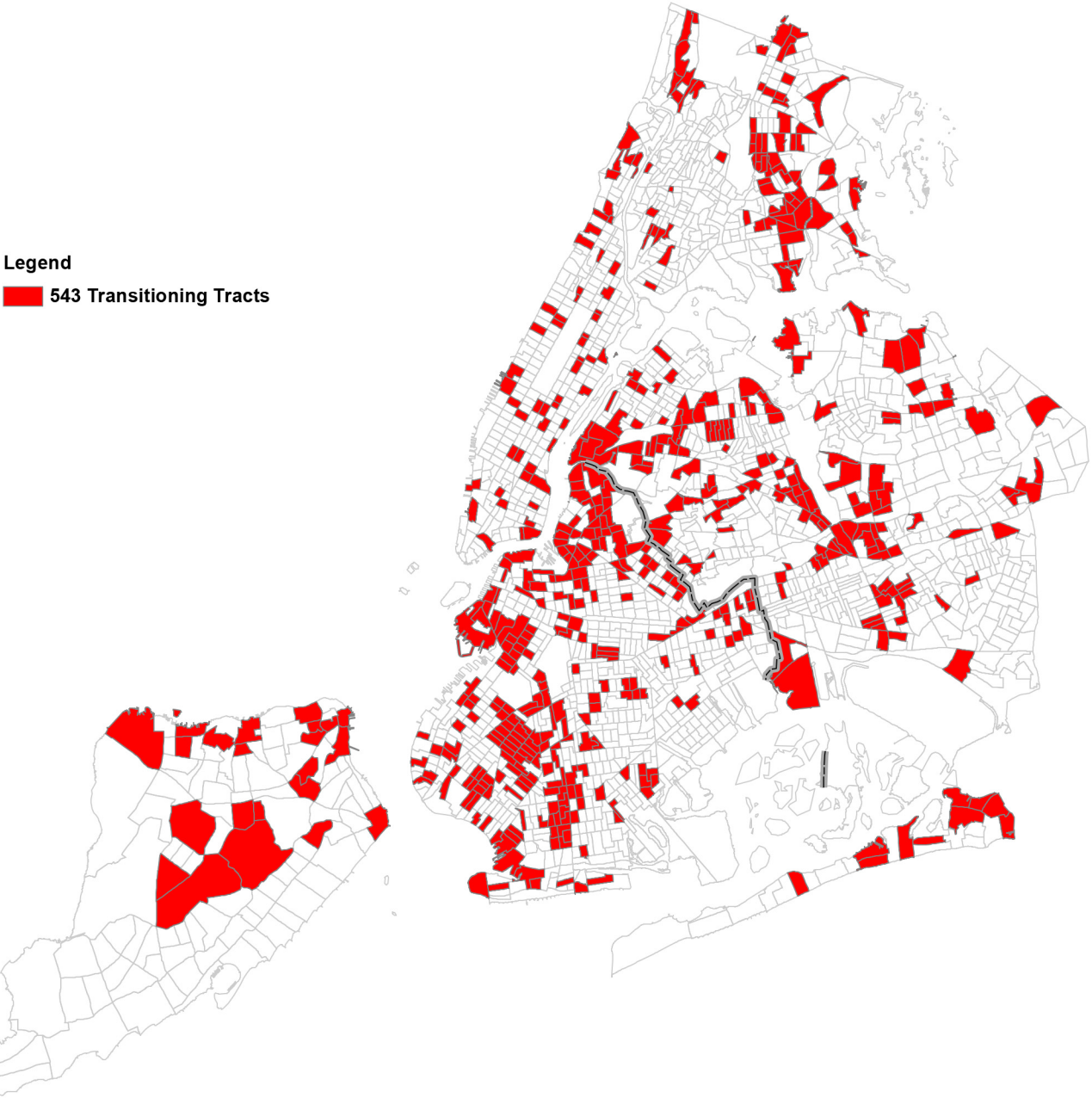
Transition matrix and specific types of neighborhood transitions

The next step in this study of neighborhood change is to analyze the most typical transitions that led to the expansion or contraction of neighborhood types described in the previous section. To do the analysis, a transition matrix was created to trace tract movement between clusters. It shows which clusters are gaining and losing tracts as a result of people moving between various clusters. The matrix is displayed in Table 5. Map 16 shows geographic locations of transitioning tracts.

Table 5. Transition Matrix for Clusters, Count of Census Tracts 2000-2010

2000 neighborhood types	2010 neighborhood types: Predominantly white			Majority Hispanic		Predominantly Black		Majority white				Plurality Asian	Mixed areas	
	White/ upper-middle-income/ families	White/ high-income/ singles, families and non-families	White/ high-income/ middle-aged and elderly/ families and singles	Hispanic& black/ low-middle-income/ families	Hispanic & racial mix/low-income/ families and singles	Black/ upper-middle-income/ famillies	Black/ low-income/ families and singles	White& Asian/ upper-middle-income/ families and singles	White& Hispanic/ middle-income/ families, singles, and nonfamilies	White& racial mix/ high-income/ singles, families and nonfamilies	White& racial mix/ middle-income/ families and singles	Asian& racial mix/ middle-income/ families	Racial mix/ middle-income/ families	Black& Hispanic/ very-low-income/ families and singles
White/upper-middle-income/families	169	0	8	0	5	8	1	14	0	0	3	0	0	1
White/high-income/singles, families and non-families	2	80	13	0	0	0	0	4	0	12	0	0	0	0
White/high-income/ middle-aged and elderly/ families and singles	19	1	61	0	0	0	1	23	0	1	0	0	0	1
Hispanic&black/low-middle-income/families	0	0	0	69	6	0	0	0	15	3	2	3	2	0
Hispanic&racial mix/low-income/families and singles	0	0	0	19	188	1	4	0	6	1	0	0	0	3
Black/upper-middle-income/famillies	2	0	0	0	0	179	35	1	0	0	1	0	8	0
Black/low-income/ families and singles	0	2	1		12	4	184	0	4	5	2	0	1	3
White&Asian/upper-middle-income/families and singles	5	0	0	0	0	0	0	105	0	0	26	3	1	0
White&Hispanic/middle-income/families, singles, and nonfamilies	3	2	0	0	2	0	0	5	52	29	25	0	0	0
White&racial mix/high-income/singles, families and nonfamilies	1	16	0	0	0	0	0	0	3	67	0	0	0	0
White&racial mix/middle-income/families and singles	45	0	2	1	11	1	1	4	0	0	109	0	2	0
Asian&racial mix/middle-income/families	0	0	0	0	0	0	0	3	0	0	16	78	0	2
Racial mix/middle-income/families	10	0	0	13	23	3	1	0	1	0	7	2	94	1
Black&Hispanic/very-low-income/families and singles	0	0	0	0	3	0	6	0	0	1	0	0	0	99

Map 16
Transitioning Census Tracts
New York CIty, 2000-2010



Six dominant trends in New York City census tract transitions over the decade emerge from this analysis:

- increasing concentrations of predominantly white, upper-middle income owner-occupancy areas;
- contraction of black areas, with wealthier ones turning poor at their borders;
- expansion of majority white and racial mix high- income and middle-income areas;
- some predominantly white areas gaining a significant Asian population;
- expansion of low-income Hispanic areas at the same time as upward dynamics of areas with majority Hispanic low-middle-income population;;
- prior racial mix areas moving toward having majority groups.

What follows is an exploration of these six trends, which will help develop an understanding of the neighborhood shifts this analysis has uncovered. Thereafter, with knowledge of these trends in hand, we attempt to identify patterns that exist related to housing outcomes by including an analysis of code violations (as a proxy for rental housing physical distress) and *lis pendens* filings (as a proxy for housing financial distress).

1. Moderate expansion of predominantly white clusters

The white population in New York City experienced a modest three-percent decline over the decade of 2000-2010. According to the NYC Department of City Planning, this decline was due to low levels of natural increase and net out-migration. The decrease was much smaller than in the preceding decades. As DCP wrote, “This lesser rate of decline was largely due to a smaller-than-expected loss through migration, associated with an increased propensity of the city to attract young domestic migrants over the last decade.”[21] The areas identified as predominantly and majority white experienced a variety of

[21] NYC 2010. Results from the 2010 Census, p. 5.

transitions, indicating that a number of different trends are occurring across these neighborhoods.

The *White/upper-middle-income/families* cluster experienced some expansion between the years 2000 and 2010, and their share increased from 10 percent to more than 12 percent of all tracts in the city. This occurred, first and foremost, due to demographic transition of tracts which had been in the *White&racial mix/middle-income/families and singles* category in 2000 (Map A4.1). This transition was the largest in scope, including 45 tracts and a population of nearly 150,000 in 2010. The areas that underwent this type of transition are located in parts of Maspeth and Kew Gardens Hills in Queens and in some areas of Brooklyn–Flatbush, Midwood, South Madison, Homecrest, and Seagate-Coney Island.[22]

As for housing type distinctions, the transitioning tracts have a larger share of units in houses with one to four units compared to the entire *White&racial mix/middle-income/families and singles* cluster; they shifted from (65 percent versus 47 percent). Yet, compared to the *White/upper-middle-income/families* cluster they transitioned to, these tracts have less owner-occupancy (36 percent versus 57 percent) and a smaller share of units in one-to-four-unit houses (65 percent vs 81 percent).

Another addition to the White/upper-middle-income/families cluster occurred as a result of 10 tracts transitioning from the *Racial mix/middle-income/families* category (Map A4.). This transition was much smaller in scope and included a population of 42,000 in 2010. Interestingly, these tracts have a much lower level of owner-occupancy (21 percent) than both the cluster they shifted from and the one they transitioned to (45 percent and 57 percent, respectively), as well as a smaller share of one-to-four-family homes.

[22] Areas of transition and dynamics of ethnic groups were identified based on findings from: NYC 2010. Results from the 2010 Census.

As a result of all these transitions, the *White/upper-middle-income/families* cluster expanded to include some predominantly rental or mixed-ownership-type housing areas with around 30 percent units in multifamily buildings of 20 or more units. These types of tracts make new addition to this cluster in terms of housing type: the overall share of units in multifamily buildings in the cluster is only 10 percent.

Between the predominantly white areas, a shift occurred from the *White/high-income/middle-aged/elderly/families and singles* type to *White/upper-middle-income/families* (Map A4.2). It included 19 tracts where nearly 54,000 people resided in 2010. It happened in parts of the Bronx (North Riverdale/Fieldston, Pelham Bay-Country Club-City Island, Van Nest-Morris Park-Westchester Square, and Throgs Neck), parts of Queens (Middle Village/Glendale, Far Rockaway-Bayswater, Howard Beach, and Rockaway Park), parts of Brooklyn (Windsor Terrace, Midwood, Bay Ridge, and Dyker Heights), and in parts of Dongan Hills in Staten Island. In terms of housing stock, the transitional tracts with the majority of units in one-to-four-family dwellings are much closer to the neighborhood type they shifted to in 2010 than the one they had belonged to in 2000. The transition reflects the trend of white upper-middle income elderly couples and single persons being replaced by middle-aged and young families.

Another moderate shift within the predominantly white areas involved 13 tracts changing from *White/high-income/singles, families and non-families* to *White/high-income/middle-aged/elderly/families and singles* (Map A4.3). The transition involved 53,500 residents and reflected young and middle-aged upper-income singles aging in place and moving into older age categories.

In sum, we conclude that between 2000 and 2010, an overwhelming pattern continued from the previous decade of the white presence in New York City increasingly consolidating in the areas of upscale, owner-occupied, *white family*

areas. Additionally, this pattern of white consolidation grew to include areas with more mixed housing stock with mixed patterns of owner occupancy.

2. Contraction of black clusters, with wealthier ones turning poor, especially at their borders

The trends in the black clusters are partially the result of a five percent decline in the black population in the city, largely through migration.[23]

The major transition that occurred in the black areas over the decade was from the *Black/upper-middle-income/families* category to *Black/low-income/families and singles* (Map A4.4). This transition was the second largest in scope, encompassing 35 tracts and 115,935 residents in 2010 and making up 13 percent of the population in the *Black/low-income/families and singles* cluster. Meanwhile, the cluster of *Black/upper-middle-income/families* lost eight tracts to the racial mix areas and 12 of the *Black/low-income/families and singles* tracts changed to *poor Hispanic* tracts.

The transitions occurred in the tracts where the owner occupancy rate was much lower in 2010 than in the *Black/upper-middle-income/families* tracts overall (37 percent versus 59 percent, respectively). The transitioning tracts are also characterized by having more units were in multifamily buildings with five or more units (27 percent versus 11 percent). Transitions may be the result of the recent economic recession and, as the *lis pendens* analysis below shows, with the concomitant overleveraging of buildings in the transitioning areas.

The transitions in this cluster involved outflow of black population in parts of Brooklyn (Crown Heights South, East Flatbush-Farragut, Brownsville, Rugby-Remsen Village, and Erasmus) and Queens (St. Albans, Erasmus, and Hollis), in

[23] Blacks accounted for more than one half of the city's net migration losses (NYC 2010. Results from the 2010 Census, p. 6).

certain areas coupled with inflow of Asians (Queens Village, South Jamaica, and Baisley Park in Queens and Flatbush in Brooklyn). Some areas, on the other hand, experienced growth of black population through either natural increase (Williamsbridge-Olinville in the Bronx, Springfield Gardens South-Brookville, and Hammels-Arverne-Edgemere in Queens) or both natural increase and in-migration (East New York and Canarsie in Brooklyn). Certain areas had a major outflow of white population (Queens Village, Canarsie in Brooklyn, and Allerton-Pelham Gardens, Woodlawn-Wakefield, and Williamsbridge-Olinville in the Bronx). Flatbush and Crown Heights South in Brooklyn, on the other hand, experienced an inflow of whites.

All these transitional areas had a major increase in Hispanic population, through either natural growth or natural growth coupled with in-migration (in areas of Williamsbridge-Olinville and Allerton-Pelham Gardens in the Bronx, South Jamaica, Hammels-Arverne-Edgemere, Baisley Park, and St. Albans in Queens). Dominicans contributed most to the growth of Hispanic population. Some areas had an inflow of other groups (such as Mexicans in Flatbush)

3. Expansion of majority white/mixed clusters

Of all the clusters identified in New York City in 2000, the one growing at the fastest rate (more than 44 percent) between 2000 and 2010 was *White&racial mix/high-income/singles, families and non-families*. The major addition to this category occurred due to the transition of 29 tracts from the *White&Hispanic/middle-income/families, singles and non-families* cluster (Map A4.5). These transitioning tracts housed nearly 82,000 residents, making this transition the third largest in scope. The tracts are located in Steinway, Astoria, Sunnyside, and West Maspeth in Queens, in Lower Manhattan, as well as Greenpoint, East Williamsburg, Park Slope, and Sunset Park West in Brooklyn.

Half of the housing stock in those transitional tracts consists of units in one-to-four-family houses, which is a much higher share than overall in the clusters these tracts belonged to both in 2000 and in 2010 (28 percent and 15 percent, respectively). Yet only 18 percent of units in the transitional tracts were in multifamily buildings with 20 or more units in 2010, versus 34 percent and 52 percent in their 2000 and 2010 clusters overall. This points to the fact that the *White&racial mix/high-income/singles, families and non-families* cluster is expanding into brownstone Brooklyn and other low-rise areas of Queens and Brooklyn. It is also possible that this cluster is expanding into higher-density new construction that didn't exist in the year 2000 in Lower Manhattan, Greenpoint, East Williamsburg, and parts of Park Slope.

Another addition to the areas *of White&racial mix/high-income/ singles, families and non-families* involved 15 tracts identified in 2000 as *white/upper-income/ singles, families and non-families*, with a combined population of more than 64,000 (Map A4.6). The process reflects the influx of other race groups—mostly Asian—into historically wealthy white areas of Turtle Bay-East Midtown, Gramercy, Stuyvesant Town-Cooper Village, Hudson Yards-Chelsea-Flat Iron-Union Square, and Lenox Hill-Roosevelt Island in Manhattan and Brooklyn Heights-Cobble Hill in Brooklyn. The less wealthy and more racially mixed areas of Hunters Point-Sunnyside-West Maspeth in Queens; East Harlem South in Manhattan; and DUMBO-Vinegar Hill-Downtown Brooklyn-Boerum Hill and Fort Greene in Brooklyn experienced an influx of Asians as well, combined with heavy outflow of Hispanic residents of various national origins. East Harlem South, DUMBO, and Fort Greene also had an outmigration of black population, combined with inflow of whites; and Hudson Yards-Chelsea-Flat Iron-Union Square and Hunters Point-Sunnyside-West Maspeth had a major inflow of white population. Many of these areas also experience rapid new construction and rezonings.

East Harlem South shows a large increase in the numbers of non-family and one-person households. DUMBO, Hudson Yards and Hunters Point-Sunnyside-West Maspeth have an inflow of a mix of household types–families with and without children, as well as shared and one-person households.

The transition may have been facilitated by the similarity of the housing makeup of the new cluster to the transitioning tracts. The housing stock of this group was very similar in 2000 and 2010: the overwhelming majority of units are in high-rise buildings with 20 or more units; and 28 percent to 29 percent of units are small-size (one or two rooms), which is the highest share among all clusters and transitioning tracts. The relatively low level of owner occupancy in the transitional tracts (22 percent) is much closer to *the White&racial mix/high-income/ singles, families and non-families* cluster (20 percent) than to the *White/high-income/ singles, families and non-families* cluster they had belonged to in 2000 (33 percent).

At the same time, a reverse trend occurred, very similar in scope, involving the transition of areas populated by *White&racial mix/high-income/singles, families and non-families* to *White/high-income/singles, families and non-families* (Map A4.7). The transition involved 16 tracts with 63,000 residents in 2010. These transitional tracts have a 34 percent owner-occupancy rate, similar to the cluster they shifted to in 2010 (33 percent). The housing stock in them differs, however: one-third of units are in one-to-four family homes and only 43 percent in high-rises with 20 or more units (versus nine percent and 64 percent, respectively, in the *White/high-income/ singles, families and non-families* cluster).

This process may reflect the inflow of young white professionals into white and racial mix high-income areas of Manhattan: Clinton, West Village, Yorkville, Chelsea, Flatiron, and Union Square. A similar inflow has also been occurring in some brownstone parts of Brooklyn, which is a new trend: Vinegar Hill, Downtown Brooklyn, Boerum Hill, Columbia Street-Red Hook, Park Slope, and

Clinton Hill; and in DUMBO, where the SOHO loft experience is being repeated.[24]

Another majority white cluster, which experienced a 17 percent expansion over the decade, was *White&racial mix/middle-income/families and singles*. It gained tracts which had been of the following types in 2000 (Map A4.8):

- *Asian&racial mix/middle-income/families* (16 tracts with 56,500 residents);
- *White&Asian/upper-middle-income/families and singles* (26 tracts with nearly 100,000 residents);
- *White&Hispanic/middle-income/families, singles and non-families* (25 tracts with more than 103,000 residents);
- *Racial mix/middle-income/families* (7 tracts with more than 26,000 residents).

This type of transition occurred all over western and central parts of Queens, in Kingsbridge in the Bronx, and in vast areas of southeast parts of Brooklyn. These trends reflect movements of wealthier Asian families to white neighborhoods or out of the city, and movement of the less poor Hispanic population to areas identified as *racial mix* in 2000. Most of the transitional tracts, except the ones shifting from *White&Hispanic/middle-income/ families, singles and non-families,* have a large majority of units in low-rise dwellings, far exceeding the 47 percent share of such units in the *White&racial mix/middle-income/families and singles*

[24] In the 1970s, SOHO was left with a lot of obsolete manufacturing buildings that had been built as commercial lofts for industrial uses. While those spaces became unattractive for the kinds of manufacturing and commerce that survived in the city at that time, they attracted artists who valued them for their large areas, large windows, and low rents. These spaces were often used illegally as living space, despite being neither zoned nor equipped for residential use: the artist-occupants were using space for which there was little demand due to the city's poor economy at the time, and which would have been abandoned otherwise. Beginning in the 1980s, the neighborhood began to draw more affluent residents. SoHo's location, the appeal of lofts as living spaces, its architecture, and its reputation as a haven for artists all contributed to the pattern of gentrification typically known as the "SoHo Effect." A backwater of poor artists and small factories in the 1970s, SoHo became home to some of the most expensive real estate in the country.

areas they shifted to. These clusters appear to be expanding into low-rise neighborhoods.

4. Some predominantly white clusters transitioning to *White & Asian*

Some tracts transitioned from the *White/upper-middle-income/families* and *White/high-income/middle-aged and elderly/families and singles* clusters to *White&Asian/upper-middle-income/families and singles* (Map A4.9). These transitions encompassed 14 and 23 tracts, respectively, with the population of more than 40,000 and more than 81,000. They occurred in a very wide range of neighborhoods: parts of the Bronx (North Riverdale-Fieldston-Riverdale, Pelham Parkway, Allerton-Pelham Gardens, and Van Nest-Morris Park-Westchester Square), in some central and eastern parts of Queens (Whitestone, Forest Hills, Woodhaven, College Point, Middle Village, Bayside-Bayside Hills, Ft. Totten-Bay Terrace-Clearview, Douglas Manor-Douglaston-Little Neck, and East Flushing); in parts of eastern and southern Brooklyn (Dyker Heights, Madison, Bath Beach, Bay Ridge, Brighton Beach, Sheepshead Bay-Gerritsen Beach-Manhattan Beach, Gravesend, Bensonhurst East, and Bensonhurst West); in Battery Park City-Lower Manhattan and in New Springville-Bloomfield-Travis in Staten Island.

The transitional tracts are very close to both their original 2000 neighborhood types, as well as to their 2010 *white & Asian* cluster, in terms of owner occupancy rate, which is above 50 percent. Housing stock in the transitional tracts consists of units in predominantly in one-to-four-family houses (especially in tracts that transitioned from *White/upper-middle-income/families*, where 90 percent of units are in such buildings). This is also similar to their 2010 *White & Asian* type. Interestingly, the *White/high-income/middle-aged and elderly/families and singles* areas that some of the transitional tracts belonged to in 2000 have only 18 percent of units in one-to-four-family houses. Thus the tracts that underwent transition to *white & Asian* represent specific low-rise enclaves of this

cluster. Apparently, the similarity of housing stock facilitates transition of tracts from *white* to *white & Asian upper-middle income* neighborhood type.

These transitions are the result of high-income Asian households moving into predominantly white areas. These moves reflect the 32 percent increase of the Asian population in New York City (the largest among race groups), which "was due to both positive net migration and natural increase."[25] Among Asian ethnic groups, it was Chinese that contributed most to the migration into these areas, as well as Koreans in Bayside-Bayside Hills and Douglaston-Little Neck, Bangladeshi in North Riverdale-Fieldston-Riverdale, and (Asian) Indians in Lower Manhattan.

5. Expansion of poor Hispanic cluster, upward dynamics of Hispanic working class tracts

Overall, the Hispanic population in New York City grew by eight percent over the decade, mostly due to natural increase.[26] One major source of the expansion of the *Hispanic&black/low-income/families and singles* cluster over the decade was the transition of *Racialmix/middle-income/families* tracts (Map A4.10). It was considerable in scope, including 23 tracts with more than 88,000 residents. The transitional tracts have a greater mix of housing types than racial mix areas overall–whereas units in racial mix areas are overwhelmingly in one-to-four-unit houses (83 percent), the transitional tracts have a smaller share of such units (68 percent), with one-fifth of units in multifamily buildings with 20 and more units. Since *Hispanic low-income* cluster overall have only one-quarter of units in one-to-four-unit houses and more than 40 percent in buildings with more than 20 units, it appears that it expanded into low-rise neighborhoods. The transitional tracts have 26 percent owner-occupancy rate, which falls between the *racial mix* and *low-income Hispanic* tracts.

[25] NYC 2010: Results from the 2010 Census. Components of Change by Race and Hispanic Origin for New York City Neighborhoods. NYC Department of City Planning Working Paper.
[26] Ibid, p. 5.

This type of transition occurred in a few areas of the Bronx (West Farms-Bronx River, Soundview-Bruckner, Parkchester, Van Nest-Morris Park-Westchester Square, and Westchester-Unionport; parts of Central Brooklyn (Williamsburg, East New York, Cypress Hills-City Line), and Borough Park; Ridgewood in Queens; and Graniteville in Staten Island. The transition occurred largely due to high natural growth of Hispanics (mostly Mexicans and Dominicans). Also, some inflow of Asians, predominantly Bangladeshi, occurred in most of these areas.
In a similar pattern, 11 tracts with nearly 50,000 residents transitioned to the *Hispanic&black/low-income/families and singles* cluster from *White&racial mix/middle-income/families and singles* (Map A4.10). This transition occurred in parts of Pelham Parkway and Westchester in the Bronx, in parts of Ridgewood in Queens, in East Harlem in Manhattan, in parts of East New York and Borough Park in Brooklyn, and in West New Brighton and Port Richmond in Staten Island.

Housing units in the transitional tracts are in a mix of buildings, with a higher share of one-to-four-family houses (47 percent) than Hispanic low-income tracts overall. Again, this shows expansion of Hispanic low-income areas into low-rise tracts. As in the case of tracts transitioning from the racial mix cluster, the owner occupancy rate (19 percent) falls between the *White&racial mix/middle-income* and *low-income Hispanic* tracts.

These shifts reflect higher-income households moving out of those areas and being replaced by low-income Hispanic households who are moving out of *white&Hispanic middle-income* neighborhoods. The process takes place in parts of Brooklyn (Borough Park, Cypress Hills-City Line, North Side-South Side, Bedford, Williamsburg, and Sunset Park East), as well as Queens (Corona, Ridgewood, Woodhaven, Queensbridge-Ravenswood-Long Island City). In all those areas, a large natural increase in Hispanic population occurred, combined with out-migration of Hispanics (except for Corona and Woodhaven). All these areas had outmigration of whites, except for Bedford and North Side-South Side,

as well as out-migration of blacks. Sunset Park East had a major inflow of Chinese population.

Reflecting similar trends, 13 *racial mix* tracts encompassing more than 52,000 residents transitioned to *Hispanic&racial mix/low-middle-income/family* (Map A4.11). This transition occurred in parts of Brooklyn (Borough Park, North Side-South Side, Cypress Hill-City Line, Sunset Park East, Williamsburg, and Bedford) and parts of Queens neighborhoods (Corona, Queensbridge-Ravenswood-Long Island City, Ridgewood, and Woodhaven).

The opposite movement is evident in 19 tracts with more than 84,000 residents that transitioned from the *Hispanic&black/low-income* cluster to the *Hispanic&mixed race/low-middle-income/families* category (Map A4.12). Those included areas in Washington Heights South in Manhattan; Belmont in the Bronx; East Elmhurst, North Corona, and Maspeth in Queens, and parts of Bedford, Bushwick, Sunset Park West, and Seagate-Coney Island, in Brooklyn.

Most of these areas, with the exception of East Elmhurst and Maspeth, had an outflow, combined with natural growth, of the Hispanic population. This led to the net increase in the number of Hispanic residents in Belmont, East Elmhurst, Maspeth, North Corona, Bushwick South, and Bedford. Simultaneously, there was moderate in-migration of Asians into many of these areas, combined with their natural growth, and a major inflow of whites into all areas except Belmont, Maspeth, and North Corona.

In terms of housing stock, the transitional neighborhoods are closer to the *Hispanic&racial mix/low-middle-income/families* areas: they have 53 percent of units in one-to-four-family houses, while the *Hispanic&racial mix/low-middle-income/families* cluster overall has 44 percent of such units (as opposed to their 25 percent share in the *Hispanic* low-income cluster they shifted from).

This addition to the *Hispanic&racial mix/low-middle-income/families* tracts was offset by the loss of some of those tracts to other clusters. Of those, the largest was the transition of 15 tracts with nearly 46,000 residents from being *Hispanic &racial mix/low-middle-income* to *White&Hispanic/middle-income/families, singles and non-families* (Map A4.13). There are no noticeable housing differences. This echoes the transitions that occurred in Washington Heights in Manhattan, part of Queens (Astoria, Queensbridge, Ravenswood, Long Island City, Astoria, and Greenpoint), and parts of Brooklyn, such as Bushwick, and Sunset Park West.

6. Transformation of racial mix areas toward having majority groups

The *Racial mix/middle-income/families* cluster had a net loss of 30 percent of its 2000 census tracts and 37 percent of its population. As the discussion above has revealed, *racial mix* cluster appeared to be undergoing two types of transitions. The first trend is the continuing consolidation of white, upper-income, owner-occupied areas. The second trend is the expansion of low-income Hispanic and to a smaller degree, low-middle-income Hispanic areas. This process is driven by large natural growth of Hispanic population and an outflow of higher-income households.

VII. ANALYSIS OF HOUSING VIOLATIONS AND *LIS PENDENS*

Housing violations: background

The number of violations is used as a measure of the physical condition of the city's rental housing stock. Housing violations data comes from municipal files of the New York City Department of Housing Preservation and Development (HPD). Violations reflect HPD's efforts to enforce compliance with the City's Housing Maintenance code and the New York State Multiple Dwelling Law. Tenants may

call the City's Citizen Service Center (311) to register complaints regarding possible housing violations in their apartment, including lack of essential services such as heat, hot or cold water, or electricity. When necessary, in response to these complaints, the HPD Division of Enforcement and Neighborhood Services sends out inspectors to inspect emergency conditions and issue a Notice of Violations (NOV). If HPD inspectors find violations , the landlord is directed to perform the repair within a timeframe specified by law. Once a landlord corrects a violation, he or she may have the violation removed from the building's record by certifying that it was corrected within the required time period specified on the NOV. There are three classes of violations: A, B, and C.

A-class violations are non-hazardous and include minor leaks, lack of signs designating floor numbers, and, when no children under the age of six live in the dwelling, chipping or peeling paint. An owner has 90 days to correct an A violation.

B-class violations are hazardous and include inadequate lighting in public areas, public doors that do not self-close, and missing smoke or carbon monoxide detectors. An owner has 30 days to correct a B violation.

C-class violations are an indication of immediately hazardous conditions, such as the lack of adequate fire exits, heat, hot water, electricity, or gas, or the presence of lead-based paint. An owner has 24 hours from the issuance of an NOV to correct non-heat or non-lead C violations, and five days to certify the correction to remove the violation. Heat violations must be corrected within 24 hours of the inspection (violations are posted at the building for this condition). Lead-based paint violations must be corrected within 21 days. If owners fail to correct C violations, HPD may initiate corrective action through its Emergency Repair Program.

Violations analysis

Our analysis focuses only on B and C violations as they are hazardous and are known to be one of the best available statistical indicators of buildings' physical problems. In order to adjust for the size of building, we use a building-level indicator: *rate of B and C violations per unit*, i.e. the number of B and C violations issued in a building over a time period divided by number of units in that building. An average violation rate was then calculated for each census tract.

For the purpose of analyzing differences in building conditions at the cluster level and identifying clusters with the poorest quality of building stock, we focused on violations issued in the year 2010 to make violations data most compatible with the data used for identifying clusters. The average violation rate in 2010 was calculated for each 2010 cluster and the results are presented in the first column of Table 6.

Four clusters have distinctly higher violations rates than others: *Hispanic&black/low-income/families and singles; Black/low-income/families and singles; Hispanic&racial mix /low-middle-income/families; and Black&Hispanic/ very-low-income/families and singles.* Although one of the contributing factors is low homeownership rates in those clusters, their building quality still needs more detailed analysis as other clusters with similar or even lower homeownership rates do not have such high average rates of violations. In order to visualize concentrations of the worst-quality buildings in those clusters, the average violations rate per census tract was mapped for each of them (Maps 5.1-5.4 of Appendix 5). To control for the size of buildings in each tract, the maps also display percent of units in one-to-four-unit buildings in each tract.

Map A5.1 shows that in the *Hispanic&black/low-income/families and singles* cluster, the highest enclaves of high-violation buildings are in the predominantly multifamily areas in the Southwest Bronx, in Washington Heights, East and West

Table 6. Average Number of B and C violations and Lis Pendens Filings in the 2010 Clusters

2010 cluster	BC per unit issued, 2010	Average number of Lis Pendens per tract, 2010	Total Lis Pendens, 2010
White/upper-middle-income/families	0.013	10.915	2,685
White/high-income/singles, families and non-families	0.037	5.404	481
White/high-income/middle-aged and elderly/families and singles	0.020	4.964	278
Hispanic/low-middle-income/families	0.156	10.594	1,070
Hispanic/low-income/families and singles	0.250	9.777	2,102
Black/upper-middle-income/famillies	0.046	17.631	3,438
Black/low-income/families and singles	0.173	18.667	4,200
White&Asian/upper-middle-income/families and singles	0.008	5.735	843
White&Hispanic/middle-income/families, singles, and nonfamilies	0.081	4.683	281
White&racial mix/high-income/singles, families and nonfamilies	0.047	5.784	590
White&racial mix/middle-income/families and singles	0.033	5.461	983
Asian&racial mix/middle-income/families	0.025	4.436	346
Racial mix/middle-income/families	0.054	16.619	1,745
Black&Hispanic/very-low-income/families and singles	0.131	7.887	560

Harlem in Manhattan, in mixed-size housing areas in Brooklyn along the Queens border, and areas of predominantly small buildings in the north of Staten Island.

Map A5.2 displays violations distribution in the *Black/low-income/families and singles* cluster. The highest concentrations of violations are in mixed-housing type areas of central Brooklyn and the northern Bronx, with the majority (more than 50 percent) of units in small buildings, as well as some areas of southeast Queens, where the majority (greater than 75 percent) of units are in small buildings.

Map A5.3 shows that in *Hispanic&black/low-income/families and singles* cluster, concentrations of high-violation buildings are in mixed-size housing areas of Brooklyn along the Queens border; in majority and predominantly small-building areas of Queens along the same border; and in central areas of Queens. Also, multifamily areas of Washington Heights in Manhattan appear to have one to three violations per unit on average.

Map A5.4 exhibits distribution of violations in the *Black&Hispanic/very-low-income/families and singles* cluster. This cluster contains a concentration of public housing units. Given that the tract-level average violation rate is calculated for all buildings in the tract, it is still very high. The highest violations rate of three to five and more than five B and C violations per unit appear to be in multifamily housing areas of the South Bronx and north-eastern parts of Brooklyn. Also, parts of East and Central Harlem show violation rates of 1 to 3 B and C violations per unit.

***Lis pendens* filings: background**

Whereas the code violations rate is used to measure the physical distress of buildings, the number of *lis pendens* filings is used as an indicator of buildings' financial problems. As opposed to foreclosure auction, which reflects the extreme

case of financial distress, *lis pendens* filings serve as a signal for property's financial problems and therefore were found to be a better proxy for such problems. A *lis pendens* (also known as a Notice of Pendency) is a written notice that a lawsuit has been filed concerning real estate, typically a foreclosure action. The filing of a *lis pendens* warns potential purchasers that the seller might not be able to sell them clear title to the property.

We use summary records of tract-level numbers of *lis pendens* filings in 2010 obtained from HPD. The filings selected were done primarily for mortgage, tax-related, or other financial reasons (for example, non-payment of condo fees).

Lis pendens **analysis**

For each cluster, the total number of *lis pendens* was calculated, as well as number of foreclosures per tract. Results are presented in the second and third columns of Table 6. Based on both indicators, the clusters with the highest numbers of *lis pendens* are as follows: *Black/low-income/families and singles; Black/upper-middle-income/families; White/upper-middle-income/families; Hispanic&black/low-income/families and singles; Racial mix/middle-income/ families;* and *Hispanic&racial mix/low-middle-income/families*.

To see the geographic concentrations of *lis pendens* filings, they were mapped for each of those clusters. To control for tenure type, *lis pendens* filings data were overlaid with percent owner-occupied units in each tract (Appendix 5, Maps A5.5.-A5.10).

Map A5.5 of the *Black/low-income/families and singles* cluster shows particularly high concentrations of *lis pendens* filings in predominantly rental areas of central Brooklyn and predominantly rental and majority rental areas of southeast Queens. Some tracts of South-East Queens with high concentrations of *lis pendens* filings are majority owner-occupied. Interestingly, those particular tracts

are the ones that transitioned between 2000 and 2010 from *Black/upper-middle-income/families* to *Black/low-income/families and singles*.

Map A5.6 of the *Black/upper-middle-income/families* cluster shows a relatively even distribution of *lis pendens* filings across the cluster areas.

Map A5.7 of the *White/upper-middle-income/families* cluster also shows an even distribution of *lis pendens* filings, with particular concentrations in predominantly and majority owner-occupied areas of Staten Island and predominantly and majority rental parts of central Brooklyn.

Map A5.8 of the *Hispanic&black/low-income/families and singles* cluster displays concentrations of lis pendens in central and eastern rental areas of the Bronx and Brooklyn along the Queens border; and mixed-ownership tracts in the northern part of Staten Island.

Map A5.9 of the *Racial mix/middle-income/families* cluster indicates that particular concentrations of *lis pendens* filings are in the eastern Queens, close to the border of African-American Upper-middle-income cluster.

Finally, Map A5.10 of the *Hispanic&racial mix/low-middle-income/families* cluster shows even distributions in the areas that are predominantly or majority rental.

VIII. CONCLUSIONS

This study presents a new step in the effort to refine the concept of neighborhoods, as true neighborhoods do not necessarily fall along historical geographic or political boundaries; to identify key neighborhood transitions that occurred between the last two census years; and to help key stakeholders better

identify problems and target programs and services to actual areas of need and not just geographic or political boundaries.

Unlike the 2008 study, this analysis first focused on demographics, and then compared clusters across several housing indicators. Although direct comparisons with the results of the prior study cannot be made, the new results can still be used to point to some key continuing and reversing trends.

Similar to the prior study, this new research started with the identification of major neighborhood types in the city. It found fourteen types of neighborhoods, defined as clusters of census tracts, in the year 2000 and analyzed shifts of tracts between clusters over the decade of 2000 through 2010. Whereas the prior study found that 22 percent of census tracts had transitioned between different clusters over the decade of 1990-2000, the new results showed that 26 percent of tracts changed the type of cluster they belonged to. This confirms that neighborhood demographic transition continues to be the norm in New York City, and study of transitions provides a powerful tool for policy makers to act on. While nearly three-quarters of the census tracts appeared to undergo a period of stability during the study period, out of the remaining quarter, some underwent improvement or decline in socio-economic outcomes. Some changes signal the need for government intervention either on a wide range of issues or in specific fields—such as schools or day care—that would be useful to examine in future research.

This study's findings are consistent overall with the fact that the degree of racial segregation in American cities (at a citywide level) has been slowly declining in the past decades, yet the level of economic segregation has been rising (as shown, for example, in the report "Mobility and Metropolis" from the Pew Charitable Trusts written by Sharkey and Graham, 2013). As outlined before, the key transition trends were found to be as follows:

- increasing concentrations of predominantly white, upper-middle income owner-occupancy areas;
- contraction of black areas, with wealthier ones turning poor at their borders;
- expansion of majority white and racial mix high- income and middle-income areas;
- some predominantly white areas gaining a significant Asian population;
- expansion of low-income Hispanic&black areas at the same time as upward dynamics of areas with majority Hispanic low-middle-income population;
- prior racial mix areas moving toward majorities made up of Hispanics or whites.

While the presence of whites continued to consolidate in upscale areas of white families living in owner-occupied private homes, the relatively new trend emerged of *White/high-income/singles, families, and non-families* transitioning into neighborhoods with a mix of race groups. The majority white cluster is now more racially mixed (with no second largest race group), populated by upper-middle-income singles. It exhibited the largest growth of all other clusters, a 37 percent increase in the number of tracts, and 44 percent increase in the population.

While nearly one-half (47 percent) of households in this cluster are singles, and they are predominantly renters, the share of small units common for such a population type is only 25 percent. A closer analysis of the housing stock structure in those areas might point to the need for a greater supply of small units, as well as units suitable for shared households, which comprise 19 percent of all households in these areas.

Interestingly, many of the transitions between white and white/mixed upper-, upper-middle, and middle-income clusters occur in the areas having relatively high shares of units in one-to-four family houses with low owner-occupancy rate.

Possibly because this pocket of the housing stock is not rent-regulated or owner-occupied, it becomes more likely to be subject to demographic changes and therefore more mobile. This could be of concern to policymakers if the changes are a result of tenant harassment and/or displacement.

The *White&racial mix/middle-income/families and singles* cluster continued to expand, gaining tracts that had previously been in the less mixed *White&Asian/upper-middle-income/families and singles* or *White&Hispanic/ middle-income/families, singles, and non-families* clusters. Given that 46 percent of this cluster is recent immigrants, overcrowding may be a concern. In particular, the availability of units that can accommodate population of this cluster may be an issue: in this majority-rental cluster, 28 percent of households are single persons, but only 10 percent of units have one to two rooms. A more detailed analysis may be needed of the ethnic/language structure of its population and the degree of its language isolation. It may, on the one hand, point to business opportunities for ethnic groups; and on the other hand, suggest the need for dissemination of information about public programs in relevant languages. The growth of these clusters, coupled with an expanding immigrant population, may also have significant impact on local schools–impacting both ESL programs and classroom capacity.

The neighborhood category that remains of greatest concern is *Hispanic&black/low-income/families and singles.* While the Hispanic population in the city increased by eight percent over the decade, the number of Hispanic poor tracts increased by 13 percent and their population increased even more, by 18 percent. As analysis of violations and *lis pendens* has shown, many parts of this cluster are in need of both foreclosure prevention policies and housing preservation efforts. Also, given that high level of economic segregation is known to limit social mobility and access to opportunities in poor areas (Sharkey and Graham, 2013), comprehensive programs are in order that may range from

various forms of subsidized housing to educational opportunities and child care (44 percent of families in the cluster are single parents).

The new trend towards the waning of the black population is evident in the contraction of areas dominated by *Black/upper-middle-income/families* and the moderate expansion of *Black/low-income/families and singles* areas, some of which occurred at the expense of wealthier black tracts becoming poor at the borders with the poor black areas. These tracts had a major increase of Hispanic population, sometimes combined with an outflow of black and/or white residents.

These results paint a picture of a hollowing out of the black middle class in New York City. This is a process that should pose policy concern, and its causes need to be examined in greater depth. As the *lis pendens* analysis has shown, foreclosure prevention policies (such as, for example, counseling/education) might be needed in the border areas, as well as all over wealthier black areas. Also, given that 42 percent of families in poor black tracts are headed by single parents, and 15 percent are couples with children, social service and educational policies need to be examined.

Clusters that have a combination of a high share of immigrants and predominance of renters, such as *Hispanic&racial mix/low-middle-income/ families* or *Black/low-income/families and singles*, may be in need of a more detailed study of their ethnic makeup and language isolation. On the one hand, it may point to the need of information dissemination in native languages. On the other hand, given that those clusters already have very high violation rates, careful attention may be needed to the condition of their rental housing stock, as segments of illegal immigrants fearful of reporting unsafe conditions may not take full advantage of the complaints and violations system currently in place.

Finally, the availability of small-size rental units may also be an issue in the *Black/low-income/families and singles* cluster, which contains overwhelmingly

renters. One-person households comprise nearly one-third of all households in this cluster, though only nine percent of units have up to two rooms.

Moderate contraction of the plurality Asian cluster appears more than offset by the vast process of predominantly white neighborhoods transitioning to *White&Asian*, as well as *White&racial mix*.

Finally, the *Racial mix/middle-income/families* cluster had a net loss of 30 percent of tracts and 37 percent of population. As the previous study of Bahchieva et al (2008) found a big increase in the number of melting pot tracts, it hypothesized that the key question for the future was whether this increase would become the norm or just a stage in a gradual transition of the non-Hispanic white population continuing to decline and/or consolidate in the city's neighborhoods. Our results showed that during the decade of 2000-2010, the *Racial mix* cluster appeared to be undergoing two types of transitions: on the one hand, the trend to the continuing consolidation of white, upper-income, owner-occupied areas; on the other hand, the trend to the expansion of poor Hispanic and to a smaller degree, low-middle class Hispanic areas. Our analysis of *lis pendens* rates suggests that *Racial mix* areas are in need of foreclosure counseling, which may improve the dynamics of those areas.

The results of the study thus highlight major patterns and trends of neighborhood dynamics that should help target and project future needs for new development in various communities of New York City.

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APPENDIX 1
CREATION OF NEIGHBORHOOD TYPES: CLUSTERING TECHNIQUE

Initial hierarchical clustering

During this first step of the 2000 neighborhood classification, the 2000 data were analyzed using agglomerative hierarchical clustering methods. These methods provide an effective tool for identifying groups within a population (Aldenderfer and Blashfield 1984). The methods differ by the procedure of computing the distance between two clusters, but the underlying process is the same. At the start of the agglomerative clustering process, each observation is in a separate cluster by itself. The two closest clusters are then merged to form a new cluster, and the process continues until only one cluster is left. The difficulty lies in choosing the most applicable hierarchical clustering method and the number of clusters in the final solution. Using SAS software, we examined six agglomerative hierarchical clustering methods: Ward, centroid, average linkage between groups, median, complete, and single. Squared Euclidean distance was used as the distance measure for all clustering methods. Ward's method worked best for our data, producing more homogeneous groups of tracts and fewer outliers than other methods.

In order to determine the optimal number of clusters, jumps in the 'height' variable, the sum of within-group variance, were used as a criterion. In theory, larger values of within-group variance indicate less similarity between joined clusters. Thus, a jump in height value signals that two heterogeneous clusters are combined. For each step in the clustering process, calculations were made of the height variable and its change. They were examined starting with the 20-cluster solution, since solutions with more than 20 groups would not be meaningful for the purposes of this analysis. When a large increase in the height occurred, the previous cluster solution was selected (Hill et al. 1998). Table A1.1 shows the agglomeration schedule for Ward method using 2000 data. Increases

Table A1.1. Ward's Method for Year 2000 Hierarchical Clustering

Number of clusters	Height variable	Change in the height variable
20	0.0073	
19	0.0080	0.0007
18	0.0082	0.0002
17	0.0085	0.0003
16	0.0089	0.0004
15	0.0097	0.0008
14	**0.0118**	**0.0021**
13	0.0118	0.0000
12	0.0126	0.0008
11	**0.0143**	**0.0017**
10	0.0152	0.0009
9	0.0192	0.0040
8	0.0203	0.0011
7	0.0218	0.0015
6	0.0404	0.0186
5	0.0670	0.0266
4	0.0677	0.0007
3	0.0721	0.0044
2	**0.1128**	**0.0407**
1	0.1728	0.0600

in the ‘height’ variable are marked in bold, and the possible solutions are at 3, 12, and 15 clusters. After examining the 2000 tract distribution for clusters and variable means and z-scores within clusters, the 15-cluster solution was chosen.

Refinement of the 15-cluster hierarchical solution using k-means

The problem with the hierarchical clustering solution is that some tracts may be closer to the center of the neighboring cluster than to the center of their own cluster (Aldenderfer and Blashfield 1984, Everitt et al.2001). At each stage of the hierarchical clustering, the two closest clusters are merged to form a new cluster, and the process continues until only one cluster is left. So once a tract is assigned to a cluster, it cannot be re-allocated to another cluster. K-means optimizes the hierarchical clustering solution by allocating each observation to the closest cluster based on the distance between the observation and the cluster center. K-means requires specification of the initial cluster centers and the number of clusters beforehand (Aldenderfer and Blashfield 1984, Everitt et al.2001). The initial cluster centers were taken from the ward’s hierarchical clustering solution. During the first pass, each observation was allocated to the closest cluster, and cluster means were recalculated. The process of re-allocating tracts to closest clusters and re-calculating cluster means was then repeated until no further improvements
could be made.

The 2010 classification

Once a refined k-means solution for 2000 neighborhood types was obtained, 2010 tract-level data was classified into 2000 neighborhood types using the cluster centers from the 2000 solution and the k-means procedure without iterations (SAS 1999). For each cluster, the cluster center is the variable means from the 2000 solution. The k-means procedure without iterations results in allocation of 2010 tracts to closest 2000 neighborhood types (clusters).

The analysis using the clustering procedure described above with the variables listed in Table 3 yielded a fifteen-category neighborhood scheme that was used to evaluate transitions. It is important to remember that this cluster scheme was actually created using 2000 data and then held constant for 2010, so that transitions could be observed using the same neighborhood categories (i.e. categories with constant mean values of variables). Upon closer examination of cluster characteristics through variables' means, variances and z-scores, we noticed that two clusters of tracts were similar in most respects: they both had mixed middle-income population which was a white and Hispanic mix with black and Asian presence. One of those clusters appeared to be predominantly traditional nuclear family, while the other tract had nuclear families mixed with single mothers. For purposes of simplifying the analysis of neighborhood transitions, these two groups were combined into one, and the final number of neighborhood types was reduced from fifteen to fourteen.

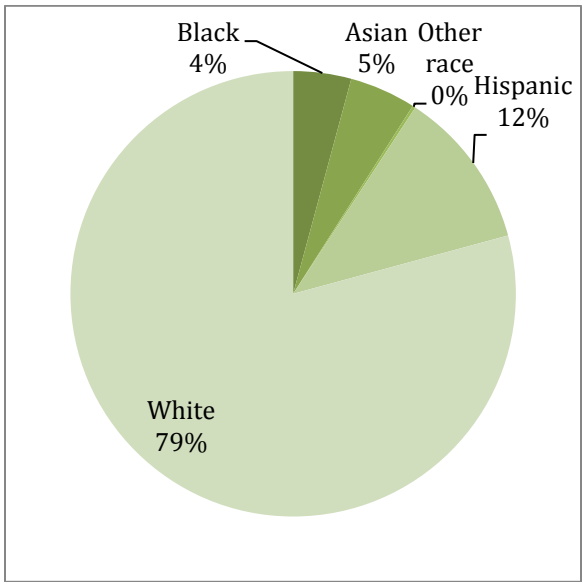
Appendix 2

Characteristics of Clusters

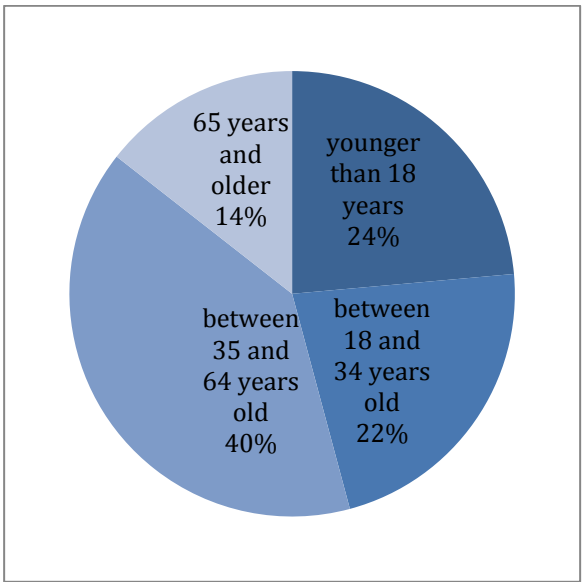
White/upper-middle-income/families

Number of Tracts in 2010: 256
Population in 2010: 885,575

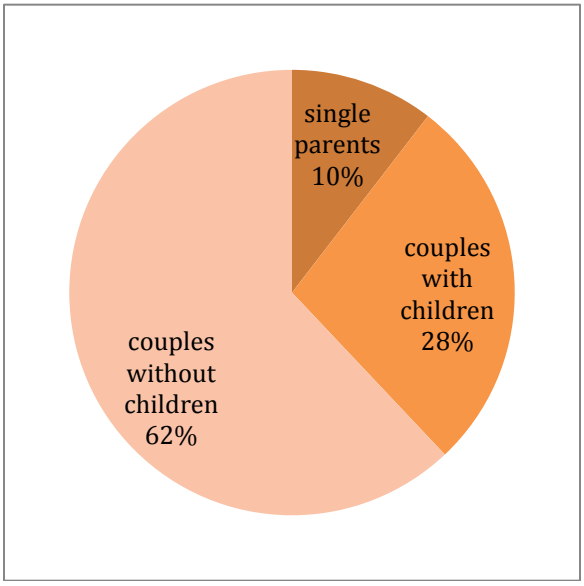
Race Composition



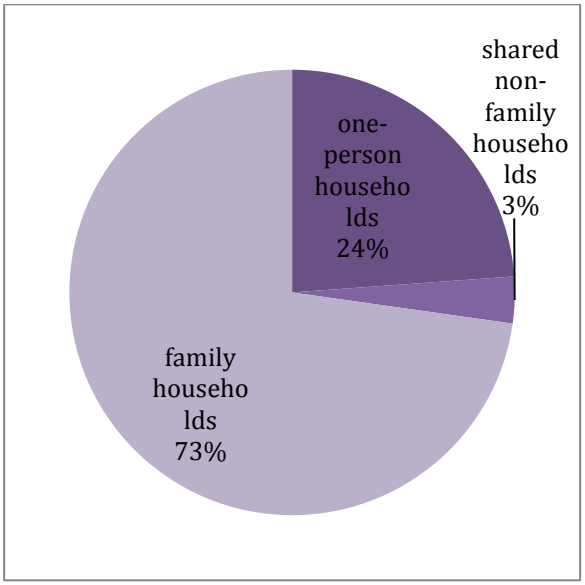
Age Composition



Family Composition



Household Composition



Percent one-person households among non-family households	88%
Percent non-family households	27%
Percent foreign-born persons	19%
Percent population 25 years and older with college degree and more education	24%
Median income as percent of borough median income	136%
Percent of persons living in poverty	8%

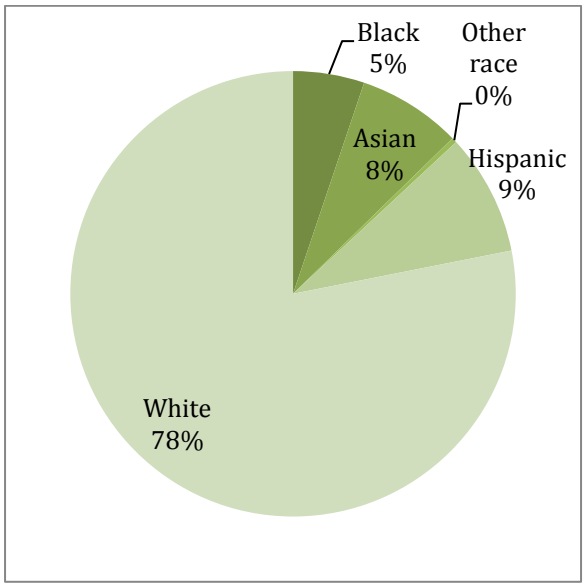
Housing characteristics

Percent owner-occupied units	56.1%
Percent crowded units	1.7%
Percent units with 1 to 2 rooms	4.5%
Percent units in buildings with 1 to 4 units	81.0%
Percent units in buildings with 5 to 19 units	4.9%

White/high-income/singles, families and non-families

Number of Tracts in 2010: 101
Population in 2010: 577,435

Race Composition



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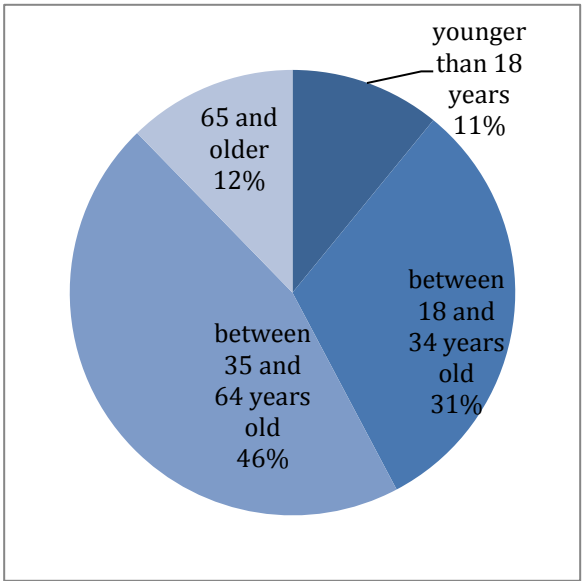

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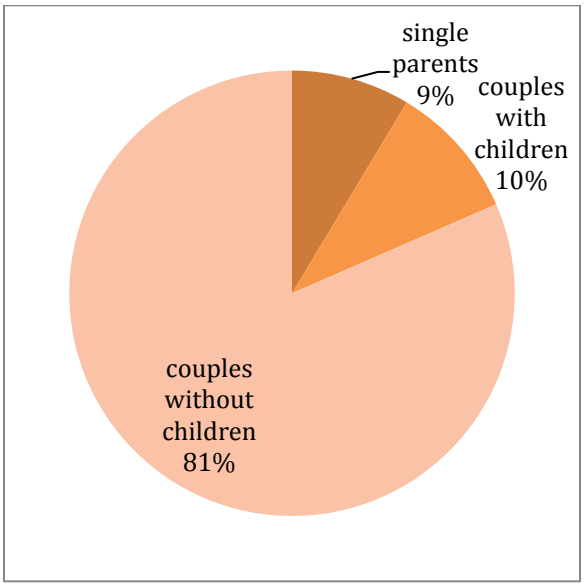
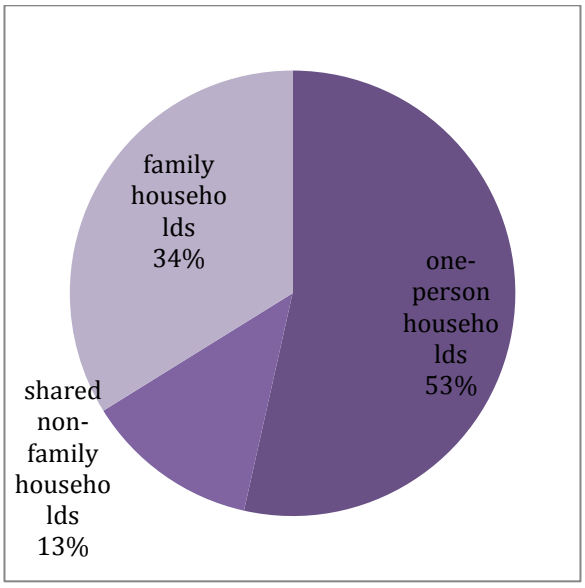


Household Composition



Percent one-person households among non-family households	81%
Percent non-family households	66%
Percent foreign-born persons	21%
Percent population 25 years and older with college degree and more education	71%
Median income as percent of borough median income	162%
Percent of persons living in poverty	9%

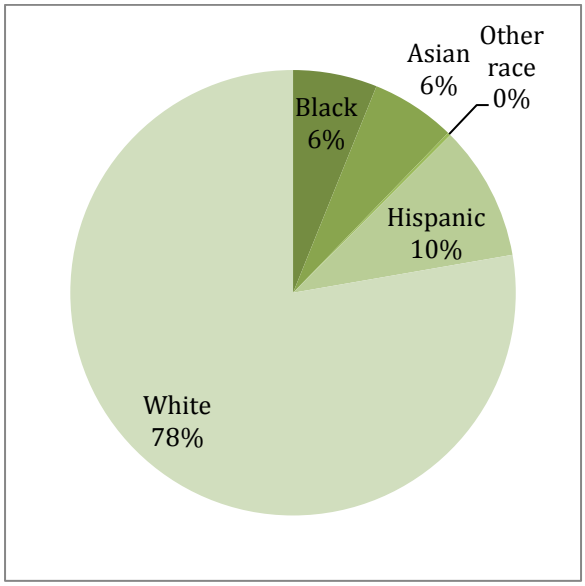
Housing characteristics

Percent owner-occupied units	34.9%
Percent crowded units	1.7%
Percent units with 1 to 2 rooms	25.3%
Percent units in buildings with 1 to 4 units	14.5%
Percent units in buildings with 5 to 19 units	21.2%

White/high-income/middle-aged and elderly/families and singles

Number of Tracts in 2010: 85
Population in 2010: 343,114

Race Composition



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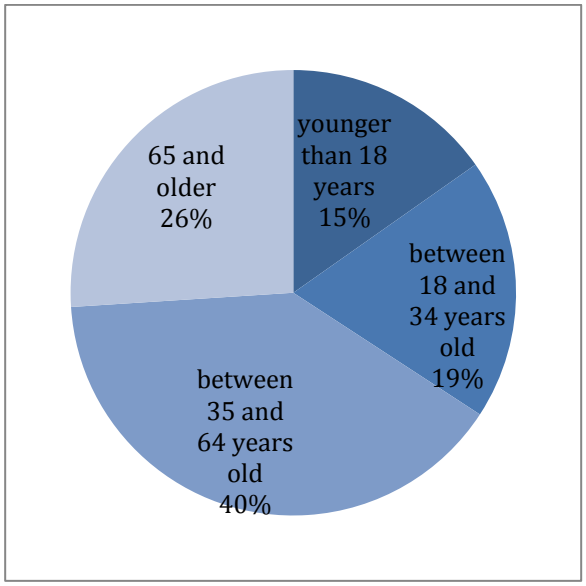

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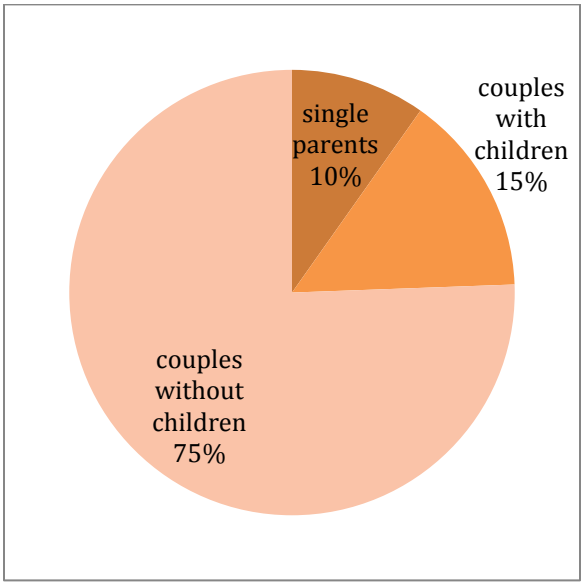
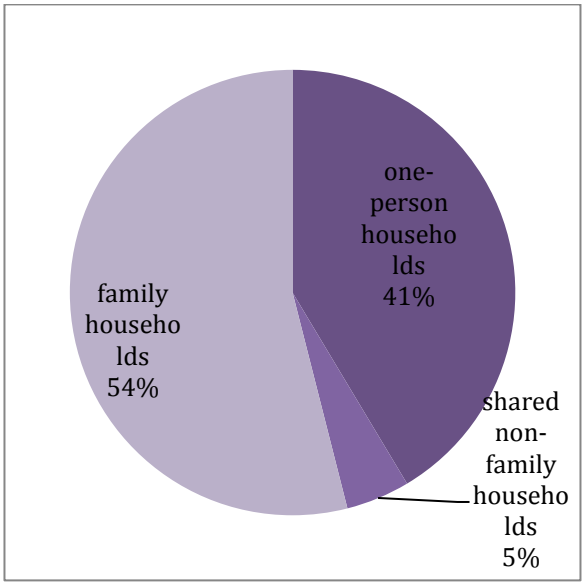


Household Composition



Percent one-person households among non-family households	90%
Percent non-family households	46%
Percent foreign-born persons	26%
Percent population 25 years and older with college degree and more education	39%
Median income as percent of borough median income	156%
Percent of persons living in poverty	9%

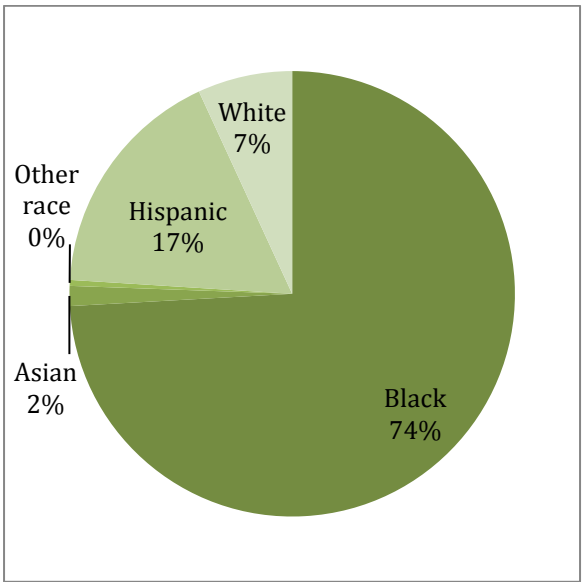
Housing characteristics

Percent owner-occupied units	53.9%
Percent crowded units	1.3%
Percent units with 1 to 2 rooms	12.7%
Percent units in buildings with 1 to 4 units	26.4%
Percent units in buildings with 5 to 19 units	5.7%

Black/low-income/families and singles

Number of Tracts in 2010: 233
Population in 2010: 928,372

Race Composition



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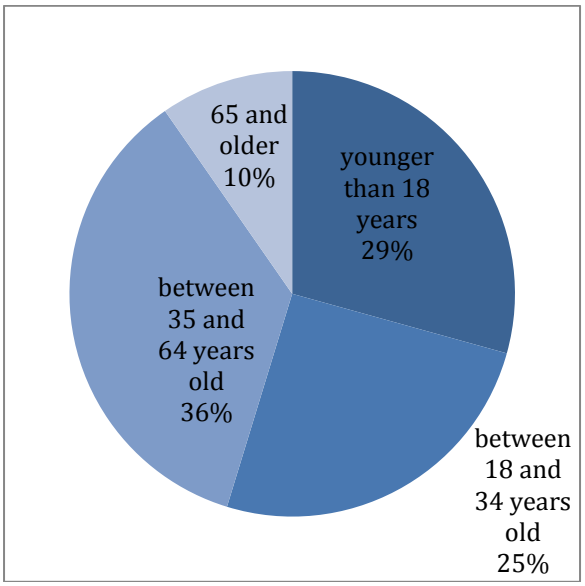

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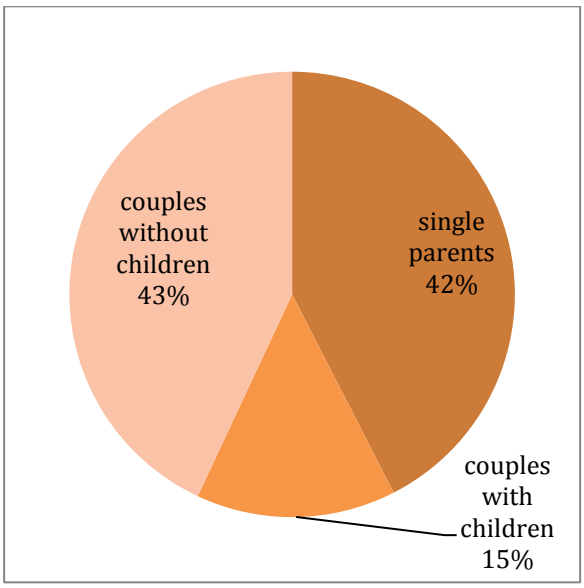
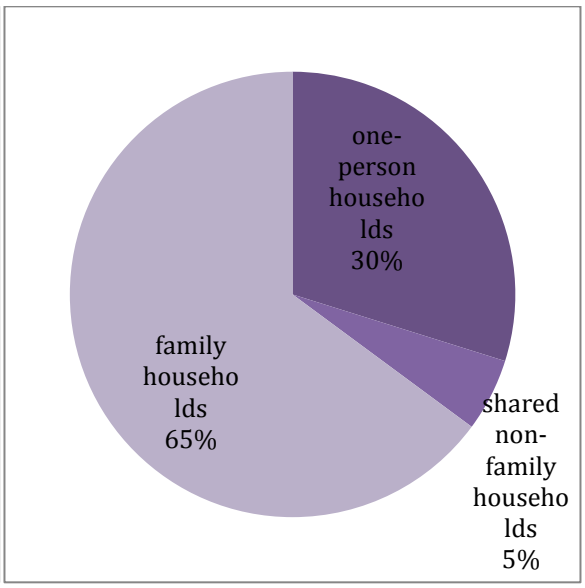


Household Composition



Percent one-person households among non-family households	85%
Percent non-family households	35%
Percent foreign-born persons	31%
Percent population 25 years and older with college degree and more education	13%
Median income as percent of borough median income	79%
Percent of persons living in poverty	29%

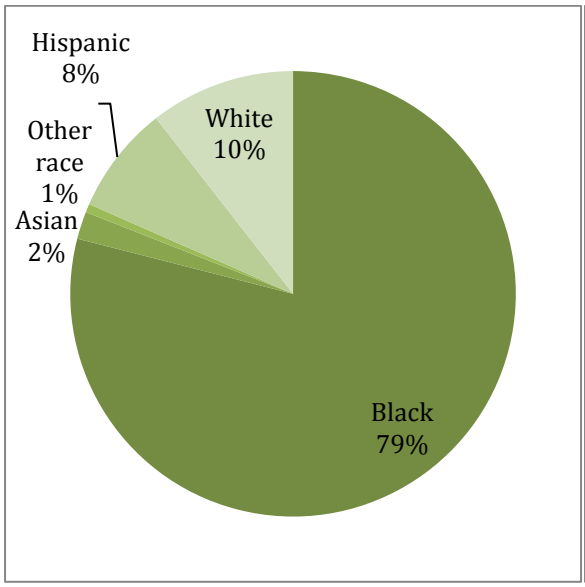
Housing characteristics

Percent owner-occupied units	22.8%
Percent crowded units	3.1%
Percent units with 1 to 2 rooms	9.4%
Percent units in buildings with 1 to 4 units	49.4%
Percent units in buildings with 5 to 19 units	15.5%

Black/upper-middle-income/families

Number of Tracts in 2010: 196
Population in 2010: 506,577

Race Composition



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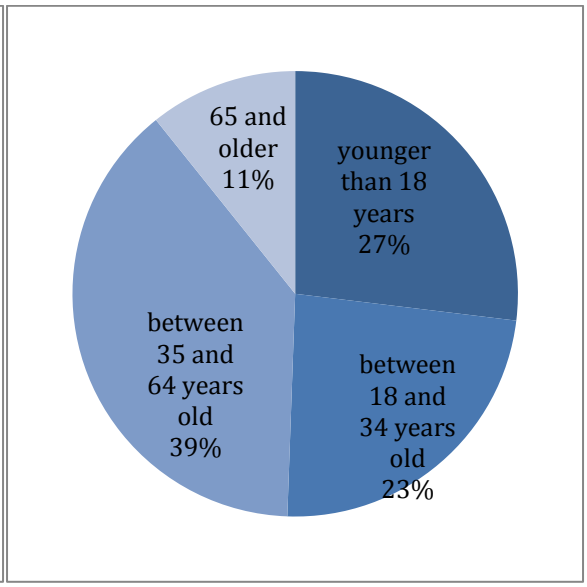

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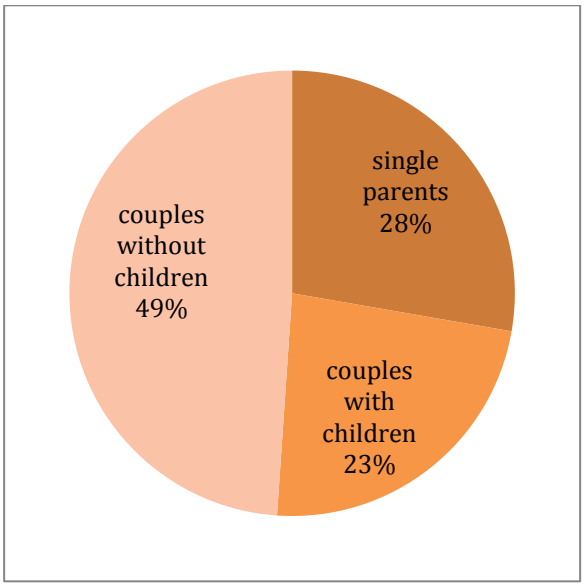
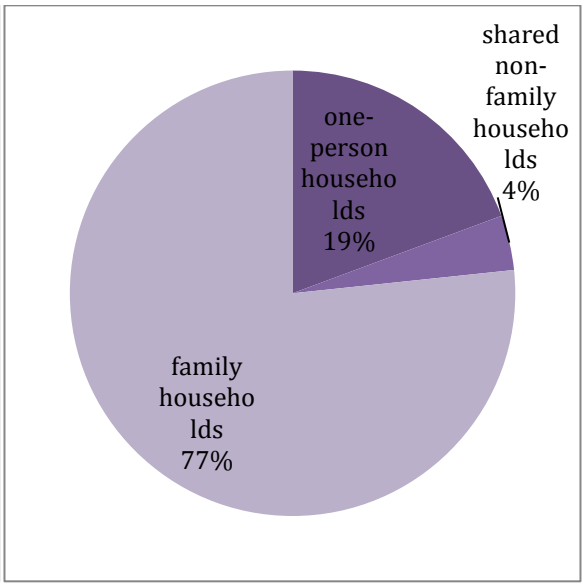


Household Composition



Percent one-person households among non-family households	83%
Percent non-family households	23%
Percent foreign-born persons	40%
Percent population 25 years and older with college degree and more education	19%
Median income as percent of borough median income	136%
Percent of persons living in poverty	13%

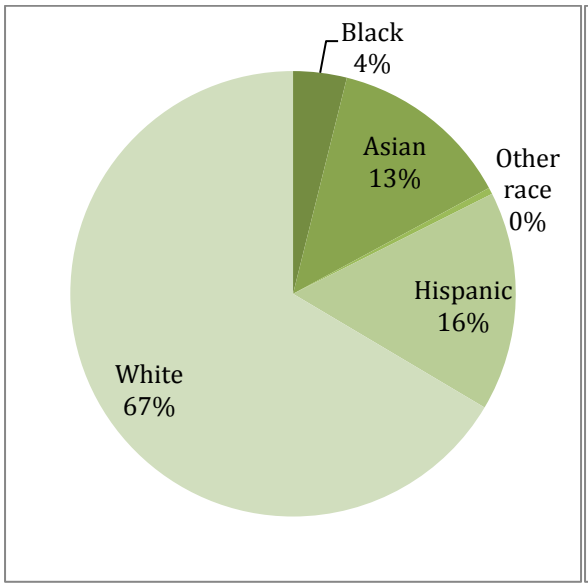
Housing characteristics

Percent owner-occupied units	59.4%
Percent crowded units	2.1%
Percent units with 1 to 2 rooms	3.7%
Percent units in buildings with 1 to 4 units	89.0%
Percent units in buildings with 5 to 19 units	2.8%

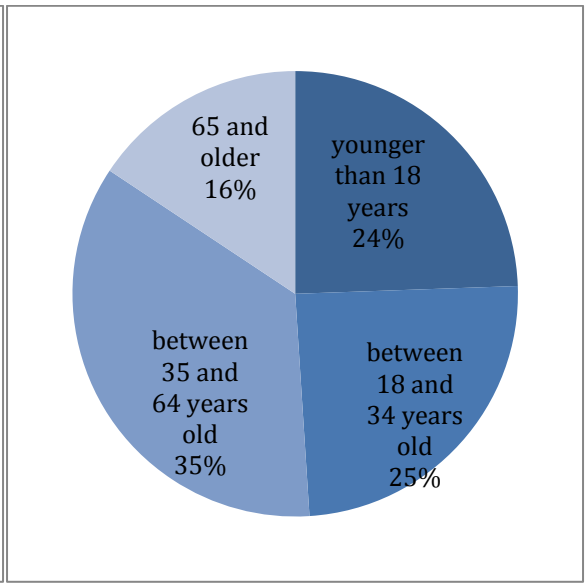
White&racial mix/middle-income/families and singles

Number of Tracts in 2010: 191
Population in 2010: 710,399

Race Composition



Age Composition



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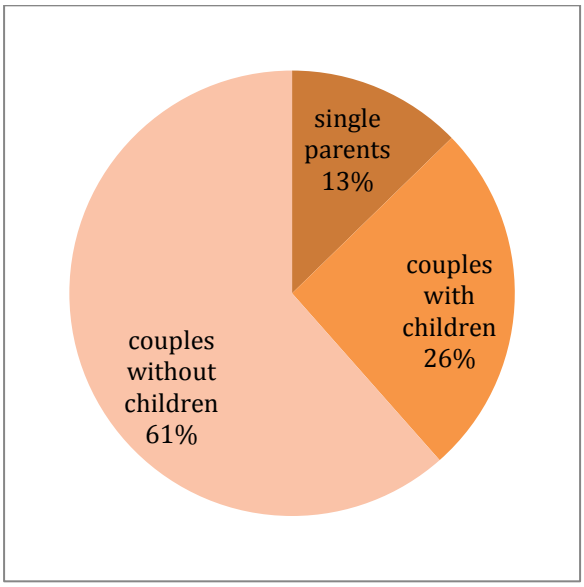
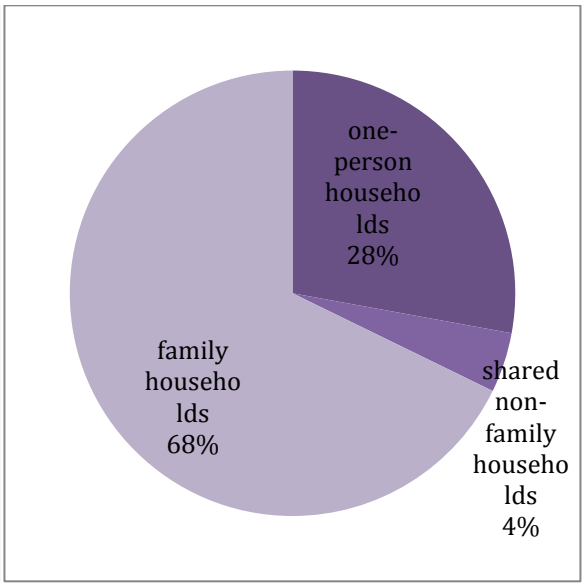


Household Composition



Percent one-person households among non-family households	86%
Percent non-family households	32%
Percent foreign-born persons	46%
Percent population 25 years and older with college degree and more education	23%
Median income as percent of borough median income	100%
Percent of persons living in poverty	20%

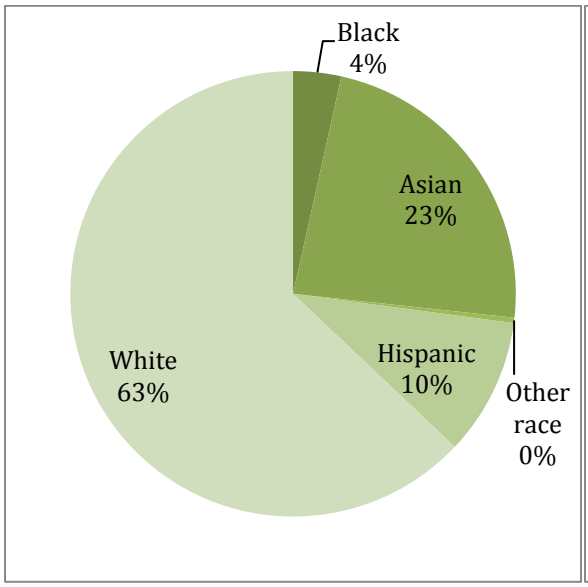
Housing characteristics

Percent owner-occupied units	32.0%
Percent crowded units	3.6%
Percent units with 1 to 2 rooms	10.1%
Percent units in buildings with 1 to 4 units	53.9%
Percent units in buildings with 5 to 19 units	11.7%

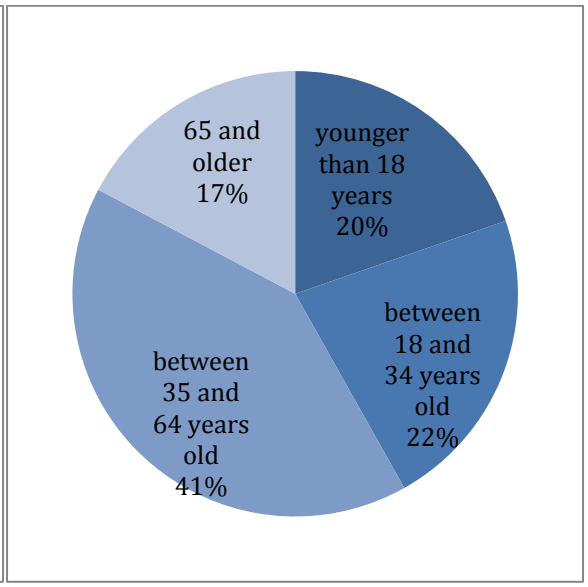
White&Asian/upper-middle-income/families and singles

Number of Tracts in 2010: 159
Population in 2010: 558,479

Race Composition



Age Composition



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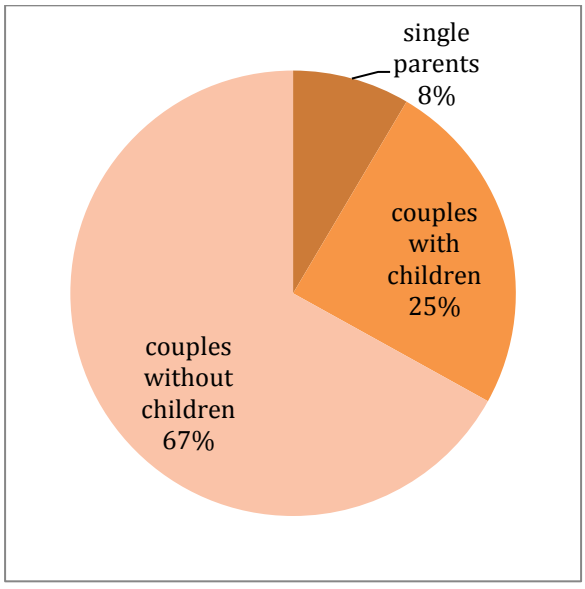
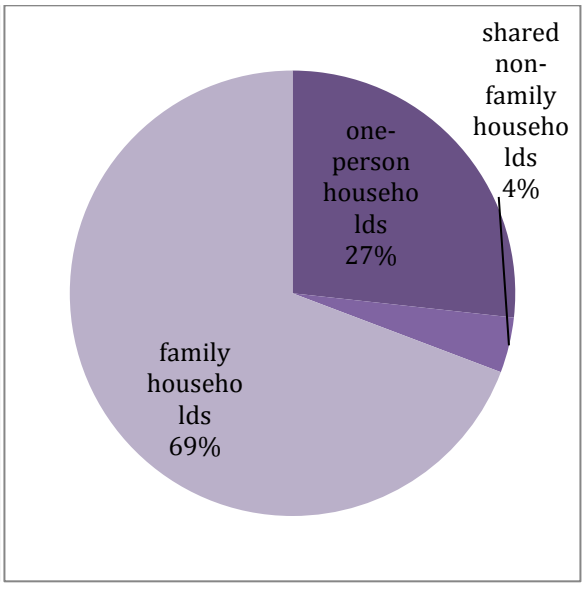


Household Composition



Percent one-person households among non-family households	87%
Percent non-family households	31%
Percent foreign-born persons	42%
Percent population 25 years and older with college degree and more education	35%
Median income as percent of borough median income	135%
Percent of persons living in poverty	9%

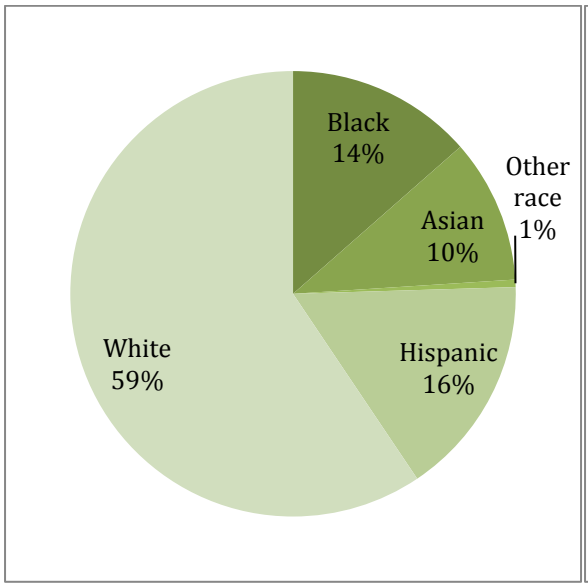
Housing characteristics

Percent owner-occupied units	59.6%
Percent crowded units	1.1%
Percent units with 1 to 2 rooms	6.2%
Percent units in buildings with 1 to 4 units	67.7%
Percent units in buildings with 5 to 19 units	4.3%

White&racial mix/high-income/singles, families and non-families

Number of Tracts in 2010: 119
Population in 2010: 464,950

Race Composition



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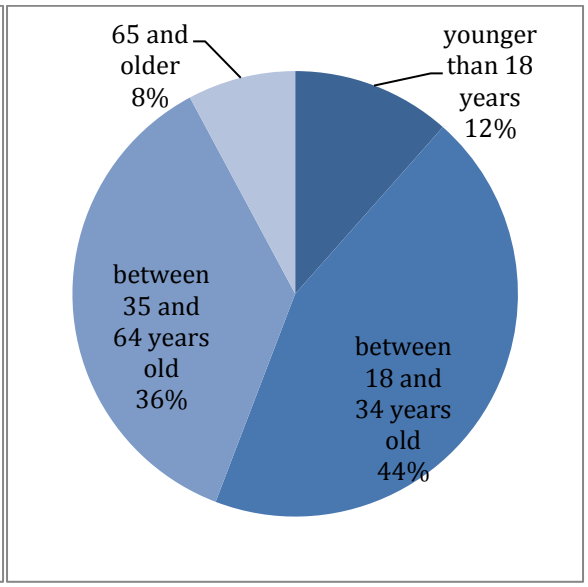

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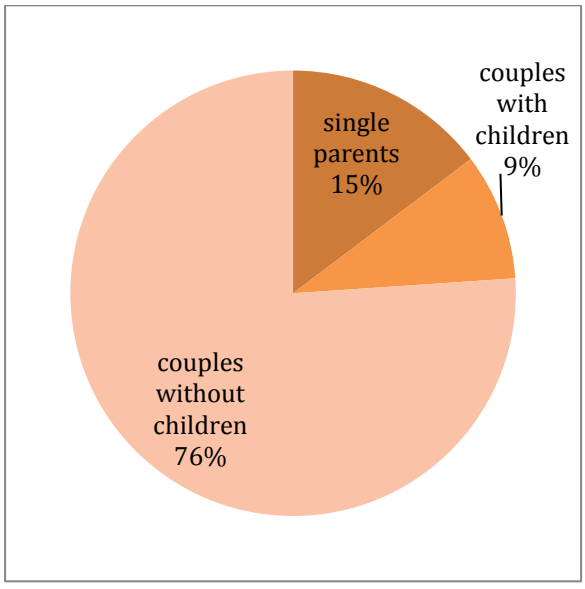
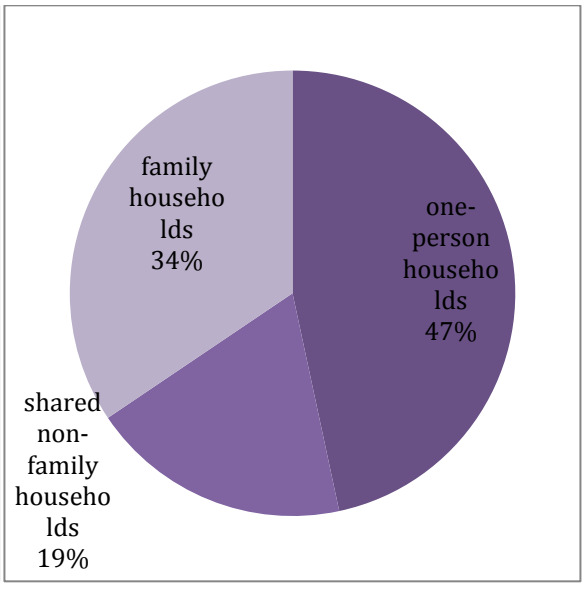


Household Composition



Percent one-person households among non-family households	71%
Percent non-family households	66%
Percent foreign-born persons	26%
Percent population 25 years and older with college degree and more education	59%
Median income as percent of borough median income	142%
Percent of persons living in poverty	15%

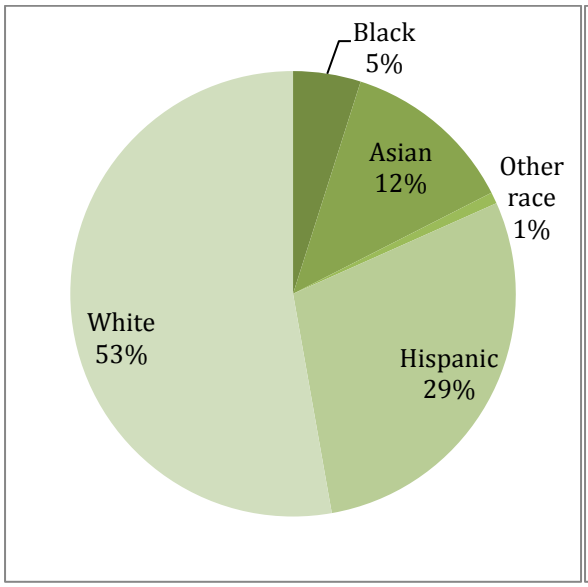
Housing characteristics

Percent owner-occupied units	21.2%
Percent crowded units	3.0%
Percent units with 1 to 2 rooms	24.8%
Percent units in buildings with 1 to 4 units	26.0%
Percent units in buildings with 5 to 19 units	24.5%

White&Hispanic/middle-income/families, singles and non-families

Number of Tracts in 2010: 81
Population in 2010: 293,027

Race Composition



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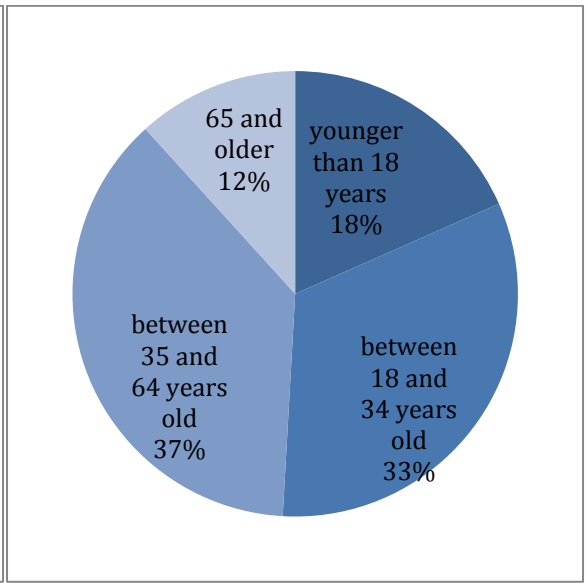

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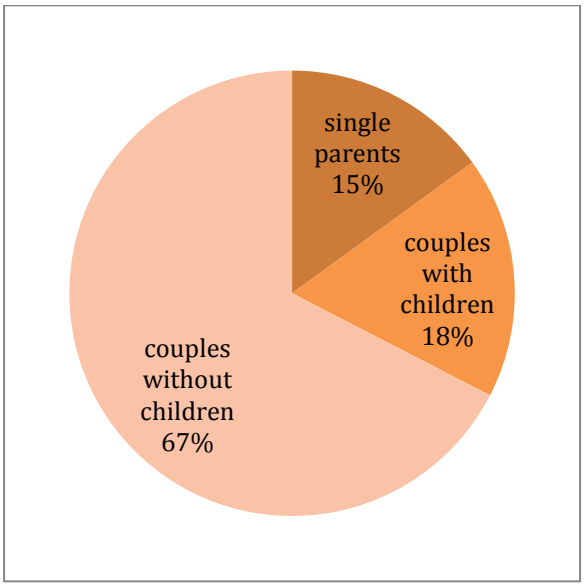
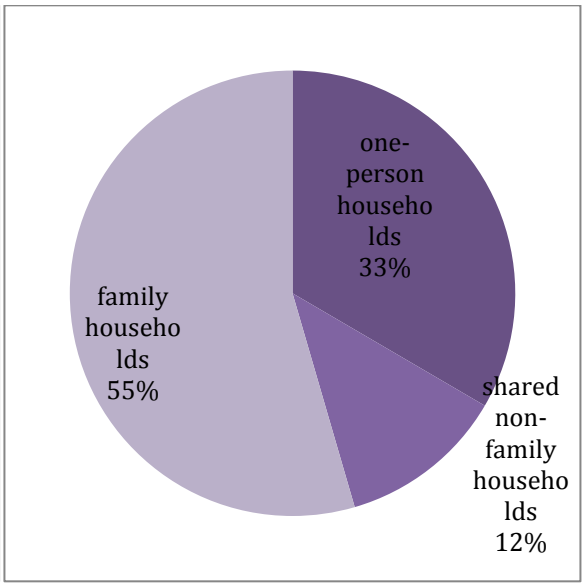


Household Composition



Percent one-person households among non-family households	73%
Percent non-family households	45%
Percent foreign-born persons	47%
Percent population 25 years and older with college degree and more education	29%
Median income as percent of borough median income	97%
Percent of persons living in poverty	18%

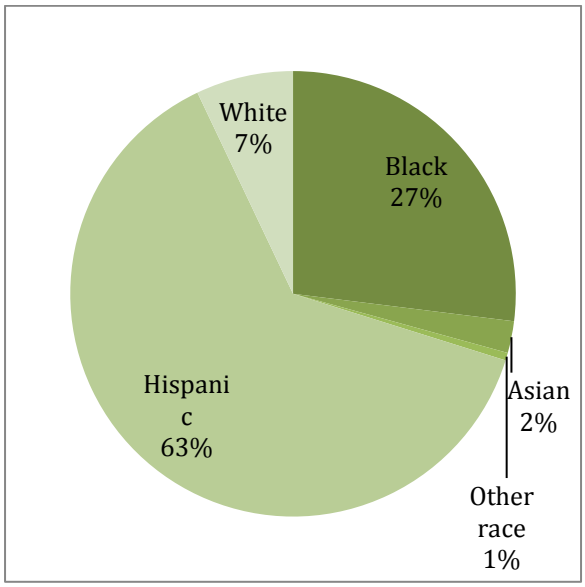
Housing characteristics

Percent owner-occupied units	16.9%
Percent crowded units	3.5%
Percent units with 1 to 2 rooms	14.2%
Percent units in buildings with 1 to 4 units	35.4%
Percent units in buildings with 5 to 19 units	28.5%

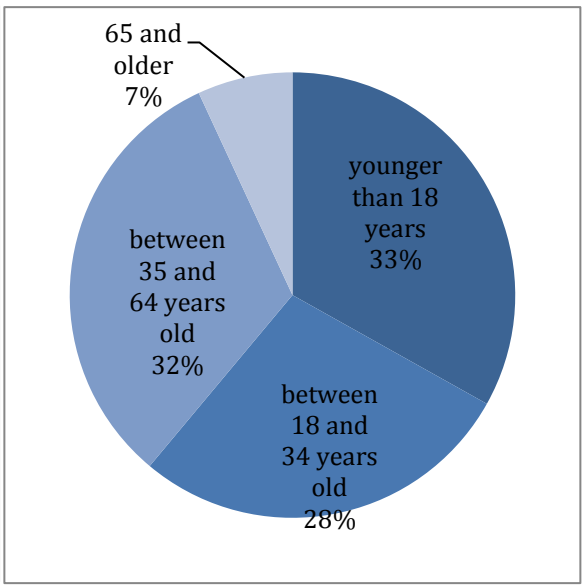
Hispanic&black/low-income/families and singles

Number of Tracts in 2010: 250
Population in 2010: 108,9335

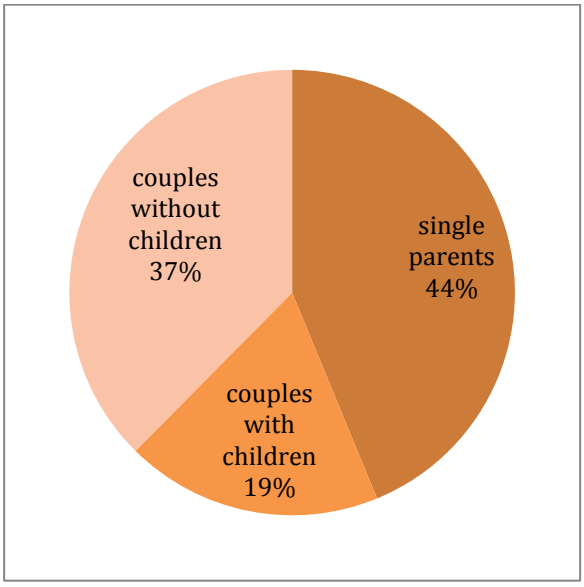
Race Composition



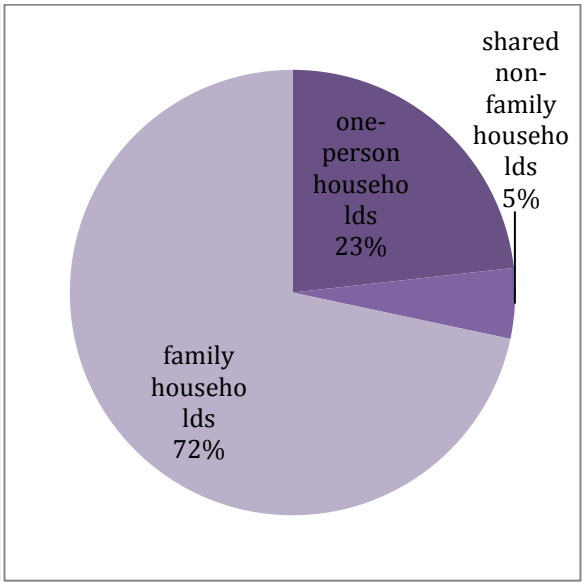
Age Composition



Family Composition



Household Composition



Percent one-person households among non-family households	82%
Percent non-family households	28%
Percent foreign-born persons	32%
Percent population 25 years and older with college degree and more education	9%
Median income as percent of borough median income	77%
Percent of persons living in poverty	39%

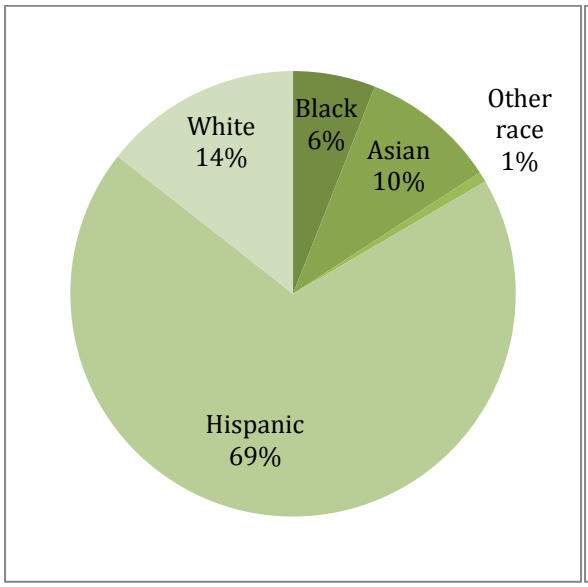
Housing characteristics

Percent owner-occupied units	12.8%
Percent crowded units	4.8%
Percent units with 1 to 2 rooms	9.6%
Percent units in buildings with 1 to 4 units	29.2%
Percent units in buildings with 5 to 19 units	12.7%

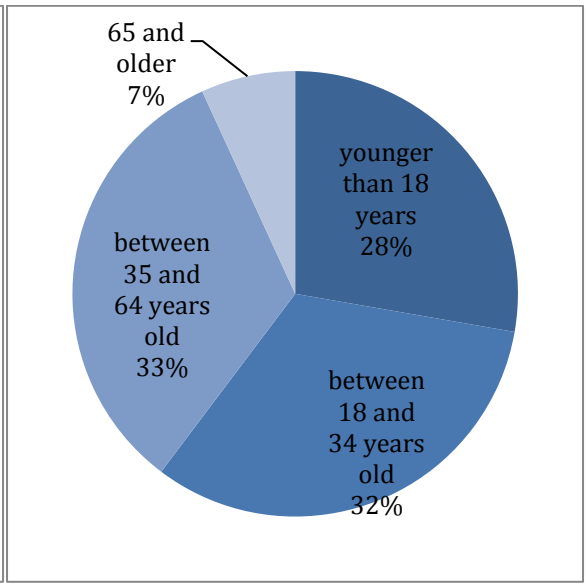
Hispanic&racial mix/low-middle-income/families

Number of Tracts in 2010: 102
Population in 2010: 494,791

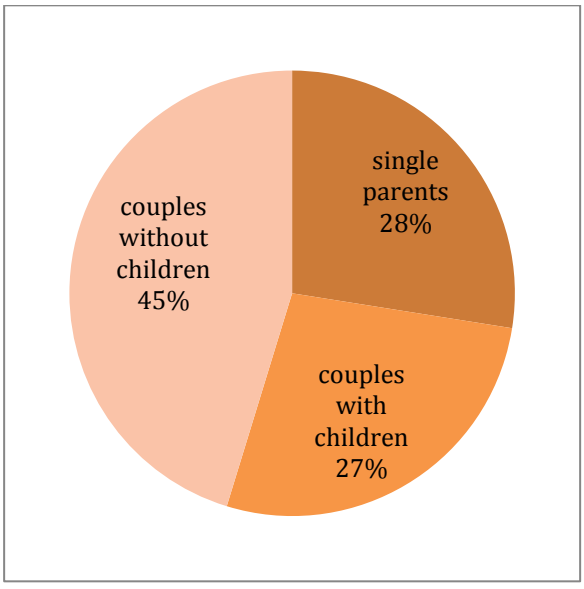
Race Composition



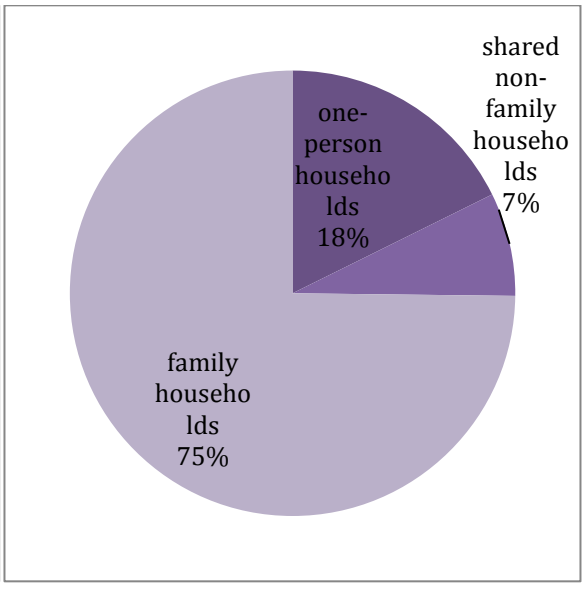
Age Composition



Family Composition



Household Composition



Percent one-person households among non-family households	70%
Percent non-family households	25%
Percent foreign-born persons	54%
Percent population 25 years and older with college degree and more education	12%
Median income as percent of borough median income	84%
Percent of persons living in poverty	27%

Housing characteristics

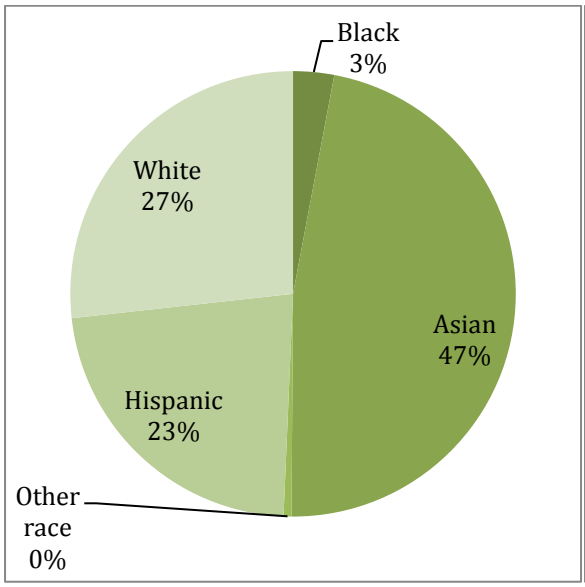
Percent owner-occupied units	19.6%
Percent crowded units	7.6%
Percent units with 1 to 2 rooms	8.5%
Percent units in buildings with 1 to 4 units	54.0%
Percent units in buildings with 5 to 19 units	25.4%

Asian&racial mix/middle-income/families

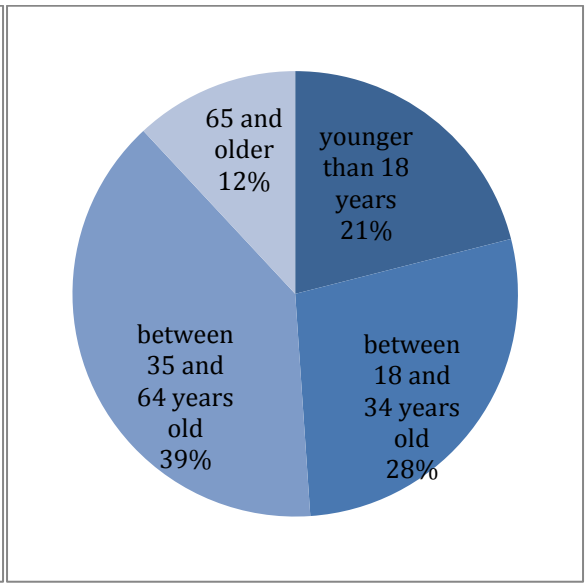
Number of Tracts in 2010: 86

Population in 2010: 380,760

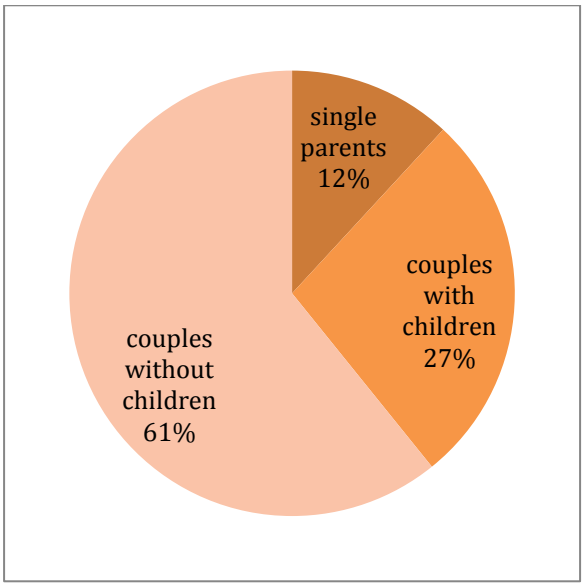
Race Composition



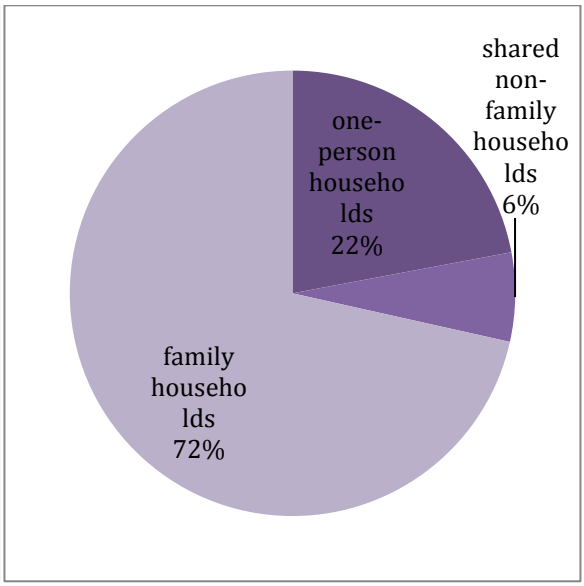
Age Composition



Family Composition



Household Composition



Percent one-person households among non-family households	77%
Percent non-family households	29%
Percent foreign-born persons	63%
Percent population 25 years and older with college degree and more education	25%
Median income as percent of borough median income	94%
Percent of persons living in poverty	19%

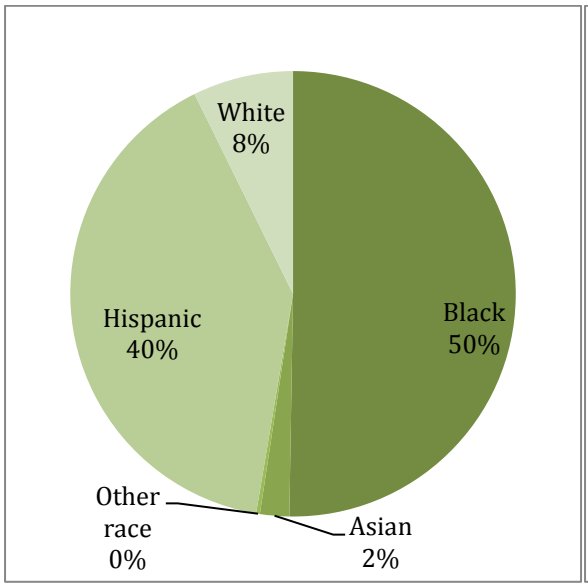
Housing characteristics

Percent owner-occupied units	32.1%
Percent crowded units	6.6%
Percent units with 1 to 2 rooms	12.7%
Percent units in buildings with 1 to 4 units	55.0%
Percent units in buildings with 5 to 19 units	13.0%

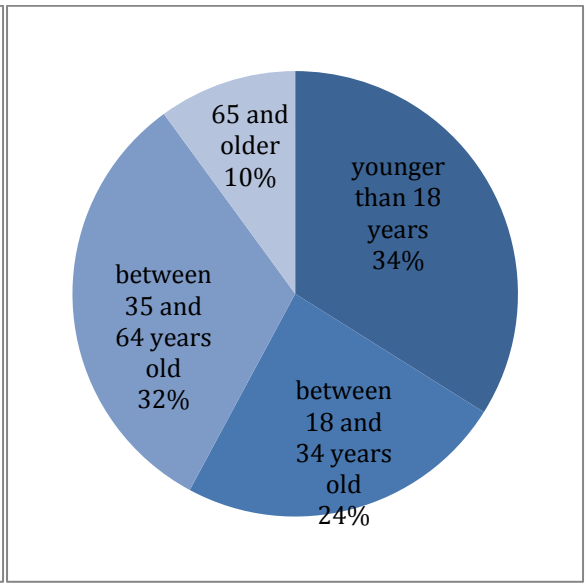
Black&Hispanic/very-low-income/families and singles

Number of Tracts in 2010: 110
Population in 2010: 548,493

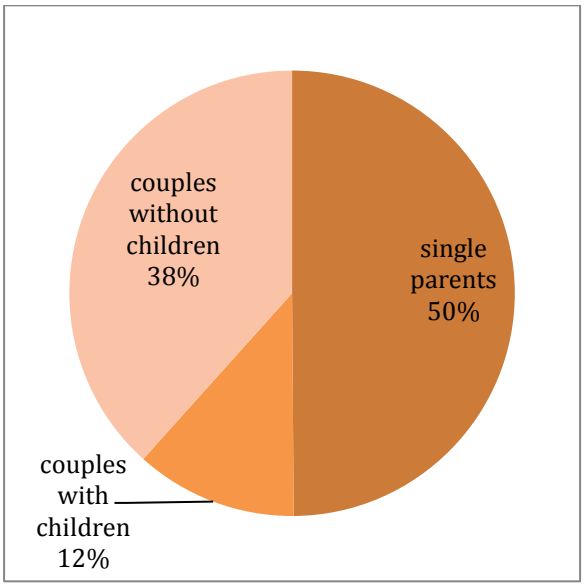
Race Composition



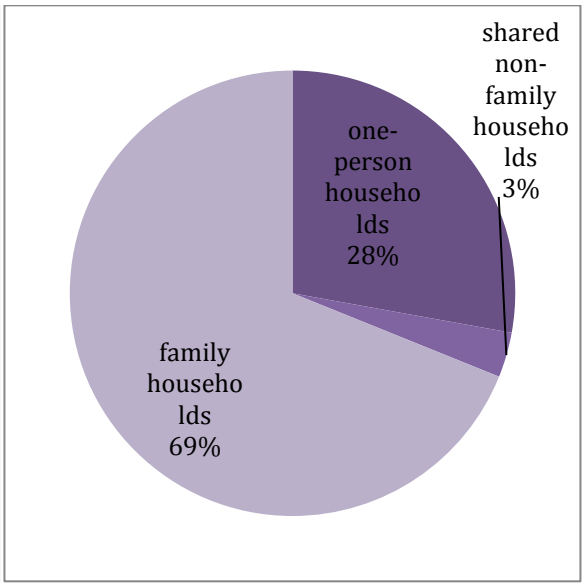
Age Composition



Family Composition



Household Composition



Percent one-person households among non-family households	89%
Percent non-family households	31%
Percent foreign-born persons	16%
Percent population 25 years and older with college degree and more education	7%
Median income as percent of borough median income	50%
Percent of persons living in poverty	45%

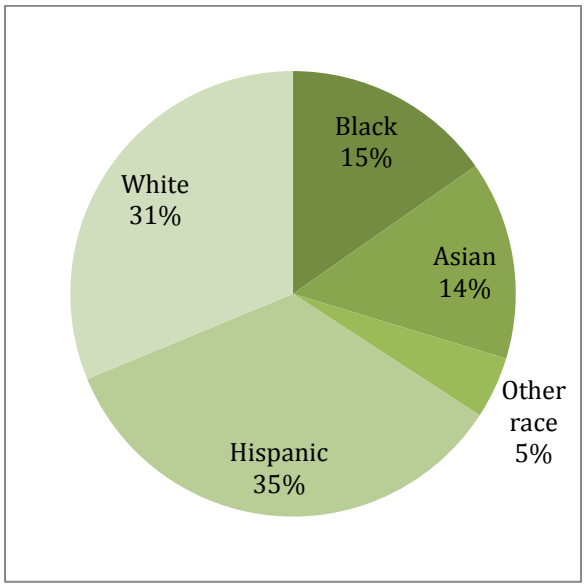
Housing characteristics

Percent owner-occupied units	6.9%
Percent crowded units	2.8%
Percent units with 1 to 2 rooms	8.3%
Percent units in buildings with 1 to 4 units	13.5%
Percent units in buildings with 5 to 19 units	12.2%

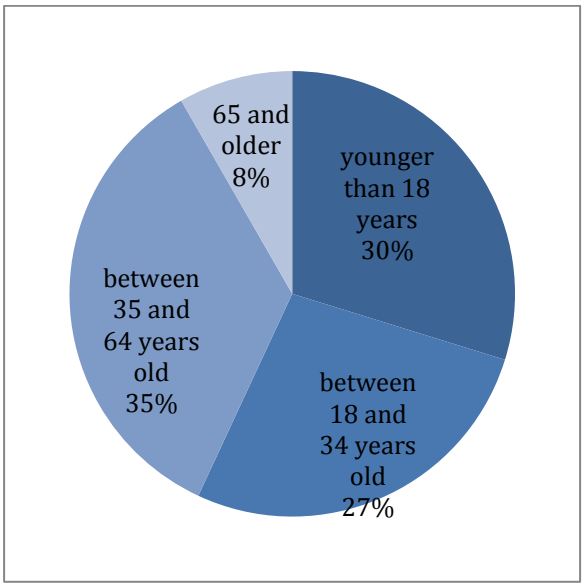
Racial mix/middle-income/families

Number of Tracts in 2010: 108
Population in 2010: 323,742

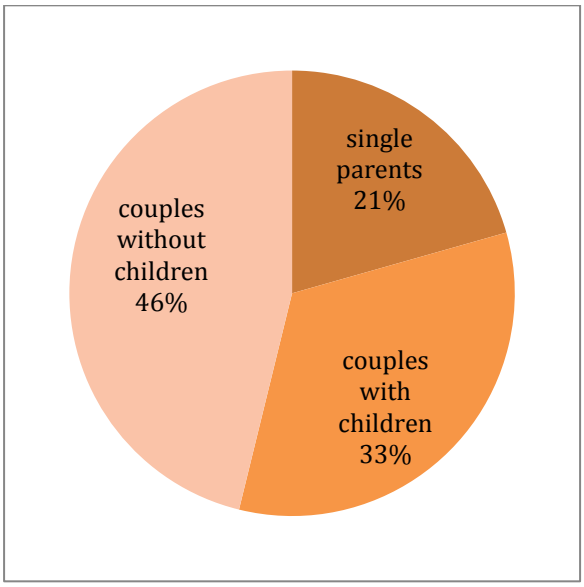
Race Composition



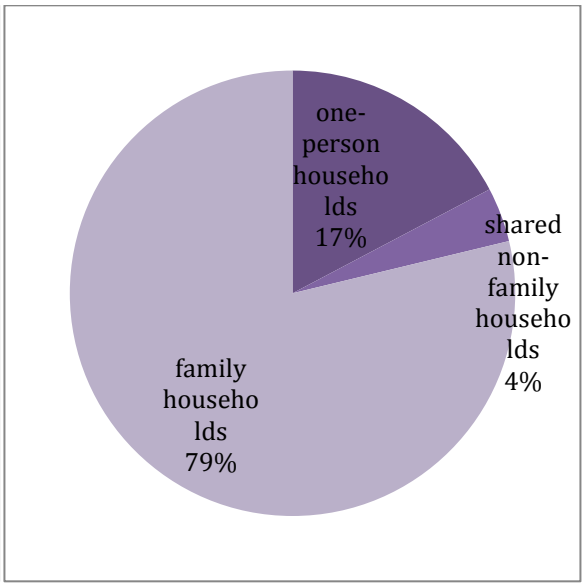
Age Composition



Family Composition



Household Composition



Percent one-person households among non-family households	81%
Percent non-family households	21%
Percent foreign-born persons	45%
Percent population 25 years and older with college degree and more education	14%
Median income as percent of borough median income	100%
Percent of persons living in poverty	20%

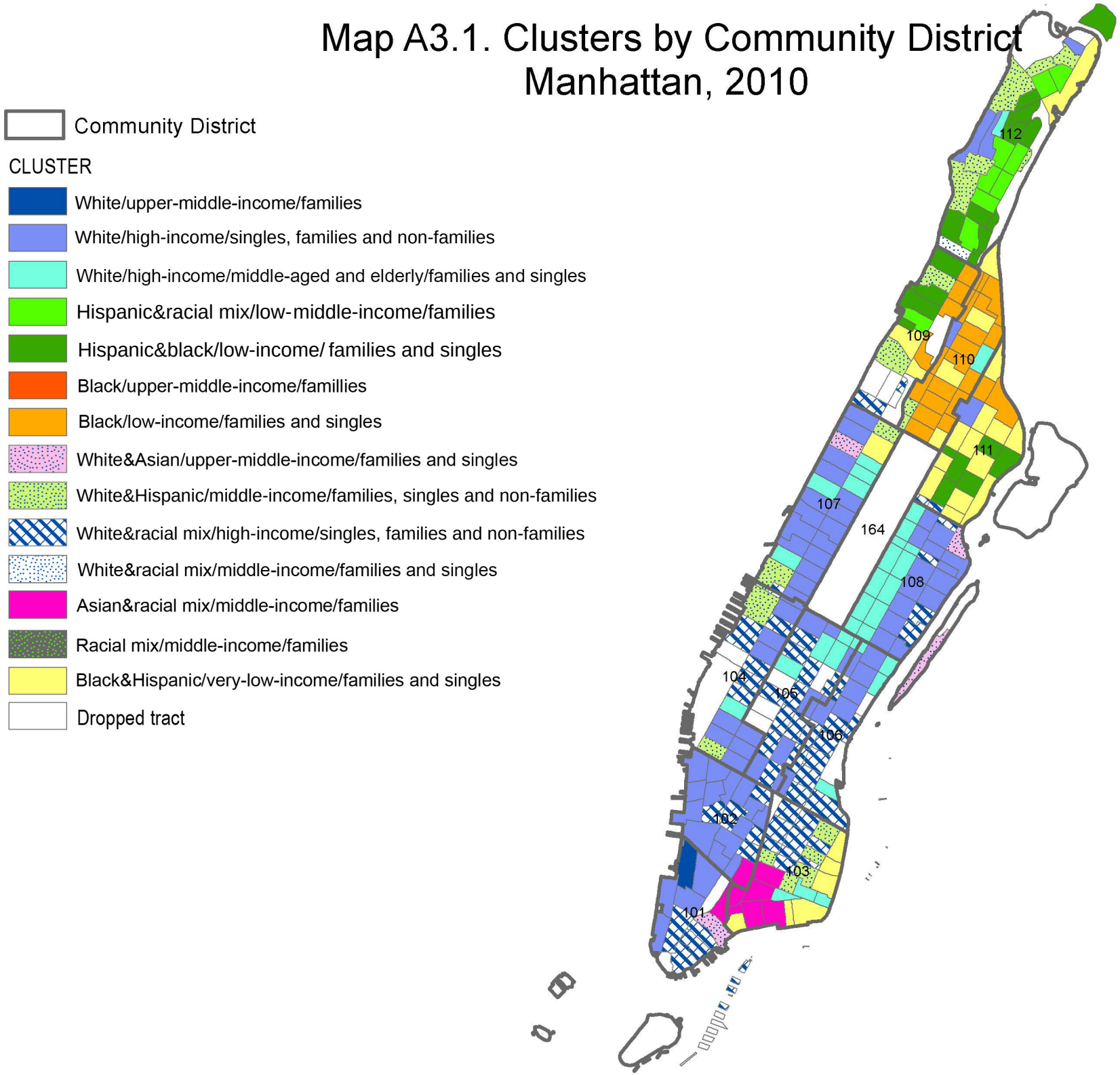
Housing characteristics

Percent owner-occupied units	47.1%
Percent crowded units	2.7%
Percent units with 1 to 2 rooms	4.9%
Percent units in buildings with 1 to 4 units	86.7%
Percent units in buildings with 5 to 19 units	4.3%

APPENDIX 3

NEIGHBORHOOD MAPS OVERLAID WITH COMMUNITY DISTRICTS

Map A3.1. Clusters by Community District
Manhattan, 2010

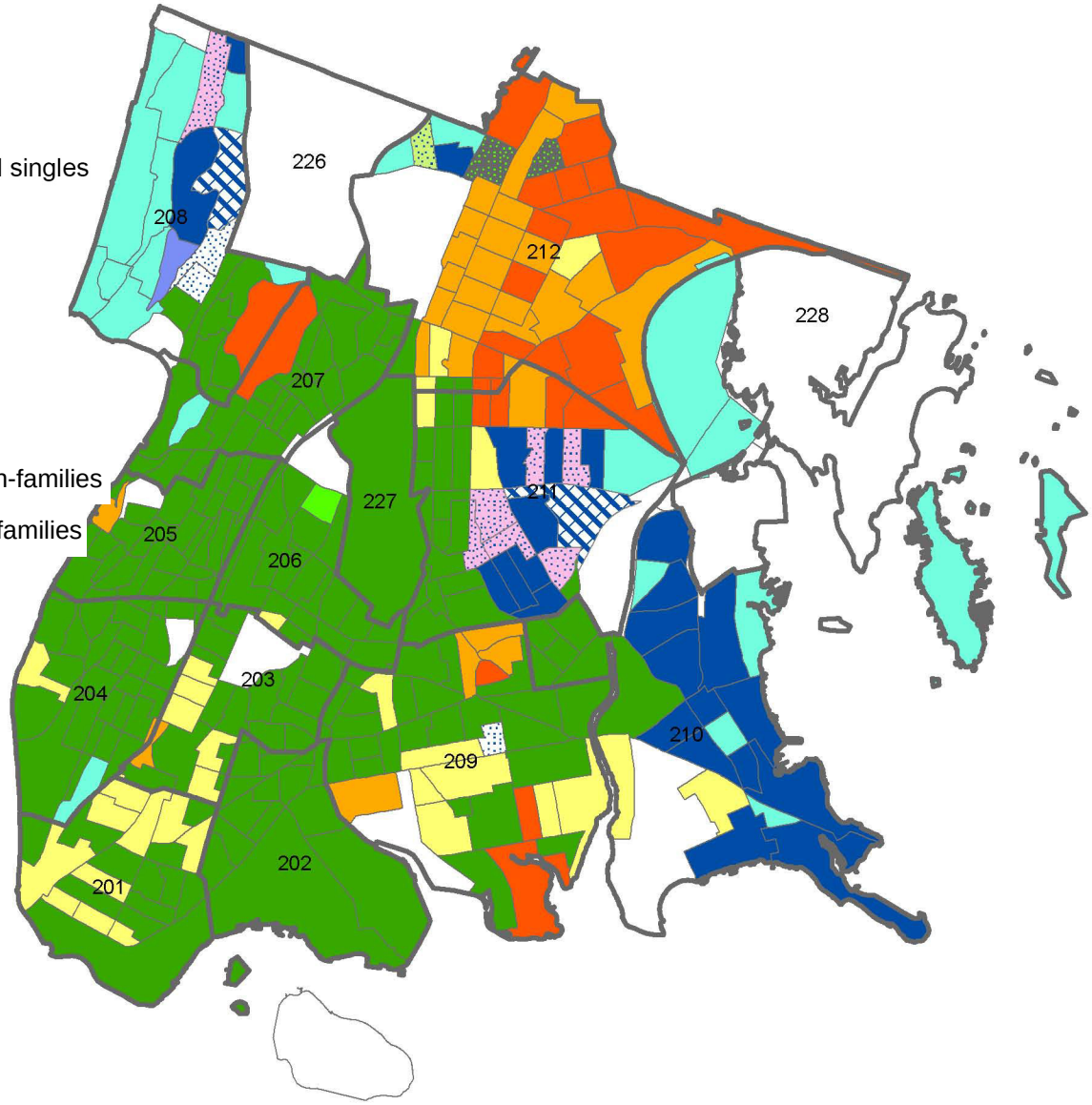


Map A3.2. Clusters by Community District
Bronx, 2010

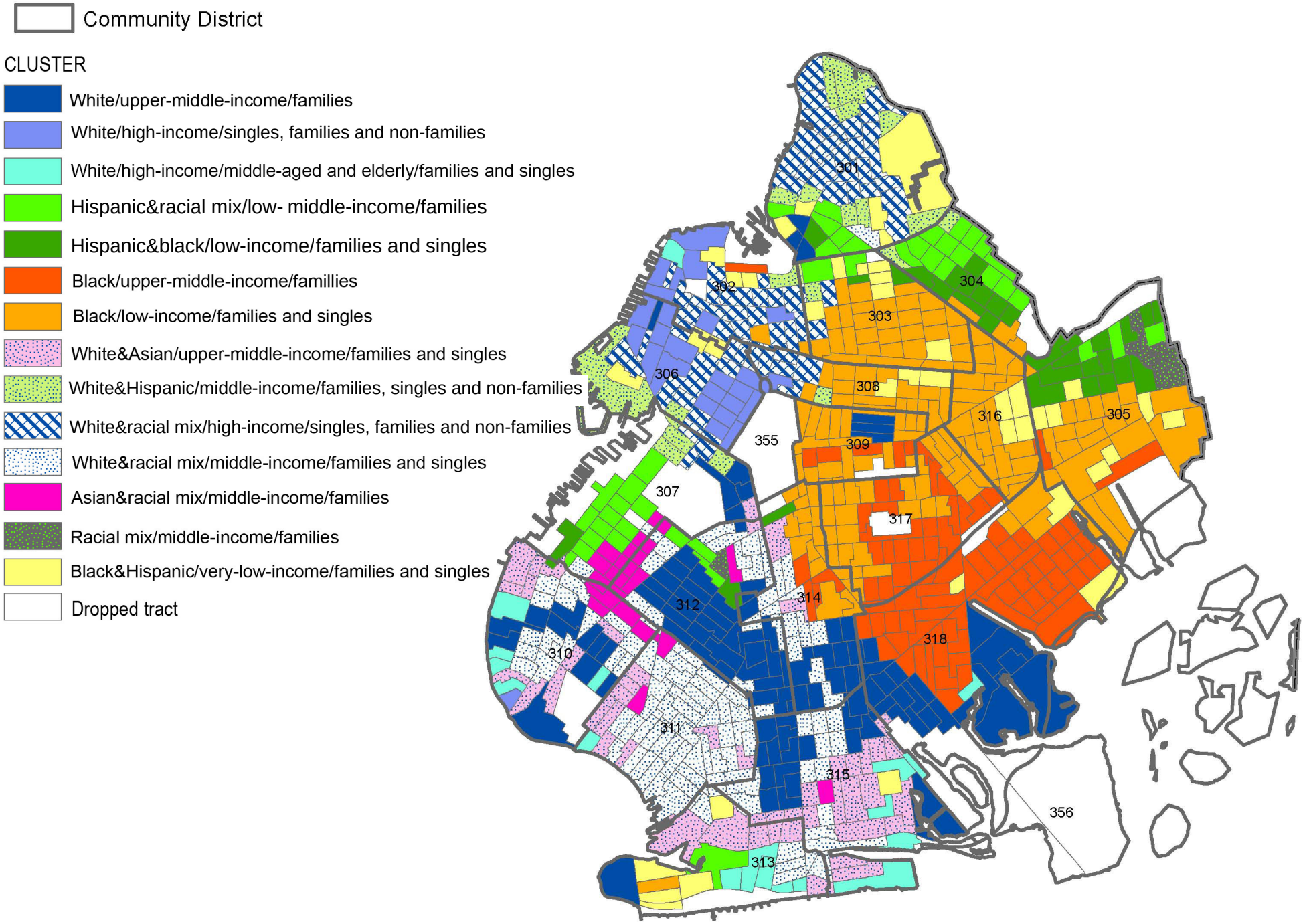
Community District

CLUSTER

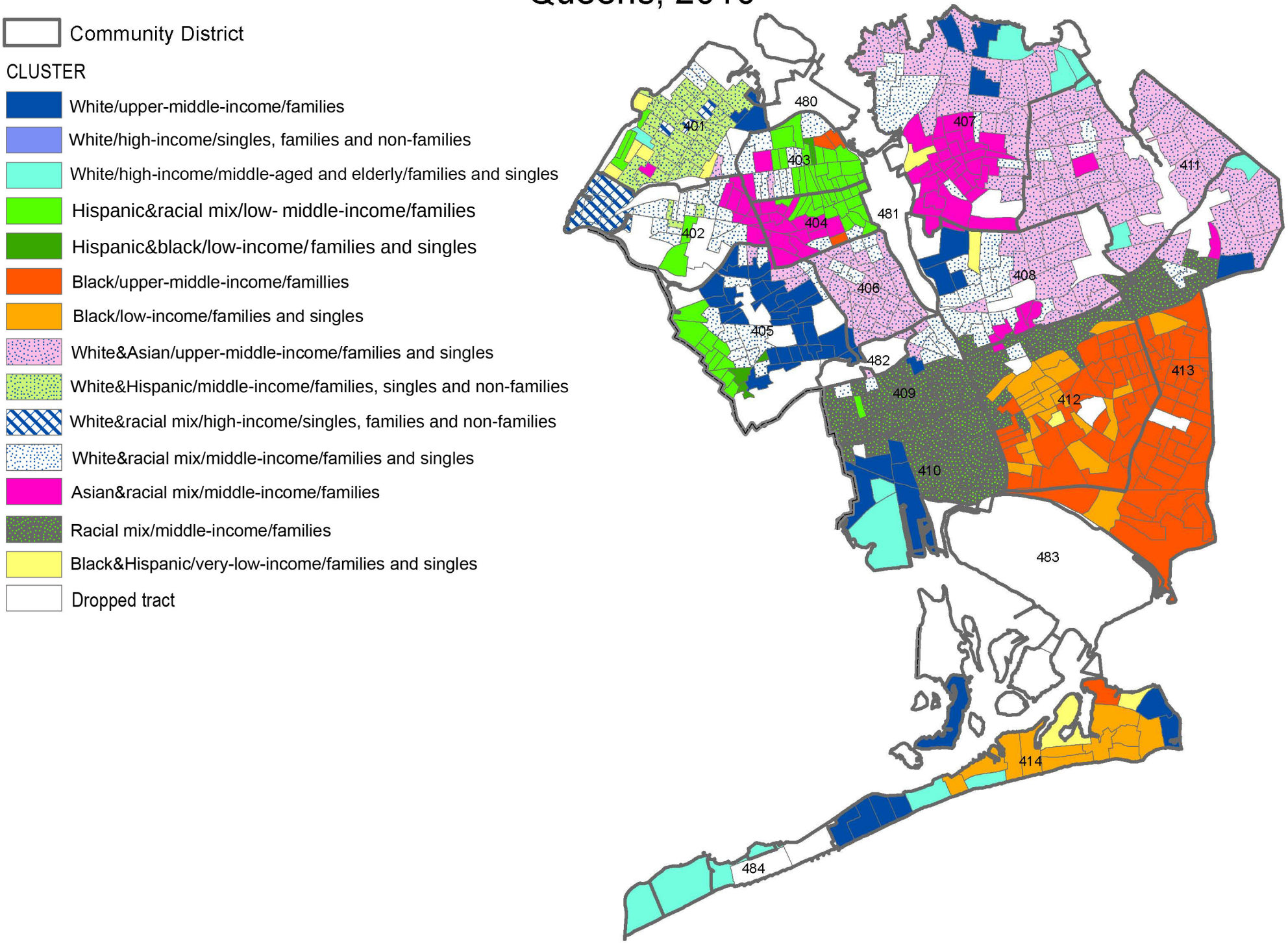
- White/upper-middle-income/families
- White/high-income/singles, families and non-families
- White/high-income/middle-aged and elderly/families and singles
- Hispanic&racial mix/low-middle-income/families
- Hispanic&black/low-income/ families and singles
- Black/upper-middle-income/famillies
- Black/low-income/families and singles
- White&Asian/upper-middle-income/families and singles
- White&Hispanic/middle-income/families, singles and non-families
- White&racial mix/high-income/singles, families and non-families
- White&racial mix/middle-income/families and singles
- Asian&racial mix/middle-income/families
- Racial mix/middle-income/families
- Black&Hispanic/very-low-income/families and singles
- Dropped tract



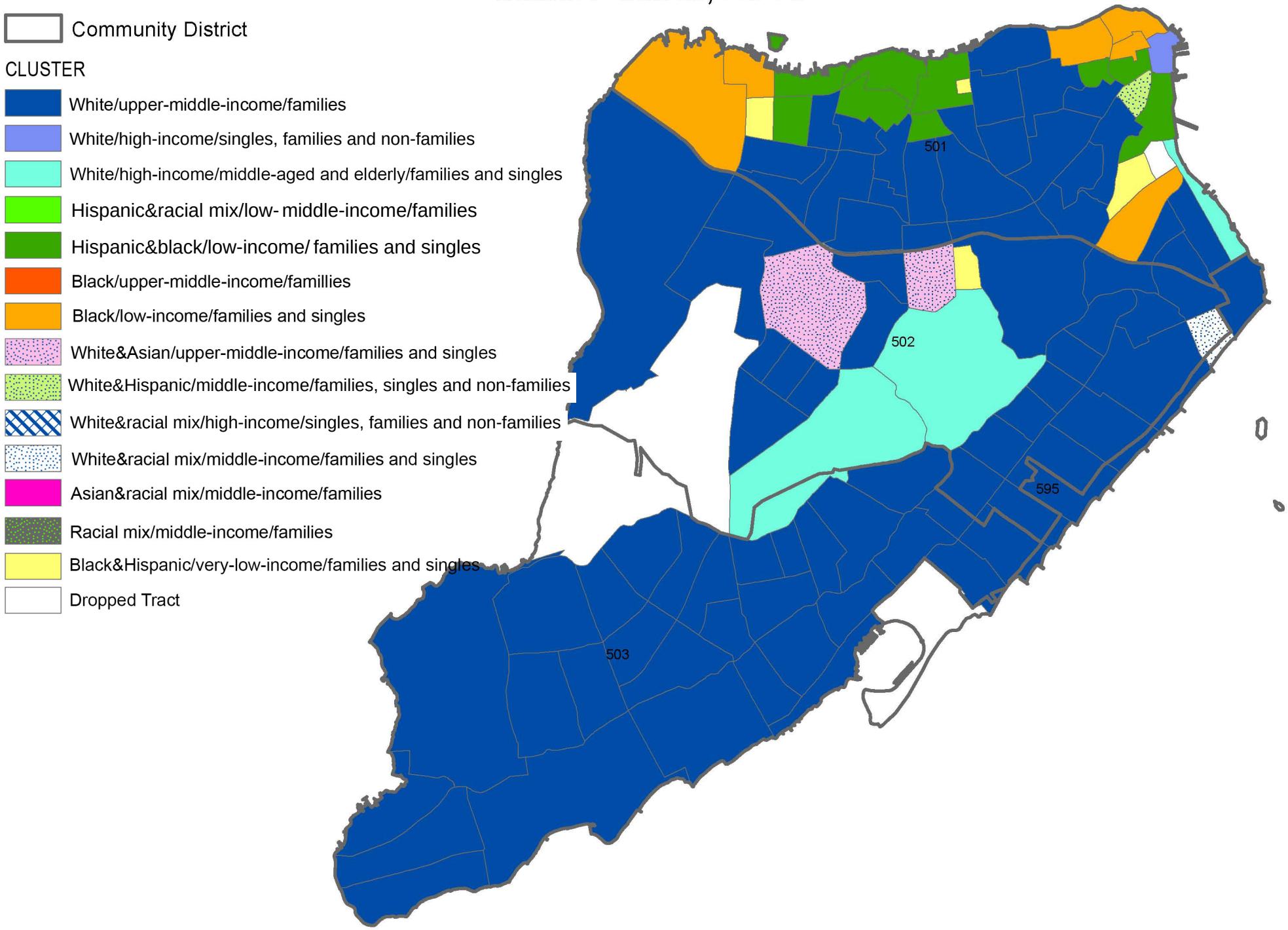
Map A3.3. Clusters by Community District
Brooklyn, 2010



Map A3.4. Clusters by Community District
Queens, 2010



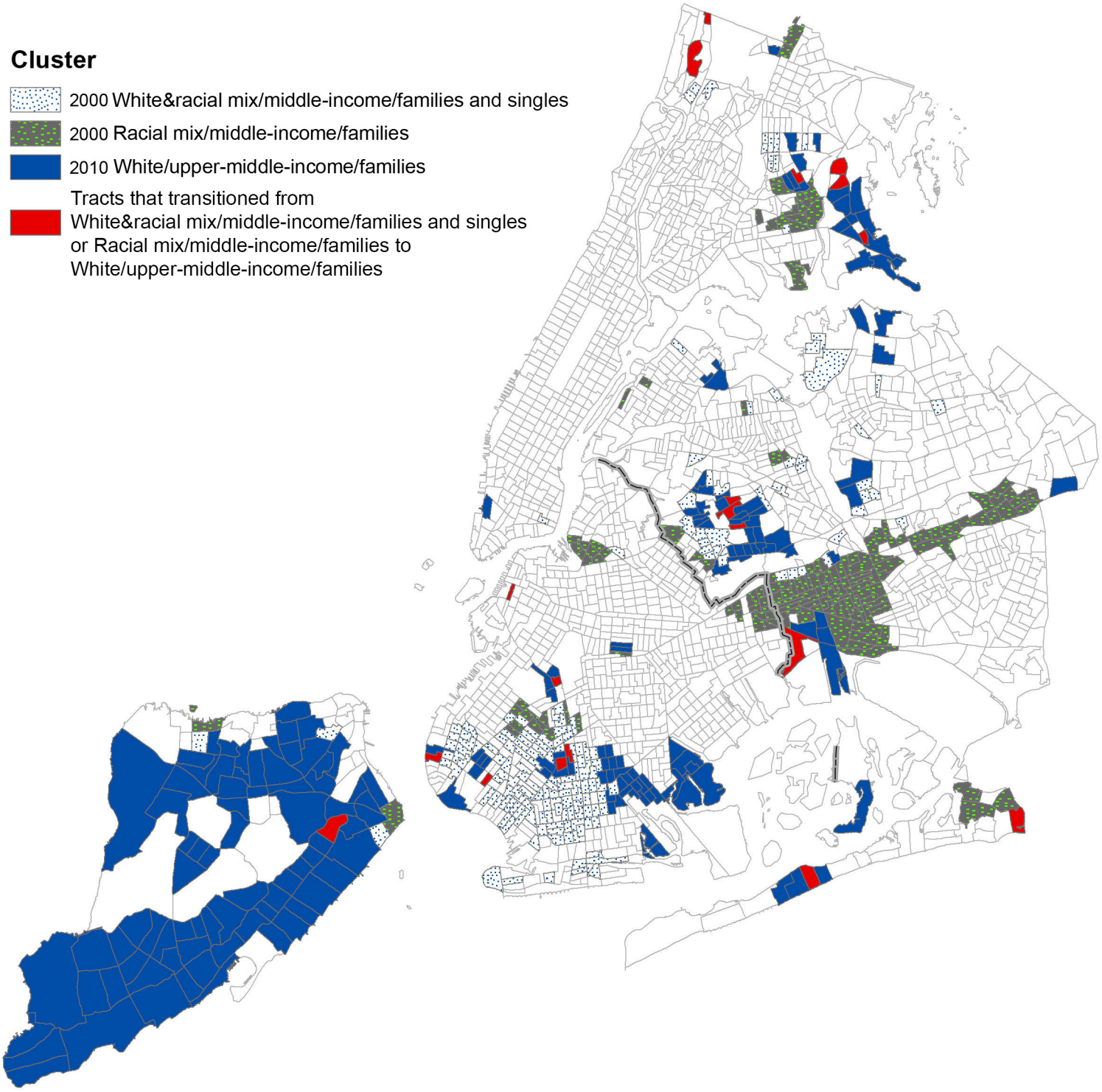
Map A3.5. Clusters by Community District
Staten Island, 2010



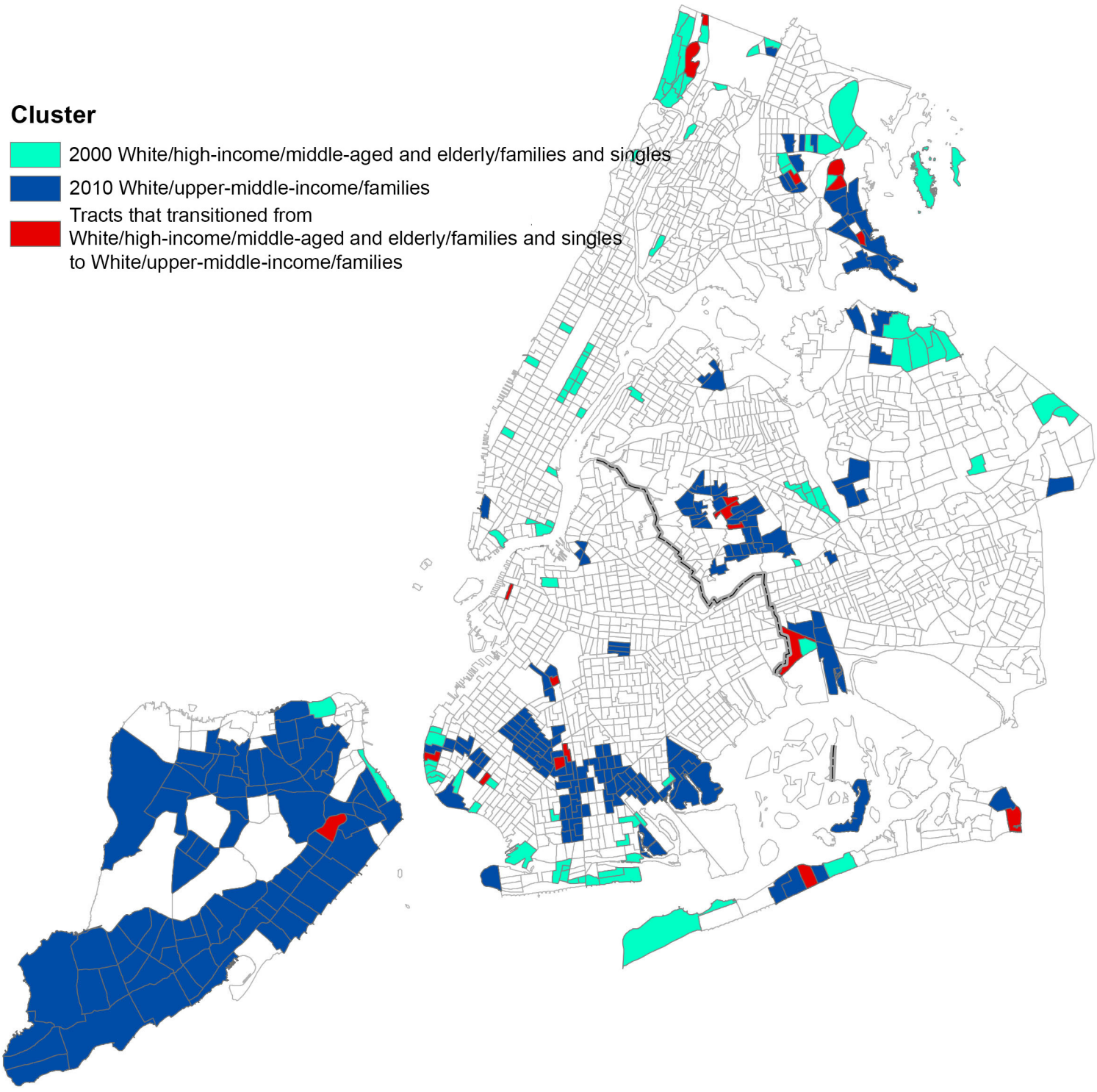
APPENDIX 4

MAPS OF TRANSITIONS

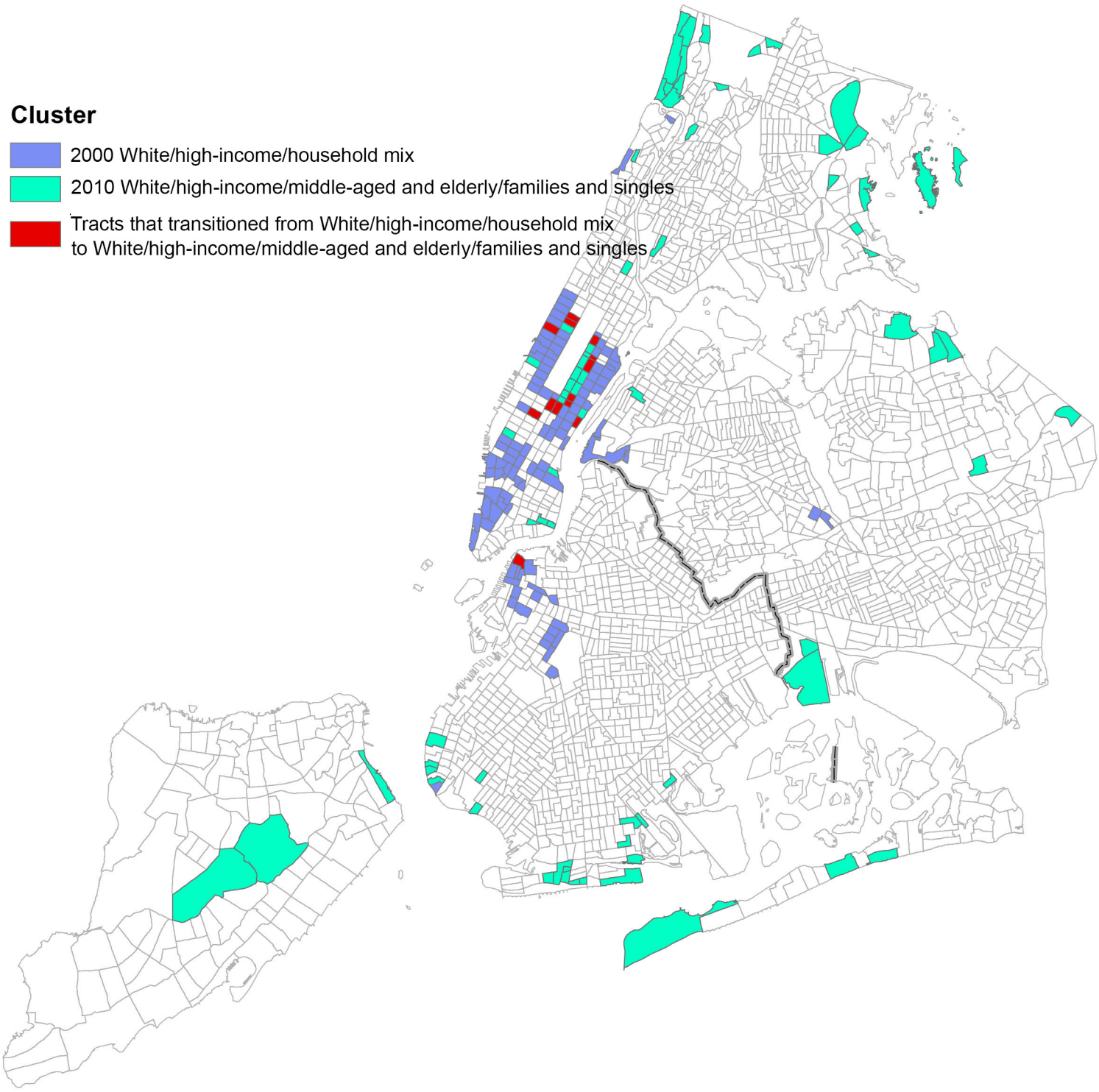
Map A4.1. Census Tracts Transitioning
from White&racial mix/middle-income/families and singles
or Racial mix/middle-income/families
to White/upper-middle-income/families
New York City, 2000-2010



Map A4.2. Census Tracts Transitioning
from White/high-income/middle-aged and elderly/families and singles
to White/upper-middle-income/families
New York City, 2000-2010

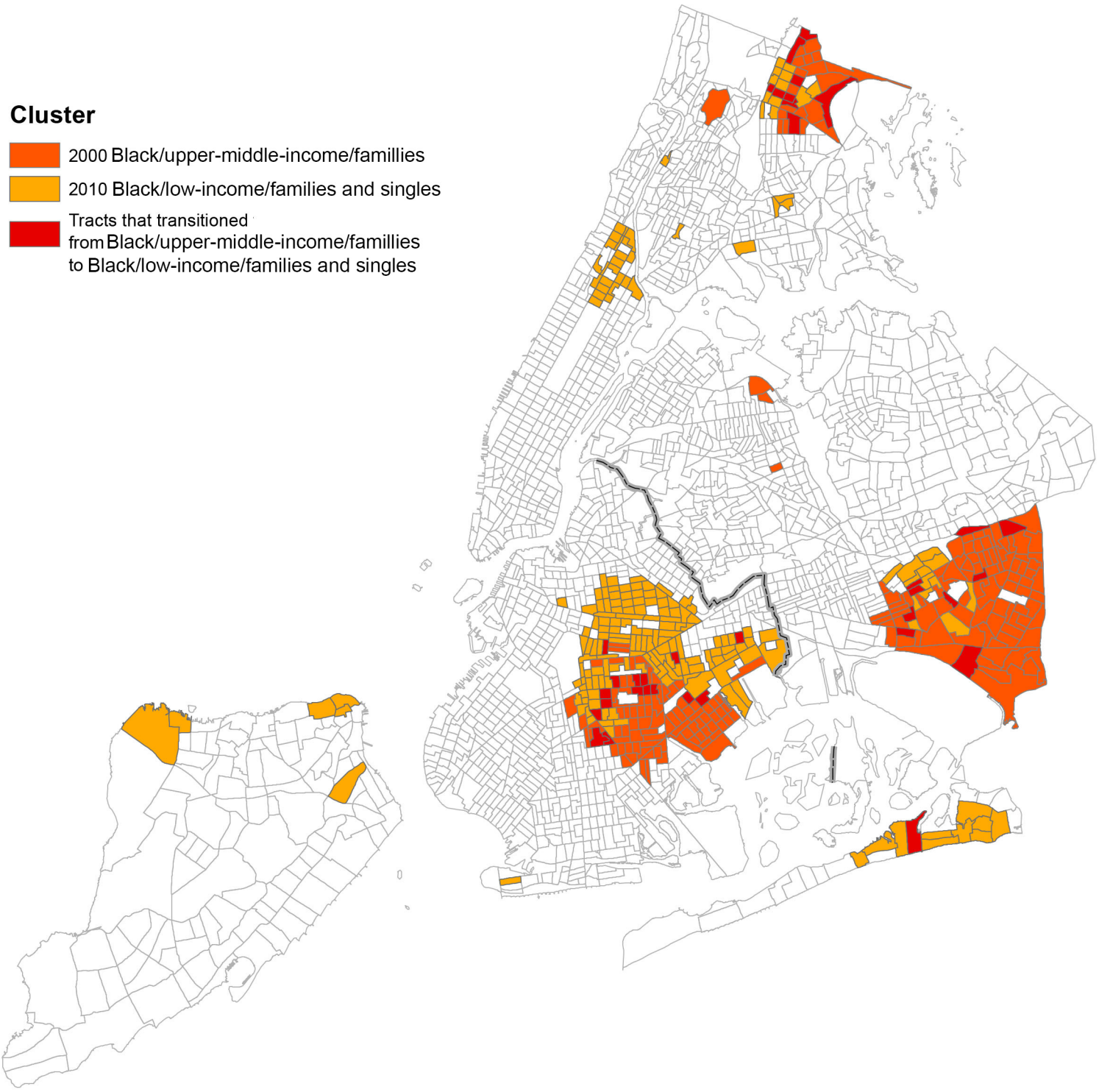


Map A4.3. Census Tracts Transitioning from White/high-income/household mix* to White/high-income/middle-aged and elderly/families and singles New York City, 2000-2010

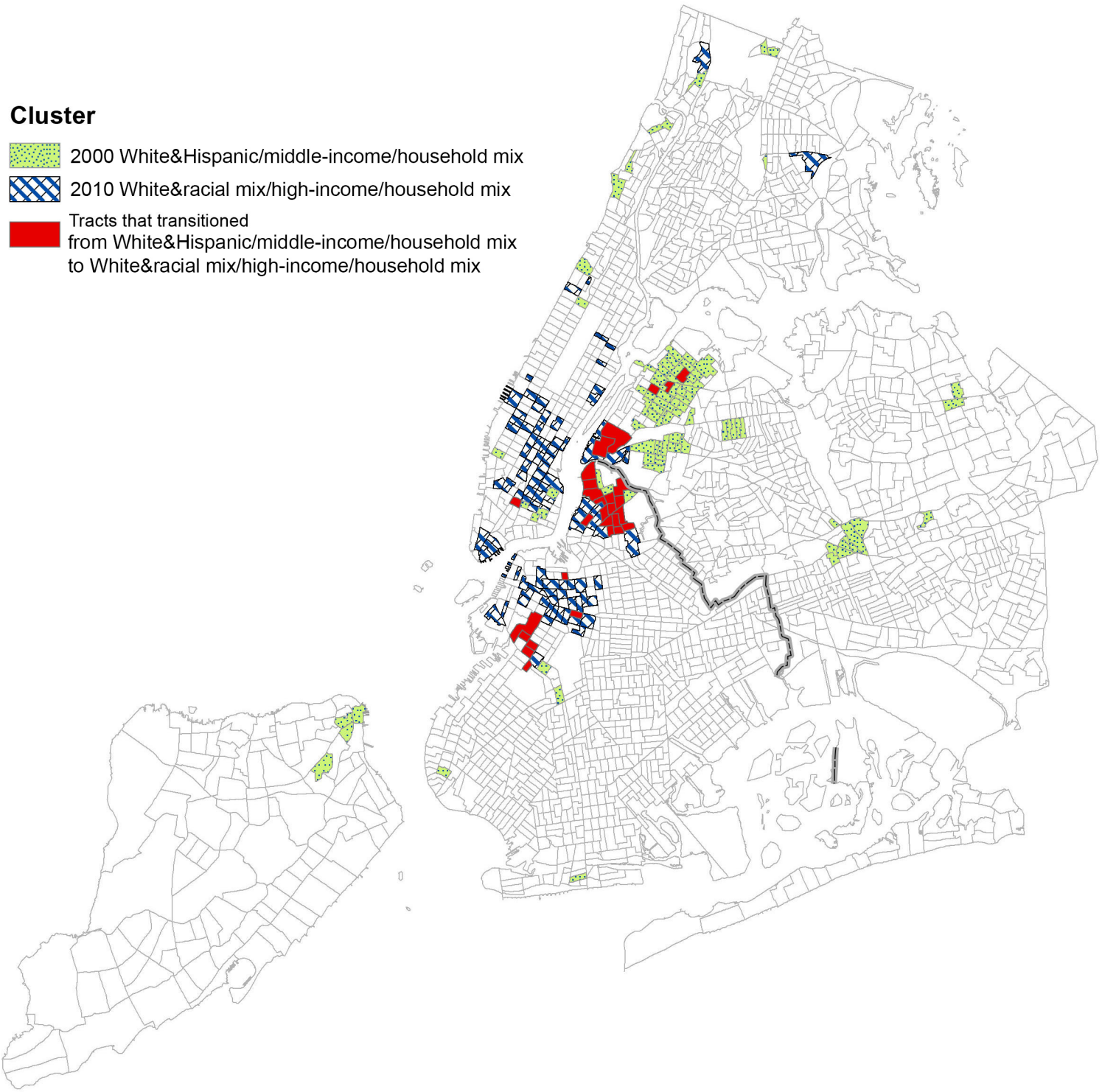


*White/high-income/singles, families and non-families

Map A4.4. Census Tracts Transitioning
from Black/upper-middle-income/famillies
to Black/low-income/families and singles
New York City, 2000-2010



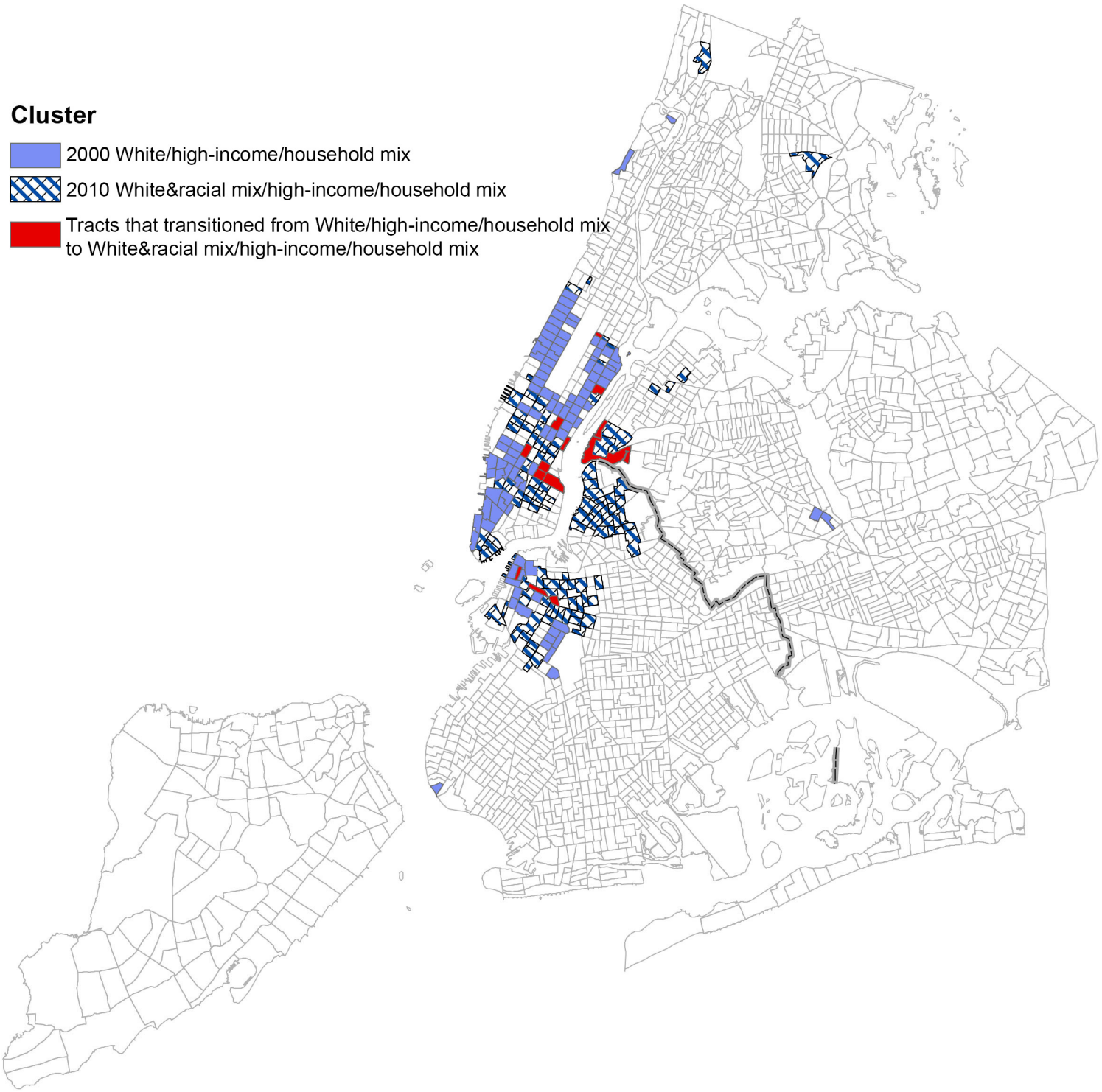
Map A4.5. Census Tracts Transitioning from White&Hispanic/middle-income/household mix* to White&racial mix/high-income/household mix** New York City, 2000-2010



* White&Hispanic/middle-income/families, singles and non-families

** White&racial mix/high-income/singles, families and non-families

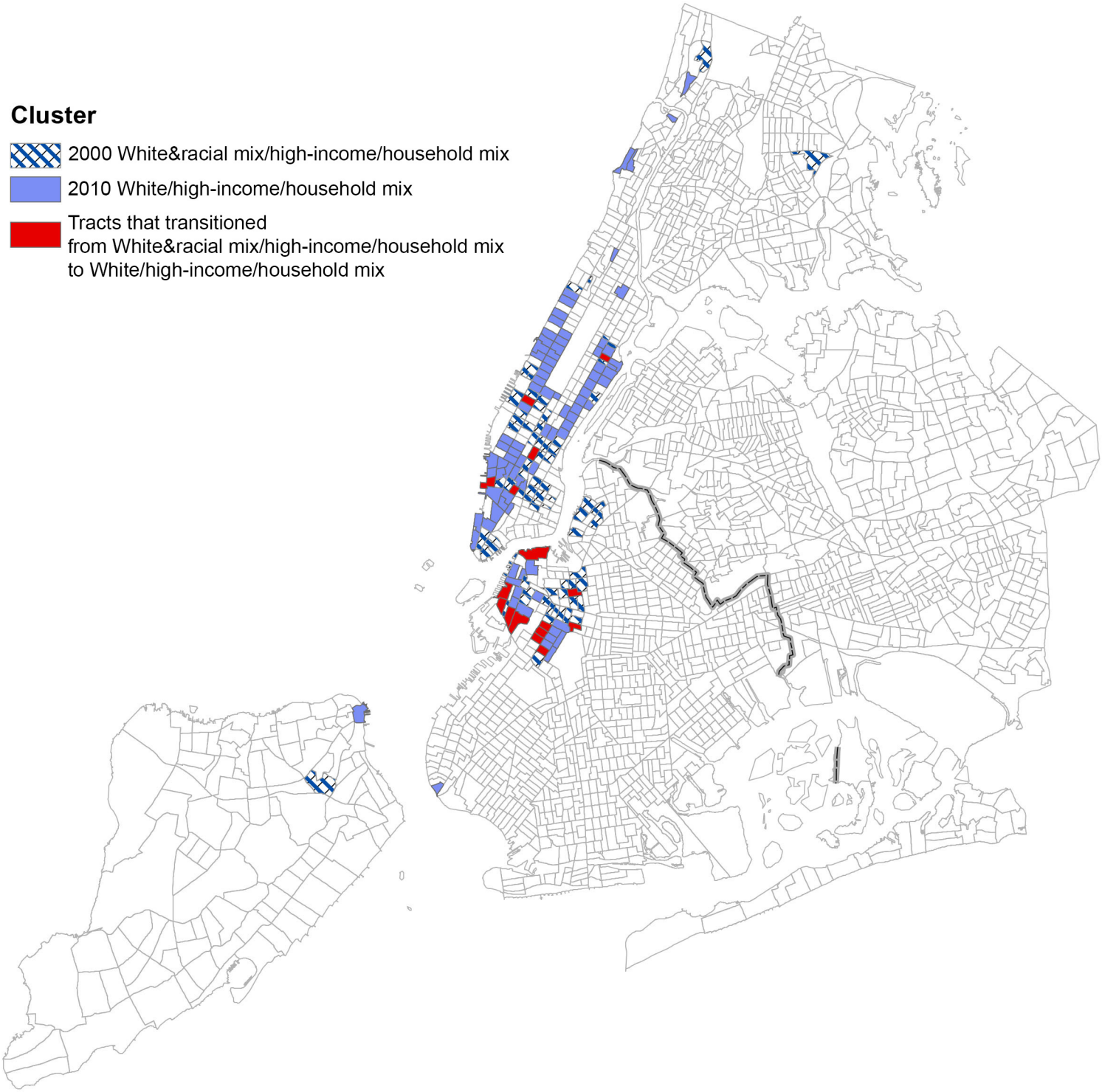
Map A4.6. Census Tracts Transitioning from White/high-income/household mix * to White&racial mix/high-income/household mix ** New York City, 2000-2010



* White/high-income/singles, families and non-families

** White&racial mix/high-income/singles, families and non-families

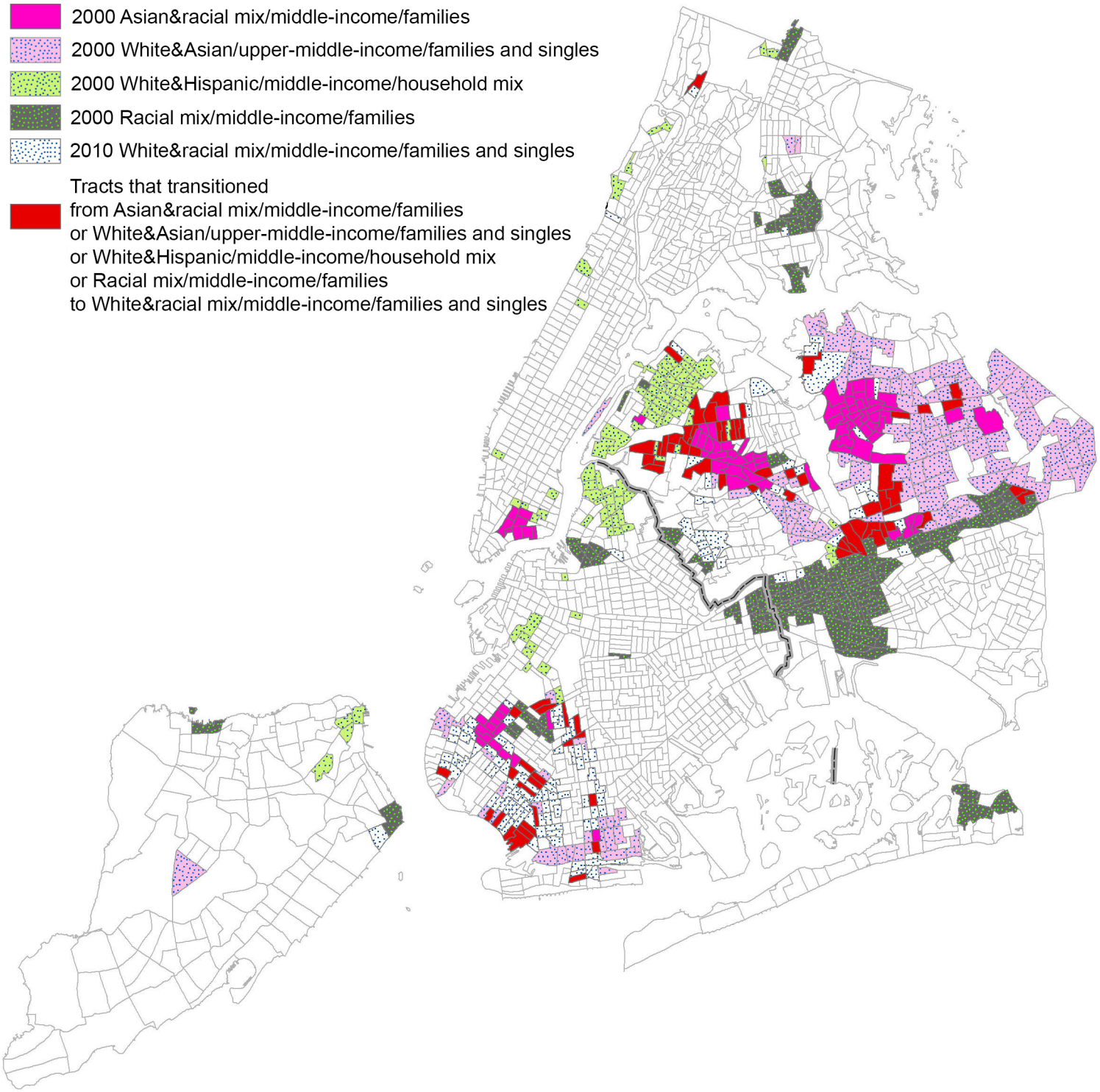
Map A4.7. Census Tracts Transitioning from White&racial mix/high-income/household mix* to White/high-income/household mix **
New York City, 2000-2010



*White&racial mix/high-income/singles, families and non-families

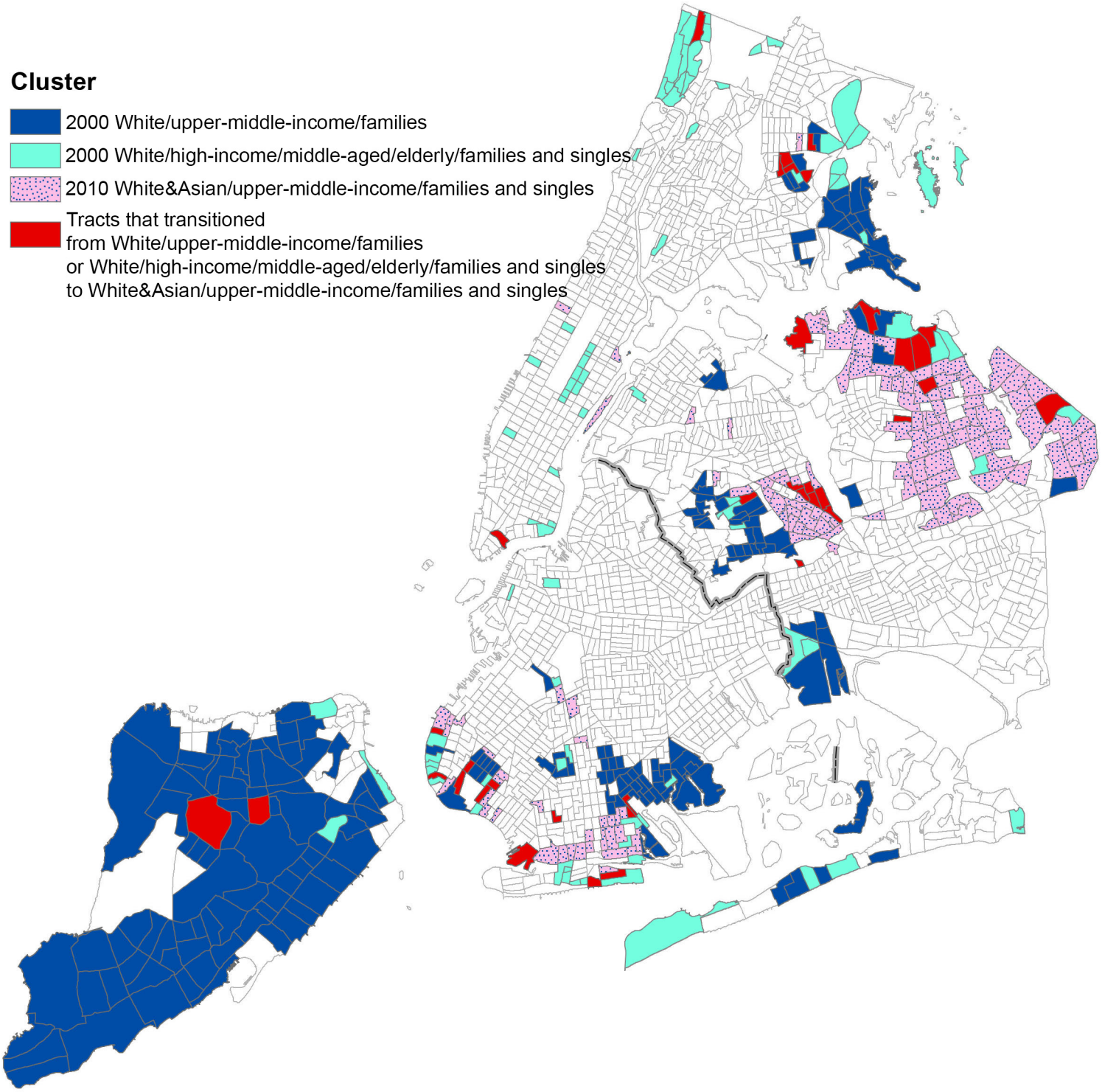
**White/high-income/singles, families and non-families

Map A4.8. Census Tracts transitioning from Asian&racial mix/middle-income/families or White&Asian/upper-middle-income/families and singles or White&Hispanic/middle-income/household mix* or Racial mix/middle-income/families to White&racial mix/middle-income/families and singles New York City, 2000-2010

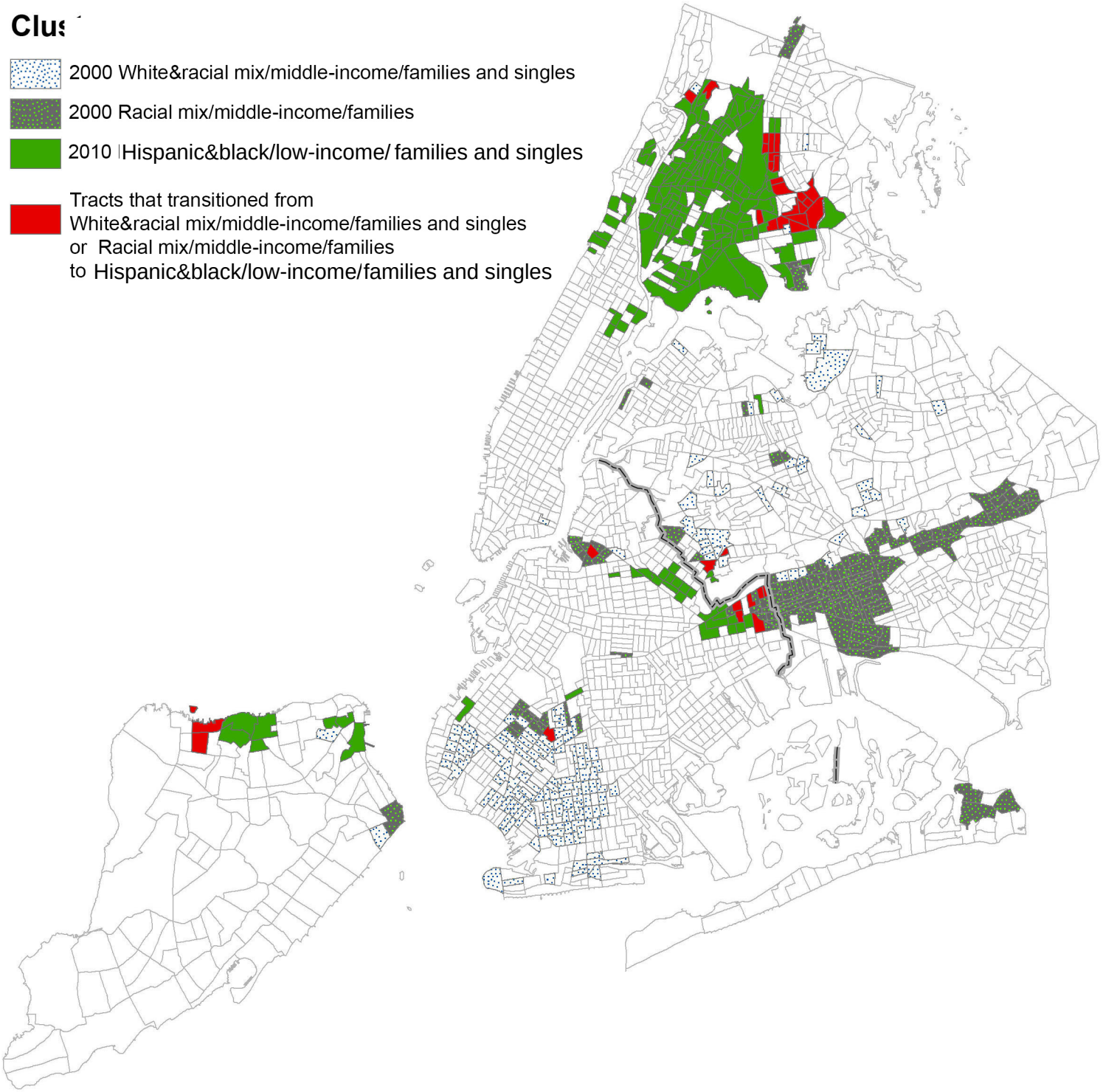


* White&Hispanic/middle-income/families, singles and non-families

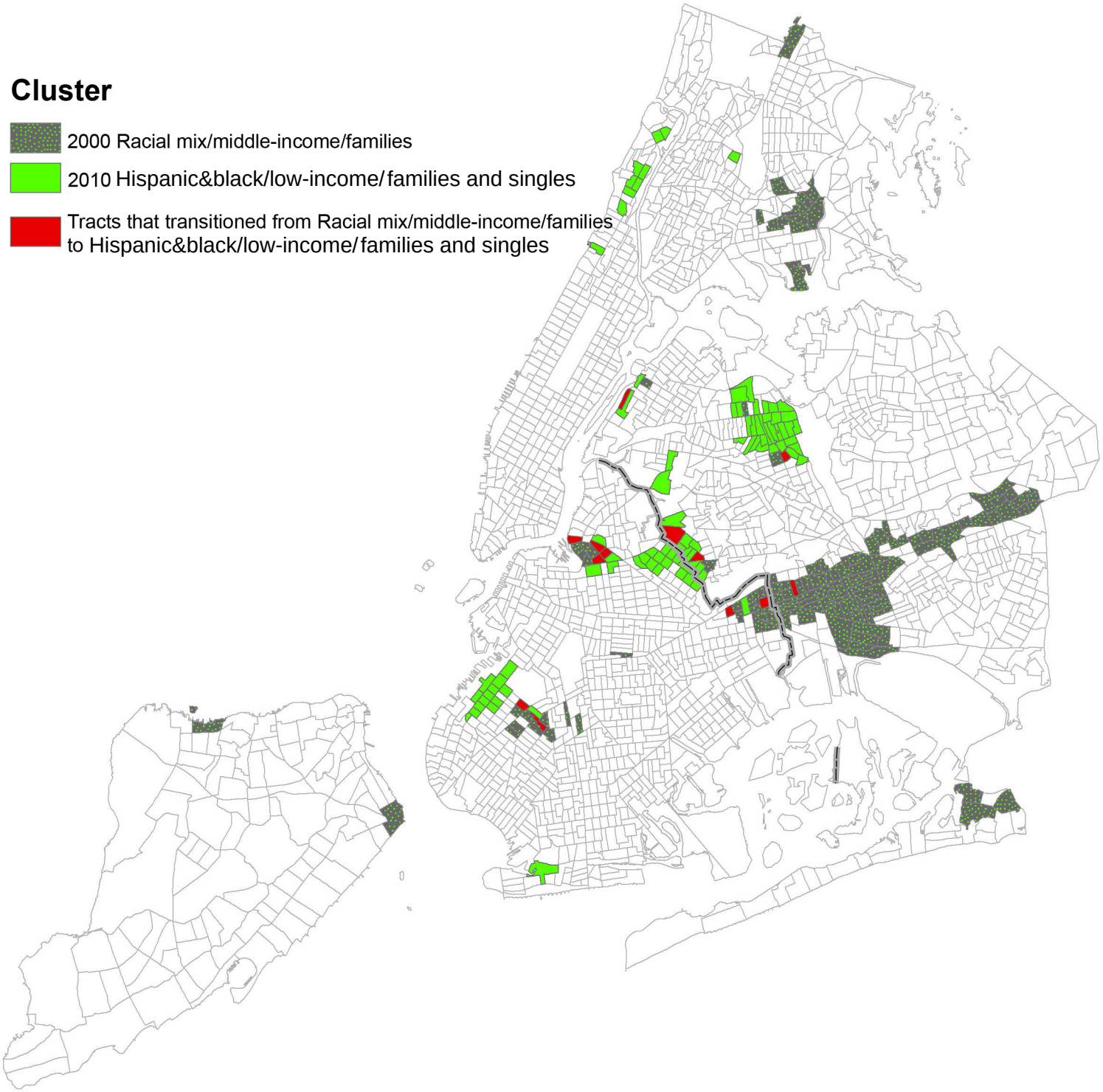
Map A4.9. Census Tracts Transitioning
from White/upper-middle-income/families
or White/high-income/middle-aged/elderly/families and singles
to White&Asian/upper-middle-income/families and singles
New York City, 2000-2010



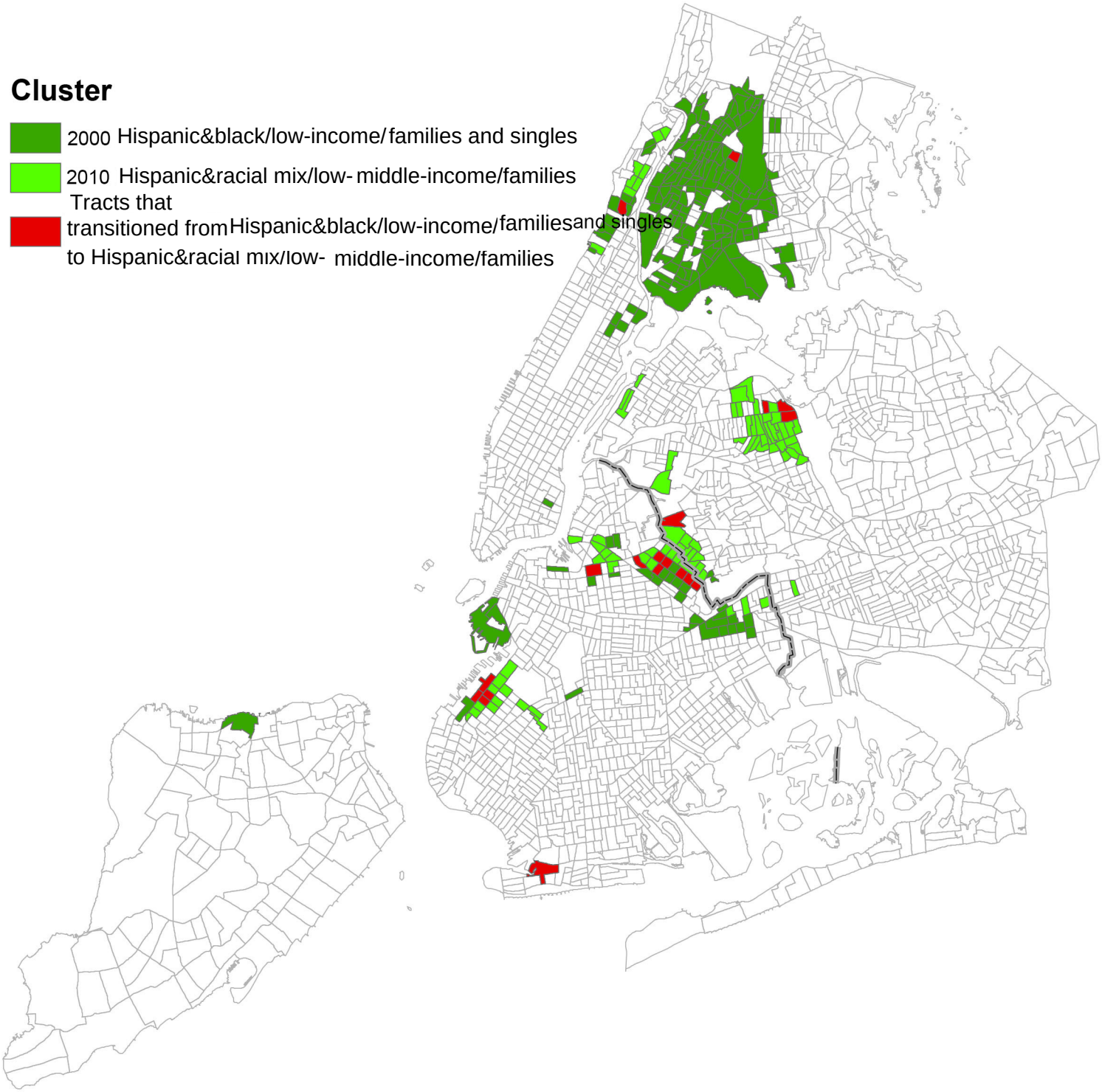
Map A4.10. Census Tracts Transitioning from
White&racial mix/middle-income/families and singles
or Racial mix/middle-income/families
to Hispanic&black/low-income/families and singles
New York City, 2000-2010



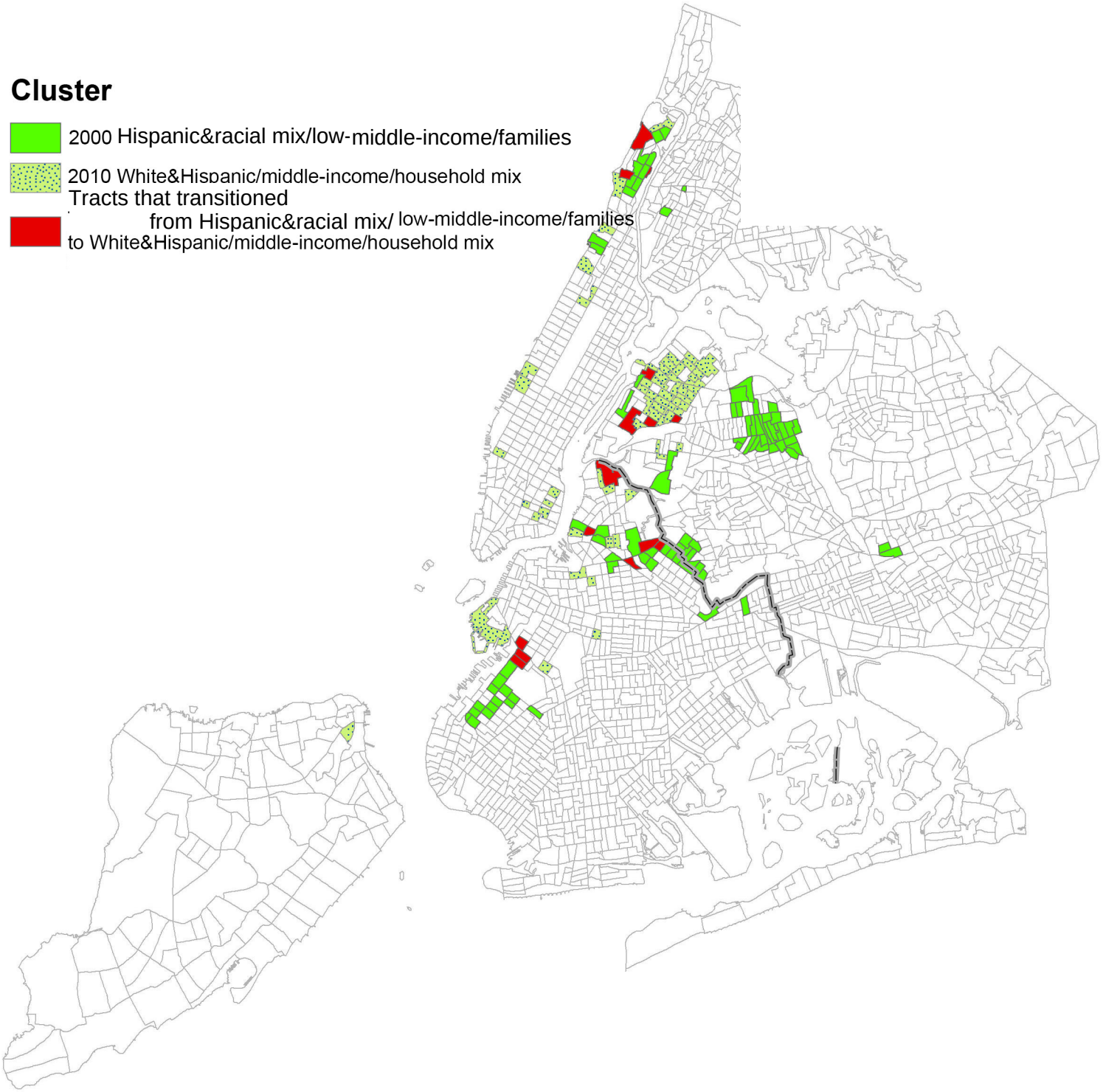
Map A4.11. Census Tracts Transitioning from Racial mix/middle-income/families to Hispanic&black/low-income/families and singles
New York City, 2000-2010



Map A4.12. Census Tracts transitioning
from Hispanic&black/low-income/families and singles
to Hispanic&racial mix/low-middle-income/families



Map A4.13.Census Tracts Transitioning from Hispanic&racial mix/low-middle-income/families to White&Hispanic/middle-income/household mix *
New York City, 2000-2010

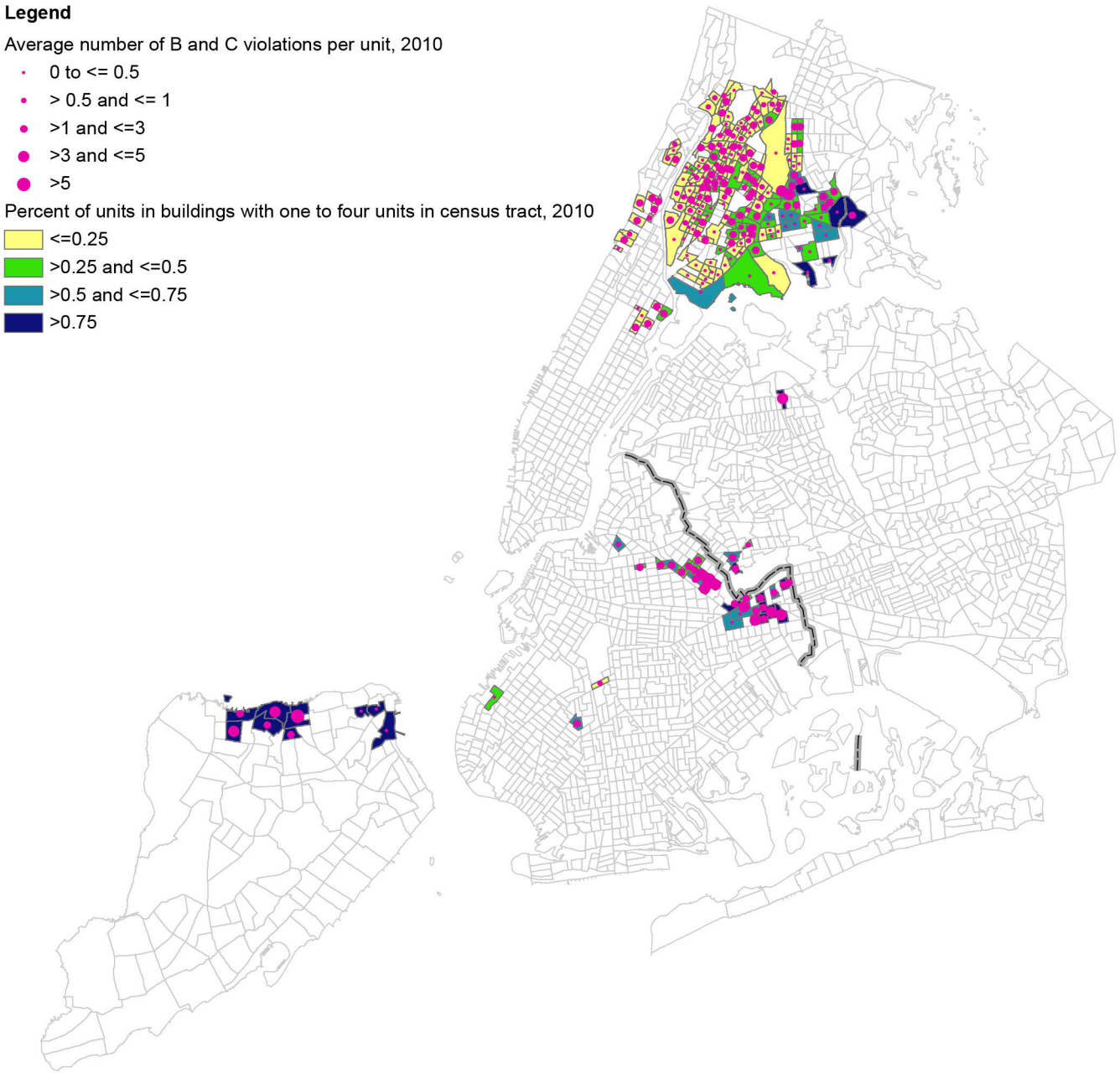


* White&Hispanic/middle-income/families, singles and non-families

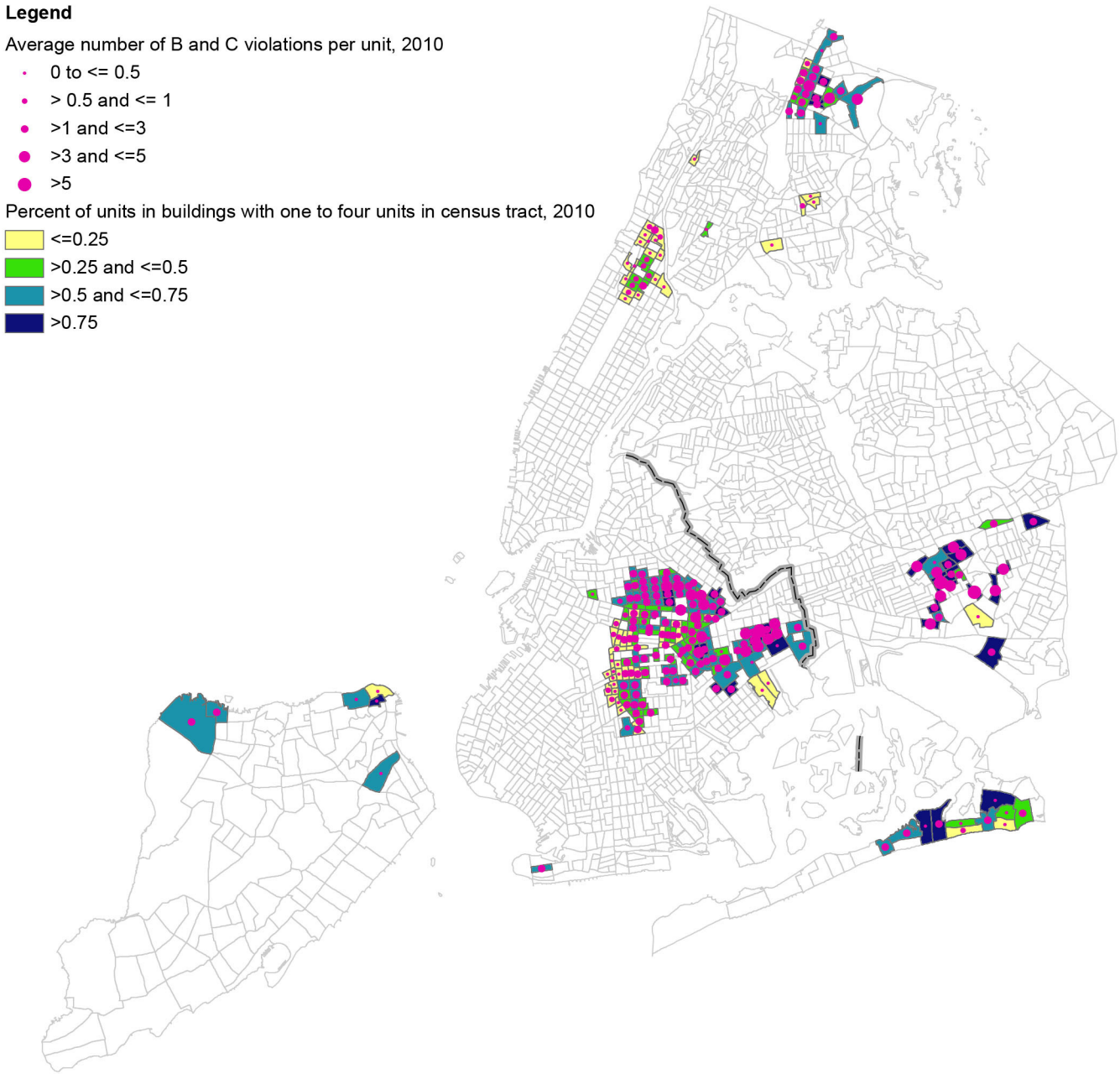
Appendix 5

Maps of Violations and Lis Pendens

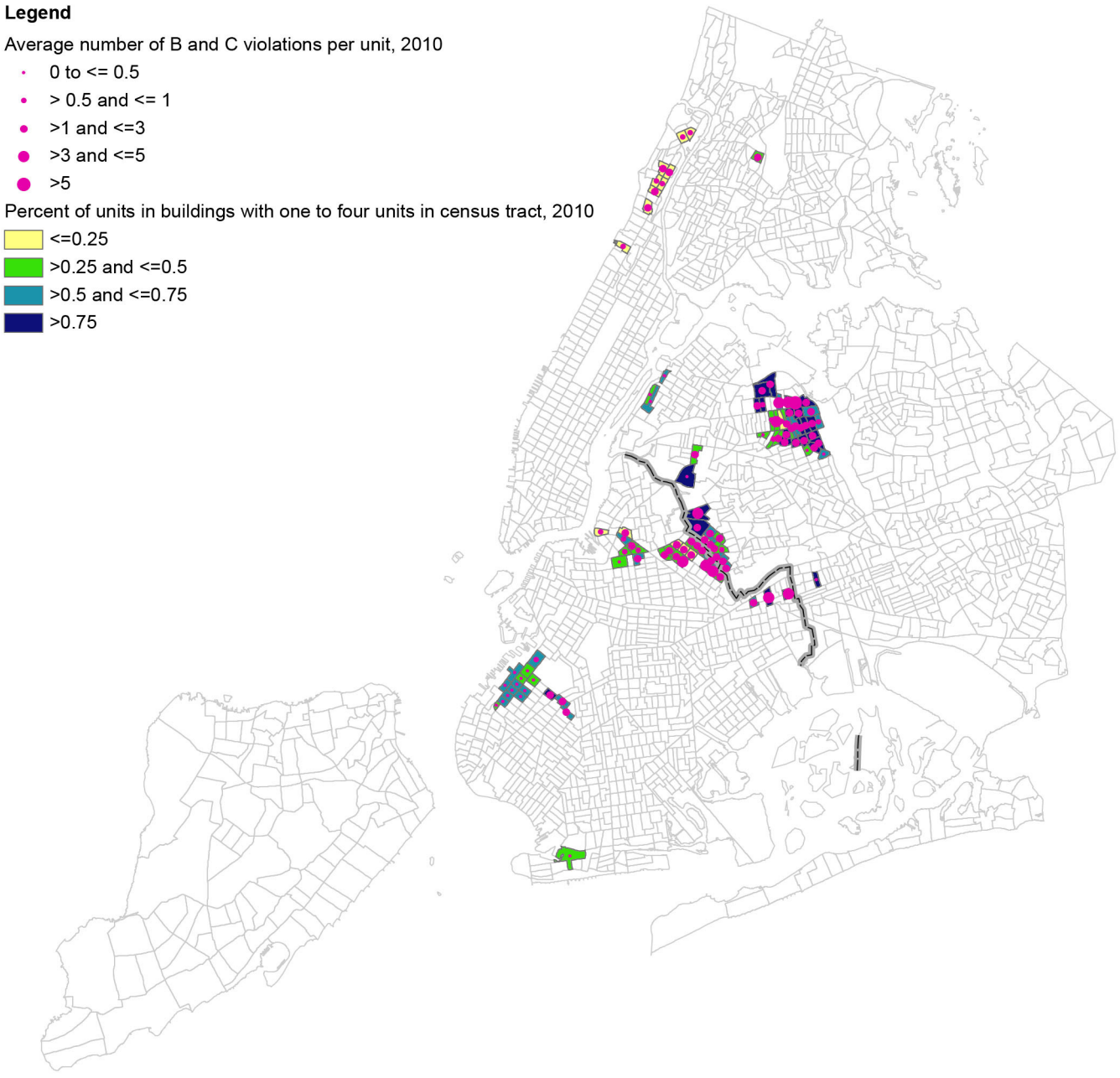
Map A5.1
Hispanic&black/low-income/families and singles: Average number B and C violations per unit by percent of units in buildings with one to four units in census tract, 2010



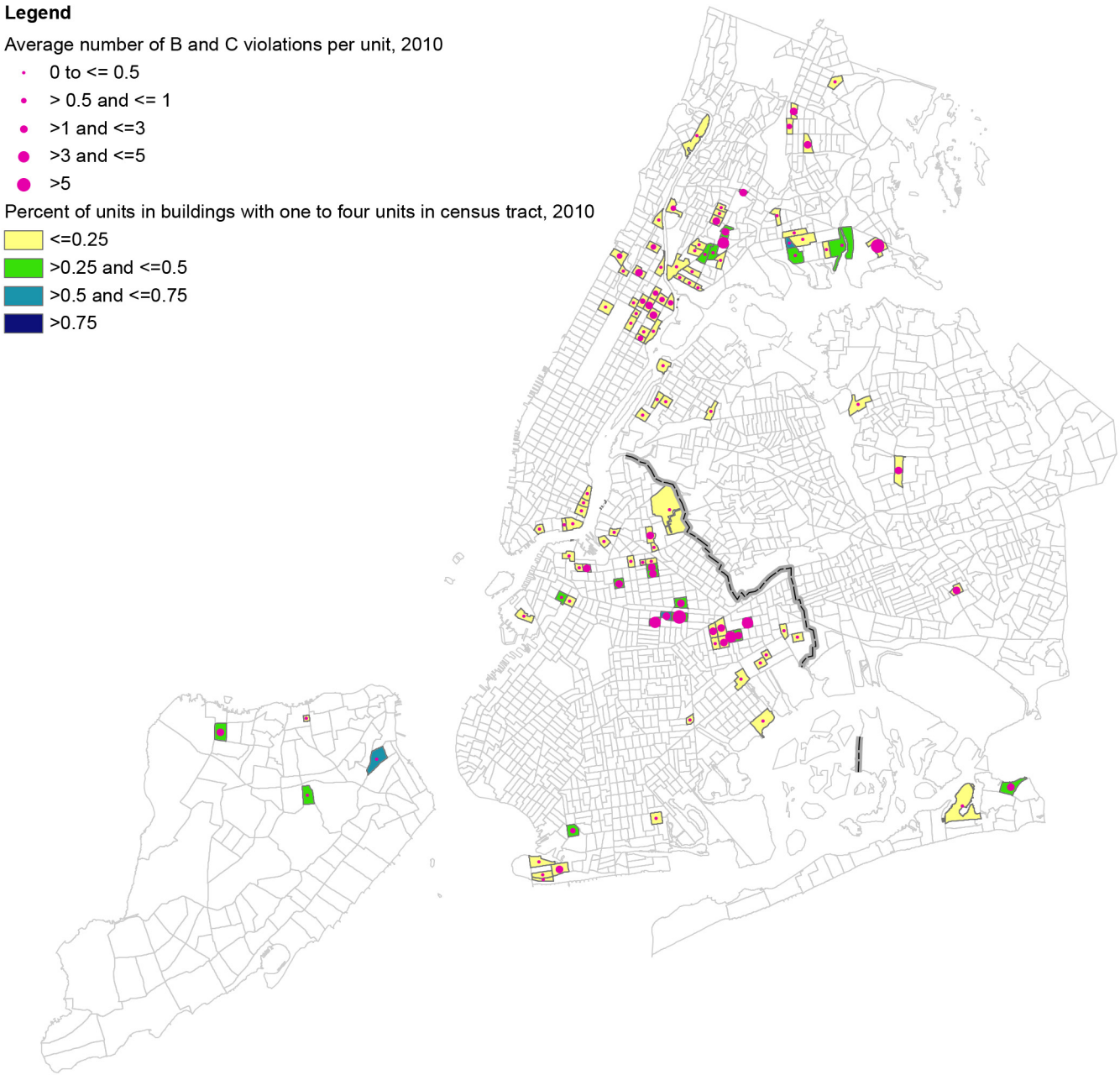
Map A5.2
Black/low-income/families and singles: Average number B and C violations per unit by percent of units in buildings with one to four units in census tract, 2010



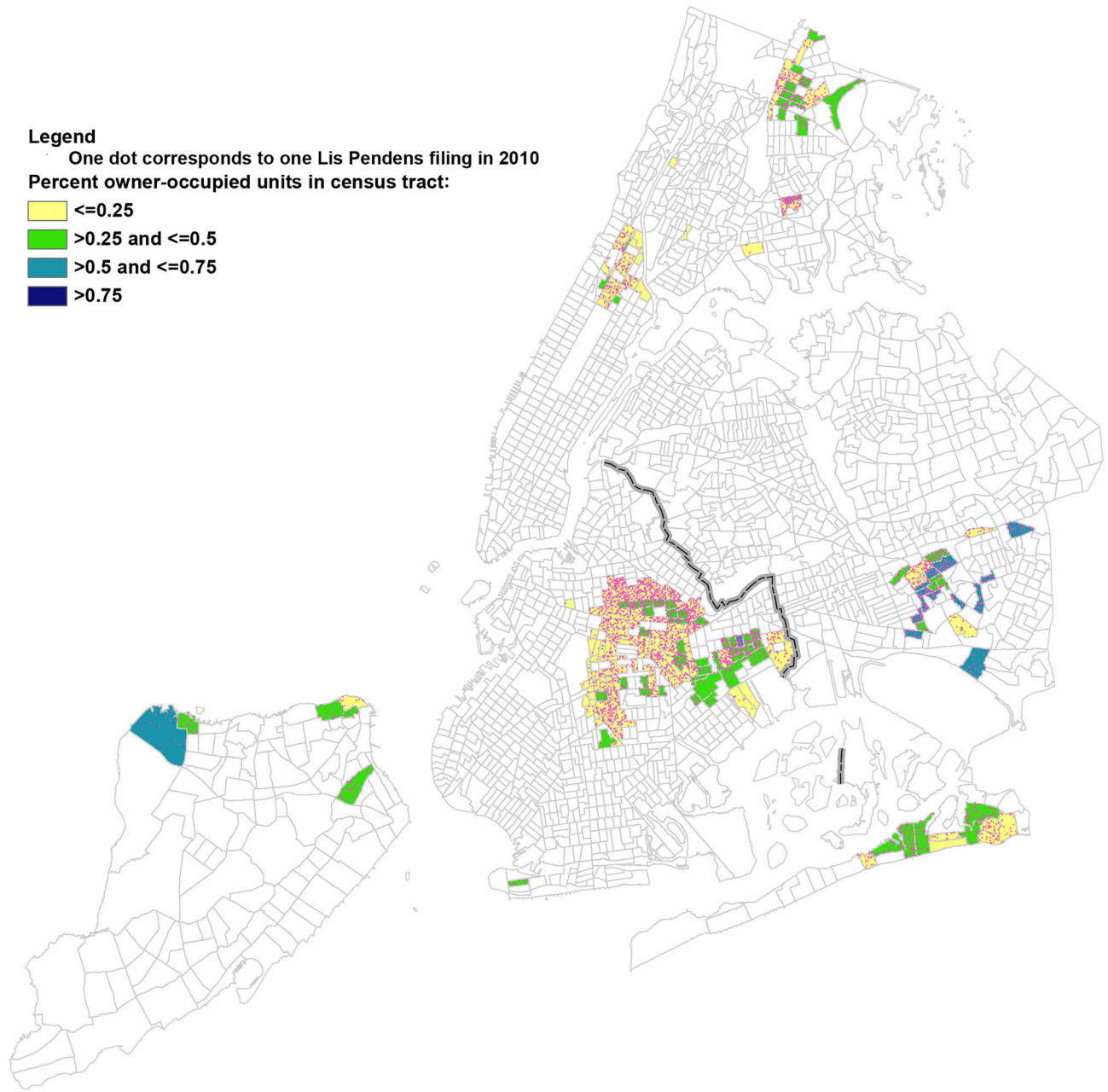
Map A5.3
Hispanic&racial mix/low-middle-income/families: Average number B and C violations per unit by percent of units in buildings with one to four units in census tract, 2010



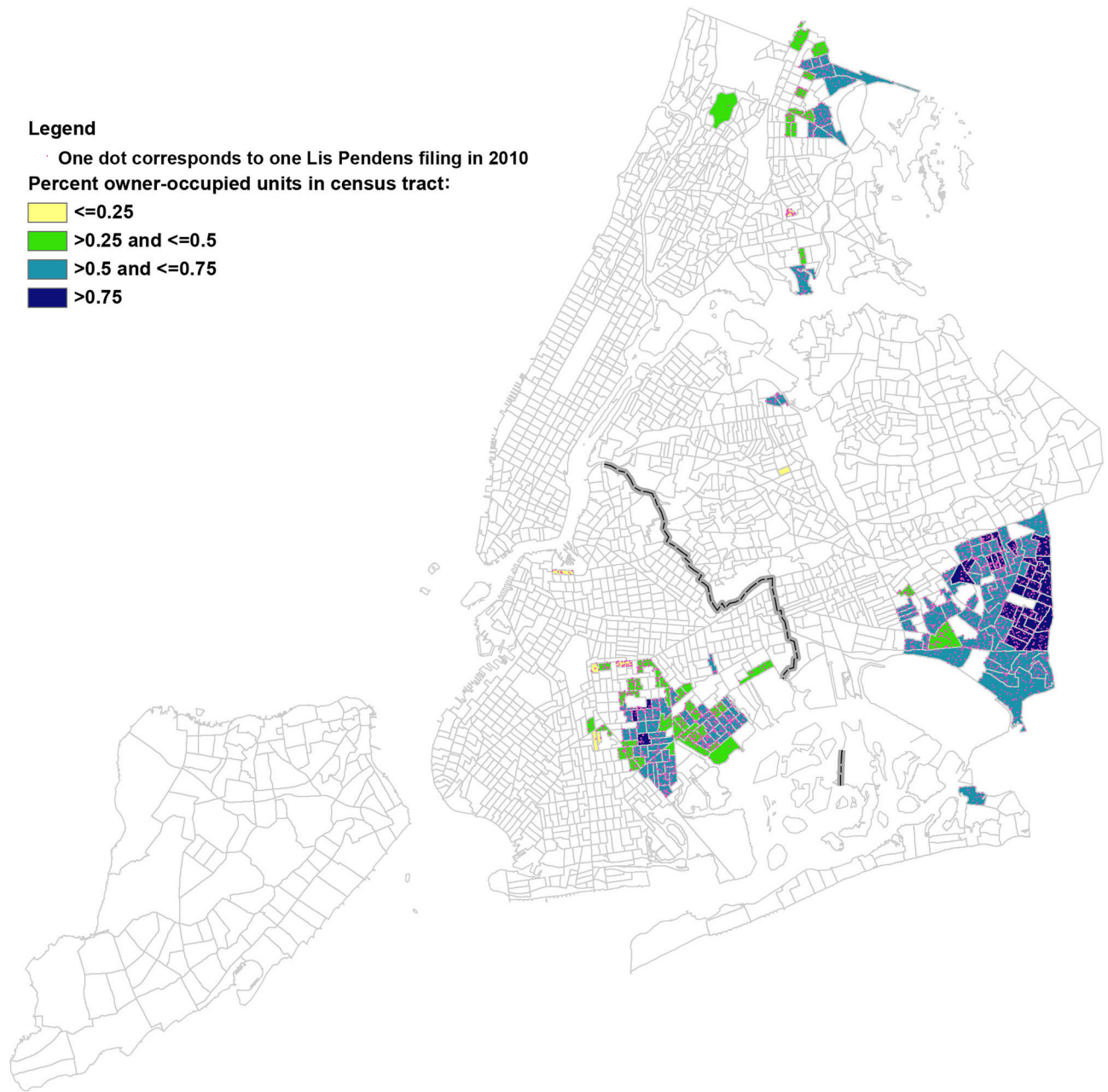
Map A5.4
Black&Hispanic/very-low-income/families and singles: Average number B and C violations per unit by percent of units in buildings with one to four units in census tract, 2010



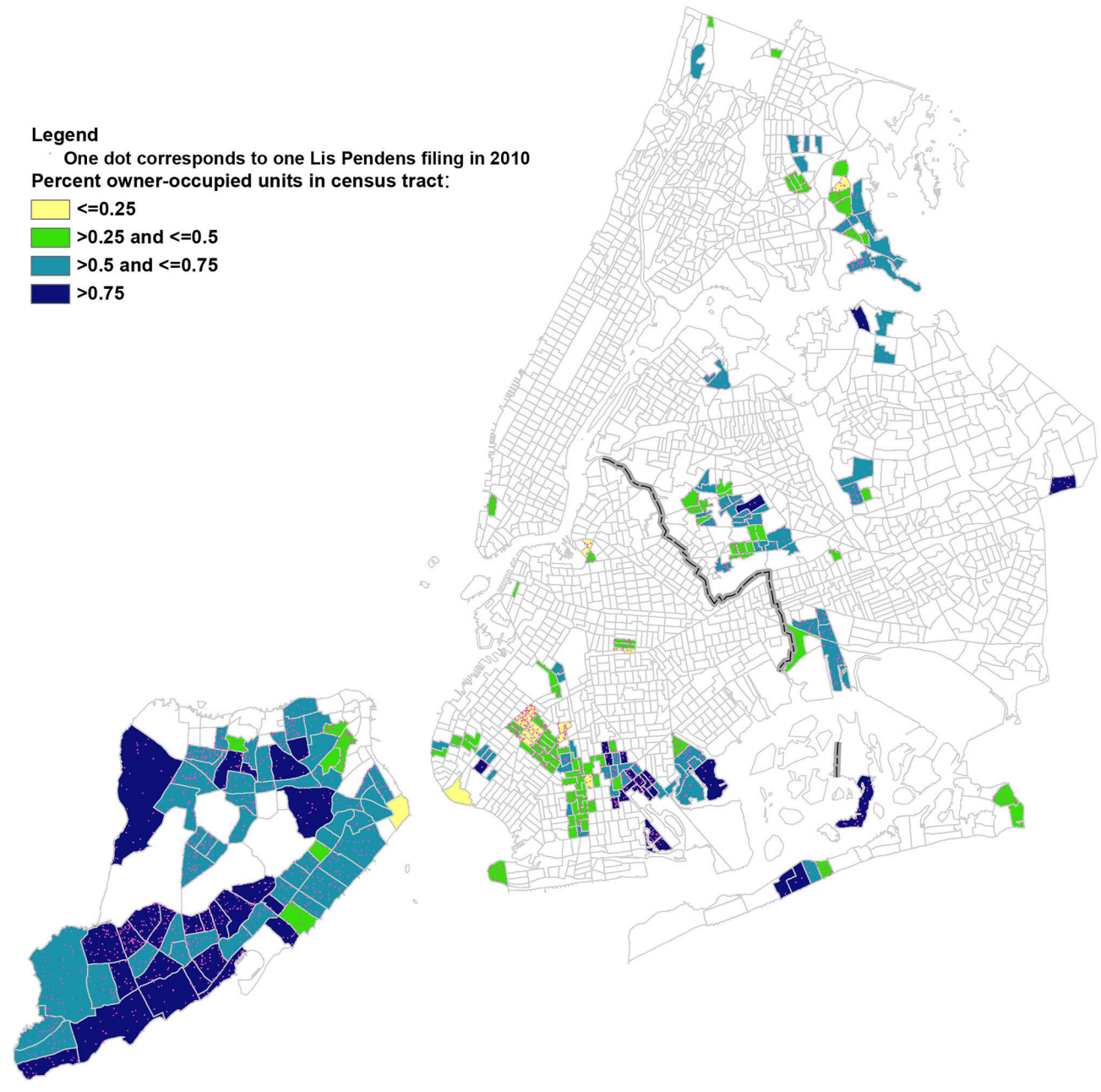
Map A5.5
Black/low-income/families and singles:
Number of Lis Pendens filings by the level of owner-occupancy per census tract, 2010



Map A5.6
Black/upper-middle-income/famillies:
Number of Lis Pendens filings by the level of owner-occupancy per census tract, 2010



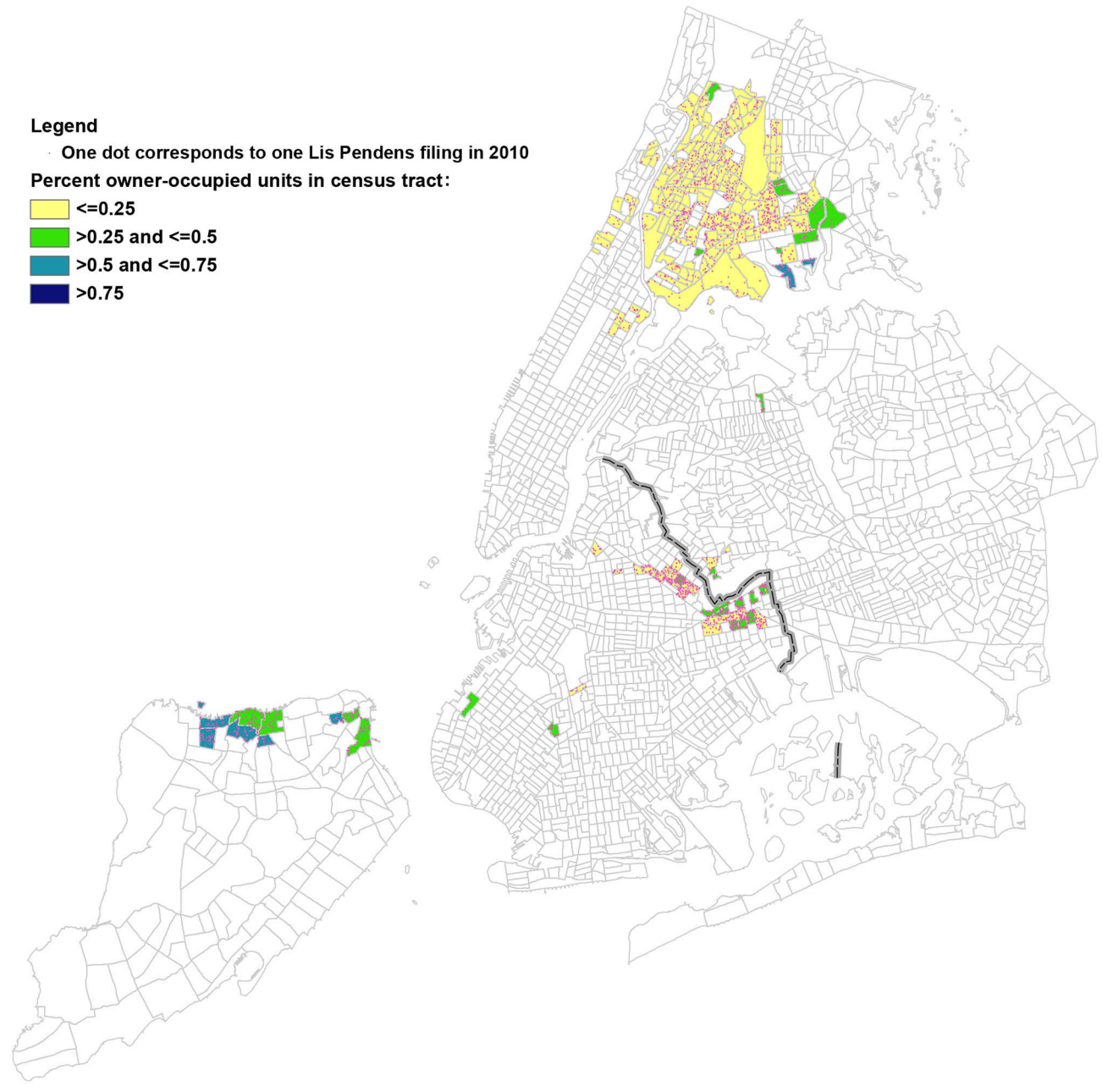
Map A5.7
White/upper-middle-income/families:
Number of Lis Pendens filings by the level of owner-occupancy per census tract, 2010



Map A5.8

Hispanic&black/low-income/families and singles:

Number of Lis Pendens filings by the level of owner-occupancy per census tract, 2010



Map A5.9
Racial mix/middle-income/families:
Number of Lis Pendens filings by the level of owner-occupancy per census tract, 2010

Map A5.10
Hispanic&racial mix/ low-middle- income/families:
Number of Lis Pendens filings by the level of owner-occupancy per census tract, 2010