Methods

Geographic Definitions

This report presents information for the entire City of New York, for each of the five boroughs, and for the neighborhoods within each borough. The city defines neighborhoods by dividing the boroughs into 59 community districts (CDs); the U.S. Census Bureau, however, divides the boroughs into 55 sub-borough areas (SBAs). This report provides data for community districts where available but otherwise employs data at the sub-borough level. The term *neighborhood* is used in this report to refer to both community districts and sub-borough areas even though they are larger than what many consider to be neighborhoods.[1] We have included reference maps for community districts and sub-borough areas following this chapter.

Borough

New York City consists of five boroughs: the Bronx, Brooklyn, Manhattan, Queens, and Staten Island. Each borough is represented by a borough president, an elected official who advises the mayor on issues related to his or her borough and, along with the borough board, makes recommendations concerning land use and the allocation of public services. Each borough is also a county. Counties are legal entities with boundaries defined by state law.

Community District (CD)

Community districts are political units unique to New York City. Each of the 59 community districts has a community board. Half of the community board's members are appointed by the borough president and half are nominated by the City Council members who represent the district. The community boards review applications for zoning changes and other land use proposals and make recommendations for budget priorities.

Each community board is assigned a number within its borough. The borough and this number uniquely identify each of the 59 community districts. Therefore, we designate each community district with a two-letter borough code and a two-digit community board code. For example, BK 02 is the community district represented by Community Board 2 in Brooklyn.

Sub-Borough Area (SBA)

Sub-borough areas are geographic units created by the U.S. Census Bureau for the administration of the New York City Housing and Vacancy Survey and were designed to have similar boundaries to those of community districts. These same areas are also defined by the U.S. Census Bureau as Public Use Microdata Areas (PUMAs), so we are able to use the two terms interchangeably. Sub-borough areas are referred to using a three-digit number, where the first digit signifies the borough (we number boroughs in alphabetical order, with the Bronx being 1 and Staten Island being 5).

There are 59 community districts in New York City but only 55 sub-borough areas. The U.S. Census Bureau combined four pairs of community districts in creating the sub-borough areas to improve sampling and protect the confidentiality of respondents. These pairs are Mott Haven/Melrose (BX 01) and Hunts Point/Longwood (BX 02) in the Bronx (combined into SBA 101), Morrisania/Crotona (BX 03) and Belmont/East Tremont (BX 06) in the Bronx (combined into SBA 102), the Financial District (MN 01) and Greenwich Village/Soho (MN 02) in Manhattan (combined into SBA 301), and Clinton/Chelsea (MN 04) and Midtown (MN 05) in Manhattan (combined into SBA 303).

Because sub-borough areas are constructed from Census tracts, their boundaries do not coincide precisely with community district boundaries, which generally follow major streets. However, they are similar enough that we use them interchangeably throughout this report. The U.S. Census Bureau periodically updates its geographic boundaries for each decennial Census, and so the shapes of sub-borough areas changed slightly between the 2011 and 2012 releases of the American Community Survey. Although we treat these different vintages of sub-borough areas as being consistent over time, we advise some caution when comparing estimates from 2011–2013 to earlier years.

Rankings

This report includes rankings of the five boroughs and all 59 community districts or 55 sub-borough areas for each indicator. The neighborhood ranked first has the highest number or percentage for the measure, even if lower values of measure are considered "better" (such as with crime rates). When possible, we rank all 59 community districts, though we present ranks for the 55 sub-borough areas for those

1 In Part 1: Focus on Density, we also use *neighborhood* to refer to Census tracts but not sub-borough areas.

indicators—including all indicators drawn from U.S. Census Bureau and Home Mortgage Disclosure Act sources—that aggregate easily to the sub-borough area level. In addition, a few indicators are not available for all neighborhoods, so we provide rankings for a subset of neighborhoods. For instance, we report the median sale price per unit at the community district level for only the predominant housing type in that district. Therefore, for each housing type, we present rankings only for the subset of community districts where that housing type predominates.

Visualization in Geographic Information Systems

Maps displaying New York City-specific administrative and political boundaries use base map data provided by the New York City Department of City Planning's Bytes of the Big Apple program. These boundaries include boroughs, community districts, zoning boundaries, public streets, police precincts, school districts, and individual properties. Maps displaying data in geographic areas defined by the U.S. Census Bureau—such as sub-borough areas, tracts, and ZIP-code tabulation areas—use base map data from Census TIGER products.

United States Census Sources

A number of the indicators presented in the *State of New York City's Housing and Neighborhoods* are derived from five data sources collected by the U.S. Census Bureau. These sources are described below along with a discussion of issues of comparability across sources.

Decennial Census (Census)

From 1970 through 2000, the decennial Census consisted of two parts: the "short form" that collected information from every person and about every housing unit in the country, and the "long form" of additional questions asked of a sample of people and households. The short form collected information on age, race, Hispanic or Latino origin, household relationship, sex, tenure, and vacancy status. The long form provided more in-depth information about personal and housing characteristics such as income, employment status, and housing costs. In this edition of the *State of New York City's Housing and Neighborhoods*, we use data from the decennial Census short and long forms to derive demographic, economic, and housing measures for the years 1970, 1980, 1990, and 2000. To create most of these indicators, we use summary Census data reported at the city, borough, and sub-borough area levels.

In 2010, the decennial Census only included the short form since most of the data that had previously been included in the long form were now reported in the American Community Survey (see below). While much of the decennial Census's short-form data is also found in the American Community Survey (such as the count of households), the two sources often report differing numbers for statistical and methodological reasons. Whenever possible, we report data from the decennial Census with one exception: the rental vacancy rate in 2010.

American Community Survey (ACS)

The American Community Survey is an annual survey that collects data similar to those formerly collected by the Census long form described above. As with the long form, the ACS covers only a sample of individuals and housing units. However, the ACS uses a smaller sample: the long form covered one out of every six housing units while the ACS only covers one in 40 housing units each year. The U.S. Census Bureau began developing the ACS in 1996, but reliable annual estimates for geographic areas with a population of 65,000 or more only became available in 2005. In December 2008, the U.S. Census Bureau began releasing three-year rolling estimates for all geographic areas with populations of 20,000 or more. In December 2010, the U.S. Census Bureau began releasing five-year rolling estimates for geographic areas as small as block groups. Multiyear estimates (whether three- or five-year) are referred to by the whole range of years covered (for example, 2011–2013) and should be interpreted as a measure of the conditions during the whole range; due to space constraints, however, multiyear estimates presented in tables in Part 3 are, where noted, labeled using only the final year of the range (that is, an indicator from the 2011–2013 ACS is listed under the heading "2013").

Most of the indicators from the ACS in this edition are derived from pre-compiled summary tables reported by the U.S. Census Bureau for the city as a whole, individual boroughs, and PUMAs, which, as discussed above, are identical to New York City's sub-borough areas (and which are often referred to in this report as *neighborhoods*).

For city- and borough-level indicators, we report figures derived from one-year estimates from the ACS. However, due to the small sample size at the SBA level, one-year estimates can be prone to volatility and sampling error, which can make it difficult to reliably discern whether an indicator's change from one year to the next represents a real change or a statistical anomaly. In order to reduce this uncertainty and draw valid conclusions from differences over both time and space, we report indicators derived from three-year ACS estimates when presenting findings at the SBA level. Please see the Sampling section below for recommendations about making comparisons over time and across geographic levels.

New York City Housing and Vacancy Survey (HVS)

The New York City Housing and Vacancy Survey is conducted every three years by the U.S. Census Bureau under contract with the City of New York. The New York City Department of Housing Preservation and Development sponsors and supervises the HVS. The primary purpose of the HVS is to satisfy the city's statutory requirement to measure the rental vacancy rate in order to determine if rent regulation will continue. In addition to the housing unit information, the survey collects other information about the household and the individual answering the questionnaire.

In this edition of the *State of New York City's Housing and Neighborhoods*, we use HVS data to construct one indicator that is specific to New York City and therefore not captured in the ACS: the number of units that are rent stabilized or rent controlled. At the time of this writing, the public-use 2014 HVS data were not available, so therefore we could not report the percentage of rental units that were rent stabilized or rent controlled. This indicator will be updated when the public-use data become available.

Public Use Microdata Samples (PUMS)

While most decennial Census- and ACS-derived indicators use pre-tabulated summary data that are already reported at a given geography, we calculate some indicators by aggregating person- and household-level data to the desired geographic level. The U.S. Census Bureau makes individual-level data available in Public Use Microdata Samples (PUMS), which are censored extracts from the confidential microdata that the U.S. Census Bureau uses in its own calculations for the decennial Census, the ACS, and the HVS. We use PUMS data to calculate the household income distribution, income diversity ratio, median rent for recent movers, severe rent burden (low-income renters), moderate rent burden (low-income renters), rent-stabilized or rent-controlled units, and several indicators in the State of New Yorkers section.

The only geographic areas that ACS PUMS data identify for a household are its state and PUMA. In order to determine the city and metropolitan area of a household, we use crosswalk files from the Missouri Census Data Center that match states and PUMAs to their respective cities and metropolitan areas. New York City's PUMAs are completely coterminous with its city boundaries.

Comparisons Between U.S. Census Bureau Products

The U.S. Census Bureau makes continual adjustments to the decennial Census and the ACS to improve the coverage of the surveys and accuracy of the results. These adjustments often make cross-year comparisons difficult. Below is a discussion of the key areas where changes in sampling, question construction, or other methods might affect the comparability of indicators that we report in the *State of New York City's Housing and Neighborhoods* over time. More information about comparability between U.S. Census Bureau data sources is available at: http://www.census.gov/acs/www/guidance_for_data_users/comparing_data/.

Sampling

Because both the ACS and HVS are sample surveys, not censuses, all data derived from them are estimates, not exact counts.[2] The ACS sample includes approximately three million housing units nationwide, including about 66,000 in New York City, while the HVS samples 18,000 housing units (all of which are in New York City). The sample for the HVS is designed primarily to achieve acceptable reliability in estimating the rental vacancy rate for the entire city, so estimates for smaller geographic units such as sub-borough areas are subject to potentially large sampling errors.

Readers should treat all estimates with some skepticism and be aware that the true value may differ from the reported

2 Censuses have their own methodological problems, of course, and may systemically under- or over-count certain populations.

estimate. This is especially important when comparing small year-to-year changes in sample-derived estimates or with estimates that are derived from a reduced sample. For example, the median rent does not use the entire sample but just the subset of respondents who are renters. The median rent for recent movers draws on an even smaller sample.

Comparisons Between Different Sampling Intervals

In order to report more reliable estimates of ACS-derived indicators for smaller geographies (such as sub-borough areas) or small populations (such as people aged 16 to 19 for the disconnected youth indicator), we use multiyear ACS estimates. The U.S. Census Bureau recommends using one-year estimates for areas with populations of at least 65,000; all sub-borough areas have populations that are above 100,000, but in some cases certain subsamples (for example, homeowners or low-income renters) are considerably smaller. Three-year estimates reflect data from three full years of surveys, allowing for more robust and accurate estimates at the expense of being slightly less current. Five-year estimates are even more reliable but less current.

Multiyear estimates should be interpreted as describing the conditions that existed during the full sample range, and therefore should not be compared directly to single-year estimates for any of the individual years in the range. For example, the median household income in SBA 201 (Greenpoint/Williamsburg in Brooklyn) was $51,450 (in 2014 dollars) according to the 2011–2013 ACS. In Brooklyn as a whole, the median household income was $48,149 according to the 2013 ACS. Since the estimate for SBA 201 is for the entire period from 2011 to 2013, it is not strictly comparable to the borough-wide number, which comes from 2013 alone; if incomes in Greenpoint/Williamsburg and in Brooklyn as a whole increased substantially between 2011 and 2013, the estimate for SBA 201 would include the lower median income in 2011 as well as the higher median income in 2013, while the borough-wide estimate would only use data from after the increase. (And, if incomes decreased during 2012, vice versa.) It is appropriate, however, to compare multiyear estimates to estimates for a single year that falls outside the multiyear range. For example, one could compare a 2011–2013 estimate to an estimate for 2010, since 2010 is not within the range of 2011–2013.

Multiyear estimates can be compared to other multiyear estimates of the same duration as long as the ranges do not overlap. So, the 2011–2013 estimates for one sub-borough area can be compared to the 2008–2010 estimates for that sub-borough area and to the 2011–2013 estimates for other sub-borough areas. To compare a neighborhood's multiyear ACS estimate to the rest of the city, it is more effective to use its ranking than to compare its multiyear neighborhood estimate to the city's single-year estimate.

Income and Rent

Question construction and data collection for income information differs between the decennial Census and the ACS. The 1990 Census asked for the respondent's 1989 income, and similarly, the 2000 Census asked for the respondent's 1999 income; thus incomes reported in 1990 and 2000 are all for one fixed period of time (calendar years 1989 and 1999 respectively). In contrast, the ACS asks for the respondent's income over the "past 12 months." As the U.S. Census Bureau collects ACS responses on an ongoing basis throughout the year, these estimates are not directly comparable; for example, a 2013 ACS respondent who was interviewed in January of 2013 would report income that was mostly earned in 2012, while a respondent who was interviewed in December of 2013 would report income that was mostly earned in 2013.

The U.S. Census Bureau notes that a comparison study of the 2000 Census and the 2000 ACS found that incomes reported in the Census were about four percent higher than the incomes reported in the ACS. Because of the data collection methods mentioned above, adjacent years of ACS data may have reference months in common; thus comparisons of income data between adjacent ACS years (for example, 2010 and 2011) should not be interpreted as precise comparisons of economic conditions in those years. The indicators that draw on the ACS income data include the income diversity ratio (from PUMS data), median household income, poverty rate, and poverty rate by age. As a result, year-to-year changes in these indicators should be interpreted with caution.

Except for the gross rent distribution charts on the city, borough, and community district data pages in Part 3, and where otherwise noted, we adjust all dollar figures for inflation (to constant 2014 dollars) from the nominal dollar values reported by the U.S. Census Bureau (see below for more on how we adjust for inflation). However, such nominal

dollar values are generated by the U.S. Census using different methods depending on the source of the data. For ACS estimates that are included in the pre-tabulated summary data, the U.S. Census Bureau reports dollar amounts that have been inflated to the annual average for the survey year (for example, calendar year 2013 for the 2013 ACS) based on the monthly Consumer Price Index (CPI). Thus, respondents' incomes (and rents) are adjusted to account for the fact that some are interviewed early in the year and others are interviewed later in the year. Such an adjustment, however, may not fully account for changes in the state of the economy over the course of the year. For example, if unemployment were higher in 2012 than in 2013, respondents interviewed in January of 2013 would be more likely to report zero earnings in the last twelve months than similar respondents interviewed in December of 2013, independent of the price level in the economy as measured by the CPI.

In order to ensure the anonymity of individual responses in the PUMS data, however, the U.S. Census Bureau does *not* adjust each respondent's income (or rent) for inflation based upon the month in which they were interviewed; instead, the identical adjustment is applied for all respondents, whether they were interviewed early or late in the year. If the rate of inflation changed over the course of the year, the dollar figures from PUMS could be biased. Since rent and income are recorded at the same time, the moderate and severe rent burden for low-income renters, which are also calculated from PUMS data, should not exhibit this bias.

Indicator Notes

Rental Housing Units by Regulation and Subsidy Status

Because so much of New York City's rental housing stock is subject to rent regulation or housing subsidy, we document changes and differences in the number of units participating in these programs. Throughout this report, we may refer to four major types of regulation or subsidy: rent stabilized or rent controlled, public housing, other subsidized (income-restricted), and market rate (the absence of rent regulation and income-restricted subsidies). Several different agencies enforce the regulations of different programs: The New York City Department of Housing Preservation and Development (HUD), New York State Homes and Community Renewal, and the U.S. Department of Housing and Urban Development all regulate different housing programs. Thus, no single agency or organization has an authoritative count of the units participating across all statuses, although several data sets track certain subsets of those units, particularly the HVS, the New York City Housing Authority (NYCHA), and the NYU Furman Center's Subsidized Housing Information Project (SHIP). We employ a general method that rectifies unit counts from these sources.

Our general method starts by identifying a total number of rental units, both vacant and occupied. Because the availability of data sources has changed over time, the source of the total number of rental units varies by year. For the total rental stock in 2012, we use the citywide estimate from the ACS.

For the number of public housing units for the boroughs and the city as a whole, we report the number of "current apartments" listed in the Summary of Developments section of the annual Development Data Books released by NYCHA.[3] We derive the total number of public housing units for sub-borough areas using a file of all public housing developments spatially joined to sub-borough areas, which includes slightly more units than NYCHA's Development Data Book for 2012.

The number of income-restricted, subsidized rental units beyond public housing comes from the SHIP Database, and reflects the number of units subsidized by at least one of four types of programs: HUD financing or insurance, HUD Project-Based Rental Assistance, the Low-Income Housing Tax Credit (LIHTC), or the Mitchell-Lama program. These four types of programs are unique in that they are the four largest subsidy programs used in New York City and all require means testing of residents. For 2012, we count the number of units that are "currently affordable." We generally treat our estimate of the number of other subsidized units as a lower-bound estimate of the city's stock of privately owned, publicly subsidized rental units. For a property to be cataloged in the SHIP Database, it must have at least one of the four subsidies listed above. The city and state administer some other programs that are not explicitly captured in the SHIP Database because they do not require

3 Available from http://www.nyc.gov/html/nycha/html/resources/development-databook.shtml.

means testing (e.g. LAMP, 8A, PLP). Those units are generally subject to rent stabilization and so are classified as rent stabilized as described below.

Our estimate of rent-stabilized or rent-controlled units is an adjustment of totals reported in the HVS. First, we sum the number of rent-stabilized and rent-controlled units as indicated in the New Control Status Recode field. A deficiency of the HVS is that it does not track units subsidized with LIHTC. Instead those units are classified by the other subsidies they receive or the other regulations to which they are subject. Some LIHTC units technically are governed by rent stabilization because they also receive a city property tax incentive, though the LIHTC rent regulations are stricter than the rent stabilization regulation. Thus, we assume that these LIHTC units are classified as rent-stabilized in the HVS. Because public-use HVS data for 2014 were not yet available as of this writing, we do not present the percentage of rental units that were rent stabilized or rent controlled in this version of the report. We will update this indicator when those data become available.

The general method above applies to totals presented at the city and borough levels. When we perform this analysis at the neighborhood level, we aggregate to the sub-borough area (SBA, the smallest geographic area available in the HVS). We also employ a few small additional changes to the method. Because the total number of rental units reported in the ACS can be subject to volatility, we generally use the number of residential units reported in the New York City Department of City Planning's PLUTO data for 2012, and multiply that total by one minus the homeownership rate of that SBA as reported in the 2011–2013 ACS. The PLUTO estimates for seven SBAs—104 (Fordham/University Heights), 105 (Kingsbridge Heights/Mosholu), 107 (Soundview/Parkchester), 109 (Morris Park/Bronxdale), 303 (Chelsea/Clinton/Midtown), 306 (Upper East Side), and 414 (Rockaways)—were deemed unreliable, so we replaced them with the total rental units from the ACS. Several properties cataloged in the SHIP do not have spatial coordinates and we cannot assign them to an SBA, so our SBA-level counts of privately owned, income-restricted, subsidized rental units may be slightly understated.

U.S. Department of Housing and Urban Development Income and Rent Limits

The U.S. Department of Housing and Urban Development (HUD) defines income eligibility limits for its Section 8 and HOME programs based on the area median income (AMI) in a metropolitan area. HUD determines three general income limits at 30, 50, and 80 percent of AMI for various household sizes. HUD does not publish income guidelines for households with more than eight members, although its methodology allows for their calculation. To ease computation, we apply the eight-person limits to these larger households. As of fiscal year 2014, HUD assigned category names to ranges of the area median income:

- *Extremely low-income* households fall **at or below 30 percent** of AMI
- *Very low-income* household*s* have incomes **above 30 and at or below 50 percent** of AMI
- *Low-income* households have incomes **above 50 and at or below 80 percent** of AMI (although this report uses "low-income" as shorthand for any household earning at or below the 80 percent limit, which described 63.5% of renter households and 35.2% of owner-occupied households in New York City in 2013)

We employ HUD's general method to calculate 130 and 165 percent of the area median income for various household sizes. While HUD does not set category names for higher income ranges, we define *moderate-income* households as those making **more than 80 and up to 130 percent** of AMI, and *middle-income* households as earning **more than 130 and up to 165 percent** of AMI.[4] Table M.1 displays these income limits in nominal terms by household size for for fiscal year 2013, along with the concomitant maximum affordable rents, which are calculated as 30 percent of the income limits. For more information about HUD's method and their published guidelines, refer to individual years' guidelines at http://www.huduser.org/portal/datasets/il.html.

4 The forthcoming report *Renting in America's Largest Cities: NYU Furman Center/Capital One National Affordable Rental Housing Landscape* uses similarly named income category names but defines them using a different methodology. Therefore, any indicators shown by household income—particularly, rates of rent burden and shares of units affordable at certain income levels—in that report are not comparable to similar indicators in the *State of New York City's Housing and Neighborhoods*.

In order to calculate the share of rental units that are affordable to households of various income levels, we need to take household size into account, since the definition of income limits (and thus maximum affordable housing costs) vary by household size. For a rental unit with *n* bedrooms, we classify it as *affordable at X% of AMI* if its gross rent is less than the maximum affordable rent specified by HUD for a household of size *n*+1; that is, a studio (i.e. a unit with zero bedrooms) is classified according to the maximum rent values for single-person households, a one-bedroom is classified according to the maximum rent values for two-person households, a two-bedroom is classified according to the maximum rent values for three-person households, and a unit with three or more bedrooms is classified according to the maximum rent values for four-person households. This method makes assumptions about the composition of the households that occupy each unit. Therefore, this indicator should be interpreted with some caution.

Index of Housing Price Appreciation

The index of housing price appreciation is a measure of relative change in property values over time. We construct housing price appreciation indices for four different property types (condominiums, one-family buildings, two- to four-family buildings, and multifamily rental buildings with five or more units) for New York City as a whole and for each borough and community district. Estimating price indices separately for different types of properties allows for different market valuations and fluctuations within each property type. However, since many community districts lack a sufficient number of properties of certain types (for example, there are very few single-family buildings in the Financial District) to be able to estimate reliable housing price indices for those property types, we report a price index covering the combination of all the above-listed residential property types in each community district and for the two predominant residential property types in each borough.

The data used to construct the price index come from two sources, both obtained from the New York City Department of Finance. The first data set is an annual sales file, which we receive under an exclusive arrangement. The second data set is the Automated City Register Information System (ACRIS) sales data, which is available online from the Department of Finance. Both data sets contain information on address, price, and date of sale for all transactions involving sales of apartment buildings, condominiums, and single- and multifamily homes in New York City between 1974 and 2014. While the ACRIS data are updated daily, the system contains less information on the circumstances of the sale than the

Table M.1: HUD Section 8 and HOME Program Income Guidelines and Maximum Affordable Rents by Household Size, New York City, Fiscal Year 2013

Income Category	*Extremely Low-Income*	*Very Low-Income*		*Low-Income*		*Moderate-Income*	*Middle-Income*
Percentage of HUD Area Median Income	30%	50%	60%	80%	100%	130%	165%
Number of People in Household				*Income Limits (Nominal 2013$)*			
1	$18,050	$30,100	$36,100	$48,100	$60,150	$78,150	$99,200
2	$20,600	$34,400	$41,250	$55,000	$68,700	$89,350	$113,400
3	$23,200	$38,700	$46,400	$61,850	$77,300	$100,500	$127,550
4	$25,750	$42,950	$51,550	$68,700	$85,900	$111,650	$141,750
5	$27,850	$46,400	$55,650	$74,200	$92,750	$120,600	$153,050
6	$29,900	$49,850	$59,800	$79,700	$99,650	$129,550	$164,400
7	$31,950	$53,300	$63,900	$85,200	$106,500	$138,450	$175,750
8	$34,000	$56,700	$68,050	$90,700	$113,400	$147,400	$187,100
			Maximum Affordable Rent (Nominal 2013$)				
1	$451	$753	$903	$1,203	$1,504	$1,954	$2,480
2	$515	$860	$1,031	$1,375	$1,718	$2,234	$2,835
3	$580	$968	$1,160	$1,546	$1,933	$2,513	$3,189
4	$644	$1,074	$1,289	$1,718	$2,148	$2,791	$3,544
5	$696	$1,160	$1,391	$1,855	$2,319	$3,015	$3,826
6	$748	$1,246	$1,495	$1,993	$2,491	$3,239	$4,110
7	$799	$1,333	$1,598	$2,130	$2,663	$3,461	$4,394
8	$850	$1,418	$1,701	$2,268	$2,835	$3,685	$4,678

Sources: U.S. Department of Housing and Urban Development, NYU Furman Center

annual sales file. The ACRIS data are used only if the sale is not recorded by the time we receive our annual sales file.

The repeat sales price indices are created using statistical regression techniques. Economists use two basic approaches to estimate housing price indices: the *hedonic regression* (which tries to predict prices based on measurements of the quality of the unit as well as conditions of the surrounding neighborhood) and the *repeat sales method*. Both of these approaches estimate temporal price movement controlling for the variation in the types of homes sold from period to period. Each method has its own strengths and weaknesses.

The repeat sales method controls for housing characteristics by using data on properties that have sold more than once. An attractive feature of this method is that, unlike the hedonic approach, it does not require the (necessarily imperfect) measurement of house quality; it only requires that the quality of individual houses in the sample did not vary over time. The most important drawback of the repeat sales method is that it is based only on properties that have sold more than once in the study period. Moreover, properties that have been sold more than once may not be representative of all properties in the market, raising concerns about sample selection bias. However, as the index period lengthens, the proportion of properties that have changed hands multiple times increases. This reduces sample selection bias but exacerbates another problem: Case and Shiller (1989) present evidence that homes with longer intervals between sales have more volatile changes in price, since the longer the time between sales, the more likely it is that some external shock to the property itself or the surrounding buildings has, independent of the price level of housing in the neighborhood, significantly affected prices.

This report overcomes most of the problems associated with the repeat sales method. Specifically, the data set used here is quite large, so we lose little precision by eliminating properties that sold only once: in the 40 years captured by our data, 61 percent of residential lots changed hands at least twice by the end of 2012.

In addition, we use the three-step procedure suggested by Case and Shiller (1989) and modified by Quigley and Van Order (1995) to account for the possibility that price changes are more volatile (that is, have higher variances) for properties that are sold less frequently.

In the first stage, the difference between the log price of the second sale and the log price of the first sale is regressed on a set of dummy variables, one for each year in the sample except for the base year (2000, when our index is set to equal 100). For each pair of sales for a property, the dummy variables have values of +1 for the year of the second sale, -1 for the year of the first sale, and zeros otherwise.

In the second stage, we calculate the squared difference between the sale price predicted by the first stage and the actual sale price and regress it on a constant term, the time interval between sales, and that time interval squared. This allows us to predict the variance of the differences between the prices predicted by the stage-one regression and the actual prices. In other words, we can predict how reliably the change in prices for a single property reflects price changes for properties overall.

In the third stage, the stage-one regression is reestimated by generalized least squares, weighting each observation by the inverse of the square root of the variance predicted by the stage-two regression. Essentially, we give lower weight to price changes for properties that, because there was a large time interval between sales, are more likely to reflect some fundamental change in the quality of the property itself or the immediately surrounding neighborhood and thus less likely to accurately reflect changes in the housing market overall.

Affordability Analysis of Home Purchases

In State of Homeowners and Their Homes in Part 2, we present an analysis of the down payment and monthly payments required to purchase homes at various prices using both a conforming loan and a Federal Housing Administration (FHA) loan. In both cases we use a 30-year fixed-rate loan. We base our monthly payment estimate on the following general annuity formula:

$$\text{payment} = \frac{principal * rate\,(1 + rate)^{term}}{(1 + rate)^{term} - 1}$$

Where *payment* is the monthly mortgage payment, *principal* is the amount of the loan, *rate* is the monthly interest rate (or the annual interest rate divided by 12), and *term* is the number of monthly payments. We calculate monthly mortgage payments for a 30-year loan, so the term equals 360 monthly payments. We implement this formula differently for each loan type.

Under the conforming loan scenario, we assume that the buyer will make a 20 percent down payment and finance 80 percent of the price of the home. The principal will then be 80 percent of the purchase price. The source of our effective interest rate for conforming loans is the Freddie Mac Primary Mortgage Market Survey annual average commitment rate for 30-year fixed-rate mortgages.[5] For our 2014 analysis for conforming loans, we used the annual average rate of 4.17 percent.

Homebuyers using FHA loans may make a down payment as small as 3.5 percent of the purchase price. Thus, to estimate an upper-bound estimate of the monthly mortgage payment under an FHA loan, we assume the purchaser will make a down payment of 3.5 percent of the purchase price and finance the remaining 96.5 percent of the purchase price. The principal will then be 96.5 percent of the home's price. Our effective interest rate for FHA loans is the sum of the FHA interest rate and the FHA mortgage insurance premium. The source of our FHA interest rate for 2014 is HSH Associates. From average monthly rates for 30-year fixed-rate FHA mortgages, we calculated an annual average mortgage rate for 2014 of 4.36 percent. FHA mortgage insurance premiums differ based on the percentage of the purchase price being financed (that is, the loan-to-value ratio) and the size of the loan. The U.S. Department of Housing and Urban Development also periodically sets new insurance premiums. For a loan financing 96.5 percent of a home's purchase price during 2014, the annual mortgage insurance premium was 135 basis points (1.35%) for a loan up to $625,000 and 155 basis points (1.55%) for a loan of more than $625,000.[6] Due to the larger principal and higher effective interest rate, monthly payments for an FHA mortgage with a 3.5 percent down payment will be higher than monthly payments for a conforming mortgage with a 20 percent down payment, all else being equal.

Housing Choice Vouchers

We use estimates of housing choice vouchers reported by the U.S. Department of Housing and Urban Development's Picture of Subsidized Households data set to calculate the percentage of renter households in privately owned units who use such vouchers to subsidize their rent. The Picture of Subsidized Households provides tract-level estimates of the number of units that voucher holders occupy, which we sum for sub-borough areas (SBAs), boroughs, and the city overall. Rather than use all rental units as the denominator for this indicator, we instead choose occupied, privately owned rental units, because tenants cannot use housing choice vouchers for public housing units.

We compute the denominator by subtracting the total number of public housing units from the number of renter-occupied units in the city. The American Community Survey (ACS) reports the total number of renter-occupied housing units, and we obtain the total number of public housing units from a data set covering all public housing developments from the New York City Housing Authority.

Consistent with our use of ACS data (described in more detail above), we use single-year estimates of occupied rental units at the city and borough levels and three-year estimates for SBAs. For SBAs, we match annual voucher totals to the middle year of the three-year ACS estimate of rental units. For example, we match the number of vouchers in 2010 with the estimated number of privately-owned rental units from 2009-2011. Because 2012-2014 ACS estimates are not yet available, we match 2013 voucher estimates with estimated counts of privately owned rental units from 2011-2013 ACS data.

Mortgage Lending Indicators

The Federal Home Mortgage Disclosure Act (HMDA) requires financial institutions with assets totaling at least $42 million as of 2013 to report information on loan applications and originations if they have originated or refinanced any first-lien home purchase loans on one- to four- family properties (including condominium and co-op units) in the previous year. Thus, the HMDA data capture most, but not all, one- to four- family residential mortgage lending activity. We use this dataset to calculate the home purchase loan rate, the refinance loan rate, and a number of derivative indicators.

All figures in our analysis are based on non-business-related loans on owner-occupied, one- to four- family properties (including condominiums). We exclude from our analysis any loans for manufactured or multifamily rental housing (with five or more units), loans on properties that are not owner-occupied, and any loans deemed to be business related (classified as those loans for which a lender reports an applicant's ethnicity, race, and sex as "not applicable").

5 Available at http://www.freddiemac.com/pmms/pmms30.htm.

6 U.S. Department of Housing and Urban Development, "Mortgagee Letter 2013-04," http://portal.hud.gov/hudportal/documents/huddoc?id=13-04ml.pdf.

The loans that we consider constituted about 85 percent of all loan originations in New York City in 2013.

Beginning in 2004, HMDA requires lenders to report when the spread between the annual percentage rate (APR) of a loan and the rate of Treasury securities of comparable maturity is greater than three percentage points for first-lien loans and five percentage points for junior-lien loans. In this report, all loans with an APR above this threshold are referred to as *higher-cost loans*.

Loan applicants were assigned to a racial/ethnic group for purposes of our research based on the first reported race of the primary applicant. However, if the applicant reported his or her ethnicity as "Hispanic" the applicant was classified as Hispanic, regardless of the applicant's reported race. When an applicant provided information to the lender via mail, internet, or telephone and did not provide information on their race, we assigned those loans to the "not reported" racial category. These loans were included in our city and borough level analyses but were omitted when calculating racial shares for our State of New Yorkers table in the New York City section in Part 3.

Notices of Foreclosure (*Lis Pendens*)

We receive data on *lis pendens* (LP) filings from a private vendor, Public Data Corporation. An LP may be filed for a host of reasons unrelated to a mortgage foreclosure, so we use a variety of screening techniques to identify only those LPs related to a mortgage. These techniques include searching for words within either of the party names and dropping any LPs that relate to a tax lien or a mechanic's lien, or that are originated by a government agency. If the same property receives any additional LPs within 90 days of the initial LP, the additional LPs are not included in our rate to avoid counting the same foreclosure twice.

Properties that Entered REO

The data for this indicator come from two sources—LPs from Public Data Corporation and residential sales data from the New York City Department of Finance. Each of these datasets identifies properties using a unique borough, block, and lot number (BBL). Starting with the set of all LPs, we use BBLs to match each LP issued since 1993 with the most recent sale of that property prior to the LP (if the sale happened in 1974 or later). We then match the LP to any sales that occurred within three years from the date of the LP, and assume that the first such sale was undertaken in response to the foreclosure filing. To identify transfers into REO, we search the grantee name field of the first sale after the LP for the word "bank" or the name of any large bank or subsidiary. Finally, we check if the name of the grantee matches the name of the LP servicer. If this is the case we classify the sale as a transfer into REO.

Units Authorized by New Residential Building Permits

This indicator measures the number of residential units in proposed developments approved by the New York City Department of Buildings (DOB). We compile this indicator from job filings and permit approvals from DOB, which are publicly available on DOB's website for full years starting in 2004.[7] In New York City, developers file a job with DOB early in the development process. These records include many details about development projects including its extent (for example, if a project is a new building or alters an existing one) and, for residential projects, the number of housing units it will contain when complete. Because developers can file jobs long before DOB allows construction to begin, and our source of job filings rarely includes the date that a project is fully permitted, we must also collect permit data. Permits, which are associated with jobs, represent partial or entire approvals of development projects. Permits allow us to count only the projects in which DOB has approved structural work, so construction of those buildings is likely to occur. Because permits lack certain information about projects—the number of proposed housing units, in particular—we must merge some detail from jobs to permits.

We consider only permits that meet the following criteria:

- The project will result in a new building (job type is "NB");
- The permit authorizes structural work (permit type is "NB");
- The development includes residential uses;
- The permit does not renew a previously approved permit (filing status is "initial");
- No other permit was filed for the same site during the previous calendar year.

7 Available at http://www.nyc.gov/html/dob/html/codes_and_reference_materials/statistics.shtml.

When multiple permits on the same site (with the same building identification number, or BIN) meet these criteria, we count just the most recently issued permit. Thus, each permit we retain should represent a unique residential building project.

The matching process for permits and jobs is somewhat imperfect. We are able to link most but not all permits to their associated jobs, because our data source does not include all job filings. When we cannot find a permit's matching job, we instead match the permit to the most recently filed job on the same BIN as the permit, as long as the job was filed no more than four years before the permit, and the job includes the number of units proposed for the site. In 2014, we counted 1,644 permits approved for new residential buildings; of that number, we matched 1,396 permits to their associated job and 164 permits to a recently filed job on the same site. We could not match 84 permits to jobs and therefore did not find the number of units proposed for those developments. Accordingly, our measure may somewhat understate the number of units in the construction pipeline.

Housing Unit Weighting Formula

Several indicators included in this report are provided at geographic levels other than the community district level—such as police precincts, school districts, or zip codes. We aggregate data to the community district level, weighting observations by the distribution of housing units.

For instance, when aggregating the student proficiency rates from the 32 school districts to the 59 community districts, we first calculate the rate for each of the 32 school districts. If a community district only contains one school district, then that rate is directly used for the community district. If multiple community districts fall within the same school district, we assign the same proficiency rate to each. If a community district contains portions of more than one school district, we weight the proficiency rate from each school district based on the share of all housing units within the community district that are in that particular school district.

For example, if community district 1 contains three school districts, A, B, and C, and of the 100 housing units in community district 1, 50 are in school district A, 30 are in school district B, and 20 are in school district C, then the proficiency rate from school district A would have weight 50/100, the rate from school district B would have weight 30/100, and rate from school district C would have weight 20/100. The proficiency rate for community district 1 would thus be given by:

$$rate_{CD1} = rate_A * .5 + rate_B * .3 + rate_C * .2$$

Halfway through 2013, a new precinct (the 121st) was created in Staten Island from portions of the 120th and 122nd precincts. Before weighting crime rates from the precinct to the community district level for 2013, we estimated the number of crimes for the 121st district as if it had existed for all of 2013 by multiplying the NYPD data for that precinct (which represented six months of data) by two. We then subtracted that number of crimes from the 120th and 122nd precincts based upon the ratio of crimes attributed to each precinct from the first half of 2013.

Calculating Distances to Parks

For New York City, each borough, and each community district, we report the percentage of housing units within one-quarter mile of a park. To calculate this, we first obtained a shapefile from the New York City Department of Parks and Recreation (updated in September of 2014 and available online through New York City's open data portal) describing the geographies of "functional parkland" overseen by the department.[8] We then combine this with a shapefile we received from the New York State Office of Parks, Recreation, and Historic Preservation containing the geographies of state-owned parks. Any park the city categorizes as "undeveloped," a "lot," a "mall," a "parkway," or a "strip" is excluded from the analysis, as are parks smaller than a quarter of an acre.

Because neither the city's nor the state's datasets contain information on the location of park entrances, we identify *entrance points* along each park's perimeter that constitute our best approximation of actual park entrances and then calculate walking distances from those entrance points. For parks with an area of less than two acres, we assume each vertex of the park polygon approximates a park entrance; since these parks are small, the actual location of entrances does not have a large effect on the *walkshed* (that is, the area reachable by walking a quarter mile or less along pedestrian

8 Avaliable at https://data.cityofnewyork.us/City-Government/Functional-Parkland/e3uq-vht9.

rights-of-way starting at any of a park's entrance points). For parks of two acres or larger, the vertices may be too far apart to realistically approximate actual park entrances; for example, the four corners of Central Park are a very poor estimation of the entrances to the park. Thus, we instead find all the intersections of pedestrian rights-of-way that fall within 150 feet of the perimeter of these larger parks to approximate the entrance points. We obtained the pedestrian rights-of-way data from the New York City Department of City Planning's LION geodatabase of public streets.

After we generate approximate park entrance points, we use Esri ArcMap's Network Analyst tool to generate walksheds estimating the areas along pedestrian rights-of-way that are located within a quarter mile of a park entrance point. In ArcMap we then select all building lots (which we get from the New York City Department of City Planning's MapPLUTO data) that fall within these walksheds and sum the total number of residential units on such lots and divide that number by the total number of residential units in a given geographic area.

Inflation Adjustments

Unless stated otherwise, when reporting dollar-denominated indicators, we adjust amounts to 2014 dollars using the Consumer Price Index for All Urban Consumers (Current Series) without seasonal adjustments from the Bureau of Labor Statistics over all major expenditure classes for the relevant metropolitan area. This allows for more consistent comparisons across years for individual indicators. The inflation-adjusted values include median monthly rent, median household income, and median price per unit. One notable exception is the gross rent distribution figures on the city, borough, and community district data pages in Part 3; in order to report more reliable data, we used the pre-compiled summary tables for 2011–2013 and 2013 gross rent from the American Community Survey, which are listed in nominal 2013 dollars.

Index of Community Districts

The Bronx

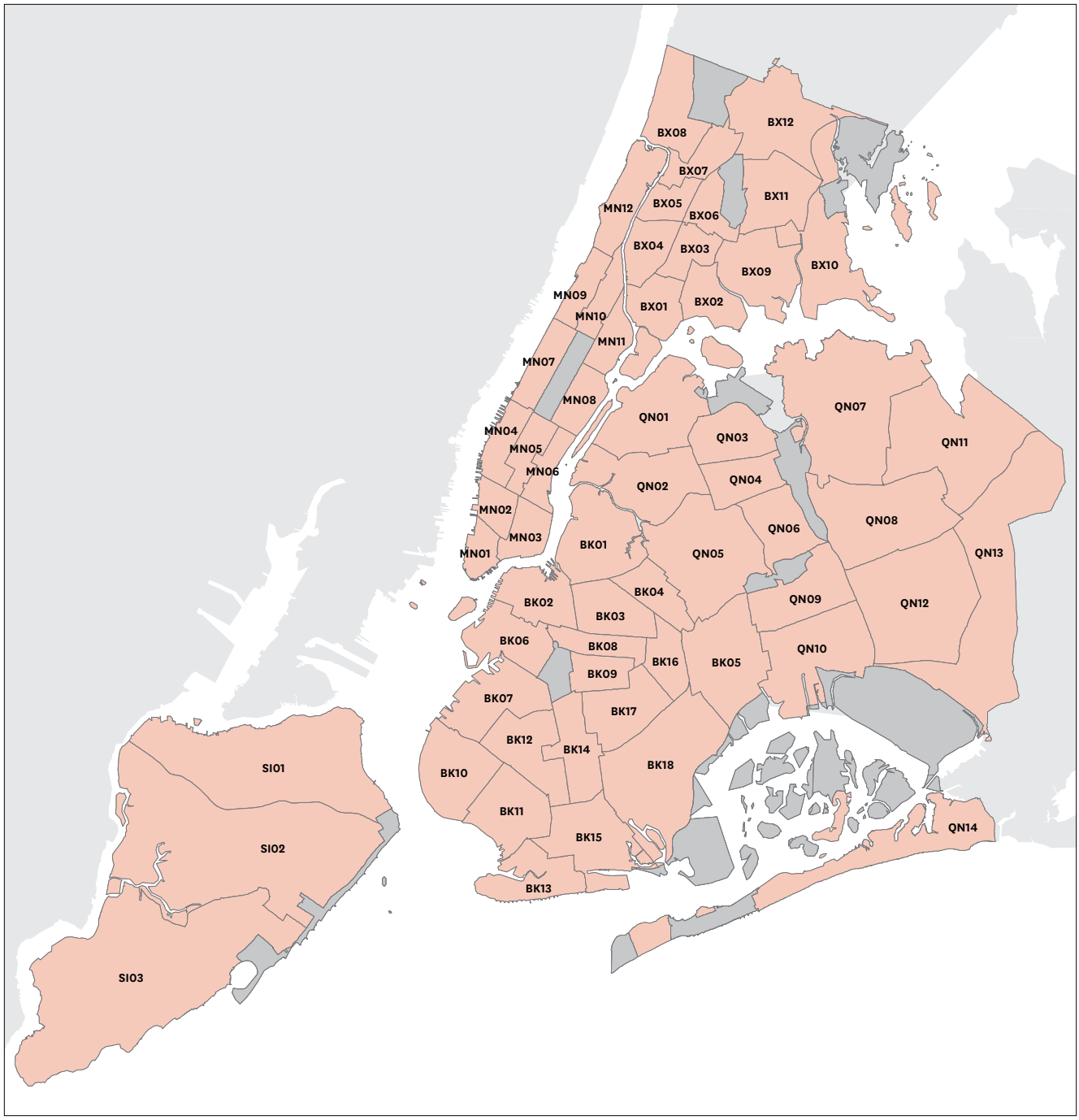
Brooklyn

Manhattan

Queens

Staten Island

New York City Community Districts



New York City Sub-Borough Areas