2021 New York City

Housing and Vacancy Survey

Sample Design, Weighting, and Error Estimation

U.S. Census Bureau, Department of Commerce

New York City Department of Housing Preservation & Development

# Overview

This document describes the sample design, weighting, and error estimation for the 2021 New York City Housing and Vacancy Survey (NYCHVS). The NYCHVS is sponsored by the New York City Department of Housing Preservation and Development (HPD) and conducted by the U.S. Census Bureau.

The City of New York is required by law to conduct a survey periodically to determine if rent regulations should be continued. A primary tool in this decision is the *"vacant available for rent"* rate, which is defined as the ratio of the vacant available for rent units to the total number of renter-occupied and vacant available for rent units for the entire city. The NYCHVS measures rental and homeowner vacancy rates, as well as various household and person characteristics. The design requires the standard error of the rental vacancy rate for the entire city to be no more than one-fourth of one percent if the actual rate was three percent.

# Sample Design

The NYCHVS is a longitudinal survey that is conducted about every three years. The main sample of the survey is selected every decade, and additional new units are selected in each subsequent NYCHVS cycle. For the decade 2020-2030, the NYCHVS was conducted in 2021, with plans for additional survey years of 2023, 2026 and 2029. The main sample was selected using the 2020 July Master Address File (MAF); additional sample units plan to be selected in 2023, 2026, and 2029.

## Eligible Universe

The universe of interest for the NYCHVS consists of the residential housing units (HUs) located within the five boroughs of New York City (Bronx, Brooklyn, Manhattan, Queens, and Staten Island). The principal exclusions are living quarters at locations that are classified as group quarters. These include:

* Correctional facilities,
* Mental health institutions,
* Hospitals,
* Military installations,
* Convents, monasteries, and rectories,
* Shelters, group homes, communes, and halfway houses,
* Home for the aged, disabled, homeless, or needy, and
* Dormitories for students or workers.

## Sampling Frames

The 2021 NYCHVS frame is constructed using several files, including the July 2020 Master Address File (MAF) extract, the American Community Survey (ACS) 2014-2018 5-year file, and several administrative files from HPD. Valid, residential HUs on the July 2020 MAF extract comprise the frame for the 2021 NYCHVS sample selection process, and all other files are used to add variables needed for sorting and strata assignments. MAFIDs (the primary HU identifying variable on the MAF) were appended to the administrative files. The administrative files were merged using MAFID with a block-level version of the ACS file and the July 2020 MAF to create the 2021 NYCVHS sample frame.

The frame was created based on the 2020 July MAF instead of the 2020 Census because the 2020 Census was not available at the time the sample was selected.

## Sample Selection

Housing units on the frame were divided into several strata based on subsidized program participation and Condo or COOP status. A minimum sample size was determined using 2017 NYCHVS data with a target goal of 30,000 sampled units, which was later reduced to 12,000 (due to constraints caused by COVID). The sampling design used two variables, Strata 1 and Strata 2, each of which had several categories within them. The sample sizes for each category are presented in Tables 2.1, 2.2, and 2.3 below, first shown by the marginal counts in each variable in Tables 2.1 and 2.2 and then by the cross-sectional counts in Table 2.3.

Table 2.1 Strata 1: First Housing Type Allocation

|  |  |  |  |
| --- | --- | --- | --- |
| **Program Type** | **Frame Total** | **30,000 Sample** | **12,000 Sample** |
| Affordable Owner | 21,983 | 1,144 | 458 |
| Affordable Renter | 92,622 | 1,205 | 482 |
| Condo | 287,259 | 2,776 | 1,110 |
| COOP | 405,779 | 3,650 | 1,460 |
| Other | 2,616,491 | 17,692 | 7,077 |
| Public Housing | 161,926 | 2,658 | 1,063 |
| Rent Control | 12,294 | 880 | 352 |

Table 2.2 Strata 2: Second Housing Type Allocation

|  |  |  |  |
| --- | --- | --- | --- |
| **Program Type** | **Frame Total** | **30,000 Sample** | **12,000 Sample** |
| Mitchell Lama COOP | 62,669 | 1,309 | 524 |
| Mitchell Lama Renter | 28,256 | 1,085 | 434 |
| Other | 2,432,618 | 19,869 | 7,947 |
| Rent Stabilized | 1,074,811 | 7,742 | 3,097 |

Table 2.3 Allocation of Minimum Sample

| **Strata 1** | **Strata 2** | **Frame Total** | **30,000 Sample** | **12,000 Sample** |
| --- | --- | --- | --- | --- |
| Affordable Owner | Mitchell Lama COOP | 12,551 | 562 | 225 |
| Affordable Owner | Other | 7,962 | 507 | 203 |
| Affordable Owner | Rent Stabilized | 1,470 | 75 | 30 |
| Affordable Renter | Mitchell Lama COOP | 509 | 10 | 4 |
| Affordable Renter | Mitchell Lama Renter | 7,486 | 288 | 115 |
| Affordable Renter | Other | 28,098 | 288 | 115 |
| Affordable Renter | Rent Stabilized | 56,529 | 619 | 248 |
| Condo | Mitchell Lama Renter | 219 | 8 | 3 |
| Condo | Other | 221,661 | 2,135 | 854 |
| Condo | Rent Stabilized | 65,379 | 633 | 253 |
| COOP | Mitchell Lama COOP | 49,609 | 737 | 295 |
| COOP | Mitchell Lama Renter | 1,614 | 62 | 25 |
| COOP | Other | 290,376 | 2,290 | 916 |
| COOP | Rent Stabilized | 64,180 | 561 | 224 |
| Other | Mitchell Lama Renter | 18,937 | 727 | 291 |
| Other | Other | 1,711,215 | 11,176 | 4,470 |
| Other | Rent Stabilized | 886,339 | 5,789 | 2,316 |
| Public Housing | Other | 161,926 | 2,658 | 1,063 |
| Rent Control | Other | 11,380 | 815 | 326 |
| Rent Control | Rent Stabilized | 914 | 65 | 26 |

A systematic random sample of housing units was selected within each cross-sectional program type in Table 2.3, sorting housing units by

* + - Borough
    - Sub-borough
* Tract
* Median Income by Tract based on 2014-2018 ACS
* Block number
* Binary variable indicating building size as “big” or “small”
* Basic street address
* Unit designation

## Interviews and Response Rates

The total number of sample housing units selected for the 2021 NYCHVS was 12,002. Table 2.4 provides the weighted and unweighted response rates by borough, as well as the distribution of completed interviews and noninterviews.

Table 2.4. Interview Activity for the 2021 New York City Housing and Vacancy Survey

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Borough** | **Unweighted Response Rate** | **Weighted Response Rate** | **Selected** | **Completed Interviews** | **Type A Non-interviews** | **Type B & C Non-interviews** |
| Bronx | 73% | ##% | 1,978 | 1,414 | 513 | 51 |
| Brooklyn | 74% | ##% | 3,573 | 2,501 | 884 | 188 |
| Manhattan | 74% | ##% | 3,320 | 2,354 | 835 | 131 |
| Queens | 72% | ##% | 2,607 | 1,773 | 683 | 151 |
| Staten Island | 71% | ##% | 524 | 352 | 142 | 30 |
| Total | 73% | ##% | 12,002 | 8,394 | 3,057 | 551 |

Source: U.S. Census Bureau, 2021 New York City Housing and Vacancy Survey.

Note: The data are subject to error arising from a variety of sources.

In past cycles (prior to 2017), the NYCHVS conducted proxy or last resort interviews, where a proxy interview consisted of interviewing a real estate agent, building manager, or someone else knowledgeable about the HU and a last resort interview involved accepting an abbreviated questionnaire as complete for reluctant respondents. In 2021, NYCHVS did not conduct proxy or last resort interviews, which resulted in higher noninterviews.

In 2021, Type A noninterviews included occupied housing units where the occupants:

* Refused to be interviewed,
* Absent due to covid,
* Unable to locate,
* Were not at home after repeated visits, or
* Were unavailable for some other reason.

Type A noninterviews also include vacant units. In these cases, an interview was not obtained if no informed respondent could be found after repeated visits.

Type B noninterviews were not interviewed because they cannot be inhabited, such as under construction or set to be demolished.

Type C noninterviews were not interviewed because they did not meet the definition of a housing unit, such as the unit no longer existed or was uninhabitable.

The response rate is calculated as the total number of interviews divided by the total eligible sample, which can be written as:

Note that the weighted response rate just applies the base weight of each HU to the counts.

For calculating response rates, enough of the interview had to be completed for it to be considered a valid interview. For vacant interviews, the entire interview must be completed. For non-vacant interviews, all of the following must be answered to be considered as a completed interview:

* Occupancy/vacancy status,
* Tenure,
* Type of vacant unit, and
* Reason Unit is not available for rent or sale

AND two of the following five items answered from the household roster for each person:

* Sex,
* Age,
* Relationship to householder,[[1]](#footnote-2)
* Hispanic origin, and
* Race.

If these criteria were not met, the sampled unit was classified as a Type A noninterview, following the definitions above.

For evaluation of interviews, a second interview was conducted of all vacant units and five percent of all occupied units. The questions asked during the reinterview included information about the previous FRs that collected data, the time, date, and length of that interview, tenure, and vacancy status.

# Weighting

To estimate HU and person characteristics for the 2021 NYCHVS, sample weights are calculated for each sample HU and each sample person. The final weight for each HU is the product of the following weights and adjustments:

## Base Weight

The base weight is the reciprocal of the probability of selecting the unit. This is simply the inverse of the rate at which HUs are selected within the cross-sectional breakdowns in Table 2.3. Note that this sample design resulted in an unequal probability of selection for HUs.

## Nonresponse Adjustment

The base weight of each interviewed HU was adjusted to account for the eligible units that did not respond (Type A noninterviews). This nonresponse adjustment was applied using a noninterview adjustment factor (NAF), which was applied to all interviewed HUs to account for Type A noninterviews. The factor was calculated using the following ratio:

A new method of calculating the NAF was introduced for the 2021 survey cycle. This involved estimating the probability of response from the responding and nonresponding HUs and grouping HUs with similar response propensities together for this adjustment. Note that some nonresponding HUs were excluded from this modeling because they could not be found within the 2020 Census. More information can be found in the XXXX INSERT LINK TO NAF MODELING DOC

## Ratio Adjustment Factors for Housing Unit Weights

New methods for implementing ratio adjustment factors (RAFs) within NYCHVS were also introduced. The HU weights were adjusted using two main sources of known totals:

* The July 2021 MAF
* Totals by program type from HPD administrative files

At each step in the ratio estimation procedure, the factors were equal to the following ratio:

The denominators of the ratios are equal to the sum of the weights of HUs (or persons) with all previous factors applied. Appendix A includes more information on the ratio adjustment factors and examples on how the process works.

The updated process creates three partitions of the sample based on borough membership, subsidized program status, and Condo/COOP, similar but not identical to the sample design. The weighting program then iterates through these three partitions until the RAF factor at each iteration stabilizes and final estimated totals of the groups within these partitions equal their known totals. The partitions are listed below.

* Partition 1: Affordable Owners, Affordable Renters, Remainder – City-wide
* Partition 2: Mitchell Lama Renter, Mitchell Lama COOP, Remainder – by Borough
* Partition 3: Public Housing, Condo, COOP, Remainder – by Borough

Note that Partition 1 was done city-wide while Partitions 2 and 3 were done by borough. “Remainder” means any HU not fitting into the other categories in the partition. Estimates of total HUs made of these particular program types at the specified level of geography match their known totals.

## Ratio Adjustment Factors for Person Weights

# Nonsampling Errors

All numbers from the NYCHVS, except for sample size, are estimates. As in other surveys, two types of general errors occur: sampling errors and nonsampling errors. Sampling errors are discussed in Section 5. The definition of nonsampling errors is—

Nonsampling errors arise mainly due to misleading definitions and concepts, inadequate sampling frames, unsatisfactory questionnaires, defective methods of data collection, tabulation, coding, incomplete coverage of sample units, and so on. These errors are unpredictable and not easily controlled. Unlike sampling error, this error may increase with increases in sample size. If not properly controlled, nonsampling error can be more damaging than sampling error for large-scale household surveys.[[2]](#footnote-3)

The various types of nonsampling errors are discussed in the following sections.

## Coverage Error

Coverage errors arise from the failure to give some units in the target population any chance of selection into the sample (undercoverage) or giving units more than one chance of selection (overcoverage). To calculate the coverage, we used the sample base weight, which is the weight prior to any sample adjustments. The sample adjustments, described in Section 3, help to mitigate the undercoverage identified in this section.

The coverage rate is the ratio of the survey population or HU estimate of a group or an area and the independent estimate (or the known totals). The undercoverage rate is calculated as:

Table 4.1a indicates the estimated undercoverage for both HUs and persons. Based on the July 2021 MAF, we missed about eight percent of the housing units in the five boroughs. Overall, we missed about ## percent of the people in sample households.

Table 4.1a Overall Undercoverage for Housing Units and Persons

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Estimated from 2021 NYCHVS Base Weights** | **Known Total** | **Undercoverage** |
| Housing Units | 3,406,477\* | 3,644,065 | 7.53% |
| Persons | ### | ### | ###% |

Source: U.S. Census Bureau, 2021 New York City Housing and Vacancy Survey.

Note: The data are subject to error arising from a variety of sources.

\*Sum of base weights for interviews and Type A noninterviews.

Table 4.1b provides the various sources of undercoverage for HUs.

Table 4.1b Undercoverage by Source for Housing Units

|  |  |
| --- | --- |
| **Source of Undercoverage** | **Undercoverage** |
| Growth from July 2020 MAF to July 2021 MAF | 1.26% |
| Type B&C Drops | 5.26% |
| Nonrespondents not matched to 2020 Census | 1.01% |
| **Total** | **7.53%** |

Source: U.S. Census Bureau, internal data files.

The within-household undercoverage varied by age, race, sex, and borough. Table 4.1c gives the undercoverage of the various race-sex groups for the city as a whole.

Table 4.1c Undercoverage by Race/Ethnicity-Sex Group

|  |  |
| --- | --- |
| **Race/Ethnicity-Sex Group** | **Undercoverage** |
| White & Other Females | #% |
| White & Other Males | #% |
| African American Females | #% |
| African American Males | #% |
| Asian Females | #% |
| Asian Males | #% |
| Hispanic Females | #% |
| Hispanic Males | #% |

Source: U.S. Census Bureau, 2021 New York City Housing and Vacancy Survey.

Note: The data are subject to error arising from a variety of sources.

We adjusted for this undercoverage through the HU and person ratio adjustment factors. These factors adjust the sample weights to population totals provided by the Census Bureau, so the resulting final weight accounts for the undercoverage identified in Tables 4.1a and 4.1b. For more information on the sample adjustment process, see Sections 3.3 and 3.4. NYCHVS data users do not have to take any additional steps to account for coverage error.

## Nonresponse Error

Some respondents refuse the interview or cannot be located. The Census Bureau mitigated the error due to nonresponse by applying the noninterview adjustment factors into the weighting process, as discussed in Section 3.2. NYCHVS data users do not have to take any additional steps to account for nonresponse error.

## Measurement Error from Missing Responses to Questions

Some respondents participate in an interview but refuse to answer questions or do not know a particular answer. For certain questions, the Census Bureau imputes missing responses. When imputing, the Census Bureau tries to find households or persons with similar characteristics to fill in missing data. For each imputation, records are divided into 'donors' and 'recipients'.

For the demographic items, the Census Bureau first tries to impute based on other household information or household members. Every household must have some demographic information for each person in the household or it would be made a Type A. It is rare that a household is missing all demographic information for one item.

For imputing the housing items (including housing quality questions), units with similar characteristics are grouped. For example, when imputing contract rent, a unit with a similar year moved, year-built range, number of bedrooms, and input control status (stabilized, public housing, unregulated, etc.) is found and unit’s contract rent is used to impute the recipient's contract rent. If no such unit can be found, contract rent is imputed based on the median value for units in 2017 (adjusted for inflation) with the same input control status in the particular borough.  In 2021, contract rent was imputed in 11.6 percent of the renter-occupied units. For some characteristics (like mortgage information), where we didn’t collect similar data in the 2017 NYCHVS, we used data from the 2019 American Housing Survey, for starting values when, in rare cases no donor could be found.

For economic items, such as income and employment status, the best possible match between donors and recipients is achieved through a statistical match with key items. The items used for matching donors and recipients are public assistance/non public assistance, borough, tenure, gender, race, ethnicity, age, relationship, education, worked last week, hours worked, type of work, government/nongovernment, and rent/value. All of these criteria are used to get the best statistical match possible. There are 33 income variables in 2021; in rare cases where a suitable donor was not found, income amount is imputed based on the median value of that income category. All donors and recipients have the same borough, tenure, and either receive public assistance or do not.

Appendix B provides the list of variables being imputed. Variables that can be used to determine imputation rates are in the public use files (PUF) and are defined on the record layout. Variables shown in Table B1 are for occupied units, Table B2 for persons, and Table B3 for vacant units. For example, using these variables from the PUF, users can see that summer gas and electricity costs were imputed for 11.4 percent of occupied units, age was imputed for 6.3 percent of all persons, and stories was imputed for 0.1 percent of vacant units.

The Census Bureau does not know how close the imputed values are to the actual values. For other items, “not reported” is used as an answer category. NYCHVS data users do not have to take any additional steps to account for measurement error from missing responses to questions.

## Quality Validity Error

In order to design a survey question that accurately measures the constructs of interest, the Census Bureau carefully tests each new survey question to ensure it is measuring the construct of interest. While the questionnaire is provided in multiple languages, sometimes the respondent does not speak those languages. In these cases, the interview must be rescheduled so that a field representative (FR) that speaks the same language as the respondent can administer the interview. Although some respondents might misinterpret questions, the Census Bureau does not have any additional information to estimate validity error rates. NYCHVS data users do not have to take any additional steps to account for validity error.

## Processing Error

After the data are collected, errors that can be introduced include data capture errors and data editing and imputation errors. The Census Bureau carefully tests all aspects of the data capture and the editing and imputation procedures. Although mistakes are possible, the Census Bureau believes they are minimal. If a processing error is discovered, the Census Bureau will let NYCHVS data users know and, in some cases, will publish revised estimates. NYCHVS data users do not have to take any additional steps to account for processing error.

## Additional Considerations

The NYCHVS is a longitudinal survey conducted about every three years. Many NYCHVS users compare current year NYCHVS with prior year estimates. Users should be aware that HPD and the Census Bureau often make changes to the text of various questions between surveys and sometimes to the underlying weighting methodology or sample design. NYCHVS data users comparing estimates with prior year surveys should consult the ‘Overview’ document on the NYCHVS website (https://www.census.gov/programs-surveys/nychvs/about/overview.html).

# Sampling Errors and Replicate Weights

Sampling error is a measure of how estimates from a sample vary from the actual value. By the term "actual value," we mean the value we would have gotten had all HUs been interviewed, under the same conditions, rather than only a sample.

Users of NYCHVS PUF should use replicate weights to estimate errors for any estimate. This is different from prior survey cycles, where the Census Bureau provided generalized variance function (GVF) parameters as an alternative method to estimate variance.

Variance estimation for surveys refers to the variation of an estimate due to selecting a sample from the set of all possible samples for a given sample design. To estimate the variance, multiple samples are needed but only one is observed. Replication allows small changes to a single probability sample to create a set of replicate samples, which can then be used to measure the variation of the estimates. Replication is done through subsets selected from the original sample in a process that mimics the original sample design. Each replicate sample, *r*, is then fully weighted, using the same process as the original sample, to ensure itrepresents the population of interest. This process forms the set of final replicate weights { | *r* = 1, … ,*R*}. Considering a particular estimate of interest, each replicate weight, , can be used to create a replicate estimate . The set of replicated estimates {| *r* = 1, … , *R*} represents the variability, or dispersion, of the estimate of interest under multiple samples of the population.

The Hadamard matrix was used to derive replicate factors to apply to individual full sample weights in creating replicate weights. Please note that for 2021 NYCHVS, the weights in Replicate 1 equal full sample weights, the weight used to derive sample estimates.

The 2021 NYCHVS uses a replicate variance estimator derived from a variance equation called the successive differences estimator. This estimator was first introduced by Fay and Train (1995) and then expanded for replication by Ash (2014). Using the replicated estimates, data users can calculate an estimated variance of an estimate of interest using the replication variance estimator:

where is the weighted point estimate of the statistic of interest, such as a total, median, mean, proportion, regression coefficient, or log-odds ratio, using the weight for the full sample and is the replicate estimate for replicate *r* of the same statistic using the replicate weights. is the full sample estimate. The value of 80 in is the number of replicates used (NYCHVS uses 80 replicates).

There are two sets of replicate weights. One set of replicate weights is used for computing standard errors of housing unit characteristics and the second set is used for computing standard errors of person characteristics.

To calculate a standard error, the measure of dispersion when parameter estimates are calculated through repeated sampling from the population, obtain the square root of the variance estimate.

The following example illustrates how a statistic would be estimated, replicated, and combined to form a variance estimate. The goal of this example is to estimate the total number of renter-occupied HUs in Queens for 2021 and its corresponding estimate of variance.

For 2021, there are 893 completed interviews that are renter-occupied HUs in Queens (sample cases in Queens with responses to tenure status question as renters). Table 6.1 displays the first four and last one renter-occupied sample units in Queens. Note that the ordering in Table 6.1 is based on the variable *CONTROL*.

*Table 6.1: Example of Estimating Variances with Replication of Renters in Queens*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample HU** | **Full Sample Weight** | **Replicate Weights** | | | | |
| **Replicate 1** | **Replicate 2** | **Replicate 3** |  | **Replicate**  **80** |
| 1 | 432.920 | 432.920 | 430.180 | 724.691 | … | 128.270 |
| 2 | 1,223.797 | 1,223.797 | 2,071.712 | 351.266 | … | 365.787 |
| 3 | 36.056 | 36.056 | 35.119 | 11.083 | …. | 61.436 |
| 4 | 476.777 | 476.777 | 470.671 | 793.062 | … | 485.903 |
| … | … | … | … | … | … | … |
| 893 | 432.899 | 432.899 | 125.991 | 724.655 | … | 747.576 |

Source: U.S. Census Bureau, 2021 New York City Housing and Vacancy Survey.

Note: The data are subject to error arising from a variety of sources.

In NYCHVS, the full sample weight and the full sample estimate are referred to as replicate weight 0 () and replicate estimate 0 (, respectively.

**Step 1:** Calculate the full sample weighted survey estimate.

The statistic of interest is the total number of renter-occupied housing units in Queens for 2021. Add the full sample weights of the sample cases that meet your criteria of interest. Therefore, the total number of renter-occupied housing units in Queens is calculated as follows:

Full Sample Renter-Occupied HUs in Queens Estimate:

**Step 2:** Calculate the weighted survey estimate for each of the replicate samples.

The replicate survey estimates are as follows:

Rep 1 Rent-Occ Estimate

Rep 2 Rent-Occ Estimate

Rep 3 Rent-Occ Estimate

**. . .**

**. . .**

**. . .**

Rep 80 Rent-Occ Estimate

**Step 3:** Use the replicate estimates in the formula below to calculate the variance estimate for the total renter-occupied HUs in Queens.

The survey estimate for total renter-occupied population in Queens is 467,730 housing units, with an estimated variance of 117,126,870 or a standard error of 10,822.5 housing units.

# References

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Appendix A. Example of Ratio Adjustments

This appendix provides one hypothetical example that demonstrates how the sample weights are ratio-adjusted so that they are consistent with a set of control totals.

For this example, assume weights were calculated for a sample, including all weighting adjustments up to a nonresponse adjustment. With these weights, totals by two categories – simply identified as A or B for Category 1 and C or D for Category 2 – were created. Table A1 summarizes the estimated totals resulting from the hypothetical sample and weights, and Table A2 shows the hypothetical control totals.

*Table A1: Example Estimated Totals Table A2: Example Control Totals*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cat1\Cat2** | **C** | **D** | **Total** |  | **Cat1\Cat2** | **C** | **D** | **Total** |
| **A** | 110 | 91 | 201 |  | **A** | 115 | 105 | 220 |
| **B** | 97 | 107 | 204 |  | **B** | 95 | 105 | 200 |
| **Total** | 207 | 198 | 405 |  | **Total** | 210 | 210 | 420 |

The control totals of Table A2 are used to improve the weights by making the estimates from the weights consistent with the control totals. Table A3 shows the Ratio Adjustment Factor (RAF) that will make the estimated totals consistent with the control totals.

*Table A3: Example Ratio Adjustment Factors*

|  |  |  |
| --- | --- | --- |
| **Cat1\Cat2** | **C** | **D** |
| **A** | 115/110 = 1.0455 | 105/91 = 1.1583 |
| **B** | 95/97 = 0.9794 | 105/107 = 0.9813 |

If the factors from Table A3 are multiplied to the weights of the sample units, then the estimates from the revised weights will be consistent with the totals of Table A2.

For example, the ratio-adjusted weights for the combination of Category 1 = A and Category 2 = C is the product of the original weight and the RAF for the A/C combination:

*Ratio-adjusted weight = original weight *

The ratio-adjusted weights for the other combinations of Categories 1 and 2 are calculated in the same way, using the corresponding RAF for each combination.

Appendix B: List of Variables Imputed for 2017 New York City Housing and Vacancy Survey

| ***Occupied Units*** | |
| --- | --- |
| ***Item Name*** | ***Variable Name*** |
| *Number of stories in building* | *STORIES\_FRONT* |
| *Need stairs from sidewalk to elevator* | *ELEV\_NO\_STEPS* |
| *Need stairs from sidewalk to unit* | *UNIT\_NO\_STEPS* |
| *Broken heat last winter* | *NOHEAT* |
| *Leaks in unit in the last year* | *LEAKS* |
| *Rodents in unit in the last 3 months* | *RODENTS\_UNIT* |
| *Rodents in building in last 3 months* | *RODENTS\_BUILD* |
| *Toilets not working for six or more hours in the last 3 months* | *TOILET\_BROK* |
| *Cracks or holes in walls or ceiling of unit* | *WALLHOLES* |
| *Holes in the floors of unit* | *FLOORHOLES* |
| *Broken plaster or peeling paint on ceilings or walls of unit* | *PEELPAINT* |
| *Broken plaster or peeling paint is larger than an 8.5x11 piece of paper* | *PEELPAINT\_LARGE* |
| *Number of times no heat in winter for six hours or more* | *NOHEAT\_NUM* |
| *Used additional heating sources in winter* | *ADDHEAT* |
| *Number of bedrooms* | *BEDROOMS* |
| *Number of rooms* | *ROOMS* |
| *Number of full bathrooms in unit* | *FULLBATH\_NUM* |
| *Number of half bathrooms in unit* | *HALFBATH\_NUM* |
| *Amount paid for rent, including fees* | *RENT\_AMOUNT* |
| *Was amount reported in RENT\_AMOUNT paid to landlord* | *RENTPAID* |
| *Amount paid was different than the amount owed last month* | *RENTPAID\_AMOUNT* |
| *rent paid by outside sources* | *RENTOUTSIDE* |
| *Amount of rent paid by outside sources* | *RENTOUTSIDE\_AMOUNT* |
| *Rent paid by rental assistance programs - Section 8/Housing Choice Voucher* | *RENTASSIST\_VOUCHER* |
| *Rent paid by rental assistance programs - Shelter Allowance/City FHEPS* | *RENTASSIST\_SA* |
| *Rent paid by rental assistance programs - SCRIE/DRIE* | *RENTASSIST\_RIE* |
| *Rent paid by rental assistance programs - Other assistance that pays part of your rent* | *RENTASSIST\_OTHER* |
| *Rent paid by rental assistance programs - None* | *RENTASSIST\_NONE* |
| *Amount paid by rental assist programs* | *RENTASSIST\_AMOUNT* |
| *Year apartment/house was purchased or inherited* | *PURCHASEYEAR* |
| *Purchase price of apartment/house* | *PURCHASEPRICE* |
| *Housing Debt - First Mortgage* | *HDEBT\_FIRSTMORT* |
| *Housing Debt - Second Mortgage* | *HDEBT\_SECONDMORT* |
| *Housing Debt - Heloc Mortgage* | *HDEBT\_HELOC* |
| *Housing Debt - Home equity Mortgage* | *HDEBT\_HOMEEQUITY* |
| *Housing Debt - Reverse Mortgage* | *HDEBT\_REVMORT* |
| *Housing Debt - Other Mortgage* | *HDEBT\_OTHER* |
| *Housing Debt - No Current Mortgage* | *HDEBT\_NONE* |
| *Amount of most recent payment for first mortgage* | *PAY\_FIRSTMORT* |
| *Frequency of loan payments on first mortgage* | *FREQPAY\_FIRSTMORT* |
| *Frequency of loan payments - specify* | *FREQPAYOTH\_FIRSTMORT* |
| *Outstanding principal balance* | *TOTAL\_FIRSTMORT* |
| *Current interest rate on loan - whole number* | *INT1\_FIRSTMORT* |
| *Current interest rate on loan - fraction* | *INT2\_FIRSTMORT* |
| *Fixed interest rate on loan* | *FIXED\_FIRSTMORT* |
| *Utilities paid – Electricity* | *UTIL\_ELECTRIC* |
| *Utilities paid - Cooking Gas* | *UTIL\_GAS* |
| *Utilities paid – Heat* | *UTIL\_HEAT* |
| *Utilities paid - Water/Sewer* | *UTIL\_WATER* |
| *Utilities paid - None of these* | *UTIL\_NONE* |
| *Utilities paid - All utilities are included in the rent or condo/co-op fees* | *UTIL\_INCLUDED* |
| *Gas and Electric costs – Summer* | *UTILCOSTS\_SUMMER* |
| *Gas and Electric costs – Winter* | *UTILCOSTS\_WINTER* |
| *Total cost of heat* | *UTILCOSTS\_HEAT* |
| *Total cost of water and sewer* | *UTILCOSTS\_WATER* |

Source: U.S. Census Bureau, 2021 New York City Housing and Vacancy Survey.

*Table B2: List of Variables Imputed for Persons*

| **Persons** | |
| --- | --- |
| **Item Name** | **Variable Name** |
| Gender of person | GENDER\_P |
| Race of person – White | RACE\_W\_P |
| Race of person - Black or African American | RACE\_B\_P |
| Race of person - American Indian or Alaska Native | RACE\_AIAN\_P |
| Race of person - Asian or Asian American | RACE\_A\_P |
| Race of person - Native Hawaiian or Other Pacific Islander | RACE\_NHOP\_P |
| Race of person – Other | RACE\_OTH\_P |
| Which Asian group – Chinese | ASIANORIG\_CH\_P |
| Which Asian group - Asian Indian | ASIANORIG\_AI\_P |
| Which Asian group – Filipino | ASIANORIG\_FIL\_P |
| Which Asian group – Korean | ASIANORIG\_KOR\_P |
| Which Asian group – Japanese | ASIANORIG\_JAPA\_P |
| Which Asian group – Vietnamese | ASIANORIG\_VIET\_P |
| Which Asian group - Something else | ASIANORIG\_ELSE\_P |
| Hispanic origin of person | HISP\_P |
| Identify with an indigenous people or tribal group | HISPINDIG\_P |
| Hispanic, Latino, or Spanish heritage - Puerto Rican | HISPORIG\_PR\_P |
| Hispanic, Latino, or Spanish heritage - Dominican | HISPORIG\_DR\_P |
| Hispanic, Latino, or Spanish heritage - Cuban | HISPORIG\_CUB\_P |
| Hispanic, Latino, or Spanish heritage - South/Central American | HISPORIG\_SCA\_P |
| Hispanic, Latino, or Spanish heritage - Mexican-American, Mexican, Chicano | HISPORIG\_MEX\_P |
| Hispanic, Latino, or Spanish heritage - Something else | HISPORIG\_ELSE\_P |
| Age of person | AGE |
| Educational level of person | EDUC\_P |
| Specify grade currently attending | EDUCSP\_P |
| Asks household members if they were enrolled in school last week. | SCHLNOW\_P |
| Type of school/program person is attending | SCHLNOW\_TYPE\_P |
| Specify grade currently attending | SCHLNOW\_TYPE\_SP |
| Year when person moved into household | MOVEIN\_P |
| Amount of rent paid by each person | RENTPAID\_P |
| Did person work for pay | WORK\_P |
| How many part-time and full-time jobs | WORKJOBS\_P |
| When did you last work | WORKLAST\_P |
| work every week of the last year | WORK52\_P |
| How many weeks did person work | WORKWEEKS\_P |
| How many hours did person unusually work a week | WORKHOURS\_P |
| Type of Government Work | WORKGOV\_P |
| Does person work daytime schedule | WORKSCHED\_P |
| Is person an owner or partner in business | BUSINESS\_P |
| Is business incorporated | BUSINESSINC\_P |
| Is Person employee of that business | BUSINESSEMP\_P |
| Type of employment - For-profit company or organization | WORKTYPE\_PROFIT\_P |
| Type of employment - Non-profit organization (including tax-exempt and charitable organizations) | WORKTYPE\_NONPROFIT\_P |
| Type of employment – Government | WORKTYPE\_GOV\_P |
| Type of employment - Self-employed or contract work | WORKTYPE\_SELF\_P |
| Type of primary employment - For-profit company or organization | WORKTYPEPRIM\_PROFIT\_P |
| Type of primary employment - Non-profit organization (including tax-exempt and charitable organizations) | WORKTYPEPRIM\_NONPROFIT\_P |
| Type of primary employment - Government | WORKTYPEPRIM\_GOV\_P |
| Type of primary employment - Self-employed or contract work | WORKTYPEPRIM\_SELF\_P |
| Most recent type of employment - For-profit company or organization | WORKTYPELAST\_PROFIT\_P |
| Most recent type of employment - Non-profit organization (including tax-exempt and charitable organizations) | WORKTYPELAST\_NONPROFIT\_P |
| Most recent type of employment - Government | WORKTYPELAST\_GOV\_P |
| Most recent type of employment - Self-employed or contract work | WORKTYPELAST\_SELF\_P |
| Did person receive income from: income from a job did person have | INC\_JOB\_P |
| Did person receive income from: salary did person have | INC\_SALARY\_P |
| Did person receive income from: wages did person have | INC\_WAGES\_P |
| Did person receive income from: tips did person have | INC\_TIPS\_P |
| Did person receive income from: income from self-employment did person have | INC\_SELF\_P |
| Did person receive income from: income from business did person have | INC\_BUSINESS\_P |
| Did person receive income from: additional income did person have | INC\_ADD\_P |
| Did person receive income from: income from bonuses or commissions did person have | INC\_BONUS\_P |
| Did person receive income from: income did person have from stipends | INC\_STIPEND\_P |
| Did person receive income from: income from renting some or all of your home did person have | INC\_RENTINC\_P |
| Did person receive income from: income from renting a property that isn't your home did person have | INC\_RENTPERS\_P |
| Did person receive income from: income from retirement did person have | INC\_RETIRE\_P |
| Did person receive income from: social security did person have | INC\_SS\_P |
| Did person receive income from: pension did person have | INC\_PENSION\_P |
| Did person receive income from: railroad retirement did person have | INC\_RAIL\_P |
| Did person receive income from: other retirement income did person have | INC\_OTHRETIRE\_P |
| Did person receive income from: disability and leave did person have | INC\_DIS\_P |
| Did person receive income from: workers compensation did person have | INC\_WORKCOMP\_P |
| Did person receive income from: paid family leave did person have | INC\_PFL\_P |
| Did person receive income from: paid family medical leave did person have | INC\_FMLA\_P |
| Did person receive income from: cash payment from supplemental insurance did person have | INC\_SUPPINS\_P |
| Did person receive income from: interest and payments did person have | INC\_INVEST\_P |
| Did person receive income from: interest of $500 or more did person have | INC\_INTEREST\_P |
| Did person receive income from: dividends did person have | INC\_DIVIDEND\_P |
| Did person receive income from: annuities did person have | INC\_ANNUITY\_P |
| Did person receive income from: estates and trusts did person have | INC\_ESTATE\_P |
| Did person receive income from: royalties did person have | INC\_ROYALTY\_P |
| Did person receive income from: other income did person have | INC\_OTHERINC\_P |
| Did person receive income from: unemployment did person have | INC\_UNEMPL\_P |
| Did person receive income from: child support and alimony did person have | INC\_CHILDSUPP\_P |
| Did person receive income from: survivor benefits did person have | INC\_SURVIVOR\_P |
| Did person receive income from: veterans payments did person have | INC\_VET\_P |
| Did person receive income from: other regular source of income did person have | INC\_OTHERSOURCE\_P |
| Did person receive income from: none | INC\_NO\_P |
| How much income from a job did person have | INCAMT\_JOB\_P |
| How much salary did person have | INCAMT\_SALARY\_P |
| How much wages did person have | INCAMT\_WAGES\_P |
| How much tips did person have | INCAMT\_TIPS\_P |
| How much income from self-employment did person have | INCAMT\_SELF\_P |
| How much income from business did person have | INCAMT\_BUSINESS\_P |
| How much additional income did person have | INCAMT\_ADD\_P |
| How much income from bonuses or commissions did person have | INCAMT\_BONUS\_P |
| How much income did person have from stipends | INCAMT\_STIPEND\_P |
| How much income from renting some or all of your home did person have | INCAMT\_RENTINC\_P |
| How much income from renting a property that isn't your home did person have | INCAMT\_RENTPERS\_P |
| How much income from retirement did person have | INCAMT\_RETIRE\_P |
| How much social security did person have | INCAMT\_SS\_P |
| How much pension did person have | INCAMT\_PENSION\_P |
| How much railroad retirement did person have | INCAMT\_RAIL\_P |
| How much other retirement income did person have | INCAMT\_OTHRETIRE\_P |
| How much disability and leave did person have | INCAMT\_DIS\_P |
| How much workers compensation did person have | INCAMT\_WORKCOMP\_P |
| How much paid family leave did person have | INCAMT\_PFL\_P |
| How much paid family medical leave did person have | INCAMT\_FMLA\_P |
| How much cash payment from supplemental insurance did person have | INCAMT\_SUPPINS\_P |
| How much interest and payments did person have | INCAMT\_INVEST\_P |
| How much interest of $500 or more did person have | INCAMT\_INTEREST\_P |
| How much dividends did person have | INCAMT\_DIVIDEND\_P |
| How much annuities did person have | INCAMT\_ANNUITY\_P |
| How much estates and trusts did person have | INCAMT\_ESTATE\_P |
| How much royalties did person have | INCAMT\_ROYALTY\_P |
| How much other income did person have | INCAMT\_OTHERINC\_P |
| How much unemployment did person have | INCAMT\_UNEMPL\_P |
| How much child support and alimony did person have | INCAMT\_CHILDSUPP\_P |
| How much survivor benefits did person have | INCAMT\_SURVIVOR\_P |
| How much veteran’s payments did person have | INCAMT\_VET\_P |
| How much other regular source of income did person have | INCAMT\_OTHERSOURCE\_P |

Source: U.S. Census Bureau, 2021 New York City Housing and Vacancy Survey.

*Table B3: List of Variables Imputed for Vacant Units*

| **Vacant Units** | |
| --- | --- |
| **Item Name** | **Variable Name** |
| Number of stories in building | STORIES\_FRONT |
| Need stairs from sidewalk to elevator | ELEV\_NO\_STEPS |
| Need stairs from sidewalk to unit | UNIT\_NO\_STEPS |
| Number of Bedrooms | V\_BEDROOMS |
| Number of Rooms | V\_ROOMS |
| Number of full bathrooms in unit | V\_FULLBATH\_NUM |
| Number of half bathrooms in unit | V\_HALFBATH\_NUM |
| Share bathroom with other apartments | V\_SHAREDBATH |
| Does unit have complete bath facilities | V\_COMPLETEBATH |
| Does unit have fridge | V\_APP\_FRIDGE |
| Does unit have stove | V\_APP\_STOVE |
| Does unit have dishwasher | V\_APP\_DISHWASH |
| Does unit have a dryer | V\_APP\_DRYER |
| Sink in unit | V\_SINK |
| Is fridge replaced in unit | V\_NEW\_FRIDGE |
| Is stove replaced in unit | V\_NEW\_STOVE |
| Is dishwasher replaced in unit | V\_NEW\_DISHWASH |
| Is washing machine replaced in unit | V\_NEW\_WASHMACH |
| Is dryer replaced in unit | V\_NEW\_DRYER |
| Are cabinets replaced in unit | V\_NEW\_CABINETS |
| Is counter replaced in unit | V\_NEW\_COUNTER |
| Does unit share a kitchen | V\_SHAREDKITCH |
| Asking price of unit | V\_ASKINGPRICE |
| Monthly asking rent for unit | V\_ASKINGRENT |

Source: U.S. Census Bureau 2021 New York City Housing and Vacancy Survey.

1. In very rare situations, having only relationship to householder was considered sufficient if the persons could be verified as real people through other methods. [↑](#footnote-ref-2)
2. https://unstats.un.org/unsd/demographic/meetings/egm/Sampling\_1203/docs/no\_7.pdf [↑](#footnote-ref-3)