



# **THE UNIFORM APPRAISAL DATASET AGGREGATE STATISTICS DATA FILE OVERVIEW**

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## 1. Overview

The Uniform Appraisal Dataset (UAD) Aggregate Statistics Data File includes summary statistics derived from aggregating UAD appraisal records. This document's purpose is to provide background information on how the Federal Housing Finance Agency (FHFA) constructed the UAD Aggregate Statistics Data File. It includes information about the universe of UAD appraisal records, the subset of UAD appraisal records that were included when computing aggregate statistics, geographic areas, disclosure avoidance, definitions of concepts, and information quality.

## 2. About the UAD

The UAD is a standardized industry dataset for appraisal information that Fannie Mae and Freddie Mac (the Enterprises) receive electronically through the Uniform Collateral Data Portal® (UCDP®). The Enterprises, at the direction of FHFA, developed the first UAD in 2010 using the Mortgage Industry Standards Maintenance Organization (MISMO®) Reference Model 2.6. MISMO models provides consistent data standards for the loans the Enterprises purchase.<sup>1</sup>

A UAD appraisal record includes information collected by appraisers using the Uniform Residential Appraisal Report (URAR). The current version of the URAR for single-family homes is Fannie Mae Form 1004 and Freddie Mac Form 70.<sup>2,3</sup> Other federal agencies also use the URAR.

The UAD appraisal records that the Enterprises collect do not reflect all their loans. Both Enterprises waive traditional appraisals in certain instances where they deem automated appraisal methods as adequate. Thus, the UAD appraisal records include only loans requiring traditional appraisals.

The UAD appraisal records that the Enterprises collect may include some appraisals related to other lending sources, including Federal Housing Administration and portfolio loans. One reason for including non-Enterprise loans is because borrowers can file applications with multiple lenders and for multiple products, and the ultimate originator may not be known when the appraisal is conducted. In addition, originators of jumbo loans or other non-conforming loans may require appraisals to be submitted to the UCDP to take advantage of the Enterprises' automated collateral evaluation tools. Finally, UAD appraisal records include appraisals not connected to any loan, such as appraisals associated with rejected loan applications.

FHFA receives UAD appraisal records from the Enterprises. The Agency currently possesses records from 2013 through the most recent quarter. This collection includes more than 80 million records about the "subject" property and more than 360 million records about "comparable" properties. However, it is important to note that not all these records reflect a property's final appraisal(s). The UCDP is a transactional business system. As such, it contains UAD appraisal records that may be incomplete or out of date.

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<sup>1</sup> This information is sourced from Fannie Mae's website describing the UAD:

<https://singlefamily.fanniemae.com/delivering/uniform-mortgage-data-program/uniform-appraisal-dataset>

<sup>2</sup> Single family includes detached, attached, or semi-detached structures and associated lots.

<sup>3</sup> There are similar forms for single-unit condominiums, manufactured homes, and small multifamily residential income (rental) properties. However, only single family and condo currently utilize UAD standardization and mapping.

### 3. Universe of UAD appraisal records in the UAD Aggregate Statistics Data File

In creating the UAD Aggregate Statistics Data File, FHFA included *unique* appraisals for loan applications, including loans the Enterprises did not purchase. In most instances, a loan has only one appraisal. In other instances, a loan has a second appraisal. However, the UCDP is a transactional business system containing far more appraisal records than “final” appraisals. For the purposes of building the UAD Aggregate Statistics Data File, it was important to keep a unique appraisal for each property by carefully removing incomplete or out-of-date appraisals.

FHFA staff, in consultation with UAD experts at Fannie Mae, developed a protocol to identify the “final” appraisal record(s) for each property. The protocol reduced the universe of UAD appraisal records to 49.4 million records. As such, the aggregate statistics presented in the UAD Aggregate Statistics Data File are based on 49.4 million appraisal records. This protocol is described in detail in Appendix 1.

Users should note that UAD Aggregate Statistics Data File statistics only represent:

- Single-family properties appraised using Fannie Mae Form 1004/Freddie Mac Form 70. Condominiums, manufactured homes, small multifamily rental properties, and other appraisals are excluded.
- Properties appraised for the purposes of a sale or refinance. Other types of appraisals, such as construction loan appraisals, are excluded.
- Properties with a street address of sufficient quality to geocode using FHFA’s geocoding system.
- Properties with an appraised value greater than \$0.00.
- Properties in the 50 U.S. states, the District of Columbia, and Puerto Rico. The Virgin Islands and Guam are excluded.

Users should also note that due to the protocols for removing incomplete or out-of-date appraisals, some previously released aggregate statistics may be slightly revised. For instance, an appraisal record for an appraisal conducted in December of 2022 is used to calculate aggregate statistics for 2022. However, if the appraisal record for that property and loan was deemed out-of-date and replaced with a new record in January 2023, it would no longer be used to calculate aggregate statistics for 2022, and instead, would be used to calculate statistics for 2023. In this example, the 2022 aggregate statistics would be revised.

### 4. Geography in the UAD Aggregate Statistics Data File

The UAD Aggregate Statistics Data File includes aggregate statistics for multiple types of geographic areas. FHFA includes the following geographic areas, subject to the suppressions described in Section 6:

- National
- The 50 states, plus the District of Columbia and Puerto Rico
- The 100 largest Metropolitan Statistical Areas (MSAs) or Metropolitan Divisions, by population<sup>4</sup>
- County
- Tract

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<sup>4</sup> FHFA uses the revised MSAs and Metropolitan Divisions the Office of Management and Budget defined in September 2018.

## 5. UAD Aggregate Statistics Data File Format

The UAD Aggregate Data Summary File format is described below. Users should consult the UAD Aggregate Statistics Data File Dictionary for a list of Statistical Series, Characteristics and Category values. Users should consult Section 7 for a definition of Loan Purpose and each of the Characteristics.

Field	Definition
SOURCE	Where the data comes from (e.g., UAD)
FREQUENCY	How often series is tabulated (e.g., annual or quarterly). For the UAD Aggregate Statistics Data File, this value is always quarterly because statistics are published on a quarterly basis.
SERIES	Full name of the statistical series. See UAD Aggregate Statistics Data File Dictionary for the list of statistical series
SERIESID	Short name of the statistical series. See UAD Aggregate Statistics Data File Dictionary for the list of statistical series.
GEOLEVEL	Level of geography for the estimate <ul style="list-style-type: none"> <li>• National</li> <li>• State</li> <li>• Metro Area</li> <li>• County</li> <li>• Tract</li> </ul>
GEONAME	Formal name of geographic unit (e.g., Florida, Carson County)
STATEPOSTAL	State postal code (e.g., AK, FL)
STATEFIPS	State Federal Information Processing System (FIPS) Code (e.g., 02, 15)
FIPS	County FIPS Code (e.g., 01001, 13005)
TRACT	Eleven-digit Census Tract code, which includes FIPS + Six-digit Tract number (2020 Census vintage) (e.g., 01001100234)
METRO	MSA or MSA Division (MSAD) Code for the Top 100 MSAs and MSADs (September 2018 vintage) (e.g., 10420).
PURPOSE	The reason for the loan for which the appraisal was conducted <ul style="list-style-type: none"> <li>• Purchase</li> <li>• Refinance</li> <li>• Both (combines purchase and refinance)</li> </ul>
YEAR	Year of the Series (e.g., 2016, 2021)
QUARTER	Quarter of the Series <ul style="list-style-type: none"> <li>• 1 = January – March</li> <li>• 2 = April – June</li> <li>• 3 = July – September</li> <li>• 4 = October – December</li> <li>• 5 = All four quarters</li> </ul>
CHARACTERISTIC1	Attributes of the structure being appraised, the neighborhood, the market, or the appraisal process (e.g., bedrooms, bathrooms, percent minority). See UAD Aggregate Statistics Data File Dictionary for the full list of characteristics.
CATEGORY1	Represents a value of the characteristic (e.g., 1 bedroom, 3 bathrooms). See Table 3 for the full list of categories for each characteristic.
SUPPRESSED	Indicator for value suppression

Field	Definition
	<ul style="list-style-type: none"> <li>• 0 = Not Suppressed</li> <li>• 1 = Suppressed</li> </ul>
VALUE	Value of the statistical series. See UAD Aggregate Statistics Data File Dictionary for notes about rounding.

## 6. Disclosure Avoidance Techniques

A UAD appraisal record contains information about the property owner, the borrower, and the appraiser(s), including Personally Identifiable Information (PII). A UAD appraisal record also includes a significant amount of information about the features, quality, and condition of the appraised property. While much of the information about appraised properties contained in a UAD appraisal record is also available in public records or real estate listings, or is observable from a publicly accessible location, some information is only available through a site visit. In order to address potential privacy concerns arising from the release of such information, FHFA has adopted the techniques described in greater detail below.

One strategy to address privacy concerns is to create summary statistics based on the UAD appraisal records. FHFA designed summary statistics in a manner that substantially reduces the potential for privacy harm to individual property owners, borrowers, or appraisers. In creating the UAD Aggregate Statistics Data File, FHFA’s privacy principle was to take all reasonable steps to ensure that (1) a borrower or property owner cannot identify themselves in the UAD Aggregate Statistics Data File; and that (2) a third party cannot identify a borrower, property owner, or individual property.

FHFA adopted several disclosure avoidance techniques to protect the privacy of borrowers, property owners, and appraisers. First, the UAD Aggregate Statistics Data File removes all PII. In addition, the following techniques were used to protect privacy.

### 6a. Minimum Record Count Threshold

For the UAD Aggregate Statistics Data File, FHFA adopted a minimum record count threshold of 11 records based on the Department of Housing and Urban Development’s (HUD’s) “Privacy Rule of Eleven.”<sup>5</sup> In short, aggregate statistics based on fewer than 11 records were suppressed (primary suppression), as well as any statistics in the same group of statistics (complementary suppression). Complementary suppression helps avoid the “disclosure by subtraction” issue that could compromise privacy. Appendix 2 describes how FHFA implemented complementary suppressions.

### 6b. Binning

Some property characteristics in the UAD Aggregate Statistics Data File that were originally continuous variables with precise values were binned into categorical variables with value ranges. This technique helps avoid violating the minimum record count threshold. Binned property characteristics include:

- Neighborhood Percent Single-Family Homes
- Year Built
- Tract Percent Minority Population
- Neighborhood Percent Built Up
- Effective Age
- Finished Area Above Grade
- Ratio of Tract Med. Inc. to MSA Med. Inc.

<sup>5</sup> <https://www.huduser.gov/portal/portal/sites/default/files/pdf/PDR-Privacy-Rule-of-Eleven.pdf>

- Tract Largest Race/Ethnicity Group
- Lot Size

### 6c. Recoding

Some property characteristics in the UAD Aggregate Statistics Data File were originally categorical variables with numerous categories. Where appropriate, FHFA combined some categories with other categories to help avoid violations of the minimum record count threshold.

- Quality of Construction
- Type of Foundation
- Central Air
- Public Sewer
- Marketing Time
- Use of Supervisory Appraiser
- Type of Structure
- Car Storage
- Type of Heating
- Public Water
- Appraisal Approaches
- Property Condition

### 6d. Bottom Coding and Top Coding

FHFA bottom-coded and/or top-coded some property characteristics in the UAD Aggregate Statistics Data File that were originally continuous variables with precise values to help avoid violations of the minimum record count threshold. The bottom code is the lower limit for all published values of a variable. The top code is the upper limit for all published values of a variable.

- Number of Rooms Above Grade
- Number of Bedrooms Above Grade
- Number of Comparable Properties Used in Appraisal
- Number of Bathrooms Above Grade
- Number of Stories

## 7. Definitions

This section provides definitions for the characteristics or other concepts contained in the UAD Aggregate Statistics Data File and the section of the Fannie Mae Uniform Residential Appraisal Report (1004) from which the characteristic or concept was derived. For additional information about definition groupings, see the Uniform Mortgage Data Program Uniform Appraisal Dataset Specification Appendix D.<sup>6</sup>

Characteristic or Concept	Definition	Form Section
Tract Percent Minority Population	Based on the 2020 Decennial Census estimates using 2020 census tracts.	Tract number derived from the property address in Subject property
Tract Largest Race/Ethnicity Group	Based on the 2020 Decennial Census estimates using 2020 census tracts. Indicates the racial or ethnic category when representing 50% or more of tract	Tract number derived from the property

<sup>6</sup> Uniform Mortgage Data Program Uniform Appraisal Dataset Specification Appendix D: Field-Specific Standardization Requirements. Document 1.7, Version Date: February 2, 2022.  
<https://singlefamily.fanniemae.com/media/21731/display>

	population. <sup>7</sup> The “Other” category includes tracts where (a) 50% or more of the tract population is American Indian or Alaska Native; (b) 50% or more of the tract population is Native Hawaiian or Pacific Islander; or (c) no racial/ethnic group comprises more than 50% of the tract population.	address in Subject property
Ratio of Tract Median Income to MSA Median Income	Based on the FHFA Low-Income Area definition for 2022. <sup>8</sup> Tract Median Income is based on five-year American Community Survey (ACS) data for 2016-2020 and uses 2020 census tracts. MSA median income is based on the 2018 MSA boundaries published by the Office of Management and Budget in September 2018. MSA area median income values are based on the five-year ACS data for 2016-2020. For non-metropolitan counties, the MSA area median income is the maximum of the county median income or the state nonmetropolitan area median income (also both based on five-year ACS data for 2016-2020).	Tract number derived from the property address in Subject property
Year Built	Year in which property was built.	Improvements
Effective Age	Effective age of the property in years.	Improvements
Type of Structure	Type of physical attachment, if any, between the dwelling unit and adjacent dwelling units.	Improvements
Quality of Construction	Overall rating of the property's quality of construction. Quality rating describes overall quality of the subject property as of the effective date of the appraisal and each comparable property.	Sale Comparison Analysis
Number of Bedrooms Above Grade	Total number of above grade bedrooms in the property. This does not include below grade bedrooms.	Improvements
Number of Bathrooms Above Grade	Total number of above grade bathrooms in the property. This does not include below grade bathrooms.	Improvements
Number of Rooms Above Grade	Total number of above grade livable rooms in the property. This does not include below grade rooms.	Improvements
Finished Area Above Grade	Total area of all above grade inhabitable rooms, in square feet. This does not include below grade areas.	Improvements
Number of Stories	Number of whole or partial stories of the structure.	Improvements

<sup>7</sup> Tract definitions for Black, Hispanic/Latino, Asian, and Other include Census populations with more than one race or ethnicity. For example, the Black population includes “Black alone” plus all other combinations of race where Black was identified. Using non-mutually exclusive race and ethnicity population data implies that proportions may exceed 100%. If a tract meets criteria for multiple categories, the category is assigned sequentially: Black, Hispanic/Latino, and Asian. Non-Hispanic White is not impacted because it excludes all other racial and ethnic populations. This metric is designed to align with Fair Lending race and ethnicity category delineations.

<sup>8</sup> FHFA Low Income Area Definition: <https://www.fhfa.gov/DataTools/Downloads/Pages/Underserved-Areas-Data.aspx>



Type of Foundation	Type of foundation underlying the structure, which includes full basement, partial basement, crawl space or concrete slab.	Improvements
Car Storage	Type of car storage, including driveway, garage, and/or carport or if the property has no car storage.	Improvements
Central Air	Indicates if the property has central air.	Improvements
Type of Heating	Indicates if the property has forced warm air or some other type of heating, including no heating.	Improvements
Property Condition <sup>9</sup>	The condition rating describes the overall condition of the subject property as of the effective date of the appraisal and each comparable property.	Improvements
Public Sewer	Indicates whether sanitary sewer to the property is through a public or non-public utility.	Site
Public Water	Indicates whether water to the property is through a public or non-public utility.	Site
Planned Unit Development	Indicates whether the property is part of a Planned Unit Development (PUD).	Subject
Adverse Site Conditions Present	Indicates whether property has adverse site conditions, such as easements, encroachments, environmental conditions, or land uses.	Site
Accessory Dwelling Unit Present <sup>10</sup>	Indicates whether property has an accessory dwelling unit (ADU). An ADU is typically an additional living area independent of the primary dwelling that may have been added to, created within, or detached from a primary one-unit dwelling. The ADU must provide for living, sleeping, cooking, and bathroom facilities and be on the same parcel as the primary one-unit dwelling.	Improvements
Urbanization Level	Appraiser's assessment of whether the neighborhood is rural, suburban, or urban.	Neighborhood
Neighborhood Percent Built Up	Appraiser's estimate of the percentage range of available land in the neighborhood that has been improved.	Neighborhood

<sup>9</sup> Properties with a condition rating of C6 are not eligible for sale to Fannie Mae. Any deficiencies impacting the safety, soundness, or structural integrity of the property must be repaired with a resulting minimum condition rating of C5 prior to delivery of the loan. Property condition rating definitions and ratings eligible for sale to Fannie Mae: <https://selling-guide.fanniemae.com/Underwriting-Property-Projects/Appraisal-Requirements/Appraisal-Report-Assessment/Property-Condition-Construction-Quality/1104684711/What-are-the-property-condition-ratings-used-by-the-appraiser.htm>

Properties with overall condition rating of C5 or C6 are not acceptable collateral to secure a mortgage sold to Freddie Mac unless all issues that caused the property to be rated with a C5 or C6 condition rating are cured prior to delivery of the mortgage. Property condition rating definitions and rating eligible for sale to Freddie Mac: [https://guide.freddiemac.com/app/guide/section/5605.5?\\_gl=1\\*\\_qkbyiv\\*\\_ga\\*MTE0MjQ2NTM1LjE2ODUzOTgxMzk.\\*\\_ga\\_W1VD6NP75S\\*MTY4NTM5ODEzOC4xLjEuMTY4NTM5ODEzOS4wLjAuMA..](https://guide.freddiemac.com/app/guide/section/5605.5?_gl=1*_qkbyiv*_ga*MTE0MjQ2NTM1LjE2ODUzOTgxMzk.*_ga_W1VD6NP75S*MTY4NTM5ODEzOC4xLjEuMTY4NTM5ODEzOS4wLjAuMA..)

<sup>10</sup> Find additional information on this characteristic in the Information Quality Table under point 6.

Neighborhood Percent Single-Family Homes	Appraiser's estimate of percentage of present land use in the neighborhood devoted to single-family homes.	Neighborhood
Marketing Time	Appraiser's estimate of average marketing time for one-unit housing in the neighborhood.	Neighborhood
Appraisal Approaches	Type of appraisal approach used.	Reconciliation
Number of Comparable Properties Used in Appraisal	Number of comparable sales or listings used in the appraisal, as recorded in the comparable properties matrix. This number reflects the number of closed sales (typically three-four) plus the number of other listings (i.e., pending sales or for sales) that were used in the appraisal. This does not reflect the total number of comparable properties offered for sale or the total number of sales in the neighborhood.	Sales Comparison Approach
Use of Supervisory Appraiser	Indicates that a supervisory appraiser also conducted an appraisal.	Reconciliation
Loan Purpose	Reason for mortgage loan, limited to either a home purchase or refinance. A home purchase mortgage is a transaction when a loan is originated for the purpose of buying a home from a different entity. A refinance is a transaction in which a borrower with an existing mortgage takes out a new mortgage and uses the proceeds from the new mortgage to repay the original mortgage.	Subject
Appraised Value	Appraiser's certified final market value of the property.	Reconciliation
Count of Appraisals	The number of appraisals.	Subject
Median Appraised Value	The midpoint value in the range of appraised values.	Reconciliation
25% Quartile of Appraised Value	The appraisal value at which 25% of appraisal values lie below it.	Reconciliation
75% Quartile of Appraised Value	The appraisal value at which 75% of appraisal values lie below it.	Reconciliation
Mean Appraised Value	The sum of all appraisal values divided by the total number of appraisals.	Reconciliation
Mean Ratio Contract Price/Appraised Value	The average ratio of the contract price of the property and the appraised value.	Contract and Reconciliation
% of Appraisals Below Contract Price	The percent of appraisals that were appraised at values lower than the prices on the properties' contracts.	Contract and Reconciliation

% of Appraisals Equal to Contract Price	The percent of appraisals that were appraised at values equal to the prices on the properties' contracts.	Contract and Reconciliation
% of Appraisals Above Contract Price	The percent of appraisals that were appraised at values higher than the prices on the properties' contracts.	Contract and Reconciliation
Contract Value	The contract price of the property if being purchased.	Contract
Mean Distance to Comps	The average distance a property is to the comparable properties used in the appraisal.	Subject and Sales Comparison Approach
Mean % of Comps in Same Census Tract	The average percent of comparable properties located in the same census tract as the appraised property.	Subject and Sales Comparison Approach
Lot Size	The area measured in acres where the subject property and comparable sales are located.	Site
Mean Comps Range Percentage	Captures where the appraised value falls in the range of adjusted comparable prices. <sup>11</sup>	Reconciliation and Sales Comparison Approach
Mean Comps Range Percentage (Settled Sales Only)	Captures where the appraised value falls in the range of adjusted comparable prices, for settled sales only.	Reconciliation and Sales Comparison Approach
Mean Comps Adjustment Percentage	Comps Adjustment <sup>12</sup> refers to changes made to comparable properties' sale prices by the Sales Comparison Approach.  Mean Comps Adjustment Percentage is equal to Comp Adjustment divided by Comp Sales Price, averaged for all Comps for each subject property.	Sales Comparison Approach

## 8. Information Quality

The table below describes aspects of information quality based on FHFA's information quality criteria.

Information Quality Criteria	Response
1. Describe the underlying source of any data used to create the product, including whether FHFA or a different agency collected the data.	Described in Sections 2 and 3.
2. Describe the statistical methods or models used to create the product.	The statistics are aggregate statistics, including counts, means, and quartiles.
3. Describe the intended uses of the product, and, if applicable, uses not recommended.	The aggregate statistics are intended to be used to understand trends and geographic variation in appraisals. They should not be used as a basis for appraising an individual property or to infer

<sup>11</sup> Calculated as follows: Appraised Value minus minimum of the Adjusted Sale Price of Comparable (ASPC), divided by the minimum of ASPC minus the maximum of ASPC.

<sup>12</sup> Comp Adjustment is synonymous with "Net Adjustment" in form 1004.

	<p>characteristics of an appraiser or the quality of an appraisal. They are not recommended for use in drawing conclusions about the prevalence of certain property characteristics among all properties in an area (such as accessory dwelling units), because the statistics are generated from appraisals performed over a specific period and do not reflect data for all properties in an area.</p>
<p>4. Describe the time period presented in the event or phenomenon reflected in the product.</p>	<p>Aggregate statistics correspond to the year and quarter in which the appraisal was conducted. For instance, 2013-Q1 means the appraisal was conducted in between January and March of 2013.</p>
<p>5. Describe the granularity (i.e., amount of disaggregation) of any key estimates. Granularity can be expressed in units of time, level of geographic detail available, or the amount of detail available on any number of characteristics.</p>	<p>FHFA disaggregates the aggregate statistics by geographic area (described in Section 5), year or quarter, appraisal purposes, and structural, land, neighborhood, and appraisal process characteristics.</p>
<p>6. Where applicable, describe any known major or significant errors in the underlying source data used to create the product.</p>	<p>FHFA is not aware of any major or significant error in the UAD appraisal records used to create the aggregate statistics; where applicable, FHFA made minor fixes to correct data quality errors. FHFA further notes that accessory dwelling unit (ADU) data may contain appraiser data entry errors. Some properties may be reported as having an ADU but, in fact, do not. In contrast, some properties with an ADU that were not reported as such, may have one. FHFA includes this data for its public value but acknowledges this limitation should be understood when using statistics about ADUs.</p>
<p>7. Where applicable, describe how users can estimate errors, such as errors from sampling.</p>	<p>The aggregate statistics are derived from a 100 percent count of the appraisal records eligible for inclusion, as described in Section 3. There was no sampling applied, and hence, no errors from sampling.</p>
<p>8. Where applicable, describe the consistency or comparability with estimates contained in other products published by FHFA.</p>	<p>The overall appraisal counts are not directly comparable to other Enterprise loan counts FHFA publishes. As noted in Section 3, the universe of appraisal records used to produce the aggregate statistics include loans the Enterprises did not purchase.</p>
<p>9. Where applicable, describe the steps taken to ensure the product protects the privacy and confidentiality of underlying entity (e.g., borrower, business) reflected in the source data, where applicable.</p>	<p>Described in Section 6.</p>

<p>10. Where applicable, describe the verification and validation steps taken to ensure errors are not introduced in the production process.</p>	<p>FHFA conducted internal verification of the aggregate statistics. The primary method was “code replication” whereby two different persons or teams produced aggregate statistics, then compared them to ensure consistency. Where inconsistency was discovered, differences were resolved.</p>
<p>11. Where applicable, describe the “chain of custody” of the product from its verification and validation to when it is posted on the website.</p>	<p>Final products are posted on FHFA’s website by its Office of Congressional Affairs and Communications. Once the final products are posted, FHFA staff download the product and perform a check to ensure the correct version of the product was posted to the website.</p>

## Appendix 1. Protocol for Identifying Unique Appraisals in the UAD

This process below describes how FHFA created the universe of appraisal records eligible for inclusion in the UAD Aggregate Statistics Data File. The steps are carried out sequentially.

1. Keep only active appraisals using the active document identification variables.
2. Keep only appraisals that were successfully submitted through the UCDP, as denoted by the document status indicator.
3. For each "folder" within each "drawer", keep only the most recent appraisal. The most recent appraisal is the one with the largest "drawer" value.
4. For each appraisal "drawer," if there are two or more appraisals by the same appraiser and for the same amount, keep the most recent appraisal. The most recent appraisal is the one with the largest "folder" value.
5. Remove any appraisal where the address could not be geocoded due to address quality.
6. Remove any appraisal in Guam or the U.S. Virgin Islands.
7. Remove any appraisal where appraised value is \$0 or missing.
8. Remove any appraisal where the loan purpose is "other" or is missing entirely. Note that even if an appraisal was classified as both "other" and "purchase" or "refinance," it is considered "other" and thereby deleted.

## Appendix 2. Primary and Complementary Suppression

For the UAD Aggregate Data File, FHFA adopted a minimum record count threshold of 11 records based on HUD’s “Privacy Rule of Eleven.”<sup>13</sup> In short, FHFA suppressed any aggregate statistic based on fewer than 11 records. This is called primary suppression.

Additionally, FHFA implemented complementary suppression. Complementary suppression helps avoid the “disclosure by addition or subtraction” issue in instances where marginal totals (i.e., row or column totals) are also published.<sup>14</sup> Due to having both non-geographic and geographic dimensions within the aggregate statistics tables, it was necessary for FHFA to implement complementary suppression both “within a geographic unit” and “across geographic units within a geographic level.” For census tract estimates, FHFA also implemented “parent-child geography” complementary suppression, meaning if estimates in a county were suppressed, all estimates in the tracts within the county were suppressed.

### *What is an Annual Table?*

FHFA defines an annual table of statistics by the unique combination of a *specific* year, cross-tabulated by one or more of the non-geographic dimensions (quarter, loan purpose, and one characteristic) and by a geographic level (e.g., states). Examples of annual tables include:

- 2015 by Loan Purpose for States
- 2015 by One Characteristic for States
- 2020 by Quarter and Loan Purpose for Counties

Table 1 below shows which annual tables FHFA constructed for each geographic level. For instance, the S1 group for the year 2015 includes one annual 2015 table including all states (52). The M3 group for 2021 includes one annual “2021 by One Characteristic” table including the 100 largest MSAs.

Due to all appraisal record counts exceeding 11 records for some groups, it was not necessary to apply primary or complementary suppression to any estimates in the following annual tables and Geographic Levels: N1-N8, S1-S2, S5-S6, M1-M2, and M5-M6.

Due to FHFA’s practices that help avoid inappropriate disclosure, FHFA did not construct annual tables for certain geographic levels if the result was suppressing most of the annual tables across all geographic units within the geographic level. For instance, FHFA did not construct “By One Characteristic” annual tables for counties because most counties’ annual tables would require suppression.

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<sup>13</sup> <https://www.huduser.gov/portal/portal/sites/default/files/pdf/PDR-Privacy-Rule-of-Eleven.pdf>

<sup>14</sup> Statistical Policy Working Paper 22 (Second version, 2005): Report on Statistical Disclosure Limitation Methodology, available at: [https://nces.ed.gov/FCSM/pdf/SPWP22\\_rev.pdf](https://nces.ed.gov/FCSM/pdf/SPWP22_rev.pdf)

Table 1. List of Aggregate Statistics Tables by Geography Level

Annual Table (one per year 2013 - 2021)	Geographic Level				
	Nation	State	Top 100 MSA/MSAD	County	Tract
No Disaggregation	N1	S1	M1	C1	T1
By Loan Purpose	N2	S2	M2	C2	T2
By One Characteristic	N3	S3	M3	---	---
By Loan Purpose and One Characteristic	N4	S4	M4	---	---
By Quarter	N5	S5	M5	C5	---
By Quarter and Loan Purpose	N6	S6	M6	C6	---
By Quarter and One Characteristic	N7	S7	M7	---	---
By Quarter and Loan Purpose and One Characteristic	N8	S8	M8	---	---

*Primary Suppressions*

Primary suppression is straightforward to implement. FHFA suppresses an estimate if the appraisal record count was less than 11. The three hypothetical examples below illustrate primary suppression.

Example 1: Primary Suppression for 2015 by Quarter for Kent County, Rhode Island (the C5 Table)

Year	State	County	Quarter	Appraisal Count	Suppression
2015	Rhode Island	Kent	1	10	Primary
2015	Rhode Island	Kent	2	23	
2015	Rhode Island	Kent	3	39	
2015	Rhode Island	Kent	4	10	Primary

Example 2: Primary Suppression for 2015 by One Characteristic for Delaware (the S3 Table)

Year	State	Number of Bedrooms	Appraisal Count	Suppression
2015	Delaware	0-2	8	Primary
2015	Delaware	3	26	



2015	Delaware	4	89	
2015	Delaware	5+	14	

Example 3: Primary Suppression for 2015 by Loan Purpose and One Characteristic for the St. Louis MSA (the M4 Table)

Year	State	Loan Purpose	Number of Bedrooms	Appraisal Count	Suppression
2015	St. Louis, MO-IL MSA	Purchase	0-2	10	Primary
2015	St. Louis, MO-IL MSA	Purchase	3	53	
2015	St. Louis, MO-IL MSA	Purchase	4	43	
2015	St. Louis, MO-IL MSA	Purchase	5+	39	
2015	St. Louis, MO-IL MSA	Refinance	0-2	6	Primary
2015	St. Louis, MO-IL MSA	Refinance	3	49	
2015	St. Louis, MO-IL MSA	Refinance	4	40	
2015	St. Louis, MO-IL MSA	Refinance	5+	35	

#### *Complementary Suppression Within a Geographic Unit*

The first type of complementary suppression FHFA implemented was within a geographic unit (e.g., a specific state, county, tract, or metropolitan areas) in an annual table. In short, for each geographic unit within an annual table of aggregate statistics, if at least one aggregate statistic for that geographic unit was suppressed, FHFA suppressed all statistics for the year for that geographic unit.

For instance, for a given year and particular geographic unit:

- In the By Quarter table, if one quarter is suppressed, all four quarters are suppressed.
- In the By One Characteristic table, if one value of an individual characteristic (e.g., bedrooms) is suppressed, all the values of that individual characteristic are suppressed. This logic is applied to each characteristic individually. For instance, suppressing the bedrooms values does not necessarily mean the bathrooms values will be suppressed. Each characteristic is evaluated separately.

FHFA acknowledges that this is a “brute force” approach to complementary suppression that may result in suppressing more estimates than could be technically necessary to avoid disclosure by addition or subtraction. However, this approach is significantly easier to implement because it does not require individual reviews of annual tables or more computationally challenging approaches such as linear programming.

The hypothetical examples below, derived from examples 1, 2, and 3 above, illustrate complementary suppression within a geographic unit.

Example 4: Complementary Suppression Within a Geographic Unit -- 2015 by Quarter for Kent County, Rhode Island (the C5 Annual Table)

Year	State	County	Quarter	Appraisal Count	Suppression
2015	Rhode Island	Kent	1	10	Primary
2015	Rhode Island	Kent	2	23	Complementary
2015	Rhode Island	Kent	3	39	Complementary
2015	Rhode Island	Kent	4	11	Complementary

Example 5: Complementary Suppression Within a Geographic Unit -- 2015 by One Characteristic for Delaware (the S3 Annual Table)

Year	State	Number of Bedrooms	Appraisal Count	Suppression
2015	Delaware	0-2	8	Primary
2015	Delaware	3	26	Complementary
2015	Delaware	4	89	Complementary
2015	Delaware	5+	14	Complementary

Example 6: Complementary Suppression Within a Geographic Unit -- 2015 by Loan Purpose and One Characteristic for Vermont

Year	State	Loan Purpose	Number of Bedrooms	Appraisal Count	Suppression
2015	Vermont	Purchase	0-2	10	Primary
2015	Vermont	Purchase	3	53	Complementary
2015	Vermont	Purchase	4	43	Complementary
2015	Vermont	Purchase	5+	39	Complementary
2015	Vermont	Refinance	0-2	6	Primary
2015	Vermont	Refinance	3	49	Complementary
2015	Vermont	Refinance	4	40	Complementary

2015	Vermont	Refinance	5+	35	Complementary
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*Complementary Suppression Across Geographic Units within a Geographic Level*

The second type of complementary suppression implemented was across geographic units within a geographic level, for a given table. This type of complementary suppression addresses instances where, for a given table:

- Only one geographic unit (e.g., a specific state) within a geographic level (e.g., states) was suppressed due to primary suppression, or;
- Two or more geographic units were suppressed due to primary suppression, but their total appraisal count is still less than 11.

In either of these instances, an additional geographic area that was not suppressed due to primary suppression must also be suppressed. Otherwise, the suppressed table estimates would be revealed by subtracting all other non-suppressed geographic units from the total.

The hypothetical Example 7 below illustrates this issue. In this example, FHFA created 2015 annual “No Disaggregation” table for Texas counties. The estimate for Anderson County, Texas is suppressed through primary suppression, but no other county estimates in Texas are suppressed through primary suppression. Because FHFA also publishes the Texas marginal estimate (i.e., 2015 “No Disaggregation” S1 table which includes an estimate for Texas), it may be feasible to determine Anderson County’s appraisal count estimate via subtraction. So, in this example, FHFA applied complementary suppression to the next smallest Texas county, Andrews County.

Example 7. Complementary Suppression Across Geographic Units -- 2015 by No Disaggregation for Texas Counties (the C1 Table)

Year	State	County	Appraisal Count	Suppression
2015	Texas	Anderson	10	Primary
2015	Texas	Andrews	15	Complementary
2015	Texas	Angelina	43	Not Suppressed
2015	Texas	...	...	Not Suppressed
2015	Texas	Zavala	...	Not Suppressed

In hypothetical Example 8 below (loan purpose linearized for ease of discussion), both Anderson County, Texas and Andrew County, Texas would be suppressed due to primary suppression. However, in the Loan Purpose - Refinance category, Anderson County’s and Andrew County’s appraisal record counts add up to 8, which is below our threshold of 11 appraisal records. As such, a third county must be suppressed.

Example 8. Complementary Suppression Across Geographic Units for 2015 by Loan Purpose for Texas Counties (the C2 Table)

Year	State	County	Purchase	Refinance	Suppression
2015	Texas	Anderson	6	4	Primary
2015	Texas	Andrews	11	4	Primary
2015	Texas	Angelina	17	26	Complementary
2015	Texas	Brown	34	31	Not Suppressed
2015	Texas	...	...	...	Not Suppressed
2015	Texas	Zavala	67	43	Not Suppressed

In hypothetical Example 9 below (loan purpose linearized for ease of discussion), both Allen County and Brown County would be suppressed due to primary suppression. However, in both the Loan Purpose – Purchase and Loan Purpose - Refinance categories, Allen County’s and Brown County’s appraisal record counts add up to 13, which is above our threshold of 11 appraisal records. As such, there is no need to subject a third county to complementary suppression.

Example 9. Complementary Suppression Across Geographic Units for 2015 by Loan Purpose for Michigan Counties (the C2 Table)

Year	State	County	Purchase	Refinance	Suppression
2015	Michigan	Allen	3	8	Primary
2015	Michigan	Brown	10	5	Primary
2015	Michigan	Cary	17	26	Not Suppressed
2015	Michigan	Dale	34	31	Not Suppressed
2015	Michigan	...	...	...	Not Suppressed
2015	Michigan	Zeta	67	43	Not Suppressed

When it is necessary to implement complementary suppression across geographic units, it is sufficient to select only one additional geographic unit. FHFA selected the geographic unit with the smallest number of cases across all categories among the non-geographic dimensions of an annual table. For instance, in Example 8, Angelina County, Texas was selected because 17 was the smallest number of appraisal records across all Texas counties for either the purchase or refinance categories. If any other Texas county had a value of less than 17 for either the purchase or refinance categories, that county would have been selected instead of Angelina County.

*Parent-Child Geography Suppression for Census Tract Estimates*

For estimates at the census tract geographic level (T1 and T2), if the corresponding estimates at the county level (C1 and C2) were suppressed due to primary or complementary suppression, then, by definition, all census tract estimates in the county were also suppressed.

It is important to note parent-child geography suppression was not necessary for counties when state estimates were suppressed because:

- No “parent” state estimates were suppressed due to primary or complementary suppression in the S1, S2, S5, and S6 tables, so no “child” county estimates need suppression.
- For the state tables where primary or complementary suppressions did occur (S3, S4, S7, S8), county tables were not created.