



Every Virginian Counts

Improving Virginia's representation in the 2020 Census

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SUMMARY

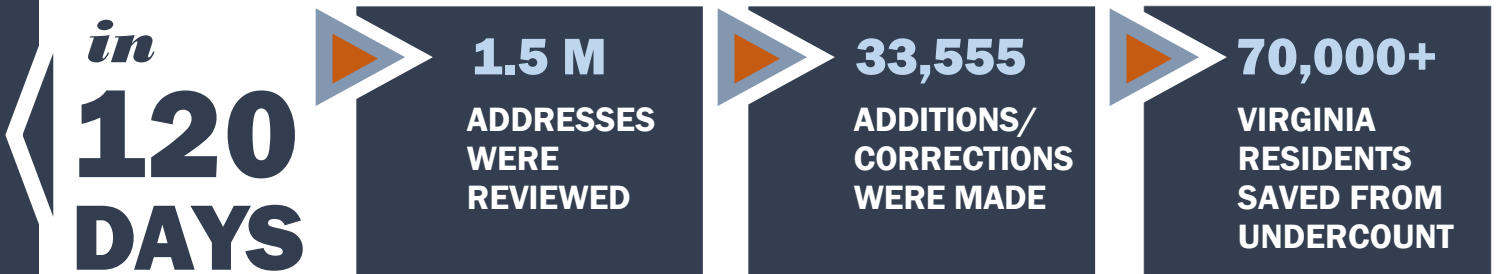
In preparation for the decennial census in 2020, the Commonwealth of Virginia, along with 44 other states, participated in the U.S. Census Bureau's Local Update of Census Addresses (LUCA) program. This program invites state, local, and tribal governments to review and comment on the U.S. Census Bureau's residential address list. The goal is to ensure a complete and accurate count of housing units and individuals in the 2020 census. As designated by the Governor of Virginia, the Weldon Cooper Center for Public Service conducted the Commonwealth's state-level address review for the LUCA program.

A complete and accurate list increases the likelihood of full representation of all Virginians in the decennial census. As census results inform congressional representation, redistricting, and awarding of more than 600 billion dollars each year of federal funding, a full and complete address list is a vital first step.

Since the Census Bureau limits the address review period to 120 days, Cooper Center staff focused primarily on the three types of localities that were most likely to have missing or incorrect information on the census address list:

1. counties with substantial rural areas
2. cities with a significant number of conversions of nonresidential buildings to residential units
3. localities experiencing rapid growth since the 2010 census

In addition, the Cooper Center reviewed address files for all 46 localities that did not register to participate in the local government LUCA program, regardless of their inclusion in one of the above priority categories.



Over 120 days (from April through July 2018), the Cooper Center reviewed and updated the Census Bureau's residential address list using the state E911 (Enhanced 911) address file as the primary comparative reference. Approximately 1.5 million residential addresses were reviewed, and 33,555 missing or corrected residential addresses were identified and submitted to the Census Bureau. If verified and accepted by the Bureau, the Cooper Center's effort will likely result in more than 70,000 additional Virginians being counted in the 2020 census.

BACKGROUND

As mandated by the U.S. Constitution, a census takes place once in every 10 years to count every resident in the United States. The fundamental purposes of the census are two: First, it is used in the reapportionment of seats allocated to the states in the U.S. House of Representatives. Second, it is used to distribute billions in federal funds to states, counties, and local communities for infrastructure, programs, and services. In 2016, more than \$675 billion was allocated by the federal government using census population data.

In order to have a successful census where everybody is counted once, only once, and in the right place, the development of a complete and accurate address list is critical because the census notices and forms are mailed to residential addresses. While the Census Bureau maintains and updates a Master Address File for all known living quarters in the United States, state and local input is important in identifying missing or incorrect addresses.

In July 2017, state, local, and tribal governments received formal invitation letters and registration forms from the Census Bureau to participate in the LUCA program. Forty-five states, including Virginia, registered for LUCA participation. The Weldon Cooper Center for Public Service served as the Commonwealth's state-level reviewer for the Census 2020 LUCA program as it did 10 years ago for the 2010 census. Among Virginia's 133 counties and cities, 87 registered to review their own community's address file. Forty-six localities did not register to participate, either because they missed the registration deadline or because they did not have the time and resources to engage in the review.

REVIEW PRIORITIES

In recent history, paper forms mailed to residential addresses were the primary mode of census data collection. To verify residential addresses, census workers walked or drove down every street in the United States. Prior to Census 2020, however, the Census Bureau is only planning to visit and check areas that have had a high level of change since 2010. As a result, work to ensure that the Census Bureau's address list is accurate and complete has become all the more important.

Since each government entity participating in the LUCA program was only allowed up to 120 days to review the census address file, it was important for the Cooper Center to prioritize the scope of their review based on which areas were most likely to have residential addresses missing from the census address list:

1. Counties with large rural areas were reviewed because they typically have high undercount due to missing addresses.
2. Localities with a large number of conversions of nonresidential buildings to residential units, such as Staunton or Roanoke, were reviewed because the converted buildings might not be included in the areas that the Census Bureau visits, and, even if visited, they may not immediately appear to be residential.

3. Localities with fast growth in this decade were reviewed, as addresses for some of the new housing (new units in multifamily structures, for example) may not be incorporated in a timely manner into the Census Bureau's Master Address File.

Additionally, the Cooper Center also prioritized the review of address files for all 46 localities in Virginia that did not register to participate in LUCA.

The state-level LUCA review was extremely time-consuming, especially since the census address list had many missing or incorrect addresses. In the 120 days allowed, Cooper Center staff managed to review 101 localities. The remaining 32 localities not reviewed by the Cooper Center included those that either informed the Cooper Center they were going to conduct in-depth reviews themselves or were known to be active, resourceful, and knowledgeable in relation to their respective local LUCA participation.

PROCESS

When the LUCA operation was initiated in the fall of 2017, Cooper Center staff members attended multiple LUCA training workshops and webinars offered by the Census Bureau. In early 2018, the Center focused its effort on the review, evaluation, and selection of Virginia address data sources that might be useful in comparison with the census address list. Data security measures and infrastructure were also developed and established during this time to ensure confidentiality and privacy required under Title 13 of the United States Code. When the census files were delivered in early April, the comprehensive review began, and it concluded at the end of July.

The Census Bureau provided the Cooper Center with an address list, an address count by census block, and Topologically Integrated Geographic Encoding and Referencing (TIGER) shapefiles. Additionally, the Census Bureau requested that their residential addresses be reviewed using the Bureau's Geographic Update Partnership Software (GUPS), a self-contained geographic information system (GIS) update and processing package. Review of the census addresses using GUPS required that each local address consist of the following elements:

1. house number
2. street name
3. apartment unit
4. zip code
5. county/city
6. latitude and longitude
7. census block number
8. census tract number

The Cooper Center engaged in a four-step process to maximize efficiency in conducting Virginia's state-level review for the LUCA program. The process consisted of: 1) selecting a primary Virginia residential address source and secondary sources to compare with the census address list, 2)

preparing the local address files for integration into GUPS, 3) comparing census addresses with local addresses to find discrepancies and errors, 4) submitting new and corrected addresses to the Census Bureau's LUCA program.

1. Selection of Address Sources for Comparison with Census Address List

In April 2018, the Census Bureau sent the Cooper Center one encrypted file for each of Virginia's 133 counties and cities, which contained all of the residential addresses the Bureau was aware of for that particular locality. In the months before the Census Bureau sent out its address list, the Cooper Center conducted research to determine the best source of local residential addresses to compare with the Census Bureau's address list. Building permits, utility records, E911 addresses, tax records, and local government GIS files were all considered for comparison.

Virginia's E911 addresses were selected as the source of address comparison for the following two reasons: First, the E911 addresses are provided by each local government and developed based on local records and expertise. Second, they are formatted consistently and updated quarterly by the Virginia Information Technologies Agency (VITA).

Although the E911 address list provides residential addresses in every county and city in Virginia, it also includes nonresidential addresses, such as those for business and government offices. In order to identify the census blocks with a large number of nonresidential addresses that should not receive a census form, the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) block-level employment files were compared with the E911 address list. The Virginia Department of Historic Resources 2018 report on historic tax credits was also used to identify localities having a large number of conversions from nonresidential to residential addresses.

2. Preparation of local address file for integration into GUPS

Virginia's E911 addresses for the first and second quarter of 2018 were downloaded from VITA's ArcGIS Online account. Although the E911 address format included house number, street name, apartment unit, zip code, and latitude and longitude, it did not always include the county or city for each address, nor did it include census block and tract numbers, all of which are required for address review in GUPS. To solve this problem, ArcMap was employed to spatially join E911 addresses to a Census Bureau shapefile containing the missing county and city information as well as the census block and tract numbers. Because of the enormous size of the E911 address list, it needed to be split into multiple regional files and reformatted so that each address field could incorporate the correct county and city information as well as accurate census block and tract numbers from the shapefile in ArcMap. Once corrected, the E911 addresses had to be broken up into individual files by county and city and then reformatted again specifically for GUPS.

3. Comparison of census address list with local address lists to identify errors

To analyze a locality targeted for review, both the census address list and the reformatted E911 addresses for the locality were loaded into GUPS and compared. The first step in analyzing the address lists in GUPS involved identifying census blocks that had a significant difference in the number of addresses between the two address lists. The LEHD file was helpful in identifying nonresidential

addresses that might be the source of the difference between the two lists. Aerial images of the review area, as well as Google Street View, zillow.com, and local property tax files were also used to verify whether E911 addresses not included in the census address list were residential or nonresidential.

The GUPS block-level review tool was helpful in identifying blocks that had a large number of possible discrepancies between the two address lists, such as those containing new subdivisions, multifamily structures, or large mobile home parks. The GUPS mapping feature, however, was better at locating smaller concentrations of addresses that were missing or misplaced in the census address list, such as rural homes on private roads or smaller infill developments.

Each time an error in the census address list was identified, the missing or corrected address information had to be pulled from the E911 list, submitted to GUPS, and then saved. After each save in GUPS, the software had to be restarted before any more address errors could be selected. As mentioned previously, this process was very time-consuming, not only because of the large number of missing or incorrect addresses in the census address list but also because of acknowledged limitations in the operational ability of the GUPS software.

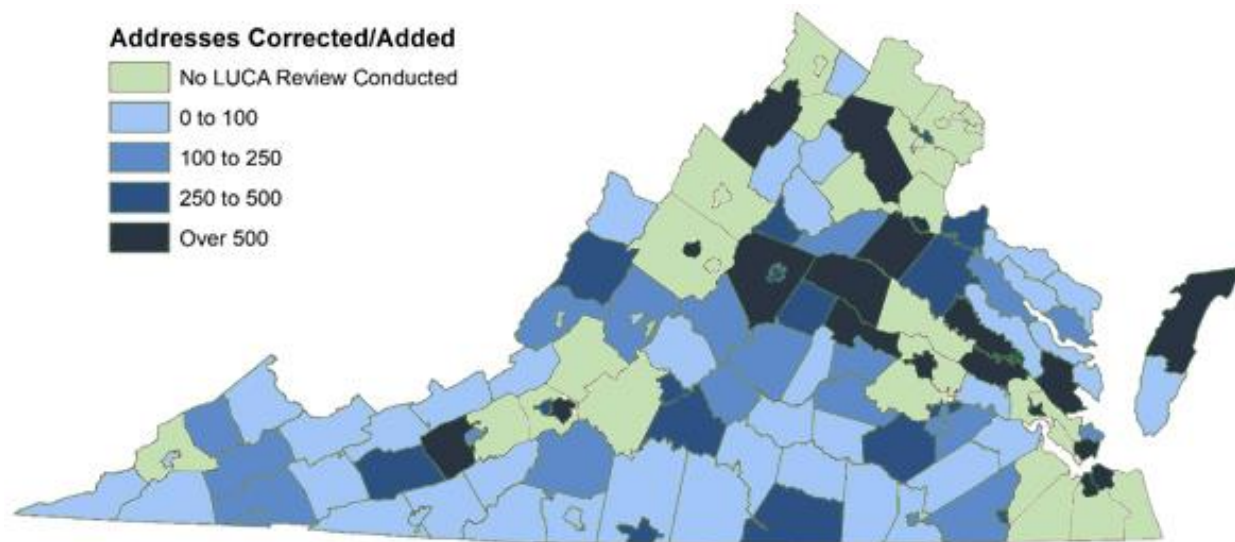
4. Submission of new and corrected addresses to the Census Bureau

Once the review of a targeted locality's addresses was complete, the addresses also had to be processed using the GUPS address verification tool and then exported into an encrypted zip file to be uploaded to the Census Bureau's secure LUCA server.

RESULTS

The availability and use of statewide E911 addresses for Virginia's LUCA review enabled it to be conducted on a larger scale than 10 years ago when the Cooper Center first participated in LUCA. For Census 2020, entire localities were reviewed, not just targeted areas, and the number of localities selected for review was also expanded by comparison.

As the map below shows, addresses were reviewed in 74 of Virginia's 95 counties and in 27 of its 38 independent cities. All localities that did not register to participate in a local-level LUCA review were included in the Cooper Center's state-level LUCA review. In total, 33,555 Virginia residential addresses were identified as missing or incorrectly located in the census address list. These addresses were submitted by the Cooper Center to the Census Bureau to be verified for inclusion in the 2020 census.



As the table below demonstrates, among the 101 counties and cities reviewed, only the City of Martinsville and Rappahannock County had no identified address errors. Conversion was a significant source of omission in the census address file for some cities. The City of Roanoke, for example, had a large number of address errors due to conversion of commercial buildings to residential units in the downtown area.

Locality	Addresses Corrected/Added
Accomack County	1,562
Albemarle County	1,868
Alleghany County	104
Amelia County	122
Amherst County	50
Appomattox County	126
Bath County	294
Bland County	67
Brunswick County	43
Buchanan County	100
Buckingham County	104
Campbell County	334
Caroline County	352
Carroll County	28
Charles City County	26
Charlotte County	29
Clarke County	73
Craig County	49

Locality	Addresses Corrected/Added
Orange County	250
Page County	42
Patrick County	79
Pittsylvania County	47
Powhatan County	168
Prince Edward County	49
Prince George County	134
Pulaski County	863
Rappahannock County	0
Richmond County	26
Rockbridge County	166
Russell County	227
Scott County	72
Shenandoah County	1085
Smyth County	89
Southampton County	103
Spotsylvania County	1723
Surry County	62

Locality	Addresses Corrected/Added
Cumberland County	6
Dickenson County	216
Dinwiddie County	467
Essex County	116
Fauquier County	1,180
Floyd County	51
Fluvanna County	353
Franklin County	187
Giles County	56
Gloucester County	593
Goochland County	764
Grayson County	87
Greene County	432
Greensville County	31
Halifax County	99
Henry County	90
Highland County	22
King and Queen County	92
King George County	260
King William County	511
Lancaster County	178
Lee County	75
Louisa County	742
Lunenburg County	48
Madison County	20
Mathews County	40
Mecklenburg County	282
Middlesex County	20
Nelson County	164
New Kent County	1124
Northampton County	90
Northumberland County	41
Nottoway County	32

Locality	Addresses Corrected/Added
Sussex County	42
Tazewell County	100
Washington County	232
Westmoreland County	58
Wythe County	314
Bristol city	205
Buena Vista city	29
Charlottesville city	255
Colonial Heights city	360
Covington city	4
Danville city	334
Emporia city	107
Franklin city	324
Fredericksburg city	595
Galax city	8
Hampton city	1751
Hopewell city	405
Lexington city	24
Lynchburg city	363
Manassas Park city	279
Martinsville city	0
Norfolk city	1860
Norton city	22
Petersburg city	158
Poquoson city	106
Portsmouth city	971
Radford city	171
Richmond city	849
Roanoke city	2197
Salem city	418
Staunton city	1523
Williamsburg city	506

The total number of Virginia residential addresses that may be added to the Census Bureau’s address list as result of Virginia’s participation in the LUCA program is likely greater than the 33,555 addresses identified in our review because the E911 address list in some cities did not provide separate addresses for each unit in converted buildings. The Census Bureau’s subsequent field visits should further clarify and most likely increase the number of addresses in these types of converted buildings.

Furthermore, each locality participating separately in the LUCA program may generate additional addresses to be incorporated by the Census Bureau.

CONCLUSIONS

It is worth noting that, while 87 Virginia localities registered to participate in LUCA to review their community address files, 46 localities did not, either because they missed the deadline or because they did not have the resources to conduct a review. The Cooper Center made it a special priority to review addresses for all 46 nonparticipating localities to ensure the completeness of their address files.

As reviewers, our analysis of both census and state E911 addresses provided us with valuable first-hand knowledge of some of the strengths and limitations of the federal and state address files. A couple of our observations on this topic seem worthy of mention here:

First, the census residential address lists are typically accurate for suburban neighborhoods consisting primarily of single-family houses built after World War II. The lists are less accurate for urban areas, where there are more residential changes and updates, and for rural areas as well, where not every living quarter has a standard street address. Addresses for multifamily units and mobile homes also tend to get missed in the census file.

Second, although the state E911 address file sometimes misses detailed unit addresses in multifamily structures, the fact that it is constructed from the ground up by localities and maintained well by VITA makes it invaluable information for purposes beyond emergency management.

On a final note, state-level participation in the LUCA program is critical for a complete census count in Virginia. Thanks to the leadership and support of the Governor's Office, the Cooper Center was able to, in four short months, review more than 1.5 million addresses and identify 33,555 of them that were missing or incorrect. If the submitted addresses are verified and accepted by the Census Bureau, it could potentially mean more than 70,000 Virginia residents are saved from undercount.