

Census 2020 Operations Quality Metrics

Prepared for the Massachusetts Secretary of the Commonwealth by
UMDI Population Estimates Program

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Background

On October 6th, 2022, the U.S. Census Bureau released operational quality metrics for the 2020 Census at the county and tract level.¹ These metrics are useful for understanding how the Census 2020 data was collected, at what rates the data was collected, and the quality of the data. The operational quality metrics include 1) percentage of all addresses in the Census Bureau universe that self-responded, 2) percentage of all address that responded online, and 3) the percentage of self-responses that were submitted online. For households enumerated within the *Nonresponse Follow-up* (NRFU) operation, the Census Bureau reported on the percentage of occupied housing units that were resolved through 1) a household member interview, 2) a proxy interview, which could be a landlord or neighbor, or 3) through administrative records. Each of the metrics mentioned above are made available at the county and tract level in the Bureau's quality metrics release. In addition, the percentage of addresses within the Nonresponse Follow-up operation that reported a population count only (and no further demographic information) and the percentage of addresses that were unresolved and went to count imputation are available at the county level only.

This report provides a summary of the Census 2020 operational metrics for Massachusetts counties and highlights of the metrics observed at the Massachusetts tract level, organized by geographic level and reporting metric. This report also offers some theories on why some areas show particular metrics; however, these are theories only, and are not tested in the scope of this report.

In addition to this report, UMDI has assembled an interactive dashboard showing various maps and charts that visualize the Census 2020 operations quality metrics that can be accessed here: https://public.tableau.com/views/CensusOperationsQualityMetrics/Home?:language=en-US&:display_count=n&:origin=viz_share_link

¹ For more information on the Census 2020 operations quality metrics visit:

https://www.census.gov/newsroom/press-releases/2022/2020-census-operational-quality-metrics.html?utm_campaign=20221006msc20s1ccnwsrs&utm_medium=email&utm_source=govdelivery

County level Metrics

Unresolved Housing Units

The Census Bureau defines unresolved housing units as “housing units that did not provide sufficient information to determine the address status or population count (Unresolved, data collection). Imputation procedures used other data sources to fill in missing data for these addresses.” Imputation occurs after all nonresponse follow-up procedures are exhausted. In Massachusetts, the county average for unresolved housing units is 1.2%, ranging from a low of 0.9% in Hampden and Plymouth Counties, to a high of 1.6% in Suffolk County. To compare, the U.S. reports an unresolved housing unit percentage of 0.9%, which is equivalent Massachusetts’ most “resolved” county. Massachusetts was very active in address submission initiatives to support the Census Master Address File ahead of the 2020 count, relative to many other states, and a higher percentage of unresolved units may simply reflect a larger number of address records overall, or it may represent an actual inability to contact householders or obtain proxy or administrative information for the units.

Table 1 Unresolved Housing Units by Massachusetts County

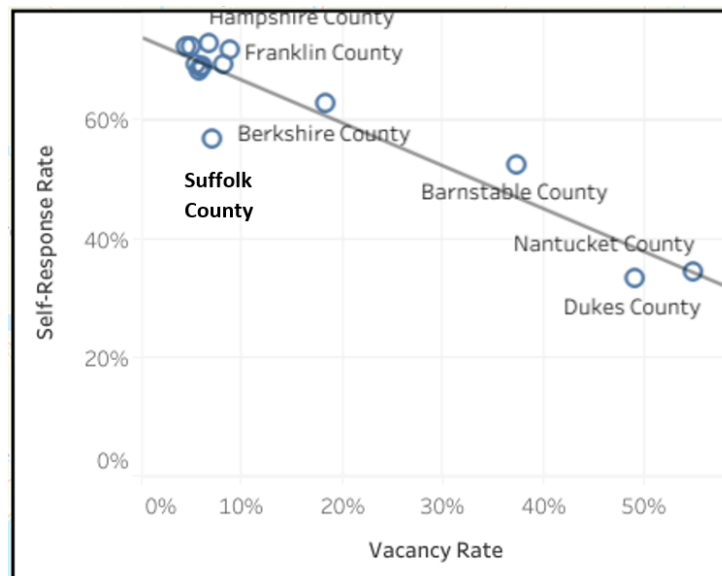
Geography Name	Final Status of Addresses Percent Resolved as: Unresolved Housing Unit (went to Count Imputation)
Barnstable County	1.4%
Berkshire County	1.2%
Bristol County	1.2%
Dukes County	1.4%
Essex County	1.4%
Franklin County	1.2%
Hampden County	0.9%
Hampshire County	1.1%
Middlesex County	1.1%
Nantucket County	1.2%
Norfolk County	1.2%
Plymouth County	0.9%
Suffolk County	1.6%
Worcester County	1.4%
Massachusetts	1.2%
United States	0.9%

Self-Response Rate

Self-response rate is defined as “housing units that responded on their own accord using the internet (a new response option in the 2020 Census), on paper using forms delivered by mail or a census taker, or by telephone.” However, the self-response rate includes *all addresses* in the Census Bureau universe, which also includes vacant units. This adversely effects the self-response rates in counties with higher vacancy rates like Nantucket, Dukes, Barnstable, and Berkshire Counties. These counties are often categorized as vacation destinations, or

“seasonal” areas, with high rates of second home ownership. The chart below shows the self-response rate plotted with the vacancy rate for each Massachusetts county.

Figure 1 Self-Response Rate by Vacancy Rate for Massachusetts Counties



There is a definite relationship between the self-response rates of counties and their vacancy rates from the Census 2020 PL 94-171 dataset except for Suffolk County which has a vacancy rate of 7.1%, but a self-response rate of 56.8%. The United States reports an average self-response rate of 65.2% and the Massachusetts County average is 62.5%. However, 9 out of Massachusetts’ 14 counties came in higher than the U.S. average while the Massachusetts average was pulled down by the cape and islands outliers.

Table 2 Self-Response Rates by Massachusetts County

Geography Name	Resolution of Housing Unit Enumeration Percent Addresses (including Deletes) Resolved as: Self Response
Barnstable County	52.7%
Berkshire County	62.9%
Bristol County	68.7%
Dukes County	33.5%
Essex County	69.3%
Franklin County	71.9%
Hampden County	69.1%
Hampshire County	73.0%
Middlesex County	72.3%
Nantucket County	34.6%
Norfolk County	72.5%
Plymouth County	69.5%
Suffolk County	56.8%
Worcester County	68.4%
Massachusetts	62.5%
United States	65.2%

Related to the self-response rate, the Census Bureau published metrics on response rates by internet for both 1) all addresses in the Census Universe and for 2) addresses that self-responded. Response rates by internet *for all addresses in the Census universe* follow a similar trend as the overall self-response rates, with higher-vacancy areas showing lower response-by-internet rates, as illustrated in the table below. The U.S. average, for comparison, is 52.0% and the Massachusetts county average is 51.1%.

Table 3 Response by Internet Rate, All Addresses by Massachusetts County

Geography Name	Resolution of Housing Unit Enumeration Percent Addresses (including Deletes) Resolved as: Internet
Barnstable County	41.8%
Berkshire County	49.0%
Bristol County	53.1%
Dukes County	22.6%
Essex County	57.3%
Franklin County	57.6%
Hampden County	52.6%
Hampshire County	62.0%
Middlesex County	64.2%
Nantucket County	30.1%
Norfolk County	62.9%
Plymouth County	56.8%
Suffolk County	47.7%
Worcester County	57.4%
Massachusetts	51.1%
United States	52.0%

However, when looking at the response-by-internet rate from just the group of housing units that fall into the self-response category, the trend shows a different picture. The table below shows response rates by internet, within self-response.

Table 4 Internet Response Rates, Within Self-Response by Massachusetts County

Geography Name	Resolution of Housing Unit Enumeration Percent Addresses (including Deletes) Resolved as: Within Self-Response, Internet
Barnstable County	79.3%
Berkshire County	77.9%
Bristol County	77.4%
Dukes County	67.3%
Essex County	82.7%
Franklin County	80.1%
Hampden County	76.1%
Hampshire County	85.0%
Middlesex County	88.8%
Nantucket County	87.0%
Norfolk County	86.8%
Plymouth County	81.8%
Suffolk County	83.9%
Worcester County	83.9%
Massachusetts	81.3%
United States	79.7%

While Dukes County is still the lowest county in percentage of responders by internet, Nantucket is the second highest county, only trailing Middlesex County by 1.8 percentage points. The second and third lowest counties are Hampden County (76.1%) and Bristol County (77.4%). The average Massachusetts county has an internet response rate, within self-response, of 81.3% compared to the U.S. average of 79.7%.

Nonresponse Follow-up

The Census Bureau operated the *Nonresponse Follow-up* program between August and October of 2020 to capture response information from households that did not self-respond to the 2020 Census. Census takers performed interviews to record information from the nonresponding households. The data collection process can be broken down into three categories; nonresponse follow-up resolved by household interview, nonresponse follow-up resolved by a proxy interview, and nonresponse follow-up resolved through administrative records. Census takers first tried to perform an interview with a member of the household and, if a member of a household was not available, then the Census Bureau referred to “high-quality administrative records” that the household had already provided to government sources such as a tax return or a previous census or survey. Finally, if high-quality administrative records were not available for the housing unit, the census taker attempted to interview a proxy for the household which could be a landlord, building manager, neighbor, real estate agent, or someone knowledgeable about the housing unit that could provide information on the people living there. If all of the above nonresponse follow-up techniques failed, the Census Bureau used a statistical technique called “imputation” to fill in the missing data for the housing unit, such as the address status or population count. Table 5 below shows the breakdown of the nonresponse follow-up resolutions by county.

Table 5 Nonresponse Follow-up Resolution Breakdown by Massachusetts County

Geography Name	NRFU Resolved Household Interview	NRFU Resolved Proxy	NRFU Resolved Administrative Records
Barnstable County	63.5%	22.3%	14.1%
Berkshire County	59.4%	23.5%	17.3%
Bristol County	52.7%	27.1%	20.1%
Dukes County	69.9%	25.4%	1.9%
Essex County	53.7%	24.1%	22.2%
Franklin County	58.8%	20.9%	20.5%
Hampden County	55.0%	23.9%	21.1%
Hampshire County	49.4%	32.4%	19.0%
Middlesex County	49.7%	28.6%	21.7%
Nantucket County	66.9%	30.6%	1.4%
Norfolk County	47.9%	25.8%	26.3%
Plymouth County	57.5%	21.0%	21.5%
Suffolk County	46.9%	30.0%	23.1%
Worcester County	58.3%	22.6%	19.1%
Massachusetts	56.4%	25.6%	17.8%
United States	55.5%	26.1%	18.4%

The average breakdown of nonresponse follow-up resolutions for Massachusetts counties is 56.4% household interview, 25.6% proxy interview, and 17.8% administrative records. The U.S. averages follow a very similar pattern at 55.5% household interview, 26.1% proxy interview, and 18.4% administrative records.

Table 5 highlights several important trends that help characterize distinct features of Massachusetts counties. The most noticeable outliers in the nonresponse follow-up operation are seen in Nantucket County and Dukes County. They clearly show the lowest levels of resolution through administrative records which also corresponds with the highest percentages of household interviews. Barnstable and Berkshire Counties follow Nantucket and Dukes Counties in terms of lowest percentage of resolution through administrative records and highest percentage of household interview. These differences most likely signify that the initial nonresponse follow-up efforts to households in these counties yielded strong results. Theoretically, areas with higher percentages of retirees and remote workers are places where interviewers are more likely to find someone home, which may explain why these seasonal and retirement areas are set apart from the rest of the state. These counties were also likely experiencing increased population at the time of the Census nonresponse follow-up operations, due to both pandemic-induced migration and the later, summer-season timing of the operations this decade. Both counties experienced unanticipated and unusually high population growth according to the 2020 count, with 40.2% population growth in Nantucket County and 24.6% population growth in Dukes County since the 2010 Census.

The nonresponse follow-up resolution by proxy interview also illustrates certain well-established characteristics of Massachusetts counties. Hampshire County has the highest

percentage of proxy interview resolutions at 32.4%. Hampshire County also has the highest percent of people living in group quarters, with 14.0% of its total population residing in group quarters due to its large college population. Also, at the time of 2020 Census enumeration, several colleges had closed in-person operations for the year due to the COVID-19 pandemic. During the nonresponse follow-up program, building managers and neighbors may have acted as the housing unit's proxy to provide the Census Bureau with student count and demographic information. This may also be true in Suffolk County, where the proxy interview resolution percentage is the third highest among Massachusetts counties at 30.0%. Suffolk County has the second highest percentage of population residing in group quarters, at 6.0%, and is also known for its high concentration of college students. In addition, Suffolk County had the lowest percentage of nonresponse follow-up resolutions through household interview and the second highest percentage of resolution through administrative records. This likely signifies that census takers were not able to access members of households for interviews at a high rate in Suffolk County. This may be due to the double effect of the COVID-19 pandemic pushing people out of the city to less densely populated areas of the state and the loss of student population due to campus closures. The metrics also suggest that there were acceptable, detailed administrative records available for the county populations, possibly including administrative student data that the Census Bureau collected from colleges and universities as part of their follow-up operations.

The final metric that the Census Bureau provided within the nonresponse follow-up program was the percent of households recorded with only a population count and no other demographic information.

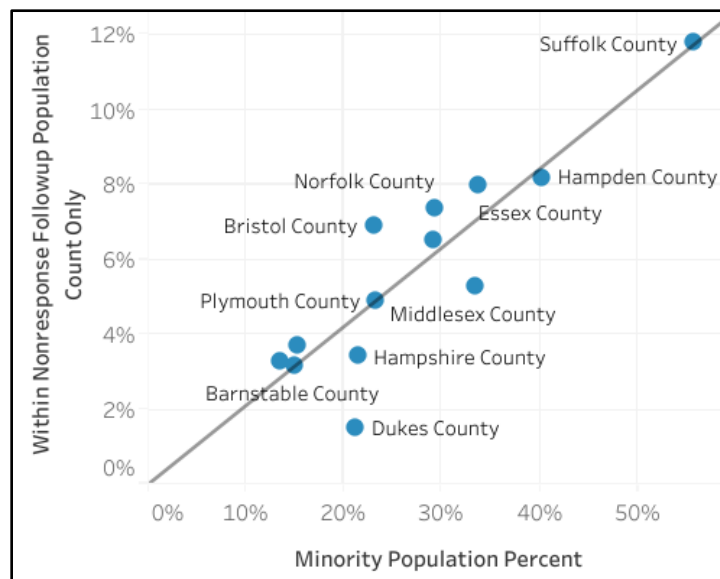
Table 6 Percent of Households within Nonresponse Follow-up that Reported a Population Count Only by Massachusetts County

Geography Name	Within Nonresponse Followup Population Count Only (NRFU Occupied from Household Interviews and Proxy Interviews)
Barnstable County	3.2%
Berkshire County	3.7%
Bristol County	6.9%
Dukes County	1.5%
Essex County	8.0%
Franklin County	3.3%
Hampden County	8.2%
Hampshire County	3.4%
Middlesex County	5.3%
Nantucket County	-
Norfolk County	7.4%
Plymouth County	4.9%
Suffolk County	11.8%
Worcester County	6.5%
Massachusetts	5.7%
United States	5.9%

Table 6 above shows the population count only rates by Massachusetts county and for the U.S. Massachusetts counties show an average of 5.7% of NRFU records with population count only while the U.S. has an average of 5.9%. Suffolk County has the highest share of population-count-only records at 11.8% followed by Hampden County at 8.2% and Essex County at 8.0%.

The chart below shows the population-count-only metric by the percent minority population in each county, with “minority” defined for the purpose of this display as the Hispanic population of any race plus the non-Hispanic population minus the “White-alone” category.

Figure 2 Population Count Only Reported within Nonresponse Follow-up by Minority Population Percent by County



There is a strong relationship between the share of “population count only” cases reported and the percent minority population in Massachusetts counties. Suffolk County, Hampden County, and Essex County not only have the highest percentages of households reporting a population count only, but also have the three highest percentages of residents identifying as cohorts other than White Alone, non-Hispanic. Many factors likely influenced these results, including the possible after-effect of a proposed, controversial citizenship question on the Census form that was eventually struck down by the Supreme Court in July of 2019.

Tract Level Metrics

At the tract level, the Census Bureau reports on six of the eight metrics that are available at the county level, excluding the “population count only” metric and the percentage of unresolved addresses that went to count imputation. In addition, the tract level metrics are more heavily impacted by the application of “differential privacy” in the Census Bureau’s *disclosure avoidance system*. As the level of geography becomes smaller, the level of “noise” injected into the data is higher and yields larger error rates due to the increased need for privacy at the smaller geographic levels. Therefore, the Census Bureau warns in their technical documentation for the operational metrics dataset that “percentages may not sum to











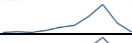
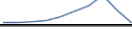

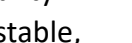
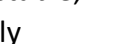
applicable totals, especially for small cell sizes, due to formal privacy techniques, and formatting practices including cell suppression and rounding”.²

Self-Response Rate

Once again, while looking at the self-response rate, it is important to point out that the denominator for this metric includes *all housing unit addresses in the Census universe*, including vacant units. The average self-response rate for Massachusetts tracts is 67.6% ranging from a low of 13.3% in tract 014100 in Bourne, Barnstable County to a high of 100.0% in tract 981600 Boston, Suffolk County. However, tract 981600 in Boston has only 2 residents. The next highest response tract is tract 317201 in Chelmsford, Middlesex County with a self-response rate of 93.5% and a population of 2,897. In addition, 17 tracts do not have a self-response rate reported. Several of these tracts are zero-population tracts, however, five are tracts with population above 100 people and which contain colleges such as Holy Cross in Worcester, Westfield State University in Westfield, Bridgewater State University in Bridgewater, and Hampshire College in Amherst. The other tract with no self-response rate reported and with population over 100 includes Franklin Park in Boston.

In terms of tract distribution by self-response rate percentage, 926 out of the 1,610 MA tracts in the dataset, or 57.5%, fall in between 60% and 80%. There are 13 Massachusetts tracts with self-response as percentage of all housing units below 30%, four of which are in Suffolk County. The table below shows the distribution of tract counts by their self-response rate and county.

Table 7 Self-Response Rate Tract Count by Percentage and County

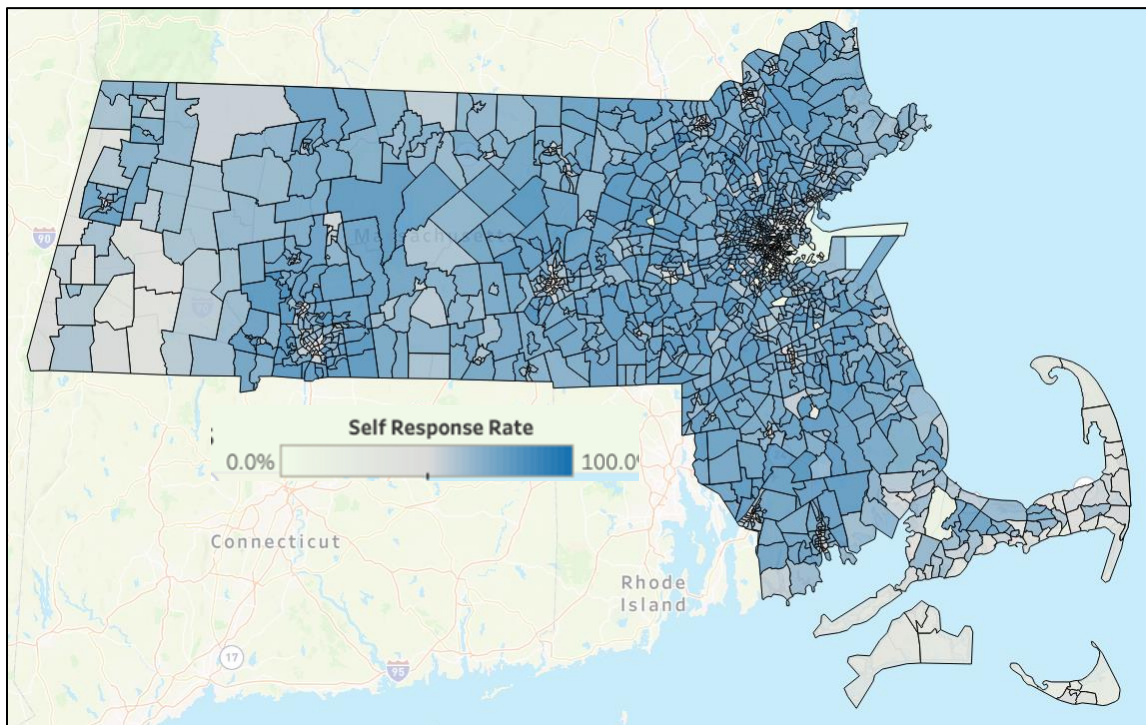
County Name	Self Response Rate count of Tracts by County										Distribution
	0-10%	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%	60%-70%	70%-80%	80%-90%	90%-100%	
Barnstable	0	1	1	7	12	13	14	8	0	0	
Berkshire	0	0	0	1	5	9	10	13	2	0	
Bristol	0	0	0	1	9	28	24	51	17	0	
Dukes	0	0	0	4	0	0	0	0	0	0	
Essex	0	0	0	1	7	30	36	70	29	0	
Franklin	0	0	0	0	0	1	4	13	1	0	
Hampden	0	0	0	1	11	15	21	31	24	0	
Hampshire	0	0	1	0	2	3	6	16	5	1	
Middlesex	0	0	1	2	13	33	65	146	91	3	
Nantucket	0	0	3	1	1	1	0	0	0	0	
Norfolk	0	0	0	1	2	7	35	71	37	0	
Plymouth	0	0	1	1	7	10	25	44	21	0	
Suffolk	0	0	4	13	35	66	68	32	3	1	
Worcester	0	1	0	5	15	19	44	78	27	1	
Massachusetts	0	2	11	38	119	235	352	573	257	6	

The map below shows the self-response rate of tracts across the state. As with the county trends, tracts in counties with higher vacancy rates, including Dukes, Nantucket, Barnstable, and Berkshire Counties, showed lower self-response rates. The tract map is more easily explored on the UMDI Tableau dashboard, referenced in this report. The dashboard features a filter where users can search by MCD to see tracts more easily. The U.S. self-response rate

² Technical Documentation – Operational Quality Metrics. Last updated 10.06.22. Accessed at: <https://www2.census.gov/programs-surveys/decennial/2020/data/operational-quality-metrics/operational-quality-metrics-technical-documentation.pdf>











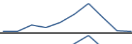
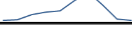


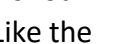
average came in at 65.2% and 1,008, or 62.6%, of Massachusetts tracts report a higher self-response rate than the U.S. average.

Figure 3 Self-Response Rates by Massachusetts Tract



Within the self-response rate metrics for tracts, the Census Bureau includes metrics for self-response rate by internet. As with counties, the Bureau published both the self-response rate by internet *out of all addresses in the Census address universe* and the rate at which people who self-responded to the census used the internet to do so. The average percent of all tracts in Massachusetts for households that self-responded to the 2020 Census is 56.7% compared to the MA county average of 51.1% and the U.S. average of 52.0%. In Massachusetts, 1,099, or 68.2% of all tracts, report a higher self-response-by-internet rate than the national average. Once again, this metric is tied to vacancy rates, like the self-response rate, due to the Census Bureau including all addresses in the Census universe in the denominator. The table below shows the distribution of tract counts by their self-response by internet rate.

Table 8 Self-Response by Internet Rate by Tract Count by Percentage and County

County Name	Self Response by Internet Rate count of Tracts by County										Distribution
	0-10%	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%	60%-70%	70%-80%	80%-90%	90%-100%	
Barnstable	0	4	8	13	9	15	6	1	0	0	
Berkshire	0	0	4	7	7	14	7	1	0	0	
Bristol	0	2	23	14	10	21	46	13	1	0	
Dukes	0	0	4	0	0	0	0	0	0	0	
Essex	0	1	12	15	16	37	55	36	1	0	
Franklin	0	0	0	1	2	8	8	0	0	0	
Hampden	0	3	17	10	11	25	22	15	0	0	
Hampshire	0	1	1	1	4	5	17	4	1	1	
Middlesex	0	0	4	10	27	60	122	119	12	0	
Nantucket	0	1	2	1	2	0	0	0	0	0	
Norfolk	0	0	1	1	7	38	72	34	0	0	
Plymouth	0	0	7	10	8	27	43	15	0	0	
Suffolk	0	2	9	54	49	66	35	5	1	1	
Worcester	0	0	15	9	21	41	68	34	2	0	
Massachusetts	0	14	107	146	173	357	501	277	18	2	

There are two tracts that report a self-response by internet rate of 100%, tract 981700 in Boston and tract 820802 in Amherst, Hampshire County. The Boston tract only contains four people while the Amherst tract includes Hampshire College and a population of 572. Like the self-response rate, the lowest internet self-response rate occurred in tract 014100 in Bourne, Barnstable County, at 10.0%. In addition, there were 15 tracts with no reported self-response-by-internet metric. 13 of these 15 tracts are the same tracts that did not report a self-response rate in the section above.

Among household that self-responded to the 2020 Census, the average Massachusetts tract included 82.5% of households responding by internet, compared to the Massachusetts county average of 81.3% and the U.S. average of 79.7%. Unlike the previous metric, this internet self-response metric only includes participants who self-responded to the census, not all addresses in the Census universe for Massachusetts. The map of within self-response, response rate by internet, below, shows a more balanced distribution of response rates across the state compared to the overall self-response rate.

Figure 4 Within Self-Response, Response Rate by Internet by Massachusetts Tract

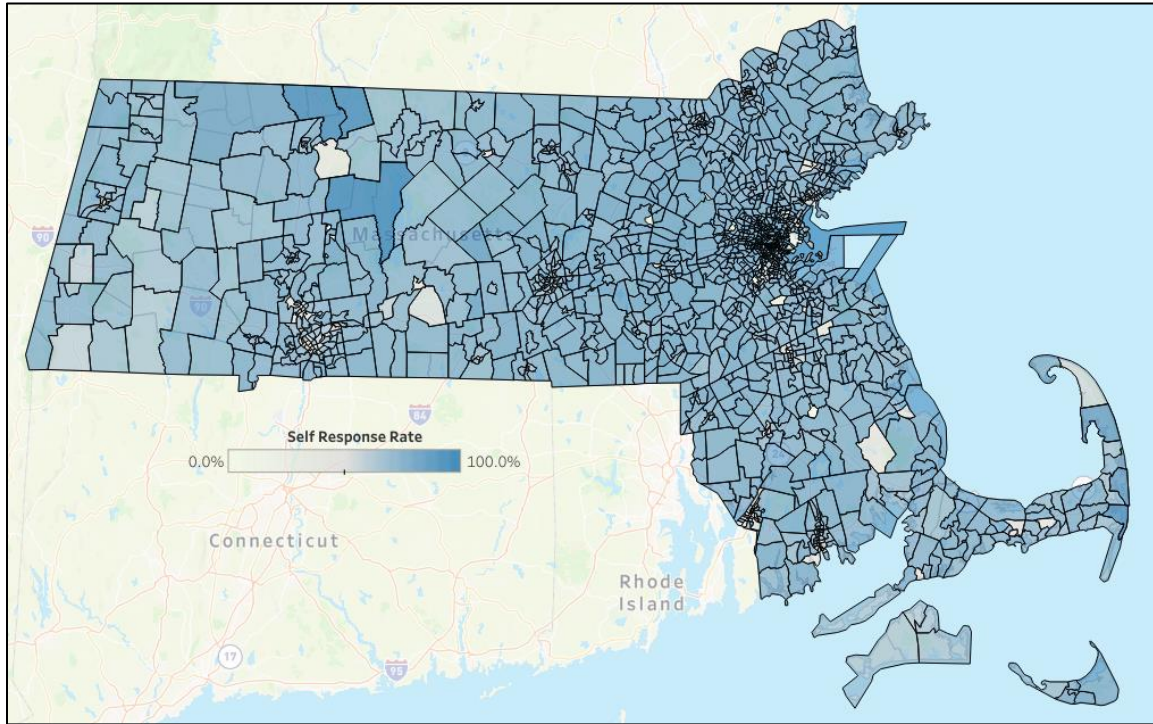


Table 9 below also illustrates the more balanced distribution of internet response rates within self-response.

Table 9 Within Self Response, Response by internet Count of Tracts by Percentage and County

County Name	Within Self Response, Reponse Rate by Internet count of Tracts by County										Distribution
	0-10%	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%	60%-70%	70%-80%	80%-90%	90%-100%	
Barnstable	0	0	0	0	3	2	0	17	32	2	
Berkshire	0	0	0	0	3	0	4	11	21	1	
Bristol	0	0	0	3	12	21	1	19	66	8	
Dukes	0	0	0	0	0	0	3	1	0	0	
Essex	0	0	0	1	6	9	6	16	113	22	
Franklin	0	0	0	0	1	0	0	5	13	0	
Hampden	0	0	0	1	13	11	5	26	46	1	
Hampshire	0	0	1	0	1	1	0	3	24	4	
Middlesex	0	0	0	0	2	3	3	10	173	158	
Nantucket	0	0	0	0	0	0	0	1	4	1	
Norfolk	1	0	0	0	0	0	0	9	110	33	
Plymouth	0	0	0	0	4	4	5	12	74	9	
Suffolk	0	1	0	1	1	7	24	20	106	62	
Worcester	0	0	0	0	3	10	6	18	120	31	
Massachusetts	1	1	1	6	49	68	57	168	902	332	

The two tracts below 20% include a tract in Quincy, MA that covers the Blue Hills Reservation with a total population of 8 and a tract in Revere, MA that covers a largely commercial district that includes Suffolk Downs with a population of 7.
















Nonresponse Follow-up

The final set of metrics that the Census Bureau released is the nonresponse follow-up resolution by type at the tract level. The average percentage breakdown by Massachusetts tract is 52.6% household interview, 26.0% proxy interview, and 23.9% administrative records. The United States has an average breakdown of 55.5% household interview, 26.1% proxy interview and 18.4% administrative records (see Table 5 in an earlier section of this report). It should be noted that the breakdowns by tract are impacted more heavily by differential privacy and often do not total to 100%.

Resolution by Household Interview

Table 10 shows the distribution of nonresponse follow-up resolution by household interview by tract count in Massachusetts counties.

Table 10 Nonresponse Follow-up Resolution by Household Interview Count of Tracts by Percentage and County

County Name	Non-reponse Follow up, Household Interview count of Tracts by County										Distribution
	0-10%	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%	60%-70%	70%-80%	80%-90%	90%-100%	
Barnstable	0	0	0	0	3	16	21	8	4	2	
Berkshire	0	0	1	1	5	9	7	6	9	1	
Bristol	0	1	1	9	37	54	22	4	1	0	
Dukes	0	0	0	0	0	0	2	1	1	0	
Essex	0	1	3	19	45	58	26	13	6	0	
Franklin	0	0	0	1	5	4	7	2	0	0	
Hampden	0	0	1	12	19	37	27	4	3	0	
Hampshire	0	2	1	4	9	9	4	2	1	1	
Middlesex	0	9	28	51	78	112	46	8	9	3	
Nantucket	0	0	0	0	0	2	2	1	0	0	
Norfolk	0	3	9	25	38	39	25	12	1	0	
Plymouth	0	2	1	5	18	37	27	13	3	1	
Suffolk	4	9	33	25	48	54	33	9	1	1	
Worcester	1	0	4	11	26	66	58	15	6	1	
Massachusetts	5	27	82	163	331	497	307	98	45	10	

The table above shows that four of the five lowest tracts by household interview rates are located in Suffolk County. These tracts include areas of Boston with several high-rise buildings such as the Seaport district on the South Boston waterfront (tract 060604), City Hall Plaza and its surrounding area (tract 030302), and the South Station and Financial district area (tract 070104). The other Suffolk County tract covers mostly Forrest Hills Cemetery and Mount Hope Cemetery and only has 97 residents while the other Boston tracts all house over 1,800 residents. The low-scoring tract in Worcester County is in a residential area of Shrewsbury and may be skewed due to differential privacy. Tract 739402 in Shrewsbury has a breakdown of 1.4% household interview, 10.1% proxy interview, and 34.2% administrative records which totals up to 45.6%, leaving room for a much higher rate of household interview that was potentially suppressed due to differential privacy. There are 45 tracts with no household interview resolution rate reported, several of which have reliable metrics reported for the other categories. Therefore, it is to be assumed that they are also suppressed due to differential privacy since there is no geographical or statistical pattern relating the tracts.

Resolution by Proxy Interview

Table 11 below shows the distribution for the proxy interview nonresponse follow-up resolution count of tracts by percentage and county.

Table 11 Nonresponse Follow-up Resolution by Proxy Interview Count of Tracts by Percentage and County













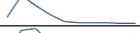
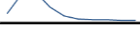

County Name	Non-reponse Follow up, Resolved by Proxy count of Tracts by County										Distribution
	0-10%	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%	60%-70%	70%-80%	80%-90%	90%-100%	
Barnstable	6	22	13	10	5	0	0	0	0	0	
Berkshire	6	12	12	7	2	1	0	0	0	0	
Bristol	5	32	44	34	14	1	0	0	0	0	
Dukes	0	0	3	1	0	0	0	0	0	0	
Essex	15	42	62	38	7	2	0	0	0	0	
Franklin	2	3	10	3	1	0	0	0	0	0	
Hampden	8	30	46	13	5	1	0	0	0	0	
Hampshire	6	5	8	4	4	1	3	1	0	0	
Middlesex	21	58	121	96	28	11	5	0	1	1	
Nantucket	0	0	2	2	1	0	0	1	0	0	
Norfolk	18	29	47	34	13	2	1	1	0	0	
Plymouth	13	35	39	15	1	0	0	0	0	0	
Suffolk	9	41	70	40	29	17	5	4	0	0	
Worcester	19	61	62	24	4	2	0	1	1	0	
Massachusetts	128	370	539	321	114	38	14	8	2	1	

In the table above, three tracts show a nonresponse follow-up resolution by proxy over 80%. The highest tract, 357500 in Middlesex County, looks to be a residential area in Belmont who's reported value may be affected by differential privacy since the breakdown of the nonresponse follow-up resolutions are 35.8% household interview, 95.5% proxy interview, and 23.9% administrative records, here again adding up to well over 100% in the Bureau's reported metrics. The other two tracts, however, encompass the College of the Holy Cross in Worcester, Worcester County (tract 732902) and Bentley University in Waltham, Middlesex County (tract 369000). These two tracts follow the county trend of large group quarters populations and high rates of proxy interview resolutions, especially near college campuses where students may have been sent home due to the COVID-19 pandemic. The lower end of the distribution contains mostly residential towns and there does not seem to be any major outliers other than two tracts that have a reporting proxy resolution rate of "<0.1%" and a population of over 2,000 people in the metrics dataset. One of the tracts, tract 100603, covers the area of Point Norfolk and Garvey Park in Dorchester, Boston, MA which seems to have a sizeable residential area within the tract boundary. The other "<0.1%" is in Lunenburg, Worcester County, MA also with a sizeable residential area. It is unclear on why there are these tracts with "<0.1%" as well as 72 tracts that do not have a nonresponse follow-up resolution by proxy interview rate listed.

Resolution by Administrative Record

The final table, Table 12, shows the distribution of the count of Massachusetts tracts with nonresponse follow-up resolution by administrative records, by percentage and county.

Table 12 Nonresponse Follow-up Resolution by Administrative Records Count of Tracts by Percentage and County

County Name	Non-reponse Follow up, Resolved by Administrative Records count of Tracts by County										Distribution
	0-10%	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%	60%-70%	70%-80%	80%-90%	90%-100%	
Barnstable	11	22	16	0	1	0	0	0	0	0	
Berkshire	7	11	10	7	0	0	0	0	0	0	
Bristol	15	46	46	14	6	1	0	0	0	0	
Dukes	1	0	0	0	0	0	0	0	0	0	
Essex	8	50	65	33	6	6	0	2	0	0	
Franklin	2	3	10	2	2	0	0	0	0	0	
Hampden	9	37	30	21	3	1	1	0	0	0	
Hampshire	5	9	14	3	0	0	1	0	0	0	
Middlesex	33	110	105	58	25	6	3	0	1	0	
Nantucket	2	0	0	0	0	0	0	0	0	0	
Norfolk	6	28	51	40	18	2	3	3	2	0	
Plymouth	11	30	44	14	5	1	0	1	0	0	
Suffolk	5	67	86	34	17	6	1	1	1	0	
Worcester	19	81	52	25	5	2	1	2	0	0	
Massachusetts	134	494	529	251	88	25	10	9	4	0	

Out of the four tracts that show a resolution by administrative records rate over 80%, only two of them have significant populations, with the other two tracts having populations of 8 and 11 people. Tract 332401 in Burlington, Middlesex County has a resolution by administrative records rate of 85.7% and the tract covers the area of the Burlington Mall as well as the surrounding residential area which has a population of 2,466. However, this may also be affected by differential privacy since the nonresponse follow-up breakdown totals 138.0% with the household interview rate at 19.0% and the proxy interview rate at 33.3%. The other tract with significant population is tract 416102 in Milton, Norfolk County with an administrative record rate of 82.9% and a population of 4,005. This tract covers a part of the Blue Hills Reservation, as well as Curry College and its surrounding residential neighborhoods. This tract is also highly affected by differential privacy with breakdowns of 45.3% household interview, 6.8% proxy interview, and 82.9% administrative records totaling 165.0%. Like the metrics for interview by proxy, there are three tracts that have sizeable population totals and reported “<0.1%” for administrative records in addition to 62 tracts that did not have a percent reported for resolution by administrative records.

Key Takeaways

To summarize the analyses provided in the sections above, we offer the following key takeaways:

In self-response rates and internet self-response rates:

- Seasonal areas like the Cape, Islands, and Berkshires have lower overall self-response rates *as a percent of all housing units* due to the higher share of vacant (including vacant/seasonal) units in those areas included in the rate denominators.
- These low seasonal-area rates pull the state’s average county self-response rate below the national average; however, all other Massachusetts counties, except Suffolk, have response rates by total addresses above the U.S. average.

- A pattern similar to the above is seen when looking at *internet* self-response as a percent of *all addresses*. However, when breaking out internet response as a percent of all *self-responding households*, Massachusetts has a higher internet response rate than the U.S. average, with some notable exceptions including Dukes, Hampden, Bristol, and Berkshire Counties, where internet response mode's share is lower than the U.S. average.

Within the Non-response Follow-up (NRFU) caseload, Massachusetts counties follow somewhat predictable patterns.

- Cape and Island counties include the highest percentages of NRFU addresses that were resolved through household interview, and the least reliance on administrative records. This may be due to the higher percentage of retirees in these areas, more likely to be found at home during enumeration; to increased short-term migration in these areas due to the COVID-19 pandemic; and the late summer timing of the Census 2020 *Nonresponse follow-up* operations.
- "College counties" including Hampshire and Suffolk, show higher-than-average percentages of resolution through proxy interview. This is likely due to more resident information being collected by neighbors or building managers when student populations left their usual college areas on account of pandemic-related closures and also the timing of the NRFU operations in the late summer, when college areas would have been less populated in general.
- Norfolk and Suffolk Counties had the greatest shares of NRFU cases resolved through administrative records. In the case of Suffolk, this may have been due to student information supplied to the Census Bureau by the many colleges and universities in the region.

Population-Only Resolution

- There is a strong relationship between the share of "population count only" cases reported and the percent minority population in Massachusetts counties. Suffolk County, Hampden County, and Essex County not only have the highest percentages of households reporting a population count only, but also have the three highest percentages of residents identifying as cohorts other than White Alone, non-Hispanic.

Last Notes

Due to the demonstrated unreliability of the Census Operations Quality Metrics at the tract level for the nonresponse follow-up resolution data, the county level metrics should be prioritized when analyzing trends across Massachusetts for this particular dataset.

Attached to this report is an Excel file with both the county and tract metrics for the state of Massachusetts as well as metrics for the United States.

The Census Bureau has also provided an interactive map viewer of the Census Operations Quality Metrics by county that can be accessed here: <https://mtgis-portal.geo.census.gov/arcgis/apps/MapSeries/index.html?appid=7be530aad3e44457bac5736a3ee3f91b>