

Health Insurance Coverage and Care in Massachusetts, 2015-2019:

A Baseline Assessment of Gaps by Age, Race & Ethnicity, and Income

December 2021

Technical Appendix



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TECHNICAL APPENDIX

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Introduction

This technical appendix provides details on the methodology used for the report *Health Insurance Coverage and Care in Massachusetts, 2015-2019: A Baseline Assessment of Gaps by Age, Race and Ethnicity, and Income*, released by the Massachusetts Center for Health Information and Analysis (CHIA) in December 2021. This appendix describes the data source, sample weights and variance estimates, unit of analysis, outcome measures, and data categorizations and groupings.

Data Source

The data source for this report is the [Massachusetts Health Insurance Survey \(MHIS\)](#), a statewide, population-based survey of non-institutionalized Massachusetts residents. As part of CHIA's Continuing Study on Insurance Coverage, Underinsurance and Uninsurance, the MHIS provides information on health insurance coverage, health care access, utilization, affordability, and emerging topics in the Commonwealth. The MHIS has been fielded periodically since 1998 and biennially since 2015.

All analyses in this report use the combined MHIS data across three biennial waves (2015, 2017, and 2019). Because certain subpopulations included in these analyses have relatively small sample sizes within each survey year, data were aggregated across three biennial waves (2015, 2017, and 2019) to increase the robustness of estimates for population subgroups. For detailed information about the survey fielding and questions asked in each survey year, please see the annual MHIS methodology reports for [2015](#), [2017](#), and [2019](#).

Sample Weights and Variance Estimates

Survey data were weighted to adjust for differential sampling probabilities, to reduce biases due to differences between respondents and non-respondents (nonresponse bias), and to address gaps in coverage in the survey frame (coverage bias). For more detail on sample weights for each survey year, please see the methodology reports for [2015](#), [2017](#), and [2019](#).

Multi-year Weights

For the multi-year MHIS data, sample weights were re-calculated to better reflect Massachusetts population over the 5-year period because original sampling weights were based on Massachusetts population for each individual survey year. Specifically, the multi-year weights used the 2015-2019 American Community Survey (ACS) 5-year estimates as benchmarks for the following demographic characteristics: gender by age, race/ethnicity, education, nativity, MA region, and population density. The 2019 ACS data was used as benchmark for family income relative to the Federal Poverty Level (FPL) as this data was not available in the 5-year data file.

Table 1. MHIS 2015-2019 Sample Population Characteristics

		Survey Sample (N)	Weighted Sample	% Weighted Population
Age	Children (0-18)	1,712	1,201,011	17.6%
	Non-elderly adult (19-64)	9,052	4,237,838	62.1%
	Elderly adult (65 and older)	4,112	1,380,923	20.2%
Gender	Male	7,015	3,298,829	48.4%
	Female	7,861	3,520,950	51.6%
Race/Ethnicity	White, non-Hispanic	11,771	5,045,184	74.0%
	Black, non-Hispanic	814	423,447	6.2%
	Other/multiple races, non-Hispanic	885	561,424	8.2%
	Hispanic	1,406	789,724	11.6%
Family Income Relative to the Federal Poverty Level (FPL)	Below 139%	3,101	1,011,728	14.8%
	From 139 to < 300%	2,963	863,173	12.7%
	From 300 to < 400%	1,564	399,469	5.9%
	At or above 400%	7,248	4,545,410	66.7%
Education	Less than high school	695	401,276	5.9%
	High school graduate or GED	2,532	1,120,715	16.4%
	Some college	1,977	859,783	12.6%
	4-year college degree or more	9,672	4,437,998	65.1%
Nativity	Not born in the USA	2176	1,192,527	17.5%
	Born in the USA	12,700	5,627,252	82.5%
MA Region	Western MA	2,070	838,696	12.3%
	Central MA	1,779	781,710	11.5%
	Northeast MA	2,953	1,430,189	21.0%
	Metro West	1,434	700,057	10.3%
	Metro Boston	3,044	1,618,606	23.7%
	Metro South	1,794	852,397	12.5%
	Southcoast	8,22	346,506	5.1%
	Cape and Islands	980	251,623	3.7%
Population Density	1 (Lowest quintile)	3,612	1,414,224	20.7%
	2	3,066	1,356,884	19.9%
	3	2,938	1,366,725	20.0%
	4	2,799	1,337,631	19.6%
	5 (Highest quintile)	2,461	1,344,315	19.7%
Total		14,876	6,819,779[†]	100.0%

Variance Estimation with Replicate Weights

Special procedures were developed to estimate the variance to account for the complex sample design, which included multiple sample frames and, within frames, stratified random sampling with oversampling of targeted populations.

[†] Note: Estimates may not equate to the total weighted population estimate (6,819,779) due to rounding.

For analyses in this report, variance estimation was calculated through replication, where replicate weights are produced. Multiple subsamples are drawn from the full sample to calculate subsample estimates of a parameter for which a “full sample” estimate of interest has been generated. Estimates are computed for each subsample, and the variability of the subsample estimates are utilized to estimate the variance of the original sample. The subsamples are called replicates, and the estimates from the subsamples are called replicate estimates. Since replicate weights allow a single sample to simulate multiple samples, the resulting variance estimates are more informed and include all information about the complex sample design. These variance estimates can then be used to obtain more precise confidence intervals and significance tests.

For the MHIS, replicate weights were computed using the same estimation steps as the full sample weight using a subsample of cases comprising each replicate. A paired jackknife replication method (JK2) was used to compute variances in each of the three waves of data utilized in these analyses. This replication method has been used by other studies such as the American Community Survey, and National Nutrition and Physical Activity Survey.^{1,2} First, variance estimation strata were created, and each variance stratum had approximately the same number of sampled units. Next, replicate base weights were computed using the same estimation steps as the full sample weight using only the subsample. Each replicate weight was computed using the same estimation steps as the full sample weight but using only the subsample of cases comprising each replicate. Hence, all of the components of the weighting process are reflected in the replicate weights. Finally, the weights were calibrated to the population estimates used for the full sample based on the 5-year period (2015-2019). Thus, the sum of the weights for each of the replicates and for the full sample matches the size of the MHIS target population (apart from rounding).

Unit of Analysis

In this report, with the exception of medical debt and medical bills, the resident (individual) is the primary unit of analysis. For the questions regarding medical debt and medical bills, residents are asked to report on the experiences of the family as a whole. “Family” refers to the individual plus any spouse/partner, parents/guardians, and siblings, children, or stepchildren under age 26 who are living in the household.

Outcome Measures

Note that measures were only included in these analyses if these questions were consistently asked in all three waves of data collection (2015, 2017, and 2019).

Health Insurance Coverage

Residents were asked about their method for paying for health care received by the target. In particular, residents were asked whether they possessed health insurance, the source of their insurance, and their experiences with coverage over the past 12 months. To assess gaps in coverage, residents were asked if they were always insured or experienced some period of uninsurance for some or all of the past 12 months. The answers received were used to create the following three measures of health insurance coverage:

- Always insured for the past 12 months
- Sometimes insured for the past 12 months
- Never insured for the past 12 months

Difficulties in Accessing Health Care at a Doctor's Office or Clinic

Residents were asked to consider any difficulties that they had faced while trying to access health care at a doctor's office or clinic. The following options were given across all three survey years. Residents could select multiple scenarios, or none if none were applicable.

- **Told doctor's office or clinic was not accepting new patients:** Being told that a doctor's office or clinic was not accepting new patients over the past 12 months
- **Uninsured or told doctor's office or clinic did not accept health insurance type:** Not having insurance for some or all of the past 12 months and/or being told that the doctor's office or clinic did not accept their insurance type over the past 12 months
- **Unable to get an appointment with a doctor's office or clinic as soon as needed:** Being unable to get an appointment at a doctor's office or clinic as soon the resident thought one was needed over the past 12 months.
- **Any difficulties in accessing health care:** This composite variable indicates whether a resident has reported experiencing any of the three difficulties in accessing health care noted above.

Health Care Utilization

Residents were asked about health care visits in the past 12 months, including visits to a general doctor for a check-up, physical examination or other preventative care, a health care specialist, or a dental provider. As well, residents were asked about their visits to the emergency room (ER) in the past 12 months; specifically, how many times the resident had received care in an ER in the past 12 months and/or whether their last visit to the ER was for a non-emergency condition. Answers to these questions were used to create the following three health care utilization measures for analysis:

- **Doctor Visit:** Whether residents had a visit with a general doctor and/or specialist in the past 12 months
- **Dental Visit:** Whether residents had a visit to a dental provider in the past 12 months
- **Potential Reliance on the ER:** Whether residents visited the ER at least three times in the past 12 months or their most recent ER visit was for a non-emergency

Health Care Affordability Issues

Residents were asked whether they or their families had any problems paying or were unable to pay any medical bills, including bills for doctor or hospital visits, dental care, prescription drugs, nursing home or home care over the past 12 months.

Residents were also asked if they or their families had medical debt, defined as any medical bills being paid over time, including bills being paid off with a credit card, through personal loans, or bill paying arrangements with the hospital or other providers.

In addition, residents were asked whether they went without needed health care because of cost in the past 12 months. These measures were used to create the following two measures of health care affordability:

- **Medical Debt or Problems Paying Medical Bills in the Family:** Whether residents or any members of their immediate families had medical debt (medical bills being paid over time) or problems paying individual or family medical bills over the past 12 months
- **Unmet Needs due to Cost for the Resident:** Whether residents have had any unmet health care needs due to cost (including general doctor care, specialist care, mental health services, dental care, or prescription drugs) over the past 12 months

Data Categorizations and Groupings

Age Groups

In the analyses of age-related differences, residents were divided into three groups: children (ages 0-18 years); non-elderly adults (19-64 years); and elderly adults (65 years or older).

Racial/Ethnic Groups

Racial/ethnic groups were determined using the conventional groupings utilized by the US Census Bureau. Specifically, participants were first asked to self-identify as either Hispanic or Latino or not Hispanic or Latino. Then they were asked to indicate their race. Options for race included White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, or specify another category that best describes the resident.

In these analyses, residents were divided into four racial/ethnic categories: non-Hispanic White; non-Hispanic Black; non-Hispanic other/multiple races; and Hispanic residents of any race. Due to small sample sizes, non-Hispanic/Latino residents who indicated that their race was Asian, Native Hawaiian or Other Pacific Islander or who selected the other/specify category were combined to create the category non-Hispanic other/multiple races.

Family Income by Federal Poverty Level (FPL)

The MHIS asks respondents about family income to better understand how to make health care more affordable. Family income is defined as the resident's income plus the income of their immediate family (including spouse/partner, parents/stepparents/guardians, and children or stepchildren under 26) who live in the household.

Residents are asked if they received any income from wages, salary, or other sources in the year prior to the survey, such as i) dividends or any interest income from bonds money market accounts, CDs or other investments; ii) social security benefits or any type of cash assistance; and, iii) income from any other sources such as self-employment, alimony, child support, contributions from family or others, unemployment compensation, worker's compensation or veteran's payments, pensions, disability benefits.

Taking all of these sources of income into consideration before taxes and other deduction, residents are asked to estimate their combined family income. If a resident fails to give an exact value amount, they are sequentially asked whether the income falls within the ranges of the categories using the annual federal poverty guideline. Details can be found in the methodology reports for each survey wave for [2015](#), [2017](#), and [2019](#).

After calculating the specific FPL category for each family, residents were then assigned to one of the following four broader FPL categories for the purpose of these analyses: less than 139% of the FPL; 139% to less than 300% of the FPL; 300% to less than 400% of the FPL, and 400% or more of the FPL. For analyses examining differences by family income within racial/ethnic groups and differences by race/ethnicity within FPL group, residents with a family income from 300% to less than 400% of the FPL and residents with a family income at or above 400% of the FPL were combined due to the limited sample size.

Specific income limits for each category of the FPL (for a family of one) are noted in the table below. For detailed breakdowns by other family sizes and year, please see methodology reports for [2015](#), [2017](#), and [2019](#).

Table 2. Income Limits for Federal Poverty Level (FPL) Categories

	2015	2017	2019
<139% FPL	<\$17,000	<\$17,000	<\$17,000
139% to <300% FPL	\$17,000-\$35,999	\$17,000-\$35,999	\$17,000-\$36,999
300% to <400% FPL	\$36,000-\$46,999	\$36,000-\$47,999	\$37,000-\$48,999
≥400% FPL	≥\$47,000	≥\$48,000	≥\$49,000

¹Birrell, C.L., Steel, D.G., Batterham, M.J., Arya, A., 2019. How to use replicate weights in health survey analysis using the National Nutrition and Physical Activity Survey as an example. *Public Health Nutrition* 22, 3315–3326. doi:10.1017/s1368980019001927

² *Replicate Weights in the American Community Survey/Puerto Rican Community Survey*. IPUMS USA. Available from: <https://usa.ipums.org/usa/repwt.shtml>.