



**The Center for Health Information and Analysis**

**2021 Massachusetts Employer Survey**

**Survey Methods Report**

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## Background and Introduction

The Massachusetts Employer Survey (MES) provides information that is critical to the mission of the Center for Health Information Analysis (CHIA) of monitoring Massachusetts health care and health insurance systems and providing reliable information and meaningful analysis for those seeking to improve health care quality, affordability, access, and outcomes. The MES was first fielded in 2001 and has been re-administered multiple times since then. The most recent administration took place in 2021.

With data collected across 20 years, the MES provides a unique lens on changes in Massachusetts health insurance markets in both pre- and post-reform periods, including the implementation of the Affordable Care Act (ACA). Throughout this period, the MES has been the primary and most relied upon source of information on employer health insurance in the state. National employer surveys, such as the Medical Expenditure Panel Survey and the Kaiser Family Foundation Employer surveys historically have not had sample sizes large enough to make reliable estimates for Massachusetts, and do not address state-specific issues. The 2021 questionnaire was based on previous CHIA survey instruments administered in 2001, 2003, 2005, 2007, 2009, 2010, 2011, 2014, 2016, and 2018 but modified to gather more detailed information about health plans and to assess the impact of the COVID-19 pandemic on Massachusetts businesses. The core topics of the 2001 to 2018 MES were retained with the following changes:

- **Additional questions to assess the impact of COVID-19 on workforce and benefits.**
- **Collected more granular data on cost-sharing for family coverage.** The 2021 survey collected cost-sharing data separately based on three types of family coverage: individual plus spouse, individual plus dependent(s), and individual plus spouse and dependent(s)
- **Restructured the survey to gather enrollment information for individual health plans.** In prior surveys enrollment information was gathered for each plan type (HMO, PPO, POS, Indemnity). In 2021, enrollment information was gathered for each specific plan offered (up to five plans).
- **Restructured the survey to gather health plan characteristics information for individual health plans.** In prior surveys, this information was gathered for the plan with the largest enrollment within each plan type (HMO, PPO, POS, and Indemnity). In 2021 this information was gathered for each specific plan offered (up to five plans). Data gathered for individual plans included premiums, deductibles for single coverage, whether the plan included a Health Savings Account (HSA) or health reimbursement arrangement (HRA), premium contributions of employers and employees, information on whether plan was self-insured, and inclusion of provider networks and ACOs
- **Additional questions to assess changes to health plans for timely services.** The 2021 survey collected data on whether firms expanded coverage of and access to mental health or substance use services/providers, expanded coverage for COVID-19 related services, and expanded access to telehealth services.

The full survey instrument was used for 2021 MES data collection from May to December 2021, resulting a sample size of 593 firms (hereafter “long version”). Additional data collection took place between December 2021 and January 2022 using a short form survey, which was adapted from the full survey to increase sample sizes for key estimates like employer offering, employee eligibility, take-up, and coverage rates for full-time and part-time employees, as well as questions regarding workforce changes resulting from the COVID-19 pandemic (hereafter “short version”). The responses from the short and long versions of the survey yielded a total sample size of 806 firms (hereafter “combined version”).

## Survey Design

### Sampling

#### Target Population

The target population for the 2021 MES consisted of all firms that have three or more employees working in Massachusetts. This included firms headquartered in Massachusetts as well as firms headquartered outside of Massachusetts. Sampling for the 2021 MES relied upon a hybrid sampling methodology combining a probability sample of firms employing three or more workers in Massachusetts with a non-probability sample drawn from a list of firms that responded to the 2016 or 2018 MES.

Stratification was based on:

- The number of employees working in Massachusetts (employee size class)
- The type of firm (North American Industry Classification System (NAICS) sector)

Sampling was based on six employee size classes and nine NAICS sector groups (either individual NAICS sectors or combinations of two or more sectors) resulting in 54 sampling strata. The employee size classes and NAICS groups are presented in the following two tables.

**Table 1. Employee Size Classes**

Size Class	Number of Massachusetts Employees
1	3-9
2	10-24
3	25-49
4	50-199
5	200-999
6	1,000 or more

**Table 2. NAICS Sector Groups**

NAICS Sector Group	NAICS Sector	Type of Firm
1	21	Mining, Quarrying, and Oil and Gas Extraction
1	22	Utilities
1	31-33	Manufacturing
1	48-49	Transportation and Warehousing
2	52	Finance and Insurance
2	53	Real Estate and Rental and Leasing
10	42	Wholesale Trade
3	44-45	Retail Trade
4	23	Construction
5	51	Information
5	54	Professional, Scientific, and Technical Services
5	55	Management of Companies and Enterprises
5	61	Educational Services
7	62	Health Care and Social Assistance
8	56	Administrative and Support and Waste Management and Remediation Services
8	81	Other Services (except Public Administration)
9	11	Agriculture, Forestry, Fishing and Hunting
9	71	Arts, Entertainment, and Recreation
9	72	Accommodation and Food Services
97	99	Industries not classified

## Source of the Sample

Two data sources were used to provide the sample for the 2021 MES

- A probability sample provided by Marketing Systems Group (MSG) drawn from the April 2021 Dun and Bradstreet database of firms.
- A non-probability panel sample provided by CHIA including firms responding to the 2016 or 2018 Massachusetts Employer Survey.

## Probability Sample

Utilizing the Dun and Bradstreet (D&B) database, MSG provided a custom dataset based on total aggregate employees within the state of Massachusetts. MSG pulled all marketable records that have a physical address within the state of MA. We excluded records with a primary SIC code of 43: USPS, and 91-97: Government entities.

Each record has a DUNS number, which is a nine-digit, non-indicative identification number. Each record also has an Ultimate DUNS, representing the highest level of ownership of a firm within the United States. Therefore, the base records are the “children” of the Ultimate DUNS, the “parent”. We output the unique children of every business within MA and rolled up the “at location” employee size that share that same parent. This then becomes the custom aggregate employee size for each parent. This process only applies to records with a family linkage. Head Quarter non-subsiary and Single Site non-subsiary locations have their DUNS number as the Ultimate. Using these custom aggregates, MSG can place each parent within the employee size categories defined by Market Decisions Research (MDR). The output record is the parent location of the Ultimate DUNS regardless of geography and is appended with the NAICS Sector code allowing for grouping by firm type.

The final probability sample file included DUNS number, the firm name, address, telephone number, a contact person (if available) along with company characteristics, including total number of employees, employees in Massachusetts, NAICS code, and location of firm headquarters.

## The Panel Sample of Prior MES Participants

CHIA provided a list of 1,472 firms that had responded to the 2016 or 2018 MES. Each record in the panel included the firm’s DUNS number, address, phone number, the contact information for the person completing the survey, the firm’s NAICS code, and the number of Massachusetts employees at the time the survey was completed.

To avoid duplicate records, the panel sample was de-duplicated against the probability sample. Thus, if a firm from the panel sample was also drawn as a part of the probability sample, it was considered part of the probability sample.

In addition, the panel sample was provided to MSG to append updated firm information.

### **Identifying Contact Person to Provide Information on Health Benefits**

One of the challenges in conducting the 2021 MES was identifying the appropriate contact person within a firm. As part of the sample generation process, MDR worked with MSG and Dunhill International to obtain contact information for staff that were the most likely to be able to provide the information asked in the MES. The combined probability sample and panel sample was sent to both MSG and Dunhill International for contact lookups. The process to identify contacts was as follows:

- First, MDR reviewed a list of available job and personnel titles to identify those most likely to be associated with providing health benefits to employees.
- MSG then searched based on these titles and appended any identified contact information to each sample record. This included, when available, a contact name, contact phone number, and/or a contact email.
- MDR then provided the sample file to Dunhill International along with the list of job titles. Dunhill International conducted a search and appended any identified contact information to each sample record. This included, when available, a contact name, contact phone number, and/or a contact email.

If available, up to six contacts were appended to a sample record.

### **Sample Generated**

The final sample file for the 2021 MES included 6,270 records from the probability sample and panel of prior MES participants.

- 5,410 sample records were used in conducting both the 2021 MES long and short versions.

The short version sample was drawn from the same sample used for the long version but excluded sample records in cases that:

- A firm had already responded to the long version
- A firm was no longer in business
- A firm did not have three or more employees in Massachusetts
- The phone number was non-working or disconnected (and another could not be identified)
- During the long version data collection, the identified contact refused

In addition, the 2021 MES short version sample prioritized larger firms with 200 or more employees in Massachusetts and smaller firms with 3-9 Massachusetts employees.

**Table 3. 2021 Sample Generated by Employee Size Class**

Massachusetts Employer Size Class	Population Size	Panel Sample Size	Non-panel sample size	Total sample size
3-9	104,810	182	1,269	1,451
10-24	21,703	198	639	837
25-49	7,075	206	659	865
50-199	5,378	189	668	857
200-999	1,392	102	939	1,041
1,000 or more	309	23	336	359
Total	140,667	900	4,510	5,410

## Data Collection

Data collection for the MES was originally scheduled to be completed in 2020, however, due to the disruptions caused by the COVID-19 pandemic to Massachusetts businesses, data collection was paused in March 2020. Multiple surges of COVID-19 proved that efficient and representative data collection was not possible during the calendar year of 2020. The MES data collection restarted in May 2021.

As data collection progressed, it became clear that the pandemic had created a shift in the workplace environment. Many employees moved from working in an office setting to working from home. This was initially a temporary measure to reduce the spread of COVID-19 but became a standard practice for many firms. This created new challenges in identifying and then reaching an employee that could provide information about a firm's health benefits. This structural change and the additional effort required to speak with employees pushed the original timeline for data collection into December 2021. This also led to the implementation of a second version of the MES; the short version tailored to gather information on the offering of health insurance and the eligibility and enrollment of employees in ESI plans.

### Summary of Data Collection Modes

The 2021 MES, both long and short versions, relied on a multi-mode data collection strategy that included:

- **The online survey:** The online survey was the primary modality offered to the sample. An online version of the survey was programmed in Voxco. The survey link and unique survey ID were included in all invitation and reminder emails.
- **The mail survey:** A printed version of the questionnaire, each with a unique survey ID, was mailed to all non-responding firms
- **The telephone survey:** The telephone survey was offered to respondents of the short version only.



## Data Collection Process

### Long Version

Data collection for the 2021 MES long version began on May 20, 2021 and was completed on January 6, 2022. Data collection relied on three modes of communication; telephone calls, mailed survey invitation letters and survey booklets, and email invitations and reminders. The methods were used concurrently throughout data collection to maximize the opportunity to speak with a person at the firm and elicit their participation in the survey.

- **Telephone Outreach.** Telephone calls began on May 20, 2021, with the last call attempt made on December 29, 2021. The purpose of the telephone outreach was to first verify that the firm was eligible to participate in the survey, to identify the correct person within the firm to participate in the survey, and to elicit the participation of the appropriate contact. Data collection calls were made by trained interviewers at Market Decisions Research and at a partnering firm, Morris Davis and Company. Telephone numbers (up to six per firm) were included in the sample and were identified by MSG. If a telephone number was determined to be non-working, additional attempts were made to other phone numbers identified for the firm. In cases where a successful call did not reach the appropriate contact to provide the survey information, interviewers attempted to identify the appropriate contact and obtain a direct telephone number used in later call attempts. Once the appropriate contact was identified and agreed to participate, the contact's direct phone number and email were recorded and an email invitation was sent. Email reminders and reminder telephone calls were made to non-responders. On average, 6.1 call attempts were made to firms included in the sample file.
- **Email Invitations and Outreach.** Email invitations were sent beginning on May 24, 2021, with the last reminder sent November 1, 2021. Email contacts were used throughout data collection to send initial survey invitations, to send email reminders following an initial email invitation, to send an invitation to a contact identified during telephone outreach, and for follow-ups to non-responders. The email included a link to the online survey and a personalized ID number to enter the survey. An initial email invitation was sent to 1,825 firms for which an email was identified during the preparation of the sample. These emails were identified by MSG and Dunhill International. Following this initial email, three reminder emails were sent to non-responders approximately one week apart and then reminders were paused. A second round of invitation emails with reminders was sent to non-responding firms in August and a final round of invitations and reminders in October. Once a firm agreed to participate, the email of the respondent was collected, and email reminders were sent weekly. Up to four email reminders were sent to recruited participants.

- **Mail Outreach:** Mail outreach consisted of both invitation letters to an online survey and mailed survey booklets. The first mailing was sent on May 24, 2021, and the final mailing of survey booklets to selected firms was sent on November 1, 2021. The letter explained the purpose of the study and value of the survey data to the state. The letter provided the link to the survey along with a unique ID number to access the survey. The letter also indicated respondents would receive an incentive for completing the survey. Following the initial invitation, a second invitation letter was sent in July via certified mail. A survey booklet was sent to select firms in September with a survey invitation letter sent to firms in low responding strata in October offering a larger incentive to complete the survey. A survey booklet was mailed to firms in low responding strata in November offering a larger incentive to complete the survey.

### Short version

Data collection for the 2021 MES short version began on December 6, 2021 and was completed on January 12, 2022. Data collection for the short version included an initial mailing of the invitation letter and paper copy of the survey, an email invitation with two reminders as well as telephone outreach. The letter explained the purpose of the study and value of the survey data to the state, and provided the link to the survey along with a unique ID number to enter the survey for those preferring to complete the survey online. The emails included a description of the survey and its purpose along with a link to the online survey and a personalized ID number to access the survey. As with the long version, respondents completing the survey were provided an incentive. Telephone calls were begun on December 6, 2021. Once the appropriate contact was identified and agreed to participate, the contact's direct phone number and email were recorded, and the respondent was sent an email invitation. Non-responders received reminder emails and were contacted by phone. On average, 2.9 call attempts were made to firms included in the sample file.

## Survey Response

In all, 593 firms completed the entire 2021 MES long version and 184 completed the 2021 MES short version. The final data (combined version) included 806 total firms, including 593 firms completing the entire long version, 29 firms that did not complete the entire long version but answered all questions regarding the number of eligible and enrolled employees, and 184 firms only completing the short version. Tables 4 and 5 summarize completed surveys by employee size class and NAICS sector.

The response rate (AAPOR Response Rate 3) for the 2021 MES was 15% for the long version and 19% for the combined version.

**Table 4. Firms Completing the Survey by NAICS Sector Group and Massachusetts Employer Size Class**

(2021 MES Long Version)

NAICS Sector Group	Massachusetts Employer Size Class						Total
	3 to 9	10 to 24	25 to 49	50 to 199	200 to 999	1000 or more	
Manufacturing, Mining, Quarrying, and Oil and Gas Extraction, Utilities, Transportation and Warehousing	15	15	17	21	18	4	90
Finance and Insurance, Real Estate and Rental and Leasing	4	7	11	12	13	1	48
Retail Trade	14	12	7	14	6	2	55
Construction	13	6	10	6	7	0	42
Professional, Scientific, Technical Services, Information, Educational, Management of Companies and Enterprises	19	24	23	23	23	6	118
Health Care and Social Assistance	9	11	12	22	18	13	85
Other Services (except Public Administration), Administrative and Support and Waste Management and Remediation Services	17	17	11	15	9	0	69
Accommodation and Food Services, Arts, Entertainment, and Recreation, Agriculture, Forestry, Fishing and Hunting	5	14	8	10	3	1	41
Wholesale Trade	8	11	16	9	1	0	45
<b>Total</b>	<b>104</b>	<b>117</b>	<b>115</b>	<b>132</b>	<b>98</b>	<b>27</b>	<b>593</b>

**Table 5. Firms Completing the Survey by NAICS Sector Group and Massachusetts Employer Size Class**  
(2021 MES Combined Version)

NAICS Sector Group	Massachusetts Employer Size Class						Total
	3 to 9	10 to 24	25 to 49	50 to 199	200 to 999	1000 or more	
Manufacturing, Mining, Quarrying, and Oil and Gas Extraction, Utilities, Transportation and Warehousing	18	20	21	24	22	4	109
Finance and Insurance, Real Estate and Rental and Leasing	6	8	12	14	16	1	57
Retail Trade	24	16	10	18	9	3	80
Construction	21	12	11	9	9	0	62
Professional, Scientific, Technical Services, Information, Educational, Management of Companies and Enterprises	27	31	28	34	31	7	158
Health Care and Social Assistance	12	18	16	31	30	17	124
Other Services (except Public Administration), Administrative and Support and Waste Management and Remediation Services	26	18	12	18	13	2	89
Accommodation and Food Services, Arts, Entertainment, and Recreation, Agriculture, Forestry, Fishing and Hunting	9	21	10	17	6	1	64
Wholesale Trade	12	14	20	13	2	2	63
Total	155	158	140	178	138	37	806

## Weighting and Imputation Methods

### Data Imputation

Data imputation is a procedure that determines the likely value of a missing case based upon other known characteristics of the respondent. Imputation relies on answers to other questions to derive the most likely value for the missing response. MDR imputed missing cases on several of the variables in the 2021 MES dataset. In those cases where a variable was imputed, the final dataset contains a copy of the variable with imputed values, a copy of the original variable with

missing values retained, and a flag variable which identifies which values were imputed and the method used. Three primary methods of data imputation were used:

### **Logical Imputation**

This step involves an assessment of answers to other questions (within the case) to determine if it is possible to deduce what is likely the correct answer to a question with a missing value. In some cases, this is done by evaluating a question that is very similar in nature and content. In other cases, it involves assessing several related questions to derive the most likely value. For example, one may be able to deduce a missing plan deductible by examining the plan maximum out-of-pocket.

### **Donor Substitution Imputation – Hot Deck Imputation**

Hot deck imputation relies on the fact that firms or health plans with similarities on several variables are likely to be similar on those variables with missing values. The process involves identifying a case (a donor) that is similar to the case on a number of variables besides the variable that is missing. Hot deck imputation is used on variables where there is a relatively limited number of possible values.

### **K-Nearest Neighbor (kNN) Imputation**

A popular approach to missing data imputation is to use a statistical model to predict the missing values. K-Nearest Neighbor (kNN) donor cases are then used to predict for missing value estimation. The configuration of kNN imputation often involves selecting the distance measure (e.g. Euclidean) and the number of contributing neighbors for each prediction, as well as the k hyperparameter of the kNN algorithm. A missing case is imputed by finding the samples in the data set “closest” to it and averages these nearby points to fill in the missing value.

### **Data Weighting**

The purpose of weighting is to produce population estimates for the target population with a known level of precision. Weighting is done to factor in the sampling design (probabilities of selection), the results of data collection (patterns of non-response), as well as aligning the data with the actual population based on the population’s known characteristics (post design weighting adjustments). The 2021 MES is unique in that the data includes several types of populations for which weights were calculated.

1. The first is the firm. Data was collected from a sample of firms on a range of topics related to health care coverage.
2. The second is the employee. The data are used to estimate various characteristics of Massachusetts employees such as the percentage of employees offered insurance and

the percentage of eligible employees that enrolled in one of a firm's offered health plans. This required a weight related to the number of Massachusetts employees

3. The final is the health plan. A firm may offer more than one type of health plan to its employees. Analysis is used to understand the characteristics of the health plans offered by Massachusetts employers requiring a weight related to the number of health plans offered by each firm.

The process of weighting is designed to allow analysis of survey data at each of these three different population levels. The weights also build upon one another. The firm level weight is the basis used in calculating plan level and employee level weights.

### **Data Sources Used in Weighting**

Weighting relies on a source that can provide an accurate estimate of the population to which survey results are compared and normalized. In the case of the 2021 MES weighting relied on three primary sources:

- The US Census Bureau's County Business Patterns (2018)
- Dun and Bradstreet's Database of US firms (2021)
- The Bureau of Labor Statistics Quarterly Census of Employment and Wages (2021)

### **US Census Bureau County Business Patterns**

The 2018 County Business Patterns (CBP) data was provided by the US Census Bureau. County business patterns data provides information about the number of establishments, firms, and employees by employee size class and NAICS code for the US and for individual states. The publicly available data did not meet the needs of the project since it includes all employees (while the 2021 MES focuses on firms with three or more employees). To obtain data in a form appropriate for weighting, Market Decision Research made a special data request to provide firm and employee counts broken out by employee size class relevant to the target population and to align with sampling.

This analysis was conducted by staff of the US Census Bureau which provided counts of firms. Establishments, employees by employee size class and NAICS codes were based on 2018 data. A potential area of concern about this information was that the counts were based on conditions prior to the COVID-19 pandemic and that the counts may not accurately reflect conditions in 2021.

### **Dun and Bradstreet Database of firms**

Dun and Bradstreet (D&B) maintains a commercial list of firms in the United States that includes characteristics including their NAICS code and number of employees. This list of firms was used to develop the sample of Massachusetts firms used during data collection.

Compared to CBP data, the advantage of Dun and Bradstreet is its recency, the data that was used in sampling for the 2021 MES was updated in April 2021 just prior to the sample being

drawn. The weakness of Dun and Bradstreet database and why it is not appropriate for population estimates is that it may not include recently created firms and that it may retain firms that are no longer in business.

While not providing an accurate population estimate of the number of firms, it did provide a way to assess changes in the distribution of firms prior to the COVID-19 pandemic and the survey period. This would provide a way to determine how well the 2018 CBP data might reflect current conditions.

For this analysis, counts of firms and employees in Massachusetts were generated using the April 2021 database and the database from January 2020. Analysis was conducted comparing the distribution of firms in Massachusetts by NAICS sector group and employee size class in January 2020 (prior to the potential impact of COVID-19 on the business landscape) to April 2021 (the beginning of survey data collection). This analysis was not used to determine the number of firms for use in weighting but rather whether change occurred in the number and distribution of firms between January 2020 and April 2021. If differences were noted, it meant that adjustments would be required to the counts from the 2018 CBP to reflect 2021 business conditions more accurately.

One assumption in the analysis was that the changes in the distribution of firms observed in the Dun and Bradstreet data would be similar to what would be expected if we had more recent CPB data. The results of this analysis indicated that, while the number of firms did change, the change was negligible (less than 1% for most sampling strata) suggesting that the 2018 CBP provided a good estimate of the number of firms in 2021. The firms count used in weighting are based on 2018 CBP without any modification.

### **Bureau of Labor Statistics Quarterly Census of Employment and Wages**

The Bureau of Labor Statistics (BLS) quarterly census of employment and wages provides counts of private sector employment months. The most recent data available provides March 2021 employment totals for the US and for individual states including Massachusetts. It provides a more up to date count of private sector Massachusetts employees than available from the 2018 CBP data, potentially allowing for more acute estimates of the number of Massachusetts employees.

But while this census provides more recent employment data, it does not provide a breakdown by firm size but rather by establishment size which is at the core of weighting. Further, its smallest category includes establishments of 5 or fewer employees. This limits the ability to use the data in developing employee level weights for the 2021 MES. However, it does provide a way to derive a more accurate estimate for the total number of Massachusetts employees in private sector companies with three or more employees. The quarterly census was used for this purpose.

The following steps were used to calculate an estimate for the total number of private sector employees with three or more employees:

- The total number of Massachusetts private sector employees was determined based on March 2021 quarterly census of employment and wages.
- The distribution of employees by employee size class was obtained from the 2018 CBP data. Specifically, the distribution was used to determine the percentage of employees in firms with zero to two employees.
- The total count of Massachusetts private sector employees determined based on March 2021 quarterly census of employment and wages was then modified, removing the percentage of employees expected to be in firms with zero to two employees.

## **Firm Level Weights**

### **Design Weights**

An initial base weight was calculated for each record included as part of the sample used during data collection, computed as the total number of firms in population (contained within the D&B database) divided by the number of firms in the sample file within each sampling strata. All records within a stratum had the same base weight but base weights differed across sampling stratum. At this stage all sample records within the sample file had a positive weight (regardless of the outcome of data collection). A non-response adjustment was then applied to all sample records which was equal to:

- 0 if the sampled firm did not complete the survey
- 0 if the firm was determined to be ineligible (fewer than three employees)
- 0 if the firm was no longer in business
- 0 if the firm was acquired by another firm
- $N/r$  if the firm was eligible and completed the survey with  $r$  equal to the response rate within the stratum to which the firm belonged

At this stage all firms that completed the survey had a positive design weight while firms that did not complete the survey had a weight of zero.

At this stage the weighted data only reflected the distribution of firms that completed the survey and did not reflect the actual distribution of firms within Massachusetts by employee size class and NAICS sector Group.

### **Post Design Weighting Adjustments**

A sequence of two weighting adjustments were then made to normalize the weighted firm level data to reflect the actual distribution of firms in Massachusetts by employee size class and NAICS sector group.

The population data for the post design weighting adjustments was provided by the US Census Bureau and was developed from the 2018 County Business Patterns (CBP) data. This data provided a breakdown of firms by NAICS sector groups by size class based on the total number of US employees at these firms.



## First Stage of Post Design Survey Weighting

A new employee size class variable was calculated based on the total number of US employees to match the CBP classification of employee size class. Data were weighted using the design weight and a weighted distribution of firms by NAICS sector group and US employee size class generated. These results were used to calculate the first firm level weighting adjustment. The first firm level weighting adjustment was equal to the CBP count of firms divided by the weighted survey count of firms within each NAICS sector group by US employee size class group. The design weight was multiplied by this adjustment. At this stage the survey data now accurately reflect the count of Massachusetts firms by NAICS Sector group and US employee size class from the 2018 CBP data.

One concern arose at this stage of weighting: The survey weights within each Massachusetts employee size class by NAICS sector group strata cell (which formed the basis of sampling) varied across firms except for firms with 1,000 or more Massachusetts employees. This is not unexpected since the CBP data included all employees and not just those in Massachusetts. Because of this, a firm may be in one size class for the US but a different size class in Massachusetts. The distribution of firms by US and Massachusetts employee size classes is presented in Table 6. The firms highlighted in green represent firms for which the Massachusetts employee size class differs from the US employee size class. In some instances, the differences are rather large. For example, there are four US firms with 1,000 or more employees with only three to nine employees in Massachusetts.

**Table 6. Size Class Comparisons of Total Us and Total Massachusetts Employees**

Number of US Employees	Number of Massachusetts Employees						Total
	3 to 9	10 to 24	25 to 49	50 to 199	200 to 999	1000 or more	
<b>3 to 9</b>	130	0	0	0	0	0	130
<b>10 to 24</b>	8	128	0	0	0	0	136
<b>25 to 49</b>	1	8	93	0	0	0	102
<b>50 to 199</b>	4	6	17	122	0	0	149
<b>200 to 999</b>	8	11	13	28	100	0	160
<b>1000 or more</b>	4	5	17	28	38	37	129
<b>Total</b>	155	158	140	178	138	37	806

The differences in weights within a specific NAICS by Massachusetts employee size class stratum varied by an average of 6:1 with one stratum having a difference of 55:1.

The implications of this include:

- With optimal weighting all firms within a single stratum would have equal weights.
- It impacts the relative contribution of firms to the survey results when analyzing the data by number of Massachusetts employees, NAICS sector group, or both of these characteristics. *In the extreme example above, one firm is contributing 55 times more to the survey results than other firms in the same strata.*

To help normalize these differences and to balance the weights so that all firms within a stratum would have equivalent weights, a second weighting adjustment was made based on Massachusetts employer size rather than US employer size. Since there was no external data source, the best way to develop estimates was to use the weighted survey data to derive counts of firms in Massachusetts defined by Massachusetts employer size class and NAICS sector group.

Using the first stage adjusted firm level weight, firms' counts were calculated within each Massachusetts employee size class by NAICS sector group. These counts became the estimated population counts used in the second stage of weighting adjustments described below.

### **Second Stage of Post Design Weighting**

The second stage of weighting calculated adjustments based on the estimated population of firms with the Massachusetts employee size class by NAICS sector calculated during the first adjustment stage of post design weighting. The data was again weighted using the firm design weight and survey counts obtained within each Massachusetts employee size class by NAICS sector group. The cells used in weighing adjustments match survey sampling strata.

Table 7 presents the estimated population counts of firms by NAICS sector group and the Massachusetts employee size class used in making the weighting adjustments. Table 8 provides the distribution of firms that completed the survey by Massachusetts employee size class and NAICS sector group.

**Table 7. Estimated Number of Massachusetts Firms by NAICS Sector Group and Massachusetts Employer Size Class**

NAICS Sector Group	Massachusetts Employer Size Class						Total
	3 to 9	10 to 24	25 to 49	50 to 199	200 to 999	1000 or more	
Manufacturing, Mining, Quarrying, and Oil and Gas Extraction, Utilities, Transportation and Warehousing	2,862	1,622	875	773	359	72	6,563
Finance and Insurance, Real Estate and Rental and Leasing	3,254	785	484	374	375	30	5,302
Retail Trade	6,059	1,814	495	560	205	92	9,225
Construction	5,904	1,796	465	347	88	0	8,600
Professional, Scientific, Technical Services, Information, Educational, Management of Companies and Enterprises	7,089	2,653	1,482	1,305	772	245	13,546
Health Care and Social Assistance	4,577	2,291	857	741	351	154	8,971
Other Services (except Public Administration), Administrative and Support and Waste Management and Remediation Services	9,441	2,830	927	656	292	74	14,220
Accommodation and Food Services, Arts, Entertainment, and Recreation, Agriculture, Forestry, Fishing and Hunting	5,349	3,936	1,969	937	159	23	12,373
Wholesale Trade	1,902	865	635	488	47	109	4,046
<b>Total</b>	<b>46,437</b>	<b>18,592</b>	<b>8,189</b>	<b>6,181</b>	<b>2,648</b>	<b>799</b>	<b>82,846</b>

**Table 8. Distribution of Completed Surveys by NAICS Sector Group and Massachusetts Employee Size Class**

NAICS Sector Group	Estimated Percent of Massachusetts Firms	Percent within MES - Long Version	Percent within MES - Combined Version
Manufacturing, Mining, Quarrying, and Oil and Gas Extraction, Utilities, Transportation and Warehousing	8%	15%	14%
Finance and Insurance, Real Estate and Rental and Leasing	6%	8%	7%
Retail Trade	11%	9%	10%
Construction	10%	7%	8%
Professional, Scientific, Technical Services, Information, Educational, Management of Companies and Enterprises	16%	20%	20%
Health Care and Social Assistance	11%	14%	15%
Other Services (except Public Administration), Administrative and Support and Waste Management and Remediation Services	17%	12%	11%
Accommodation and Food Services, Arts, Entertainment, and Recreation, Agriculture, Forestry, Fishing and Hunting	15%	7%	8%
Wholesale Trade	5%	8%	8%
<b>Massachusetts Employer Size Class</b>			
3 to 9	56%	18%	19%
10 to 24	22%	20%	20%
25 to 49	10%	19%	17%
50 to 199	7%	22%	22%
200 to 999	3%	17%	17%
1000 or more	1%	5%	5%

The second firm level weighting adjustment was equal to the estimated population of firms divided by the weighted survey count of firms within each NAICS sector group by Massachusetts employee size class group. The design weight was multiplied by this adjustment to arrive at the final firm weight. Where there were instances where a specific weighting cell was empty; a final weighting adjustment was made to normalize the number of firms within a Massachusetts size class with empty weighting cells to the total number of firms within the class.

By using the final firm weight in analysis, the survey data now accurately reflect the estimated population of Massachusetts private sector firms with three or more employees.

## **Employee Level Weights**

### **Defining Employee Population Counts**

The population estimates used in weighting the data set to the total number of Massachusetts employees were computed using both the 2018 CBP and the March 2021 BLS Quarterly Census of Employment and Wages. The 2018 data was used to define the distribution of businesses across Massachusetts size classes (since CPB provides firm level counts) while the BLS quarterly survey was used to define the total number of private sector employees. Through these two data sources, an estimated population count of private sector Massachusetts employees was calculated for each NAICS sector group by Massachusetts employee size class strata. The weights are based on 2,858,400 employees in Massachusetts working for private firms with three or more employees.

### **Calculating the Employee Level Weights**

Prior to calculating the employee level weight, it was necessary to transpose the file. Rather than the data file containing one record for each firm, a new file was created where there was one record for each employee. A set of variables was then used to define the characteristics of each employee (whether they were full or part time, whether eligible for health insurance through the firm, and whether enrolled in health insurance through the firm). Firm level variables were appended to each record including the final firm weight in this data set.

The data was weighted by the final firm weight and survey counts of employees obtained within each Massachusetts employee size class by NAICS sector group. The employee level weighting adjustment was equal to the estimated population of Massachusetts employees divided by the weighted survey count of employees within each NAICS sector group by Massachusetts employee size class group. The final firm weight was multiplied by this adjustment to calculate the final employee level weight. Where there were instances where a specific weighting cell was empty, a final weighting adjustment was made to normalize the number of employees within a Massachusetts size class with empty weighting cells to the total number of employees within the class.

By using the final employee level weight in analysis, the survey data now accurately reflect the estimated population of Massachusetts employees working in private firms with three or more employees.

**Plan Level Weights**

The plan level weight is equivalent to the firm level weight. This weight is appended to each record in the plan level file.

**Sample Design Effect**

The overall sample design effect for the 2021 MES were:

- 2.28 for the 2021 MES long version
- 2.20 for the 2021 MES combined version

**Analysis**

Analyses were conducted using the statistical computing package SAS. The firm size classification for these analyses was based on firms’ self-reported number of employees in Massachusetts. Reported measures were checked to ensure internal consistency between question responses. In some cases, the analytical approach for the 2021 MES data differed from past MES data analyses. Table 9 summarizes the population used for specific measures.

**Table 9. Summary of Populations Used for 2021 MES Firm-Based Analysis**

Population	Measures	Reasoning	Data Source
Firms	<ul style="list-style-type: none"> <li>• Offer Rate</li> <li>• Some measures from COVID-19 Impact section</li> </ul>	Firm-level analyses were used when the decision-making power rests with the firm rather than the employee. Since the decisions made by a firm apply to all employees, analyzing these variables at the firm-level is most appropriate.	Combined version

Population	Measures	Reasoning	Data Source
Firms	<ul style="list-style-type: none"> <li>• Number of Health Plan Options Offered by Employer</li> <li>• High-Deductible Health Plan (HDHP) Employer Offering</li> <li>• Decision-making measures</li> <li>• Some measures from COVID Impact section</li> </ul>	Firm-level analyses were used when the decision-making power rests with the firm rather than the employee. Since the decisions made by a firm apply to all employees, analyzing these variables at the firm-level is most appropriate.	Long version
Employees	<ul style="list-style-type: none"> <li>• Eligibility Rate</li> <li>• Coverage Rate</li> </ul>	These analyses apply to all employees regardless of whether they enroll in insurance or not, such as how many employees are eligible or covered by health insurance. While the firm makes the decision to offer insurance, it is the individual employee who is eligible or covered.	Combined version
Covered Employees	<ul style="list-style-type: none"> <li>• Premiums</li> <li>• Deductibles</li> <li>• Out-of-Pocket Max</li> <li>• Copays</li> <li>• Enrollment by Plan Type</li> <li>• Enrollment in HDHPs</li> </ul>	These analyses apply only to individuals that are enrolled in the employer’s plan. Individuals that do not enroll in a plan are not subject to a plan’s premium or cost-sharing requirements, so it is not appropriate to include them in these analyses.	Long version
Eligible Employees	<ul style="list-style-type: none"> <li>• Take-Up Rate</li> </ul>	The eligible employee population was used for only one analysis: take-up rate. Here, the decision about whether or not to enroll in insurance can only be made by those who are eligible to enroll. Thus, we would not want to include all employees, since not all have the ability to decide whether or not to enroll.	Combined version

Where there are comparisons to national data, the national estimates come from the 2021 Kaiser Family Foundation and Health Research & Educational Trust Employer Health Benefits Survey (<https://www.kff.org/health-costs/report/2021-employer-health-benefits-survey/>).