PMRS Earnings Outcome Metrics: Methodology

Overview

The Massachusetts Board of Higher Education (BHE) approved two post-enrollment earnings metrics in December 2018 for inclusion in the Performance Measurement Reporting System (PMRS). The metrics were developed in consultation with the Massachusetts Department of Higher Education's (DHE) data governance bodies and incorporated in PMRS in November 2025. They focus on two distinct cohorts: students who enroll in Massachusetts public higher education immediately after high school, and students who enroll at age 25 or older.

These metrics will provide the public with a basis to begin measuring the economic value of Massachusetts public higher education.

Earnings Data Source and Limitations

The earnings measures are based on a match between Massachusetts public higher education student data from DHE's centralized postsecondary education data warehouse (HEIRS) and quarterly earnings records from the Massachusetts Department of Unemployment Assistance's (DUA) Unemployment Insurance database. Under a data sharing agreement among the Massachusetts education and labor and workforce development agencies, DHE obtains the earnings records from 2010 onward from DUA for individuals who have enrolled in Massachusetts public higher education using a secure matching process providing anonymized records back to DHE.

Key limitations:

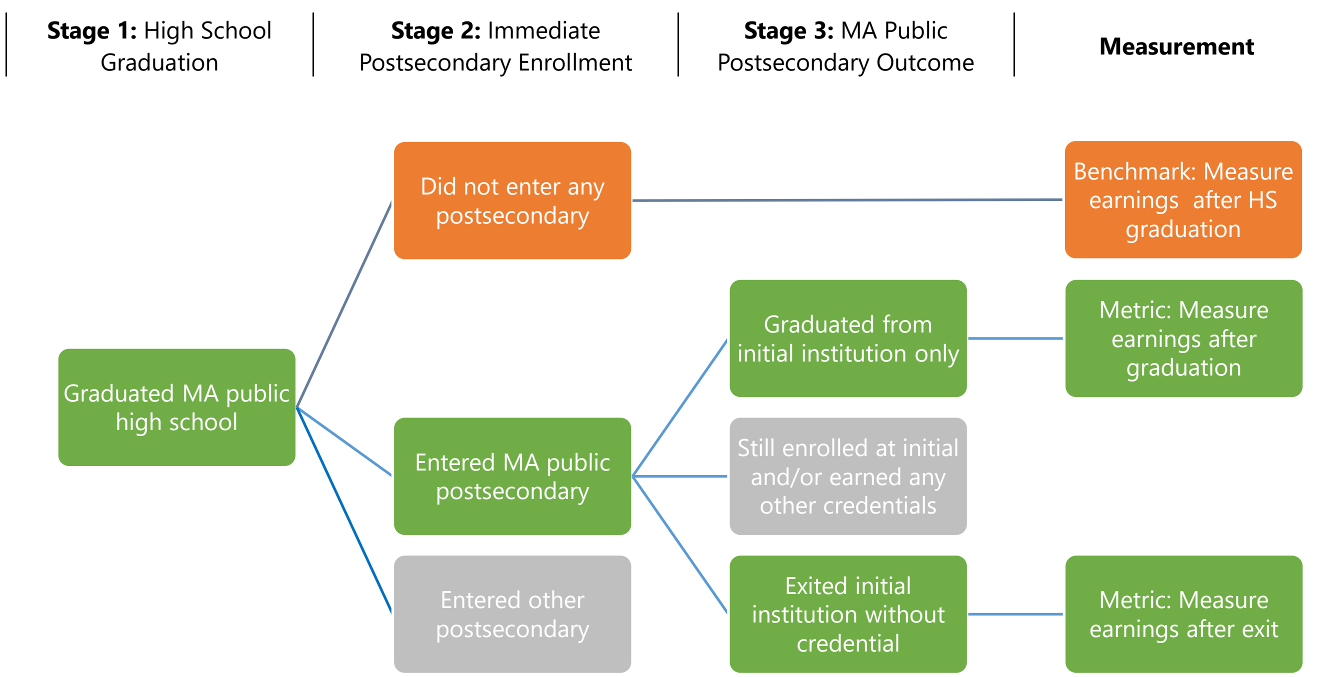
- DUA earnings data are limited to employment within Massachusetts and exclude self-employed individuals, military personnel, federal government workers, and persons employed out of state.
- DUA earnings data are aggregated by industry sector and not available by occupation.
- DUA earnings data are aggregated by quarter and provide no indication of the dates or number of hours worked during said quarter.

Metric: Post-Enrollment Earnings of Students Who Enrolled Immediately After High School

Table 1. Metric Description

Definition	Median annual earnings after (a) completion or (b) last known date of enrollment for students entering Massachusetts public postsecondary education in the immediate fall after graduating from a Massachusetts public high school.
Purpose	To assess the extent to which enrollment and award completion at the institution contribute to earnings gains.
Segment	Community Colleges, State Universities
Comparison/Benchmark	• Benchmark: Median annual earnings of comparable Massachusetts residents who are high school graduates only, from Census Bureau's American Community Survey (5-Year Estimates) • Trend
Data Sources	• DHE's Higher Education Information Resource System (HEIRS) • DESE's Student Information Management System (SIMS) • DUA's Unemployment Insurance (UI) records • National Student Clearinghouse (NSC) records

Diagram 1. Flow Chart of Stages and Outcomes Leading to Earnings Measurement



Whose outcomes are measured?

Stage 1: High School Graduation. The cohort analysis begins with:

- **Graduated MA public high school:** The cohort is limited to students who graduated from Massachusetts public high schools each year, beginning in 2012, according to DESE's Student Information Management System (SIMS).

Stage 2: Immediate Postsecondary Enrollment. The cohort is then divided based on whether they:

- **Did not enter any postsecondary:** This group is intended to represent the benchmark for this metric. DESE's match with DUA wage records is currently under redesign, and comprehensive earnings outcome data on recent MA public high school graduates is not available. When it becomes available, DHE will be able to use earnings outcomes of students who graduate from MA public high schools and do not pursue any postsecondary education as a benchmark for this metric. Until that data becomes available, DHE will use a proxy: average annual earnings of MA residents with only a high school diploma, retrieved from the Census American Community Survey (ACS) 5-Year Estimates Public Use Microdata Sample.
- **Entered MA public postsecondary:** This group includes individuals who enroll in Massachusetts community colleges and state universities as first-time degree-seeking undergraduates in the first fall after MA public high school graduation, and it is broken out further based on subsequent outcomes (see next section). For students entering community colleges, only students who have no prior associate degree or above are included; for students entering state universities, only students having no prior bachelor's degree or above are included.
- **Entered other postsecondary:** This group is excluded from the analysis because reporting on post-enrollment earnings outcomes of students who enter as non-first-time students, or who enter the University of Massachusetts, private, and/or out-of-state postsecondary institutions is out of scope of DHE's data sharing agreement with DUA and/or out of scope of this PMRS metric.

Stage 3: MA Public Postsecondary Outcome. For those students who **Entered MA public postsecondary,** numerous subsequent pathways are possible. For the purposes of this metric, DHE is reporting on the earnings outcomes of individuals who:

1. **Graduated from initial institution only:** Students who initially enrolled at a Massachusetts community college must complete a certificate or associate degree within four years to be included in this outcome group; students who initially enrolled at a Massachusetts state university must complete a bachelor's degree within six years to be included. In addition, these individuals must have no record (from HEIRS or NSC) of earning an additional credential at the same time as or after their enrollment/graduation from their initial MA IHE.
2. **Exited initial institution without credential:** This group includes individuals who are no longer enrolled at their initial institution as of four years after initially enrolling if at a Massachusetts community college, or six years after initially enrolling if at a Massachusetts state university. Similar to the **Graduated from initial institution only** group, these individuals must also have no record (from HEIRS or NSC) of earning a credential anywhere after their enrollment in their initial MA IHE.

These exclusions help to ensure that the metric specifically captures the economic value of enrolling in and earning credits or a credential from the initial institution, without the influence of additional credentials. In addition to the exclusions listed above, within this metric, DHE is not reporting on the individuals who **Entered MA public postsecondary** and are **Still enrolled** as of the four-year mark after initially enrolling at a Massachusetts community college, or the six-year mark after initially enrolling at a Massachusetts state university, even if they earn a credential from their initial institution at a later date.

Tables 2 and 3 illustrate the flow of students through these initial stages and outcomes, using the 2012 high school graduating cohort.

Table 2. Sample Sizes: 2012 High School Graduating Cohort in Stages 1–2

Stage	Outcome	Sample size
Stage 1: High School Graduation	Graduated high school	65,140
Stage 2: Immediate Postsecondary Enrollment	Did not enter any postsecondary	20,185
	Entered MA public postsecondary—community college	10,339
	Entered MA public postsecondary—state university	5,578
	Entered other postsecondary	29,038

Table 3. Sample Sizes: 2012 High School Graduating Cohort in Stage 3

Segment of Enrollment	Stage	Outcome	Sample size
Community Colleges	**Stage 3:** MA Public Postsecondary Outcome • Outcome must be met within four years of initial enrollment	Graduated from initial institution only	2,220
		Exited initial institution without credential	6,934
		Entered an excluded group: Still enrolled, earned multiple credentials, etc.	1,180
State Universities	**Stage 3:** MA Public Postsecondary Outcome • Outcome must be met within six years of initial enrollment	Graduated from initial institution only	3,339
		Exited initial institution without credential	2,146
		Entered an excluded group: Still enrolled, earned multiple credentials, etc.	93

What outcomes are reported?

The outcomes are reported by the fiscal year in which each student graduated or exited and by degree level (certificate, associate, or bachelor's). For the **Graduated from initial institution only** and **Exited initial institution without credential** groups, the median of annual earnings available in the dataset is reported for these points in time after graduation or exit:

- Year 1
- Year 3
- Year 5
- Year 10—to be reported at a future date, when enough years of DUA data are available

Each of those groups' outcomes are compared to the **Did not enter any postsecondary** benchmark. Currently, this benchmark is a proxy, calculated using the U.S. Census Bureau's American Community Survey (ACS) 5-year Public Use Microdata Sample (PUMS).[*] The ACS is an ongoing monthly survey that collects detailed, self-reported housing and socioeconomic data, with data released annually in the form of 1-year and 5-year estimates. Table 4 provides the criteria used to specify the sample for each ACS vintage dating back to 2012.

Table 4. ACS Sample Specification

Criteria	ACS Variable	Value / Condition
Age group	AGEP	Grouped as: 18–20, 21–22, 23–25
Not enrolled in school	SCH	SCH = 1
Employed (civilian)	ESR	ESR = 1 or 2
Resides in Massachusetts	STATE	STATE = 25
Works in Massachusetts	POWSP	POWSP = 25
Education level	SCHL	SCHL = 16 (HS diploma) or 17 (GED)
Minimum wage threshold	WAGP	WAGP > Massachusetts minimum wage (full-time yearly)[†]

[*] Like DHE, the Massachusetts Department of Elementary and Secondary Education (DESE) also has an agreement with DUA to match student and graduate records with the state unemployment insurance database. The methodology for this match is under revision. Once DESE's redesigned matching process is completed and the match rate improves, DHE intends to use DESE's DUA-linked data on Massachusetts public high school graduates to calculate this benchmark.

[†] See Table 9 for more information on the calculation of full-time yearly minimum wage.

Working with these ACS samples, Metropolitan Statistical Areas (MSAs) with similar economies are grouped into one of three tiers:

- Tier 1: Higher-earning regions
- Tier 2: Mid-earning regions
- Tier 3: Lower-earning regions

For each tier, weighted median annual earnings are then calculated using the WAGP variable and the ACS person weight (PWGTP variable) for each ACS vintage, MSA, and age group (18–20, 21–22, 23–25).

These data points are then crosswalked:

- To institutions, based on the MSA/Tier in which they are located;
- To years in the workforce after earning their last educational credential, by mapping 18–20 to Year 1 in the workforce, 21–22 to Year 3, and 23–25 to Year 5; and
- To data year, by mapping the year for which earnings are being measured to the equivalent vintage year of the ACS.

Individuals may move into groups excluded from reporting at any time after their graduation or exit from their initial institution. When this occurs, those individuals' earnings outcomes are excluded from reporting, beginning at the point of transition into an excluded group. For example, an individual whose outcome meets the definition of **Exited initial institution without credential** in Years 1 and 3 will be included in the median earnings calculation for those years. However, if that individual then earns a credential between Years 3 and 5, they will be excluded from the Year 5 median earnings calculation.

To continue the prior example of sample sizes, Table 5 provides the numbers of individuals from the 2012 high school graduating cohort who meet the definition of **Graduated from initial institution only** or **Exited initial institution without credential** as of the Year 1, Year 3 and Year 5 measurement stages.

Table 5. Sample Sizes: 2012 High School Graduating Cohort in Measurement Stage

Segment of Enrollment	Outcome	Year 1 sample size	Year 3 sample size	Year 5 sample size
Community Colleges	Meets definition of "Graduated from initial institution only"	2,218	1,666	1,190
	Meets definition of "Exited initial institution without credential"	6,932	6,767	6,105
State Universities	Meets definition of "Graduated from initial institution only"	3,329	3,161	2,843
	Meets definition of "Exited initial institution without credential"	2,123	1,956	1,494

How are post-enrollment earnings calculated?

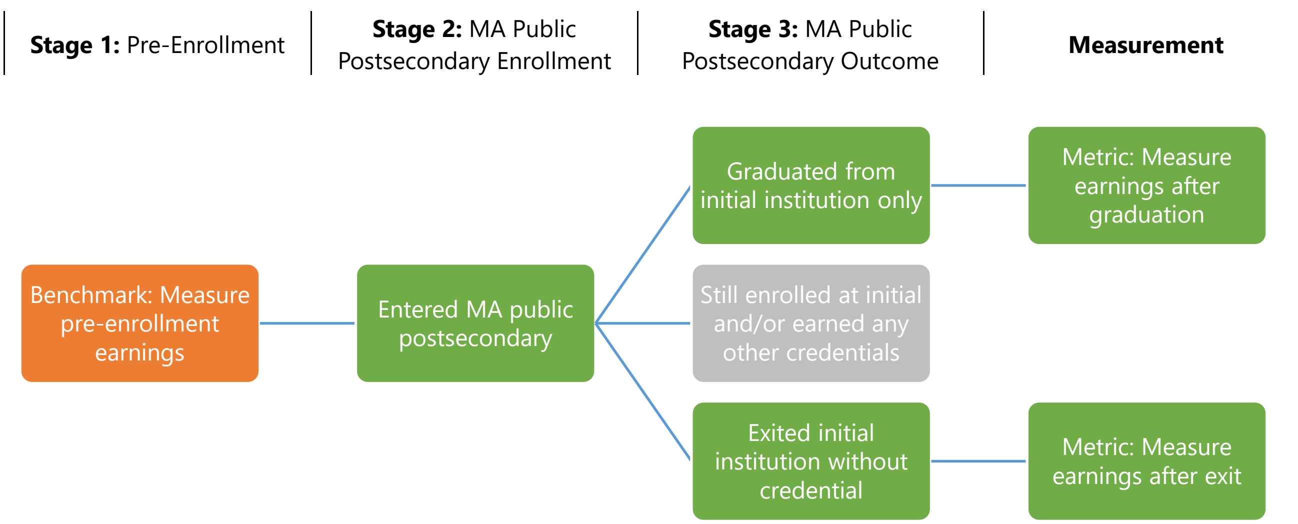
See Calculation of Earnings Outcomes section for this information.

Metric: Post-Enrollment Earnings of Students Who Enrolled at Age 25 or Older

Table 6. Metric Description

Definition	Median annual earnings after (a) completion or (b) last known date of enrollment for Massachusetts residents entering Massachusetts public postsecondary education at age 25 or older.
Purpose	To assess the extent to which enrollment and award completion at the institution contribute to earnings gains.
Segment	Community Colleges, State Universities
Comparison/Benchmark	• Benchmark: Median pre-enrollment earnings of the cohort, based on each member's highest-earning year from the two years prior to enrollment in a public MA IHE • Trend
Data Sources	• DHE's Higher Education Information Resource System (HEIRS) • DUA's Unemployment Insurance (UI) records • National Student Clearinghouse (NSC) records

Diagram 2. Flow Chart of Stages and Outcomes Leading to Earnings Measurement



Whose outcomes are measured?

Stage 1: Pre-Enrollment. The cohort is defined in Stage 2, but for benchmarking purposes, the DUA match includes data on the cohort members' earnings in the two years prior to enrollment, if available, as far back as 2010.

Stage 2: MA Public Postsecondary Enrollment. The cohort includes students who **Entered MA public postsecondary** (specifically Massachusetts community colleges and state universities) as new first-time, new transfer, or readmitted or reactivated students in a fall term. Students in the cohort must be Massachusetts residents and age 25 or older, as of September 1 of the entering fall. For students entering community colleges, only students who have no prior associate degree or above are included; for students entering state universities, only students having no prior bachelor's degree or above are included. The cohort is then broken out further based on subsequent outcomes (see next section).

Stage 3: MA Public Postsecondary Outcome. For those students who **Entered MA public postsecondary,** numerous subsequent pathways are possible. For the purposes of this metric, DHE is reporting on the earnings outcomes of individuals who:

1. **Graduated from initial institution only:** Students who initially enrolled at a Massachusetts community college must complete a certificate or associate degree within four years to be included in this outcome group; students who initially enrolled at a Massachusetts state university must complete a bachelor's degree within six years to be included. In addition, these individuals must have no record (from HEIRS or NSC) of earning an additional credential at the same time as or after their enrollment/graduation from their initial MA IHE.
2. **Exited initial institution without credential:** This group includes individuals who are no longer enrolled at their initial institution as of four years after initially enrolling if at a Massachusetts community college, or six years after initially enrolling if at a Massachusetts state university. Similar to the **Graduated from initial institution only** group, these individuals must also have no record (from HEIRS or NSC) of earning a credential anywhere after their enrollment in their initial MA IHE.

These exclusions help to ensure that the metric specifically captures the economic value of enrolling in and earning credits or a credential from the initial institution, without the influence of additional credentials. In addition to the exclusions listed above, within this metric, DHE is not reporting on the individuals who **Entered MA public postsecondary** and are **Still enrolled** as of the four-year mark after initially enrolling at a Massachusetts community college, or the six-year mark after initially enrolling at a Massachusetts state university, even if they earn a credential from their initial institution at a later date.

Table 7 illustrates the flow of students through these initial stages and outcomes, using the 2012 entering cohort.

Table 7. Sample Sizes: 2012 25+ Entering Cohort Sample Sizes

Segment of Enrollment	Stage	Outcome	Sample size
Community Colleges	**Stage 2:** MA Public Postsecondary Enrollment	Enrolled in a community college	8,696
	Stage 3: MA Public Postsecondary Outcome • Outcome must be met within four years of initial enrollment	Graduated from initial institution only (with one credential)	2,452
		Exited initial institution without credential	5,624
		Entered an excluded group: Still enrolled, earned multiple credentials, etc.	620
State Universities	**Stage 2:** MA Public Postsecondary Enrollment	Enrolled in a state university	1,033
	Stage 3: MA Public Postsecondary Outcome • Outcome must be met within six years of initial enrollment	Graduated from initial institution only (with one credential)	567
		Exited initial institution without credential	429
		Entered an excluded group: Still enrolled, earned multiple credentials, etc.	37

What outcomes are reported?

The outcomes are reported by the fiscal year in which each student graduated or exited and by degree level (certificate, associate, or bachelor's). For the **Graduated from initial institution only** and **Exited initial institution without credential** groups, the median of annual earnings available in the dataset is reported for these points in time after graduation or exit:

- Year 1
- Year 3
- Year 5
- Year 10—to be reported at a future date, when enough years of DUA data are available

The post-enrollment earnings of the group of students who **Graduated from initial institution only** in a given fiscal year are compared with that respective group's pre-enrollment earnings. The post-enrollment earnings of the group of students who **Exited initial institution without credential** in a given fiscal year are compared with that respective group's pre-enrollment earnings.

Individuals may move into groups excluded from reporting at any time after their graduation or exit from their initial institution. When this occurs, those individuals' earnings outcomes are excluded from reporting, beginning at the point of transition into an excluded group. For example, an individual whose outcome meets the definition of **Exited initial institution without credential** in Years 1 and 3 will be included in the median earnings calculation for those years. However, if that individual then earns a credential between Years 3 and 5, they will be excluded from the Year 5 median earnings calculation.

To continue the prior example of sample sizes, Table 8 provides the numbers of individuals from the 2012 entering cohort who meet the definition of **Graduated from initial institution only** or **Exited initial institution without credential** as of the Year 1, Year 3 and Year 5 measurement stages.

Table 8. Sample Sizes: 2012 25+ Entering Cohort in Measurement Stage

Segment of Enrollment	Outcome	Year 1 sample size	Year 3 sample size	Year 5 sample size
Community Colleges	Meets definition of "Graduated from initial institution only"	2,433	2,183	1,902
	Meets definition of "Exited initial institution without credential"	5,600	5,419	5,158
State Universities	Meets definition of "Graduated from initial institution only"	548	528	488
	Meets definition of "Exited initial institution without credential"	419	388	363

How are post-enrollment earnings calculated?

See Calculation of Earnings Outcomes section for this information.

How are pre-enrollment earnings calculated?

See Calculation of Pre-Enrollment Earnings section for this information.

Calculation of Earnings Outcomes

For both metrics, earnings outcomes are calculated in the same manner.

How are the annual earnings measures calculated?

First, DHE determines the date of the person's last outcome before earnings measurement should begin:

- For an individual who **Did not enter any postsecondary**, this is the date of their high school graduation. (These individuals will only appear in Metric: Post-Enrollment Earnings of Students Enrolling Immediately After High School and only when their earnings data become available from DESE. Until then, average annual earnings of Massachusetts residents ages 25–34 who are high school graduates only, from the Census Bureau's American Community Survey, are used as a proxy.)
- For an individual who **Graduated from initial institution only**, this is the date that the credential was awarded.
- For an individual who **Exited initial institution without credential,** this is their last fall or spring term of enrollment. Fall terms are assumed to conclude by December 31 and spring terms are assumed to conclude by June 30.

For each individual appearing in the DUA data, Year 1 earnings are then calculated, beginning with the earnings from the first full quarter after the date described above. The earnings from this quarter and the three subsequent quarters are summed to calculate an annual earnings amount. Year 3 and Year 5 earnings are calculated in the same manner, but exactly two and four years later, respectively. To provide an example, for an individual who exits during/after the Spring 2016 term, which is assumed to conclude by June 30, 2016, earnings measurement begins with the July–September 2016 quarter. While this is Q3 of Calendar Year 2016, it is Q1 of this person's Year 1 earnings. Their full Year 1 earnings are those from July 2016–June 2017. Their Year 3 earnings are those from July 2018–June 2019, and their Year 5 earnings are those from July 2020–June 2021.

Because the DUA earnings data are aggregated at the quarterly level with no indication of the number of hours worked in the quarter, steps are taken to remove seemingly underemployed persons from the dataset. For an individual's annual earnings to be included in the dataset, the person must have earnings in at least three of the four quarters of the measurement year, and their total annual earnings cannot be less than the equivalent of full-time, minimum wage earnings for the same set of four quarters. To calculate this threshold, State Minimum Wage Rate for Massachusetts (Dollars per Hour, Annual, Not Seasonally Adjusted) is extracted from the Federal Reserve Economic Data (FRED) of the Federal Reserve Bank of St. Louis.

Table 9 illustrates the calculation of the minimum wage threshold for an individual whose annual earnings were based on Q3 and Q4 of 2016 and Q1 and Q2 of 2017.

Table 9. Illustration of Minimum Wage Threshold Calculation

Quarter	Massachusetts minimum wage	x hours/week	x weeks/quarter	Quarterly subtotal
2016 Q3	$10/hour	x 40	x 13	$5,200
2016 Q4	$10/hour	x 40	x 13	$5,200
2017 Q1	$11/hour	x 40	x 13	$5,720
2017 Q2	$11/hour	x 40	x 13	$5,720
Individual's annual earnings must be greater than or equal to:				**$21,840 total**

All calculated earnings are then inflation-adjusted at the quarterly level using the Saint Louis Federal Reserve Economic Data (FRED) annual average Consumer Price Index-Urban (CPI-U), and then summed to an annual total.

If any earnings data point is based on fewer than 10 students, it is suppressed due to privacy and validity concerns.

To complete the prior examples of sample sizes, Tables 10 and 11 provide the number of individuals from the described cohorts with earnings available in the final dataset at Year 1, Year 3 and Year 5.

Table 10. Sample Sizes: 2012 High School Graduating Cohort in Measurement Stage, with Earnings Data

Segment of Enrollment	Outcome	Year 1 sample size	Year 3 sample size	Year 5 sample size
Community Colleges	Meets definition of "Graduated from initial institution only," and earnings appear in dataset	617	640	583
	Meets definition of "Exited initial institution without credential," and earnings appear in dataset	1,571	1,245	1,330
State Universities	Meets definition of "Graduated from initial institution only," and earnings appear in dataset	1,882	1,853	1,644
	Meets definition of "Exited initial institution without credential," and earnings appear in dataset	445	371	415

Table 11. Sample Sizes: 2012 25+ Entering Cohort in Measurement Stage, with Earnings Data

Segment of Enrollment	Outcome	Year 1 sample size	Year 3 sample size	Year 5 sample size
Community Colleges	Meets definition of "Graduated from initial institution only," and earnings appear in dataset	1,357	1,126	979
	Meets definition of "Exited initial institution without credential," and earnings appear in dataset	2,484	1,179	1,091
State Universities	Meets definition of "Graduated from initial institution only," and earnings appear in dataset	368	313	278
	Meets definition of "Exited initial institution without credential," and earnings appear in dataset	226	94	79

Calculation of Pre-Enrollment Earnings

For each individual appearing in the DUA data, two years of pre-enrollment earnings are calculated using earnings from the eight full quarters prior to the student's enrollment. As with post-enrollment earnings, for an individual's annual earnings to be included in the dataset, the person must have earnings in at least three of the four quarters of the measurement year, and their total annual earnings cannot be less than the equivalent of full-time, minimum wage earnings for the same set of four quarters.

To create the pre-enrollment benchmark for the **Post-Enrollment Earnings of Students Enrolling at Age 25 or Older** metric, the pre-enrollment earnings are adjusted for inflation, and each person's highest-earning year from the two years prior to enrollment is included in the median calculation for the cohort.