

# Introduction

Over the past several years, Tennessee has prioritized industry-recognized credentials as part of its strategy to ensure students are prepared for success in college and career. An industry-recognized credential is a certification, license or other credential that is conferred by a third-party certifying agency, such as an industry association, occupational association, professional society, or other qualified third party.

At the K-12 level, industry-recognized credentials are incorporated and promoted in the state's K-12 Career and Technical Education ([CTE](#)) [programs of study](#) and are included in Tennessee's [ESSA Ready Graduate](#) indicator and the [A-F School Letter Grades College and Career Readiness](#) indicator. The new [TISA funding formula](#) also provides outcomes bonus funding based, in part, on industry-recognized credential attainment. At the postsecondary level, industry-recognized credentials are often embedded within—or available in conjunction with—programs at [Tennessee Colleges of Applied Technology \(TCATs\) and Community Colleges](#). A key challenge for the state is that there is currently no comprehensive, statewide mechanism to collect postsecondary data on the availability and attainment of industry-recognized credentials.

Tennessee has set ambitious goals through the [Drive to 55](#), expanded postsecondary access through [Tennessee Promise](#) and [Tennessee Reconnect](#), and enacted postsecondary [outcomes-based funding](#) that incorporates job placement. While these and other state policies and programs have increased the emphasis on industry credentials, there is little public information about which credentials students are earning—and the currency each credential carries with Tennessee employers in terms of hiring, career advancement, and wage advantages. In other words, it's unclear whether students/families, employers, educators, and community members have the information they need about which credentials are promoted, earned, and valued in Tennessee's labor market.

[ExcelinEd](#) has partnered with [Lightcast](#) to explore how Tennessee's industry-recognized credentials align with the industry credentials valued by Tennessee employers. This research builds on our previous [Credentials Matter](#) work, providing an updated analysis of the state's current promoted industry credential list, more recent attainment data and a deeper analysis and findings centered in Tennessee's unique context.

Lightcast completed the following stages of work to assess the alignment between supply of and demand for industry-recognized credentials. This document serves as a summary of the methodology used.

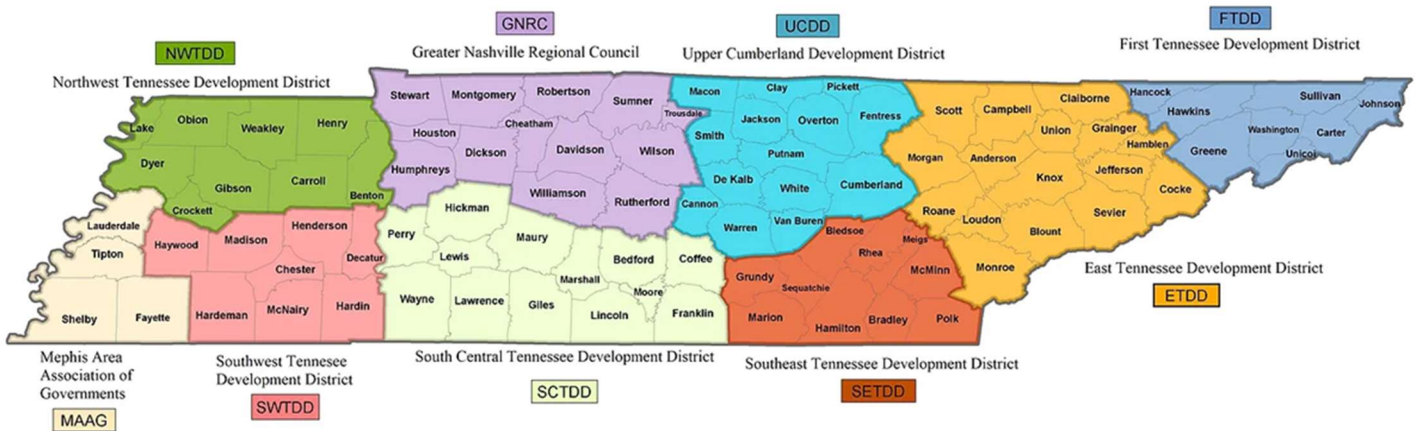
- Collecting and cleaning credential supply data from K-12 and postsecondary institutions to form a statewide and regionally disaggregated master credential list
- Measuring employer demand for earned/promoted credentials through job posting data
- Calculating credential supply data from K-12 and postsecondary institutions
- Assessing alignment between supply and employer demand

# Methodology

Lightcast and ExcelinEd used the following methodology to measure the supply of and demand for credentials in the Tennessee labor market, as well as overall alignment of promoted and earned credentials.

## Geographic coverage

Lightcast conducted the supply and demand analysis at both the state level and the regional level to understand credential alignment across the state of Tennessee. For the purposes of this analysis, the regional level analysis aligns with the nine [Tennessee Development Districts](#), as shown in the map below.



## Collecting and cleaning credential supply data from K-12 and postsecondary institutions to form a statewide and regionally disaggregated master credential list

### Data collection

To create a statewide master list of credentials, Lightcast and ExcelinEd started with the Tennessee Department of Education’s (TDOE) 2023 list of Promoted Industry Credentials for K-12 students, which contained 186 credentials along with program of study, career cluster, tier and graduation year for each credential.

Supplemental research was conducted to:

- Confirm the current list of Promoted Credentials for K-12 students
- Collect lists of industry-recognized credentials promoted and earned at each Community College and Tennessee College of Applied Technology (TCAT) to create a master statewide list of credentials
- Obtain attainment data for both K-12 and postsecondary students

Lightcast and ExcelinEd submitted a data request to the Tennessee Department of Education (TDOE) to confirm the current list of [Promoted Student Industry Credentials](#), as well as obtain credential-level attainment data for K-12 students. This request also asked for information about each Local Education Agency (LEA) to support the regional analysis and qualitative information surrounding the existing process for developing the promoted credential list, as well as making determinations around occupation demand and wage thresholding. TDOE has developed clear criteria to review and [promote industry credentials statewide](#). The process allows for industry credentials to be submitted for review by representatives of the secondary, postsecondary,

workforce, and other governmental agencies. Each credential is evaluated and scored using a rubric, which includes some minimum criteria, as well as criteria around relevance and necessity, external validation, capstone, and workforce validation. If approved, the industry credential is categorized into one of three tiers – Recognized, Valued, or Preferred – and promoted for use in K-12 schools. A description of each tier is provided below:

- **Tier 1 (Recognized):** Industry credentials that are the lowest value credentials. While valuable, employers and industry value these credentials least of the credentials on the list.
- **Tier 2 (Valued):** Industry credentials that are the middle value credentials. Employers and industry value these credentials for the specific skills and knowledge they represent.
- **Tier 3 (Preferred):** Industry credentials that are the highest value credentials. These include credentials that indicate completion of a program or required licenses for employment in certain industries.

Lightcast also conducted direct outreach to each of the 37 community colleges and TCATs across the state to collect lists of promoted/earned industry-recognized credentials and credential attainment data for the 2021-22 school year. This outreach included a short survey to understand each postsecondary institution's data collection process and wage thresholds for industry-recognized credentials. A summary of postsecondary survey responses can be found in the full report.

Of the 37 Tennessee postsecondary institutions, 34 completed the qualitative survey (92%) and 33 submitted credential and attainment data (89%). Among those who submitted credential lists and/or attainment data, data completeness and quality varied significantly. Most postsecondary institutions that participated collect attainment data for at least some licenses and certifications; however, the level of data varies as well as the process by which credential attainment data is reported (e.g., via instructors, credentialing entities, students, etc.). More information on the postsecondary data collection process and survey responses can be found in the appendix. *Note: Not all submissions included complete and comprehensive credential and attainment data. The supply analysis was conducted based on the data provided to Lightcast by each institution.*

#### Data cleaning

Lightcast collected credential names and associated career clusters from K-12 and each postsecondary institution and then mapped each to a clean credential name and a standardized set of career clusters to ensure consistency across submissions.

Credentials were grouped into the following types by Lightcast and ExcelinEd. These categories determine the type of query to use in the employer demand analysis (described below).

- **License:** Licenses are mandated by law for workers to gain permission to practice in specific occupations and must be renewed periodically. Requirements vary by state and/or by licensing agency.
- **Certification:** A certification signals an individual has acquired a set of abilities and, in some cases, allows them to perform a specific job. Certifications are not a legal requirement but may open doors to entry-level jobs or help seasoned workers advance up the career ladder in their field.
- **General Career Readiness:** Measures general foundational workplace skills including basic reading, math, financial and digital literacy, workplace safety and basic life support or first aid. These types of skills are necessary across virtually all occupations.

## Measuring employer demand for earned/promoted credentials through job posting data

### Query job posting text for credentials

Lightcast and ExcelinEd measured employer demand for the credentials compiled above. Employer demand for credentials indicates how well a credential expresses proficiency in a set of knowledge, skills, and abilities in a labor market where job seekers and employers do not have perfect information about each other. In cases where employers are not able to test for those knowledge, skills, or abilities, they might rely on a credential to positively signal that the credential holder has them.

In order to measure employer demand for credentials, Lightcast searched for references to credentials in Tennessee online job postings from May 2021 to May 2023. Lightcast maintains a comprehensive database of millions of job postings and its spidering technology extracts information from more than 50,000 online job boards, newspapers, and employer sites on a daily basis and deduplicates postings for the same job, whether posted multiple times on the same site or across multiple sites. Lightcast extracts information from the job postings including location, employer name, job title, and job text. Job text is then sent through a parsing program to extract skills, degrees, education and experience requirements, advertised salary, and other features.

Lightcast and ExcelinEd used information from the data collection process detailed below to develop search rules that would trigger based on the text of job postings, for each promoted credential offered at the K-12 or postsecondary level. Search rules or queries were scoped based on the three categories of credentials listed above and described below.

- **License:** Job postings were tagged if the title of the job corresponds to the occupation targeted by the license. In cases where a license can be relevant across a range of job titles, such as a Commercial Driver's License or a drone license, search parameters were scoped around the name or possible names of the license.
- **Certification:** Search parameters were scoped deliberately around the name or possible names of a credential. Demand for the credential corresponds to employers explicitly requesting the credential.
- **General Career Readiness:** Because these reflect competency in skills that are not occupation-specific, demand is not reported.

*Unspecified queries.* In some cases, employers are not as precise when requesting credentials as vendors are when naming them. That is, an employer may ask for a ServSafe certification without specifying whether it is the Food Handler certification, the Person In Charge certification, or some other ServSafe certification. In these cases, Lightcast created an "unspecified" category to register demand for the credential but at a level of specificity less granular than what is explicitly conferred. The benefit of this approach is that demand is captured for (1) sets of related credentials where any one credential would not register demand and (2) credentials with "levels" where employers don't reference the level that they require. "Unspecified" credentials or demand may also indicate that an institution did not provide a level of granularity that other institutions did provide, so Lightcast captured "unspecified" demand for whatever level the institution did provide.

*Rolled-up queries.* Some credentials are offered across multiple levels, yet employers do not specify a level when requesting the credential (e.g., "NCCER" - Carpentry Level 1 and Level 2). Further, some credentials are offered by multiple credentialing authorities, yet employers do not specify a preferred provider when requesting the credential (e.g., Certified Coding Specialist credentials are offered by "AAPC" and "AHIMA"). In these cases, employer demand is measured for a "rolled-up" query that does not specify the given level or credentialing authority.

*Signaling value.* The signaling value of a credential represents how well the credential serves as an expression for those knowledge, skills, and abilities in a labor market where job seekers and employers do not have perfect information about each other. In cases where employers are not able to test for certain knowledge, skills, or abilities, they might rely on a credential to positively signal that the credential holder has them. The signaling value is what Lightcast measures by querying our databases of job postings and professional profiles. Lightcast and ExcelinEd established very low thresholds to register employer demand as a proxy for this signaling value (Assessing Alignment, below). The low threshold is meant to capture any sign in job postings that employers recognize and acknowledge a given credential as a signal for job readiness and competency in occupation-specific skills. It is still possible, however, that employers value credentials in the hiring process even if they do not list those credentials on a job posting. This analysis does not measure whether a jobseeker advertising a credential on their *resume*, for example, fares better with employers than an otherwise similar jobseeker who does not.

### Aggregate calculations

Once job postings were tagged with relevant credentials, Lightcast calculated aggregate statistics for each credential. Aggregate statistics include average annual job posting count and average advertised salary by credential. Aggregate statistics were calculated for Tennessee overall and for each Development District.

Average annual job posting count is calculated over a period of two years between May 2021 and May 2023. This period smooths out some year-to-year volatility, is a recent time period, and includes months after most COVID-19 restrictions in Tennessee were lifted.

### Education filters

Lightcast and ExcelinEd aim to measure which credentials lead to jobs that typically do not require a Bachelor's degree or higher. To that end, Lightcast also applied a filter to its job postings where minimum education requested by employers is less than a Bachelor's degree (sub-BA). In the case of a NULL education value from the job postings data, Lightcast replaced it with the [Bureau of Labor Statistics](#) (BLS) typical entry-level education for that occupation.

### Average Advertised Salary

Average advertised salary is calculated over a period of two years from May 2021-May 2023, for all sub-BA job postings with salary information.

### Area Median Income

In order to understand which credentials lead to living-wage jobs, Lightcast and ExcelinEd set a **wage threshold** of 120% of Area Median Income (AMI), which is used throughout the analysis and report. AMI is defined as the midpoint of a specific area's income distribution and is calculated on an annual basis. It provides a helpful benchmark for understanding regional income levels.

Tennessee-specific AMI was calculated based on the state's [Supply and Demand Report](#) (regional median wages are listed in the underlying data download). The threshold of 120% of AMI aligns with the state's TISA funding formula ([Direct Allocations for CTE](#), pending rule revisions), and is the threshold defined in the state's [Perkins V State Plan](#).

For a credential to meet the wage threshold, average advertised salary from job postings must be at or above 120% of Area Median Income (AMI) for the state or respective region (listed below).

Region	120% of Annual Area Median Income (AMI)	
	Annual Wage	Hourly Wage
<b>State of Tennessee</b>	<b>\$45,240</b>	<b>\$21.75</b>
East Tennessee Development District	\$48,578	\$23.35
First Tennessee Development District	\$43,805	\$21.06
Greater Nashville Regional Council	\$46,862	\$22.53
Memphis Area Association of Governments	\$45,677	\$21.96
Northwest Tennessee Development District	\$42,962	\$20.65
South Central Tennessee Development District	\$44,273	\$21.29
Southeast Tennessee Development District	\$44,741	\$21.51
Southwest Tennessee Development District	\$43,805	\$21.06
Upper Cumberland Development District	\$42,619	\$20.49

*Note: Hourly wage is calculated by dividing annual AMI by 2080 hours and is included here for reference purposes.*

## Calculating credential supply data from K-12 and postsecondary institutions

### K-12 Credentials Earned

TDOE provided anonymized student-level data on credential attainment during the 2021-22 school year. Lightcast counted the distinct number of credentials earned for each credential that year.

### Postsecondary Credentials Earned

As described in above, Lightcast conducted direct outreach to each of the 37 community colleges and TCATs across the state to collect credential and attainment data. The postsecondary institutions aggregated the number of credentials earned for each credential that they offered during the 2021-22 school year. Credential names often differed across institutions, so Lightcast and ExcelinEd mapped each to a clean credential name standardized across institutions.

*Aggregations.* There were 862 instances of institutions reporting a non-zero number of students earning a credential at their respective institution (i.e., 862 rows of attainment at the submitted credential name - institution level). In most cases (78% of rows), institutions submitted a credential name that mapped one-to-one with a credential name that could be used in the demand-side analysis (detailed above).

In the remaining cases (22% of rows), an institution reported attainment across multiple *submitted names* that map to a single *clean name*. There are two reasons for the presence of multiple submitted names for the same credential: (1) the submitted names differ by vendor and/or program affiliation or (2) the clean name was created as a “roll up” to better correspond to the manner in which employers reference the credentials in job postings and thereby enable demand-side queries (see the description of *rolled-up queries*, above). For an example of the first case, the Advanced Emergency Medical Technician (AEMT) license can be reported twice under different vendors, the National Registry of Emergency Medical Technicians (NREMT) and the State of Tennessee. For an example of the second case, an institution can submit the number of earners for three separate levels of the NCCER - Millwright certification.

When multiple submitted names correspond to one clean name, summing data across the credential earners category risks double-counting students. In the above case of the AEMT license, the same students are likely being reported to multiple vendors. And in the case of the roll-ups, it is likely that the students who earned the

lower level ‘NCCER – Millwright’ certification are also the students who continued on to earn the higher-level millwright certification. This suspicion is confirmed by the fact that, in many cases, the *same number* of earners were reported across all of the credentials that were grouped together in a roll-up – this was the case in 39% of the instances with multiple submitted names that map to the same credential. To mitigate the risk of double-counting earners, Lightcast took the *higher* of the reported earners across credentials that were rolled up together, by institution. Two illustrative examples are shown below with artificial data.

When the same number of earners are reported across multiple submitted credential names that map to the same clean name, double-counting is avoided by assigning that number to the clean credential name.

Institution Name	Submitted Credential Name	Clean Credential Name	Number of Earners
TCAT A	Millwright Level 1 (Book One)	NCCER - Millwright	20
TCAT A	Millwright Level 2 (Book Two)	NCCER - Millwright	20
TCAT A	Millwright Level 3 (Book Three)	NCCER - Millwright	20



Institution Name	Clean Credential Name	Number of Earners
TCAT A	NCCER - Millwright	20

When there are different numbers of earners across submitted credential names that map to the same clean name, double-counting is avoided by taking the higher of the earner totals.

Institution Name	Submitted Credential Name	Clean Credential Name	Number of Earners
TCAT B	3G TIG Certification	AWS TIG	10
TCAT B	4G TIG Certification	AWS TIG	8



Institution Name	Clean Credential Name	Number of Earners
TCAT B	AWS TIG	10

## Assessing alignment between supply and employer demand

Lightcast assigned each credential to one of five mutually exclusive alignment categories using the relationship between the number of credentials earned and the number of average annual sub-BA job postings requesting that credential. This analysis was conducted at both the statewide and regional levels. These categories are:

- **Aligned:** Not undersupplied or oversupplied. Justifications for the undersupplied and oversupplied categories are provided below.
- **Undersupplied:** Credentials that are requested in at least two-times more average annual job postings than credentials earned (statewide minimum of 100 average annual postings or regional minimum of 25 average annual job postings). The justification for this threshold is that needing to double the earning rate among the graduating class to meet demand represents significant undersupply.
- **Oversupplied:** At least 25 more credentials earned than postings. The justification for this threshold is that one full class of 25 students may find difficulty connecting their earned credential to a job vacancy.
- **Not demanded:** Credentials that are requested in fewer than 100 average annual Tennessee job postings or fewer than 25 regional job postings. The justification for this category is that 100 postings at a statewide level is a very low threshold to register demand.
- **General career readiness:** General career readiness credentials reflect demand for general skills that are not occupation-specific, and which are necessary but insufficient for employment. When an employer references a general career readiness certification, there will be other occupation-specific characteristics that the employer is also seeking. Therefore, for the purposes of this analysis, there can be no meaningful supply-demand assessment for general career readiness credentials.

The analysis also shows how the advertised salary compares to the wage threshold, where appropriate:

- **High-wage:** Credentials that are undersupplied, oversupplied or aligned **and** have advertised wages above the 120% AMI wage threshold.
- **Low-wage:** Credentials that are undersupplied, oversupplied or aligned **and** have advertised wages below the 120% AMI wage threshold.

As seen in graph below, the alignment categories are not particularly sensitive to other mathematical specifications. For the most part, undersupplied credentials are very undersupplied, and oversupplied credentials are very oversupplied.

