Iowa:

Education and Workforce Trends through 2025

With a foreword by Governor of Iowa, Terry E. Branstad and Lieutenant Governor of Iowa, Kimberly K. Reynolds

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IOWA DEPARTMENT OF EDUCATION COMMUNITY COLLEGES

GEORGETOWN UNIVERSITY
Center on Education and the Workforce
McCourt School of Public Policy

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Terry E. Branstad
GOVERNOR

OFFICE OF THE GOVERNOR

Kim Reynolds
LT. GOVERNOR

Building a Future Ready Iowa

Every year, we travel to all 99 counties in Iowa. During our employer visits, we regularly hear about the struggle to find workers with the credentials or other skill sets required to meet job needs. We're working hard to close the skills gap, so our employers have the talent they need to compete in a knowledge-based, global economy.

We're aligning our efforts through numerous statewide initiatives, including Skilled Iowa, Home Base Iowa, and the Governor's STEM Advisory Council, to name just a few. In addition, Iowa has launched several targeted workforce development and education initiatives ranging from growing the number of apprenticeships to creating the most extensive teacher-leadership system in the nation.

Yet, we have more work to do to strategically align our education and workforce systems to empower students and ensure employee success. Toward that end, we are grateful to receive a National Governors Association Talent Pipeline Grant to do that work.

This report by the Georgetown University Center on Education and the Workforce is helping our state set an ambitious target for the share of Iowans who will need education or training beyond high school by 2025. It also provides great insight into industry and occupational trends that will help us identify future workforce development and education needs to support Iowa's economic growth. That includes the growth that we anticipate in the 12 distinct industry clusters identified in Battelle's 2014 "Iowa's Re-Envisioned Economic Development Roadmap."

We truly appreciate the work of the Georgetown University Center on Education and the Workforce and its collaboration with the Iowa Department of Education, Iowa Workforce Development, and other Iowa stakeholders as we work together to craft a shared vision.

We look forward to leveraging this important work to advance Iowa's economic growth and career opportunities for our current and future workforce.

Sincerely,

Terry E. Branstad

Governor of Iowa

Kimberly K. Reynolds

Lieutenant Governor of Iowa

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We wish to thank Jeremy Varner, Paula Nissen, and Pradeep Kotamraju of the Division of Community Colleges, Iowa Department of Education for their excellent assistance with state supply-side dynamics and in calculating rates of credentialing for middle skills in Iowa. We thank Ed Wallace, Ryan Murphy, and Jason Crowley of Iowa Workforce Development and Gail Kotval of the Iowa Development Authority for reviewing the report and providing excellent comments on content and organization. We also thank Linda Fandel of the Iowa Governor's Office for coordinating interagency exchange of information in Iowa and for her thoughtful comments on this report.

Many have contributed their thoughts and feedback throughout the production of this report. That said, all errors, omissions, and views remain the responsibility of the authors.

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Summary

The Georgetown University Center on Education and the Workforce (CEW) in collaboration with the Iowa Department of Education has compiled this report in support of the Iowa Governor's Office projections of long-term education goals. As part of the National Governors Association's work on Iowa's talent pipeline, we have utilized information on industry and occupational trends to identify long-term education goals and workforce development needs that will be necessary to achieve the state's economic development goals. Education needs are based on projections of traditional industry growth, new horizon industries, and forecasts of occupational needs to fill those industries. The education goals serve to inform postsecondary institutions and K-12 schools of the enrollment, completion, and graduation objectives necessary to fill potential job positions, while taking into account net migration of skilled labor from other states. Education projections are also especially important in determining the appropriate future government investments in education and informing government allocations.

By 2025, the Georgetown University Center on Education and the Workforce projects that 68 percent of jobs in Iowa will require education and training beyond high school – 3 percentage points above the national average of 65 percent.[1]

Since the 1980s, education or training beyond high school has become the new minimum threshold for Americans to earn a living wage and attain middle class status. In 1973, only 28 percent of U.S. jobs required education beyond a high school diploma; by 2025, almost two out of three jobs in the nation will require at least some postsecondary education or training. Iowa's economy reflects this national trend and demonstrates a steady increase in the demand for postsecondary education and training in the industries that form the mainstay of the national economy.

1 The 2025 projections presented here largely reflect Georgetown University Center on Education and the Workforce 2020 projections of education and employment in Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020,* 2013. Due to slow growth and protracted economic recovery, we do not foresee 2025 employment trends to be substantively different from our initial 2020 projections.

By education:

The Georgetown University Center on Education and the Workforce's analysis of industry and occupational requirements projects that by 2025 68 percent of jobs in Iowa will require postsecondary education or training beyond high school.

The breakdown is as follows:

- 32 percent of jobs will require a high school diploma or less. These jobs tend to be largely in blue-collar;[2] food service; and some healthcare support occupations. Even in these categories, however, the trend is increasingly toward upskilling, especially for blue-collar production occupations in advanced manufacturing.

- 39 percent of jobs will require at least some college[5] or an Associate's degree. These "middle-skills" jobs may require education and training beyond a high school diploma, but not a Bachelor's degree or above. These include Associate's degrees, postsecondary vocational certificates, occupational licenses and professional certifications, apprenticeship programs, and some college credits. In Iowa, the breakdown of requirements for middle-skill jobs is projected to be:

  > 12 percent Associate's degrees;
  > 5 percent postsecondary vocational certificates;
  > 5 percent occupational licenses and professional certifications;
  > 3 percent apprenticeship programs; and
  > 14 percent some college credits that have market value including noncredit courses with market value.

- 21 percent of jobs will require a Bachelor's degree.

- 8 percent of jobs will require a graduate degree.

2 Blue-collar jobs are those types of jobs defined by tasks that are largely manual in nature. While many blue-collar jobs are distributed across numerous industries, the majority are found in agriculture, manufacturing, quarrying, and construction industries. CEW includes the following categories of both skilled and unskilled occupations as blue collar: farming, fishing, and forestry; construction and extraction; installation, maintenance, and equipment repair; production; and transportation and material moving.

By industry:

Through 2025, Iowa's economy will add nearly 250,000 net new jobs over the 2010 base year:

In terms of both output – contribution to the state's gross domestic product (GDP) – and employment, Iowa's largest industries are manufacturing; healthcare and social assistance; and finance and insurance.

The industries that have the largest numbers of job opportunities and will contribute the most job growth are: healthcare and social assistance (40,000 jobs); finance and insurance (27,000 jobs); and administrative and support and waste management and remediation services (23,000 jobs). Together, these industries will account for close to one in four of all new openings in the state. Healthcare especially has weathered the storm, even during the financial collapse of 2007, and remained one of the few industries that continued to add jobs when others showed decline. For the nation, one in every five dollars spent is devoted to healthcare – a trend that will continue through 2025.

Manufacturing, Iowa's largest industry, will grow substantially, adding nearly 19,000 jobs – an 11 percent increase through 2025.

The fastest-growing industries will be quarrying[3] (33% growth); administrative and support and waste management and remediation services (31% growth); and management of companies and enterprises (30% growth). However, these three industries combined account for just 6 percent of all employment in Iowa. This is not surprising as relatively smaller industries – by number of employees and contribution to state GDP – are often able to grow faster than larger, more mature industries.

By occupation:

Blue-collar jobs will account for nearly 60,000 new jobs, followed by 50,000 new sales and office support jobs, and 40,000 food and personal services jobs.

The fastest-growing jobs will be healthcare support jobs (31% growth); healthcare professional and technical jobs (22% growth); and science, technology, engineering, and mathematics (STEM) jobs (22% growth).

3 This National American Industry Classification System (NAICS) defines the mining, quarrying, and oil and gas extraction industry as a broad category. However, both mining and oil and gas extraction activities are minor in Iowa.

Table 1. By 2025, 68 percent of jobs in Iowa will require at least some education or training beyond high school, making Iowa 18th among the states in the share of jobs that will require postsecondary education or training beyond high school.

Rank	State	Share of jobs (%)	Rank	State	Share of jobs (%)
1	Minnesota	74	26	Maine	66
2	Colorado	74	27	Alaska	66
3	Massachusetts	72	28	Vermont	66
4	North Dakota	72	29	Georgia	65
5	Rhode Island	71	30	South Dakota	65
6	Kansas	71	31	Florida	65
7	Nebraska	71	32	Wyoming	65
8	Oregon	71	33	Ohio	64
9	Illinois	70	34	Oklahoma	64
10	Washington	70	35	Utah	64
11	Michigan	70	36	Delaware	63
12	Connecticut	70	37	New Mexico	63
13	Hawaii	70	38	Pennsylvania	63
14	Montana	69	39	Alabama	63
15	Maryland	69	40	Texas	62
16	New York	69	41	Indiana	62
17	Arizona	69	42	Wisconsin	62
18	**Iowa**	**68**	43	Nevada	62
19	New Jersey	68	44	Kentucky	62
20	New Hampshire	68	45	South Carolina	62
21	Idaho	68	46	Mississippi	61
22	California	67	47	Arkansas	59
23	North Carolina	67	48	Tennessee	59
24	Virginia	67	49	Louisiana	56
25	Missouri	66	50	West Virginia	55
United States		**65**			

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.

2

Job openings and education projections

Between 2010 and 2025, just over two-thirds (68 percent) of job openings in Iowa will require education beyond high school.[4]

Most job openings in management and professional office, STEM, social sciences, education, and healthcare professional and technical occupations will require postsecondary education beyond high school.

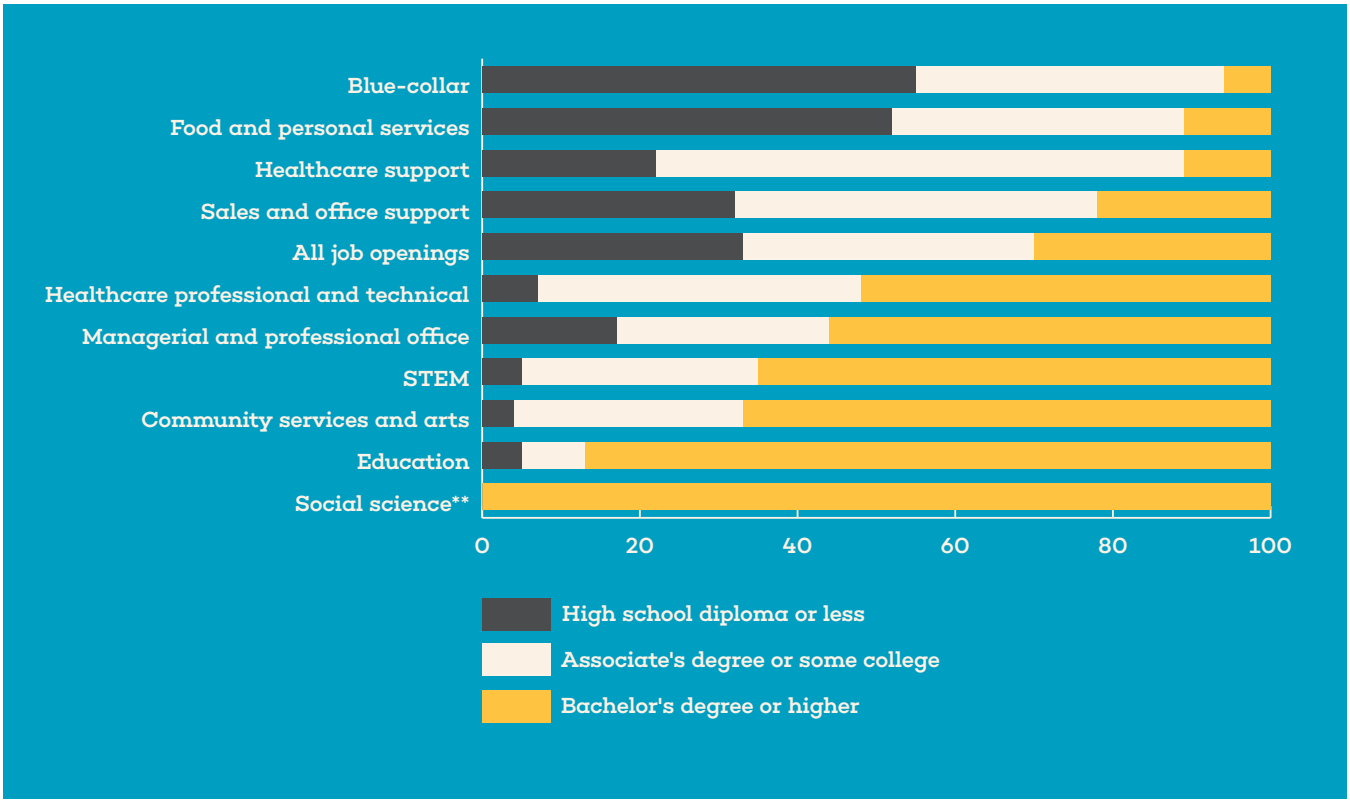
More than two-thirds of jobs in sales and office support occupations will require at least some college education.[5] Forty-five percent of jobs in blue-collar occupations will require postsecondary education or training.

Social sciences, education, community and the arts, and STEM jobs require the most education. A majority of those job openings require a Bachelor's degree or higher. This trend is not surprising for any of these occupations. Jobs in the social science occupations include research work, which often require advanced degrees. Community and arts jobs often involve counselors, therapists, and social and religious workers. Advanced degrees are required for these occupations. STEM jobs (including mathematical occupations, physical science research, and engineering) have traditionally required at least baccalaureate degrees. More recently, however, many STEM jobs have been considered middle-skills and require sub-baccalaureate credentials such as test-based licenses or credentials (the Microsoft Certified Solutions Expert, for example) that require holders to renew at the end of each pre-defined period, and, for software-based certifications, when a new version of the program has been released. This movement in the education demand for STEM jobs has been slow but steady. However, many workers who hold these test-based certifications also have a degree.

4 To analyze workforce needs, CEW determines the occupational composition of each industry and identifies the education requirements associated with those occupations. State data from 1983 on the education distribution of jobs are accessible in the *Current Population Survey (CPS)* from the U.S. Census Bureau, but the data often have very small sample sizes for certain education and occupational groups. As a result, an equivalent model at the state level is limited by data availability. For state-level analysis, CEW takes each state's data in the base year and determines each occupation's rate of education growth using national data. In this way, each state maintains its individual characteristics, while skill-biased technological change and upskilling reflect national trends or national changes in requirements per occupation.

5 "Some college" is an amorphous category that consists of Iowans who've completed a postsecondary vocational certificate, occupational license, professional certification, some college credit, noncredit coursework, or an apprenticeship program. National survey instruments such as the *American Community Survey (ACS)* and the *CPS* are currently changing the way these questions are asked so that more complete information on sub-baccalaureate credentials will become available in the near future.

Figure 1. **Social science, education, community services and arts, and STEM occupations will have the largest shares of jobs that require postsecondary education and training, while blue-collar and food and personal services occupations will offer the most opportunities for workers with a high school diploma or less.**



Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.
**Due to small sample size, data have been suppressed.
Note: Percentages may not sum to 100 percent due to rounding.

3

The future of middle-skill jobs in Iowa

Middle-skill jobs will comprise 39 percent of Iowa's employment. That 39 percent breaks down into these categories:

- Associate's degree holders (12%)
- Certificate holders (5%)[6]
- Workers with a professional certification or occupational license as their only credential beyond high school (5%)
- Workers who completed apprenticeships (3%)
- Workers who completed some college coursework that have market value including noncredit courses with market value, (14%)

Some college is always a difficult category to justify as part of a goal, but it should never be excluded. First, approximately 42 percent of the some-college workforce has at least two years of full-time college credit. Second, market value is the important criterion for deciding whether some college adds value to the individual who decides to pursue it. While we do not dispute the sheepskin effect – where named credentials are highly associated with increases in human capital and wages – national data show that one is better off with some college than no college at all, as long as the student does not incur too much debt financing his or her education. The Organization for Economic Co-operation and Development (OECD)[7] data estimate than an extra year of schooling increases wages by an average of 5.6 percent. Furthermore, workers with some college credit can earn 20 percent more than a high school graduate and 38 percent more than a high school dropout.

These percentage distributions represent our best approximation of middle credentials. It is necessary to approximate for two reasons:

1. Traditional Census Bureau national surveys do not collect data that differentiate between these types of credentials. Furthermore, since these additional sub-baccalaureate categories are important to the state, we deduce their relative contributions from alternative sources. Both the *Survey of Income and Program Participation (SIPP)* and the *Occupational Information Network (O*NET)* databases provide an opportunity to estimate the size of the middle-skill credentials and their contributions to the "some college" category of the education distribution.

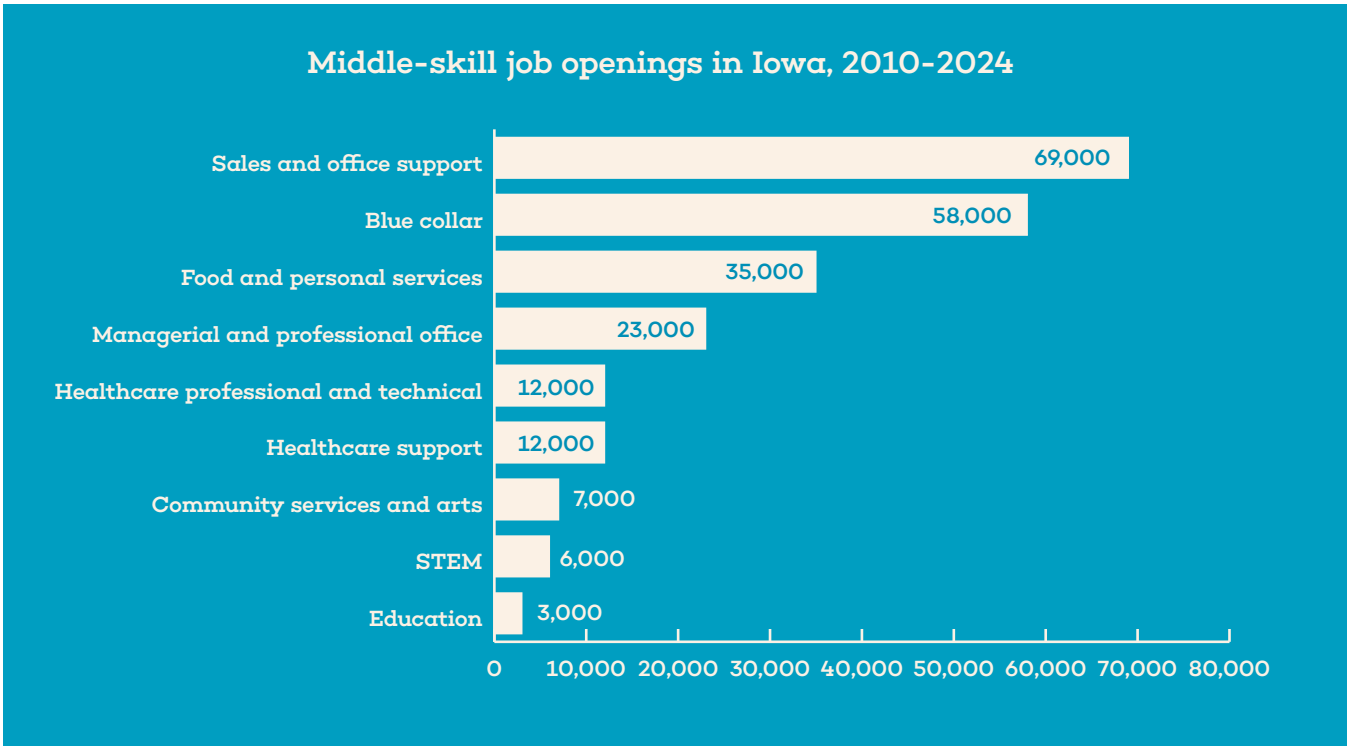
6 This is a rough estimate since many standard government sources that collect data on the education distribution of workers do not isolate specific postsecondary vocational certificates. Both the *ACS* and the *CPS* expect to rectify this deficiency soon. By 2016, data on test-based licenses as a distinct education category will be collected in the *CPS*, while information on postsecondary vocational certificates will be collected by 2017.

7 OECD, *OECD Economic Outlook*, 2014.

2. Many state workforce development agencies and postsecondary institutions collect data on apprenticeships, noncredit education, certificates, certifications and licenses. However, these data are not parsed out as independent categories for the highest education attained. Many individuals hold these credentials concurrently with other postsecondary degrees.

Between 2010 and 2025, 225,000 job openings (37% of all job openings in Iowa) will be in middle-skill jobs. But the share of middle-skill job openings will be much higher in certain occupations – especially healthcare support occupations, where 67 percent of job openings will require some postsecondary education or training but not a Bachelor's degree. Many of the other middle-skill jobs in Iowa are concentrated in the construction and manufacturing sectors of the economy.[8]

Figure 2. Sales and office support occupations and blue-collar occupations will account for more than half of the middle-skill job openings generated by Iowa's economy between 2010 and 2025.



Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.

8 Iowa Workforce Development, *Middle-Skills Jobs in Iowa*, 2013.

In the American education system, the four-year Bachelor's degree is the default educational pathway. However, many good jobs pay a living wage and do not require a Bachelor's degree, but they do require some education or training beyond high school. There are 29 million such jobs in the national economy.[9] In Iowa, there are 400,000 middle-skill jobs that pay at least $35,000 per year; this represents 26 percent of all jobs in Iowa.[10] Forty percent of these jobs pay more than $50,000 annually and 14 percent pay more than $75,000 annually.

There are five pathways to these jobs: two-year Associate's degrees, postsecondary certificates, professional certifications and occupational licenses, apprenticeships, and employer-based training. Another pathway, in which students and trainees take a series of noncredit courses in a narrow range of occupational competencies, has also demonstrated promise.[11]

Associate's degrees

Associate's degrees are postsecondary awards that represent the completion of a course of study; these programs typically require the equivalent of two full-time years of coursework, four semesters, or around 60 college credits:

- Three out of four students enrolled in Associate's degree programs attend community colleges. Most others attend for-profit colleges.
- Slightly more than half of Associate's degree holders have an academic Associate's degree, while slightly less than half have a career-focused Associate's degree.
- Associate's degree holders are more likely than high school graduates to be employed: 77 percent of Associate's degree holders are employed compared to 66 percent of high school graduates.
- Associate's degree holders earn 44 percent more than high school graduates, on average.

9 Carnevale, Jayasundera, and Hanson, *Career and Technical Education: Five Ways That Pay Along the Way to the B.A.*, 2012.

10 Georgetown University Center on Education and the Workforce analysis of *American Community Survey (ACS)*, 2012-2013. The middle-skill jobs that pay a living wage are classified based on an education requirement of less than Bachelor's degree and a median annual wage of $35,000 or more.

11 Booth and Bahr, *The Missing Piece: Quantifying Non-Degree Pathways to Career Success,* 2013.

- Associate's degrees in some fields – such as health sciences, drafting, protective services, and information technology – pay more than some baccalaureate degrees – such as education, arts, and psychology.[12]

Associate's degrees in Iowa are separated into six different categories; Associate of Arts (AA), Associate of Applied Arts (AAA); Associate of General Studies (AGS), Associate of Science (AS), Associate of Applied Science (AAS) and the Associate of Science/Career Option (ASCO). AA degrees and AAS degrees combined account for 86 percent of all Associate's degrees awarded in the state (FY2012). One year after attainment, AAS degrees have, by far, the greatest value, both in terms of adjusted median annual wage ($30,379) and average employment percentage (93.6%).[13]

In Iowa, the share of workers with an Associate's degree is 12 percent, slightly above the national Associate's degree attainment rate.[14] Iowa has a distinctive focus on Associate's degrees as opposed to certificates: 70 percent of sub-baccalaureate awards in Iowa are Associate's degrees, while 30 percent are certificates.[15] Iowa has the third highest Associate's degree share of sub-baccalaureate attainment among the states.

Nursing and industrial technology programs offer the highest median first-year earnings to Iowa community college graduates.[16]

Certificates

Postsecondary certificates are similar to Associate's degrees in that they are awarded by education institutions after the completion of a course of study and are most commonly awarded by community colleges and for-profit colleges. The primary differences between Associate's degrees and certificates are (1) certificates require fewer courses to complete – the majority can be completed in two semesters; (2) they are relatively more common at for-profit colleges; and (3) the coursework in certificate programs features fewer general education courses and more targeted career preparation or training.

12 Georgetown University Center on Education and the Workforce upcoming report on Associate's degrees.
13 Iowa Community Colleges, *Education Outcomes: Certificate, Diploma and Associate Degree Programs,* September 2014.
14 Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey (ACS)* data, 2012-2013.
15 Carnevale, Rose, and Hanson, *Certificates: Gateway to Gainful Employment and College Degrees,* 2012.
16 Iowa Workforce Development, *Iowa's Workforce and the Economy,* 2015.

Nationally:

- Eleven percent of workers report a certificate as their highest educational attainment, which makes them more common than Associate's or graduate degrees in the workforce;
- One million certificates are awarded by postsecondary education and training institutions each year (22% of awards); and
- Certificate holders in many fields earn more than the average Associate's degree holder, and those with information technology certificates earn more than the average baccalaureate degree holder.[17]

Certificates are less prevalent in Iowa than in the rest of the United States. Nine percent of Iowa's workforce have attained a certificate and represent 30 percent of sub-baccalaureate awards in Iowa.[18] Between 2004 and 2013, the number of certificates awarded in Iowa increased from 6,000 a year to 8,000 a year[19], a 33 percent growth rate compared to a national growth rate of 48 percent.[20]

Although Iowa has not utilized certificates to the extent other states have, it ranks seventh nationally in the share of certificates that provide a substantial return on investment. Three out of five certificate holders in Iowa earn at least 20 percent more than the average high school graduate, compared to half of all certificate holders who meet this threshold nationally.[21]

Certifications and licenses

Professional certifications are credentials awarded by private certification bodies – such as industry groups and professional associations – upon the satisfaction of a list of specified criteria, often including earning a passing grade on exams. Occupational licenses are government-issued credentials which legally are required before a worker can perform certain jobs. Certifications are sometimes tied to government regulations that guarantee the right to a specific job title such as a Certified Nursing Assistant.

17 Carnevale, Rose, and Hanson, *Certificates: Gateway to Gainful Employment and College Degrees*, 2012.
18 Ibid
19 Numbers are rounded to the nearest thousand so percentages reflect the original number of certificates.
20 Georgetown University Center on Education and the Workforce analysis of National Center for Education Statistics, *Integrated Postsecondary Education Data System (IPEDS)* data, 2004-2013.
21 Carnevale, Rose, and Hanson, *Certificates: Gateway to Gainful Employment and College Degrees*, 2012.

Certifications are unique postsecondary credentials:

- They are not tied to formal programs of study that feature curricula and commonly have shorter time requirements than those based on credit hours.

- They are highly specialized and tend to reflect specific competencies that relate to narrow career fields.

- They require little involvement from the public sector, though they are sometimes tied to occupational regulations.

- They sometimes influence curriculum decisions within formal postsecondary programs of study, especially in career and technical education programs, even though they are administered outside of education institutions. For example, some community colleges structure their certificate programs to prepare students to pass certification exams in an associated career field.

Certifications and licenses make workers more employable and increase their earnings:

- Certification holders are more likely to be employed than workers without certifications – 81 percent of certification holders are employed, compared to 57 percent of workers without certifications. Certification holders often hold these credentials concurrently with academic degrees.

- Certifications are most in demand in the healthcare industry. They are also in high demand in the professional and business services, information services, and financial services industries.[22]

- In Iowa, 33 percent of workers are licensed, the highest rate of licensure among states (Nevada is second, at 31 percent). Five percent of workers in Iowa are certified, which is lower than the national average of 7 percent.[23]

22 Georgetown University Center on Education and the Workforce upcoming report on certifications and licenses.

23 Kleiner, *Reforming Occupational Licensing Policies,* 2015.

Apprenticeships

Apprenticeships are training programs that combine paid, supervised, on-the-job learning experience with related academic instruction. Apprenticeships are designed to provide individuals with a specific advanced set of skills that meets the particular needs of employers. Apprenticeship programs typically last between three and four years. Some coursework is typically completed as part of the program, generally equivalent to at least one year at a community college.

The Registered Apprenticeship program is a joint initiative of State Apprenticeship Agencies and the Office of Apprenticeship, two separate entities that are housed under the Employment and Training Administration (ETA) within the U.S. Department of Labor. Registered apprenticeship programs facilitate connections among employers, employer associations, and joint labor-management partnerships – together known as sponsors – with job seekers who are interested in learning new skills through the combination of paid on-the-job training and academic instruction. Only 25 percent to 50 percent of all apprenticeships are captured by the registered program.

More than 388,000 Americans are currently obtaining postsecondary education and career skills by participating in Registered Apprenticeship programs. More than 128,000 new apprentices entered, while some 54,000 apprentices graduated from the Registered Apprenticeship system in FY 2011. Apprentices constitute just 0.3 percent of the overall civilian employment base in the United States, or three apprentices per 1,000 employed individuals. Unregistered apprenticeships – which have not been measured precisely – involve between 400,000 and 1.2 million more apprentices in informal, employer-based programs.[24]

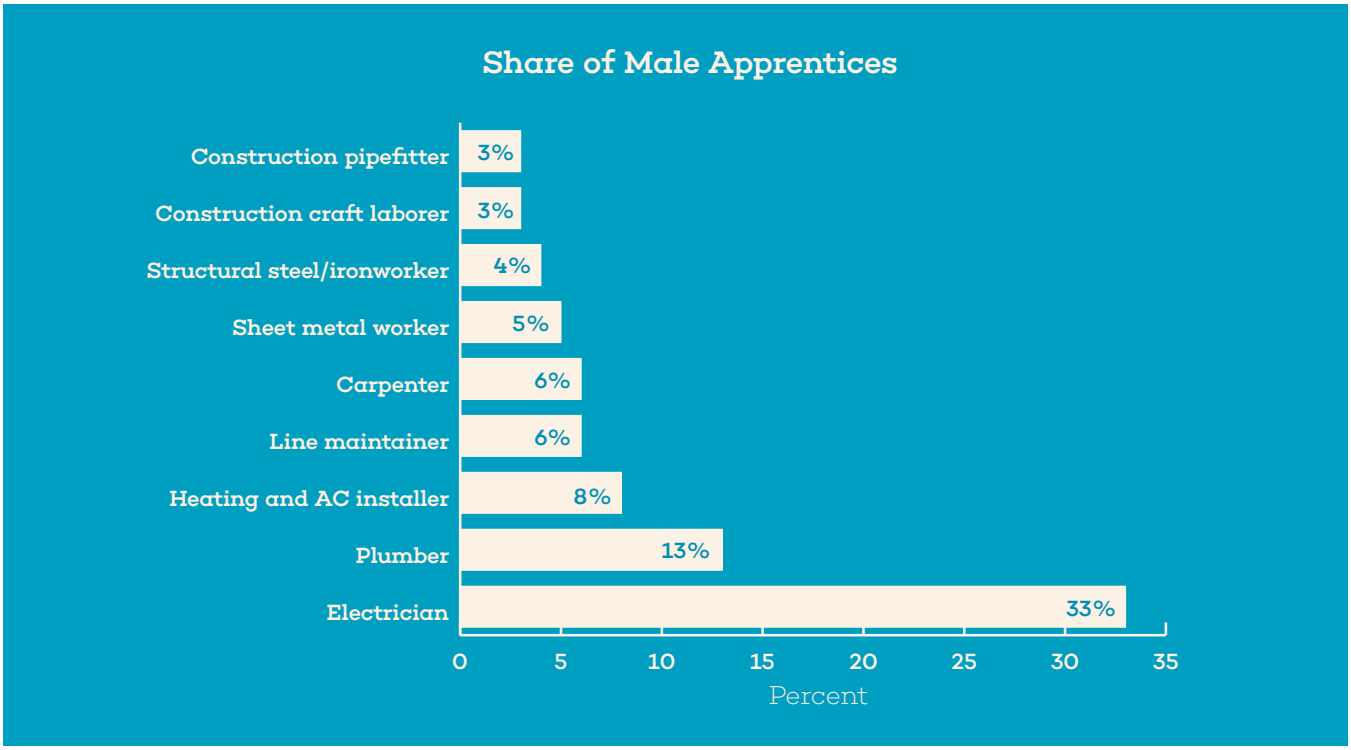
Nationally, we estimate that roughly 5 million workers (3% of all workers) have completed an apprenticeship. More than half of apprentices work in the construction industry and more than 90 percent are men. The most common age group for apprentices is 25-to-34-year-olds; this group represents 43 percent of apprentices.[25]

In May 2014, the Iowa Apprenticeship and Job Training Act was signed into law. The act aims to help training of young workers to fill middle-skill jobs without their having to take on student loan debt.[26]

24 Carnevale, Jayasundera, and Hanson, *Career and Technical Education: Five Ways That Pay Along the Way to the B.A.*, 2012.
25 Ibid.
26 Iowa Workforce Development, *Iowa's Workforce and the Economy*, 2015.

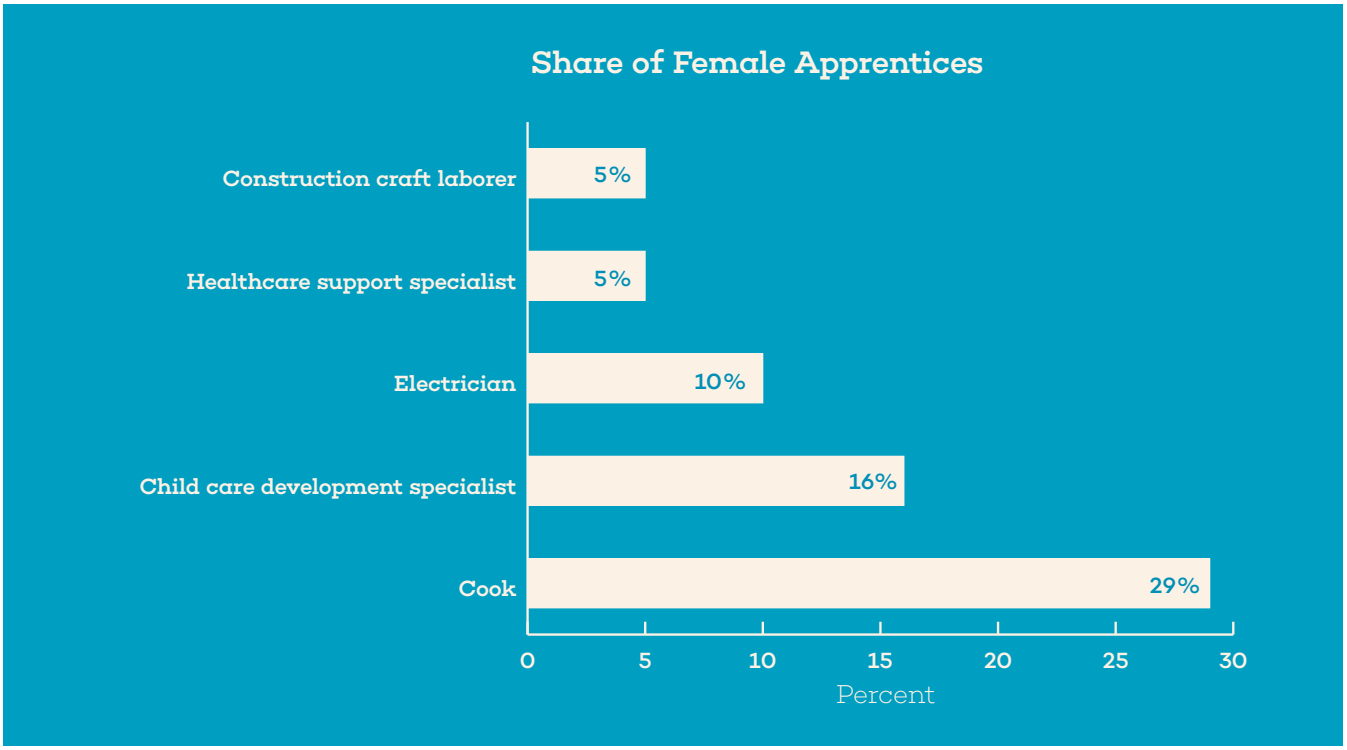
Between 2005 and 2013, nearly 11,000 individuals were registered in Iowa apprenticeship programs. More than 95 percent of participating apprentices were male. Male apprentices tend to concentrate in construction apprenticeships, in areas such as electrician (33%), plumber (13%), and HVAC installer (8%) (Figure 3). Of the active female apprentices between 2005 and 2013, nearly 30 percent participated in cooking apprenticeship programs. Comparatively large percentages of female apprentices also participate in childcare development specialist (16%), electrician (10%), healthcare support specialist (5%), construction craft laborer (5%), and carpenter (3%) programs (Figure 4).

Figure 3. Electrician is the most common apprenticeship program for males in Iowa.*



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Department of Labor's Office of Apprenticeship, 2005-2013.
*Eighteen percent of male apprentices are not included in these figures and fall into non-specified categories.

Figure 4. **Cook is the most common apprenticeship in Iowa for females.***



Source: Georgetown University Center on Education and the Workforce analysis of data from the U.S. Department of Labor's Office of Apprenticeship, 2005-2013.
*Thirty-two percent of female apprentices are not represented in these figures and fall into non-specified categories.

The average hourly starting wage for apprentices in Iowa is $13.02, while the average completion wage is $23.95. This places the average earnings level of Iowa apprenticeship graduates above that of Associate's degree holders. Annually, male apprentices earn $45,900 and female apprentices earn $29,800.[27]

27 2008 earnings adjusted to 2014 dollars using CPI-URS.

Employer-provided training

Each year, U.S. employers spend $177 billion on formal training programs and $413 billion on informal on-the-job training.[28] Employers often hire other businesses, educational institutions, or individuals to train their employees. While employers spend most of their formal training dollars on college-educated workers, they spend 25 percent of their formal training budgets on middle-skill workers and 17 percent on high school graduates.[29]

Employers spend the vast majority of their formal training dollars, 86 percent, on prime-age workers between the ages of 25 and 54. Three industry sectors – finance, insurance, and real estate; transportation, communication, and public utilities; and manufacturing – are among the largest investors in formal training.[30]

Two of these industries – finance, insurance, and real estate and manufacturing – are two of the largest industries in Iowa. In 2013, the manufacturing sector spent more than $25 billion nationally on formal training while the finance, insurance, and real estate industry spent nearly $17 billion nationally.

Iowa has two programs designed to support job training and development for new employees (260E) and existing employees (260F).[31] Together, they are an important part of the state's workforce development efforts. These programs, which are administered through the community colleges, play an essential role in enabling employees to remain current in their training and development so that the businesses they work for remain competitive. Through these public-private partnerships, employer training is provided at little or no cost. The programs are supported through bonds that are repaid using a diversion of a portion of payroll withholding tax revenue. [32]

28 Carnevale, Strohl, and Gulish, *College Is Just the Beginning: Employers' Role in the $1.1 Trillion Postsecondary Education and Training System,* 2015. Formal training involves scheduled regimented learning and commonly follows a curriculum. Informal on-the-job training involves learning in the course of performing ordinary job duties.

29 Ibid.

30 Ibid.

31 260E refers to the Iowa New Jobs Training Program and 260F refers to the Iowa Jobs Training Program. These program codes refer to their funding under Iowa law.

32 Iowa Economic Development Authority and Iowa Department of Education.

Noncredit course clusters

Though economists have long known that individuals who complete higher levels of education earn additional economic returns in the labor market even when there is no credential attached, they have only recently begun to study the systematic course-taking behavior of students and trainees in this domain.

Community colleges offer noncredit courses that are typically short-term and career-focused, driven by the demands of local industry. These courses are sometimes developed to prepare students for certification or licensure exams. Community colleges do not need to submit noncredit courses to the accreditation process in order to qualify for federal financial aid. This provides community colleges the necessary flexibility to ensure their noncredit course offerings are targeted, timely, and relevant.

Recent research in the California Community Colleges System demonstrates that there are positive returns in the labor market for students who complete noncredit coursework. For example, students who complete the equivalent of six credits in water and wastewater technology fields receive a 14 percent increase in wages, which increases to more than 25 percent when they earn the equivalent of 12 credits.[33]

Noncredit courses in Iowa's community college system include a broad array of offerings, including: leisure and recreation classes, adult basic education, and workforce training courses.

In fiscal year 2014, 141,226 students participated in credit courses and programs in Iowa. In the same year, total noncredit enrollment in the state was 241,500.[34] For every enrolled credit student, 1.7 students were enrolled in noncredit courses. Thus, the vast majority of the Iowa community college students were enrolled in the noncredit, continuing education areas.

33 Booth and Bahr, *The Missing Piece: Quantifying Non-Degree Pathways to Career Success*, 2013.
34 Iowa Department of Education, *The Annual Condition of Iowa's Community Colleges 2014: Tables*, 2014.

4

Toward defining career pathways in Iowa

Workers do not typically remain in the same job over their entire careers. In fact, it is not uncommon for individuals to hold more than 10 jobs from entry into the workforce until retirement.

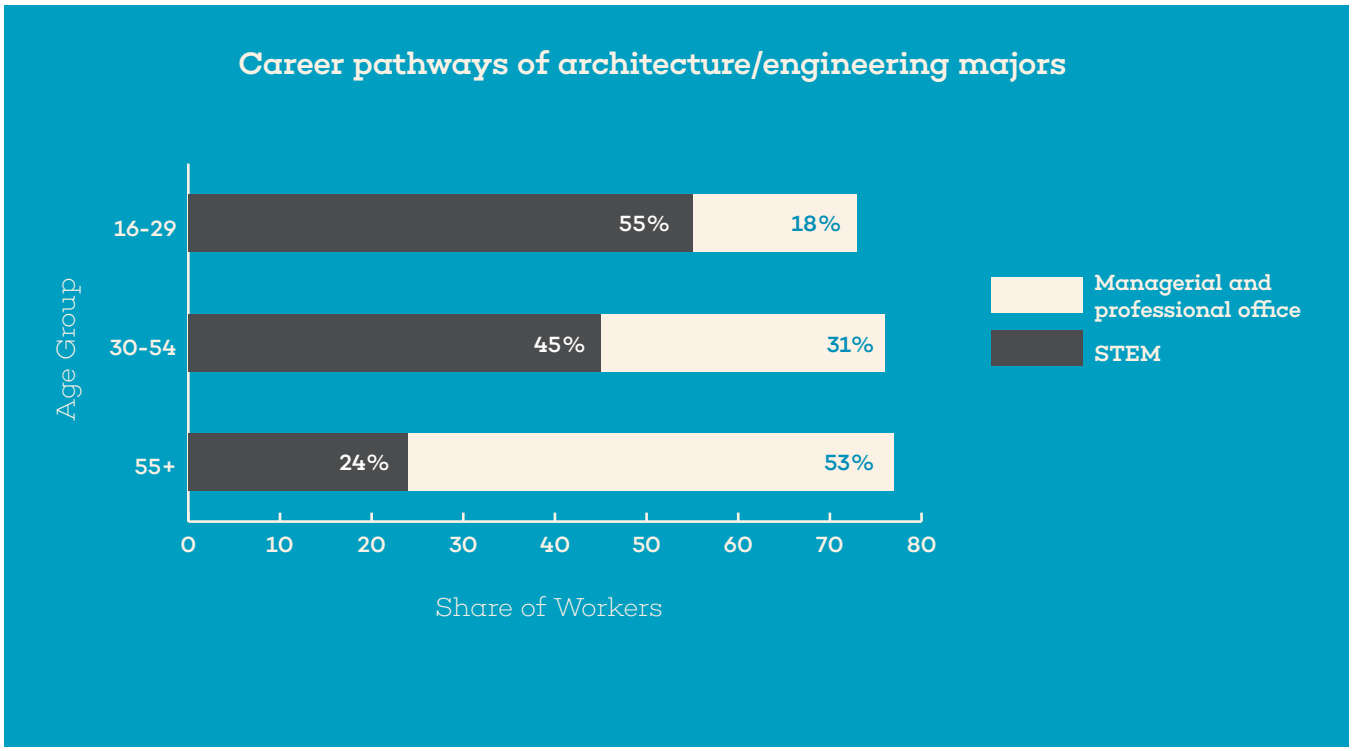
Career pathways, ladders, and lattices refer to upward mobility opportunities within jobs and occupations over time.[35] Typically, these movements would represent a promotion or improvement from one job to the next, and would involve access to new education and training to perform the new job. Career pathways can be reflected in the uniform movement of age cohorts from one occupation to the next. Job movement can also be parallel in nature – that is, the individual's position in the organizational structure does not always involve a promotion or increase in responsibilities or wages.

Typically, workers transition into managerial or supervisory positions as they age and gain experience. Architecture and engineering majors provide a great example of this type of career pathway development. Over the course of their careers, architecture and engineering majors often transition from STEM jobs to management.

Among young Iowans who majored in architecture and engineering, 55 percent work in STEM occupations, while only 18 percent work in managerial and professional office occupations (Figure 5). At prime-age, 45 percent work in STEM and 31 percent in managerial and professional office occupations. By the time architecture and engineering majors in Iowa reach age 55 and older, more than half of them work in managerial and professional office occupations, while only 24 percent work in STEM occupations.

35 We attempt to represent pathways by observing the movement of three different age cohorts within 10 occupations (Appendix 6 has more detailed analysis).

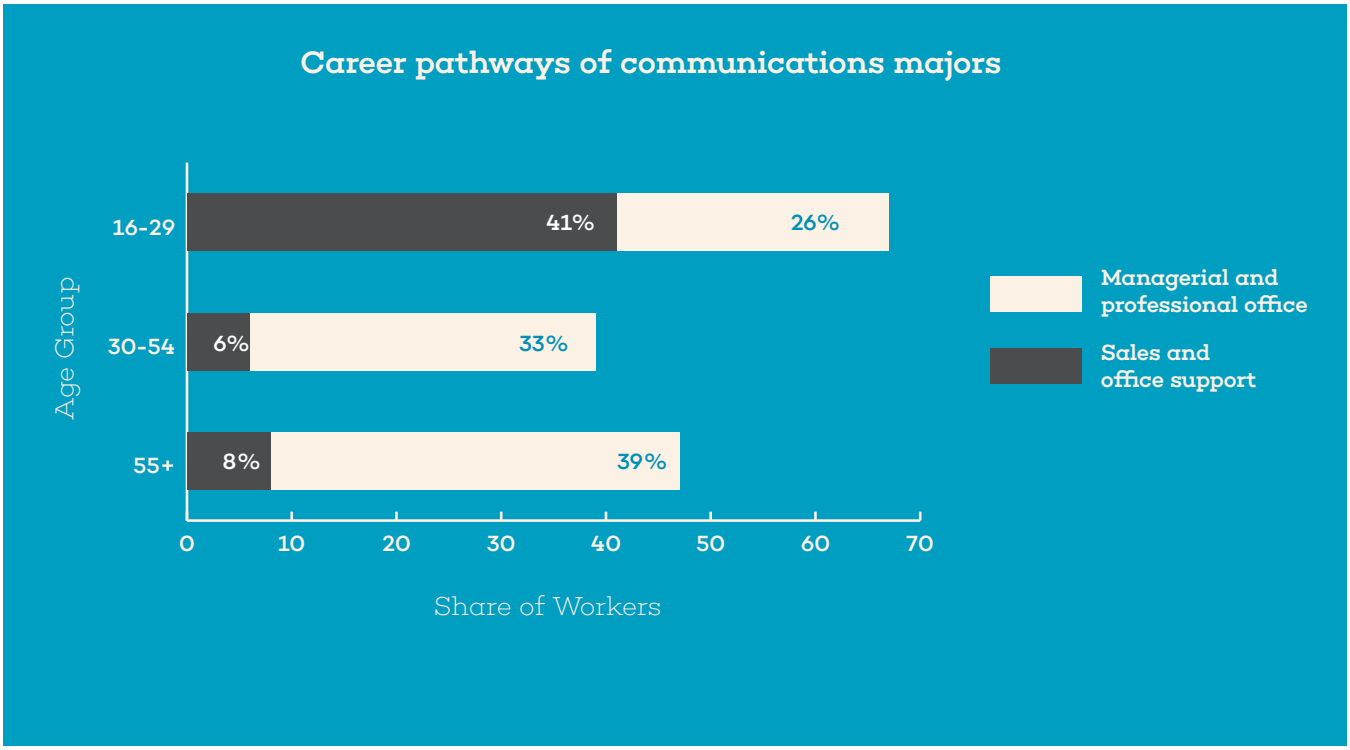
Figure 5. Architecture and engineering majors in Iowa frequently transition from STEM occupations to managerial and professional occupations over the course of their careers.



Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau's *American Community Survey* data, 2012-2013.

Communications majors follow a similar trajectory into managerial and professional office occupations over the course of their careers (Figure 6). They most commonly start out in sales and office support occupations: 41 percent work in these jobs during the ages of 16 to 29. By the middle of their careers, however, only 6 percent work in these jobs, while 33 percent work in managerial and professional office occupations.

Figure 6. Communications majors commonly transition from sales and office support occupations to managerial and professional office occupations over the course of their careers.



Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau's *American Community Survey* data, 2012-2013.

The education and training required to attain these new jobs is important for policymakers to understand, so they know the number of degrees with labor market value needed for the future. To arrive at these estimates, more detailed information by age cohort, by major, by occupation, and by industry is necessary to determine the extent to which certain credentials provide labor market value in the short and long runs. Administrative data – such as student records maintained by community colleges and public universities as well as Unemployment Insurance (UI) wage records – can be used to estimate the number of credentials being produced and the labor market outcomes associated with those credentials and programs of study.

5

Job growth by industry in Iowa – 2010 to 2025

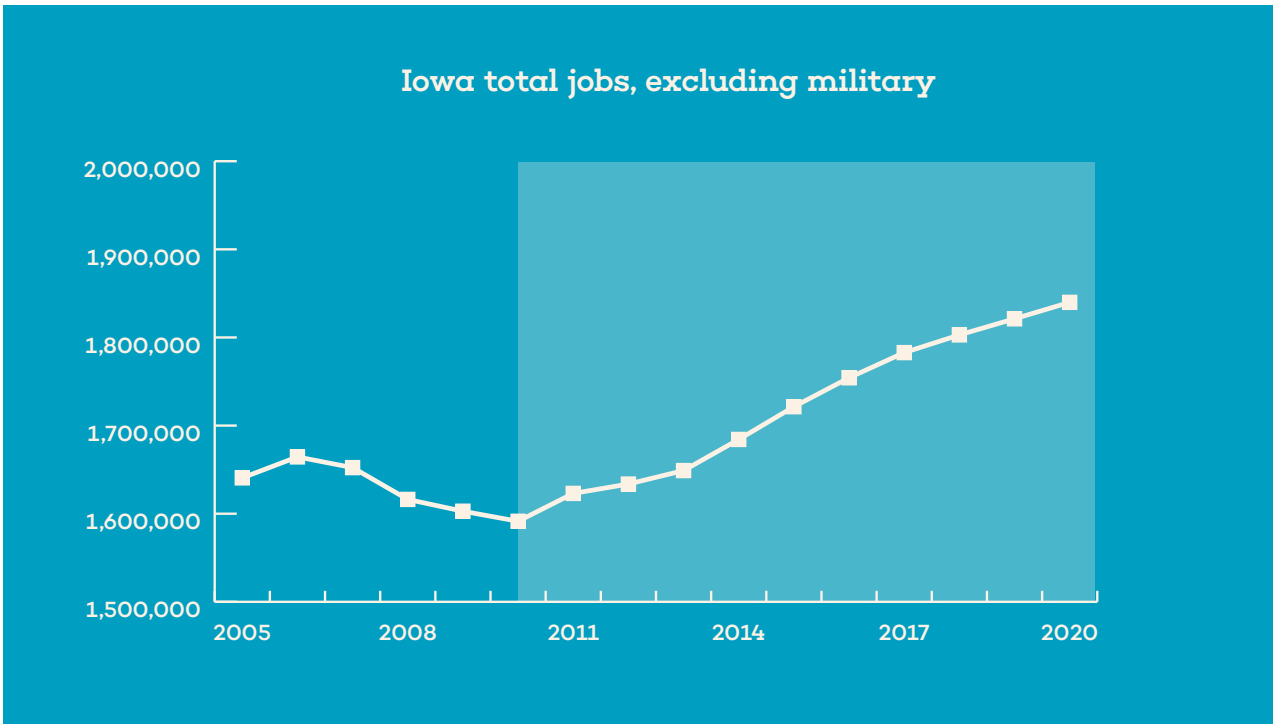
Iowa's economy continues to recover from the Great Recession and experience strong growth in many sectors. In 2014, Iowa's exports expanded by $1.2 billion; construction employment grew by 10 percent; and average home values increased to $157,400.[36] Earnings of Iowa workers improved along with the economy. Between 2010 and 2014, Iowa's per capita income grew from $39,000 to $45,000.[37]

Our projections show that between 2010 and 2025, Iowa's economy will grow from 1.59 million jobs to 1.84 million jobs, an increase of roughly 250,000 net new jobs.[38] Iowa's annual job growth rate of 1.1 percent to 1.3 percent has been marginally slower than the national rate of 1.2 percent to 1.9 percent, but faster than its neighbors in the Midwest.[39] Iowa's pre-recession employment level was 1.66 million. So the economy first has to recover the jobs it lost in the recession before going on to add additional opportunities for unemployed workers and new entrants into the workforce.

Manufacturing is the largest industry in Iowa (Table 2). Though manufacturing nationally contributes a smaller fraction of workers to today's workforce than in its heyday in the 1940s, this industry is still extremely productive. In the 1970s, with 40 percent of workers employed in manufacturing nationally, each manufacturing worker contributed $100,000 (inflation-adjusted) to the manufacturing output. Today, though manufacturing accounts for just 11 percent of national employment, each manufacturing worker contributes $300,000 (inflation-adjusted) to manufacturing output.[40]

36 Iowa Workforce Development, *Iowa's Workforce and the Economy*, 2015.
37 Ibid.
38 CEW's projections are grounded in a macro/micro modeling framework based on industry-led growth that connects to macroeconomic projections of the national economy.
39 Ibid.
40 Carnevale and Rose, *The Economy Goes to College*, 2015.

Figure 7. Iowa employment declined from 1.66 million in 2006 to 1.59 million in 2010; by the end of the forecast horizon, Iowa employment will grow to 1.84 million.*



Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020,* 2013.
* Note, the 2020 projections shown in this figure mimic projections for 2025 due to the depth of the recession and the slow rate of job growth in the protracted recovery.

Manufacturing accounts for both the largest share of output (18% of Iowa's GDP) and the highest share of employment (16%). Today, manufacturing comprises traditional manufacturing, which consists of converting raw materials into finished products for sale on the market (e.g., steel and automobile manufacturing), and advanced manufacturing, which is technology and capital-intensive and highly productive (e.g., aerospace, medical device, and pharmaceutical manufacturing). Nearly one-fourth of Iowa's manufacturing workers have skills or experience in advanced manufacturing.[41] These are excellent precursors for an economy poised to continue to invest in sophisticated manufacturing technology, which is highly productive and pays a good premium to skilled workers.

41 Iowa Workforce Development, *State of Iowa Laborshed Analysis: A Study of Workforce Characteristics,* 2015.

Healthcare and social assistance is the second largest industry in Iowa. It accounts for 7 percent of output and 14 percent of employment. The finance and insurance industry, retail trade, and government also employ significant numbers of Iowans and contribute substantially to the state's GDP.

Table 2. In terms of both output and employment, manufacturing is the largest industry in Iowa.

Industry	Share of GDP (%)	Share of employment (%)
Manufacturing	18	16
Healthcare and social assistance	7	14
Finance and insurance	11	7
Retail trade	6	11
Government	11	3
Real estate and rental and leasing	11	1
Agriculture, forestry, fishing, and hunting	7	4
Educational services	1	10
Construction	4	6
Wholesale trade	6	3
Accommodation and food services	2	5
Transportation and warehousing	3	4
Professional, scientific, and technical services	3	4
Other services, except government	2	4
Administrative and waste management services	2	3
Information	2	2
Utilities	2	1
Arts, entertainment, and recreation	1	1
Management of companies and enterprises	1	<1
Mining	<1	<1
Total	**100**	**100**

Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2012-2013 and the Bureau of Economic Analysis, Gross Domestic Product by State (NAICS GDP) data, 2014.
Note: Column cells may not sum to 100 due to rounding.

Two of the three largest industries in Iowa – healthcare and social assistance and finance and insurance – will add the most jobs over the next 10 years (Table 3). The healthcare and social assistance industry will account for 16 percent of all job growth through 2025, while the finance and insurance industry will account for 11 percent of the job growth. Other industries that will account for a substantial number of new jobs are administrative and support and waste management and remediation services (23,000 jobs); government (23,000 jobs); and manufacturing (19,000 jobs).

Employment in the mining, quarrying, and oil and gas extraction industry will grow by 33 percent, the fastest among industries. The administrative and support and waste management and remediation services (31% growth) and management of companies and enterprises (30% growth) will also experience rapid job growth. The other industries projected to have job growth at rates above 20 percent are finance and insurance; healthcare and social assistance; construction; transportation and warehousing; and arts, entertainment, and recreation.

Table 3. The healthcare and social assistance and finance and insurance industries will account for 68,000 new jobs in Iowa, or 27 percent of new jobs by 2025.

Industry	Employment		Job growth	Growth rate (%)	Share of job growth (%)
	2010	2025			
Healthcare and social assistance	172,500	213,000	40,500	23	**16.2**
Finance and insurance	106,600	133,900	27,300	26	**10.9**
Administrative and support and waste management and remediation services	74,300	97,500	23,200	31	**9.3**
Government	203,300	226,600	23,300	11	**9.3**
Manufacturing	171,200	189,900	18,700	11	**7.5**
Accommodation and food service	97,600	116,000	18,400	19	**7.4**
Construction	84,500	99,700	15,200	18	**6.1**
Transportation and warehousing	65,200	79,500	14,300	22	**5.7**
Construction	58,500	71,900	13,400	23	**5.4**
Retail trade	176,700	189,700	13,000	7	**5.2**
Educational services	38,300	47,000	8,700	23	**3.5**
Real estate and rental and leasing	46,200	54,700	8,500	18	**3.4**
Other services (except public administration)	74,100	80,700	6,600	9	**2.6**
Arts, entertainment, and recreation	28,100	34,200	6,100	22	**2.4**
Wholesale trade	58,400	63,500	5,100	9	**2.0**
Management of companies and enterprises	11,400	14,800	3,400	30	**1.4**
Information	27,100	30,200	3,100	11	**1.2**
Utilities	5,900	6,100	200	3	**0.1**
Mining, quarrying, and oil and gas extraction	3,300	4,400	1,100	33	**0.4**
Agriculture, forestry, fishing, and hunting	88,300	86,700	-1,600	-2	**0.0**
Total	**1,591,400**	**1,839,900**	**248,500**	**16**	**100**

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.

Iowa's top employers are clustered in high-growth industries, especially healthcare and social assistance. The majority of Iowa's top employers are in the healthcare and social assistance, finance, insurance and manufacturing industries

6

Occupational growth – 2010 to 2025

The Georgetown University Center on Education and the Workforce projects that by 2025, 68 percent of all jobs in Iowa will require postsecondary education and training beyond high school. The model that produces these results is historic in nature and employs a macro/micro approach to analyze the state economy. Unemployment levels, inflation rates, and the level of labor force participation must be incorporated into an understanding of the industrial growth necessary to capture this movement in the macro-economy. But it is the occupational changes within industry that allows us to understand the education requirements of the state.

Classifying jobs by occupation better captures the demand for postsecondary education than classifying jobs by industry because occupations are more closely tied to education and training requirements. For example, manufacturing not only comprises engineers and technicians, but also attorneys, accountants, managers, and secretarial staff. The education and training required for competence in each of these occupations are quite distinct from the average of the manufacturing industry.

Appendix 5 illustrates the occupational diversity within the top 20 industry segments in Iowa. For example, more than half of the workers in the hospital sector are employed in healthcare professional and technical occupations; but the industry also employs workers in sales and office support, food and personal services, managerial and professional office, and other occupations. Similarly, the higher education sector employs workers in a range of occupations: 20 percent in sales and office support occupations and 13 percent in managerial and professional office occupations. Only 36 percent of workers employed in the higher education sector work in the education occupations.

By 2025, blue-collar jobs – representing a broad category consisting of production; transportation and material moving; installation, maintenance and repair; and farming, fishing and forestry occupations – will overtake sales and office support jobs as the largest source of employment for Iowans, accounting for 24 percent of new jobs added between 2010 and 2025. After blue-collar, sales and office support jobs (20% of jobs added); food and personal services jobs (16% of jobs added); and managerial and professional office jobs (12% of jobs added) will together account for seven out of 10 new jobs in Iowa between 2010 and 2025.

Healthcare support jobs (31% growth), STEM jobs (22% growth), and healthcare professional and technical jobs (22% growth) will grow the fastest among occupations. STEM and healthcare professional and technical occupations are distinctive for having a significant share of jobs that will require a college degree or some postsecondary education and training beyond high school.

Table 4. Blue-collar jobs will account for 24 percent of job growth in Iowa between 2010 and 2025.

Occupation	Employment		Job growth	Growth rate (%)	Share of job growth (%)
	2010	2025			
Blue collar	395,300	454,600	59,300	15	**24**
Sales and office support	404,200	454,500	50,300	12	**20**
Food and personal services	241,100	281,600	40,500	17	**16**
Managerial and professional office	226,500	257,200	30,700	14	**12**
Healthcare professional/technical	67,100	82,000	14,900	22	**6**
Education	95,800	111,800	16,000	17	**6**
Community services and arts	62,900	74,500	11,600	18	**5**
STEM	50,600	61,500	10,900	22	**4**
Healthcare support	42,700	55,800	13,100	31	**5**
Social science	5,400	6,500	1,100	20	**0**
Total	**1,591,400**	**1,839,900**	**248,500**	**16**	**100**

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.
Note: Column cells may not sum to 100 due to rounding.

7

Estimated job openings

The previous analysis projects employment levels or the total stock of jobs through 2025 by industry and occupation. But job seekers will likely be most interested in the job openings or vacancies that will be available in the coming decade.

Between 2010 and 2025, CEW projects that the Iowa economy will generate 612,000 job openings. These job openings will result from newly created jobs as well as replacement jobs, mostly due to retirement:

- **New job openings** are created by innovation, economic growth, and entrepreneurship.

- **Replacement job openings** occur as workers leave their jobs for various reasons. Baby boomer retirements are expected to be the primary source of replacement job openings through 2025.[42]

Nationally, job openings that result from replacements will outnumber the number of newly created jobs by a 1.5 to 1 ratio. But the ratio varies by occupation; specifically, low-skill occupations have a higher ratio of job openings from replacements to new jobs compared to high-skill occupations. For example, for waitressing jobs, the ratio of job openings from replacements to job openings from new jobs is 13 to 1; for doctors, it is 1 to 1. In other words, job openings from newly created jobs are more likely to be in high-skill occupations.

In Iowa between 2010 and 2025, there will be 77,000 job openings in office and administrative support occupations and 74,000 job openings in sales occupations. Together, these occupations will account for one out of four job openings in the state. Management occupations (53,000 job openings) and production occupations (51,000 job openings) will also generate significant numbers of job openings.

42 "Net replacement jobs" is an estimate of the number of workers leaving an occupation who will need to be replaced by other workers. It often is used to approximate openings stemming from retirements and from the need to replace workers who permanently leave an occupation for other reasons. Age cohort analysis of occupational employment levels by age over time was used to determine job separations or net entrants to each occupational grouping. Replacement needs are based on the assumption that retirees will continue to leave occupations at similar rates in the future and that new entrants will come in at similar rates as well.

Table 5. One out of four job openings generated by 2025 will be in sales and office support occupations.

Occupation group	Job openings, 2010-2025	
	Total	Share (%)
Office and administrative support	77,300	12.6
Sales	73,800	12.1
Management	53,000	8.7
Production	50,900	8.3
Transportation and materials moving	42,300	6.9
Protective services	42,200	6.9
Arts, design, entertainment, sports, and media	37,200	6.1
Construction and extraction	28,800	4.7
Healthcare professional and technical	27,400	4.5
Building and grounds cleaning and maintenance	23,900	3.9
Installation, maintenance, and repair	22,800	3.7
Food preparation and serving-related	20,700	3.4
Healthcare support	18,400	3.0
Financial services	15,300	2.5
Business operations	14,300	2.3
Education, training, and library	14,300	2.3
Architecture	10,600	1.7
Legal	10,400	1.7
Personal care and services	6,900	1.1
Farming, fishing, and forestry	6,500	1.1
Life and physical science	4,400	0.7
Social sciences	3,400	0.6
Computers and mathematical science	3,000	0.5
Engineering	2,200	0.4
Community and social services	2,100	0.3
Total	**612,000**	**100**

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.

8

Conclusion

Economic projections show that skills-based technological change across industries and occupations will support rising demand for postsecondary education and training. By 2025, the Georgetown University Center on Education and the Workforce projects that 68 percent of the jobs in Iowa will require some level of postsecondary education. A key driver is the growing need for workers in healthcare, education, management, STEM, and other high-skill occupations. Many of the largest employers in the state – clustered in healthcare, finance and insurance, manufacturing, and education – need workers with at least some college education. Businesses that relocate to or expand in Iowa will also require an educated workforce. Setting a goal of having 68 percent of the workforce achieve a postsecondary degree, certification, or other industry-recognized credential with labor market value by 2025 would not just be reasonable, given demand-side projections, but also highly supportive of future economic growth in the state.

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Appendix 1. **National projections and why Georgetown Center on Education and the Workplace projections differ from Bureau of Labor Statistics projections.**

All national projections are part of a four-step model that connects national forecasts of the macro-economy to industry projections, occupational projections, and, finally, education projections. CEW's education projections differ significantly from other education demand numbers that are available from other sources such as the Bureau of Labor Statistics (BLS).

For one, the BLS does not project education demand. The agency provides a static estimate of the minimum entry-level education required for a job and multiplies that by the number of jobs in that field. Of course, this number will be extremely small, since it assumes that all jobs in the entire economy (the stock) will demand the minimum entry-level education for a junior position. If one applies these BLS data estimates nationally, one may conclude that less than one-third of all jobs will require postsecondary education and training beyond high school. However, BLS advises against using the data in this way, instead suggesting that each individual occupation should be discussed separately for school guidance and counseling purposes.

Rather than using one measure of education to define an entire field, we use U.S. Census Bureau data to estimate the education demand within occupations. Beginning with 1983, we obtain *Community Population Survey (CPS)* estimates of the education distribution of prime-age workers within occupations. Each of the 25 broadly defined occupational categories contains eight education levels for every year between 1983 and 2010. Using time series autoregressive–moving-average (ARMA) modeling and exponential smoothing, we forecast the distributions 10 years into the future. Each projected education level within an occupation is then connected to the number of jobs in that occupation and collapsed by occupation to obtain education demand for the national economy.

This method has many distinct advantages over alternative methodologies. It:

1. Allows for possible change in the educational distribution across occupation – skills based technical change;

2. Places greater emphasis on most recent observations in determining the distribution on the forecasts; and

3. Creates annual forecasts.

Table A. CEW projects more total jobs by 2025 than the state of Iowa projects.

Industry	Iowa projections	CEW projections	Difference
Educational services	187,000	47,000	*140,000*
Healthcare and social assistance	244,700	213,000	*31,700*
Manufacturing	221,100	189,900	*31,200*
Agriculture, forestry, fishing, and hunting	108,600	86,700	*21,900*
Accommodation and food services	127,300	116,000	*11,300*
Wholesale trade	74,000	63,500	*10,500*
Management of companies and enterprises	22,300	14,800	*7,500*
Retail trade	193,500	189,700	*3,800*
Utilities	6,100	6,100	0
Mining, quarrying, and oil and gas extraction	2,200	4,400	2,100
Information	27,000	30,200	3,300
Transportation and warehousing	75,200	79,500	4,300
Other services (except public administration)	68,900	80,700	11,800
Arts, entertainment, and recreation	22,400	34,200	11,800
Administrative and support and waste management and remediation services	82,500	97,500	15,000
Professional, scientific, and technical services	53,900	71,900	18,000
Construction	80,100	99,700	19,600
Finance and insurance	105,200	133,900	28,700
Real estate and rental and leasing	15,100	54,700	39,600
Government	87,600	226,600	138,900
Total	**1,804,600**	**1,839,900**	**35,300**

Note: Differences shown in *italics* are cases for which Iowa projections for the particular occupation are higher than CEW projections. Columns may not sum to totals due to rounding.
Sources: Labor Force & Occupational Analysis Bureau, Iowa Workforce Development, "Iowa Industry Projections by (2012-2022) by NAICS Code," 2015; and Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.

We project that Iowa will have approximately 1.84 million jobs in 2025; while Iowa projects it will have 1.8 million in 2022. In particular, we estimate there will be a larger number of jobs in government, real estate, and professional, scientific, and technical services, while Iowa projects there will be a larger number of jobs in education.

One of the main differences between the projections is that we include self-employed and unpaid family workers in our projections, while Iowa separates them out. The classification of public education employment also differs between both categories (government employment versus education employment). Another difference is the projection time frame. Iowa projects to 2022. Our initial projections were to 2020. But due to the depth of the recession and slow recovery, our national projection numbers for 2025 are roughly equivalent to our national projections numbers for 2020. Further, our projections also show slowly increasing growth of employment toward the end of the forecast horizon and as a result could possibly account for differences in the projection numbers between 2022 and 2025.

Appendix 2. **Educational distribution of 2025 employment by occupation in Iowa (number)**

Occupation	Less than HS	HS	Some college	Assoc. degree	Bach. degree	Masters degree	Prof.	PhD	Total
Office and administrative support	4,200	74,200	77,900	38,900	33,300	4,000	100	**	232,500
Sales	11,200	58,100	62,800	27,600	58,000	2,800	1,100	500	222,000
Management	2,400	31,000	29,600	16,700	53,000	22,200	2,000	2,300	159,200
Production	24,800	67,300	40,600	10,900	8,400	900	**	**	152,900
Transportation and material moving	14,400	55,500	36,300	14,100	6,900	**	**	**	127,100
Protective services	1,200	21,800	43,800	27,100	31,200	1,900	**	**	126,900
Arts, designs, entertainment, sports, and media	1,500	4,700	11,500	26,300	52,700	11,000	2,400	1,600	111,800
Construction and extraction	9,500	36,300	22,500	11,400	6,600	200	**	**	86,500
Healthcare professional and technical	**	5,200	8,500	25,800	23,100	8,400	8,700	2,900	82,500
Building and grounds cleaning and maintenance	7,800	37,400	13,800	6,800	6,100	**	**	**	71,900
Installation, maintenance, and repair	5,000	25,000	20,000	13,900	4,200	400	**	**	68,500
Food preparation and serving related	11,300	28,400	14,300	5,200	2,400	**	**	500	62,200
Healthcare support	1,300	13,000	23,400	12,000	3,500	500	1,600	**	55,200
Financial services	**	3,200	5,000	4,800	25,200	7,100	700	**	45,900
Business operations	**	7,000	6,800	3,500	21,000	3,900	200	600	43,100
Education, training, and library	**	1,800	1,900	1,100	21,500	13,500	600	2,900	43,100
Architecture	**	**	600	16,600	14,600	**	**	**	31,800
Legal	**	1,300	7,200	3,100	900	1,600	16,500	900	31,400
Personal care and services	400	6,100	7,200	3,600	3,200	200	**	**	20,600
Farming, fishing, and forestry	3,700	7,400	4,400	2,100	1,900	100	**	**	19,600
Life and physical science	**	1,200	1,200	1,000	3,200	1,600	400	4,500	13,200
Social sciences	**	**	**	**	700	4,200	**	5,400	10,300
Computers and mathematical science	**	400	1,900	1,500	3,900	1,400	**	**	9,000
Engineering	**	400	900	800	3,600	800	**	100	6,500
Community and social services	**	400	800	200	2,800	1,900	100	**	6,200
Total	**98,700**	**487,100**	**442,900**	**275,000**	**391,900**	**88,600**	**34,400**	**22,200**	**1,839,800**

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.
**Due to insufficient sample size of workers with this level of education in the particular occupation in the labor force surveys, the specific number of jobs in 2025 cannot be projected.

Appendix 3. **Educational distribution of 2025 employment by occupation in Iowa (percent)**

Occupation	Less than HS (%)	HS (%)	Some college (%)	Assoc. degree (%)	Bach. degree (%)	Master's degree (%)	Prof. (%)	PhD (%)	Total %
Office and administrative support	1.8	31.9	33.5	16.7	14.3	1.7	0.0	**	**100**
Sales	5.0	26.2	28.3	12.4	26.1	1.3	0.5	0.2	**100**
Management	1.5	19.5	18.6	10.5	33.3	13.9	1.3	1.4	**100**
Production	16.2	44.0	26.6	7.1	5.5	0.6	**	**	**100**
Transportation and material moving	11.3	43.7	28.6	11.1	5.4	**	**	**	**100**
Protective services	0.9	17.2	34.5	21.4	24.6	1.5	**	**	**100**
Arts, designs, entertainment, sports, and media	1.3	4.2	10.3	23.5	47.1	9.8	2.1	1.4	**100**
Construction and extraction	11.0	42.0	26.0	13.2	7.6	0.2	**	**	**100**
Healthcare professional and technical	**	6.3	10.3	31.3	28.0	10.2	10.5	3.5	**100**
Building and grounds cleaning and maintenance	10.8	52.0	19.2	9.5	8.5	**	**	**	**100**
Installation, maintenance, and repair	7.3	36.5	29.2	20.3	6.1	0.6	**	**	**100**
Food preparation and serving related	18.2	45.7	23.0	8.4	3.9	**	**	0.8	**100**
Healthcare support	2.4	23.6	42.4	21.7	6.3	0.9	2.9	**	**100**
Financial services	**	7.0	10.9	10.5	54.9	15.5	1.5	0.0	**100**
Business operations	**	16.2	15.8	8.1	48.7	9.0	0.5	1.4	**100**
Education, training, and library	**	4.2	4.4	2.6	49.9	31.3	1.4	6.7	**100**
Architecture	**	**	1.9	52.2	45.9	**	**	**	**100**
Legal	**	4.1	22.9	9.9	2.9	5.1	52.5	2.9	**100**
Personal care and services	1.9	29.6	35.0	17.5	15.5	1.0	**	**	**100**
Farming, fishing, and forestry	18.9	37.8	22.4	10.7	9.7	0.5	**	**	**100**
Life and physical science	**	9.1	9.1	7.6	24.2	12.1	3.0	34.1	**100**
Social sciences	**	**	**	**	6.8	40.8	**	52.4	**100**
Computers and mathematical science	**	4.4	21.1	16.7	43.3	15.6	**	**	**100**
Engineering	**	6.2	13.8	12.3	55.4	12.3	**	1.5	**100**
Community and social services	**	6.5	12.9	3.2	45.2	30.6	1.6	**	**100**

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.
**Due to insufficient sample size of workers with this level of education in the particular occupation in the labor force surveys, the specific percentage of jobs in 2025 cannot be projected.
Note: Row cells may not sum to 100 due to rounding.

Appendix 4. **Job openings by occupation in Iowa, 2010-2025**

Occupation	Job openings, 2010-2025	
	Number	Share (%)
Blue-collar	**151,300**	**24.7**
Production	50,900	8.3
Transportation and material moving	42,300	6.9
Construction and extraction	28,800	4.7
Installation, maintenance, and repair	22,800	3.7
Farming, fishing, and forestry	6,500	1.1
Sales and office support	**151,100**	**24.7**
Office and administrative support	77,300	12.6
Sales	73,800	12.1
Food and personal services	**93,700**	**15.3**
Protective services	42,200	6.9
Building and grounds cleaning and maintenance	23,900	3.9
Food preparation and serving-related	20,700	3.4
Personal care and services	6,900	1.1
Managerial and professional office	**93,000**	**15.2**
Management	53,000	8.7
Financial services	15,300	2.5
Business operations	14,300	2.3
Legal	10,400	1.7
Community services and arts	**39,300**	**6.4**
Arts, design, entertainment, sports, and media	37,200	6.1
Community and social services	2,100	0.3
Healthcare professional and technical	**27,400**	**4.5**
STEM	**23,600**	**4**
Computers and mathematical science	3,000	0.5
Architecture	10,600	1.7
Engineering	2,200	0.4
Life and physical science	4,400	0.7
Healthcare support	**18,400**	**3**
Education, training, and library	**14,300**	**2.3**
Social sciences	**3,400**	**0.6**
Total	**612,000**	**100**

Source: Carnevale, Smith, and Strohl, *Recovery: Job Growth and Education Requirements through 2020*, 2013.
Note: Column cells may not sum to total due to rounding.

Appendix 5. **Distribution of occupations in top 20 industries by employment in Iowa**

Rank by size	Industry	Occupation				
		Managerial and professional office (%)	STEM (%)	Social science (%)	Education (%)	Community services and arts (%)
1	Construction	12	2	0	0	1
2	Elementary and secondary schools	5	0	1	67	2
3	Hospitals	7	4	1	1	2
4	Restaurants and other food services	15	0	0	0	0
5	Colleges, universities, and professional schools, including junior colleges	13	6	0	36	7
6	Insurance carriers and related activities	31	10	0	0	0
7	Grocery stores	1	0	0	0	1
8	Nursing care facilities	5	0	0	0	2
9	Crop production	68	1	0	0	0
10	Banking and related activities	44	6	0	0	0
11	Truck transportation	7	0	0	0	0
12	Animal production and aquaculture	54	0	0	0	0
13	Department stores and discount stores	1	0	0	0	0
14	Child day care services	5	0	0	17	0
15	Agricultural implement manufacturing	19	21	0	0	0
16	Animal slaughtering and processing	11	1	0	4	0
17	Justice, public order, and safety activities	6	3	1	0	7
18	Other amusement, gambling, and recreation industries	7	1	0	2	5
19	Outpatient care centers	6	0	0	0	9
20	Individual and family services	19	0	0	2	34

Appendix 5 (cont.). **Distribution of occupations in top 20 industries by employment in Iowa**

Rank by size	Industry name	Occupation					
		Healthcare professional and technical (%)	Healthcare Support (%)	Food and personal services (%)	Sales and office support (%)	Blue-collar (%)	Total %
1	Construction	0	0	1	6	78	100
2	Elementary and secondary schools	1	0	12	6	5	100
3	Hospitals	51	11	6	17	2	100
4	Restaurants and other food services	0	0	73	9	3	100
5	Colleges, universities, and professional schools, including junior colleges	1	0	12	20	3	100
6	Insurance carriers and related activities	1	0	1	55	1	100
7	Grocery stores	2	0	15	69	11	100
8	Nursing care facilities	27	44	15	3	3	100
9	Crop production	0	0	0	4	26	100
10	Banking and related activities	0	0	1	48	1	100
11	Truck transportation	0	0	0	17	75	100
12	Animal production and aquaculture	0	0	1	1	43	100
13	Department stores and discount stores	0	0	3	87	9	100
14	Child day care services	0	0	76	1	1	100
15	Agricultural implement manufacturing	0	0	0	11	48	100
16	Animal slaughtering and processing	0	0	7	5	71	100
17	Justice, public order, and safety activities	2	0	58	17	1	100
18	Other amusement, gambling, and recreation industries	0	0	69	11	4	100
19	Outpatient care centers	38	16	4	26	2	100
20	Individual and family services	1	3	30	10	1	100

Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2012-2013.
Note: Row cells may not sum to 100 due to rounding.

Appendix 6. **Career Pathways in Iowa**

Table A. Distribution of employment in Iowa by major and occupation, 16-to-29-year-olds

Major	Occupation				
	Managerial and professional office (%)	STEM (%)	Social science (%)	Community services and arts (%)	Education (%)
Agriculture and natural resources	27	14	0	2	9
Architecture and engineering	18	55	0	1	10
Arts	8	0	0	13	22
Biology and life sciences	9	15	0	0	26
Business	44	5	0	2	3
Communications	26	4	0	16	3
Computers, statistics, and mathematics	19	46	0	0	21
Education	2	2	0	4	72
Health	9	6	0	0	6
Humanities and liberal arts	21	7	0	6	13
Industrial arts, consumer services, and recreation	9	1	0	7	22
Law and public policy	5	3	0	1	1
Physical sciences	27	27	0	0	7
Psychology	10	3	6	31	8
Social sciences	39	5	0	5	3

Table A (cont.). Distribution of employment in Iowa by major and occupation, 16- to-29-year-olds

Major	Occupation					
	Healthcare professional and technical (%)	Healthcare support (%)	Food and personal services (%)	Sales and office support (%)	Blue-collar (%)	Total (%)
Agriculture and natural resources	1	0	11	15	20	100
Architecture and engineering	0	0	1	7	8	100
Arts	0	1	21	23	13	100
Biology and life sciences	22	5	8	11	3	100
Business	1	0	7	34	4	100
Communications	2	0	7	41	0	100
Computers, statistics, and mathematics	1	0	2	4	6	100
Education	1	0	8	10	2	100
Health	53	4	8	13	0	100
Humanities and liberal arts	2	0	10	35	4	100
Industrial arts, consumer services, and recreation	5	0	20	29	7	100
Law and public policy	6	0	39	24	19	100
Physical sciences	12	0	3	21	4	100
Psychology	11	2	9	16	4	100
Social sciences	1	0	15	28	4	100

Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2012-2013.
Note: Row cells may not sum to 100 due to rounding.

Table B. Distribution of employment in Iowa by major and occupation, 30-to-54-year-olds

Major	Occupation				
	Managerial and professional office (%)	STEM (%)	Social science (%)	Community services and arts (%)	Education (%)
Agriculture and natural resources	44	8	1	4	
Architecture and engineering	31	45	2	5	2
Arts	17	3	26	18	2
Biology and life sciences	11	16	1	6	48
Business	54	6	0	3	1
Communications	33	5	17	7	2
Computers, statistics, and mathematics	26	39	1	14	3
Education	15	2	2	63	1
Health	15	2	0	5	65
Humanities and liberal arts	25	8	6	11	2
Industrial arts, consumer services, and recreation	28	2	7	7	3
Law and public policy	34	0	9	3	8
Physical sciences	19	26	1	13	25
Psychology	33	1	7	8	12
Social sciences	50	6	2	8	3

Table B (cont.). Distribution of employment in Iowa by major and occupation, 30- to 54-year-olds

Major	Occupation					
	Healthcare professional and technical (%)	Healthcare support (%)	Food and personal services (%)	Sales and office support (%)	Blue-collar (%)	Total (%)
Agriculture and natural resources	0	5	16	18	0	100
Architecture and engineering	0	1	7	8	0	100
Arts	0	7	15	10	0	100
Biology and life sciences	1	1	13	3	0	100
Business	0	4	24	8	0	100
Communications	0	0	29	6	0	100
Computers, statistics, and mathematics	0	2	11	5	0	100
Education	0	3	10	3	0	100
Health	3	2	5	2	0	100
Humanities and liberal arts	0	9	27	10	1	100
Industrial arts, consumer services, and recreation	0	16	24	15	0	100
Law and public policy	0	19	17	8	0	100
Physical sciences	0	2	8	5	0	100
Psychology	3	6	21	2	6	100
Social sciences	0	5	21	5	0	100

Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2012-2013.
Note: Row cells may not sum to 100 due to rounding.

Table C. Distribution of employment in Iowa by major and occupation, workers 55 and over

Major	Occupation Group				
	Managerial and professional office (%)	STEM (%)	Social science (%)	Community services and arts (%)	Education (%)
Agriculture and natural resources	64	4	2	1	4
Architecture and engineering	53	24	0	2	1
Arts	52	3	11	10	6
Biology and life sciences	41	6	0	9	36
Business	61	3	1	2	1
Communications	39	0	16	15	0
Computers, statistics, and mathematics	42	19	1	18	1
Education	47	1	2	29	2
Health	35	4	2	5	49
Humanities and liberal arts	52	3	5	17	1
Industrial arts, consumer services, and recreation	50	1	3	6	11
Law and public policy	56	1	9	6	9
Physical sciences	51	10	0	9	17
Psychology	50	1	5	13	1
Social sciences	63	3	1	8	0

Table C (cont.). Distribution of employment in Iowa by major and occupation, workers 55 and older

Major	Occupation Group					
	Healthcare professional and technical (%)	Healthcare support (%)	Food and personal services (%)	Sales and office support (%)	Blue-collar (%)	Total (%)
Agriculture and natural resources	0	1	14	11	0	100
Architecture and engineering	0	1	11	7	0	100
Arts	0	1	13	5	0	100
Biology and life sciences	0	1	4	3	0	100
Business	0	2	21	8	0	100
Communications	2	1	18	8	0	100
Computers, statistics, and mathematics	0	3	13	4	0	100
Education	0	3	11	5	0	100
Health	1	0	3	0	0	100
Humanities and liberal arts	0	4	11	5	2	100
Industrial arts, consumer services, and recreation	0	6	14	8	0	100
Law and public policy	0	4	12	2	0	100
Physical sciences	0	1	8	5	0	100
Psychology	1	6	14	5	5	100
Social sciences	0	5	12	4	2	100

Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2012-2013.
Note: Row cells may not sum to 100 due to rounding.

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