FEBRUARY 2023

APPENDIX:
NORTH CAROLINA STATE PROFILE

CLOSING THE DIGITAL *SKILL* DIVIDE

THE PAYOFF FOR WORKERS, BUSINESS, AND THE ECONOMY

By Amanda Bergson-Shilcock
and Roderick Taylor
with Nye Hodge

NATIONAL SKILLS COALITION

Federal Reserve Bank *of* Atlanta

NORTH CAROLINA

THE BIG PICTURE: UNDERSTANDING THE DEMAND FOR DIGITAL SKILLS

North Carolina is one of the larger southern states by both population and economic activity. There are about 10.6 million people in North Carolina, and its GDP[1] was $660 billion in 2021. The median household income[2] is about $57,000. White, Black, and American Indian and Alaska Native people are overrepresented in the state compared to national averages, while Latinos and Asian American and Pacific Islanders are underrepresented.

North Carolina has strong demand for workers with technology skills. In the Lightcast dataset of 2021 job postings used for this analysis,[3] there were almost 1.5 million postings for jobs located in the state. Among those job ads, 670,000, or 46 percent, required at least one ***definitely digital*** skill, and 91 percent required a ***definitely*** or ***likely digital*** skill. (These numbers are consistent with the national averages of 47 percent and 92 percent, respectively.)

ZOOMING IN: DIGITAL SKILL DEMANDS DIFFER BY INDUSTRY

Perhaps unsurprisingly, foundational skills such as spreadsheets, data entry, typing, and "basic internet skills" are widely required across all industries in North Carolina. But when it comes to more sophisticated skills, there are notable differences by sectors. For example, many job postings in the real estate industry require familiarity with Yardi software, while a surprisingly high number of ads in the retail trade sector seek people with robotics expertise. In manufacturing, employers are looking for workers with Enterprise Resource Planning (ERP) software skills, while in accommodation and food services, Lotus Domino is in frequent demand. In the utility sector, Global Positioning System (GPS) and SCADA (supervisory control and data acquisition) system skills are crucial.

Knowing which digital skills are broadly in demand throughout an industry sector — or are transferrable across different industries — can help stakeholders to make wise decisions about where to invest time and resources. State policymakers and workforce and education advocates can stress-test workforce program designs against on-the-ground data from employers and job postings to ensure a clear connection between training programs' focus and the skills workers will need on the job.

The Lightcast dataset also reveals some *occupations* where demand in North Carolina is especially acute. The roles highlighted in Figure 2 do not require a bachelor's degree, and therefore could be valuable opportunities for workers with more limited education who are seeking to build their digital skills and obtain higher-wage employment.

---

1 *Gross Domestic Product: All Industry Total in North Carolina,* U.S. Bureau of Economic Analysis, retrieved from FRED, Federal Reserve Bank of St. Louis (2022)

2 *QuickFacts: North Carolina*, U.S. Census Bureau (2022)

3 For more information on this dataset, see the full report: *Closing the Digital Skill Divide: The Payoff for Workers, Business, and the Economy*.

FIGURE 2: Top sub-baccalaureate occupations in North Carolina with high demand for digital skills (2021)

Occupation	Total job postings	Subset of job postings requesting ***definitely digital*** skills	Percent of job postings requiring ***definitely digital*** skills
Software Developer / Engineer	1,413	1,335	94%
Computer Support Specialist	2,825	2,626	93%
Bookkeeper / Accounting Clerk	3,754	3,294	88%
Human Resources / Labor Relations Specialist	1,558	1,329	85%
Radiologic Technician / Technologist	1,018	865	85%
Personal Banker / Banking Sales Staff	2,340	1,968	84%
Office / Administrative Assistant	11,204	9,272	83%
Loan Officer	1,075	866	81%
Paralegal / Legal Assistant	1,004	806	80%
Security Officer	10,136	8,067	80%

Source: FRB/NSC analysis of Lightcast data.

Note: Analysis limited to occupations that Lightcast shows as requiring a high school diploma/equivalent or an associate degree. Occupations that had fewer than 1,000 total job posts in the 2021 Lightcast dataset were omitted.

Consistent with national findings, these in-demand North Carolina jobs typically require both foundational and industry-specific digital skills. For example, both Microsoft Excel (a foundational skill) and the more specialized accounting software QuickBooks are frequently listed in job ads for bookkeeper/accounting clerk positions.

In job postings for security officers, basic "computer literacy" is the most-requested skill by far. But these job ads also call for a range of more sophisticated skills, from surveillance system monitoring to IBM Cloud to Microsoft Azure.

Digital skills in real life: What skills look like on the job

Knowing how digital skills are showing up in the real world can help state leaders and other stakeholders to connect the dots between workforce and education investments, talent development pipelines, and business vitality. Below, selected major North Carolina industry sectors are highlighted with examples.

Manufacturing

Nearly 650,000 North Carolinians work in the manufacturing sector. Manufacturing workers in the state are disproportionately likely to be Black, Latino, or Asian compared to the overall workforce in North Carolina. Manufacturing workers are also more likely to have limited educational attainment of a high school diploma (or less), more likely to live in rural areas, and to have limited proficiency in English.[4]

While roles such as CNC operator or Programmable Logic Control (PLC) technician have long required some degree of digital skills, the transformation to Industry 4.0[5] is driving increased digital adoption in companies large and small. Manufacturing companies today are increasingly seeking workers with expertise in areas as diverse as robotics, AutoCAD, Human-Machine Interface, data analysis, and the SQL programming language.

One recent survey showed that the percentage of advanced manufacturing companies adopting Industry 4.0 technologies *doubled* between 2020 and 2021,[6] a rapid rate of increase that coincided with the beginning of the Covid pandemic. In particular, the number of companies using 3D printing technology grew from 24 percent to 39 percent, and the number using collaborative robots grew from 6 percent to 22 percent.

Construction

Construction is a major industry in the state, employing more than 375,000 people. Construction workers in the state are disproportionately likely to be Latino or American Indian or Alaska Native when compared to the overall workforce in North Carolina. Construction workers also more likely to have limited educational attainment of a high school diploma (or less), more likely to live in rural areas, and to have limited proficiency in English.[7]

A recent national survey of construction industry leaders found that 91 percent reported using their smartphones daily for work purposes. Sixty-one percent said they used at least three different construction apps — such as Procore or Bluebeam Revu — for tasks such as daily reporting, safety management, Building Information Modeling (BIM) file viewing, and tool tracking.[8]

An interview conducted by NSC with a construction company executive in a large southern state illustrates how even frontline workers' jobs have changed to require more digital skills. "Over the past few years, almost all of our [general contractor] customers have shifted to using digital blueprints," explains the executive. "If we as the subcontractor notice a problem on the building site, we have to submit a Request for Information (RFI) to the general contractor to ask about the conflict." Workers have to be able to spot a problem on site, take a photo, and immediately submit an RFI.

The shift to digital blueprints caused a cascade effect, says the executive. "We quickly realized that it meant that our frontline workers needed to have iPads and e-mail access so they could communicate with the general contractors." It was a substantial shift, especially given that many of the company's frontline workers are navigating English-language software programs without necessarily being fluent in English themselves and are often working on far-flung job sites with spotty or no internet access.

4 FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org.

5 For more information, see https://www.sap.com/insights/what-is-industry-4-0.htm

6 For more information, see: https://www.conexusindiana.com/2022/01/new-study-tech-adoption-among-indiana-advanced-manufacturers-more-than-doubles-from-2020-to-2021/

7 FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org.

8 *Construction Technology Report*, 10th edition. (JB Knowledge, 2021.)

Healthcare

More than 720,000 workers in North Carolina are employed in the healthcare sector. Compared to the overall North Carolina workforce, healthcare workers are disproportionately Black, and they are also more likely to be women and to have college degrees.[9]

While electronic medical records have been a feature of the landscape for more than a decade, the pandemic kicked other aspects of the industry's digital transformation into high gear. Interviews and previous research conducted by NSC have highlighted some common digital skill demands on the job. For example, home health workers in the field often use tablet computers to track their hours, log patient vital signs, and communicate with higher level medical specialists about patient care.

At health clinics, reception desk workers increasingly have the responsibility of assisting patients in installing, using, and troubleshooting telehealth services. In hospitals and other institutional settings, workers in non-clinical jobs have had to adapt to more digitally driven processes in procurement and compliance.

PUTTING THIS DATA TO WORK: RESOURCES FOR STATE DIGITAL EQUITY PLANNING

As noted above, states are now engaged in their federally required development of 5-year Digital Equity Act plans and 5-year Broadband Equity, Access, and Deployment (BEAD) Action Plans.

State Digital Equity Plans must describe how states will close the digital skill divide for the following populations:

- Low-income individuals;
- Aging individuals;
- Veterans;
- Individuals with disabilities;
- Individuals with English language barriers;
- Individuals with limited literacy skills;
- People of color;
- Individuals living in rural areas; and
- Individuals currently incarcerated (in non-federal correctional facilities).

In this section, we highlight data sources that states can use to better understand each population. By juxtaposing this Census Bureau American Community Survey with our Lightcast findings, states can better identify where to focus their digital skill-building investments.

Low-income individuals

As described in the full ***Closing the Digital Skill Divide*** report, low-income individuals face significant challenges in building their digital skills and are disproportionately likely to need such skills.

Fifteen percent of North Carolinians aged sixteen to sixty-four live in households that are at or below 150 percent of the poverty line. While that number is already high, it's even higher for the subset of individuals working[10] in certain industries. For example, it rises to 29 percent for workers in the accommodation and food services sector, 25 percent for workers in the administrative and support and waste management and remediation services, and 20 percent for individuals in the construction sector.

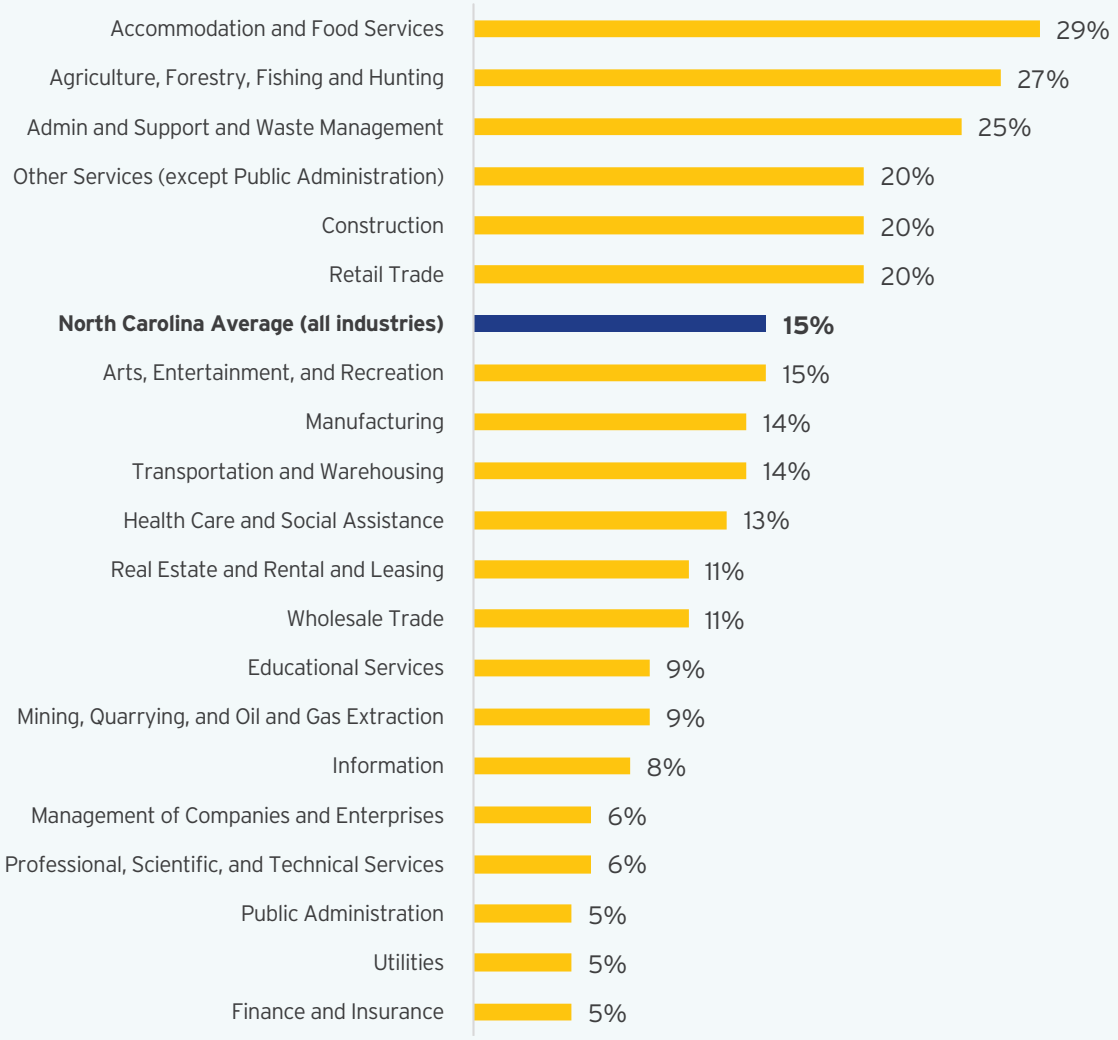
---

9 FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org.

10 In our industry analyses, we've excluded workers who are active military or whose last industry was in the military. For individuals who are not currently working, the data reflect the industry in which they were most recently employed.

This data is particularly notable because there is strong demand for workers with digital skills in these industries, which signals that North Carolina has two reasons to invest in these workers: First, to support their individual economic mobility and meet requirements under the Digital Equity Act, and second, to ensure that the the state workforce is equipped to meet the growing demand for technological skills in these industries. Nationwide, 23 percent of accommodation and food services, 49 percent of administrative and support and waste management, and 39 percent of construction job postings required at least one ***definitely digital*** skill.

FIGURE 3: Percent of North Carolinians aged 16-64 living in low income households, by Industry of Employment



Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

Aging individuals

In general, aging populations have slightly lower levels of digital skills than younger populations,[11] so they should be considered when developing community-centric programs. Focusing on digital skills during traditional years of education (K-12 and young adulthood) is insufficient. Adult workers need timely, relevant education and workforce development opportunities at mid-career and later in their working years, as their jobs continue to change beneath their feet.

In North Carolina, 9 percent of working age individuals are aged between sixty and sixty-four. The agriculture, forestry, fishing and hunting sector and the utilities industry have disproportionate numbers of older workers. Older workers are also more likely to live in non-metro or mixed (metro and non-metro) areas.[12]

FIGURE 4: Percent of North Carolinians aged 60-64, by Industry of Employment

Industry	Percent of working-age adults 60 or above
Utilities	16%
Real Estate and Rental and Leasing	12%
Mining, Quarrying, and Oil and Gas Extraction	11%
Public Administration	11%
Agriculture, Forestry, Fishing and Hunting	11%
Manufacturing	11%
Educational Services	11%
Transportation and Warehousing	10%
Management of Companies and Enterprises	10%
Other Services (except Public Administration)	10%
Wholesale Trade	10%
Health Care and Social Assistance	9%
Information	9%
Professional, Scientific, and Technical Services	9%
North Carolina Average (all industries)	**9%**
Finance and Insurance	8%
Retail Trade	8%
Construction	7%
Admin and Support and Waste Management and Remediation Services	7%
Arts, Entertainment, and Recreation	7%
Accommodation and Food Services	3%

Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

11 *The New Landscape of Digital Literacy* (National Skills Coalition, 2020.)

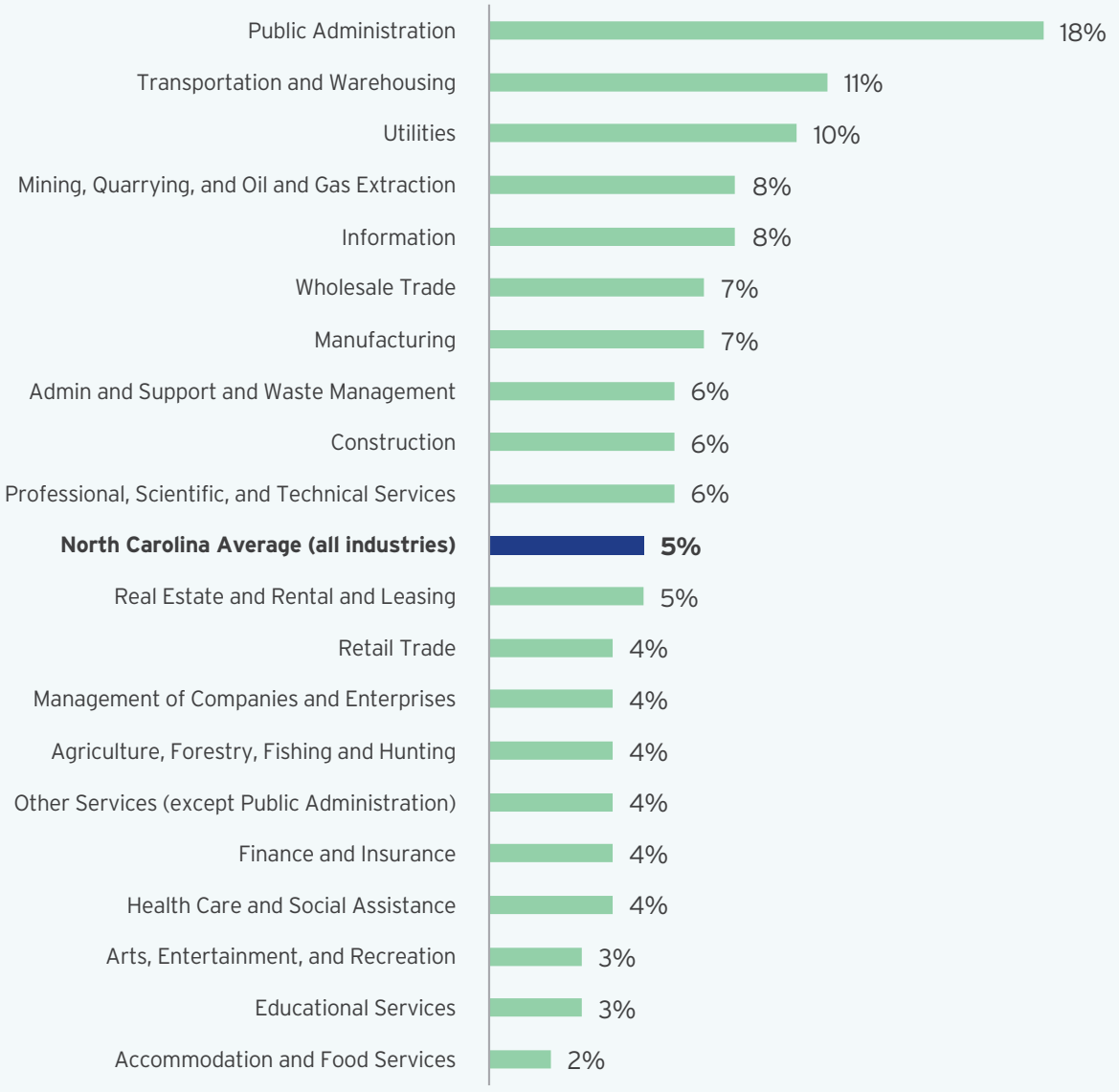
12 The Census Bureau's ACS data does not tell us whether someone resides in a rural or an urban area. However, it does provide information on whether someone is located in a metropolitan area, not in a metro area, or if their approximate location is "on the fence" (i.e., mixed).

Veterans

Veterans are a critical group for states to consider when developing their Digital Equity Plans. Some veterans have acquired technology skills through their former military jobs, while others need opportunities to upskill or reskill into civilian industries that require such skills.

There are roughly 300,000 veterans[13] aged sixteen to sixty-four living in North Carolina. Overall, military veterans comprise 5 percent of working-age North Carolinians. However, some industries have substantially greater concentrations. For example, roughly 18 percent of public administration workers are veterans, dramatically higher than any other industry. The transportation and warehousing and the utilities sectors also have a disproportionately high percentage of veterans, at 11 percent and 10 percent of their workforce, respectively.

FIGURE 5: Percent of veterans among all North Carolina workers 16-64, by Industry of Employment



Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

13 For this analysis, veterans were included only if they are currently in or have worked in industries outside of the military after their service was completed.

Individuals with disabilities

While often thought of as a group that *lacks* digital skills, individuals living with one or more disabilities are often on the cutting edge of technology adoption through necessity. For example, people with visual disabilities have long been accustomed to using screen readers, voice-to-text software, and other devices to enable them to participate equitably in the online world. People with disabilities have also been leaders in developing new technologies that are widely used by people of all backgrounds, such as automatic captioning for online videos.[14]

However, workers with disabilities also face barriers in seeking and maintaining employment. States seeking to close equity gaps among this population should work directly with disability advocates to better understand the unique capabilities and particular challenges facing these workers.

The Census Bureau American Community Survey collects disability data across five categories, including individuals who face:

- **Cognitive difficulty:** An individual who has difficulty remembering, concentrating, or making decisions because of a physical, mental, or emotional problem.
- **Ambulatory difficulty:** An individual who has serious difficulty walking or climbing stairs.
- **Independent living difficulty:** An individual who has difficulty doing errands alone such as visiting a doctor's office or shopping because of a physical, mental, or emotional problem.
- **Self-care difficulty:** An individual having difficulty bathing or dressing.
- **Vision or hearing difficulty:** An individual who has a condition such as blindness, deafness, or a severe vision or hearing impairment.

Overall, 7 percent of working-age North Carolina residents have a disability. As shown in Figure 6, the admin and support and waste management and remediation services industry, the mining, quarrying, and oil and gas extraction industry, and retail trade industry have a higher-than-average percentage of workers with disabilities.

14 For example, see: https://www.npr.org/templates/story/story.php?storyId=124501330 and https://news.microsoft.com/features/people-disabilities-using-improving-accessible-technology/

FIGURE 6: Percent of North Carolinians aged 16-64 living with a disability, by Industry of Employment

Industry	Percent with a disability
Mining, Quarrying, and Oil and Gas Extraction	10%
Admin and Support and Waste Management and Remediation Services	10%
Retail Trade	9%
Transportation and Warehousing	8%
Other Services (except Public Administration)	8%
Construction	8%
Accommodation and Food Services	8%
Public Administration	8%
Agriculture, Forestry, Fishing and Hunting	8%
Manufacturing	7%
North Carolina Average (all industries)	**7%**
Health Care and Social Assistance	7%
Real Estate and Rental and Leasing	7%
Information	6%
Wholesale Trade	6%
Management of Companies and Enterprises	6%
Utilities	6%
Arts, Entertainment, and Recreation	6%
Educational Services	6%
Professional, Scientific, and Technical Services	5%
Finance and Insurance	4%

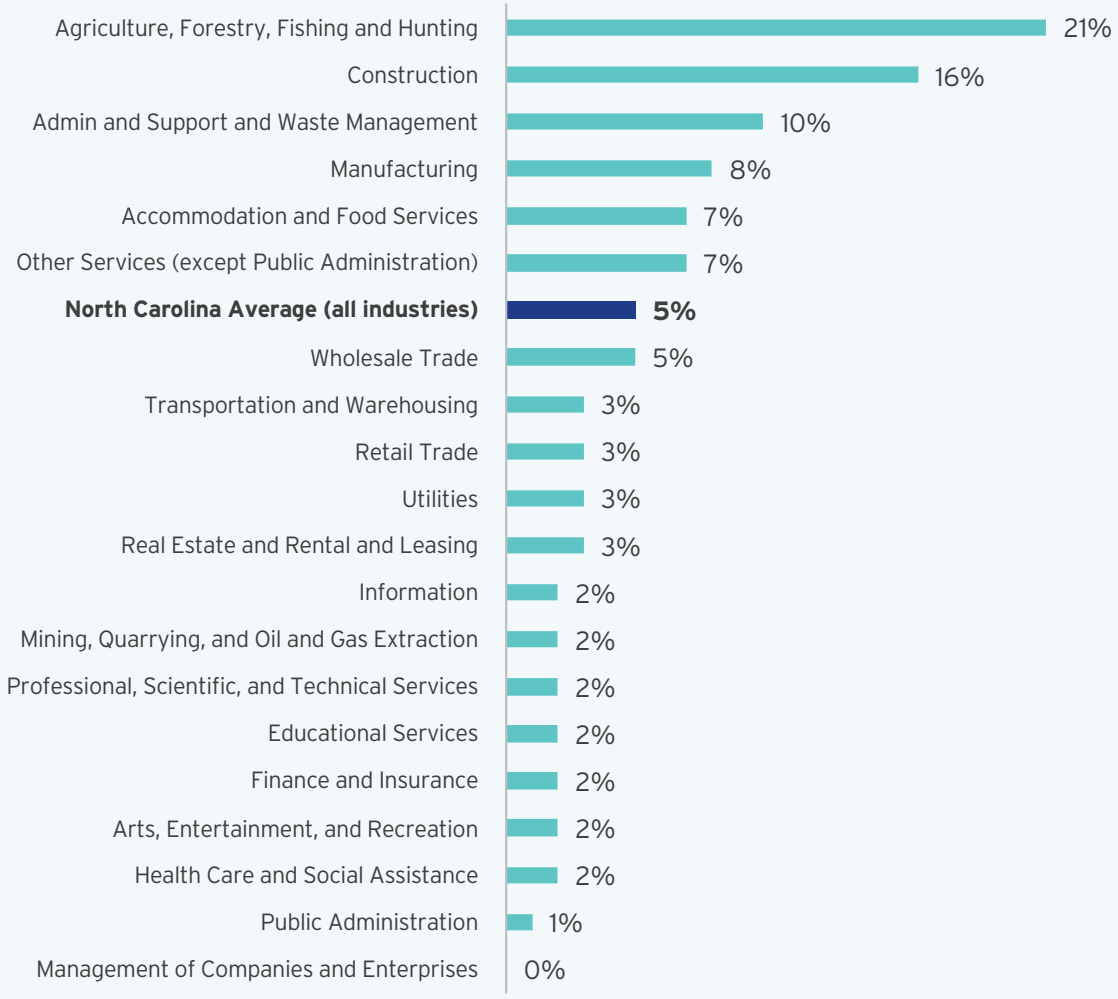
Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

Individuals with English language barriers

While some immigrants and adult English learners have robust digital skills, others need opportunities to develop those skills. Overall, at the national level, immigrants and adult English learners are more likely to lack digital skills, compared to white native-born Americans.[15] As states seek to identify effective tools to help their constituents navigate and acquire digital skills, English language learning models that include strong digital literacy components will be an important part of the solution.[16]

In North Carolina, the agriculture, forestry, fishing, and hunting; construction; and admin and support and waste management industries have a disproportionate number of workers who have english language barriers.

FIGURE 7: Percent of North Carolinians aged 16-64 with English language barriers, by Industry of Employment



Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

15 For more information on this topic, see NSC's fact sheet on Applying a Racial Equity Lens to Digital Literacy: https://nationalskillscoalition.org/wp-content/uploads/2020/12/Digital-Skills-Racial-Equity-Final.pdf.

16 For more information on this topic, see NSC's Amplifying Impact report: https://nationalskillscoalition.org/wp-content/uploads/2020/12/06-25-2020-NSC-Amplifying-Impact.pdf

Individuals with limited literacy skills

Across North Carolina, thousands of workers with limited literacy skills are holding down jobs across many different industries. Employed in retail shops and restaurants, hotels and hospitals, and manufacturing jobs, among many others, these workers not only help fuel the country's economy — they keep daily life in America humming smoothly along.

Due in large measure to structural forces in American society, digital skill needs are closely correlated to limited literacy skills.[17] As states identify tools to help these constituents and mitigate digital equity needs, it's important that they understand the particular challenges facing these workers.

In the full ***Closing the Digital Skill Divide*** report, our findings point to the need to invest in workers with limited formal education. Policymakers should be clear that these workers, who are often employed in entry-level jobs, need the same access to digital skill-building opportunities that their more educated peers expect and receive.

While the ACS does not specifically gather data on literacy skills, it does include educational attainment data, so we've used educational attainment of lower than high school as a proxy. In North Carolina, the construction; agriculture, forestry, fishing and hunting; and accommodation and food services industries have a disproportionate number of workers with limited literacy skills.

FIGURE 8: Percent of North Carolinians aged 16-64 with limited literacy skills, by industry of employment

Industry	Percent with literacy barriers
Agriculture, Forestry, Fishing and Hunting	29%
Construction	25%
Accommodation and Food Services	23%
Admin and Support and Waste Management and Remediation Services	17%
Mining, Quarrying, and Oil and Gas Extraction	15%
Arts, Entertainment, and Recreation	14%
Manufacturing	12%
Other Services (except Public Administration)	11%
Retail Trade	10%
North Carolina Average (all industries)	**10%**
Wholesale Trade	9%
Transportation and Warehousing	9%
Real Estate and Rental and Leasing	5%
Utilities	3%
Health Care and Social Assistance	3%
Information	3%
Management of Companies and Enterprises	2%
Educational Services	2%
Public Administration	2%
Professional, Scientific, and Technical Services	2%
Finance and Insurance	1%

Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

17 *The New Landscape of Digital Literacy* (National Skills Coalition, 2020) and *Foundational Skills in the Service Sector* (National Skills Coalition, 2018).

People of color

While many workers facing a digital skill divide are white, people of color are disproportionately affected.[18] The ripple effects of historical policies and structural racism continue to contribute to modern-day inequities in digital skills and access to them. From digital redlining that limits the availability of high-speed internet in some communities, to under-funded educational institutions unable to provide their students with robust digital technologies for learning, barriers to access often limit workers' ability to build digital skills and businesses' ability to advance into the digital age. These wide-ranging effects emphasize the vital role of public policy in remedying inequities caused by prior policies.

As states identify ways to target their Digital Equity Act investments to reduce racial inequities, understanding the industries with high concentrations of workers of color can point the way.

In North Carolina, Black workers (who represent 21% of working-age state residents overall) are disproportionately concentrated in the transportation and warehousing (34%), admin and support and waste management and remediation services (27%), and manufacturing (23%) industries.

Workers of Hispanic or Latino origin (who represent 9% of working-age state residents) are disproportionately concentrated in the agriculture, forestry, fishing and hunting (27%), construction (25%), and accommodation and food services (14%) industries.

Asian American and Pacific Islander workers (who represent 3% of working-age state residents) are disproportionately concentrated in the professional, scientific, and technical services (8%), management of companies and enterprises (6%), and the other services except public administration (6%) industries.

American Indian or Alaska Native people (who represent 0.9% of working-age state residents) are disproportionately concentrated in the public administration (1.5%), agriculture, forestry, fishing and hunting (1.2%), and construction (1.1%) industries.

When looking at the intersection of race and gender, Black women in North Carolina (who represent 12% of working-age residents) are more likely to be in health care and social assistance (23% of health care workers); Black men (10% of working-age state residents) in manufacturing (14%); Latinas (4% of working-age state residents) in agriculture, forestry, fishing and hunting (8%); and Latinos (5% of working-age state residents) in construction (23%).

Asian women (2% of working-age state residents) are over-represented in the other services except public administration (4%) industry sector; asian men (2% of working-age state residents) are more concentrated in professional, scientific, and technical services (5%); American Indian or Alaska Native women (0.5% of working-age state residents) in health care and social assistance (0.9%); and American Indian or Alaska Native men (0.5% of working-age state residents) in construction (1.5%) sectors.

Notably, many of these industries are also ones that employ significant numbers of other "covered populations", making them particularly appealing areas for state policymakers to target.

Closing equity gaps can catapult both workers and businesses to greater economic success. As the data on occupational segregation highlights, many marginalized workers are clustered in industries that have rapidly growing demand for technological skills. As a result, both workers themselves and the companies that employ them can flourish if given the opportunity for upskilling.

Individuals living in rural areas

Individuals in rural communities face compounded challenges — they are more likely to lack broadband internet access due to their geographic location, and this lack of access then hampers their ability to get online and build better digital skills by participating in educational and workforce opportunities. Tackling these issues is crucial to ensure an even playing field for individuals in rural areas.

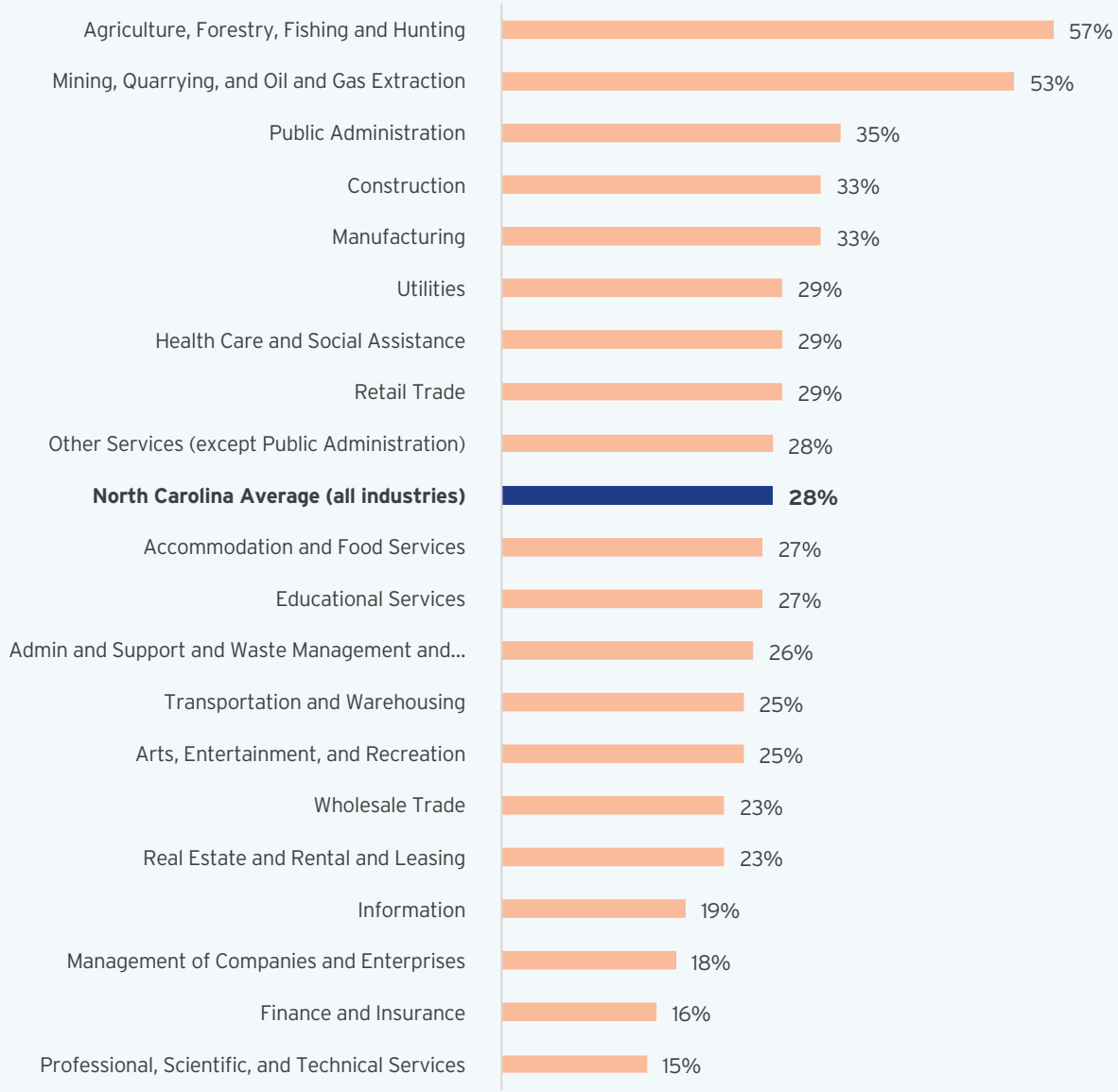
---

18 For more information on this topic, see NSC's fact sheet on Applying a Racial Equity Lens to Digital Literacy: https://nationalskillscoalition.org/wp-content/uploads/2020/12/Digital-Skills-Racial-Equity-Final.pdf.

The Census Bureau American Community Survey does not tell us whether someone resides in a rural or an urban area. However, it does provide information on whether someone is located in a metropolitan area, not in a metro area, or if their approximate location is "on the fence" (i.e., mixed). In North Carolina, 75 percent of American Indians or Alaska Natives live in non-metro or mixed areas, significantly above the 28 percent average for North Carolina and the 19 percent average for the United States. In the industries that American Indian and Alaska Native women and men are disproportionately in, public administration and construction, roughly 78 percent of the American Indians and Alaska Natives in those jobs reside in non-metro or mixed areas.

In North Carolina, the agriculture, forestry, fishing and hunting; construction; and mining, quarrying, and oil and gas extraction industries have disproportionate percentages of workers located in non-metro or mixed areas.

FIGURE 9: Percent of North Carolinians aged 16-64 that reside in non-metro or mixed areas, by industry of employment



Source: FRB/NSC analysis of 2016-2020 American Community Survey data accessed via IPUMS-USA, University of Minnesota, www.ipums.org

Individuals who are currently incarcerated

People who are incarcerated (in non-federal institutions) are another "covered population" under the Digital Equity Act. These individuals face particular challenges in building digital skills while behind bars. Correctional education programs may restrict or even prohibit the use of digital technology or internet access, which puts justice-involved people at a disadvantage when reentering society.

The Sentencing Project, a nonprofit organization, found that in North Carolina, there are almost 50,000 people incarcerated in prisons or jails.[19] The Sentencing Project also found that the Black imprisonment rate in North Carolina is almost four times the white imprisonment rate. Removing technology and internet restrictions can allow individuals to prepare effectively for life and employment after release.[20]

19 *U.S. Criminal Justice Data*, The Sentencing Project (2022)

20 Building the Technology Ecosystem for Correctional Education: Brief and Discussion Guide **https://lincs.ed.gov/sites/default/files/tech-ecosystem-correctional-ed.pdf**, (U.S. Department of Education, 2022.)