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LABOR MARKET INFORMATION SERVICE

A Study of the Top 10 Healthcare Middle-Skill Jobs in NYC: A Mixed-Methods Approach

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ABOUT US

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New York City Labor Market Information Service (NYCLMIS) is a workforce development and educational opportunity-focused research, evaluation, and consulting organization. Located within the Center for Urban Research at the CUNY Graduate Center, NYCLMIS is comprised of expert researchers with diverse backgrounds and skillsets, from economists to sociologists to political scientists. It supports other mission-driven groups by helping them to harness the power of research insights and labor market data to inform best-practice interventions, with and through engagement of their client communities. NYCLMIS is dedicated to supporting social good and connecting individuals and communities to opportunity, particularly those who have historically been excluded or find themselves in the bottom half of the income distribution. NYCLMIS partners with nonprofits, government agencies, educational institutions, employers, private sector clients, and other programs that share this goal.

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EXECUTIVE SUMMARY

PURPOSE

In 2017, New York City Labor Market Information Service (NYCLMIS) at the CUNY Graduate Center, with support from the New York Community Trust (NYCT) and the NYC Workforce Funders, released a report that examined the supply of and demand for middle-skill occupations[1] in New York City, with a particular focus on healthcare (Biu & Hirsch, 2017). This second report is a continued study with further support from the NYCT and the NYC Workforce Funders. It advances a deeper understanding of the labor dynamics in middle-skill occupations within the healthcare industry in New York City by focusing on a set of ten occupations in the healthcare sector that each reflect both large employment sizes and strong rates of projected growth. The study examines three key areas for the ten occupations: 1) the demographic profile of the people working in these occupations in New York City; 2) the supply of and demand for these jobs; and 3) how trends in the healthcare industry are likely to affect supply and demand for the jobs.

METHODS

This study employed a mixed-method design, collecting and analyzing both qualitative and quantitative data to meet the research objectives. First, NYCLMIS applied a comprehensive list of criteria to define middle-skill jobs in New York City. These were used to identify the full set of 95 middle-skill occupations, and then to home in on the top ten healthcare occupations (i.e. those with the largest employment size and highest rates of projected growth). Second, NYCLMIS analyzed two consecutive five-year intervals of data: 2008-2012 and 2013-2017 Public Use Microdata Sample (PUMS) data from the U.S. Census Bureau's American Community Survey (ACS). These data sets were used to provide a demographic description of New Yorkers who work in these ten occupations. Third, NYCLMIS used a number of supply and demand indicators to analyze and compare findings between this study and the 2017 report. These indicators were informed by the literature (Orr, 2017) and a panel of technical advisors and stakeholders that represents the healthcare industry and workforce development system of New York City. While this study excluded a few supply indicators that were used in the 2017 report due to the most recent datasets not being readily available, a number of additional indicators were added to better capture various dimensions of supply and demand. Finally, NYCLMIS conducted focus group research to explore trends in the healthcare industry and their implications for future levels of supply and demand in the selected occupations.

FINDINGS

The ten occupations of focus in this report are as follows: Nursing Assistants, Licensed Practical and Licensed Vocational Nurses, Medical Assistants, Pharmacy Technicians, Dental Assistants, Emergency Medical Technicians and Paramedics, Radiologic Technologists, Medical Records and Health Information Technicians, Dental Hygienists, and Surgical Technologists.

Demographic Profile of Workers in Selected Occupations[2]

[1] Middle-skill occupations are defined as jobs that "require education beyond high school but not a four-year degree [and] make up the largest part of [the] labor market" in the United States and in each of the 50 states, according to the National Skills Coalition (2017).

[2] As described below in the Limitations section of the Executive Summary and the Methods section of the report, the demographic analysis was performed on nine occupations due to data constraints: six specific healthcare middle-skill occupations plus three broader healthcare occupational categories. The findings highlighted in this section focus on the six specific middle-skill occupations;

Overall, in New York City, the ten middle-skill occupations of interest are filled by either younger (18-34) or middle-aged (35-54) female workers who primarily identify as white or black and have completed less formal education than a bachelor's degree. They are nearly equally divided between native-born and foreign-born (52% and 48%, respectively). That said, there are a few exceptions to this general demographic profile: In the five-year sample ending in 2017, Licensed Practical and Licensed Vocational Nurses and Medical Records and Health Information Technicians are comprised of a comparatively large share (31% and 33%, respectively) of older workers (55+); Emergency Medical Technicians and Paramedics have a higher portion of male workers (65%) than female workers (35%); and Dental Hygienists have the largest share of workers (among the specific occupations) with a bachelor's degree or above (42%).

The data suggest that there are additional demographic shifts for these jobs on the horizon. There is a slow but steady trend towards an aging workforce, more men seem to be entering traditionally female-dominated occupations (not yet a consistent trend in these ten occupations), there is growing ethnic diversity, and there are increased levels of educational attainment and credentialing in the five-year sample ending in 2017 compared to that ending in 2012.

Supply of and Demand for Selected Occupations

NYCLMIS calculated composite scores of Supply and Demand for each of the 10 occupations based on aggregating a set of indicators (detailed below) for each. The scores were then categorized as reflecting either Low, Moderate, or High supply and demand. Therefore, for each occupation, there is an aggregated supply indicator (Low, Moderate, or High) and an aggregated demand indicator (Low, Moderate, or High).

Overall, the data indicate that the labor supply for these ten occupations aligns well with labor market demand. Those occupations that are both Low Supply and Low Demand include Dental Assistants, Emergency Medical Technicians and Paramedics, Pharmacy Technicians, Radiologic Technologists, Dental Hygienists, and Surgical Technologists. Licensed Practical and Licensed Vocational Nurses are Moderate Supply and Moderate Demand, and there is High Supply and High Demand for Nursing Assistants. Only two occupations' analyses reflect an imbalance between supply and demand: Medical Assistants face an over-supply issue (High Supply and Moderate Demand), while Medical Records and Health Information Technicians face an under-supply issue (Low Supply and High Demand).

When compared to findings from the 2017 report, supply and demand indicators remained unchanged for over half of the occupations. Other occupations experienced a decrease in supply ranking, such as Medical Records and Health Information Technicians shifting from High Supply and High Demand to Low Supply and High Demand. Three other occupations—Dental Assistants, Emergency Medical Technicians and Paramedics, and Pharmacy Technicians—shifted from Moderate Supply and Low Demand to Low Supply and Low Demand.

Trends in Healthcare and Implications for Future Supply and Demand in Selected Occupations

results for the broader occupational categories are shown in Figures 1-5 and discussed in the Findings section of the report.

The study's focus group participants agreed that two trends will increasingly impact the healthcare industry—technological advances and aging baby boomers (i.e. people born between the years 1946 –1964). The aging population may result in both job vacancies as older adults leave the workforce, and a need for more healthcare services to meet the needs of older adults requiring care. There was a lack of consensus among the participants regarding whether automation from technological advances will lower demand as workers are replaced by machines. Despite uncertainties about the impact of automation on jobs, all participants mentioned a trend in healthcare that values workers with better technology training, more education, and specific credentials focused on the needs of older adults. From the perspective of supply, healthcare educational and training programs should include basic competencies in technology (particularly around database management and electronic records) and geriatric education to address the necessary competencies associated with these two trends.

RECOMMENDATIONS

Workforce Training Providers

The findings suggest that education and training providers should proceed cautiously with any plans to expand training opportunities in the Medical Assistants field since this occupation has Moderate Demand and High Supply. Conversely, given the high level of demand for workers in Medical Records and Health Information Technology, education and training providers should explore ways to increase the availability of training programs that would expand the supply of individuals to fill those jobs. Additionally, education and training providers in healthcare could include basic competencies in technology and geriatric education to address skill shifts associated with evolving technologies and the City's (and United States') aging population (Bloomberg & Burden, 2013). Finally, given the growing proportion of the New York City workforce with a bachelor's degree or above who are competing for middle-skill jobs, education and training providers should consider how to adjust the program design or curriculum to make middle-skill workers more competitive.

Funding Agencies that Support Workforce Education and Training

This study points to the need for public and private funders to invest in improving workforce training providers' ability to collect accurate and complete data, including student enrollment, rates of program completion, and most importantly, employment outcomes. Particularly, the New York State Department of Education's offices, responsible for overseeing professional licensing and proprietary schools, should be sufficiently staffed and funded to maintain the data, protect participant confidentiality, and also support efforts of other public agencies and research organizations to access these data for their work. Equally important, funders should identify ways to support the efforts of unemployed and underemployed New Yorkers seeking to enter some of these high-demand middle-skill healthcare occupations. Two possibilities include: financing easily accessible scholarships for academic or credentialing opportunities, and funding free on-site childcare at these educational institutions and training sites.

LIMITATIONS

This study has a few limitations. First, four occupational groupings (Nursing Assistants, Radiologic Technologists, Pharmacy Technicians, and Surgical Technologists) in the American Community Survey (ACS) are included in three broader occupations that contain other types of jobs. The misalignment of occupation between the ACS and Standard

Occupational Classification (SOC) system requires interpreting the findings with caution. Second, some sources of supply data were unavailable or incomplete. Many publicly available data sources do not record complete data on an annual basis, which presents some challenges. For example, historical licensing data for Licensed Practical Nurses, Dental Assistants, and Dental Hygienists are not available, instead only the most recent year's number of active licenses can be accessed. Third, modifications to the supply and demand indicators used in the initial study mean that findings between the 2017 and 2019 studies are not wholly comparable. Finally, this study uses past and current employment as indicators of future supply. The predictive accuracy of this approach hinges on the assumption that educational institutions and workforce training providers respond to demand shifts in the industry.

INTRODUCTION

Globalization and advances in science and technology over the past few decades have resulted in growing attention on high-skill workers[3] with advanced degrees (Achieve, 2012). Unarguably, they are essential to building a competitive and innovative American workforce, but equally, if not more important, is the need to educate and train workers to fill middle-skill occupations. These are typically defined as jobs requiring more than a high school diploma but less than a bachelor's degree (Modestino, 2016). According to recent data from the National Skills Coalition (2019), more than half of jobs in the U.S. labor market are considered middle-skill. Even in large urban centers like New York City where there is higher demand for high-skill workers, middle-skill jobs comprise an indispensable portion of all jobs – 16.3% of all jobs in 2012, and projected to decrease slightly to 15.6% of all jobs by 2022 (NY State of Department Labor, 2016). Additionally, obtaining middle-skill occupations are an important next step on the career ladder for low-skill workers, often providing higher pay, more employee benefits, and better job security.

In 2017, New York City Labor Market Information Service (NYCLMIS) released a report that examined the supply of and demand for middle-skill occupations in New York City, with a particular focus on 30 occupations from two major healthcare occupation groups: Healthcare Practitioners, and Technical and Healthcare Support occupations (Biu & Hirsch, 2017). The focus on healthcare in the 2017 study was based on two considerations. First, nationally and citywide, healthcare is one of the largest and fastest growing industries. Second, it is also one of the few sectors in New York City that includes many growing opportunities for middle-skill workers, and the city has invested considerable resources in improving healthcare systems and training individuals for employment in healthcare occupations.

As a follow-up to the first report in 2017, this second report continues to focus on middle-skill occupations in healthcare in New York City. In contrast to the 2017 study that provided a full-picture overview of the middle-skill healthcare opportunities in New York City, this study provides a deeper understanding of the labor dynamics of ten select occupations in the healthcare sector – those that reflect the largest employment sizes and strongest rates of projected growth. In order to achieve this goal, this study examines three key areas for the ten occupations: 1) the demographic profile of the people working in these jobs within New

[3] The definitions of high-skill and middle-skill workers are not based on the skill level, but education level of the workforce. Generally, high-skill workers are defined as individuals with a four-year college or more advanced degree, and middle-skill workers are defined as individuals with some postsecondary education but less than a four-year college degree.

York City; 2) supply and demand; and 3) how trends in the healthcare industry are likely to affect labor demand and skills requirements.

METHODS

This study employed a mixed-method design, collecting and analyzing both qualitative and quantitative data to meet the research objectives: 1) NYCLMIS applied a comprehensive list of criteria to define middle-skill jobs in New York City; 2) NYCLMIS used the list to identify the top ten healthcare occupations (i.e. those with the largest employment size and highest rates of projected growth); 3) NYCLMIS analyzed two non-overlapping, five-year intervals of data: 2008-2012 and 2013-2017 Public Use Microdata Sample (PUMS) data from the U.S. Census Bureau's American Community Survey (ACS). These were used to provide the demographic description of New Yorkers who work in these ten occupations[4]; 4) NYCLMIS used a number of supply and demand indicators to analyze and compare findings between this study and the 2017 report. These indicators were informed by the literature (Orr, 2017) and a panel of technical advisors and stakeholders that represent the healthcare industry and workforce development system of New York City. While this study excluded a few supply indicators that were used in the 2017 report due to the most recent datasets not being readily available, several additional indicators were added to better capture various dimensions of supply and demand; and 5) NYCLMIS conducted focus group research to explore trends in the healthcare industry and their implications for future levels of supply and demand in the ten targeted occupations.

1) Determine Middle-Skill Occupations in New York City

This study employed the same measures introduced in the 2017 report to determine which of nearly 500 potential occupations could be accurately labeled middle-skill. In 2017, NYCLMIS conducted a full review of the literature to identify a set of criteria for categorizing a job as "middle-skill", which are summarized in Table 1, below:

Using the data sources above, NYCLMIS applied the following thresholds for defining "middle-skill":

i. An occupation that met the local ACS criterion *and* at least two out of the first four national criterion measures listed (BLS and O*NET) was considered a middle-skill occupation;

ii. If an occupation met any or all of the four national criteria (the two BLS measures and two O*NET measures) but failed to meet local criteria from ACS, an additional test using real-time data from Burning Glass was performed to gather information on educational credentials requested by local employers;

   - If more than 50% of online job advertisements sought minimum educational qualifications associated with middle-skill candidates, the occupation was included. If fewer than 50% of job advertisements specified an education level associated with middle-skill candidates, the occupation was not included. If there were too few ads to make a determination (fewer than 50), the occupation was excluded from the analysis.

[4] The demographic analysis reflects NYC residents who work in one of the ten healthcare occupations regardless of whether or not that job is in the city.

Table 1. Criterion in Determining Middle-Skill Occupations

Source	Description	Criterion	Qualifying Occupations
U.S. Bureau of Labor Statistics Education Attainment (Employment Projections, table 5.3)	U.S. Bureau of Labor Statistics shows the distribution of educational attainment by occupation for the nation as a whole.	Percent of U.S. workforce who have attained a postsecondary non-degree award; some college, no degree; or an associate degree should be equal or greater than 40%	189
U.S. Bureau of Labor Statistics Education & Training Assignment (Employment Projections, table 5.4)	U.S. Bureau of Labor Statistics assigns each occupation to a category according to the typical education required for entry.	Postsecondary non-degree award; Some college, no degree; Associate degree	99
O*NET Education, Training, & Experience	The occupational information network (O*NET) asks a sample of employers to report the education required to perform the functions of a given occupation. The results are reported as a distribution of employer responses.	Percent of employers responding that the occupation requires a postsecondary non-degree award; some college, no degree; or an associate degree should be equal or greater than 50%	109
O*NET Job Zones	O*NET online employs expert analysts who assign "job zones" to occupations according to their judgment of the required level of experience, education, and training as well as the standard vocational preparation recorded in the Department of Labor's dictionary of occupations.	Category 2 (require a high school diploma) or 3 (require vocational training, related on the job experience, or an associate degree)	430
American Community Survey (ACS)	An analysis of the actual distribution of educational attainment of workers by occupation in New York City, also using the ACS 5-year microdata sample (2012-2016).	Percent of New York City workforce who have attained a postsecondary non-degree award; some college, no degree; or an associate degree should be equal or greater than 40%	101
Burning Glass Data	Real-time labor market information provides access to data about employers' preferences as they appear in job ads.	Percent of online job ads in NYC seeking middle-skill candidates should be equal to or greater than 50%	Secondary criterion

Based on this analysis, 95 occupations qualified as middle-skill. A full list of these occupations along with how each performed against the above criteria is included in Appendix A. The 2017 study identified 103 middle-skill occupations. This decrease in the number of middle-skill occupations is primarily accounted for by shifts in the Personal Care and Service Occupations; Office and Administrative Support Occupations; Installation, Maintenance, and Repair Occupations; and Production Occupations. The comparison of middle-skill occupations between this study and the 2017 study is presented in Appendix B.

2) Determine Ten Middle-Skill Occupations in Healthcare

NYCLMIS focused the research on the ten middle-skill occupations in healthcare with the largest employment sizes, nine of which also have "much faster than average" projected growth rates in New York City (according to the U.S. Bureau of Labor Statistics, a job growth rate greater than 15% is considered much faster than average and a job growth rate ranging between 11% and 14% is considered faster than average). The ten occupations that met these criteria are shown in Table 2.

Table 2. Criterion in Determining Ten Healthcare Middle-Skill Occupations

Occupation Title	Current Employment	Percent of all middle-skill occupations in NYC	Projected growth rate (2016-2026)
Nursing assistants	35,880	8.3%	15.3%
Licensed practical and licensed vocational nurses	13,920	3.2%	20.5%
Medical assistants	12,850	3.0%	44.7%
Pharmacy technicians	8,780	2.0%	15.2%
Dental assistants	7,980	1.9%	23.8%
Emergency medical technicians and paramedics	6,500	1.5%	14.8%
Radiologic technologists	4,850	1.1%	18.9%
Medical records and health information technicians	3,730	0.9%	18.2%
Dental hygienists	2,590	0.6%	23.9%
Surgical technologists	2,350	0.5%	17.5%

Source: NYS Department of Labor, 2018 Occupational Employment and Wages and Long-Term Occupational Employment Projections for New York City

3) Demographic analysis of the ten targeted middle-skill occupations

NYCLMIS examined the age, sex, education level, race, and country of origin of the New Yorkers who work in these ten occupations. The analysis was conducted using the weighted Public Use Microdata Sample (PUMS) from the ACS from two consecutive five-year intervals—2013-2017 (the most recent interval available) and 2008-2012. The 5-year estimates from the ACS are "period" estimates that represent data collected over a period of time. Compared to a single year of data, the 5-year estimate has increased statistical reliability because it comprises a longer interval.

Table 3. Occupation Crosswalk between 2010 SOC and ACS

2010 SOC Occupation code	2010 SOC Occupation Title	ACS Occupation code	ACS Occupation Title
311014	Nursing Assistants	311010	Nursing, Psychiatric, and Home Health Aides*
292061	Licensed Practical and Licensed Vocational Nurses	292061	Licensed Practical and Licensed Vocational Nurses
319092	Medical Assistants	319092	Medical Assistants
292052	Pharmacy Technicians	292050	Health Practitioner Support Technologists and Technicians*
319091	Dental Assistants	319091	Dental Assistants
292041	Emergency Medical Technicians and Paramedics	292041	Emergency Medical Technicians and Paramedics
292034	Radiologic Technologists	292030	Diagnostic Related Technologists and Technicians*
292071	Medical Records and Health Information Technicians	292071	Medical Records and Health Information Technicians
292021	Dental Hygienists	292021	Dental Hygienists
292055	Surgical Technologists	292050	Health Practitioner Support Technologists and Technicians*

It should be noted that occupations in the ACS are not completely aligned with the Standard Occupational Classification (SOC). Four SOC occupations (Nursing Assistants, Radiologic Technologists, Pharmacy Technicians, and Surgical Technologists) are included in three broader ACS occupations (Nursing, Psychiatric, and Home Health Aides; Health Practitioner Support Technologists and Technicians; and Diagnostic Related Technologists and Technicians) that contain other types of jobs; these are marked with asterisks in Table 3. NYCLMIS opted to use these broader occupations rather than exclude them entirely, as they still provide useful insights into demographic patterns despite being less precise. Additionally, the demographic analysis yielded patterns in nine jobs, as two occupations (Pharmacy Technicians and Surgical Technologists) belonged to the same broader occupational category in the ACS data (Health Practitioner Support Technologists and Technicians).

4) Analyze and compare supply and demand in these ten occupations

As addressed in the 2017 report, there is no standardized methodology for estimating labor supply and demand or calculating a measure that compares the two. Studies have used a variety of measures based on different data needs and time frames, and each has had its own advantages and limitations. Another challenge arising from the current literature is that many measures are retrospective in nature, including assumptions that may or may not pertain to the future (Orr, 2017). In response to these challenges, NYCLMIS used a multi-indicator approach to obtain as many indicators of supply and demand as possible for the 2017 report. This approach was informed by a review of best practices in the scholarly and workforce literature (Orr, 2017) and input from a panel of technical advisors and stakeholders that represents the healthcare industry and workforce development system of New York City. In this study, NYCLMIS continued to use the majority of the 2017 indicators.

Table 4 depicts the supply indicators used in this study. They incorporate the most recently available data on the number of graduates who have completed relevant Associate degrees or certificates as well as the number of employed workers in these occupations. From an economic standpoint, wage change is another indicator included in the analysis, as wages increase when labor demand exceeds the supply. Hence, a positive change in wages either indicates a higher demand for workers, or an under-supply of workers. The list in Table 4 also includes supply indicators that are not often reflected in the literature, such as those taking into account individuals who received training from non-degree granting institutions and proprietary schools (e.g. number of certifications from Career and Technical Education (CTE) Programs and number of licenses issued).

This study added four indicators to those used in the 2017 research (they are marked with asterisks in Table 4). These additional indicators include net and percent change in employment, percent change in wage, and percent change in Associate degrees conferred between 2013 and 2017. Additionally, this study did not use several supply indicators that were part of the 2017 analysis due to updated data not being readily available. These excluded indicators, described in the table below, are unemployment insurance beneficiaries, seats available in training programs, and individuals who have obtained non-degree credentials from CUNY or workforce training providers.

Table 4. Supply Indicators

Data Source	Description	Supply Indicators in 2017 study	Supply Indicators in 2019 study	Limitations
NY State Department of Labor, OES	Number of people who are currently employed within a given occupation	• Current employment, 2015	• Current employment, 2018	No specific challenges
ACS One Year Sample	Number of people who were employed within a given occupation	• ACS employment, 2011 • ACS employment, 2015	• ACS employment, 2013 • ACS employment, 2017 • ACS employment change, 2013-2017* • ACS employment, %change, 2013-2017*	Occupations in ACS are not completely aligned with the Standard Occupational Classification (SOC).
ACS One Year Sample	Change in the average wage of people who were employed within a given occupation	• Wage change, 2011-2015	• Wage change, 2013-2017 • % Wage change, 2013-2017*	
Career and Technical Education (CTE) Programs	Number of certifications that are offered by career and technical education programs	• CTE certifications, 2017	• CTE certifications, 2018	Number of programs was used as a proxy for number of certifications in 2017 study.
New York State, Education Department, 2019	Number of licenses issued in certain healthcare occupations	• License issued, 2017	• License issued, 2019	Data only showed licenses issued as of current year. There is no historical, year-by-year information.
Integrated Postsecondary Education System (IPEDS)	Number of and changes in Associate Degrees conferred within the five-year period	• Associate degree, 2011 • Associate degree, 2015 • Associate degree, average, 2011-2015 • Associate degree, change, 2011-2015	• Associate degree, 2013 • Associate degree, 2017 • Associate degree, average, 2013-2017 • Associate degree, change, 2013-2017 • Associate degree, % change, 2013-2017*	Education programs are not fully aligned with occupation titles. It is also possible for training programs to relate to multiple jobs, although such issue is less serious in healthcare
NY State Department of Labor, Unemployment	Number of unemployment insurance beneficiaries whose last job was in a middle-skill occupation	• Unemployment insurance beneficiaries, 2011 • Unemployment insurance beneficiaries, 2015 • Unemployment insurance beneficiaries, change, 2011-2015	Excluded	Only a portion of unemployed persons qualifies for or receives unemployment insurance. Occupations titles are self-reported, and are not fully aligned with SOC.
Eligible Training Provider List	Number of seats available in training programs	• Training provider class size, 2015	Excluded	Class size was used as a proxy for actual enrollment and completion data were unavailable.
CUNY Certificate Programs	Number of individuals who have obtained certifications in related CUNY non-degree programs	• CUNY certificate completers, 2011 • CUNY certificate completers, 2015 • CUNY certificate completers, average, 2011-2015 • CUNY certificate completers, change 2011-2015	Excluded	The data was self-reported. Some programs did not collect completion data in all years.
Survey of Workforce Providers	Number of individuals who completed non-degree training programs from non-profit workforce providers	• Workforce providers certifications, 2015	Excluded	Some providers were unable to collect data.

Table 5 depicts the list of indicators using the most recent data available to estimate various dimensions of labor demand, including online job postings and biannual 10-year long-term job projections. NYCLMIS included additional indicators using data provided by 1199SEIU, the largest private sector healthcare union. Compared to the 2017 report, this study added three additional indicators (they are marked with asterisks in Table 5) that measured percent change in job postings between 2014 and 2018 and both the net and percent change in union job placements. These additional data points that measure the degree of change in job postings and placements over time help to capture a more robust picture of demand.

Table 5. Demand Indicators

Data Source	Description	Demand Indicators in 2017 study	Demand Indicators in 2019 study	Limitations
1199 SEIU	Number of jobs posted from 1199 SEIU	• 1199 SEIU Job placements, 2011 • 1199 SEIU Job placements, 2015	• 1199 SEIU Job placements, 2014 • 1199 SEIU Job placements, 2018 • 1199 SEIU Job placements, change, 2014-2018* • 1199 SEIU Job placements, % change, 2014-2018*	Some titles are not well aligned to SOC codes.
NY State Department of Labor, Long-term Employment Projections	Ten-year projected growth and annual average openings.	• Long-term projection, number, 2012-2022 • Long-term projection, % change, 2012-2022 • Average annual openings, 2012-2022	• Long-term projection, number, 2016-2026 • Long-term projection, % change, 2016-2026 • Average annual openings, 2016-2026	Some biases may exist where small samples were taken. Turnover not currently included in count of openings
Burning Glass	Number of jobs posted from real-time labor market information	• Job ads, 2011 • Job ads, 2015 • Job ads, average, 2011-2015 • Job ads, change, 2011-2015	• Job ads, 2014 • Job ads, 2018 • Job ads, average, 2014-2018 • Job ads, change, 2014-2018 • Job ads, % change, 2014-2018*	Job postings may not reflect actual hiring practices. Many employers do not list educational and credential requirements.

Consistent with the 2017 study, the score of each indicator was rescaled to have a value between 0 and 1 to make them comparable to one another. The equation for normalization is derived by initially deducting the minimum value from each data point of the variable to be normalized. The minimum value is then deducted from the maximum value, and the previous result is divided by the latter for each data point.

Each occupation can be measured as "Low", "Moderate", or "High" against each of the above supply and demand indicators based on the rescaled score. An occupation with a score falling between 0 and 0.333 qualified as Low; an occupation with a score falling between 0.334 and 0.667 qualified as Moderate; and an occupation with a score falling between 0.668 and 1 was qualified as High in supply or demand.

Each occupation also received an aggregated score for supply and an aggregated score for demand by averaging across the individual indicators. The average score was then normalized using the same approach discussed above. Possible combinations included: Low Supply-Low Demand, Low Supply-Moderate Demand, Low Supply-High Demand, Moderate Supply-Low Demand, Moderate Supply-Moderate Demand, and so forth. The findings section will indicate how each of these ten occupations is performing, compared with the aggregated supply and demand indicator, as well as compared with individual supply and demand indicators.

5) Explore trends in healthcare and further implications for these ten occupations.

Qualitative data is useful in addressing the "why" and "how" questions behind the phenomena of interest. NYCLMIS conducted a focus group to learn how members of the healthcare field interpret and understand certain trends shaping healthcare, including technology advances and aging baby boomers, as well as implications for future supply and demand in these ten occupations.

The participants represented a variety of healthcare perspectives, including an education and training provider, a professional association, and a large city agency. The diversity of our participants offered an opportunity to gather valuable perspectives on future supply and demand and trends impacting workers. The focus group protocol with detailed guiding questions can be found in Appendix C.

FINDINGS

DEMOGRAPHIC PROFILE OF SELECTED[5] OCCUPATIONS

NYCLMIS accessed data from the American Community Survey (ACS) and conducted demographic analyses to develop an understanding of the age, sex, racial, education, and country of origin composition of New Yorkers who work in the nine occupations and how demographic trends have changed over time from the five-year period from 2008-2012 to the 2013-2017 period.

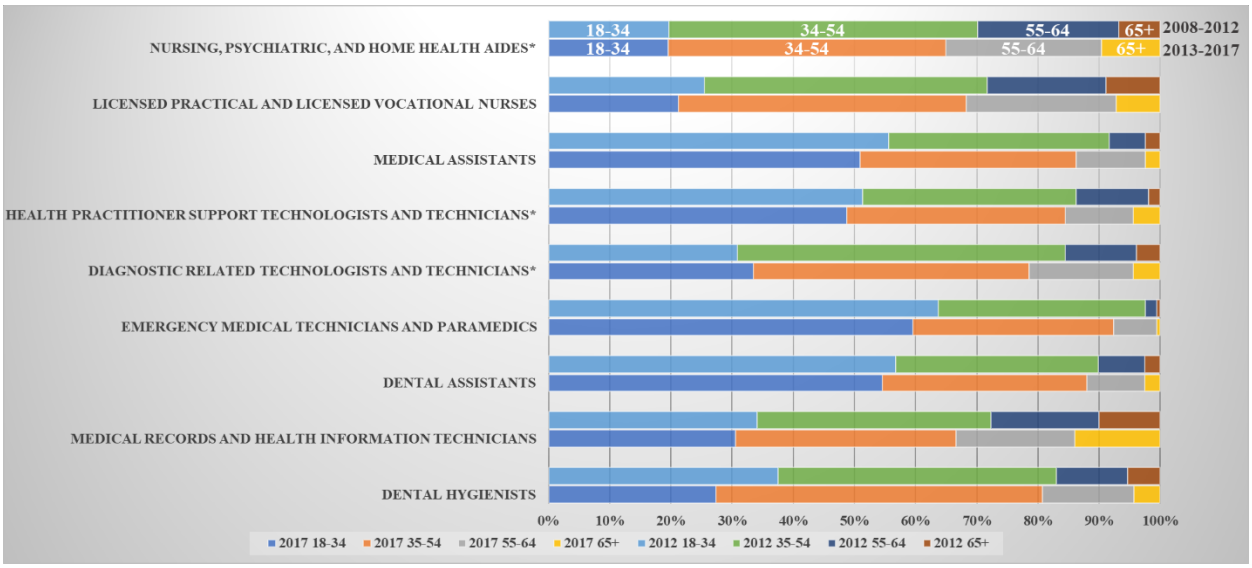
Overall, in New York City, the nine occupations of interest are filled by either young (18-34) or middle-aged (35-54) female workers who primarily identify as white or black and have completed less formal education than a bachelor's degree. The workers employed in these nine occupations are nearly equally divided between native-born and foreign-born (52% and 48%, respectively). There are a few exceptions to this general profile. In the five-year sample ending in 2017, the narrow occupations of Licensed Practical Nurses and Licensed Vocational Nurses, and Medical Records and Health Information Technicians have a comparatively large

[5] As previously noted, the demographic analysis yielded patterns in nine jobs, as two occupations (Pharmacy Technicians and Surgical Technologists) belonged to the same broader occupational category in the ACS data (Health Practitioner Support Technologists and Technicians).

share (31% and 33%, respectively) of older workers (55+). Emergency Medical Technicians and Paramedics have a higher proportion of male workers (65%) than female workers (35%). Dental Hygienists have the largest share of workers (among the specific occupations) with a bachelor's degree or above (42%).

The data suggest that there are additional demographic shifts for these jobs on the horizon. These shifts include: a slow but steady trend towards an aging workforce; more men seem to be entering traditionally female-dominated occupations (this has not yet emerged as a consistent trend across the middle-skill healthcare occupations); there is growing ethnic diversity; and increased levels of educational attainment and credentialing in 2013-2017 compared to 2008-2012. Below are detailed descriptions of each demographic dimension—age, sex, race, education, and country of origin—in these nine occupations.

Figure 1. Age Distribution of Nine Occupations in Healthcare[6]



Source: U.S. Census Bureau, American Community Survey (ACS), Five-Year Public Use Microdata Sample (PUMS)

Figure 1 displays the age distribution across nine occupations. For each occupation, the top and lower bar, respectively, represent the percent distribution of four age groups in the five-year samples ending in 2012 and 2017. Not surprising given the aging workforce, each occupation had a smaller proportion of younger (18-34) and middle-aged (35-54) workers relative to their proportion of older workers (55-64 and 65+) in 2013-2017 compared to 2008-2012.

Consistent across both five-year samples is that over half of the occupations are filled by middle-aged workers (35-54) with younger workers (18-34) composing the second largest group, followed by older workers (55-64 and 65+). The pattern is slightly different in four occupations, including Medical Assistants, Health Practitioner Support Technologists and Technicians, Emergency Medical Technicians and Paramedics, and Dental Assistants, where the proportion of younger workers (18-34) is

[6] In Figure 1, the labels "2012" and "2017" refer to the ranges 2008-2012 and 2013-2017, respectively.

Occupations with an asterisk are based on the ACS definition, which is broader than the SOC definition.

larger than or equals the proportion of middle-age workers (35-54).

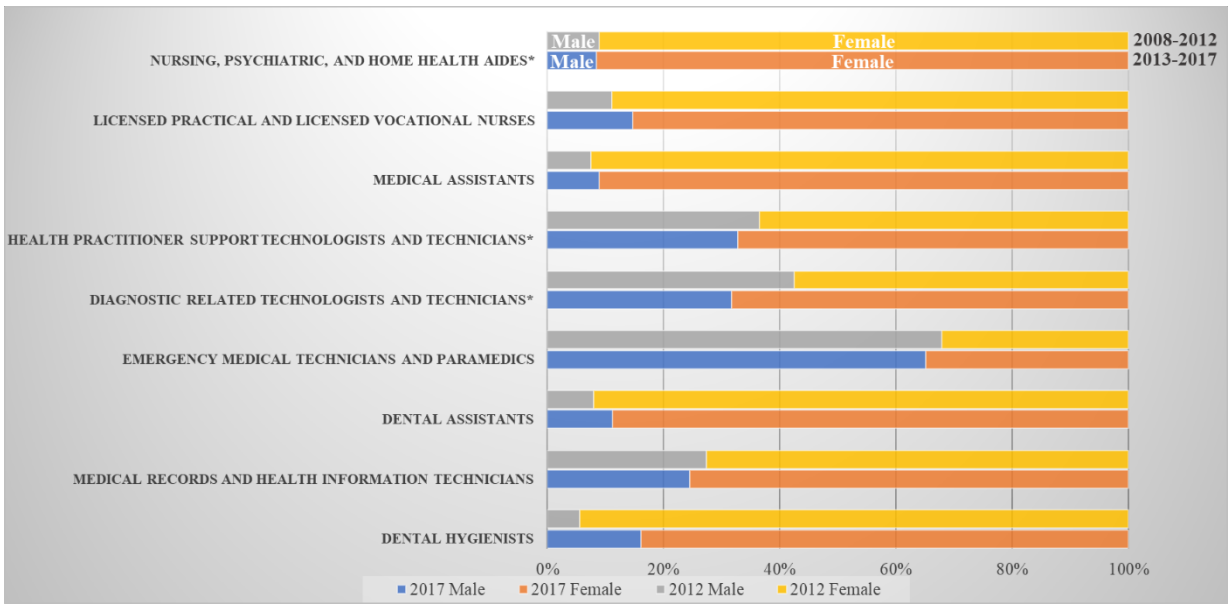
Except for the rather larger proportion (around 30%) of older workers (55-64 and 65+) in the Nursing, Psychiatric and Home Related Aides; Licensed Practical and Licensed Vocational Nurses; and Medical Records and Health Information Technicians occupations, older workers don't represent a major group in the labor force in the rest of the occupations. However, because Nursing, Psychiatric and Home Related Aides includes not only Nursing Assistants but other occupations (e.g. Home Health Aides, which is a "lower-skill" job), NYCLMIS could not determine whether this relationship also holds true among Nursing Assistants.

To understand why a noticeably higher share of older workers are employed within the Licensed Practical and Licensed Vocational Nurses occupations, NYCLMIS reviewed relevant literature and found a combination of social and educational factors. The size of the cohorts in the nurse education programs, which typically drew young women, declined in the 1980s, thereby creating opportunities for older workers in the market. In addition, the relatively low educational demand and high wages in nursing occupations attracted more older women who wished to resume their careers after childbearing/ rearing hiatuses (Buerhaus, Staiger, & Suerbach, 2000; Fitzgerald, 2007).

Figure 2 shows the gender distribution across nine occupations. Most of these occupations are composed primarily of women, except for Emergency Medical Technicians and Paramedics. The prevalence of males in this occupation could be the result of the more grueling physical nature of the work, or its higher level of risk of injury and physical danger.

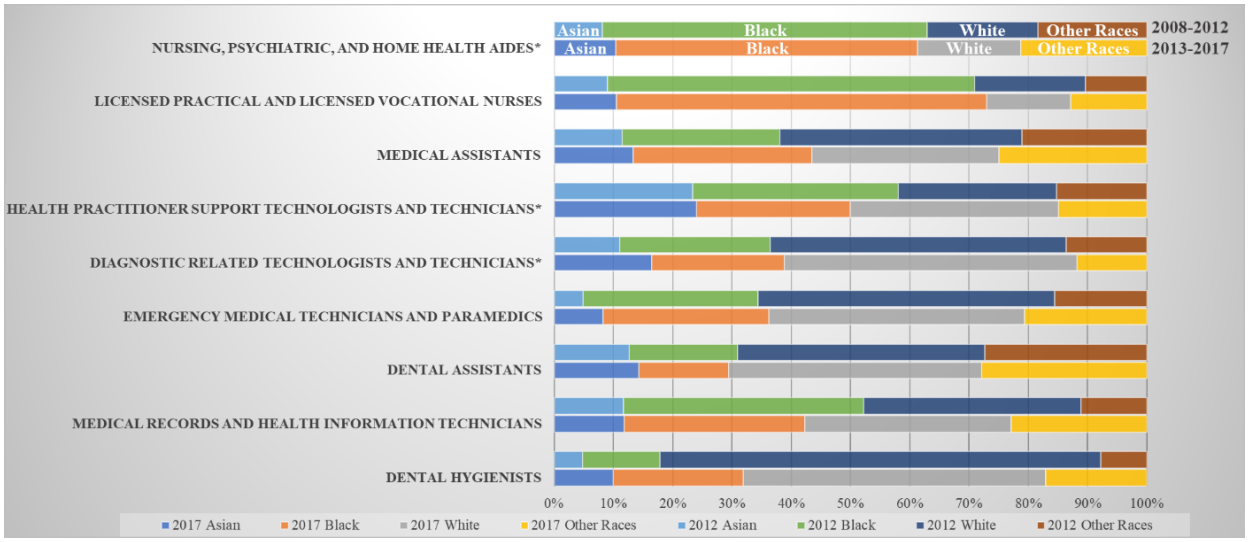
Nearly half of the occupations experienced an increasing share of male workers between the 2008-2012 and 2013-2017 samples, with the largest increase in Dental Hygienists (from 5% to 19%). In other occupations, the percentage of male workers declined across these time intervals. Diagnostic Related Technologists and Technicians experienced the biggest drop in the percentage of male workers, decreasing from 41% to 30%. Another three occupations, including Emergency Medical Technicians and Paramedics, Health Practitioner Support Technologists and Technicians, and Medical Records and Health Information Technicians, also experienced a slight drop in the share of male workers. However, due to the much broader types of jobs included in Health Practitioner Support Technologists and Technicians and Diagnostic Related Technologists and Technicians, NYCLMIS could not determine if this trend holds true specifically for Radiologic Technologists, Pharmacy Technicians, and Surgical Technologists.

Figure 2. Gender Distribution of Nine Occupations in Healthcare[7]



Source: U.S. Census Bureau, American Community Survey (ACS), Five-Year Public Use Microdata Sample (PUMS)

Figure 3. Race Distribution of Nine Occupations in Healthcare



Source: U.S. Census Bureau, American Community Survey (ACS), Five-Year Public Use Microdata Sample (PUMS)

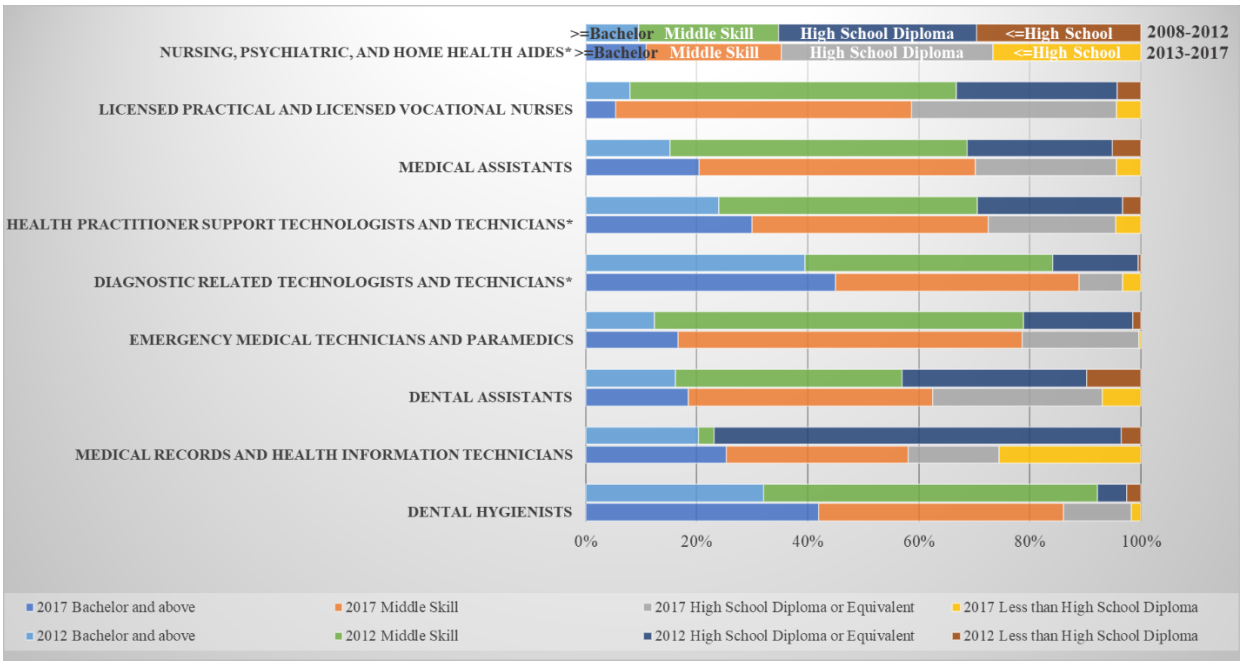
Figure 3 presents the race distribution across nine occupations. Black and white workers account for the majority of professionals in these occupations, while Asian and other races constitute a smaller portion of the workforce. In both the samples ending in 2012 and 2017, black workers accounted for the largest proportion of Nursing, Psychiatric, and Home Health Aides and Licensed Practical and Licensed Vocational Nurses, as well as a large share of Medical Records and Health Information

[7] In Figures 2 and 3, the labels "2012" and "2017" refer to the ranges 2008-2012 and 2013-2017, respectively. Occupations with asterisk means they are based on the ACS definition, which is broader than the SOC definition.

Technicians. White workers are the largest racial group in Diagnostic Related Technologists and Technicians, Emergency Medical Technicians and Paramedics, Dental Assistants, and Dental Hygienists.

From the 2008-2012 data sample to the 2013-2017 sample, there was a decrease in the share of black and white workers, and a corresponding increase in the share of Asian and other-race workers.

Figure 4. Education Distribution of Nine Occupations in Healthcare[8]



Source: U.S. Census Bureau, American Community Survey (ACS), Five-Year Public Use Microdata Sample (PUMS)

Figure 4 presents the education distribution across nine occupations. While most of these occupations continue to be primarily staffed by workers with either a high school diploma or some postsecondary education, but less than a four-year college degree, from the five-year sample ending in 2012 to that ending in 2017, many experienced growth in the share of workers with a bachelor's or more advanced degrees.

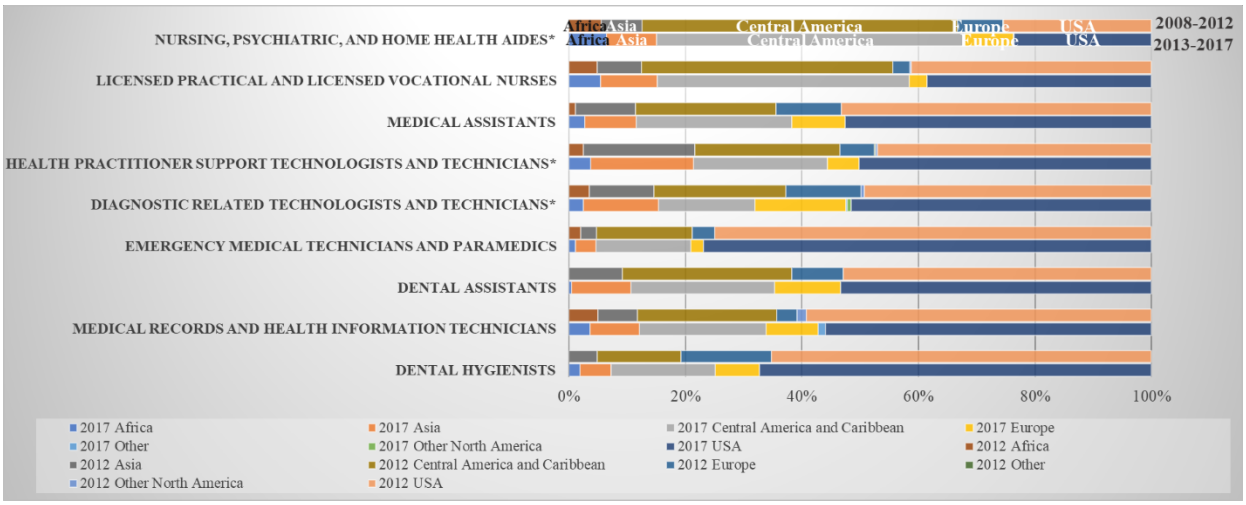
Diagnostic Related Technologists and Technicians is the occupation with the largest share (45%) of four-year or advanced degree holders, followed by Dental Hygienists (42%) and Health Practitioner Support Technologists and Technicians (30%). Dental Hygienists also saw the largest increase in the share of workers having at least a bachelor's degree from the five-year sample ending in 2012 to that ending in 2017 – approximately ten percentage points. Perhaps unsurprisingly, this occupation that is increasingly drawing candidates with more formal education is also the highest-paying of the ten middle-skill healthcare occupations studied (wage information is available in the supply and demand analysis in the next section).

Due to the fact that Diagnostic Related Technologists and Technicians and Health

[8] In Figure 4, the labels "2012" and "2017" refer to the ranges 2008-2012 and 2013-2017, respectively. Occupations with asterisk means they are based on the ACS definition, which is broader than the SOC definition.

Practitioner Support Technologists and Technicians include other occupations, NYCLMIS could not determine whether the relationship between more education and higher wages is true specifically for Radiologic Technologists, Pharmacy Technicians, and Surgical Technologists.

Figure 5. Country of Origin Distribution of Nine Occupations in Healthcare[9]



Source: U.S. Census Bureau, American Community Survey (ACS), Five-Year Public Use Microdata Sample (PUMS)

Figure 5 presents the country of origin distribution across nine occupations. Immigrants represent a significant slice of these occupations' labor forces, and this trend remained stable from the 2008-2012 sample to the 2013-2017 sample. Emergency Medical Technicians and Paramedics is the occupation in which foreign-born workers compose the smallest share of workers in the labor force, 23%. In contrast, Nursing, Psychiatric, and Home Health Aides have the largest share of foreign-born workers compared to the other occupations, with a share of 76%. However, due to the much broader types of jobs included in Nursing, Psychiatric, and Home Health Aides, NYCLMIS could not determine if this distribution holds true specifically for Nursing Assistants. In other occupations, the workers are nearly equally divided between native-born and foreign-born. Among immigrants, Central America and Caribbean is the leading region of birth, followed by Asia, Europe and Africa.

SUPPLY AND DEMAND ANALYSIS

Figure 6 shows the results of the analysis of labor supply and demand for the ten middle-skill healthcare occupations. Overall, the data indicate that the labor supply for these ten occupations tracks well to labor market demand. Those occupations that are both Low Supply and Low Demand include Dental Assistants, Emergency Medical Technicians and Paramedics, Pharmacy Technicians, Radiologic Technologists, Dental Hygienists, and Surgical Technologists. Licensed Practical and

[9] In Figure 5, the labels "2012" and "2017" refer to the ranges 2008-2012 and 2013-2017, respectively. Occupations with asterisk means they are based on the ACS definition, which is broader than the SOC definition.

Licensed Vocational Nurses are measured as Moderate on both Supply and Demand, and there is High Supply and High Demand for Nursing Assistants. Only two occupations' analyses indicate a supply and demand imbalance. Medical Assistants face an over-supply issue (High Supply and Moderate Demand), while Medical Records and Health Information Technicians face an under-supply issue (Low Supply and High Demand).

When compared to findings from the 2017 report, supply and demand indicators remained unchanged for over half of the occupations. Other occupations experienced a decrease in supply ranking, including Medical Records and Health Information Technicians, shifting from High Supply and High Demand to Low Supply and High Demand. Three other occupations - Dental Assistants, Emergency Medical Technician and Paramedics, and Pharmacy Technicians - shifted from Moderate Supply and Low Demand to Low Supply and Low Demand. Yet, caution is needed when interpreting the results. The drop in the aggregated supply indicator might be reflective of an actual decline in labor supply but could also be the result of excluding indicators that were used and ranked high in the 2017 study. The following section contains detailed findings for each of the ten middle-skill healthcare occupations and its comparison with findings from the 2017 report.

Figure 6. The Supply of and Demand for Ten Middle-Skill Healthcare Occupations

		Demand		
		Low	Moderate	High
Supply	High		• Medical Assistants	• Nursing Assistants
	Moderate		• Licensed Practical and Licensed Vocational Nurses	
	Low	• Dental Assistants • EMT and Paramedics • Pharmacy Technicians • Radiologic Technologists • Dental Hygienists • Surgical Technologists		• Medical Records and Health Information Technicians

Nursing Assistants: High Supply and High Demand

Table 6. Nursing Assistants Profile

Occupation Title	2018[10] Employment	Annual Wage		
		Mean	Entry[11]	Experienced[12]
Nursing Assistants	35,880	$42,830	$34,310	$47,090
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Nursing Assistants provide patient care under direction of nursing staff. They perform duties such as feeding, bathing, dressing, grooming, and moving patients; changing linens; and transferring or transporting patients. As shown in Table 6, the occupation accounts for approximately 30% of the employment among all healthcare middle-skill occupations, yet, the pay is lower than average compared to all healthcare middle-skill occupations.

Tables 7 and 8 present the individual and aggregated supply and demand indicators. Indicators and rankings described as "Excluded" were used in the 2017 study but not in this study. Indicators and rankings described as "Not used" were not part of the 2017 study, but were part of this study's analyses, and those labeled "N/A" mean the data was not available. For example, there is missing data in 2013-2017 employment and wage measures from ACS, for which data is only available in a broader category that includes Nursing Assistants along with other occupations.

As shown in Table 7, this occupation ranks High in current employment and number of certifications offered by CTE programs in 2018; Moderate on the change in the number of Associate degrees conferred between 2013 and 2017; and Low on the number of Associate degrees conferred in 2013 and 2017. For supply indicators that are available in both studies, rankings are consistent.

According to Table 8, this occupation ranks High and Moderate in almost all of the demand indicators. It only ranks Low on two indicators—the percent change in citywide online job posts between 2014 and 2018 and projected percent change in jobs between 2016 and 2026. For demand indicators that are available in both studies, rankings are consistent.

Overall, consistent with findings from the 2017 study, this occupation ranks High on both aggregate Supply and Demand, indicating balance in the labor market.

[10] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.
[11] According to Occupational Employment Statistics (OES), entry wage refers to the mean (average) of the bottom third of wages in an occupation.
[12] According to OES, experienced wage refers to the mean (average) of the top two-thirds of wages in an occupation.

Table 7. Supply Indicators in Nursing Assistants

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	High	Current employment, 2015	High
ACS employment, 2013	N/A	ACS employment, 2011	N/A
ACS employment, 2017	N/A	ACS employment, 2015	N/A
ACS employment, change, 2013-2017	N/A	Not used	Not used
ACS employment, % change, 2013-2017	N/A	Not used	Not used
Wage change, 2013-2017	N/A	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	N/A	Not used	Not used
CTE certifications, 2018	High	CTE certifications, 2017	High
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	Moderate	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Moderate	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	High
Excluded	Excluded	CUNY certificate completers, 2015	High
Excluded	Excluded	CUNY certificate completers, average 2011-2015	High
Excluded	Excluded	CUNY certificate completers, change 2011-2015	Low
Excluded	Excluded	Unemployment insurance claimants, 2011	N/A
Excluded	Excluded	Unemployment insurance claimants, 2015	N/A
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	N/A
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	High	Aggregated supply measure	High

Table 8. Demand Indicators in Nursing Assistants

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	High	1199 SEIU Job placement, 2011	High
1199 SEIU Job placement, 2018	High	1199 SEIU Job placement, 2015	High
1199 SEIU Job placement, change, 2014-2018	High	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Moderate	Not used	Not used
Long-term projection, number, 2016-2026	High	Long-term projection, number, 2012-2022	High
Long-term projection, % change, 2016-2026	Low	Long-term projection, % change, 2012-2022	Low
Annual Average Openings, 2016-2026	High	Annual Average Openings, 2012-2022	High
Job ads, 2014	Moderate	Job ads, 2011	Moderate
Job ads, 2018	Moderate	Job ads, 2015	Moderate
Job ads, change, 2014-2018	Moderate	Job ads, change, 2011-2015	Moderate
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	High	Aggregated demand measure	High

Licensed Practical and Licensed Vocational Nurses: Moderate Supply and Moderate Demand

Table 9. Licensed Practical and Licensed Vocational Nurses Profile

Occupation Title	2018[13] Employment	Annual Wage		
		Mean	Entry	Experienced
Licensed Practical and Licensed Vocational Nurses	13,920	$56,600	$47,420	$61,200
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

[13] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

Licensed Practical and Licensed Vocational Nurses care for ill, injured, or convalescing patients or persons with disabilities in hospitals, nursing homes, clinics, private homes, group homes, and similar institutions. They may work under the supervision of a registered nurse and are required licensing. As shown in Table 9, workers in this occupation have higher-than-average salary in the realm of healthcare middle-skill occupations.

Tables 10 and 11 present the individual and aggregated supply and demand indicators in Licensed Practical and Licensed Vocational Nurses. According to Table 10, this occupation ranks High in measures that are a proxy for future supply, such as current and past employment in New York City; but Moderate and Low on current supply measures, including number of and change in Associate degrees conferred in 2013 and 2017, wage change between 2013 and 2017, and number of certifications offered by CTE schools in 2018. Compared to matching indicators from the 2017 study, there are changes in two rankings. This occupation ranks High in current employment, rather than Moderate from the 2017 report. It also ranks Low on the growth of Associate degrees conferred between 2013 and 2017, as opposed to High on growth of Associate degrees conferred between 2011 and 2015. According to Table 11, this occupation ranks Low and Moderate on most demand indicators, with the exception of three, including the percent change in the number of job posts from the 1199 SEIU Union between 2014 and 2018, and the number of jobs posted in New York City in 2018 and its net change from 2014 to 2018. Compared to matching indicators from the 2017 study, there are changes in four rankings. The ranking drops from Moderate to Low in annual average job openings and percent change (ten-year job projections) and increases from Moderate to High in the number of online job posts in New York City and growth from the past five years.

Overall, consistent with findings from the 2017 study, this occupation ranks Moderate in both Supply and Demand, indicating balance in the labor market. However, the demographic analysis discussed suggests there will be lower supply in the labor market in the coming years since this occupation has a relatively high proportion (30%) of older workers (ages 55 and older) nearing retirement.

Table 10. Supply Indicators in Licensed Practical and Licensed Vocational Nurses

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	High	Current employment, 2015	Moderate
ACS employment, 2013	High	ACS employment, 2011	High
ACS employment, 2017	High	ACS employment, 2015	High
ACS employment, change, 2013-2017	High	Not used	Not used
ACS employment, % change, 2013-2017	Moderate	Not used	Not used
Wage change, 2013-2017	Low	Wage change, 2011-2015	Low
% Wage change, 2013-2017	Low	Not used	Not used
CTE certifications, 2018	Moderate	CTE certifications, 2017	Moderate
License issued, 2019	High	License issued, 2017	High
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	Low	Associate degree, change, 2011-2015	High
Associate degree, % change, 2013-2017	Low	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	Low
Excluded	Excluded	CUNY certificate completers, 2015	Low
Excluded	Excluded	CUNY certificate completers, average 2011-2015	Low
Excluded	Excluded	CUNY certificate completers, change 2011-2015	N/A
Excluded	Excluded	Unemployment insurance claimants, 2011	Low
Excluded	Excluded	Unemployment insurance claimants, 2015	Low
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	High
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Moderate	Aggregated supply measure	Moderate

Table 11. Demand Indicators in Licensed Practical and Licensed Vocational Nurses

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Moderate	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	High	Not used	Not used
Long-term projection, number, 2016-2026	Moderate	Long-term projection, number, 2012-2022	Moderate
Long-term projection, % change, 2016-2026	Low	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Moderate
Job ads, 2014	Moderate	Job ads, 2011	Moderate
Job ads, 2018	High	Job ads, 2015	Moderate
Job ads, change, 2014-2018	High	Job ads, change, 2011-2015	Moderate
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	Moderate	Aggregated demand measure	Moderate

Medical Assistants: High Supply and Moderate Demand

Table 12. Medical Assistants Profile

Occupation Title	2018[14] Employment	Annual Wage		
		Mean	Entry	Experienced
Medical Assistants	12,850	$40,140	$31,060	$44,670
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Medical Assistants perform both administrative and certain clinical duties under the direction of a physician. Administrative duties may include scheduling appointments, maintaining medical records, billing, and coding information for insurance purposes. Clinical duties may include taking and recording vital signs and medical histories, preparing patients for examination, drawing blood, and

[14] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

administering medications as directed by a physician. As shown in Table 12, this occupation is paid lower than the average of healthcare middle-skill occupations.

Tables 13 and 14 present the individual and aggregate supply and demand indicators for Medical Assistants. As shown in Table 13, this occupation ranks Low and Moderate on future supply measures, such as current employment and change in employment from 2013 to 2017, but High on many current supply measures, including the number of Associate degrees conferred and the change between 2013 and 2017. For supply indicators that are available in both studies, measurements are consistent.

As shown in Table 14, most demand indicators ranked Low and Moderate with the exception of the percent change in ten-year job projections and net change in online job posts in New York City in the past five years. When compared to the findings from the 2017 report, these two indicators respectively increased in the ranking from Moderate to High and Low to High.

Consistent with findings from the 2017 report, this occupation ranks High in aggregated Supply and Moderate in aggregated Demand, indicating over-supply imbalance in the labor market.

Table 13. Supply Indicators in Medical Assistants

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	High	ACS employment, 2011	High
ACS employment, 2017	Moderate	ACS employment, 2015	Moderate
ACS employment, change, 2013-2017	Low	Not used	Not used
ACS employment, % change, 2013-2017	Low	Not used	Not used
Wage change, 2013-2017	Low	Wage change, 2011-2015	Low
% Wage change, 2013-2017	Moderate	Not used	Not used
CTE certifications, 2018	Low	CTE certifications, 2017	Low
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	High	Associate degree, 2011	High
Associate degree, 2017	High	Associate degree, 2015	High
Associate degree, average, 2013-2017	High	Associate degree, average, 2011-2015	High
Associate degree, change, 2013-2017	High	Associate degree, change, 2011-2015	High
Associate degree, % change, 2013-2017	Moderate	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	Moderate
Excluded	Excluded	CUNY certificate completers, 2015	High
Excluded	Excluded	CUNY certificate completers, average 2011-2015	High
Excluded	Excluded	CUNY certificate completers, change 2011-2015	High
Excluded	Excluded	Unemployment insurance claimants, 2011	High
Excluded	Excluded	Unemployment insurance claimants, 2015	High
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	Moderate
Excluded	Excluded	Training provider class size	Moderate
Excluded	Excluded	Workforce provider certifications, 2015	Low
Aggregated supply measure	High	Aggregated supply measure	High

Table 14. Demand Indicators in Medical Assistants

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Moderate	Not used	Not used
Long-term projection, number, 2016-2026	Moderate	Long-term projection, number, 2012-2022	Moderate
Long-term projection, % change, 2016-2026	High	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Moderate	Job ads, 2015	Moderate
Job ads, change, 2014-2018	High	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	Moderate	Not used	Not used
Aggregated demand measure	Moderate	Aggregated demand measure	Moderate

Pharmacy Technicians: Low Supply and Low Demand

Table 15. Pharmacy Technicians Profile

Occupation Title	2018[15] Employment	Annual Wage		
		Mean	Entry	Experienced
Pharmacy Technicians	8,780	$37,530	$28,080	$43,050
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Pharmacy Technicians prepare medications under the direction of a pharmacist. They may measure, mix, count out, label, and record amounts and dosages of medications according to prescription orders. As shown in Table 15, this occupation is paid lower than average in the realm of healthcare middle-skill occupations.

[15] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

Tables 16 and 17 present the individual and aggregated supply and demand indicators for Pharmacy Technicians. According to Table 16, this occupation ranks Low and Moderate on all available supply measures. For supply indicators that are available in both studies, their measurements are consistent.

Similarly, as shown in Table 17, all demand indicators were Low except for the percent change in SEIU job placements and net change in citywide online job posts from 2014 to 2018. Compared to the matching indicators from the 2017 study, there are changes in two measurements. The measurement drops from Moderate to Low in the percent change in ten-year job projection and increases from Low to Moderate in the net change in citywide online job posts from the past five years.

This occupation ranks Low in both aggregated Supply and Demand, indicating balance in the labor market. Compared to the 2017 report, there is a drop from Moderate to Low in the aggregated supply.

Table 16. Supply Indicators in Pharmacy Technicians

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	N/A	ACS employment, 2011	N/A
ACS employment, 2017	N/A	ACS employment, 2015	N/A
ACS employment, change, 2013-2017	N/A	Not used	Not used
ACS employment, % change, 2013-2017	N/A	Not used	Not used
Wage change, 2013-2017	N/A	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	N/A	Not used	Not used
CTE certifications, 2018	Low	CTE certifications, 2017	N/A
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	Moderate	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Low	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	Moderate
Excluded	Excluded	CUNY certificate completers, 2015	Moderate
Excluded	Excluded	CUNY certificate completers, average 2011-2015	Moderate
Excluded	Excluded	CUNY certificate completers, change 2011-2015	Low
Excluded	Excluded	Unemployment insurance claimants, 2011	Low
Excluded	Excluded	Unemployment insurance claimants, 2015	Low
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	Moderate
Excluded	Excluded	Training provider class size	Low
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Low	Aggregated supply measure	Moderate

Table 17. Demand Indicators in Pharmacy Technicians

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Moderate	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Low	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Low	Job ads, 2015	Low
Job ads, change, 2014-2018	Moderate	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	Low	Aggregated demand measure	Low

Dental Assistants: Low Supply and Low Demand

Table 18. Dental Assistants Profile

Occupation Title	2018[16] Employment	Annual Wage		
		Mean	Entry	Experienced
Dental Assistants	7,980	$38,770	$28,080	$44,470
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

[16] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

Dental Assistants set up equipment, prepare patients for treatment, and keep records. As shown in Table 18, this occupation is paid lower than average compared to all middle-skill occupations in healthcare.

Tables 19 and 20 present the individual and aggregated supply and demand indicators for Dental Assistants. According to Table 19, this occupation ranks Low and Moderate on all available supply measures. Compared to findings from the 2017 report, there is a decrease in ranking for wage change from 2011-2015 (High) to 2013-2017 (Moderate). Given that wages increase when labor demand exceeds the supply, a lower increase in wage either indicates a lower demand for or over-supply of workers over the time period. The ranking for employment size based on historic ACS data changed from Low in 2011 to Moderate in 2013. Yet, the aggregated supply is measured Low as all other individual supply indictors are measured Low or Moderate.

Similarly, as shown in Table 20, all demand indicators are measured Low except for the projected percent change in jobs between 2016 and 2026 (Moderate), and percent change in job placements from the 1199 SEIU union between 2014 and 2018 (High). For indicators that are available in both studies, their measurements are consistent.

This occupation ranks Low in both aggregated Supply and Demand, indicating balance in the labor market. Yet, the occupation was ranked Moderate on aggregated Supply and Low on aggregated Demand in the 2017 report.

Table 19. Supply Indicators in Dental Assistants

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	Moderate	ACS employment, 2011	Low
ACS employment, 2017	Low	ACS employment, 2015	Low
ACS employment, change, 2013-2017	Low	Not used	Not used
ACS employment, % change, 2013-2017	Low	Not used	Not used
Wage change, 2013-2017	Moderate	Wage change, 2011-2015	High
% Wage change, 2013-2017	Moderate	Not used	Not used
CTE certifications, 2018	Low	CTE certifications, 2017	Low
License issued, 2019	Low	License issued, 2017	Low
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	Moderate	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Moderate	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	Low
Excluded	Excluded	CUNY certificate completers, 2015	Moderate
Excluded	Excluded	CUNY certificate completers, average 2011-2015	Low
Excluded	Excluded	CUNY certificate completers, change 2011-2015	Moderate
Excluded	Excluded	Unemployment insurance claimants, 2011	High
Excluded	Excluded	Unemployment insurance claimants, 2015	High
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	High
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Low	Aggregated supply measure	Moderate

Table 20. Demand Indicators in Dental Assistants

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	High	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Moderate	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Low	Job ads, 2015	Low
Job ads, change, 2014-2018	Low	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	Low	Aggregated demand measure	Low

Emergency Medical Technicians and Paramedics: Low Supply and Low Demand

Table 21. Emergency Medical Technicians and Paramedics Profile

Occupation Title	2018[17] Employment	Annual Wage		
		Mean	Entry	Experienced
EMT and Paramedics	6,500	$49,930	$32,740	$58,520
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Emergency Medical Technicians and Paramedics assess injuries, administer emergency medical care, extricate trapped individuals, and transport injured or sick persons to medical facilities. As shown in Table 21, this occupation is paid close to average compared to all middle-skill occupations in healthcare.

Tables 22 and 23 present the individual and aggregated supply and demand indicators in Emergency Medical Technicians and Paramedics. According to Table 22, this

[17] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

occupation ranks Low and Moderate on all available supply measures in this study. Compared to findings from the 2017 report, there is a decrease in rank for the number of certifications offered by CTE schools.

Similarly, as shown in Table 23, all demand indicators are measured Low except for the projected percent change in jobs between 2016 and 2026 (Moderate), and percent change in job placements from the 1199 SEIU union between 2014 and 2018 (High). For demand indicators that are available in both studies, their measurements are consistent.

This occupation ranks Low in both aggregated Supply and Demand, indicating balance in the labor market. Yet, the occupation was ranked Moderate on aggregated Supply and Low on aggregated Demand in the 2017 report.

Table 22. Supply Indicators in Emergency Medical Technicians and Paramedics

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	Low	ACS employment, 2011	Low
ACS employment, 2017	Low	ACS employment, 2015	Low
ACS employment, change, 2013-2017	Moderate	Not used	Not used
ACS employment, % change, 2013-2017	Moderate	Not used	Not used
Wage change, 2013-2017	Low	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	Low	Not used	Not used
CTE certifications, 2018	Low	CTE certifications, 2017	Moderate
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	Moderate	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Moderate	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	High
Excluded	Excluded	CUNY certificate completers, 2015	High
Excluded	Excluded	CUNY certificate completers, average 2011-2015	High
Excluded	Excluded	CUNY certificate completers, change 2011-2015	Low
Excluded	Excluded	Unemployment insurance claimants, 2011	Low
Excluded	Excluded	Unemployment insurance claimants, 2015	Low
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	High
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Low	Aggregated supply measure	Moderate

Table 23. Demand Indicators in Emergency Medical Technicians and Paramedics

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	High	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Moderate	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Low	Job ads, 2015	Low
Job ads, change, 2014-2018	Low	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	Low	Aggregated demand measure	Low

Radiologic Technologists: Low Supply and Low Demand

Table 24. Radiologic Technologists Profile

Occupation Title	2018[18] Employment	Annual Wage		
		Mean	Entry	Experienced
Radiologic Technologists	4,850	$77,200	$56,590	$87,500
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Radiologic Technologists take X-Rays and CAT scans or administer nonradioactive materials into patients' blood stream for diagnostic purposes. As shown in Table 24, this occupation has higher-than-average pay compared to all middle-skill occupations in healthcare.

Tables 25 and 26 present the supply and demand indicators in Radiologic Technologists. According to Table 25, this

[18] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

occupation ranks Low on current employment and number of Associate degrees conferred in 2013 and 2017, and High and Moderate on the net and percent change (respectively) in the number of Associate degrees conferred between 2013 and 2017. For supply indicators that are available in both studies, their measurements are mostly consistent.

As shown in Table 26, all demand indicators are measured Low except for the percent change in citywide online job posts between 2014 and 2018 (Moderate). For demand indicators that are available in both studies, their measurements are mostly consistent.

Consistent with findings from 2017, this occupation ranks Low in both aggregated Supply and Demand, indicating balance in the labor market. Yet, the fact that this occupation is high-paid in the realm of healthcare middle-skill occupations may indicate a higher demand and a possible need for stronger growth in supply.

Table 25. Supply Indicators in Radiologic Technologists

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	N/A
ACS employment, 2013	N/A	ACS employment, 2011	N/A
ACS employment, 2017	N/A	ACS employment, 2015	N/A
ACS employment, change, 2013-2017	N/A	Not used	Not used
ACS employment, % change, 2013-2017	N/A	Not used	Not used
Wage change, 2013-2017	N/A	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	N/A	Not used	Not used
CTE certifications, 2018	N/A	CTE certifications, 2017	N/A
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	High	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Moderate	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	N/A
Excluded	Excluded	CUNY certificate completers, 2015	N/A
Excluded	Excluded	CUNY certificate completers, average 2011-2015	N/A
Excluded	Excluded	CUNY certificate completers, change 2011-2015	N/A
Excluded	Excluded	Unemployment insurance claimants, 2011	N/A
Excluded	Excluded	Unemployment insurance claimants, 2015	N/A
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	N/A
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Low	Aggregated supply measure	Low

Table 26. Demand Indicators in Radiologic Technologists

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Low	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Low	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Low	Job ads, 2015	Low
Job ads, change, 2014-2018	Low	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	Moderate	Not used	Not used
Aggregated demand measure	Low	Aggregated demand measure	Low

Medical Records and Health Information Technicians: Low Supply and High Demand

Table 27. Medical Records and Health Information Technicians Profile

Occupation Title	2018[19] Employment	Annual Wage		
		Mean	Entry	Experienced
Medical Records and Health Information Technicians	3,730	$49,940	$32,870	$58,470
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Medical Records and Health Information Technicians compile, process, and maintain patient medical records consistent with medical, administrative, ethical, legal, and regulatory requirements of the healthcare system. As shown in Table 27, this occupation is paid close to average

[19] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

compared to all middle-skill occupations in healthcare.

Tables 28 and 29 present the supply and demand indicators in Medical Records and Health Information Technicians. According to Table 28, this occupation ranks Low on most supply indicators except for wage change measures between 2013 and 2017. A higher increase in wages indicates either a higher demand or under-supply of workers over the years. For supply indicators that are available in both studies, their measurements are mostly consistent. Yet, the aggregated supply measure drops from High to Low in this study. The drop could imply the actual decline in supply but could also be affected by the fact that a number of excluded indicators (e.g. CUNY certificate completers, change in unemployment insurance claimants and workforce provider certifications) ranked high in 2017 study.

As shown in Table 29, this occupation ranks High in measures related to citywide job posts between 2014 and 2018, Moderate on measures related to job placements from the 1199 SEIU union between 2014 and 2018, and Low on measures related to the ten-year job projection. For demand indicators that are available in both studies, their measurements are mostly consistent.

This occupation ranks Low on aggregated Supply and High on aggregated Demand, indicating imbalance in the labor market. Yet, the occupation was ranked High on aggregated Supply and High on aggregated Demand in the 2017 report

Table 28. Supply Indicators in Medical Records and Health Information Technicians

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	Low	ACS employment, 2011	N/A
ACS employment, 2017	Low	ACS employment, 2015	N/A
ACS employment, change, 2013-2017	Low	Not used	Not used
ACS employment, % change, 2013-2017	Low	Not used	Not used
Wage change, 2013-2017	High	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	High	Not used	Not used
CTE certifications, 2018	Low	CTE certifications, 2017	Low
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	Low	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Low	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	High
Excluded	Excluded	CUNY certificate completers, 2015	High
Excluded	Excluded	CUNY certificate completers, average 2011-2015	High
Excluded	Excluded	CUNY certificate completers, change 2011-2015	Low
Excluded	Excluded	Unemployment insurance claimants, 2011	Low
Excluded	Excluded	Unemployment insurance claimants, 2015	Low
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	High
Excluded	Excluded	Training provider class size	Low
Excluded	Excluded	Workforce provider certifications, 2015	High
Aggregated supply measure	Low	Aggregated supply measure	High

Table 29. Demand Indicators in Medical Records and Health Information Technicians

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Moderate	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Moderate	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Moderate	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Low	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	High	Job ads, 2011	High
Job ads, 2018	High	Job ads, 2015	High
Job ads, change, 2014-2018	High	Job ads, change, 2011-2015	High
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	High	Aggregated demand measure	High

Dental Hygienists: Low Supply and Low Demand

Table 30. Dental Hygienists Profile

Occupation Title	2018[20] Employment	Annual Wage		
		Mean	Entry	Experienced
Dental Hygienists	2,590	$87,130	$72,480	$94,450
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Dental Hygienists clean teeth and examine oral areas, head, and neck for signs of oral disease. As shown in Table 30, this occupation has higher-than-average pay compared to all middle-skill occupations in healthcare.

Tables 31 and 32 present the supply and demand indicators for Dental Hygienists. As reflected in Table 31, this occupation ranks Low on most supply indicators except for wage change between 2013 and 2017, the percent change in employment between

[20] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

2013 and 2017, and net and percent change in the number of Associate degrees conferred between 2013 and 2017. For supply indicators that are available in both studies, their measurements are mostly consistent.

As shown in Table 32, all demand indicators are measured Low except for the percent change in citywide online job posts between 2014 and 2018 (High) and projected percent change in jobs between 2016 and 2026 (Moderate). For demand indicators that are available in both studies, their measurements are unchanged.

Consistent with findings from 2017, this occupation ranks Low in both aggregated Supply and Demand, indicating balance in the labor market. Yet, the fact that this occupation has higher-than-average salary in the realm of healthcare middle-skill occupations may indicate a higher demand in the labor market.

Table 31. Supply Indicators in Dental Hygienists

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	Low	ACS employment, 2011	N/A
ACS employment, 2017	Low	ACS employment, 2015	N/A
ACS employment, change, 2013-2017	Low	Not used	Not used
ACS employment, % change, 2013-2017	High	Not used	Not used
Wage change, 2013-2017	Moderate	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	Moderate	Not used	Not used
CTE certifications, 2018	Low	CTE certifications, 2017	N/A
License issued, 2019	Low	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	High	Associate degree, change, 2011-2015	Moderate
Associate degree, % change, 2013-2017	Moderate	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	N/A
Excluded	Excluded	CUNY certificate completers, 2015	N/A
Excluded	Excluded	CUNY certificate completers, average 2011-2015	N/A
Excluded	Excluded	CUNY certificate completers, change 2011-2015	N/A
Excluded	Excluded	Unemployment insurance claimants, 2011	Low
Excluded	Excluded	Unemployment insurance claimants, 2015	Low
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	High
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Low	Aggregated supply measure	Low

Table 32. Demand Indicators in Dental Hygienists

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Low	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Moderate	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Low	Job ads, 2015	Low
Job ads, change, 2014-2018	Low	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	High	Not used	Not used
Aggregated demand measure	Low	Aggregated demand measure	Low

Surgical Technologists: Low Supply and Low Demand

Table 33. Surgical Technologists Profile

Occupation Title	2018[21] Employment	Annual Wage		
		Mean	Entry	Experienced
Surgical Technologists	2,350	$63,040	$45,990	$71,570
All Healthcare Middle-Skill Occupations	119,190	$50,167	$38,348	$56,196

Source: New York State Department of Labor, May 2018 Occupational Employment Statistics (OES), New York City

Surgical Technologists assist in operations, under the supervision of surgeons, registered nurses, or other surgical personnel. As shown in Table 33, this occupation has higher-than-average pay in the realm of middle-skill occupations in healthcare. Tables 34 and 35 present the supply and demand indicators in Surgical Tech-

[21] Employment figures from the reported OES data are benchmarked against the average from May 2018 and November 2017.

nologists. According to Table 34, this occupation ranks Low on all available supply indicators except for the net change in the number of Associate degrees conferred between 2013 and 2017 (High). For supply indicators that are available in both studies, their measurements are consistent.

As shown in Table 35, all demand indicators are measured Low except for the percent change in job placements from the 1199 SEIU union between 2014 and 2018 (Moderate). For demand indicators that are available in both studies, their measurements are mostly consistent.

Unchanged from the 2017 report, this occupation ranks Low in both aggregated Supply and Demand, indicating balance in the labor market.

Table 34. Supply Indicators in Surgical Technologists

Supply Indicators in 2019 Study	2019 Ranking	Supply Indicators in 2017 Study	2017 Ranking
Current employment, 2018	Low	Current employment, 2015	Low
ACS employment, 2013	N/A	ACS employment, 2011	N/A
ACS employment, 2017	N/A	ACS employment, 2015	N/A
ACS employment, change, 2013-2017	N/A	Not used	Not used
ACS employment, % change, 2013-2017	N/A	Not used	Not used
Wage change, 2013-2017	N/A	Wage change, 2011-2015	N/A
% Wage change, 2013-2017	N/A	Not used	Not used
CTE certifications, 2018	N/A	CTE certifications, 2017	N/A
License issued, 2019	N/A	License issued, 2017	N/A
Associate degree, 2013	Low	Associate degree, 2011	Low
Associate degree, 2017	Low	Associate degree, 2015	Low
Associate degree, average, 2013-2017	Low	Associate degree, average, 2011-2015	Low
Associate degree, change, 2013-2017	High	Associate degree, change, 2011-2015	High
Associate degree, % change, 2013-2017	Low	Not used	Not used
Excluded	Excluded	CUNY certificate completers, 2011	N/A
Excluded	Excluded	CUNY certificate completers, 2015	N/A
Excluded	Excluded	CUNY certificate completers, average 2011-2015	N/A
Excluded	Excluded	CUNY certificate completers, change 2011-2015	N/A
Excluded	Excluded	Unemployment insurance claimants, 2011	Low
Excluded	Excluded	Unemployment insurance claimants, 2015	Low
Excluded	Excluded	Unemployment insurance claimants, change 2011-2015	High
Excluded	Excluded	Training provider class size	N/A
Excluded	Excluded	Workforce provider certifications, 2015	N/A
Aggregated supply measure	Low	Aggregated supply measure	Low

Table 35. Demand Indicators in Surgical Technologists

Demand Indicators in 2019 Study	2019 Ranking	Demand Indicators in 2017 Study	2017 Ranking
1199 SEIU Job placement, 2014	Low	1199 SEIU Job placement, 2011	Low
1199 SEIU Job placement, 2018	Low	1199 SEIU Job placement, 2015	Low
1199 SEIU Job placement, change, 2014-2018	Low	Not used	Not used
1199 SEIU Job placement, % change, 2014-2018	Moderate	Not used	Not used
Long-term projection, number, 2016-2026	Low	Long-term projection, number, 2012-2022	Low
Long-term projection, % change, 2016-2026	Low	Long-term projection, % change, 2012-2022	Moderate
Annual Average Openings, 2016-2026	Low	Annual Average Openings, 2012-2022	Low
Job ads, 2014	Low	Job ads, 2011	Low
Job ads, 2018	Low	Job ads, 2015	Low
Job ads, change, 2014-2018	Low	Job ads, change, 2011-2015	Low
Job ads, % change, 2014-2018	Low	Not used	Not used
Aggregated demand measure	Low	Aggregated demand measure	Low

TRENDS IN HEALTHCARE AND IMPLICATIONS FOR FUTURE SUPPLY AND DEMAND IN SELECTED OCCUPATIONS

Qualitative data is useful in addressing the "why" and "how" questions behind the phenomena of interest. NYCLMIS conducted a focus group to learn how members of the healthcare field interpret and understand certain trends shaping healthcare, as well as implications for future supply and demand in these ten occupations.

The participants represented a variety of healthcare perspectives, including an education and training provider, a professional association, and a large city agency. The diversity in our participants offered an opportunity to gather valuable perspectives on future supply and demand and trends impacting workers. The focus group protocol with detailed guiding questions can be found in Appendix C.

Trends in Healthcare

The qualitative data revealed two trends that are and will increasingly impact healthcare: technological advancements and aging baby boomers.

Healthcare has benefitted from many technological advancements in the past two decades, ranging from minor changes that smooth work processes to more fundamental changes that have reshaped and improved

patient care. A good example of the former is the adoption of electronic records, and examples of the latter include telemedicine/ telehealth and technologies that directly enable a primary doctor to send requests to the specialist doctor. All participants recognized the potential consequences of poorly designed technology. One participant shared an anecdote:

"*We went to do a training. When we talked to technology people, we said this isn't going to work for certain kinds of workers. They're like, 'no, this is the best practice in cyber security.' We went to do a training and it turns out that at least five out of twenty people in the training either didn't have a phone or refused to use their personal phone for whatever reason, which is very common in healthcare at least. We had to stop the training midway through because they couldn't log in until we [found] the supervisor ....*"

Yet, on the flip side, participants also agreed that technology, when deliberately designed with intended audience and user prioritized, can help to enhance work efficiency, enable better information sharing among healthcare professionals, boost team collaboration, and create a better patient experience. One participant shared an experience to illustrate the positive outcomes from technology adoption:

"It turns out that pediatric mental health screening is a very complicated process. It's in August and nobody can complete that. But we need that information. What we did was we built a whole team of engineers, software developers, and high-tech people. We figured out how to build a system that a patient would be able to interact with to complete the form. We made it kind of cartoony and interactive so it would keep people there. The outcome was awesome!"

A second central theme, aging baby boomers, will prompt additional evolution within the healthcare industry. The nearly 77 million baby boomers compose a large portion of the U.S. population, and it is predicted that 1 out of 4 workers will be over age 55 by the year 2020 (Silverstein, 2008; Toossi, 2012). Such a striking demographic shift in the labor force portends two shifts in healthcare. On one hand, the aging population, along with increased longevity due to technology and medicine advancement, will increase demand for long-term care, home aides, and direct care. On the other hand, the healthcare workforce is aging and there are concerns about filling those jobs. One participant shared a story from his experience:

"*I'll give you a quote from one of the community hospitals in that aspect, specifically about lab techs and some of the other tech jobs. She started listing the people that she had. She said, 'I have one person 80, one person that's 63. I have one person that's in their 70s'…*"

Implications for Future Supply and Demand in Selected Occupations

In discussing the impact of healthcare trends on future supply and demand, there was consensus among focus group participants that aging baby boomers would increase demand, but a debate on whether or not technological advances would result in automation of jobs that would lead to lowered demand for workers.

All participants agreed that aging baby boomers would both lower supply and increase demand. On one hand, they believe the aging workforce in healthcare will lower supply as more workers are facing retirement or shifting from full-time to part-time jobs. Nursing Assistants, Licensed Practical Nurses and Licensed Vocational

Nurses, and Medical Records and Health Information Technicians could have a much lower supply, due to the much larger proportion of older workers in these three occupations (30% compared to 10% to 20% in other occupations). On the other hand, participants noted that the aging population would lead to increased demand across the healthcare industry, as more patients would require various kinds of healthcare services, including long-term care and home aides for chronic conditions, dental care for maintaining dental health, medical services for tracking patient history, urgent and inpatient care for age-related emergencies such as heart attacks and strokes, diagnostic service for performing MRI, CT or ultrasound, and pharmacy care for all age-related illness. In light of these possibilities, the ten occupations are expected to have a strong demand in the near future and may even face a shortage if retiring older workers are not replaced with younger workers.

Compared to the shared opinions on the impact of the aging population on future demand, there are mixed views on how technological advancements will shape future demand. One participant believed that automation poses a threat to low-skill and middle-skill jobs in the long-run. He argued that such a trend will be more prominent in middle-skill occupations with few human interactions and more administrative tasks, such as Medical Records and Health Information Technicians. He explained:

"*Many of these jobs might also be automated in the not so…distant future. We've see[n] how automation kicked in and then displaced a lot of workers…people start to say 'oh my god we care a whole lot about this job. I need to get better people in it. I need to get more people in it'. Then wait a second, it's automated and we don't need people anymore or its offshore or something like that. Many of these jobs or even right now these aren't available jobs, like the analytics, using data to target populations. It's made up by people right now trying to sort through data. At some point, the technology will catch up to that. We won't need the people to do that much anymore.*"

In contrast, other participants believed that technology should be treated as a tool to enhance work efficiency and emphasized that employers could never automate parts that involve human touch and interaction. Workers in healthcare middle-skill occupations are mainly assistants to physicians and other leaders and are much more involved in patient communication and interaction. From this perspective, automation would not eliminate jobs in most healthcare middle-skill occupations. According to one of the participants:

"*I think one of the things that technology can't replace is people interaction. It makes me hopeful because it's a social model; that human piece of it will never be replaceable until we can get fully control of tech.*"

The interplay of these two forecasted changes on future demand is unknown. Whether or not the possible decline in demand associated with automation will be covered by the growth in demand associated with aging population is not clear. Despite the uncertainties, all participants mentioned a trend in healthcare that values workers with better training in technology and more education and credentials focused on meeting the needs of older adults. Due to the technological advances and aging population, the healthcare industry is moving towards value-based care and improved customer satisfaction. Employers need trained healthcare professionals who can quickly learn and master technology to better serve patients. In addition, the aging population requires workers with different sets of skills that address the needs of older

adults. The quote below further explains this point:

"*...for each place, the acuity level is getting higher. In hospitals, it's the sickest people who are in the hospital. The people who used to be in the hospitals that are now in nursing homes. Now it's the nurs[ing] facilities [that] have higher-needs patients today that they have to work to have a license, but they need thing[s] better all the way down through primary care and to community-based care. ... people want to be staying in their homes or closer to their community. It's great for human life and livelihood. It's also cheaper, right? But every step along the way, the workers need to be higher skilled to deal with more complex or more acute patients*."

On the supply side, all participants agreed that existing education and workforce providers should address challenges associated with technology and the aging population. They suggested two things.

First, healthcare educational programs should include basic competencies in technology. According to the participants, basic technical competencies, such as entry-to-intermediate knowledge in Word, Excel, and database management, are necessary not only in healthcare occupations, but in most other occupations. As far as specific work-related technologies or mobile applications, on-the-job training is essential in refining employees' technical competencies and skills. Hospitals and clinics should collaborate with technology vendors to provide on-site education and training on how to use a particular technology. Second, healthcare educational programs should include basic competencies in geriatric education. According to participants, workers in many health professions and occupations will need better training in geriatric issues, yet many occupations do not yet offer formal credentials focused on the needs of older adults. As one participant stated:

"*To answer the question about the need of education programs, I think there is probably going to be a growing need for movement science, exercise science... these kinds of low, middle-skilled interventions, really, for this [older]population of people*."

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Middle-skill jobs are critical to the U.S. workforce as they compose a big portion (over 50%) of all jobs in the United States (National Skills Coaliation, 2019). Many rely on these middle-skill jobs for financial security and as important rungs in their career ladders. In New York City, middle-skill occupations are concentrated in healthcare, which accounts for 28% of the jobs in New York City and is also the largest and fastest-growing industry citywide. In light of these trends, this study focuses on ten promising healthcare middle-skill occupations in New York City to provide a clearer and more actionable understanding of the local labor market.

The demographic analyses indicate that in New York City, the majority of these ten middle-skill occupations are filled by women who identify as black or white and have less than a bachelor's degree. The workers employed in these ten occupations are nearly equally divided between native-born and foreign-born. However, the data suggest that these jobs are evolving to reflect a workforce that includes more older adults (55+), more men (in some occupations), more ethnic diversity, and increased levels of educational attainment and credentialing.

The majority of these ten middle-skill healthcare occupations are in balance in the labor market. The relative supply of workers—whether High, Moderate, or Low—matches employer demand. It appears that overall education and training providers are operating in balance with labor market demand. The two exceptions are Medical Assistants and Medical Records and Health Information Technicians. While the former face an over-supply issue, the latter face an under-supply issue. When compared to findings from the 2017 report, over half of the occupations remain unchanged in the aggregated level of supply and demand and others (Medical Records and Health Information Technicians, Dental Assistants, Emergency Medical Technician and Paramedics, and Pharmacy Technicians) experience a decrease in supply ranking. Yet, caution is needed when interpreting the results. The drop in the aggregated supply indicator might be reflective of an actual decline in labor supply but could also be the result of limitations in data collection and analysis (see details in the limitations section earlier in the report).

The qualitative findings contextualize these demographic and supply-and-demand trends with two fundamental emerging themes: technological advances and aging baby boomers. There was shared opinion among focus group participants that the aging population will increase demand, and mixed views regarding whether automation will decrease labor demand. Despite the uncertainties, all participants noted a trend in healthcare that values workers with better technology training and more education and credentials focused on the needs of older adults. In response, health worker educational programs should include basic competencies in technology and geriatric education to address the necessary skills associated with these two trends.

RECOMMENDATIONS

Workforce Training Providers

This study's findings suggest that education and training providers should proceed cautiously with any plans to expand training opportunities in the Medical Assistants field since this occupation has Moderate Demand and High Supply. Conversely, given the

strong level of demand, education and training providers should explore ways to increase the availability of training programs that would expand the supply of workers in Medical Records and Health Information Technology. Additionally, education and training providers in healthcare should strongly consider including basic competencies in technology and geriatric education to address skill shifts associated with evolving technologies and the city's (and United States') aging population (Bloomberg & Burden, 2013). Finally, given the growing proportion of the New York City workforce that has a bachelor's degree or above, and are competing for middle-skill jobs, education and training providers should consider how to adjust the program design or curriculum to make middle-skill workers more competitive.

Funding Agencies that Support Workforce Education and Training

This study points to the need for public and private funders to invest in workforce training providers' ability to collect accurate and complete data, including student enrollment, rates of program completion, and most importantly, employment outcomes. Particularly, the New York State Department of Education's offices, responsible for overseeing professional licensing and proprietary schools, should be sufficiently staffed and funded to maintain the data, protect participant confidentiality, and also support efforts of other public agencies and research organizations to access these data for their work.

Equally important, funders are advised to identify ways to support the efforts of unemployed and underemployed New Yorkers seeking to enter some of these high-demand middle-skill occupations. Two possibilities include: financing easily accessible scholarships for academic or credentialing opportunities; and funding free on-site childcare at these educational institutions and training sites.

APPENDIX A. The Determination of Middle-Skill Occupations based on Designation Criteria in 2019 Study

Occupation Title	Bureau of Labor Statistic (BLS)		O*NET		American Community Survey (ACS)	Burning Glass
	Education Attainment	Education & Training Assignment	Education, Training, & Experience	Job Zones	% Middle-Skill in NYC	Real-time Data
Architecture and Engineering						
Aerospace engineering and operations technicians	✓	✓	X	X	✓	N/A
Civil engineering technicians	✓	✓	✓	✓	✓	N/A
Electrical and electronics engineering technicians	✓	✓	✓	✓	✓	N/A
Electro-mechanical technicians	✓	✓	✓	✓	✓	N/A
Environmental engineering technicians	✓	✓	X	X	✓	N/A
Industrial engineering technicians	✓	✓	✓	✓	✓	N/A
Mechanical engineering technicians	✓	✓	X	✓	✓	N/A
Engineering technicians, except drafters, all other	✓	✓	X	X	✓	N/A
Surveying and mapping technicians	✓	X	✓	✓	✓	N/A
Education, Training, and Library						
Teacher assistants	✓	✓	✓	✓	X	✓
Arts, Design, Entertainment, Sports, and Media						
Audio and video equipment technicians	✓	✓	X	✓	X	✓
Healthcare Practitioners and Technical Occupations						
Radiation therapists	✓	✓	✓	✓	✓	N/A
Respiratory therapists	✓	✓	✓	✓	✓	N/A
Dental hygienists	✓	✓	✓	✓	✓	N/A
Cardiovascular technologists and technicians	✓	✓	✓	✓	✓	N/A
Diagnostic medical sonographers	✓	✓	✓	✓	✓	N/A
Nuclear medicine technologists	✓	✓	✓	✓	✓	N/A
Radiologic technologists	✓	✓	✓	✓	✓	N/A
Magnetic resonance imaging technologists	✓	✓	✓	✓	✓	N/A
Emergency medical technicians and paramedics	✓	✓	✓	✓	✓	N/A
Dietetic technicians	✓	✓	X	✓	✓	N/A
Pharmacy technicians	✓	X	X	✓	✓	N/A
Psychiatric technicians	✓	✓	X	✓	✓	N/A
Respiratory therapy technicians	✓	✓	✓	✓	✓	N/A
Surgical technologists	✓	✓	✓	✓	✓	N/A
Veterinary technologists and technicians	✓	✓	✓	✓	✓	N/A

Ophthalmic medical technicians	✓	✓	✓	✓	✓	N/A
Licensed practical and licensed vocational nurses	✓	✓	✓	✓	✓	N/A
Medical records and health information technicians	✓	✓	✓	✓	✓	N/A
Opticians, dispensing	✓	X	✓	✓	✓	N/A
Hearing aid specialists	✓	X	X	✓	✓	N/A
Health technologists and technicians, all other	✓	✓	✓	✓	✓	N/A
Healthcare Support Occupations						
Nursing assistants	✓	✓	X	✓	X	✓
Occupational therapy assistants	✓	✓	✓	✓	✓	N/A
Occupational therapy aides	✓	X	✓	✓	✓	N/A
Physical therapist assistants	✓	✓	✓	✓	✓	N/A
Physical therapist aides	✓	X	X	✓	✓	N/A
Massage therapists	✓	✓	✓	✓	✓	N/A
Dental assistants	✓	✓	✓	✓	✓	N/A
Medical assistants	✓	✓	✓	✓	✓	N/A
Phlebotomists	✓	✓	✓	✓	✓	N/A
Protective Service Occupations						
First-line supervisors of police and detectives	✓	X	X	✓	✓	N/A
First-line supervisors of firefighting and prevention workers	✓	✓	✓	✓	✓	N/A
Firefighters	✓	✓	X	✓	✓	N/A
Fire inspectors and investigators	✓	✓		✓	✓	N/A
Forest fire inspectors and prevention specialists	✓	X	X	✓	✓	N/A
Bailiffs	✓	X	X	✓	✓	N/A
Correctional officers and jailers	✓	X	X	✓	✓	N/A
Parking enforcement workers	✓	X	X	✓	✓	N/A
Police and sheriff's patrol officers	✓	X	X	✓	✓	N/A
Transit and railroad police	✓	X	X	✓	✓	N/A
Animal control workers	✓	X	X	✓	✓	N/A
Food Preparation and Serving Related Occupations						
Chefs and head cooks	✓	X	✓	✓	X	✓
Residential advisors	✓	X	X	✓	✓	N/A
Sales and Related Occupations						
Telemarketers	✓	X	X	✓	✓	N/A
Travel agents	✓	X	✓	✓	X	✓
Office and Administrative Support Occupations						
Bill and account collectors	✓	X	X	✓	✓	N/A
Payroll and timekeeping clerks	✓	X	✓	✓	✓	N/A
Loan interviewers and clerks	✓	X	X	✓	✓	N/A
Reservation and transportation ticket agents and travel clerks	✓	X	X	✓	✓	N/A
Postal service clerks	✓	X	X	✓	✓	N/A
Postal service mail carriers	✓	X	X	✓	✓	N/A

Data entry keyers	✓	X	X	✓	✓	N/A
Insurance claims and policy processing clerks	✓	X	X	✓	✓	N/A
Medical secretaries	✓	X	✓	✓	X	✓
Office clerks, general	✓	X	✓	✓	X	✓
Construction and Extraction Occupations						
Electricians	✓	X	✓	✓	✓	N/A
Construction and building inspectors	✓	X	✓	✓	X	✓
Installation, Maintenance, and Repair Occupations						
Radio, cellular, and tower equipment installers and repairs	✓	✓	✓	✓	✓	N/A
Telecommunications equipment installers and repairers, except line installers	✓	✓	X	✓	✓	N/A
Avionics technicians	✓	✓	✓	✓	✓	N/A
Electronic equipment installers and repairers, motor vehicles	✓	X	✓	✓	✓	N/A
Automotive service technicians and mechanics	X	✓	✓	✓	X	✓
Millwrights	✓	X	X	✓	X	✓
Heating, air conditioning, and refrigeration mechanics and installers	✓	✓	✓	✓	X	✓
Electrical power-line installers and repairers	✓	X	✓	✓	✓	N/A
Telecommunications line installers and repairers	✓	X	X	✓	✓	N/A
Camera and photographic equipment repairers	✓	X	X	✓	✓	N/A
Medical equipment repairers	✓	✓	X	✓	✓	N/A
Musical instrument repairers and tuners	✓	X	✓	✓	✓	N/A
Watch repairers	✓	X	✓	✓	✓	N/A
Industrial machinery mechanics	✓	X	✓	✓	X	✓
Production Occupations						
Prepress technicians and workers	X	✓	✓	✓	✓	N/A
Machinists	✓	X	✓	✓	X	✓
Transportation and Material Moving Occupations						
Air traffic controllers	✓	✓	X	✓	✓	N/A
Airfield operations specialists	✓	X	X	✓	✓	N/A
Locomotive engineers	✓	X	X	✓	✓	N/A
Locomotive firers	✓	X	X	✓	✓	N/A
Rail yard engineers, dinkey operators, and hostlers	✓	X	X	✓	✓	N/A
Railroad brake, signal, and switch operators	✓	X	X	✓	✓	N/A
Railroad conductors and yardmasters	✓	X	X	✓	✓	N/A
Subway and streetcar operators	✓	X	X	✓	✓	N/A
Captains, mates, and pilots of water vessels	X	✓	X	✓	✓	N/A
Motorboat operators	X	✓	✓	✓	✓	N/A
Traffic technicians	✓	X	X	✓	✓	N/A

APPENDIX B. Middle Skill Occupations in 2019 Study VS. Middle Skill Occupations in 2017 Study

17-0000	Architecture and Engineering Year 2019 *(9)*	Architecture and Engineering Year 2017 *(8)*
17-3021	Aerospace engineering and operations technicians	Aerospace engineering and operations technicians
17-3022	Civil engineering technicians	Civil engineering technicians
17-3023	Electrical and electronics engineering technicians	Electrical and electronics engineering technicians
17-3024	Electro-mechanical technicians	Electro-mechanical technicians
17-3025	Environmental engineering technicians	Environmental engineering technicians
17-3026	Industrial engineering technicians	Industrial engineering technicians
17-3027	Mechanical engineering technicians	Mechanical engineering technicians
17-3029	Engineering technicians, except drafters, all other	None
17-3031	Surveying and mapping technicians	Surveying and mapping technicians

19-0000	Life, Physical, and Social Science Year 2019 *(0)*	Life, Physical, and Social Science Year 2017 *(1)*
19-4031	None	Chemical technicians

25-0000	Education, Training, and Library Year 2019 *(1)*	Education, Training, and Library Year 2017 *(1)*
25-9041	Teacher assistants	Teacher assistants

27-0000	Arts, Design, Entertainment, Sports, and Media Year 2019 *(1)*	Arts, Design, Entertainment, Sports, and Media Year 2017 *(0)*
27-4011	Audio and video equipment technicians	None

29-0000	Healthcare Practitioners and Technical Occupations Year 2019 *(21)*	Healthcare Practitioners and Technical Occupations Year 2017 *(20)*
29-1124	Radiation therapists	Radiation therapists
29-1126	Respiratory therapists	Respiratory therapists
29-2021	Dental hygienists	Dental hygienists
29-2031	Cardiovascular technologists and technicians	Cardiovascular technologists and technicians
29-2032	Diagnostic medical sonographers	Diagnostic medical sonographers
29-2033	Nuclear medicine technologists	Nuclear medicine technologists
29-2034	Radiologic technologists	Radiologic technologists
29-2035	Magnetic resonance imaging technologists	Magnetic resonance imaging technologists
29-2041	Emergency medical technicians and paramedics	Emergency medical technicians and paramedics
29-2051	Dietetic technicians	Dietetic technicians
29-2052	Pharmacy technicians	Pharmacy technicians
29-2053	Psychiatric technicians	Psychiatric technicians
29-2054	Respiratory therapy technicians	Respiratory therapy technicians
29-2055	Surgical technologists	Surgical technologists
29-2056	Veterinary technologists and technicians	Veterinary technologists and technicians
29-2057	Ophthalmic medical technicians	Ophthalmic medical technicians
29-2061	Licensed practical and licensed vocational nurses	Licensed practical and licensed vocational nurses
29-2071	Medical records and health information technicians	Medical records and health information technicians
29-2081	Opticians, dispensing	Opticians, dispensing
29-2092	Hearing aid specialists	None
29-2099	Health technologists and technicians, all other	Health technologists and technicians, all other

31-0000	Healthcare Support Occupations Year 2019 *(9)*	Healthcare Support Occupations Year 2017 *(9)*
31-1014	Nursing assistants	Nursing assistants
31-2011	Occupational therapy assistants	Occupational therapy assistants
31-2012	Occupational therapy aides	Occupational therapy aides
31-2021	Physical therapist assistants	Physical therapist assistants
31-2022	Physical therapist aides	Physical therapist aides
31-9011	Massage therapists	Massage therapists
31-9091	Dental assistants	Dental assistants
31-9092	Medical assistants	Medical assistants
31-9097	Phlebotomists	Phlebotomists

33-0000	Protective Service Occupations Year 2019 *(11)*	Protective Service Occupations Year 2017 *(11)*
33-1011	None	First-line supervisors of correction officers
33-1012	First-line supervisors of police and detectives	First-line supervisors of police and detectives
33-1021	First-line supervisors of firefighting and prevention workers	First-line supervisors of firefighting and prevention workers
33-2011	Firefighters	Firefighters
33-2021	Fire inspectors and investigators	Fire inspectors and investigators
33-2022	Forest fire inspectors and prevention specialists	Forest fire inspectors and prevention specialists
33-3011	Bailiffs	Bailiffs
33-3012	Correctional officers and jailers	Correctional officers and jailers
33-3041	Parking enforcement workers	None
33-3051	Police and sheriff's patrol officers	Police and sheriff's patrol officers
33-3052	Transit and railroad police	Transit and railroad police
33-9011	Animal control workers	None
33-9093	None	Transportation security screeners

35-0000	Food Preparation and Serving Related Occupations Year 2019 (*1*)	Food Preparation and Serving Related Occupations Year 2017 (*0*)
35-1011	Chefs and head cooks	None

39-0000	Personal Care and Service Occupations Year 2019 *(1)*	Personal Care and Service Occupations Year 2017 (*4*)
39-4011	None	Embalmers
39-4021	None	Funeral attendants
39-4031	None	Morticians, undertakers, and funeral directors
39-9041	Residential advisors	Residential advisors

41-0000	Sales and Related Occupations Year 2019 (*2*)	Sales and Related Occupations Year 2017 (*1*)
41-3041	Travel agents	None
41-9041	Telemarketers	Telemarketers

43-0000	Office and Administrative Support Occupations Year 2019 (*10*)	Office and Administrative Support Occupations Year 2017 (*16*)
43-2011	None	Switchboard operators, including answering service
43-3011	Bill and account collectors	None
43-3051	Payroll and timekeeping clerks	None
43-4031	None	Court, municipal, and license clerks
43-4071	None	File clerks
43-4081	None	Hotel, motel, and resort desk clerks
43-4111	None	Interviewers, except eligibility and loan
43-4131	Loan interviewers and clerks	Loan interviewers and clerks
43-4181	Reservation and transportation ticket agents and travel clerks	Reservation and transportation ticket agents and travel clerks
43-5031	None	Police, fire, and ambulance dispatchers
43-5032	None	Dispatchers, except police, fire, and ambulance
43-5051	Postal service clerks	Postal service clerks
43-5052	Postal service mail carriers	Postal service mail carriers
43-5053	None	Postal service mail sorters, processors, and processing machine operators
43-6014	None	Secretaries and administrative assistants, except legal, medical, and executive
43-6031	Medical secretaries	Medical secretaries
43-9021	Data entry keyers	None
43-9022	None	Word Processors and typists
43-9041	Insurance claims and policy processing clerks	Insurance claims and policy processing clerks
43-9061	Office clerks, general	None

47-0000	Construction and Extraction Occupations Year 2019 *(2)*	Construction and Extraction Occupations Year 2017 *(2)*
47-2111	Electricians	Electricians
47-4011	Construction and building inspectors	Construction and building inspectors

49-0000	Installation, Maintenance, and Repair Occupations Year 2019 *(14)*	Installation, Maintenance, and Repair Occupations Year 2017 *(16)*
49-1011	None	First-line supervisors of mechanics, installers, and repairers
49-2011	None	Computer, automated teller, and office machine repairers
49-2021	Radio, cellular, and tower equipment installers and repairs	Radio, cellular, and tower equipment installers and repairers
49-2022	Telecommunications equipment installers and repairers, except line installers	Telecommunications equipment installers and repairers, except line installers
49-2091	Avionics technicians	None
49-2092	None	Electric motor, power tool, and related repairer
49-2094	None	Electrical and electronics repairers, commercial and industrial equipment
49-2096	Electronic equipment installers and repairers, motor vehicles	Electronic equipment installers and repairers, motor vehicles
49-2098	None	Security and fire alarm systems installers
49-3011	None	Aircraft mechanics and service technicians
49-3023	Automotive service technicians and mechanics	Automotive service technicians and mechanics
49-9021	Heating, air conditioning, and refrigeration mechanics and installers	Heating, air conditioning, and refrigeration mechanics and installers
49-9031	None	Home appliance repairers
49-9041	Industrial machinery mechanics	Industrial machinery mechanics
49-9044	Millwrights	Millwrights
49-9051	Electrical power-line installers and repairers	None
49-9052	Telecommunications line installers and repairers	Telecommunications line installers and repairers
49-9061	Camera and photographic equipment repairers	None
49-9062	Medical equipment repairers	Medical equipment repairers
49-9063	Musical instrument repairers and tuners	None
49-9064	Watch repairers	None

51-0000	Production Occupations Year 2019 *(2)*	Production Occupations Year 2017 *(6)*
51-4111	None	Tool and die makers
51-5111	Prepress technicians and workers	Prepress technicians and workers
51-8091	None	Chemical plant and system operators
51-8092	None	Gas plant operators
51-8093	None	Petroleum pump system operators, refinery operators, and gaugers
51-8099	None	Plant and system operators, all other
51-4041	Machinists	None

53-0000	Transportation and Material Moving Occupations Year 2019 *(11)*	Transportation and Material Moving Occupations Year 2017 *(9)*
53-2021	Air traffic controllers	None
53-2022	Airfield operations specialists	None
53-4011	Locomotive engineers	Locomotive engineers
53-4012	Locomotive firers	Locomotive firers
53-4013	Rail yard engineers, dinkey operators, and hostlers	Rail yard engineers, dinkey operators, and hostlers
53-4021	Railroad brake, signal, and switch operators	Railroad brake, signal, and switch operators
53-4031	Railroad conductors and yardmasters	Railroad conductors and yardmasters
53-4041	Subway and streetcar operators	Subway and streetcar operators
53-5021	Captains, mates, and pilots of water vessels	None
53-5022	Motorboat operators	None
53-6041	Traffic technicians	Traffic technicians
53-4099	None	Rail transportation workers, all other
53-6099	None	Transportation workers, all other

APPENDIX C. Industry Conversation Protocol

1. Healthcare can sometimes lag in the adoption of new technology because of safeguards like medical device regulation. But as IT trends like advances in computer networking and automation become increasingly common and create change across industries, how do you think they will impact the demand for healthcare middle-skill jobs (i.e. those that don't require a bachelor's degree)?
2. How – if at all - do you think middle-skill health care jobs will be affected by "baby boomers" (people currently about 55-75 years old): A. starting to age out of the labor market? B. becoming older adults?
3. We'd like to spend some time focusing on the jobs below in particular. We're especially interested in asking your opinion on some data and research we've conducted, and some of the changes we're seeing in the demand for these jobs in NYC, as well as the available supply of professionals to fill them.

    - Nursing Assistants
    - Licensed Practical and Licensed Vocational Nurses
    - Medical Assistants
    - Pharmacy Technicians
    - Dental Assistants
    - Emergency Medical Technicians and Paramedics
    - Radiologic Technologists
    - Medical Records and Health Information Technicians
    - Dental Hygienists
    - Surgical Technologists

    3.1 Based on our 2016[22] study, the supply and demand for most of these jobs are located in the low-to-moderate supply and demand zone. Now they rank top 10 in terms of employment size and projected growth rate, suggesting their demand is growing. Is this change aligned with your impression? In terms of supply, do we have more education and training programs to address the change?

    3.2 Our demographic analysis shows that, although women dominate these 10 jobs, we see the growing proportion of men in some jobs, like nurses, emergency medical technicians. Do our current training programs notice and address the change?

    3.3 Our demographic analysis shows that people born outside of U.S. accounts for a big portion in several of these jobs. Do our current training programs notice and address the change?

4. Thinking about research focused on the healthcare industry, are there burning questions out there not being addressed?
5. Anything about middle-skill healthcare jobs that we haven't raised, but that you think it's important to mention?

[22] Note that "2016 study" in the protocol refers to the data collected for the 2017 report.

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