



Data-Driven Solutions for the Healthcare Workforce Challenges

A labor shortfall in healthcare roles threatens the stability of the healthcare industry in the US. How can data science help solve this crisis?

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Table of contents

Executive summary	3
Introduction	5
The growing nursing shortage	6
The evolving learning needs.....	10
Responsible technology implementation	14
Conclusions.....	18
Appendix	19
Page notes.....	20

Executive summary

Healthcare is one of the most rapidly changing industries, and the COVID-19 pandemic acted like a magnifying glass, placing a spotlight on specific workforce challenges.

Data science, and in particular, predictive analytics, can help healthcare organizations identify key trends and transformational opportunities that will impact the workforce, allowing for a proactive approach to staffing decisions. By using advanced analytics, healthcare leaders can make sure their workforce strategy is based on fact rather than fear, building a strong workforce to support efficient care delivery today and in the future.

Three challenges in the healthcare industry that can be addressed with data-driven solutions:

1. The nursing shortage

Worldwide nursing shortages are primarily caused by increasing demands for health services coupled with a shrinking workforce. In the wake of the pandemic, a record number of nurses are retiring or leaving the workforce altogether due to stressful work environments.

Faethm, a predictive workforce analytics firm, performs research on the impact of technology on the workforce. Faethm evaluated the tasks performed by nurses to uncover the technologies that can make nursing more efficient by eliminating repetitive tasks thus increasing productivity and allowing nurses to focus on those areas that matter: empathy, critical thinking, and quality patient care.

2. The evolving learning and development needs

The learning and development (L&D) needs in healthcare are dramatically different from those of other industries. Patient-provider interactions vary widely, and technologies are updated frequently, requiring quick upskilling and reskilling of the workforce. As expected in a fast-changing industry, the challenge lies in defining what, where and who the organization should train to future-proof. Or, in other words, where to target the L&D budget.

L&D departments need to take a science-based, forward-looking approach to align learning with current and future workforce needs. L&D leaders can also use data-driven models to understand the future capabilities that workers will need as technology advances.

Identifying upskilling opportunities at the task and skill level enables hospitals to target L&D investments on important knowledge gaps.

3. The importance of responsible technology implementation

There is no denying that the healthcare industry is at the forefront of technological adoption. From wearable patches that monitor vital signs to AI chatbots helping diagnose medical conditions, technology is designed to better the lives of both patients and caregivers. Simply put, medical technology has become an integral part of healthcare, and its role will only continue to grow as the industry progresses.

However, with such a rush to adopt new technology, there is growing concern surrounding responsible technology implementation in healthcare. As automating technologies continue to be adopted, the surplus of workers in those automated roles continues to increase.

A report by Faethm and BCG, "[The Future of Jobs in the Era of AI](#)", uncovered a growing misalignment between the demand and supply

of skills in the market, with a very real possibility that tens of thousands of workers in some job markets will be displaced.

Healthcare organizations should have a data-driven workforce strategy that embeds analytics into every stage of the talent life cycle. The development of this data-driven approach must begin with a deep understanding of the existing workforce, their roles and tasks, their gaps in knowledge and skillsets, any planned changes to technology or processes that may impact learning needs, and the current training being provided to caregivers.

Introduction

The healthcare industry, which employs 14 percent of US workers¹, is experiencing a disruptive and lasting transformation because of the COVID-19 pandemic. Despite increasing demand for health care services, hospital employment data indicates a critical shortage of staff to meet that demand.

For healthcare organizations, talent shortfalls and poor workforce planning can have serious consequences for patient safety, customer service, operating budgets, innovation, and growth.

Additionally, in a competitive healthcare labor market with both current and expected talent shortages, it can be especially challenging to retain and recruit the right people. That's why some even talk about a "Post-Pandemic Health Care Talent Revolution"².

At Faethm we identified three challenges in the healthcare industry that can be addressed using data-driven solutions:

- The nursing shortage
- The new learning and development needs
- The importance of responsible technology implementation

Faethm's predictive analytics can provide healthcare organizations with higher levels of insight into their workforce so they can make data-driven decisions and be proactive rather than reactive.

Applied correctly, predictive analytics can provide a forward-looking view into how:

- New technologies will impact the healthcare landscape
- Those impacts will affect required competencies today and in the future
- To upskill and reskill current employees
- The organization can source new talent to meet its future needs

This predictive, data-driven approach enables an organization to make informed decisions today and be well-prepared for what is coming tomorrow.

Solving the challenges listed above requires a multi-disciplinary team that brings HR leaders together with leaders from medical, operations, finance, and digital transformation functions to address today's workforce challenges.

The growing nursing shortage

The national turnover rate for Registered Nurses in 2021 was 40.45 percent³.

The combination of an aging workforce, high burnout rates, and an insufficient number of new nursing graduates is leading to a growing workforce crisis. As the nursing shortage continues to worsen, hospitals and other healthcare employers will need innovative solutions to maintain patient care, improve health outcomes, and mitigate employee burnout.

As the baby boomer generation ages, the need for nursing services grows while at the same time, a significant number of nurses, who have formed the backbone of the nursing workforce, are retiring. The 65+ demographic has increased by 75 percent, from 41 million in 2011 to 71 million in 2019⁴. At the same time, the average age of a Registered Nurse has risen from 42.7 to 47.9 years old. Over 47 percent of nurses are now over 50 years old. Additionally, the COVID-19 pandemic led to a wave of early retirements as hospitals furloughed employees in an attempt to cut costs. Between March and June of 2020, hospitals and clinics across the country furloughed or laid off over 100,000 employees, many of them nurses⁵.

The reduction of staff at many hospitals as well as the overwhelming demands of delivering healthcare during a deadly pandemic has also led to an increase in nurse burnout, a state of mental, physical, and emotional exhaustion caused by sustained work-related stressors⁶. It is well documented that increased stress leads to a rise in the turnover rate for Registered Nurses⁷. A recent report from McKinsey indicates that 22 percent of nurses intend to leave their jobs within the next year⁸. Hospital and Healthcare Compensation Services uncovered that the national turnover rate for Registered Nurses increased from 34.81 percent in 2020 to 40.45 percent in 2021.⁹

The U.S. Bureau of Labor Statistics (BLS) projects growth across multiple nursing roles including licensed nurse practitioners (LPNs), nurse anesthetists, nurse practitioners, and nurse-midwives. Higher-level nursing roles require master's degrees and as these roles are filled, new Registered Nurses' roles will need to be backfilled.

A contributing factor to nurse retirement is the growing discord between core nurse staff and traveling nurses who are often contracted at higher compensation for the same work as a core staff.

There is also a serious pipeline problem preventing new Registered Nurses from entering the workforce. The same stressors on the population of nurses also affect the population of nursing educators. In 2020, over 80,000 qualified applications were not accepted at schools of nursing due primarily to a shortage of clinical sites and faculty with which to educate them¹⁰. Fewer educators means fewer nurses entering the workforce.

How predictive analytics can help

Faethm's predictive analytics engine was used to examine the healthcare workforce in the US. We found that automation and augmenting technologies will impact Registered Nurses to a greater degree than other roles. By implementing these technologies, employers may be able to mitigate the talent shortfall.

Figure 1. Automation and augmentation rates for most populous roles in the US healthcare system

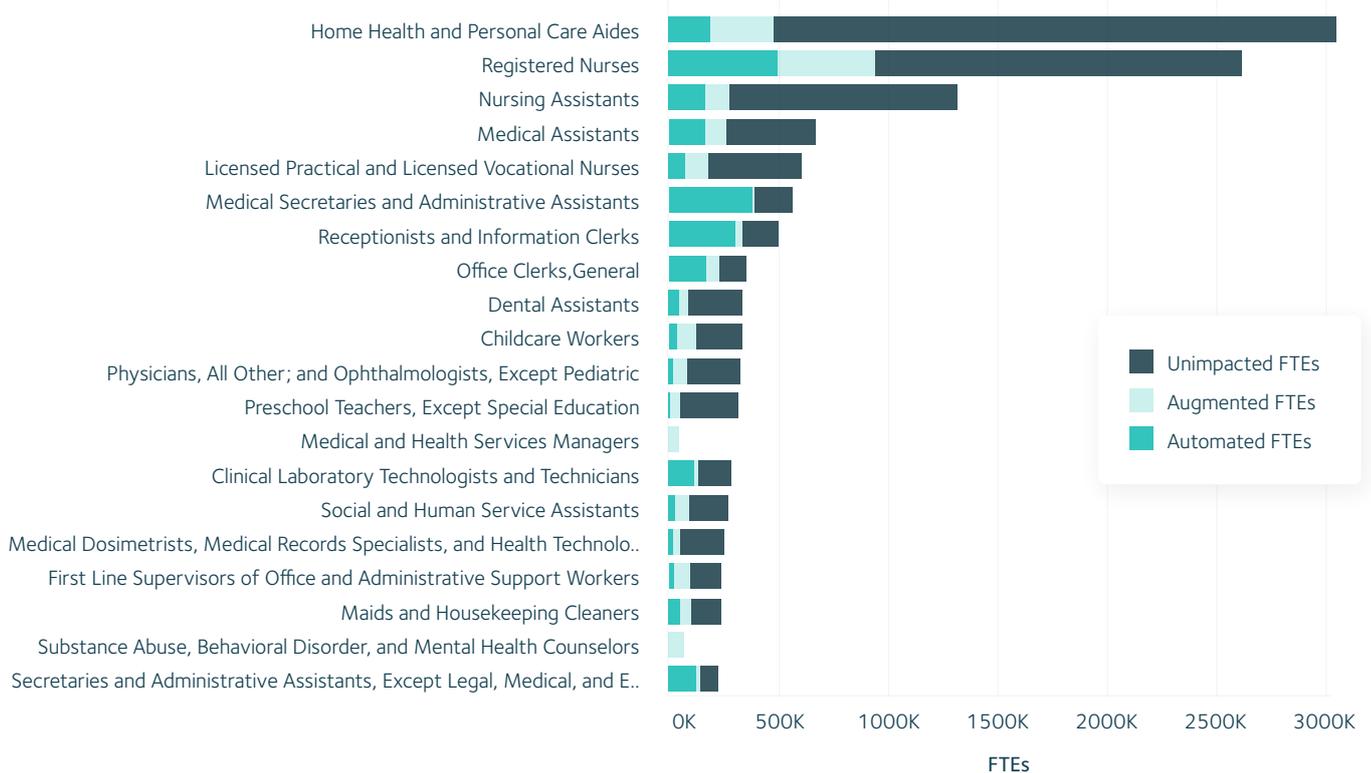
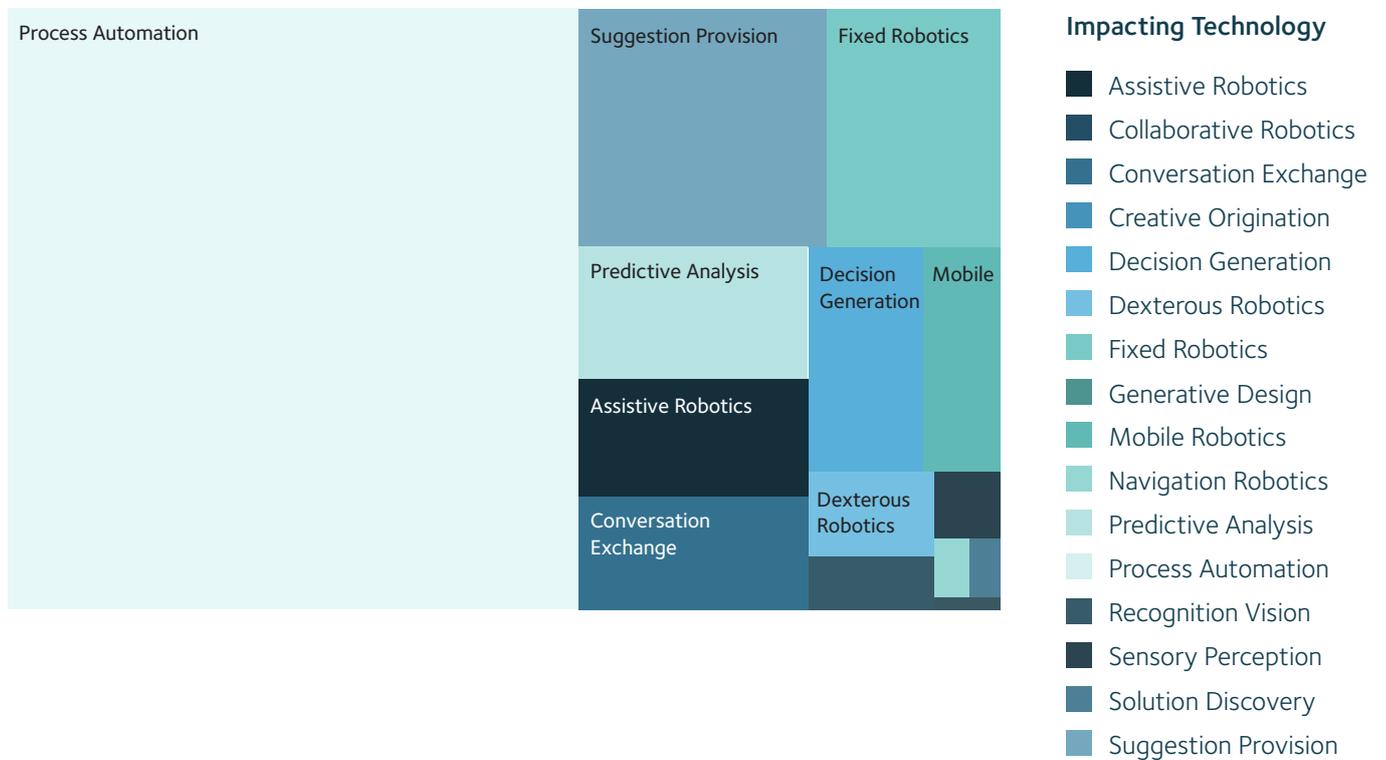


Figure 1 shows that more than a third of Registered Nurses will be impacted by new technologies in the next ten years. Roughly half of that impact will be in the form of automation, while the other half will be from augmenting technologies, which will allow nurses to perform tasks more quickly and efficiently. Employers may be able to leverage new technologies to close the gap between worker supply and demand.

For example, Faethm can predict the technologies that can make nursing more efficient. Figure 2 shows the technology groups that will transform the largest amount of task-time in the nursing job family in the US.

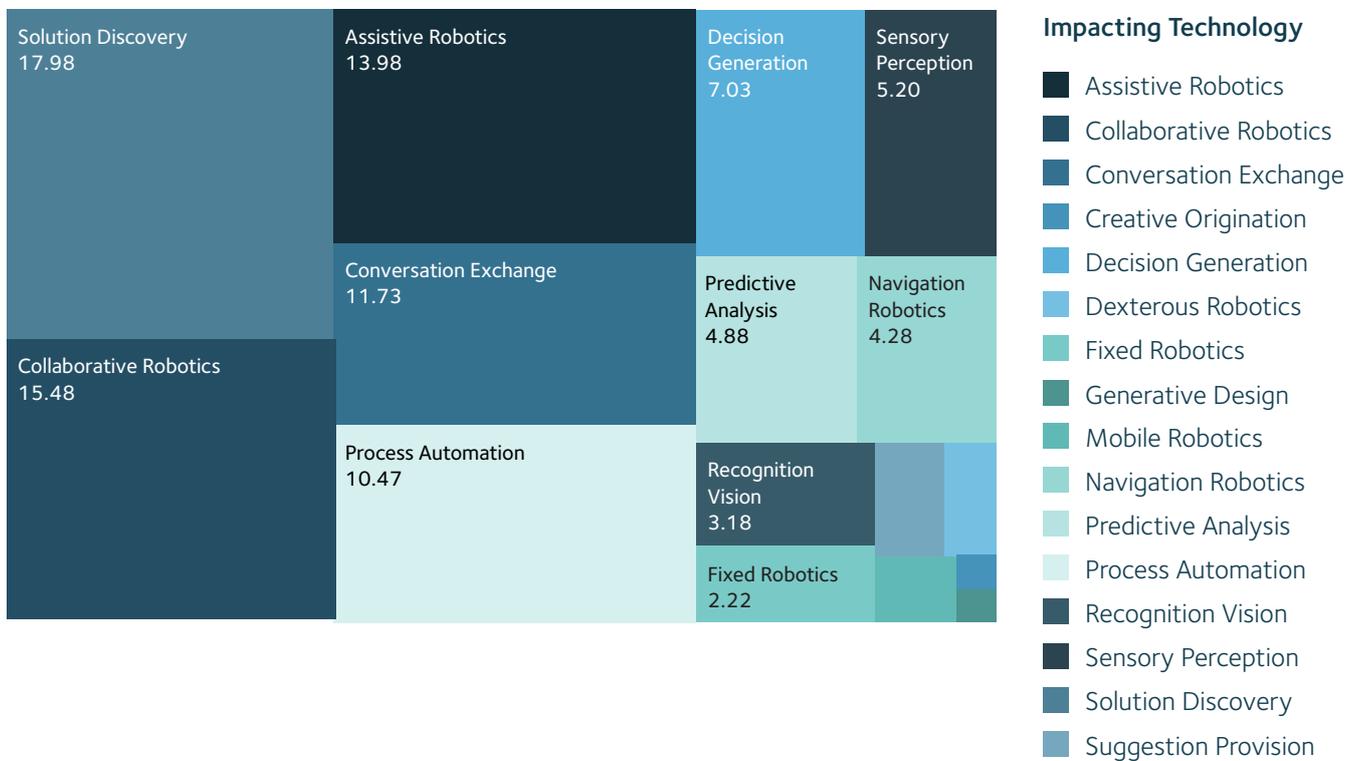
Process Automation, which will have the largest automating impact on the healthcare industry, can assist with tasks such as claims and payment processing, appointment scheduling, and compliance management. By freeing nurses from these tasks, employers can accomplish real gains in productivity.

Figure 2. Automating technologies by time impacted



Augmenting technologies will also have a big impact on nursing. As we can see in Figure 3, Assistive Robotics is one of the technology groups that will have the greatest augmenting impact. Assistive Robotics includes technologies such as post-stroke rehabilitation robots, mobility assistance robots, and robotic guides for the visually impaired¹¹. These innovations can free nurses from physically strenuous or time-consuming activities so that they can focus on higher-value work or take on a higher volume of patients, thus decreasing demand for nurses.

Figure 3. Augmenting technologies by time impacted



The evolving learning needs

The L&D needs for healthcare practitioners are dramatically different from those of other industries. Patient-provider interactions vary widely, and technologies are updated frequently, requiring constant training of staff.

To provide caregivers with the targeted training they need to gain the knowledge and abilities necessary to fulfill the specific requirements of their roles, L&D departments need to use data-driven models to understand the future capabilities that workers will need as technology advances.

Faethm's predictive analytics allow healthcare organizations to be proactive about how they execute strategies so they can plan to have the right workers with the right skills in place at the right time.

For example, predictive analytics can help foresee how automating and augmenting technologies can potentially impact the organizational skillset:

- Healthcare workers whose tasks will be automated must have access to educational opportunities to re-skill into another role.
- Additionally, to successfully leverage augmenting technologies, many workers will need upskilling to acquire the capabilities that allow them to get the most out of emerging technologies.

Of course, most healthcare workers will be impacted by both automating and augmenting technologies, and that's where predictive analytics can inform a comprehensive L&D strategy.

The data challenges are significant when trying to understand how new technologies will require shifting skillsets. For example, voice-enabled applications will likely impact not only nurse roles but will also require an entirely new set of skills for health care administrators and other non-clinical professionals.

Figure 4. Automation and augmentation rates for most impacted roles in the US healthcare system

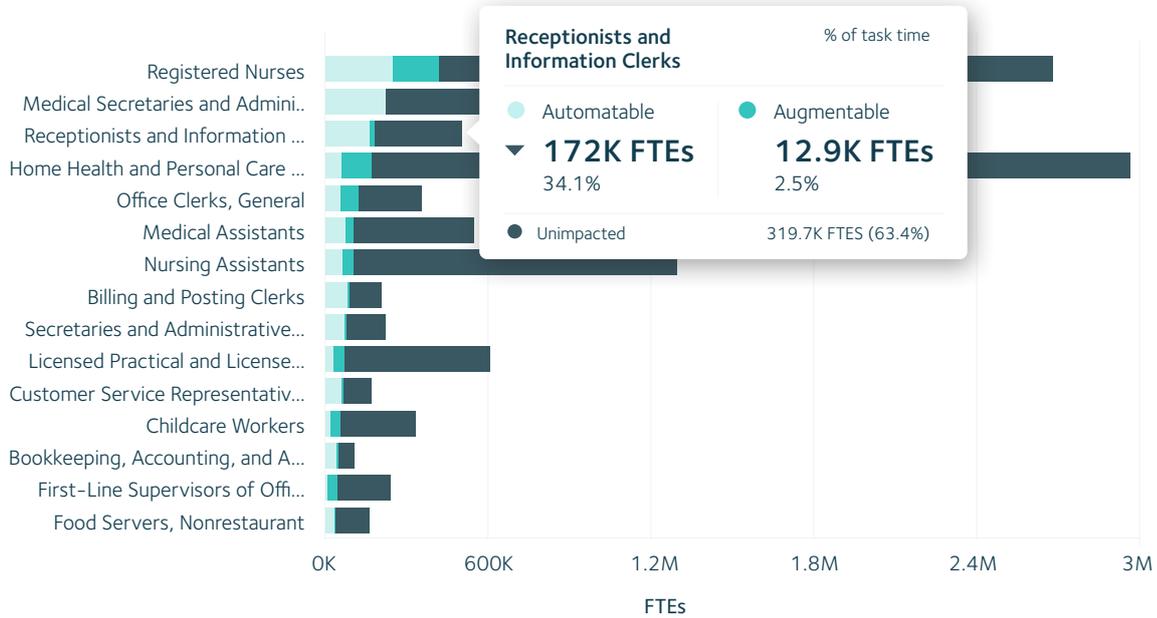
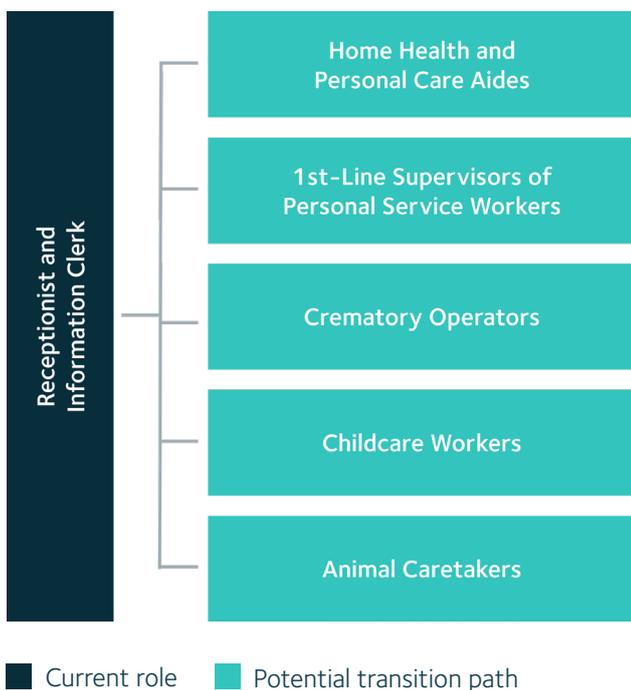


Figure 4 shows the healthcare roles that will have the highest number of workers impacted by technology. We can see that Receptionists and Information Clerks is one of the roles that will be heavily impacted over the next five years, with 172,000 FTEs at risk of automation. Faethm’s Job Corridor can help reveal viable career pathways for individuals working as Receptionists and Information Clerks into future-proof roles.

Faethm’s Job Corridor is an interactive tool that reveals how to reskill impacted roles, through unearthing overlapping skillsets, tasks, and work environments, ensuring that everyone can participate in the future workforce.

Figure 5 shows some of the most viable career pathways for the Receptionist and Information Clerk role into roles with future prospects and lower risk of automation.

Figure 5. Career pathways for Receptionist and Information Clerk



Finally, the Job Corridor has a multidirectional function. This means the tool can explore the future jobs a healthcare organization wishes to fill and identify where to source these jobs within the organization. Organizations are then able to identify new pools of talent from which to draw workers into roles with a shortage of labor. For example, the Job Corridor can help employers identify workers who could easily transition into a Registered Nurse role. This can help close the hiring and recruiting gap and make more nurses available.

Figure 6. Career pathways for a Registered Nurse role



How predictive analytics can help

Using machine learning and predictive analytics, L&D and Workforce Planning teams can:

- Understand which roles could be transformed by automating or augmenting technologies over the next 15 years, and what capabilities will be required to remain successful in the future.
- Identify what future capabilities will be required at the job level, not just data and digital literacies but also the innate human attributes required to deliver quality outcomes.
- Where those competencies are needed in the organization.
- What training paths will be required to acquire those competencies.
- Build personalized learning paths for employees based on their areas of developmental need, competency gaps, and individual workflows.

Responsible technology implementation

There is no denying that the healthcare industry is at the forefront of technological adoption (see Figures 2 and 3). From wearable patches that monitor vital signs to artificial intelligence (AI) chatbots helping diagnose medical conditions, technology is designed to better the lives of both patients and caregivers. Simply put, medical technology has become an integral part of healthcare, and its role will only continue to grow as the industry progresses.

However, with such a rush to adopt new technology, there is growing concern surrounding responsible technology implementation in healthcare. As automating technologies continue to be adopted, the surplus of workers in those automated roles continues to increase. [Faethm modelling shows](#) that there's a growing misalignment between the demand and supply of skills in the market, with a very real possibility that tens of thousands of workers in some job markets will be displaced.

Figure 7. Gap between workforce supply and demand (thousand of FTEs)

Job family groups

	Cumulative shortfall -50%			Gap in current supply (%)			Cumulative surplus +50%		
Architecture and engineering	-60	-621	-1,258	-36	-520	-1,136			
Arts, design, entertainment, sports, and media	104	-286	-594	129	-174	-471			
Building and grounds cleaning and maintenance	566	351	476	613	538	657			
Business and financial operations	-29	-972	-1,593	33	-714	-1,313			
Community and social services	7	-349	-652	29	-254	-546			
Computer and mathematics	-571	-3,387	-6,138	-527	-3,123	-5,779			
Construction and extraction	721	680	760	780	793	874			
Educational instruction and library	249	-490	-1,131	325	-132	-745			
Farming, fishing and forestry	50	3	36	58	33	66			
Food preparation and service	2,000	2,100	2,458	2,063	2,395	2,760			
Health care practitioners and technical support	-134	-1,021	-1,693	-55	-652	-1,295			
Health care support	95	-148	-260	125	-9	-113			
Installation, maintenance, and repair	318	185	210	354	325	349			
Legal	-3	-19	-4	9	4	17			
Life, physical, and social sciences	3	-83	-114	14	-45	-75			
Management	231	-1,903	-3,919	360	-1,340	-3,306			
Office and administrative support	1,369	1,885	3,019	1,520	2,459	3,557			
Personal care and service	565	77	-261	608	270	-51			
Production	927	1,086	1,417	998	1,372	1,690			
Protective services	138	185	271	161	238	325			
Sales and related fields	1,091	690	615	1,216	1,244	1,180			
Transportation and material moving	1,312	1,292	1,683	1,389	1,609	1,985			
Total	8,949	-744	-6,673	10,169	4,315	-1,372			

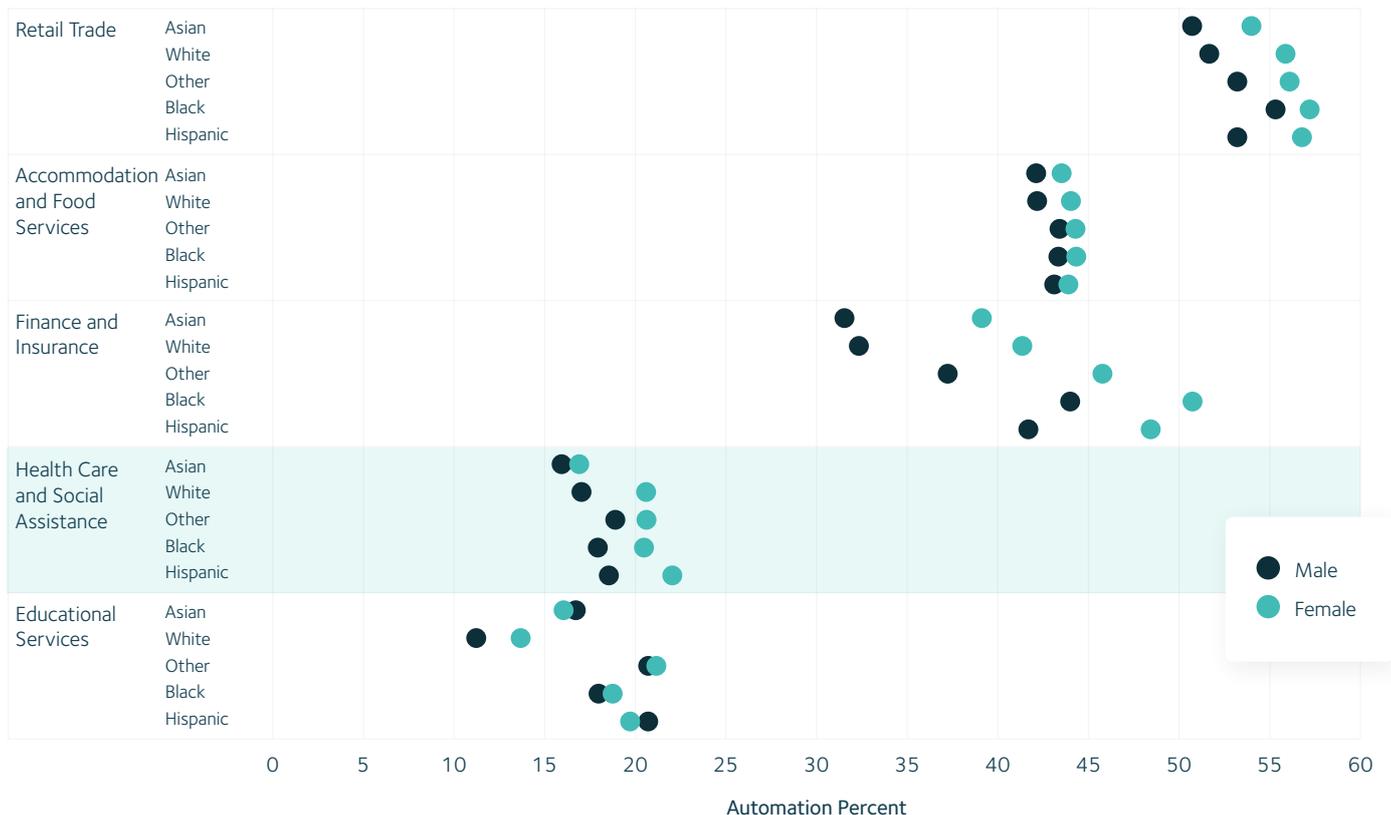


This displacement will predominately be seen in low and medium salary jobs, impacting specific socio-economic groups. [Faethm research has uncovered](#) that digital transformation can accelerate existing workforce inequities. This is particularly true for Black and Hispanic employees, for women, and women of color, as they tend to occupy roles with repetitive and lower-skilled tasks which are prone to replacement by technology. According to Faethm analysis (see figure 8), in the Healthcare and Social Assistance industry, the female Hispanic population will be more impacted by automation in the next five years.

Practically, this means individuals in roles most prone to disruption may need to completely shift careers in order to remain employable in the market. Though all communities will require skills uplift in the future to remain competitive, these highly impacted communities will face the most near-term job disruption and will require more agile learning opportunities.

As important as it is to commit to lifelong learning to remain employable, the responsibility for this should not lie with workers themselves. Governments and companies must take charge now in order to prevent massive skills imbalances and worker surplus, as well as to ensure there are workers to fill the roles that are projected to have a huge demand for workers.

Figure 8. Automation rates by race and gender in select industries, 2030



The challenge lies in the intersection of the people and technology strategies – what technology, when, where, and whose work will be transformed and will require additional training.

Figure 9 highlights the healthcare roles that will have the highest percentage of workers impacted by automation. We can see that over 65 percent of the tasks performed by many administrative workers will be impacted by automation.

Figure 9. Roles in the US healthcare industry with the highest percentage of workers impacted by automation



Good use of technology not only benefits patients by creating easier ways for doctors to provide treatment, but it improves the long-term efficiency and sustainability of healthcare organizations, as well as their ability to offer personalized care.

How predictive analytics can help

- Understanding which technology types will drive more impact for each area of the organization, today, and up to 15 years in the future.
- Identifying the tasks that will be transformed by digitization and the technologies that will drive that impact.
- Understanding which processes utilize new technologies that impact staff roles and skillsets.
- Identifying the gaps in staff skillsets as new technologies are implemented.
- Building workforce development plans to close those gaps using existing tools such as corporate universities, on-the-job training, and community colleges.
- Creating an implementation roadmap to help adapt staff skills, processes, and roles as new technology is added.

Conclusions

The realization that healthcare is about to change in ways that few could have imagined even ten years ago is putting the industry into high gear. This fast-paced environment presents both challenges and opportunities for today's healthcare organizations. The winners in this new digital economy will be those who can adapt quickly to the changing landscape, develop an efficient workforce, and embrace technology without losing sight of what is most important: their patients and caregivers.

For many industries, automating technologies represent a worrying disruption to a stable workforce. However, the healthcare industry is already in the middle of serious disruption. There may be no better example of an industry where technology can be a steadying influence, providing a solution to a gap in human labor and bringing patient care into a bright future. There are serious challenges, but there are also ample opportunities to identify new pools of talent to bring fresh perspectives into the industry.

This is why healthcare organizations should have a data-driven workforce strategy that embeds analytics into every stage of the talent life cycle. This allows managers to allocate resources effectively across the workforce in response to changes in demand, retention data, and other key factors in the business.

The development of this data-driven approach must begin with a deep understanding of the existing workforce, their roles and tasks, their gaps in knowledge and skillsets, any planned changes to technology or processes that may impact learning needs, and the current training being provided to caregivers.

The next step in this process is to look forward to the future. Planning and decision-making must take into consideration the availability of new technologies, either through implementation or planned upgrades. These technologies will change the interactions of workers with each other and with patients, and require training paths to evolve to meet future learning needs.

Faethm's predictive analytics can help healthcare organizations identify key trends and transformational opportunities that will impact the workforce, allowing for a proactive approach to staffing decisions. By using advanced analytics, healthcare leaders can make sure their workforce strategy is based on fact rather than fear, building a strong workforce to support efficient care delivery today and in the future.

Appendix

Report Methodology

Projection of the impact of emerging technology

Emerging technology can impact the evolution of work both indirectly and directly: indirectly by disrupting an entire industry, impacting part of an industry's value chain, or replacing an entire business process; or directly by impacting a job or job task. In this study, we have focused our analysis on the direct impact of emerging technology on jobs and work tasks.

The Faethm model begins with an assessment of whether a job is automatable or not. We apply a support vector machine (SVM) that learns from expert elicited labeling of jobs data. The SVM learns what skills are associated with being automated, and any job analyzed by the model is given a probability of Automation. In addition to the SVM, the Faethm model applies an analysis of work tasks and technology-to-task impact over time. A natural language processing (NLP) approach is used to assign one of 16 emerging technology types to a work task (see figure on Faethm's technology taxonomy). The SVM is combined with the task model to identify which jobs and tasks may be impacted by a specific technology and whether a task is likely to be automated or augmented. Adoption scenarios over ten years are also applied to each technology-to-task combination and adjusted by industry-specific technology adoption rates.

The data we apply in Faethm modeling is collected from multiple respected sources. Our core jobs data is an extension of the most comprehensive dataset on jobs, O*NET. Faethm's technology readiness and adoption rates across 152 countries and 19 industries are fueled by research from WEF, INSEAD, Cornell, and McKinsey.

Page notes

¹ Census Bureau's 2019 American Community Survey

² Get Ready for the Post-Pandemic Health Care Talent Revolution <https://www.brinknews.com/get-ready-for-the-post-pandemic-health-care-talent-revolution/>

³ CCRC Registered Nurse Hourly Rates Increased 3.42% in 2021 <https://leadingage.org/workforce/ccrc-registered-nurse-hourly-rates-increased-342-2021>

⁴ University of St. Augustine for Health Sciences, The 2021 American Nursing Shortage: A Data Study, <https://www.usa.edu/blog/nursing-shortage/>

⁵ Alia Paavola, 266 hospitals furloughing workers in response to COVID-19, <https://www.beckershospitalreview.com/finance/49-hospitals-furloughing-workers-in-response-to-covid-19.html>

⁶ University of St. Augustine for Health Sciences, Nurse Burnout: Risks, Causes, and Precautions, <https://www.usa.edu/blog/nurse-burnout/>

⁷ Beatrice Van der Heijden, Christine Brown Mahoney, Yingzi Xu, Impact of Job Demands and Resources on Nurses' Burnout and Occupational Turnover Intention Towards an Age-Moderated Mediation Model for the Nursing Profession, <https://www.mdpi.com/1660-4601/16/11/2011/htm>

⁸ Gretchen Berlin, Meredith Lapointe, Mhoire Murphy, and Molly Viscardi, Nursing in 2021: Retaining the healthcare workforce when we need it most, <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/nursing-in-2021-retaining-the-healthcare-workforce-when-we-need-it-most>

⁹ Hospital and Healthcare Compensation Service, CCRC RN Hourly Rates Increased 3.42% in 2021, <https://www.hhcsinc.com/news-7-2021.html>

¹⁰ American Association of Colleges of Nursing, Student Enrollment Surged in U.S. Schools of Nursing in 2020 Despite Challenges Presented by the Pandemic, <https://www.aacnursing.org/News-Information/Press-Releases/View/ArticleId/24802/2020-survey-data-student-enrollment>



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