Part of the Solution:
Pre-Baccalaureate Healthcare Workers in a Time of Health System Change

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"Pre-baccalaureate healthcare workers make up a large share of the healthcare workforce and should be seen as an asset in providing high-quality, cost-effective healthcare."

Summary

Healthcare occupations account for a large and growing share of the workforce and span the education and earnings continuum. Although many discussions of the healthcare workforce focus on doctors and other occupations requiring advanced degrees, the healthcare system would not function without pre-baccalaureate workers—those with less than a bachelor's degree. These workers perform a variety of clinical, assistive, and administrative tasks, and like all healthcare staff, should be working at their full level of competence in order to achieve the "triple aim" of improving the experience of care, improving health outcomes, and reducing per capita costs.

While individuals with less than a bachelor's degree work in multiple healthcare occupations, they are overwhelmingly concentrated in a subset of occupations. This report identifies the 10 largest "pre-baccalaureate" healthcare occupations, those in which substantial shares of workers—ranging from 39 percent to 94 percent—have less than a bachelor's degree, and focuses on those workers in the 10 occupations, unless otherwise noted. Using labor market and American Community Survey data from 2000 and 2009-2011, our analysis across the nation's 100 largest metropolitan areas finds that:

- **Workers with less than a bachelor's degree in the 10 largest pre-baccalaureate healthcare occupations total 3.8 million, accounting for nearly half (49 percent) of the total healthcare workforce in the nation's 100 largest metropolitan areas.** Occupations with the highest numbers of pre-baccalaureate workers include nursing, psychiatric and home health aides (1.2 million), registered nurses (680,000), personal care aides (542,000), and licensed practical nurses (343,000).
- **Educational attainment varies considerably among workers in pre-baccalaureate healthcare occupations, and earnings largely track education.** Pre-baccalaureate RNs and diagnostic technologists and technicians typically have associate's degrees or other post-secondary educational experience and have the highest median annual earnings (full-time, year-round) of pre-baccalaureate healthcare workers, at $60,000 and $52,000 respectively. By contrast, about half of personal care aides and nursing, psychiatric and home health aides have a high school diploma or less, and post median annual earnings of $21,000 and $25,000, respectively.
- **Pre-baccalaureate healthcare workers in the 10 largest pre-baccalaureate healthcare occupations are racially and ethnically diverse and overwhelmingly female.** Men are a minority in all of the occupations except for emergency medical technicians / paramedics. Half of the occupations have higher shares of blacks, Asians and Hispanics than the average among pre-baccalaureate workers across all occupations. Moreover, the pre-baccalaureate healthcare workforce has grown more diverse over time: In 2009-2011, whites made up 49 percent of pre-baccalaureate workers in the 10 highlighted occupations, down from 59 percent in 2000. Foreign-born workers are especially concentrated among pre-baccalaureate personal care aides and nursing, psychiatric and home health aides.

- **The number of jobs held by pre-baccalaureate workers in the 10 largest pre-baccalaureate healthcare occupations increased at a faster rate than jobs held by similarly educated workers overall, but the largest growth was among lower-paying pre-baccalaureate healthcare occupations, and only registered nurses experienced real earnings growth between 2000 and 2009–2011.** The number of jobs held by pre-baccalaureate workers in the 10 highlighted occupations increased by 46 percent between 2000 and 2009–2011, compared to growth of 3 percent among pre- baccalaureate workers across all occupations. The bulk of the growth was among occupations with lower earnings, particularly personal care aides, whose numbers rose by nearly 400,000 (277 percent). Pre-baccalaureate RNs were the only occupation to post statistically significant real earnings growth between 2000 and 2009–2011, with a 6 percent increase in annual median earnings ($3,300). By contrast, median earnings among pre-baccalaureate workers across all industries and occupations fell by 14 percent, or about $5,500.
- **The size and nature of the pre-baccalaureate healthcare workforce varies by region, reflecting demographics and healthcare industry mix.** Pre-baccalaureate healthcare workers in the 10 highlighted occupations account for lower shares of the total healthcare workforce in more highly-educated regions that are often home to medical schools and teaching hospitals, and higher shares of the healthcare workforce in areas with smaller numbers of such institutions, and with lower levels of education and older populations. Pre-baccalaureate workers in the 10 highlighted occupations range from 37 percent and 40 percent of all healthcare workers in the Denver, CO and San Jose, CA metro areas, respectively, to 63 percent and 72 percent of all healthcare workers in the Modesto, CA and McAllen, TX metro areas, respectively.

It is a dynamic moment for the healthcare industry, which is experiencing multiple pressures for change: expanded access, an aging population, technological advancements, cost-reduction imperatives, and most importantly, a call for improved health outcomes. Healthcare providers and insurers are experimenting with new or adapted models to finance and deliver care, with an emphasis on team-based and coordinated care focused on primary and preventive care and undergirded by electronic health records and other information technology (IT) tools. The workforce is at the heart of the healthcare delivery system, and work redesigns inevitably have repercussions on the roles and necessary skills mix of healthcare staff. In a more team-based approach to care with a strong health IT infrastructure, pre-baccalaureate healthcare workers can use standardized, evidence-based guidelines of care to take on more routine responsibilities, such as screening, outreach, and health education. Doctors and other clinicians can then focus on diagnosis and treatment of patients with more complex conditions, responsibilities for which their specialized education makes them uniquely qualified. Accordingly, education and training programs for incumbent and future pre-baccalaureate healthcare workers (indeed, for all workers) need to be adapted to meet the changing practices of healthcare delivery, to ensure that every member of the healthcare team contributes to the fullest extent of his or her training and capabilities.

Healthcare providers should view pre-baccalaureate workers as resources. The following recommendations are designed to help healthcare providers meet the triple aim while improving the career opportunities of pre-baccalaureate healthcare workers: Expand research and evaluation on new roles with increased responsibility for pre-baccalaureate healthcare workers; rationalize the patchwork state-level scope-of-practice framework governing the services that members of healthcare occupations can provide; and strengthen regional partnerships of healthcare employers, educators, workforce boards, and other stakeholders to meet the specific healthcare employment needs of local and regional labor markets.

Introduction

Workers in healthcare occupations account for a large and growing share of the U.S. workforce, accounting for more than 12 million jobs, or about 9 percent of all workers in the U.S. economy. Between 2000 and 2009–2011, the number of workers in healthcare occupations in the U.S. increased by 39 percent, or 3.4 million jobs.[2] The Department of Labor projects that healthcare occupations will show strong growth between 2012 and 2022, adding nearly three million more jobs.[3] Specifically, occupations in which substantial shares of workers have less than a bachelor's degree are growing the most and the fastest. These include home health aides, nursing aides, personal care aides, licensed practical and vocational nurses, medical assistants, registered nurses, physical therapist assistants/aides, diagnostic medical sonographers, occupational therapy assistants/aides, and dental hygienists.[4]

The healthcare industry is experiencing dramatic challenges. It faces rapidly increasing demand from a surging older population plus vibrant bio-medical and technological innovation transforming care. At the same time it faces directives to expand access, reduce costs, redesign the financing and delivery of care, and most importantly, improve health outcomes.

In concert with other forces shaping the industry, the Patient Protection and Affordable Care Act (ACA) has far-reaching implications for the healthcare workforce. While the ACA legislation is thousands of pages long and its implementation is an unfolding saga, its basic aims are fairly easily described: make healthcare accessible to more people, control healthcare costs, and improve the healthcare delivery system.[5] There has been no shortage of critiques to date of health care's fragmented delivery system, acute-care focus, volume-driven reimbursement methodology, and a professional scope of practice framework that inhibits flexibility and teamwork among staff. The ACA's provisions on how providers are reimbursed and how medical care should be organized and delivered are intended to build on previous reforms and spur innovation to achieve the "triple aim" of improving the experience of health care, improving health, and reducing per capita costs.[6]

The ACA's support of alternative payment and service delivery models through such means as the Centers for Medicare and Medicaid Services (CMS) Innovation Center will alter the mix and responsibilities of healthcare staff among participating organizations.[7] As these alternative models are tested and refined and demonstrate success, the goal is to scale them up and spread them throughout the healthcare system. For example, teams are central to Accountable Care Organizations (ACOs) and Patient-Centered Medical Homes (PCMHs), both of which seek to reduce costs and improve care by increasing screening and preventive care and ensuring that care is better coordinated across providers. ACOs are groups of doctors, hospitals, and other healthcare providers who work together to provide coordinated care to specific sets of patient, often Medicare enrollees. PCMHs are primary care practices that build strong relationships between patients and physicians backed up by coordinated healthcare teams and electronic health systems. In both models, the specific team configurations are based upon the patient population and practice size and type, but a primary care team might include physicians, nurse practitioners, physician assistants, registered nurses, social workers, dieticians, licensed practical nurses, medical assistants, or community health workers.[8] Consequently, there is renewed attention to questions of how to educate and train the healthcare workforce (both new and incumbent, and at all levels of educational attainment) to work in service delivery models that emphasize team-based care and care coordination.[9] In fact, the ACA created a National Healthcare Workforce Commission to analyze healthcare workforce issues and advise policymakers. Although Commission members were appointed by September 2010, it has never met nor conducted any business, since Congress has declined to fund it.[10] Additionally, the National Governors Association recently announced that seven states will participate in a policy academy focused on the preparing the healthcare workforce for a changing health care environment."[11]

The need to slow healthcare spending growth inevitably includes a review of healthcare staffing patterns, since more than half (57 percent) of healthcare expenditures are labor costs.[12] Healthcare occupations span the education and earnings continuum, including workers with graduate degrees and years of specialized training and those with a high school diploma or less. While many discussions of the healthcare workforce focus on doctors and other professions with advanced degrees, workers with lower levels of education make up a large share of the healthcare workforce and carry out functions critical to an effective healthcare system. The training and skills of healthcare workers in supportive

and assistive roles are central yet often overlooked in generating quality care and patient satisfaction.[13] Alternative payment and delivery models, such as those supported by the CMS Innovation Center, open up possibilities for what we call "**pre-baccalaureate**" **healthcare workers**—those with less than a bachelor's degree—to play enhanced roles in providing high-quality care in a more efficient manner and at lower cost. (Please see the Methodology section for more information on the specifics of how pre-baccalaureate healthcare workers and occupations are defined.) Pre-baccalaureate healthcare workers can take on more responsibility for screening, patient education, health coaching, and care navigation, and by doing so, free up doctors and other advanced practitioners to focus on the more complex medical issues for which they are uniquely qualified.

This analysis of the pre-baccalaureate healthcare workforce is designed for leaders in healthcare, education, and workforce development, particularly those working at the regional level. Understanding the size and characteristics of the pre-baccalaureate healthcare workforce is critical for regional leaders who want to deliver high-quality healthcare while adapting to new models, as well as for educational and workforce officials charged with preparing current and future workers for a changing workplace. Because healthcare offers large numbers of jobs for workers with less than a bachelor's degree, these jobs are important for efforts to support upward social mobility, since they can serve as entry points into the labor force for workers with lower levels of education and potentially open up career ladders.

Methodology

Identifying and Selecting Pre-baccalaureate Healthcare Occupations for Analysis

To identify pre-baccalaureate healthcare occupations, we used the U.S. Department of Labor's Standard Occupational Classification (SOC) system, specifically the two major healthcare occupation groups: 29-000: Healthcare Practitioners and Technical Occupations and 31-0000: Healthcare Support Occupations. However, the analysis also includes one occupation not classified as healthcare. Personal care aides (SOC code 39-9021), within the major group 39-000: Personal Care and Service Occupations, are included based on their similar job duties as the healthcare occupations of nursing assistants and home health aides.[14]

To assess the educational levels of workers in healthcare occupations and develop the threshold criteria that would designate an occupation as "pre-baccalaureate," the 2009-2011 American Community Survey (ACS) 3-year pooled microdata were used.[15] We used the educational attainment of incumbent healthcare workers to define occupations as "pre-baccalaureate," rather than the system classifying occupations by typical education required for entry developed by the U.S. Department of Labor, for several reasons. Using the educational level of current workers allows us to more directly measure employer preferences as shown by their hiring decisions, and also allows us to examine the range of educational credentials held by workers within a given occupation, since the typical education required for entry does not always preclude workers with other educational backgrounds from performing the same job.

Using the ACS, we examined the distribution of educational attainment (less than high school, high school diploma or equivalent, some college, associate's degree, bachelor's degree, graduate or professional degree) among workers in healthcare occupations in the nation's 100 largest metropolitan areas. Shares of workers who were pre-baccalaureate—with educational attainment equaling an associate's degree or less—ranged from 94 percent (licensed practical and vocational nurses) to 0 percent (dentists, among other occupations). Since there is no standardized definition of what share of the workforce of a given occupation should have less than a bachelor's degree in order to be designed a "pre-baccalaureate" occupation, we examined the educational distribution to identify patterns and any natural breaks. The threshold of 37 percent of workers emerged as a natural break in the distribution: 37 percent of "all other healthcare practitioners and technical workers" hold an associate's degree or less, followed by 30 percent of "recreational therapists"). We adopted 37 percent of workers holding an associate's degree or below as our education threshold and classified these occupations as pre-baccalaureate. In other words, more than one-in-three workers in what we define as pre-baccalaureate healthcare occupations hold an associate's degree or below.

Three-year pooled microdata from the 2009-2011 ACS was also used to provide data on the number, earnings and demographic characteristics of workers in pre-baccalaureate occupations at the metropolitan level. Unfortunately, occupational categories from the ACS do not always perfectly match most 6-digit SOC codes for detailed occupations, instead providing some occupations at the 6-digit detailed occupation level and the remaining at the 5-digit broad occupational level. Thus, the final list of pre-baccalaureate healthcare occupations includes both 6-digit detailed occupations and 5-digit broad occupations and there are some detailed occupations this report cannot analyze on their own. For example, ACS provides data on the 5-digit broad group of nursing aides, psychiatric aides, and home health aides, and does not allow analysis of nursing aides on their own, separate from psychiatric aides and home health aides.

Twenty-four occupations in the ACS meet the criteria that 37 percent of workers have an associate's degree or less, as shown in Table 1.[17] To streamline the analysis, the report focuses on the 10 largest pre-baccalaureate occupations, which account for the vast majority (85 percent) of all pre-baccalaureate healthcare workers in the nation's 100 largest metropolitan areas.

Table 1. Healthcare Occupations with High Concentrations of Pre-Baccalaureate Workers, Top 100 Metropolitan Areas, 2009-2011

SOC Code	Occupation Title	Number of workers	Share Pre-BA	Number of Pre-BA workers	Rank by size of Pre-BA workers
31-1010	Nursing, psychiatric, and home health aides	1,341,000	90%	1,209,000	1
29-1141	Registered nurses	1,750,000	39%	680,000	2
39-9021	Personal care aides	618,000	88%	542,000	3
29-2061	Licensed practical and licensed vocational nurses	364,000	94%	343,000	4
29-2050	Health practitioner support technologists and technicians	322,000	81%	262,000	5
31-9092	Medical assistants	281,000	90%	253,000	6
31-9091	Dental assistants	183,000	90%	165,000	7
29-2030	Diagnostic related technologists and technicians	194,000	74%	144,000	8
29-2010	Clinical laboratory technologists and technicians	231,000	45%	101,000	9
29-2041	Emergency medical technicians and paramedics	104,000	83%	86,000	10
31-909X	Healthcare support workers, all other, including medical equipment preparers	97,000	88%	85,000	11
31-9011	Massage therapists	98,000	75%	74,000	12
29-2021	Dental hygienists	99,000	61%	61,000	13
29-2090	Micellaneous health technologists and technicians	83,000	68%	56,000	14
29-2071	Medical records and health information technicians	69,000	81%	56,000	15
31-9097	Phlebotomists	59,000	88%	52,000	16
29-1126	Respiratory therapists	64,000	67%	43,000	17
31-9094	Medical transcriptionists	39,000	85%	33,000	18
31-2020	Physical therapist assistants and aides	41,000	73%	30,000	19
29-2081	Opticians, dispensing	33,000	82%	27,000	20
31-9095	Pharmacy aides	29,000	80%	23,000	21
29-9000	Other healthcare practitioners and technical occupations	53,000	37%	20,000	22
31-2010	Occupational therapy assistants and aides	8,000	83%	7,000	23
29-1124	Radiation therapists	8,000	54%	5,000	24

Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

Analyses are based on the 100 largest metropolitan areas in the United States, defined by population size in the 2010 decennial census. The metropolitan areas are based on the Office of Management and Budget's (OMB) 2009 delineation of the 2003 standards, the delineation that corresponds to the 2009-2011 microdata used in the analysis. Geographies are standardized between years.

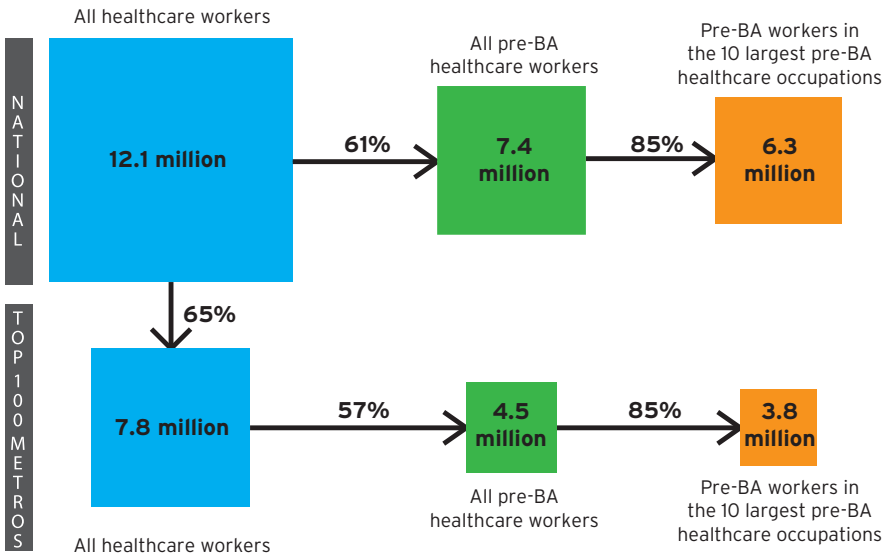
Findings

A. Workers with less than a bachelor's degree in the 10 largest pre-baccalaureate healthcare occupations total 3.8 million, accounting for nearly half (49 percent) of the total healthcare workforce in the nation's 100 largest metropolitan areas.

The 3.8 million pre-baccalaureate healthcare workers in the 10 largest pre-baccalaureate healthcare occupations account for the vast majority (85 percent) of all pre-baccalaureate healthcare workers in the nation's 100 largest metropolitan areas (see Figure 1). In other words, most pre-baccalaureate healthcare staff work in the 10 occupations that this paper will examine in detail. As described in the Methodology, these 10 are the largest healthcare occupations in which 37 percent or more of the workers have an associate's degree or below. Occupations with the highest numbers of pre-baccalaureate workers include nursing, psychiatric and home health aides (1.2 million), registered nurses (680,000), personal care aides (542,000), and licensed practical nurses (343,000). Please see Appendix A for a description of the duties and responsibilities of each of the 10 highlighted occupations.

As with other economic activity, the healthcare workforce—at all educational levels—concentrates in metropolitan areas: The nation's 100 largest metropolitan areas are home to 7.8 million healthcare workers, accounting for 65 percent of the national healthcare workforce of 12.1 million. Nationally, pre-baccalaureate workers are also concentrated in the occupations highlighted in this paper, with the 6.3 million pre-baccalaureate workers in the 10 largest pre-baccalaureate healthcare occupations accounting for 85 percent of all pre-baccalaureate healthcare workers in the United States. Pre-baccalaureate healthcare workers make up a slightly higher share of all healthcare workers (61 percent) nationally compared to the top 100 metropolitan areas (57 percent), suggesting that the healthcare workforce is slightly more educated in metropolitan areas relative to the nation as a whole.

Figure 1. Pre-Baccalaureate Healthcare Workers Within the Total Healthcare Workforce, 2009-2011



Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

The inclusion of registered nurses in a list of pre-baccalaureate occupations merits some discussion, given their high educational attainment levels relative to the other highlighted occupations: 39 percent have an associate's degree or below and 61 percent have a bachelor's degree or above. Indeed, in the near future, the registered nurse may not be considered a "pre-baccalaureate" occupation, given the Institute of Medicine's recommendation that 80 percent of RNs have bachelor's degrees by 2020.[19] However, it is also likely that the associate's degree will remain an important entry point into the field, but with a greatly increased emphasis on strengthening academic pathways for associate's degree nurses to earn bachelor's degrees.[20] As will be seen throughout the paper, pre-baccalaureate RNs differ from the other highlighted occupations in terms of demographics and earnings, reflecting their significant clinical responsibilities for patient care. This paper includes them in the analysis based on the large size of the occupation in absolute numbers and the substantial share that holds an associate's degree. Indeed, even though RNs have the smallest *share* of pre-baccalaureate workers at 39 percent, as noted above and in Table 2, they make up the second largest *number* of pre-baccalaureate workers by occupation, following nursing, psychiatric and home health aides.

The total size of the workforce varies by occupation, as does the size of the pre-baccalaureate workforce, as shown in Table 2. Although a clear majority of workers in the 10 selected occupations have an associate's degree or less (70 percent), some workers in these occupations do have bachelor's degrees or above. Registered nurses have the largest total number of workers (1.7 million) and the second highest number of pre-baccalaureate workers (680,000).[18] Nursing, psychiatric and home health aides have the highest number of pre-baccalaureate workers by far (1.2 million), and are second to RNs in terms of total workforce (1.3 million). Emergency medical technicians have the smallest total workforce (104,000) as well as the smallest number of pre-baccalaureate workers (86,000).

Table 2. Top 10 Pre-Baccalaureate Healthcare Occupations, Top 100 Metropolitan Areas, 2009-2011

Occupation	Total Number of Workers (in thousands)	Pre-BA Workers (in thousands)	Share Pre-BA (%)
Nursing, psychiatric, and home health aides	1,341,000	1,209,000	90%
Includes home health aides, psychiatric aides, nursing assistants, and orderlies			
Registered nurses	1,750,000	680,000	39%
Personal care aides	618,000	542,000	88%
Licensed practical and licensed vocational nurses	364,000	343,000	94%
Health practitioner support technologists and technicians	322,000	262,000	81%
Includes dietetic technicians, pharmacy technicians, psychiatric technicians, respiratory therapy technicians, surgical technologists, and veterinary technologists and technicians			
Medical assistants	281,000	253,000	90%
Dental assistants	183,000	165,000	90%
Diagnostic related technologists and technicians	194,000	144,000	74%
Includes cardiovascular technologists and technicians, diagnostic medical sonographers, nuclear medicine technologists, radiologic technologists, and magnetic resonance imaging technologists			
Clinical laboratory technologists and technicians	231,000	101,000	44%
Includes medical and clinical laboratory technologists and medical and clinical laboratory technicians			
Emergency medical technicians and paramedics	104,000	86,000	83%
All 10 pre-baccalaureate healthcare occupations	5,388,000	3,785,000	70%
All pre-baccalaureate workers, all occupations	93,054,000	60,229,000	65%

Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

B. Workers show substantial variation in educational attainment among the pre-baccalaureate occupations, and earnings largely track education.

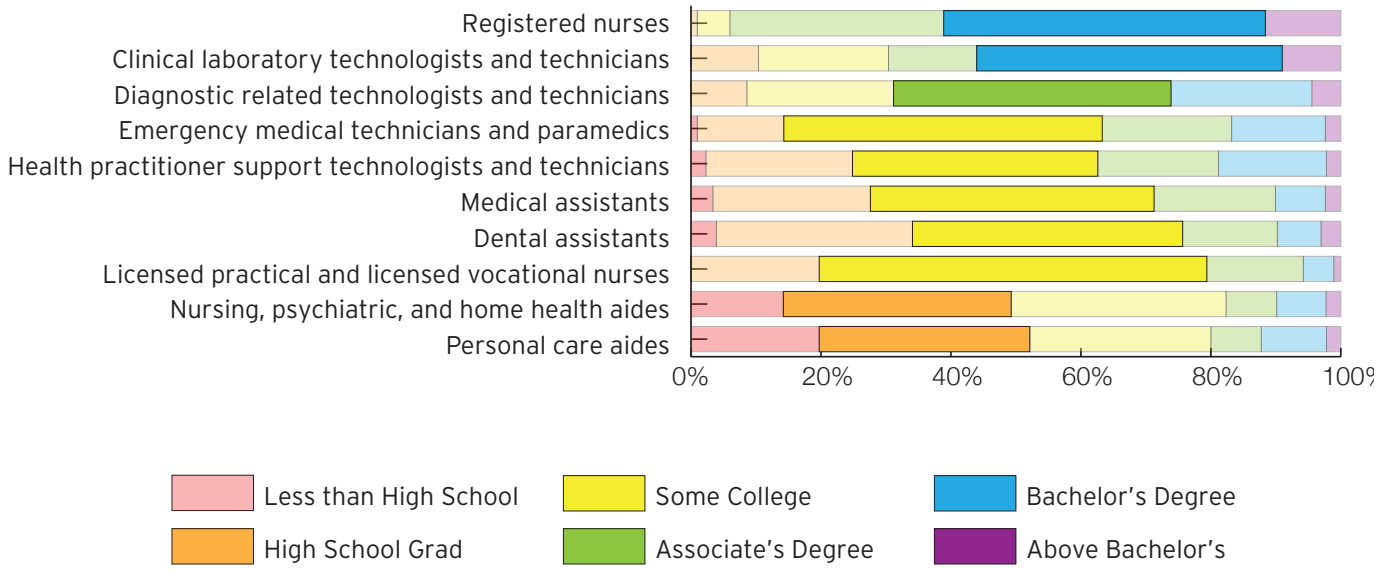
Educational attainment varies widely within and across occupations, providing entry points for job seekers and workers with a variety of educational backgrounds. Earnings are higher in occupations with higher levels of worker educational attainment, which can provide the basis for worker advancement by earning additional educational credentials and increasing their skills.

Career ladders exist in practice in some cases, when they are supported by employers and educational institutions and there is a clear route from one occupation to another. A common ladder includes upward progression in the nursing field: from entry-level nursing assistant to a more advanced patient care technician position to licensed practical nurse to an RN with an associate's degree (ADN) to an RN with a bachelor's degree (BSN).[21] Employers have mapped out career ladders and the corresponding educational requirements for other occupations, in some cases adding new rungs within an occupation (such as creating more senior Pharmacy Technicians) and in other cases showing how to progress from one occupation, such as sterile processing technician, to higher paying ones such as surgical technicians and radiologic technologists.[22]

However, career ladders do not always work in practice, and many workers in low-paying occupations will find upward mobility quite challenging. Although the healthcare field does include many occupations requiring more than a high school diploma but less than a four-year degree to which lower-wage workers can aspire, the field is nonetheless pyramid-shaped, with a large number of positions requiring low levels of education and far fewer as educational and professional licensure requirements increase. Additionally, many workers with low levels of educational attainment have limited literacy and math skills as well as family responsibilities, both of which make it difficult and time-consuming to complete additional education and training courses.[23]

Even within the subset of healthcare occupations categorized as "pre-baccalaureate," the range of educational attainment is wide. One approach to understand this variation is to identify the modal educational credential within each occupation, that is, the educational credential held by the largest share of workers.[24]

Figure 2. Educational Attainment by Occupation, Top 100 Metropolitan Areas, 2009-2011



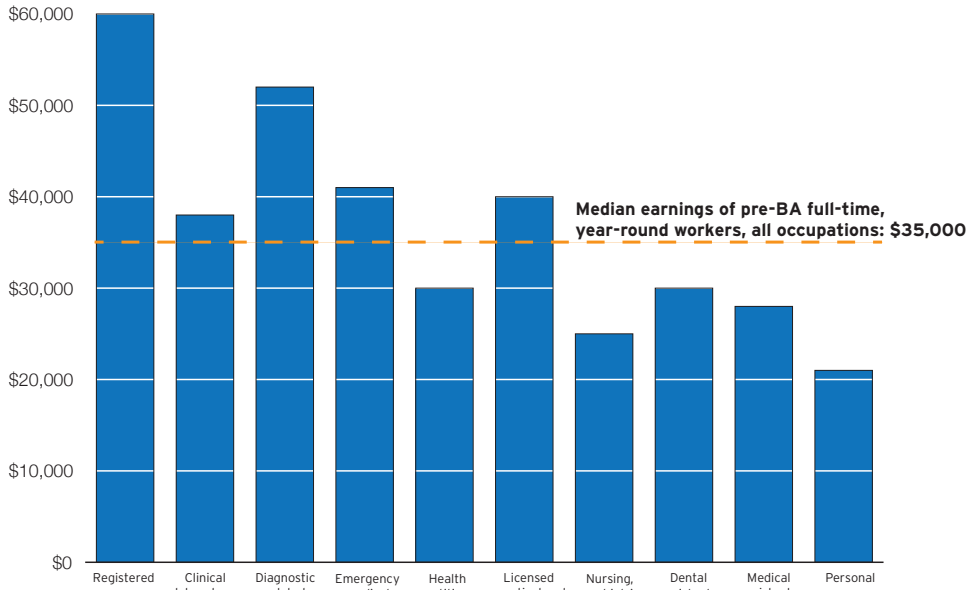
Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

The bachelor's degree is the modal educational credential for workers in two occupations: registered nurses (50 percent) and clinical laboratory technologists and technicians (47 percent).[25] Sizable shares of workers within these occupations also report pre-baccalaureate experience: 33 percent of registered nurses and 14 percent of clinical laboratory technologists and technicians have an associate's degree, and 5 percent of nurses and 20 percent of laboratory technologists and technicians report having attended some college without earning a degree.[26] Pre-baccalaureate RNs have the highest earnings of the 10 highlighted occupations, at $60,000 for those working full-time year-round, as shown in Figure 3. Pre-baccalaureate clinical laboratory technologists and technicians earn $38,000 for full-time, year-round work.[27]

The associate's degree is the modal educational credential for diagnostic related technologists and technicians: 43 percent have a two-year degree. About one-quarter (22 percent) has a bachelor's degree, and another quarter (23 percent) has some college experience. Pre-baccalaureate workers in this occupation have the second highest median earnings, at $52,000 for those working full-time, year-round.

The modal educational level is some college for workers in five occupations: licensed practical and vocational nurses (60 percent), emergency medical technicians and paramedics (49 percent), medical assistants (44 percent), dental assistants (42 percent), and health practitioner support technologists and technicians (38 percent). These occupations typically require some post-secondary education but not a two- or four-year degree. Earnings in this educational category for full-time, year-round work are highest for emergency medical technicians and paramedics ($41,000), followed closely by licensed practical and vocational nurses ($40,000). Earnings are lower for health practitioner support technologists and technicians ($30,000), dental assistants ($30,000), and medical assistants ($28,000). The variations in earnings in this category suggest that not all post-secondary education or credentials have equal effects on earnings.

Figure 3. Median Earnings of Pre-Baccalaureate Full-Time, Year-Round Workers by Occupation, Top 100 Metropolitan Areas, 2009-2011



	Registered nurses	Clinical laboratory technologists and technicians	Diagnostic related technologists and technicians	Emergency medical technicians and paramedics	Health practitioner support technologists and technicians	Licensed practical and licensed vocational nurses	Nursing, psychiatric, and home health aides	Dental assistants	Medical assistants	Personal care aides
Share full-time, year-round	71%	75%	74%	80%	66%	70%	60%	54%	71%	46%

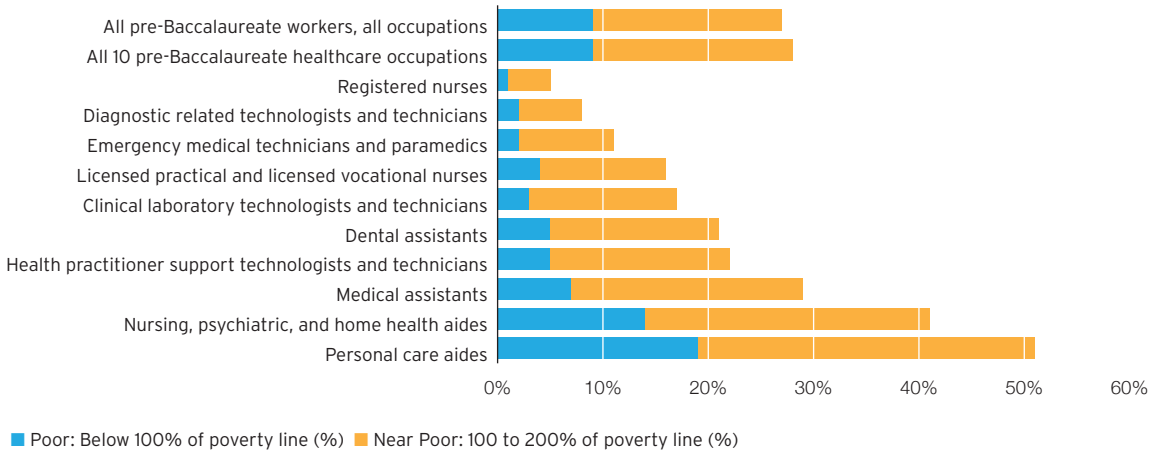
Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

Personal care aides and nursing, psychiatric, and home health aides have the lowest levels of education. The high school diploma is the modal level of educational attainment for these occupations, representing the highest level of education for 35 percent of nursing aides and 32 percent of personal care aides. Notably, many of the workers in these occupations did not complete high school: 14 percent of nursing aides and 20 percent of personal care aides do not have a high school diploma. These two occupations also have the lowest earnings: $25,000 for full-time, year-round work for nursing aides and $21,000 for personal care aides.

As noted above, earnings calculations are based on full-time, year-round work: at least 35 hours per week and 50 weeks per year. Part-time or part-year work can be voluntary, perhaps reflecting a desire for flexible use of time, or involuntary, reflecting an inability to find full-time work or spells of unemployment. Figure 3 indicates the share of workers in each occupation working full-time, full-year, ranging from 46 percent of personal care aides to 80 percent of emergency medical technicians and paramedics. Across all occupations in all industries in the nation's largest metropolitan areas, 66 percent of workers work full-time, year-round. Three of the pre-baccalaureate healthcare occupations fall below this average: personal care aides (46 percent), dental assistants (54 percent), and nursing, psychiatric, and home health aides (60 percent).

As shown in Figure 4, median earnings in some occupations are low enough to place sizable shares of workers in the working poor category. Across the 10 highlighted occupations, 28 percent of pre-baccalaureate workers live in families with incomes below 200 percent of the federal poverty line. Shares of those living below 200 percent of the poverty line are particularly high in three occupations: 51 percent of pre-baccalaureate personal care aides, 41 percent of nursing aides and 29 percent of medical assistants. Fourteen (14) percent of nursing aides and 19 percent of personal care aides live in families with incomes below the official poverty line.

Figure 4. Share of Pre-Baccalaureate Workers Living In Families with Incomes Below 200 Percent of the Poverty Line, Top 100 Metropolitan Areas, 2009-2011



Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

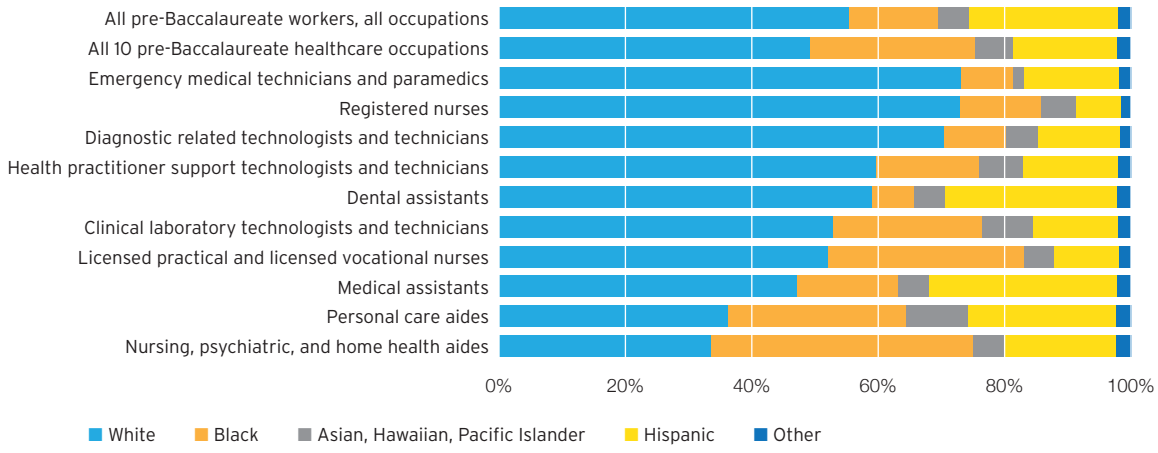
C. Pre-baccalaureate healthcare workers in the 10 largest pre-baccalaureate healthcare occupations are racially and ethnically diverse and overwhelmingly female.

Healthcare institutions recognize that a diverse workforce is a pillar of providing high-quality, culturally competent healthcare. While there is no one established definition of "culturally competent care," Betancourt provides a concise and broadly applicable description: "the ability of systems to provide care to patients with diverse values, beliefs and behaviors, including tailoring delivery to meet patients' social, cultural and linguistic needs. . . [It is both] a vehicle to increase access to quality care for all patient populations and . . . a business strategy to attract new patients and market share."

Accordingly, the diverse nature of the pre-baccalaureate healthcare workforce can be a significant asset to healthcare providers. Pre-baccalaureate workers in these occupations are disproportionately people of color; five occupations have higher shares of blacks, Asians and Hispanics than the average of pre-baccalaureate workers across all occupations. Moreover, these 10 occupations have become more diverse over the last decade. In 2000, a majority (59 percent) of pre-baccalaureate workers in the 10 highlighted occupations were white. By 2011, the share of white workers had dropped to just under half (49 percent). Of particular note is the change in the share of pre-baccalaureate healthcare workers who are Hispanic, increasing from 10 percent in 2000 to 17 percent by 2011, with increases concentrated in the dental assistant and medical assistant occupations.

- Whites make up large shares of the following pre-baccalaureate healthcare occupations: registered nurses (73 percent), emergency medical technicians and paramedics (73 percent), diagnostic related technologists and technicians (70 percent), health practitioner support technologists and technicians (60 percent), and dental assistants (59 percent).
- Blacks make up 14 percent of pre-baccalaureate workers across all occupations, and 26 percent of pre-baccalaureate workers in the 10 highlighted occupations. In particular, they make up large shares of the following occupations: 41 percent of nursing aides, 31 percent of licensed practical and vocational nurses, 28 percent of personal care aides, and 24 percent of clinical laboratory technologists and technicians.
- Asians account for 5 percent of the pre-baccalaureate workforce across all occupations and 6 percent of pre-baccalaureate workers in the 10 highlighted occupations. They are concentrated in several pre-baccalaureate healthcare occupations, comprising 10 percent of personal care aides, 8 percent of clinical laboratory technologists and technicians, and 7 percent of health practitioner support technologists and technicians.
- Hispanics make up 24 percent of the pre-baccalaureate workforce across all occupations, and 17 percent of pre-baccalaureate workers in the 10 highlighted occupations. They are heavily represented in several pre-baccalaureate healthcare occupations, accounting for 30 percent of medical assistants and 27 percent of dental assistants.

Figure 5. Race/Ethnicity of Pre-Baccalaureate Healthcare Workers, Top 100 Metropolitan Areas, 2009-2011



Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

Two occupations include high shares of foreign-born workers. About one-third of pre-baccalaureate nursing aides (31 percent) and personal care aides (33 percent) are foreign-born, compared to 23 percent among pre-baccalaureate workers in the 10 highlighted occupations as well as across all occupations. Pre-baccalaureate foreign-born workers nursing aides and personal care aides are from a wide range of countries. Almost one-quarter of pre-baccalaureate foreign-born personal care aides are originally from Mexico (22 percent); the next largest nationalities are those from the Philippines (10

percent) and China (5 percent). Among foreign-born nursing aides, 12 percent are from Jamaica and Haiti each, 11 percent from Mexico, and 8 percent from the Dominican Republic.

Lastly, in nine of the 10 occupations, the vast majority of pre-baccalaureate workers (at least 70 percent) are female. The exception is the occupation of emergency medical technicians and paramedics, of which about one-quarter of the pre-baccalaureate workforce (27 percent) is female. In four occupations, more than 90 percent of the pre-baccalaureate workforce is female: dental assistants (96 percent), medical assistants (93 percent), registered nurses (92 percent), and licensed practical and vocational nurses (91 percent). By contrast, 47 percent of the pre-baccalaureate workforce across all occupations is female.

D. The number of jobs held by pre-baccalaureate workers in the 10 largest pre-baccalaureate healthcare occupations increased at a faster rate than jobs held by similarly educated workers overall, but the largest growth was among lower-paying pre-baccalaureate healthcare occupations, and only registered nurses experienced real earnings growth between 2000 and 2009-2011

By its nature, healthcare is a labor-intensive enterprise, even accounting for technological advances, and it has increased in response to a growing and aging population. Across the top 100 metropolitan areas, the number of pre-baccalaureate workers in the combined 10 occupations grew by 1.2 million or 46 percent between 2000 and 2009–2011. By comparison, the number of pre-baccalaureate workers across all industries and occupations increased by only 3 percent.

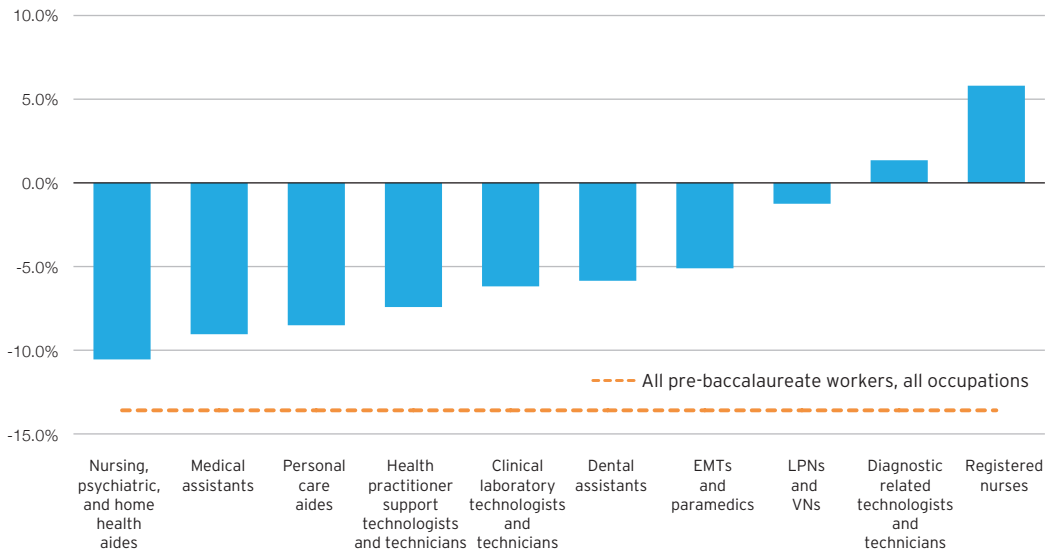
The bulk of the growth in pre-baccalaureate healthcare workers was among those with lower earnings. Four occupations, all with median annual earnings at or below $30,000, accounted for three-quarters (77 percent) of the job growth: personal care aides, nursing aides, health practitioner support technologists and technicians, and medical assistants. Pre-baccalaureate personal care aides stood out for their rapid growth: they had the largest increase in absolute numbers (nearly 400,000) as well as the largest percentage change (277 percent). Pre-baccalaureate RNs had the slowest growth rate (12 percent), although they were starting from a larger base than most other pre-baccalaureate healthcare occupations in 2000. In absolute numbers, the smallest increase was among clinical laboratory technologists and technicians (24,000).

Table 3. Growth in the Number of Pre-Baccalaureate Workers by Occupation, Top 100 Metropolitan Areas, 2000 to 2009-2011

Occupation	2000	Change	Change (%)
Personal care aides	144,000	398,000	277%
Nursing, psychiatric, and home health aides	885,000	324,000	37%
Health practitioner support technologists and technicians	157,000	105,000	67%
Medical assistants	160,000	93,000	59%
Registered nurses	605,000	76,000	12%
Licensed practical and licensed vocational nurses	277,000	66,000	24%
Dental assistants	127,000	38,000	30%
Diagnostic related technologists and technicians	108,000	36,000	33%
Emergency medical technicians and paramedics	52,000	34,000	65%
Clinical laboratory technologists and technicians	77,000	24,000	31%
All 10 pre-Baccalaureate healthcare occupations	2,591,000	1,194,000	46%
All pre-Baccalaureate workers, all occupations	58,300,000	1,930,000	3%

Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates and 2000 Decennial Census

Figure 6. Earnings Change for Pre-Baccalaureate Workers by Occupation, Top 100 Metropolitan Areas, 2000 to 2009-2011



Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates and 2000 Decennial Census

Of the 10 highlighted occupations, only pre-baccalaureate registered nurses experienced significant growth in median earnings between 2000 and 2009–2011, with a 6 percent increase ($3,300) among full-time, year-round workers, as shown in Figure 6. Pre-baccalaureate workers in the remaining eight occupations either saw no significant change in median wages or experienced declines. The four occupations with the largest job growth in absolute numbers between 2000 and 2009–2011 also experienced the sharpest wage declines over the same time period: 11 percent or $2,900 for nursing aides; 9 percent or $2,800 for medical assistants; 9 percent or $2,000 for personal care aides, and 7 percent or $2,400 for health practitioner support technologists and technicians. However, even these declines were smaller than the drop in median earnings faced by the typical pre-BA worker averaged across all industries and occupations of 14 percent, or about $5,500.

Earnings changes for are statistically significant at a 90 percent confidence interval for all occupations except diagnostic related technologists and technicians and EMTs and paramedics.

E. The size and nature of the pre-baccalaureate workforce varies by region, reflecting demographics and healthcare industry mix.

Pre-baccalaureate workers in the 10 largest pre-baccalaureate healthcare occupations account for varying shares of the healthcare workforce by region, based on demographics—reflecting both the patient base and the labor pool—and healthcare industry mix. Accordingly, strategies across the country to connect pre-baccalaureate workers to healthcare jobs—and to help them advance in the field—should not be overly standardized replications of each other. While healthcare jobs are plentiful around the country, unlike jobs in more geographically clustered industries such as manufacturing, each labor market has its own dynamic based on its population and types of healthcare providers.

Pre-baccalaureate healthcare workers tend to account for lower shares of the total healthcare workforce in more highly-educated and younger regions. In 13 of the 20 metro areas with the lowest shares of pre-baccalaureate workers in the 10 highlighted occupations, more workers have bachelor's degrees or above than the typical worker in the top 100 metropolitan areas (35 percent). In only four of the metro areas is the median age higher than the typical median age for the top 100 metropolitan areas (36 years old), and in cases where the median age is higher, it is not by much (topping out at age 38).

Regions with lower shares of pre-baccalaureate healthcare workers also tend to be home to medical schools and teaching hospitals that conduct research and attract patients for medical care they

might not be able to receive elsewhere, requiring a more highly educated and specialized workforce. Eighteen of the 20 metropolitan areas with the smallest shares of pre-baccalaureate workers in the 10 highlighted occupations are home to one or more medical schools (Table 5).[33, 34] Denver, CO has the lowest share of pre-baccalaureate healthcare workers in the 10 highlighted occupations, accounting for 37 percent of the total healthcare workforce, followed by San Jose, CA at 40 percent, and several regions at 41 percent (San Francisco, CA; Honolulu, HI; Washington, DC; and Boston, MA).

By contrast, the 20 metropolitan areas where the highlighted pre-baccalaureate healthcare occupations account for the highest shares of the total healthcare workforce show different demographics: a mix of places with aging populations and those with young populations but very low levels of educational attainment. All of them have lower educational attainment levels than the average for the top 100 metropolitan areas, and some of them are substantially lower, with only 16 to 19 percent of workers holding bachelor's degrees in places like Bakersfield, CA; Modesto, CA; and McAllen, TX. They show considerable variation in median ages. The median age in 11 of the 20 metro areas is higher than the median across all large metro areas, primarily on the East Coast, the Midwest, and Florida. In other metropolitan areas, the median age is fairly young, mostly concentrated in California and Texas

Table 4. Metropolitan Areas with the Lowest Share of Pre-Baccalaureate Workers in the 10 Largest Pre-Baccalaureate Healthcare Occupations as a Share of All Healthcare Workers, 2009-2011

Metropolitan area	Pre-BA workers in the 10 largest Pre-BA occupations as a share of all healthcare	Rank	Share of all workers with a BA or above	Median age
Denver-Aurora-Broomfield, CO	37%	100	41%	35
San Jose-Sunnyvale-Santa Clara, CA	40%	99	48%	36
San Francisco-Oakland-Fremont, CA	41%	98	48%	38
Honolulu, HI	41%	97	34%	37
Washington-Arlington-Alexandria, DC-VA-MD-WV	41%	96	50%	35
Boston-Cambridge-Quincy, MA-NH	41%	95	47%	38
Colorado Springs, CO	42%	94	36%	34
Seattle-Tacoma-Bellevue, WA	43%	93	39%	36
Las Vegas-Paradise, NV	43%	92	23%	35
Salt Lake City, UT	43%	91	29%	30
Nashville-Davidson--Murfreesboro--Franklin, TN	43%	90	35%	35
Omaha-Council Bluffs, NE-IA	44%	89	32%	35
Atlanta-Sandy Springs-Marietta, GA	44%	88	38%	34
Madison, WI	44%	87	45%	34
Indianapolis-Carmel, IN	44%	86	35%	35
Chicago-Joliet-Naperville, IL-IN-WI	44%	85	38%	35
Baltimore-Towson, MD	44%	84	39%	38
San Diego-Carlsbad-San Marcos, CA	45%	83	37%	34
Raleigh-Cary, NC	45%	82	44%	34
Knoxville, TN	46%	81	34%	38
Top 100 Metro Areas	*49%*	-	*35%*	*36*

Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

(largely overlapping with the areas with lower educational attainment). Judging by the lower concentration of medical schools and teaching hospitals in these metropolitan areas, healthcare providers are geared more towards meeting every-day and ongoing healthcare needs rather than specialized care. Only eight of the 20 metropolitan areas are home to a medical school.

The direct care workforce, defined here as personal care aides and nursing, psychiatric and home health aides, is a major driver of the total pre-baccalaureate healthcare workforce by region by virtue of its size. Pre-baccalaureate workers in these two occupations total 1.8 million in the 100 largest metro areas, or 46 percent of all pre-baccalaureate workers in the 10 highlighted occupations. In 13 of the twenty metro areas with the highest share of pre-baccalaureate healthcare workers, the share of direct care workers is higher than the average of 46 percent. By contrast, in the 20 metro areas with the lowest share of pre-baccalaureate healthcare workers, only four have higher than average shares of direct care workers.

Table 5. Metropolitan Areas with the Highest Share of Pre-Baccalaureate Workers in the 10 Largest Pre-Baccalaureate Healthcare Occupations as a Share of all Healthcare Workers, 2009-2011

Metropolitan area	Pre-BA workers in the 10 largest Pre-BA occupations as a share of all healthcare workers	Rank	Share of all workers with a BA or above	Median age
McAllen-Edinburg-Mission, TX	72%	1	19%	28
Modesto, CA	63%	2	19%	32
Stockton, CA	60%	3	20%	32
Lakeland-Winter Haven, FL	59%	4	21%	40
Fresno, CA	58%	5	23%	30
Dayton, OH	58%	6	28%	39
El Paso, TX	58%	7	24%	31
Youngstown-Warren-Boardman, OH-PA	57%	8	23%	42
Riverside-San Bernardino-Ontario, CA	57%	9	21%	32
Lancaster, PA	57%	10	25%	38
San Antonio-New Braunfels, TX	56%	11	27%	33
Syracuse, NY	56%	12	32%	38
Springfield, MA	56%	13	32%	39
Palm Bay-Melbourne-Titusville, FL	56%	14	28%	45
Bakersfield-Delano, CA	56%	15	16%	30
Providence-New Bedford-Fall River, RI-MA	55%	16	32%	39
Baton Rouge, LA	54%	17	29%	34
Greensboro-High Point, NC	54%	18	29%	38
Chattanooga, TN-GA	54%	19	27%	39
Scranton--Wilkes-Barre, PA	54%	20	27%	42
Top 100 Metro Areas	*49%*	-	*35%*	*36*

Source: U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates

Conclusion and Recommendations

The healthcare industry and healthcare jobs can be viewed through multiple lenses. Most importantly, healthcare workers heal people, ease pain, and promote health and well-being. The healthcare industry also provides millions of jobs at all levels of the education spectrum and often serves as an anchor of local and regional economies. For low-wage workers, healthcare jobs can provide career ladders leading to economic self-sufficiency, although the potential of upward mobility is not always realized or easily achieved.

Nationally, pre-baccalaureate healthcare workers account for three in five of all healthcare workers, with most working in the 10 occupations highlighted in this paper. These 10 occupations are a diverse group, with a wide range of responsibilities, educational requirements, pay, and status within the sector. Multiple forces—cost pressures, technology, and new payment and delivery models—are pushing to restructure the delivery of healthcare into less acute settings and according to the mantras of "coordinated care" and "team-based care." This creates an opportunity to upgrade the skills and increase the responsibilities of pre-baccalaureate workers to improve both the nature of the jobs and the performance of the healthcare system.

It is a truism within the field of workforce development that education and training initiatives must be "industry-driven": To be successful, they must tailor their curricula and programs to meet the needs of area employers and the regional labor market. Like most truisms, it is easier said than done. To be truly industry-driven in this environment of change, educators must have very high levels of engagement with healthcare employers as they determine how they will adapt to pressures such as

What does "practice redesign" mean, and what are examples of pre-baccalaureate workers taking on increased responsibilities as part of the care team?

"Practice redesign" refers to the organizational and staffing changes a medical practice makes in order to transform itself into a Patient Centered Medical Home (PCMH). The most concise definition of a PCMH is "a team of people committed to improving the health and healing of individuals in a community." More broadly, PCMHs are characterized by the following: the fundamental tenets of primary care (e.g. accessibility, comprehensiveness, coordination and integration, relationships), new ways of organizing care (e.g., electronic visits and team-based care), developing internal capabilities (e.g. leadership and management structure and capacities), and making reimbursement changes (e.g. blended payments and care management fees).[38]

As one physician wrote after reviewing a detailed description of his office's volume and type of services over the course of a year, "How and by whom the work is done is a continuing project of primary care redesign, dependent on both the skills of available non-physician staff and the extent of information-technology support."[39] Subsequent to the review, the practice made several staffing changes. It hired a new RN to do "information triage" of incoming lab reports, telephone calls, and consultation notes, as well as additional front-desk staff and medical assistants to handle increased tasks associated with comprehensive management of chronic diseases.[40]

Other examples:

- The California Long-Term Care Education Center is leading a project, "Care Team Integration of the Home-Based Workforce," supported by a grant from the CMS Innovation Center. Personal home care aides serving Medicaid and Medicare enrollees as part of the state's In-Home Supportive Services (IHSS) program receive training to integrate them more fully into the patient's healthcare team by providing them with additional training on patient monitoring, health coaching, using electronic medical records, and communicating with members of the larger healthcare team. The project's goals are to train 6,000 aides and reduce emergency room visits by 23 percent and average length of stay in nursing homes by 10 percent over three years.[41]
- The AtlanticCare health system in New Jersey uses a team-based model for patients with chronic diseases, with medical assistants taking on the role of health coach. Patients are assigned a health coach responsible for providing continuous contact, patient education, social service intervention, and cultural and linguistic support. Health coaches can perform specific clinical tasks such as A1C tests for patients with diabetes, glucose monitoring, blood pressure monitoring, and exercise counseling. The entire healthcare team participates in a 30 minute huddle each morning to review patient cases and discuss care plans. An estimated 50 percent of all patient encounters are conducted solely with health coaches.[42]

coverage expansion and payment reform. While policy directives and frameworks typically come from the federal or state government, it is institutions acting locally at the site of healthcare—hospitals, ambulatory care centers, long-term care facilities, patients' homes—that make staffing decisions and determine how clinical, administrative, and care coordination duties are allocated among staff.

In order to meet the triple aim of better care, better health, and lower costs, the worlds of healthcare practice and healthcare education (at all levels of credentials) need to exponentially strengthen their bonds and interactions so that education and training for both incumbent and future workers is more connected to the actual delivery of care. While much attention and energy is focusing on practice redesign, relatively little has been devoted to ensuring that workers are trained to adapt to new systems and deliver patient care in a more coordinated and team-based fashion. In fact, one recent report called for a "quadruple aim" of aligning healthcare education and practice and continued, "educators and health systems need to work together to define the training needs of students in workforce competencies." That is, educators and trainers (at all educational levels) need to be part of decisions about how healthcare will be delivered if they are going to equip the future and incumbent workforce with the right skills. This goes beyond typical conceptions of "industry-driven" workforce development or "employer engagement," and will involve significant organizational cultural change among most healthcare providers and educators.

A healthcare delivery system is only as effective as its workforce. There appears to be a rough consensus on two fronts: a) Given the focus on reducing the growth of healthcare spending, every member of the healthcare workforce needs to contribute to the fullest extent of his or her training, capabilities, and license, and b) high-quality healthcare will increasingly be delivered by multi-disciplinary teams that include licensed and unlicensed staff with various levels of education and credentials.

These propositions provide a strong framework for action. Pre-baccalaureate staff who take more responsibility as part of the healthcare team for the quality of care may earn higher wages due to increased skills and productivity, which is obviously to the benefit of workers since many pre-baccalaureate occupations offer fairly low wages. However, resource-constrained healthcare providers and payers may well find these increased wages pay off through reduced turnover, increased efficiency associated with all healthcare staff working at the top of their capacity and training as part of a team, and reduced hospitalizations and emergency department visits associated with higher quality care. The following recommendations are designed to take advantage of the current opportunity to improve patient care and health while also upgrading the skills, career opportunities and earnings of pre-baccalaureate healthcare workers.

1. **Expand research and evaluation on the effects of redesigned roles with greater responsibilities among pre-baccalaureate healthcare workers in order to improve care and reduce costs. Actively disseminate findings in user-friendly formats to practitioners, healthcare employers, payers, and policymakers.** The delivery of healthcare is increasingly moving away from a "lone physician" model to a more team-based approach, which requires "front-line primary care clinicians, staff, and leaders to reexamine traditional roles and responsibilities, create teams with shared responsibility and accountability, and retrain clinicians and staff for these new roles."[45] There are examples of healthcare practices that have re-organized themselves into high functioning teams, and numerous demonstration and research projects addressing practice redesign and its impact on the workforce, including pre-baccalaureate occupations.[46] And there is evidence that well-functioning interdisciplinary teams and enhanced roles for pre-baccalaureate workers such as medical assistants lead to better patient outcomes.[47, 48]

   However, practice redesign represents a major transformation for the medical field and is very much an ongoing task, as is the issue of adapting educational and training programs—for staff at all educational and specialty levels—to reflect this new practice model. Serious challenges stand in the way. Scope of practice laws at the state level delineate the services that members of a given health profession may provide under what conditions, and limit flexibility in allocating tasks and responsibilities among healthcare teams.[49] The predominant educational model does not support team-based care. Students of different health professional and occupational programs are typically separate until they are fully trained and only then do they work together in teams, so they do not enter the workforce with an understanding of the diverse cultures and skill sets of the various

professions and occupations.[50] Physician aversion to delegating tasks and status differences between occupations can make interprofessional education "fraught with logistical and territorial complications."[51]

Highly visible research on team-based care, and specifically on the role of pre-baccalaureate healthcare workers, can support the adoption of new staffing models that create more productive roles for such workers by addressing multiple concerns. Some of this research already exists but can be collected and summarized in a more user-friendly manner. The knowledge gained from previous and on-going initiatives should inform strategies to provide high-quality care more cost-effectively while also improving the jobs and career opportunities of pre-baccalaureate healthcare workers, but more research and planning is necessary.[52] For example, the following topics require further exploration:

- Are changes in worker responsibilities and assignments associated with improved health outcomes (or at the least, no negative health effects) in conjunction with improved efficiency or lower costs?
- How should the curriculum and training approach be designed to best prepare pre-baccalaureate healthcare workers to contribute to team-based care? While it is clear that increased clinical knowledge, and strengthened communication, problem-solving, observational, and technological skills are necessary, successfully operationalizing those goals into a training program that is responsive to healthcare settings is a non-trivial matter. What should be the roles of online learning, on-the-job training, work-based learning, and apprenticeships?
- How can different occupations contribute to the triple aim? Medical assistants have emerged as a central focus in terms of upgrading their skills and increasing their responsibilities, an appropriate development, but additional occupations also merit careful attention.[53] For example, the direct care workforce (personal care aides, home health aides, and nursing aides) is the largest segment of the pre-baccalaureate healthcare workforce, is projected to show strong growth, and serves as the "hands, face, and voice of healthcare" for millions of Americans.[54] They are perhaps one of the most underutilized and undervalued members of the healthcare workforce. Direct care workers provide essential daily supports and services to patients with aging-related impairments, chronic disease, and other disabilities. By virtue of their regular contact with patients, they are well-positioned to observe health condition changes, identify problems, and facilitate communication between the patient and the rest of the healthcare team to improve care.[55] Additional training and redesigned care teams to take advantage of direct care workers' knowledge should be a priority.
- What are the appropriate wages to compensate for increased productivity and skill and to improve job quality and retention? How do wage increases and/or additional hires of pre-baccalaureate workers balance against the need to achieve cost savings?

This recommendation could be operationalized in multiple ways, which are not mutually exclusive:

1a. Fund a neutral organization to develop a clearinghouse that shares best practices and data about how healthcare practices are deploying pre-baccalaureate healthcare workers to support the triple aim, emphasizing findings on health outcomes, process redesign, training, wages, and cost. This could be jointly funded by the federal government and foundations. It could be housed at a university-affiliated research center or another research- or policy-oriented organization. It should summarize research and could also conduct webinars and organize conferences to support a community of practice.

1b. Fund additional research focused specifically on advancing knowledge about how pre-baccalaureate healthcare workers can serve the triple aim. What are the most appropriate and productive responsibilities and tasks for them to carry out, what kinds of skills do they need, and how should curriculum and training be designed? Research should also address the question of job quality, measured most concretely by wages but also by employee satisfaction, promotions, and the extent to which pre-baccalaureate workers are integrated into teams sharing responsibility for health outcomes. This research could be conducted at multiple institutions, as is the case now, or it

could be centralized into a specific research center. A potential organizational model is the National Center for Interprofessional Practice and Education at the University of Minnesota, which focuses primarily on health professionals with graduate degrees. In either case, it could be funded by the federal government and foundations, either separately or jointly.

1c. Continue and expand the Primary Care Extension Program (PCEP) to assist primary care practices implement the Patient Centered Medical Home model, building on AHRQ's IMPaCT program (Infrastructure for Maintaining Primary Care Transformation). Modeled on the U.S. Department of Agriculture's Cooperative Extension, the PCEP creates Health Extension Agents who assist health care practices (primarily small and mid-size ones) in re-organizing their practices around the patient-centered medical home model.[56] The PCEP would primarily engage with physicians and administrators, since practice redesign involves transforming multiple dimensions of a given healthcare setting. However, it would likely involve reviewing patient flow through the office and staff work processes, leading to a reconsideration of how staff are currently deployed and their roles, which would have implications for the pre-baccalaureate healthcare workforce.

2. **Rationalize the patchwork, state-by-state scope of practice framework that governs the services that members of a given healthcare occupation can provide.** Myriad laws and regulations at the state level specify the services that may and may not be provided by members of various health care professions. These statutes are a serious barrier to developing team-based care, as they prevent non-physicians from carrying out tasks for which they may well be capable of doing with additional training, or in fact for which their education has already prepared them. (Legal scopes of practice are sometimes more restrictive than professional competencies). State regulations may list specific clinical functions a given healthcare occupation can carry out, or they may specify what clinical tasks physicians and sometimes other licensed practitioners can delegate to others. For example, depending on the state, medical assistants may or may not be able to give vaccines, start an IV, or perform an allergy scratch test.[57] These varying scopes of practice are out of synch with the demands of healthcare today. They approach workforce issues through the frame of occupational interest and geography instead of how to best deliver care to meet patient need.

   Changing this system is a formidable challenge, and will not be quick. It involves state-by-state action and is an often adversarial process as different occupations protect their turf, but it is necessary in order to achieve the goal that all healthcare workers operate at the top of their skills and competencies. The following steps would enhance states' ability to support the development of a flexible workforce able to provide high-quality, cost-effective health care:[58]

2a. Develop standard scopes of practice for pre-baccalaureate healthcare workers aligned with professional competencies that states could adopt. While many professions have developed model practice acts, such acts may need to be developed for some of the pre-baccalaureate healthcare occupations examined in this paper. Developing model scopes of practice for pre-baccalaureate healthcare workers would likely have a cascading effect, since it would involve reviewing and perhaps revising the scopes of practice for doctors, nurses and other professionals who can delegate authority to other staff. At the state level, enacting these model acts would likely require amending existing regulations, which would be time-consuming but provide an opportunity to emphasize that the goal of state regulation is to ensure the effective and safe delivery of health care, which can more efficiently be achieved through scopes of practice that allow occupations to have overlapping competencies commensurate with education and training. A neutral body unaffiliated with particular professions or healthcare settings is best suited for the task of developing model practice acts. An existing organization could accomplish this, especially if it were to receive philanthropic support for the project.

2b. Provide waivers and allow demonstration projects with broader scopes of practice. States could allow demonstration projects to test expanded scopes of practice in a controlled way, by requiring rigorous evaluation of these projects' outcomes. The resulting data on the effects of the change should inform future decisionmaking.

3. **Develop and strengthen regional healthcare partnerships of employers and educators to meet regional healthcare workforce needs, with a focus on helping pre-baccalaureate workers increase their skills and advance on the job.** Much of the work to tailor curriculum for pre-baccalaureate occupations to the specifics of healthcare delivery in particular settings should take place at the local and metropolitan level, following the geography of labor markets and the "coverage areas" of community colleges and other post-secondary institutions, high schools, and labor-management education partnerships. While pre-baccalaureate healthcare workers are in demand across the country, local and regional factors such as demographics, healthcare industry mix and state regulations shape the specifics of healthcare delivery in any given place. Accordingly, strategies to create a pipeline of workers or assist incumbent workers in adjusting to workplace changes should not be overly standardized replications of each other, but should be tailored to local conditions.

   Successful workforce development initiatives develop in-depth knowledge about a given industry in a given place and its skill needs across employers. Several regions around the country are home to mature healthcare partnerships that carry out the dual focus mission of sector initiatives: addressing the interests of both workers and employers by providing education and skills training corresponding to specific workforce needs identified in collaboration with employers. They take various forms. Some are labor-management education partnerships, such as the **District 1199C Training and Upgrading Fund** in Philadelphia, the **SEIU UHW-West & Joint Employer Education Fund** in the Western states, the **1199SEIU Training and Employment Funds** on the East Coast, and the **Los Angeles Healthcare Workforce Development Program**. Others bring together employers, community colleges, public workforce systems and community-based organizations, such as the **Boston Healthcare Careers Consortium**, the **Health Careers Collaborative of Greater Cincinnati**, and the **Baltimore Alliance for Careers in Healthcare**.

   Regional partnerships depend upon the leadership and engagement of employers in active partnership with community colleges, labor management partnerships, and other stakeholders. They rely on funding from multiple sources: employer contributions, in-kind contributions, and grants from public and philanthropic sources. For now, amid the country's slow recovery from the Great Recession and the uncertainty associated with the ACA's implementation, employers are focusing on retraining incumbent workers and regional partnerships are developing their agenda accordingly.[59] As the recovery continues and healthcare providers gain more clarity about how to work within the ACA framework, employers are likely to increase their hiring, and these partnerships can expand their focus to developing external pipelines.

Appendix A: Detailed Descriptions of the Ten Largest Pre-Baccalaureate Healthcare Occupations

This appendix includes Standard Occupational Classification (SOC) codes and descriptions of occupations included in the analysis. Information is drawn from the Department of Labor's website on the 2010 Standard Occupational Classification. The 10 occupations included in the paper are listed in bold. In the case of broad occupations that are composed of multiple detailed occupations, those detailed occupations are described below their larger heading.

Registered Nurses (29-1141): Assess patient health problems and needs, develop and implement nursing care plans, and maintain medical records. Administer nursing care to ill, injured, convalescent, or disabled patients. May advise patients on health maintenance and disease prevention or provide case management. Licensing or registration required. Includes Clinical Nurse Specialists. Excludes "Nurse Anesthetists" (29-1151), "Nurse Midwives" (29-1161), and "Nurse Practitioners" (29-1171). Illustrative examples: Psychiatric Nurse, Hospice Registered Nurse, Coronary Care Unit Nurse

Clinical Laboratory Technologists and Technicians (29-2010) are composed of two detailed occupations:

- ***Medical and Clinical Laboratory Technologists (29-2011):*** Perform complex medical laboratory

tests for diagnosis, treatment, and prevention of disease. May train or supervise staff. Illustrative examples: Cytogenetic Technologist, Blood Bank Laboratory Technologist, Immunohematologist

- ***Medical and Clinical Laboratory Technicians (29-2012):*** Perform routine medical laboratory tests for the diagnosis, treatment, and prevention of disease. May work under the supervision of a medical technologist. Illustrative examples: Serology Technician, Pathology Technician, Histology Technician

Diagnostic related technologists and technicians (29-2030) are composed of five detailed occupations:

- ***Cardiovascular Technologists and Technicians (29-2031):*** Conduct tests on pulmonary or cardiovascular systems of patients for diagnostic purposes. May conduct or assist in electrocardiograms, cardiac catheterizations, pulmonary functions, lung capacity, and similar tests. Includes vascular technologists. Illustrative examples: EKG Technician, Cardiac Catheterization Technologist
- ***Diagnostic Medical Sonographers (29-2032):*** Produce ultrasonic recordings of internal organs for use by physicians. Illustrative examples: Echocardiographer, Ultrasound Technologist, Registered Diagnostic Medical Sonographer
- ***Nuclear Medicine Technologists (29-2033):*** Prepare, administer, and measure radioactive isotopes in therapeutic, diagnostic, and tracer studies using a variety of radioisotope equipment. Prepare stock solutions of radioactive materials and calculate doses to be administered by radiologists. Subject patients to radiation. Execute blood volume, red cell survival, and fat absorption studies following standard laboratory techniques. Illustrative examples: Radioisotope Technologist, Nuclear Cardiology Technologist, Certified Nuclear Medicine Technologist
- ***Radiologic Technologists (29-2034):*** Take x rays and CAT scans or administer nonradioactive materials into patient's blood stream for diagnostic purposes. Includes technologists who specialize in other scanning modalities. Excludes "Diagnostic Medical Sonographers"(29-2032) and "Magnetic Resonance Imaging Technologists" (29-2035). Illustrative examples: X-Ray Technician, Computed Tomography (CT) Scanner Operator
- ***Magnetic Resonance Imaging Technologists (29-2035):*** Operate Magnetic Resonance Imaging (MRI) scanners. Monitor patient safety and comfort, and view images of area being scanned to ensure quality of pictures. May administer gadolinium contrast dosage intravenously. May interview patient, explain MRI procedures, and position patient on examining table. May enter into the computer data such as patient history, anatomical area to be scanned, orientation specified, and position of entry. Illustrative examples: MRI Technologist, Computed Tomography/Magnetic Resonance Imaging (CT/MRI) Technologist

Emergency Medical Technicians and Paramedics (29-2041): Assess injuries, administer emergency medical care, and extricate trapped individuals. Transport injured or sick persons to medical facilities. Illustrative examples: Flight Paramedic, EMT

Health practitioner support technologists and technicians (29-2050) are composed of seven occupations:

- ***Dietetic Technicians (29-2051):*** Assist in the provision of food service and nutritional programs, under the supervision of a dietitian. May plan and produce meals based on established guidelines, teach principles of food and nutrition, or counsel individuals. Dietary Technician, Registered Diet Technician
- ***Pharmacy Technicians (29-2052):*** Prepare medications under the direction of a pharmacist. May measure, mix, count out, label, and record amounts and dosages of medications according to prescription orders. Illustrative examples: Pharmacist Technician, Certified Pharmacy Technician
- ***Psychiatric Technicians (29-2053):*** Care for individuals with mental or emotional conditions or disabilities, following the instructions of physicians or other health practitioners. Monitor patients' physical and emotional well-being and report to medical staff. May participate in rehabilitation and treatment programs, help with personal hygiene, and administer oral or injectable medications. Illustrative examples: Mental Health Technician, Behavioral Health Technician

- ***Respiratory Therapy Technicians (29-2054):*** Provide respiratory care under the direction of respiratory therapists and physicians. Illustrative examples: Oxygen Therapy Technician, Certified Respiratory Therapy Technician
- ***Surgical Technologists (29-2055):*** Assist in operations, under the supervision of surgeons, registered nurses, or other surgical personnel. May help set up operating room, prepare and transport patients for surgery, adjust lights and equipment, pass instruments and other supplies to surgeons and surgeon's assistants, hold retractors, cut sutures, and help count sponges, needles, supplies, and instruments. Illustrative examples: Surgical Scrub Technologist, Operating Room (OR) Tech, Certified Surgical Technologist
- ***Veterinary Technologists and Technicians (29-2056):*** Perform medical tests in a laboratory environment for use in the treatment and diagnosis of diseases in animals. Prepare vaccines and serums for prevention of diseases. Prepare tissue samples, take blood samples, and execute laboratory tests, such as urinalysis and blood counts. Clean and sterilize instruments and materials and maintain equipment and machines. May assist a veterinarian during surgery. Illustrative examples: Veterinary Laboratory Technician, Veterinary X-Ray Operator, Veterinary Surgery Technologist
- ***Ophthalmic Medical Technicians (29-2057):*** Assist ophthalmologists by performing ophthalmic clinical functions. May administer eye exams, administer eye medications, and instruct the patient in care and use of corrective lenses. Illustrative examples: Ophthalmic Technologist, Ocular Care Technologist

Licensed Practical and Licensed Vocational Nurses (29-2061): Care for ill, injured, or convalescing patients or persons with disabilities in hospitals, nursing homes, clinics, private homes, group homes, and similar institutions. May work under the supervision of a registered nurse. Licensing required. Illustrative examples: Pediatric Licensed Practical Nurse, LVN, LPN

Nursing, psychiatric, and home health aides (31-1010) are composed of four detailed occupations:

- ***Home Health Aides (31-1011):*** Provide routine individualized healthcare such as changing bandages and dressing wounds, and applying topical medications to the elderly, convalescents, or persons with disabilities at the patient's home or in a care facility. Monitor or report changes in health status. May also provide personal care such as bathing, dressing, and grooming of patient. Illustrative examples: Home Hospice Aide, Home Health Attendant
- ***Psychiatric Aides (31-1013):*** Assist mentally impaired or emotionally disturbed patients, working under direction of nursing and medical staff. May assist with daily living activities, lead patients in educational and recreational activities, or accompany patients to and from examinations and treatments. May restrain violent patients. Includes psychiatric orderlies. Illustrative examples: Psychiatric Nursing Aide, Psychiatric Technician Assistant, Mental Health Orderly
- ***Nursing Assistants (31-1014):*** Provide basic patient care under direction of nursing staff. Perform duties such as feed, bathe, dress, groom, or move patients, or change linens. May transfer or transport patients. Includes nursing care attendants, nursing aides, and nursing attendants. Excludes "Home Health Aides" (31-1011), "Orderlies" (31-1015), "Personal Care Aides" (39-9021), and "Psychiatric Aides" (31-1013). Illustrative examples: Certified Nursing Assistant, Nursing Care Attendant, Certified Nurse Aide
- ***Orderlies (31-1015):*** Transport patients to areas such as operating rooms or x-ray rooms using wheelchairs, stretchers, or moveable beds. May maintain stocks of supplies or clean and transport equipment. Psychiatric orderlies are included in "Psychiatric Aides" (31-1013). Excludes "Nursing Assistants" (31-1014). Illustrative examples: Hospital Orderly, Surgical Orderly, Medical Orderly

Dental Assistants (31-9091): Assist dentist, set up equipment, prepare patient for treatment, and keep records. Illustrative examples: Orthodontic Assistant, Certified Dental Assistant

Medical Assistants (31-9092): Perform 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 administering medications as directed by physician. Excludes "Physician Assistants" (29-1071). Illustrative examples: Chiropractic Assistant, Orthopedic Cast Specialist, Morgue Attendant

Personal Care Aides (39-9021): Assist the elderly, convalescents, or persons with disabilities with daily living activities at the person's home or in a care facility. Duties performed at a place of residence may include keeping house (making beds, doing laundry, washing dishes) and preparing meals. May provide assistance at non-residential care facilities. May advise families, the elderly, convalescents, and persons with disabilities regarding such things as nutrition, cleanliness, and household activities. Illustrative examples: Geriatric Personal Care Aide, Elderly Companion, Blind Escort

Endnotes

1. Martha Ross is a fellow and Nicole Prchal Svajlenka is a research analyst at the Brookings Metropolitan Policy Program. Jane Williams was formerly a research assistant at the Brookings Metropolitan Policy Program.

2. U.S. Census Bureau, 2009-2011 American Community Survey 3-year estimates and the 2000 Decennial Census. The job count is based on the U.S. Department of Labor's Standard Occupational Classification (SOC) system, and includes jobs in the two major healthcare groups of 29-000: Healthcare Practitioners and Technical Occupations and 31-000: Healthcare Support Occupations. Based on similar job duties as those of home health aides, the job count also includes Personal Care Aides, coded as 39-9021 in the SOC major category of Personal Care and Service Occupations. It excludes SOC codes 31-9096 (veterinarian assistants and lab animal caretakers) and 29-1131 (veterinarians).

3. Bureau of Labor Statistics, *Occupational Employment Projections to 2022*, Monthly Labor Review (Department of Labor, December 2013). Specifically, the Bureau of Labor Statistics projects that between 2012 and 2022, the number of jobs in healthcare practitioner and technical occupations will increase by 1,732,900 and the number of jobs in health care support occupations will increase by 1,155,800, for a total of 2,888,700 new jobs.

4. Bureau of Labor Statistics, *Occupational Employment Projections to 2022*, Tables 25 and 26.

5. The Henry J. Kaiser Family Foundation, Summary of the Affordable Care Act, undated, available at http://kaiserfamilyfoundation.files.wordpress.com/2011/04/8061-021.pdf, accessed June 11, 2014.

6. Randall Wilson, "Implementing the Patient Protection and Affordable Care Act," (Boston: Jobs for the Future, 2014); Donald M. Berwick, Thomas W. Nolan and John Whittington, "The Triple Aim: Care, Health, And Cost," *Health Affairs*, 27 (3) (2008):759-769.

7. The mission of the CMS Innovation Center is to test "innovative payment and service delivery models to reduce program expenditures …while preserving or enhancing the quality of care." Available at http://innovation.cms.gov/About/index.html, accessed June 19, 2014.

8. Catherine Dower, Jean Moore and Margaret Langelier, "It is Time to Restructure Health Professions Scope-of-Practice Regulations to Remove Barriers to Care," *Health Affairs* 32 (11) (2013): 1971-1976.

9. For example, see the November 2013 thematic issue of the journal *Health Affairs: Redesigning the Health Care Workforce* 32 (11) (2013); the December 2013 thematic issue of A*cademic Medicine: A Special Issue on Training the Future Healthcare Workforce* 88 (12) (2013); The Josiah Macy Jr. Foundation, "Transforming Patient Care: Aligning Interprofessional Education with Clinical Practice Redesign" (2013).

10. Peter I. Buerhas and Sheldon M. Retchin, "The Dormant National Health Care Workforce Commission Needs Congressional Funding to Fulfill its Promise," *Health Affairs*, 32 (11) (2013): 2021-2014.

11. "States to Focus on Health Care Workforce," May 12, 2014, available at http://www.nga.org/cms/home/nga-center-for-best-practices/center-divisions/page-health-division/col2-content/list---health-left/list-health-highlight/content-reference-1@/states-to-focus-on-health-care-w.html, accessed June 19, 2014.

12. Ani Turner and Paul Hughes-Cromwick, "Connecting U.S. Health Expenditures with the Health Sector Workforce," *Business Economics* 48 (1) (2013): 42-57.

13. Thomas C. Ricketts and Erin P. Fraher, "Reconfiguring Health Workforce Policy So That Education, Training and Actual Delivery of Care are Closely Connected," *Health Affairs* 32 (11) (2013): 1874-1880.

14. While administrative and social-service related workers are also found in healthcare settings and perform work related to healthcare, the challenge was to identify those occupations with a sufficient level of concentration in healthcare settings to merit inclusion in this analysis. For example, a caseworker could work in a hospital or community health center, but he or she could also work in a school, a social service agency, or a welfare office. After some exploration, no clear methodology emerged to systematically determine which occupations outside of the two major healthcare groups are disproportionately found in healthcare settings or otherwise focused on healthcare-related job duties.

15. The Department of Labor's O*NET database was also considered as a source to determine the educational distribution within occupations. It includes information on post-secondary certificates not available in the American Community Survey, a valuable measure in the pre-baccalaureate labor market. However, for a variety of reasons O*NET was not a perfect fit for this study. O*NET's occupational data is presented at the detailed occupational level (6- and O*NET-defined 8- digit SOC codes), which does not always align with ACS, the primary data source for this analysis, which presents occupational data using 5- and 6-digit SOC codes. O*NET data is based on a different geography than used in this report (national vs. metropolitan areas). Additionally, since the ACS does not include measures of post-secondary certificates separate from attending "some college," the analysis would not be able to report on workers with post-secondary certificates by metropolitan area.

16. The Bureau of Labor Statistic's Occupational Employment Statistics (OES) dataset was considered as a source for counts and wages of workers at the metropolitan level and using the ACS to provide demographic data only. However, several OES data characteristics prevented made the OES a poor fit for this analysis. First, OES data for metropolitan areas is only available at the 6-digit SOC code-level. ACS-derived demographic data would be unavoidably presented at the 5-digit level for several occupations, making it more difficult to use consistent occupational definitions for employment counts, wages, and demographics. Due to small sample sizes in a number of metropolitan areas, OES data do not always include all of the 6-digit occupations to be aggregated up to the 5-digit level, meaning that the rolled-up reports on the 5-digit occupations would be based on incomplete data. Secondly, in larger metropolitan areas, OES data is provided for detailed metropolitan divisions rather than for the entire region. In many of these sub-regional metropolitan divisions, occupational data was not available due to small sample size, meaning it was not possible to aggregate up to a complete estimate at the metropolitan level. Both of these issues resulted in higher levels of missing data values than was desirable.

17. The list originally included 25 occupations. Veterinary assistants and laboratory animal caretakers were removed on the ground that the study is focused on healthcare for humans, bringing the list to 24 occupations.

18. When reporting data on the individual occupations that make up the bulk of this report, individuals in certain occupations who reported their education attainment as less than high school were recoded and removed from the analysis. Some occupations require post-secondary education for entry into the field, sometimes due to licensure prerequisites. Authors consulted the Department of Labor's Occupational Outlook's entry-level education requirements for each of the 10 occupations and determined that workers in four occupations (registered nurses, clinical laboratory technologists and technicians, diagnostic related technologists and technicians, and licensed practical nurses and licensed vocational nurses) reporting less than a high school diploma were likely errors attributed to self-reporting in the ACS. Respondents reporting less than high school education attainment in these four occupations were recoded to unknown occupations.

19. Institute of Medicine, *The Future of Nursing: Leading Change, Advancing Health* (Washington, DC: National Academies Press, 2011).

20. Donna Meyer, "Moving Forward on the Nursing Credential Debate," *Community College Daily*, September 18, 2012, available at http://www.ccdaily.com/Pages/Opinions/Moving-forward-on-the-nursing-credential-debate.aspx, accessed June 10, 2014; Robert Wood Johnson Foundation and the George Washington University, "The Case for Academic Progression: Why Nurses Should Advance Their Education and the Strategies that Make this Feasible" (2013).

21. CAEL, "How Career Lattices Help Solve Nursing and Other Workforce Shortages in Healthcare: A Guide for Workforce Investment Boards, One-Stop Career Centers, Healthcare Employers, Industry Alliances, and Higher Education Providers" (2005); Paul Osterman and Beth Shulman, *Good Jobs America: Making Work Better for Everyone* (New York: Russell Sage Foundation, 2011); William Ebenstein and Travis Dale, "Emerging Career Pathways in the New York City Healthcare Workforce: Changes in the Nursing Career Ladder" (New York: The City University of New York, 2013).

22. Beth Israel Deaconness Medical Center and the Silverman Institute for Health Care Quality and Safety, "Bolstering the Pharmacy Technician Workforce," undated; Baltimore Alliance for Careers in Healthcare, "Technician Positions," available at www.baltimorealliance.org, "Guide to Careers," accessed June 10, 2014; Jobs for the Future, "Health Care Pathways for Opportunity Youth" (2014).

23. Jobs for the Future, "Health Care Pathways for Opportunity Youth" (2014); Paul Osterman and Beth Shulman, *Good Jobs America: Making Work Better for Everyone* (New York: Russell Sage Foundation, 2011).

24. Although this report focuses on the characteristics of pre-baccalaureate workers, the education analysis is an exception and will include Bachelor's degree holders. Since high shares of workers in a few occupations hold Bachelor's degrees, a discussion of educational attainment would be incomplete and potentially misleading by excluding workers with those degrees.

25. The relatively high share of Bachelor's degree holders among clinical laboratory technologists and technicians is primarily due to the fact that the American Community Survey combines two detailed occupations (clinical laboratory technologists and clinical laboratory technicians) together into one broad occupation. The Department of Labor's O*NET database indicates that technologists have higher educational levels than technicians (Bachelor's degree vs. Associate's degrees, vocational schooling, or related on-the-job experience), but via the ACS it is not possible to disaggregate the two detailed occupations. National data from the Department of Labor's Occupational Employment Statistics program for the years 2009-2011 indicates that the broad occupation is split fairly equally between the two detailed occupations, with technologists accounting for 52 percent of the broad occupation and technicians accounting for 48 percent.

26. Nurses with "some college" but no degree are probably "diploma nurses." Students in diploma programs attend classes in nursing schools affiliated with hospitals or medical facilities rather than post-secondary institutions. Graduates earn a diploma but not a traditional academic degree such as an Associate's or Bachelor's degree.

27. In practice, the earnings figure of $38,000 most likely refers to clinical laboratory technicians, since the data are based on workers with an Associate's degree or less, and clinical laboratory technologists typically have Bachelor's degrees. Unfortunately, the American Community Survey data do not allow the two occupations [lab technologists and lab technicians] to be analyzed separately. The Department of Labor's O*NET database shows that median annual wages in 2013 was $58,000 for clinical laboratory technologists and was $38,000 for clinical laboratory technicians.

28. In addition to the pre-baccalaureate healthcare worker, there may be other workers or sources of income in the family that are considered when designating a family's poverty status.

29. Institute of Medicine, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare*, (Washington, DC: National Academies Press, 2002); Kristine Martin Anderson, Grant Mclaughlin, and Carla Dancy Smith, "Improving Health Care Quality by Valuing Diversity," (Washington, D.C.: American Hospital Association Quality Center, 2007); The Joint Commission, "Advancing Effective Communication, Competence, and Patient and Family-Centered Care: A Roadmap for Hospitals" (2010); Edward L. Martinez, Frederick D. Hobby, and Robert C. Like, "Leaders' Role in Advancing Health Equity," Hospitals and Health Networks Daily, April 17, 2014, available at http://www.hhnmag.com/display/HHN-news-article.dhtml?dcrPath=/templatedata/HF_Common/NewsArticle/data/HHN/Daily/2014/Apr/041714-martinez-healthdisparities, accessed June 11, 2014; The Joint Commission, "Advancing Effective Communication, Competence, and Patient and Family-Centered Care: A Roadmap for Hospitals" (2010)

30. Joseph R. Betancourt, Alexander R. Green and J. Emilio Carrillo, "Cultural Competence in Health Care: Emerging Frameworks and Practical Approaches" (New York: Commonwealth Fund, 2002).

31. Figures are adjusted for inflation and use 2011 dollars as a base.

32. While diagnostic related technologists and technicians posted growth of 1 percent ($700), this modest change is not statistically significant.

33. This statement is based upon a review of the medical school membership of the American Association of Medical Colleges (AAMC), whose mission is to "strengthen the world's most advanced medical care by supporting the entire spectrum of education, research, and patient care conducted by our member institutions" and which describes itself as representing all 141 accredited U.S. medical schools and nearly 400 major teaching hospitals and health systems. The list of medical school members is available at https://members.aamc.org/eweb/DynamicPage.aspx?site=AAMC&webcode=AAMCOrgSearchResult&orgtype=Medical%20School, accessed June 5, 2014, and was supplemented by a web search of medical schools to identify medical school campuses by metropolitan area. The total number of medical schools in the 20 metropolitan areas equals 32. 16 of the 20 metropolitan areas have hospital or health systems that belong to the AAMC, with a total of 100 institutional members located in the 16 metro areas. The list of hospital/health system membership of the AAMC is available at https://members.aamc.org/eweb/DynamicPage.aspx?site=AAMC&webcode=AAMCOrgSearchResult&orgtype=Hospital/Health%20System, accessed June 5, 2014.

34. The two exceptions are Colorado Springs, CO and Raleigh-Cary, NC, both of which nonetheless have characteristics suggesting their healthcare workforce is more specialized than is typical. Colorado Springs is home to a nursing and health sciences program offering Bachelor's, Master's and Doctoral degrees as well as a sports medicine facility for elite athletes training at the Olympic Training Center, also located in Colorado Springs. The Raleigh-Cary metropolitan area is adjacent to the Durham-Chapel Hill, NC region, home to Duke University and the University of Chapel Hill, both of which have medical schools. The Raleigh-Durham-Chapel Hill area, although divided into two metropolitan areas by the Census Bureau for statistical purposes, has a fairly cohesive regional identity as the "Research Triangle."

35. This statement is based upon a review of the medical school membership of the AAMC, described in Footnote 33. The total number of medical schools in the 20 metropolitan areas equals 8. Additionally, 11 of the 20 metro areas have hospital or health systems that belong to the AAMC, with a total of 26 institutional members located in the 11 metro areas.

36. Direct care workers made up higher than average shares of the pre-baccalaureate workforce in the following metropolitan areas: McAllen, TX; Modesto, CA; Stockton, CA; Fresno, CA; Dayton, OH; El Paso, TX; Youngstown, OH; Riverside, CA; Springfield, MA; Bakersfield, CA; Providence, RI; Baton Rouge, LA; and Greensboro, NC;

37. Direct care workers made up higher than average shares of the pre-baccalaureate workforce in the following metropolitan areas: San Jose, CA; San Francisco; Madison, WI; and San Diego, CA.

38. "Health Extension Toolkit glossary entry for 'Patient Centered Medical Home,'" available at http://healthextensiontoolkit.org/quick-find/glossary-of-terms/, accessed June 20, 2014.

39. Richard J. Baron, "What's Keeping Us So Busy in Primary Care? A Snapshot from One Practice," The New England Journal of Medicine 362 (17) (2010): 1632-1636.

40. Richard J. Baron, "What's Keeping Us So Busy in Primary Care? A Snapshot from One Practice," The New England Journal of Medicine 362 (17) (2010): 1632-1636.

41. CMS Innovation Center, "HealthCare Innovation Awards: California, California Long-Term Care Education Center," available at http://innovation.cms.gov/initiatives/Health-Care-Innovation-Awards/California.html, accessed June 20, 2014.

42. Kavita Patel, Jeffrey Nadel, and Mallory West, "Redesigning the Care Team: The Critical Role of Frontline Workers and Models for Success" (Washington: Brookings Institution, 2014).

43. Thomas C. Ricketts and Erin P. Fraher, "Reconfiguring Health Workforce Policy So That Education, Training and Actual Delivery of Care are Closely Connected," *Health Affairs* 32 (11) (2013): 1874-1880.

44. Josiah Macy Jr. Foundation, "Transforming Patient Care: Aligning Interprofessional Education with Clinical Practice Redesign" (2013).

45. Maryjoan D. Ladden et al, 2013. "The Emerging Primary Care Workforce: Preliminary Observations from the Primary Care Team: Learning from Effective Ambulatory Practices Project." Academic Medicine 88 (12): 1830-1834.

46. Robert Reid et al, "The Group Health Medical Home at Year Two: Cost Savings, Higher Patient Satisfaction and Less Burnout for Providers," Health Affairs 29 (5) (2010): 835-843; Rachel Willard and Tom Bodenheimer, "The Building Blocks of High-Performing Primary Care: Lessons from the Field" (California: California HealthCare Foundation, 2012); Kavita Patel, Jeffrey Nadel, and Mallory West, "Redesigning the Care Team: The Critical Role of Frontline Workers and Models for Success" (Washington: Brookings Institution, 2014); Tom

Strong, "Hitachi Foundation Sheds Light on the New Role Frontline Workers Play in Health Care," *Health Affairs* GrantWatch Blog, April 24, 2014, available at http://healthaffairs.org/blog/2014/04/24/the-hitachi-foundation-sheds-light-on-the-new-role-frontline-workers-play-in-health-care/?cat=grantwatch, accessed June 20, 2014; UCSF Center for the Health Professions, "Innovative Workforce Models in Health Care," available at http://futurehealth.ucsf.edu/Public/Center-Research/Home.aspx?pid=539, accessed June 20, 2014.

47. Thomas C. Ricketts and Erin Fraher, "Reconfiguring Health Workforce Policy so that Education, Training, and Actual Delivery of Care are Closely Connected," *Health Affairs* 32 (11) (2013): 1874-1880; Maryjoan D. Ladden et al, 2013. "The Emerging Primary Care Workforce: Preliminary Observations from the Primary Care Team: Learning from Effective Ambulatory Practices Project." *Academic Medicine* 88 (12): 1830-1834; Interprofessional Education Collaborative. 2011. "Core Competencies for Interprofessional Collaborative Practice: Report of an Expert Panel." Washington, D.C.

48. "Enhanced roles" refers to activities such as panel management and health coaching. "Panel management" refers to identifying and addressing any gaps in patients' chronic and preventive care services recommended by clinical practice guidelines.

49. Catherine Dower, Jean Moore and Margaret Langelier, "It is Time to Restructure Health Professions Scope-of-Practice Regulations to Remove Barriers to Care," *Health Affairs* 32 (11) (2013): 1971-1976.

50. George Thibault, "Reforming Health Professions Education Will Require Culture Change and Closer Ties Between Classroom and Practice," *Health Affairs* 32 (11) (2013): 1928-1932; Thomas C. Ricketts and Erin P. Fraher, "Reconfiguring Health Workforce Policy So That Education, Training and Actual Delivery of Care are Closely Connected," *Health Affairs* 32 (11) (2013): 1874-1880.

51. Rob Cunningham, "On Workforce Policy, Consensus is Hard to Find," *Health Affairs* 32 (11) (2013): 1871-1873.

52. For example, relevant initiatives include Better Jobs Better Care: Building a Strong Long-Term Care Workforce; Jobs to Careers: Transforming the Front Lines of Health Care; CareerSTAT; the Health Careers Pathways Consortium; projects funded through the CMI Innovations Center; the Primary Care Team: Learning from Effective Ambulatory Practices (LEAP), as well as other ongoing workforce development initiatives too numerous to mention.

53. Randall Wilson. 2014. "Implementing the Patient Protection and Affordable Care Act," Boston: Jobs for the Future and the National Fund for Workforce Solutions; UCSF Center for the Health Professions, "Innovative Workforce Models in Health Care, available at http://futurehealth.ucsf.edu/Public/Center-Research/Home.aspx?pid=539, accessed June 17, 2014; Maryjoan D. Ladden et al, 2013. "The Emerging Primary Care Workforce: Preliminary Observations from the Primary Care Team: Learning from Effective Ambulatory Practices Project." *Academic Medicine* 88 (12): 1830-1834.

54. Steve Dawson and Rick Surpin, "Direct Care Workers: The Unnecessary Crisis in Long-Term Care" (Washington, D.C.: The Aspen Institute, 2001).

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