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Review Article
https://doi.org/10.63501/8dr9p742

Aligning Allied Health Science Programs with Workforce Demand in the United States and Texas

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ABSTRACT:

Allied health professionals constitute the majority of the U.S. health workforce and are essential to addressing population aging, chronic disease, and rapid technological change. Recent projections, however, show uneven patterns of shortage and surplus across professions and geographies. This narrative, policy-oriented review synthesizes national and Texas data to identify allied health programs that are most aligned with workforce demand, with a particular focus on pathology diagnostics (histology, cytogenetics, and molecular diagnostics) and gateway entry roles such as medical assistants and phlebotomists. Using U.S. Bureau of Labor Statistics (BLS) projections, Health Resources and Services Administration (HRSA) workforce models, Texas workforce reports, vacancy surveys, and professional white papers, we find strong and persistent demand for diagnostic imaging, rehabilitation, respiratory care, clinical laboratory science, and anatomic/molecular pathology support roles, with especially acute shortages in Texas. Within laboratory medicine, histotechnology and clinical genomics, especially cancer cytogenetics and fluorescence in situ hybridization (FISH), emerge as high-need subspecialties where vacancy rates, retirement-driven openings, and the collapse of many formal National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)-accredited cytogenetics programs combine to create structural workforce gaps. At the same time, rapid advances in the adoption of artificial intelligence (AI) are poised to reshape staffing models in these domains, shifting demand away from purely manual, repetitive bench work toward AI-enabled roles that emphasize data interpretation, quality oversight of automated workflows, informatics, and human–machine collaboration. In contrast, pharmacy and selected assistant-level occupations show signals of emerging surplus in some markets. Aligning academic portfolios with these patterns will require expanding and modernizing programs in histotechnology, clinical laboratory science, and cytogenetics/molecular diagnostics; explicitly integrating AI, digital pathology, and data science competencies into curricula; leveraging American Society for Clinical Pathology (ASCP)-recognized alternate training pathways and private–academic collaborations (such as Texas-based cytogenetics initiatives) to replace lost program capacity; using medical assistant and phlebotomy programs as structured on-ramps into higher-skill fields; and exercising caution in further expansion of programs where national projections point toward oversupply.

KEYWORDS: *allied health, workforce planning, histotechnology, cytogenetics, molecular diagnostics, medical assistants, phlebotomists, Texas, clinical laboratory science, AI, artificial intelligence*

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INTRODUCTION:

Allied health professionals, including rehabilitation therapists, imaging technologists, clinical laboratory scientists, respiratory therapists, medical assistants, phlebotomists, and numerous technical support roles, constitute a large share of the U.S. healthcare workforce. Recent analyses suggest that allied health roles account for a majority of the clinical workforce, yet the infrastructure to train them is unevenly distributed across regions and institution types (Adashi *et al*., 2025; Center for Law and Social Policy [CLASP], 2024). Healthcare occupations overall are projected to grow much faster than the average for all occupations over the next decade, with large numbers of annual openings driven by both new job creation and replacement of retiring workers (U.S. Bureau of Labor Statistics [BLS], 2024a).

Texas, the fastest-growing U.S. state by absolute population gain, illustrates these pressures acutely. Health care and social assistance already represent its largest employment sector, and many counties are designated health professional shortage areas (Texas Higher Education Coordinating Board [THECB], 2023). A recent Governor's Task Force report emphasizes that "gateway" health occupations, direct-care workers, medical assistants, phlebotomists, clinical laboratory assistants, and diagnostic staff are central to maintaining hospital operations and building sustainable career ladders for Texans (Governor's Task Force on Health Care Workforce Shortages, 2024).

Despite strong overall demand, not all allied health professions are in short supply. HRSA's National Center for Health Workforce Analysis (NCHWA) projects significant deficits in multiple allied health occupations, including respiratory therapists and physical therapists, but also forecasts that the national pharmacist supply is likely to exceed demand by 2030 (Health Resources and Services Administration [HRSA], 2018, 2024). In parallel, analysts of the pharmacy workforce have described a shift "from shortage to surplus," driven in part by rapid expansion of pharmacy schools and changing practice patterns (Brown, 2020; Lebovitz & Eddington, 2019; Watanabe, 2019).

Within laboratory medicine, workforce imbalances are particularly acute. National surveys by the ASCP and American Society for Clinical Laboratory Science (ASCLS) document persistent vacancy and retirement pressures across clinical laboratories ASCP, 2024; ASCLS, 2022). Histology and anatomic pathology laboratories report exceptionally high vacancy rates, while clinical genomics laboratories spanning cytogenetics and molecular diagnostics face chronic difficulties recruiting and retaining technologists (Akkari *et al*., 2023; National Society for Histotechnology [NSH], 2022).

At the same time, rapid advances in AI, automation, and digital health are beginning to reshape how diagnostic and support work is organized across imaging, pathology, and administrative "gateway" roles. AI applications now extend from clinical decision support and image analysis to laboratory workflow optimization, quality control, and test utilization management, with early evidence of gains in diagnostic accuracy, efficiency, and productivity (Alowais *et al*., 2023; Rahman et al., 2024). In laboratory medicine and diagnostic pathology, AI-enabled tools are being integrated with high-throughput automation and digital slide workflows, supporting triage, pattern recognition, and complex data interpretation rather than simply replacing human expertise at the bench (Giesriegl *et al*., 2025; Shafi & Parwani, 2023; Swartz, 2024). Commentators on the healthcare workforce increasingly highlight that these technologies are likely to shift the mix of skills required—reducing time spent on repetitive manual tasks while increasing demand for competencies in data interpretation, informatics, oversight of AI systems, and communication of probabilistic outputs, rather than uniformly decreasing headcount (Reddy, 2024; World Health

Organization, 2024). Global guidance further underscores that realizing AI's benefits will depend on deliberate workforce preparation, ethical governance, and new training models that equip allied health professionals to collaborate effectively with AI systems while safeguarding equity and patient safety (World Health Organization, 2021, 2024).

Against this backdrop, academic institutions and health systems in Texas and elsewhere face strategic decisions about which allied health programs to expand, maintain, or reconfigure. This article therefore aims to identify the highest-demand allied health programs nationally, with a particular emphasis on Texas; to examine in detail the labor market for pathology diagnostics specifically histology, cytogenetics, and molecular diagnostics as a high-need subdomain within allied health; and to highlight professions, including medical assistants and phlebotomists as gateway roles and pharmacists as a potential surplus profession, where training capacity should be adjusted carefully to match workforce demand better.

METHODS:

We conducted a narrative, policy-oriented review of allied health workforce demand in the United States, with particular emphasis on Texas and pathology diagnostics. Rather than a formal systematic review, the primary objective was to synthesize authoritative national data, state-level workforce analyses, and profession-specific surveys to inform program planning and capacity decisions for academic institutions and health systems.

Data were drawn from four main source categories. First, we used federal labor and workforce projections, including the U.S. Bureau of Labor Statistics (BLS) Occupational Outlook Handbook and 10-year forecasts for healthcare occupations overall and selected allied health categories such as clinical laboratory technologists and technicians, diagnostic medical sonographers, radiologic and MRI technologists, respiratory therapists, physical therapist assistants, physician assistants, medical assistants, and phlebotomists, as well as BLS employment projections summaries for all occupations and major sectors (BLS, 2024a, 2024b, 2024c, 2024d).

Second, we reviewed Health Resources and Services Administration (HRSA) health workforce projections and briefs, including the National Center for Health Workforce Analysis "Health Workforce Projections" data covering allied health projections to 2037 and allied health workforce projections for pharmacists from 2016 to 2030 (HRSA, 2018, 2024).

Third, we examined Texas-specific workforce reports, including Building Texas' Future Health Care Workforce (2024), the Governor's Task Force report describing statewide and regional needs with an emphasis on "gateway" allied health occupations; the Report on the Need for Health Professions in Texas (2023), which analyzes supply, demand, and educational capacity across health disciplines; the Texas Allied Health Labor Force Analysis detailing allied health employment patterns, demographics, and regional disparities; and Texas Workforce Commission occupational projections and high-demand/high-wage occupation lists, which explicitly identify medical assistants and phlebotomists as key occupations (Governor's Task Force on Health Care Workforce Shortages, 2024; Texas Workforce Investment Council, 2021; Texas Workforce Commission, 2024; THECB, 2023).

Fourth, we incorporated professional society reports and peer-reviewed literature, including NSH workforce and policy documents describing histology vacancy rates and estimated national workforce size;

ASCP vacancy surveys of U.S. medical laboratories; ASCLS position papers and briefs on the clinical laboratory workforce shortage and training pipeline; histotechnology workload and staffing studies; a technologist-based survey of 70 U.S. clinical genomics laboratories detailing cytogenetics and molecular workforce shortages; and workforce analyses and commentaries on the pharmacist labor market (Akkari *et al*., 2023; ASCP, 2024; ASCLS, 2022; Brown, 2020; Dwyer *et al*., 2020, 2022; Garcia *et al*., 2024; Kohl *et al*., 2011; Lebovitz & Eddington, 2019; NSH, 2022, 2024; Watanabe, 2019; HRSA, 2018).

We followed HRSA and Texas workforce reports in defining allied health as non-physician, non-nursing clinical occupations involved in diagnostics, imaging, rehabilitation, technical support, and health information management (HRSA, 2024; Texas Workforce Investment Council, 2021). Within this broad category, we distinguished "high-demand" fields as those with projected national shortages of at least 5% by 2030–2037 and/or projected job growth of at least 10% over a decade, supported by corroborating vacancy and recruitment difficulty data. In contrast, "surplus" or "watch-list" fields were defined as occupations for which HRSA projections and workforce briefs indicate that the national supply meets or exceeds projected demand, or for which state-level analyses indicate that higher-education output is already at or above the required annual supply for specific roles.

Medical assistants and phlebotomists were treated as gateway allied health occupations, characterized by relatively short training paths, high employment volume, and strong turnover-driven replacement demand (BLS, 2024c, 2024d; Governor's Task Force on Health Care Workforce Shortages, 2024; Texas Workforce Commission, 2024). Pathology, histology, cytogenetics, and molecular diagnostics were analyzed as a higher-skill subdomain of clinical laboratory science. Because these specialties are often subsumed under broader BLS and HRSA categories, we relied heavily on vacancy surveys, workforce white papers, and profession-specific studies for this portion of the analysis (Akkari *et al*., 2023; Garcia *et al*., 2024; NSH, 2022).

RESULTS:

Overall Allied Health Demand in the United States:

BLS projects that healthcare practitioners and technical occupations, along with healthcare support roles, will grow substantially faster than the overall labor market over the next decade (BLS, 2024a). Healthcare occupations are expected to generate large numbers of job openings each year, driven by both net job growth and the replacement of retiring workers.

Within allied health, several occupations are projected to show robust national growth. These include diagnostic medical sonographers, radiologic and MRI technologists, respiratory therapists, physical therapist assistants, and physician assistants (BLS, 2024a, 2024b). HRSA's allied health projections to 2037 similarly indicate persistent national shortages for multiple allied health categories, including respiratory therapists and physical therapists, even after accounting for anticipated growth in educational programs (HRSA, 2024).

Texas-specific Allied Health Demand:

Texas workforce reports underscore the central role of allied health in the state's talent pipeline. The *Building Texas' Future Health Care Workforce* report identifies "gateway" positions, such as medical

assistants, phlebotomists, clinical laboratory assistants, and imaging technologists, as high-priority targets for expansion because they support both service delivery and career advancement (Governor's Task Force on Health Care Workforce Shortages, 2024).

The Report on the Need for Health Professions in Texas documents gaps between current educational capacity and projected demand for multiple allied health professions, including clinical laboratory science, imaging, and rehabilitation (THECB, 2023). Complementary analyses in the Texas Allied Health Labor Force Analysis describe geographic maldistribution, with urban centers having higher concentrations of allied health workers and rural areas experiencing chronic deficits (Texas Workforce Investment Council, 2021).

Long-term occupational projections from the Texas Workforce Commission show double-digit job growth for several allied health roles, including diagnostic medical sonographers, radiologic technologists, and clinical laboratory technologists and technicians, generally with wages above state medians (Texas Workforce Commission, 2024). Taken together, these data support prioritizing imaging, respiratory care, and clinical laboratory science in Texas program planning.

Pathology Diagnostics: *Histology and Anatomic Pathology*

Multiple sources converge on a picture of chronic shortage in histology and anatomic pathology support roles. NSH workforce and policy documents describe histology vacancy rates of approximately 8-9%, particularly high in supervisory roles and in rural or smaller laboratories, and estimate roughly 18,000 histology professionals working in U.S. histopathology laboratories (NSH, 2022, 2024). These figures are consistent with ASCP vacancy surveys, which have reported vacancy rates in the high single digits or low double digits for many anatomic pathology departments (Garcia *et al*., 2024; ASCP, 2024). Figure 1 summarizes histology vacancy rates across ASCP Vacancy Surveys from 2012 to 2022, demonstrating a steep, sustained increase in unfilled positions.

Histotechnology workload and productivity studies show that histotechnologists in busy hospital laboratories routinely handle high volumes of tissue blocks and slides, with limited slack to absorb additional workload without staffing increases (Dwyer *et al*., 2020, 2022; Kohl *et al*., 2011). These findings suggest that persistent vacancy rates translate into real constraints on turnaround time and quality, rather than representing a marginal or easily absorbed shortage.

BLS groups histotechnicians and histotechnologists under the category of clinical laboratory technologists and technicians. While aggregate projections show modest net employment growth for this broad category, they still anticipate large numbers of annual openings driven by retirements and job changes (BLS, 2024b). ASCLS notes that academic programs are producing less than half of the number of laboratory professionals needed annually, leaving chronic vacancy gaps even when employment growth is moderate (ASCLS, 2022).

Texas-specific data mirror these national patterns. The Building Texas' Future Health Care Workforce report lists histologic technicians and medical laboratory assistants among key gateway occupations. It highlights laboratory roles as a high-priority area for expansion (Governor's Task Force on Health Care Workforce Shortages, 2024). Community college program descriptions and employer testimony similarly

emphasize strong job prospects and sustained vacancy levels in histotechnology across Texas, particularly outside major metropolitan areas.

Figure 1: Vacancy Rates in Histology, Cytogenetics, and Molecular Diagnostics in U.S. Pathology Laboratories (*ASCP Vacancy Surveys 2012–2022*)

ASCP Survey Year	Histology Vacancy Rate (%)	Cytogenetics Vacancy Rate (%)	Molecular Diagnostics Vacancy Rate (%)	Notes/Main Sources
2012	4.0	–	–	Early ASCP Vacancy Survey baseline for histology (Garcia *et al*., 2013).
2016 - 2017	5.6	–	–	Rising histology vacancies mid-decade (Garcia *et al*., 2019).
2018	8.37	10.9	5.68	NSH summary of ASCP histology data; ASCP reports higher cytogenetics and notable molecular vacancies (NSH, 2022; Garcia *et al*., 2019).
2020	8.6	–	–	ASCP 2020 Vacancy Survey showing continued histology pressure (Garcia *et al*., 2021).
2022	13.2	7.0	–*	ASCP 2022 Vacancy Survey reporting steep increase in histology vacancies and continued cytogenetics shortages (Garcia *et al*., 2024; ASCP, 2024).

*Molecular diagnostics vacancy percentages are not consistently reported across all survey years. Still, they are described in ASCP reports and related commentary as persistently elevated, with extended time-to-hire and recruitment challenges.
Abbreviations: ASCP: American Society for Clinical Pathology; NSH: National Society for Histotechnology

Pathology Diagnostics: *Cytogenetics and Molecular Diagnostics*

Commentaries based on national and specialty-specific data describe clinical genomics laboratories as being in a precarious staffing situation, emphasizing that without sufficient technologists, laboratories cannot maintain test volumes or adopt new technologies (Carpenter, 2024; Akkari *et al*., 2023). Studies in hematologic malignancies and optical genome mapping similarly note shortages of cytogenetic technologists and discuss strategies, such as integrated genomic testing, to reduce workload amid staffing constraints (Levy *et al*., 2024; Li *et al*., 2025). Together, these reports indicate that cytogenetics and molecular diagnostics are among the most difficult areas in which to sustain a stable workforce.

Over the past two decades, formal cytogenetics training capacity in the United States has contracted sharply. Abbasi *et al*. (2023) note that more than 40 NAACLS-accredited cytogenetics technology programs were active roughly 20 years ago; today, only a small handful of dedicated programs remain, including the University of Texas MD Anderson Cancer Center cytogenetics program and a limited number of regional university-based programs. This decline reflects a combination of funding constraints, shifting institutional priorities toward newer program types, and limited awareness of cytogenetics within undergraduate curricula.

Cytogenetics technologists are uniquely trained laboratory professionals with a bachelor-level education explicitly focused on cancer cytogenetics, fluorescence in situ hybridization (FISH), and related molecular techniques. In the traditional route, students complete a BS degree within a NAACLS-accredited cytogenetics program that integrates didactic instruction with supervised clinical rotations in Clinical Laboratory Improvement Amendments (CLIA)- and College of American Pathologists (CAP)-accredited laboratories. In parallel, the ASCP Board of Certification offers an alternate pathway to the Cytogenetic Technologist [CG(ASCP)] credential for graduates holding a bachelor's degree in a biological science or chemistry who complete at least one year of full-time experience in an acceptable CAP-accredited cytogenetics laboratory. As NAACLS-accredited programs have closed, this alternate pathway has become increasingly important, effectively shifting a substantial portion of the training burden from universities to clinical laboratories (Abbasi *et al*., 2023).

A Texas-based private–academic collaboration illustrates how this model can be leveraged to sustain the cytogenetics workforce. Abbasi *et al*. (2023) describe a CLIA/CAP-accredited cancer cytogenetics and FISH laboratory in San Antonio, Texas, that has partnered with NAACLS-accredited programs, provided structured on-the-job cytogenetics training to bachelor's-trained staff, and successfully prepared multiple cohorts for CG(ASCP) certification. Through teaching affiliations with programs such as the MD Anderson Cancer Center cytogenetics program, this initiative functions as a regional training hub for Texas and surrounding states, demonstrating how private–academic collaboration can sustain a shrinking subspecialty as formal programs are curtailed.

Gateway Entry Roles: Medical Assistants and Phlebotomists

Medical assistants and phlebotomists are among the most common gateway roles in the allied health workforce. These occupations typically require relatively short training programs and provide rapid entry into frontline clinical roles across primary care, hospital, and outpatient settings.

BLS classifies medical assistants as growing much faster than average, with strong projected employment growth over the decade and large numbers of annual openings driven primarily by turnover and replacement needs rather than solely by net new positions (BLS, 2024c). Phlebotomists are similarly projected to grow faster than average, with steady annual openings across hospital, laboratory, and outpatient settings (BLS, 2024d).

Texas workforce reports and regional labor market analyses frequently list medical assistants and phlebotomists among target or high-demand occupations, especially in large metropolitan regions such as the Gulf Coast (Governor's Task Force on Health Care Workforce Shortages, 2024; Texas Workforce Commission, 2024). At the same time, because training programs for these roles are relatively widespread and shorter in duration, the degree of unmet demand is generally less acute than for histotechnologists, cytogenetic technologists, or medical laboratory scientists.

These patterns suggest that medical assistants and phlebotomists are best viewed as high-volume entry roles that support the broader diagnostic workforce pipeline and provide on-ramps into more specialized programs in clinical laboratory science, histotechnology, and imaging.

Professions in Relative Surplus or "Watch List."

While most allied health occupations show strong or growing demand, federal projections and sector-specific analyses suggest that pharmacy may be trending toward surplus at the national level. HRSA's pharmacist projections indicate that the supply of full-time equivalent pharmacists is likely to exceed demand under several plausible scenarios by 2030 (HRSA, 2018). Workforce analysts have linked this potential oversupply to rapid expansion in the number of PharmD programs, stagnant or restructured positions in retail pharmacy, and shifts toward more team-based and technology-enabled dispensing models (Brown, 2020; Lebovitz & Eddington, 2019; Watanabe, 2019).

State-level analyses also show that some assistant-level allied health roles may be approaching supply–demand equilibrium or modest oversupply in certain regions. These patterns do not necessarily apply uniformly to Texas, but they underscore the importance of monitoring localized saturation risk for specific allied health programs and adjusting training capacity accordingly.

DISCUSSION:

This review highlights a recurring theme across national and Texas-specific data: allied health fields remain central to the healthcare workforce, but demand is uneven across occupations. Diagnostic imaging, respiratory care, rehabilitation, and clinical laboratory science, including anatomic and molecular pathology support roles, emerge as consistently high-need areas. In contrast, pharmacy and some assistant-level roles warrant more cautious expansion. Table 2 summarizes selected allied health occupation groups, their projected demand status, and recommended program responses for Texas.

Vacancy surveys and workforce white papers consistently document chronic shortages of histotechnicians, histotechnologists, and medical laboratory scientists, as well as cytogenetic and molecular technologists, even when net employment growth appears modest at the aggregate level (Akkari *et al*., 2023; ASCLS, 2022; Garcia *et al*., 2024; NSH, 2022, 2024). Key drivers include high retirement rates in an aging laboratory workforce, long time-to-hire, persistent vacancy rates in histology and genomics laboratories, and a limited number of specialized training programs, particularly in cytogenetics and molecular diagnostics.

These findings strongly support the expansion of educational capacity in:

- Histotechnology (certificate, associate degree, and post-baccalaureate programs).
- Bachelor's programs in medical laboratory science/clinical laboratory science with dedicated anatomic pathology tracks.
- Cytogenetics and molecular diagnostics certificate or master's programs, potentially embedded within broader laboratory science curricula.

Programs should incorporate modern competencies, such as digital pathology, molecular techniques, basic bioinformatics, AI, and quality management, to align graduates with emerging practice models.

Cytogenetics is a particularly compelling test case for such targeted expansion. Abbasi *et al*. (2023) emphasize that NAACLS-accredited cytogenetics technology programs in the United States have declined from more than 40 two decades ago to only a handful today, even as demand for cancer cytogenetics and

https://doi.org/10.63501/8dr9p742

FISH testing continues to rise. In this context, Texas-based private–academic collaborations in cytogenetics, including teaching affiliations with the MD Anderson Cancer Center cytogenetics program and structured on-the-job training in CLIA/CAP-accredited cancer cytogenetics laboratories, offer a scalable template: bachelor-level science graduates receive competency-based training that leads to CG(ASCP) certification. In contrast, academic partners maintain curricular oversight and formal clinical rotations.

Table 2: Selected Allied Health Occupation Groups, Demand Status, and Recommended Program Responses in Texas:

Occupation Group	Example Roles	Demand Status (U.S./Texas)	Key Evidence Sources	Suggested Program Response in Texas
Diagnostic Imaging	Diagnostic medical sonographers; radiologic and MRI technologists	**High demand** - strong projected growth nationally and in Texas; double-digit job growth and above-median wages	BLS 2024a–b; TX Workforce projections; THECB 2023	Expand or create imaging programs; prioritize clinical placement capacity and partnerships with high-need regions
Respiratory Care	Respiratory therapists (RT)	**High demand** - persistent projected national shortage through 2037; critical role in acute and chronic care	HRSA 2024; BLS 2024a; state workforce reports	Maintain/expand RT programs; target recruitment to rural and border regions; develop advanced practice/critical-care tracks
Rehabilitation	Physical therapists (PT); physical therapist assistants (PTA)	**High demand** - nationally; regional variation in assistant-level roles (some approaching equilibrium)	HRSA 2024; state and regional workforce analyses	Maintain PT capacity; expand PTA cautiously based on local vacancy and wage data
Clinical Laboratory Science (core lab)	Medical laboratory scientists (MLS); clinical laboratory technologists (CLS) and technicians	**High demand** - large annual replacement openings; chronic vacancy and retirement pressure	BLS 2024b; ASCP vacancy surveys; ASCLS policy briefs	Expand MLS/CLS programs; integrate modern analytics, QC, and informatics; strengthen hospital-lab partnerships for training sites
Pathology Diagnostics (anatomic and molecular)	Histotechnicians, histotechnologists; cytogenetic and molecular technologists	**Critical shortage** - 8–9% histology vacancies; persistent difficulty recruiting cytogenetics/molecular staff	NSH 2022, 2024; ASCP vacancy surveys; Akkari *et al*. 2023	High-priority growth area: develop/expand histotechnology certificates and degrees; add cytogenetics/molecular diagnostics tracks or post-bac certificates; position Texas as a regional training hub
Gateway Entry Roles	Medical assistants; phlebotomists; clinical lab assistants	**High volume, steady demand** -faster-than-average growth and large replacement needs; less acute shortage than pathology subspecialties	BLS 2024c–d; TX Workforce Commission; TX Task Force report	Continue/expand selectively based on regional data; explicitly design these programs as on-ramps into imaging, CLS, and histotechnology (ladder and bridge programs)
Pharmacy (watch list)	Pharmacists	**Potential surplus** - nationally projected supply exceeding demand in several scenarios	HRSA pharmacist projections; Brown 2020; Lebovitz & Eddington 2019; Watanabe 2019	Avoid indiscriminate expansion of PharmD seats; focus on niche tracks (pharmacogenomics, clinical analytics, lab-linked roles) and close monitoring of regional employment outcomes

Abbreviations: BLS, Bureau of Labor Statistics; HRSA, Health Resources and Services Administration; ASCP: American Society for Clinical Pathology; NSH: National Society for Histotechnology; CLS, Clinical Laboratory Science; QC: Quality Control.

Texas is a regional hub for anatomic and molecular pathology training. Texas already hosts large academic pathology departments and commercial laboratories with advanced histology and genomics capabilities. The Building Texas' Future Health Care Workforce report explicitly identifies histologic technicians and laboratory assistants among key gateway occupations, suggesting an existing policy foundation for growth in this area (Governor's Task Force on Health Care Workforce Shortages, 2024). By strategically expanding histotechnology and clinical genomics programs, particularly at public universities and community colleges serving rural, border, and underserved regions, Texas could alleviate local and statewide shortages in pathology diagnostics, attract out-of-state students, and strengthen academic–industry partnerships around digital pathology, precision oncology, and genomic medicine.

Medical assistants and phlebotomists play a crucial role as high-volume entry points into the allied health workforce. Their relatively short training pipelines, broad employment opportunities, and prevalence in primary care, outpatient clinics, and hospital settings make them essential for both service delivery and workforce diversification (BLS, 2024c, 2024d). However, because these roles are widely distributed across community colleges, proprietary schools, and employer-based training programs, their labor markets are more sensitive to local conditions. Expansion of medical assistant and phlebotomy programs in Texas should therefore be guided by regional vacancy and turnover data rather than by national projections alone. Importantly, these roles can be intentionally positioned as stepping stones into higher-skill diagnostic careers, such as histotechnology, clinical laboratory science, or imaging, through structured career ladders, bridge programs, and employer tuition support.

In contrast to histology and genomics, pharmacy programs face a more uncertain job market. HRSA projections and multiple workforce analyses suggest that the national pharmacist supply is likely to exceed demand under many scenarios (HRSA, 2018; Brown, 2020; Lebovitz & Eddington, 2019; Watanabe, 2019). For Texas institutions, this argues against indiscriminate expansion of PharmD class sizes. Instead, program leaders might consider interprofessional and niche tracks that align pharmacy training with precision medicine, pharmacogenomics, and laboratory-based roles, or with team-based primary care models that fully utilize pharmacists' clinical skills.

Because BLS and HRSA aggregate many pathology diagnostics roles under broader "clinical laboratory technologist" or "medical scientist" codes, national projections may understate shortages in specific subdomains such as histology and cytogenetics. Similarly, gateway roles such as medical assistants and phlebotomists may appear plentiful nationwide but remain in short supply in specific Texas regions.

For program planning, institutions and policymakers should therefore complement federal projections with:

- Local vacancy and turnover data from pathology and ambulatory-care laboratories.
- Time-to-hire metrics and recruitment outcomes from hospital and reference-laboratory partners.
- Regional wage trends and reliance on temporary staffing as indicators of underlying shortages.

Routine collaboration among academic partners, hospital laboratory directors, primary-care employers, and professional societies (ASCP, ASCLS, and the National Society for Histotechnology [NSH]) can provide

the granular intelligence needed to refine enrollment targets and avoid both under- and overproduction of graduates.

This analysis has several limitations. First, it relies on secondary data with varying methodologies and baseline assumptions; subsequent changes in health-care delivery, widespread adoption of telehealth, and economic conditions may alter actual trajectories. Second, occupational aggregation in federal datasets obscures sub-specialty shortages and requires reliance on professional surveys and local experience. Third, Texas-specific findings are not uniformly generalizable to all states, particularly those with different payer mixes, demographic patterns, or educational infrastructures. Finally, rapid advances in automation and AI may substantially alter staffing models over the coming decade: algorithmic triage, automated image analysis, and AI-driven decision support could reduce demand for certain manual, repetitive functions while increasing the need for roles focused on data curation, validation, and monitoring of AI tools, workflow integration, and communication of probabilistic results to clinicians and patients. As such, any workforce projections based on current scopes of practice should be interpreted with caution, as they may under- or overestimate demand for specific skill sets within both laboratory medicine and gateway roles.

Despite these limitations, the convergence of multiple independent data sources (federal projections, Texas workforce reports, and profession-specific surveys) supports the conclusion that pathology diagnostics represent a high-need, undersupplied area within allied health, while gateway roles like medical assistants and phlebotomists remain essential to entry-level staffing and career progression.

CONCLUSION:

Allied health professions are indispensable to the functioning of the U.S. and Texas healthcare systems, accounting for a majority of clinical roles and providing critical diagnostic, imaging, and rehabilitative services. National and state-level data indicate that demand for many allied health occupations, particularly diagnostic imaging, respiratory care, rehabilitation, and clinical laboratory science, will remain strong over the coming decade.

Within laboratory medicine, histology, cytogenetics, and molecular diagnostics stand out as high-need specialties where vacancy rates, retirement-driven openings, and limited training capacity combine to create persistent workforce gaps. The sharp contraction of NAACLS-accredited cytogenetics technology programs from more than 40 two decades ago to only a handful today has shifted much of the training burden onto CLIA- and CAP-accredited clinical laboratories and ASCP-recognized alternate pathways. Texas-based private–academic collaborations in cancer cytogenetics and FISH demonstrate that it is feasible to rebuild this capacity by pairing bachelor-level science graduates with structured on-the-job training that leads to CG(ASCP) certification, while maintaining strong ties to remaining academic cytogenetics programs.

For universities and community colleges in Texas, aligning allied health portfolios with these realities means expanding and modernizing programs in histotechnology, clinical laboratory science, and clinical genomics; explicitly incorporating cytogenetics and FISH into curricula and clinical rotations; and developing formal affiliation agreements with high-complexity reference laboratories that can host trainees and support ASCP-recognized alternate routes to certification. At the same time, institutions should strategically use medical assistant and phlebotomy programs as structured on-ramps into these higher-skill fields, exercise caution in further expanding programs such as pharmacy, where national projections point

to oversupply, and use granular, locally sourced workforce data to refine capacity decisions across all allied health programs.

By prioritizing pathology diagnostics, particularly histotechnology and cytogenetics/molecular diagnostics, and other high-demand allied health roles while carefully monitoring potential surplus professions, Texas institutions can better support both their students and the evolving needs of a rapidly changing healthcare system. The cytogenetics experience in Texas illustrates how state-level stakeholders can turn a looming subspecialty crisis into an opportunity to build resilient, innovation-ready workforce pipelines that are responsive to advances in precision oncology and genomic medicine.

As AI adoption accelerates, staffing models will evolve, with demand moving from traditional roles focused on manual, repetitive tasks to new, AI-enabled skill sets that emphasize data interpretation, quality oversight of automated workflows, informatics, and human–machine collaboration. Rather than simply "running tests," future laboratorians and gateway staff will be expected to validate algorithms, monitor performance drift, adjudicate discrepant results, troubleshoot complex human-AI workflows, and communicate probabilistic outputs to clinicians and patients in an understandable way. This shift will affect both core laboratory medicine positions and "gateway" roles that interface with clinicians, patients, and administrative systems, necessitating deliberate reskilling, upskilling, and redesign of job descriptions across the diagnostic workforce. Workforce planners and educators will need to embed competencies in data science, digital pathology, clinical informatics, and AI ethics into existing curricula; create new hybrid roles that bridge bench science and informatics; and develop flexible continuing-education pathways so that incumbent staff are not displaced but instead transitioned into higher-value, supervision and interpretation-focused functions.

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