Utah Medical Education Council
A Blueprint for Tomorrow – Shaping Tomorrow's Healthcare Workforce

Utah's Clinical Laboratory Workforce 2006:
A Study of Workforce Characteristics and Training Capacity

Utah Medical Education Council
May, 2009

Utah's Clinical Laboratory Workforce 2006: A Study of Workforce Characteristics and Training Capacity

A Survey Report by The Utah Medical Education Council

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Utah Medical Education Council

The Utah Medical Education Council (UMEC) was created in 1997 by H.B.141 out of a need to secure and stabilize the state's supply of health care clinicians. This legislation authorized the UMEC to conduct ongoing health care workforce analysis and to assess Utah's training capacity and graduate medical education (GME) financing policies. In addition, H.B. 141 requires the UMEC to advise on these issues and to provide policy recommendations for achieving state workforce objectives.

Charge to the Utah Medical Education Council

- Determine the number and mix of healthcare professionals needed in Utah and develop strategies to assure that the projected requirements are met.
- Identify ways to protect and maximize existing revenue streams that support GME.
- Obtain and manage federal waiver so that receipt of federal funds is linked to addressing Utah's health care workforce requirements.
- Advise on strategies to ensure that Utah has an adequate healthcare workforce.

Board members of the UMEC include:

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Glossary

- **CYTOGENETICIST:** An expert in studying chromosomes from samples of human blood, tissue, bone marrow or other bodily fluids to diagnose genetic diseases and abnormalities. The majority of the cytogeneticists' work revolves around three main categories: analysis of genetic material, prenatal diagnosis, and helping hematologists**.**[a] Most Cytogeneticists are certified by the American Board of Medical Genetics.[b]

- **CYTOTECHNOLOGIST (CT):** A CT specializes in the microscopic study of cells for detection of cancer and viral and bacterial infections. Primarily, CTs analyze the Pap smear test.[c] Usually, CTs have a bachelor degree and have completed an accredited CT program.[b]

- **HISTOTECHNOLOGIST (HTL) AND HISTOTECHNICIAN (HT):** HTLs process and stain very thin slices of body tissues for examination by a pathologist. The processing makes tissue structures visible under a microscope. A primary function of histological techniques is to aid pathologists and dermatologists in the identification of tumors and cancer cells.[d] HTLs have a bachelor's degree and have completed an accredited HTL program. HTs perform less complex procedures and aid HTLs. HTs have at least a high school diploma and have completed an accredited histology program[b], although some may be trained on the job.

- **LABORATORY ASSISTANTS**: Includes clinical lab assistants (CLA), pathology lab assistants (PLA) and medical assistants (MA). Laboratory Assitants record patients' medical history and vital statistics. Laboratory assistants collect blood, tissue and other laboratory specimens, log specimens, and prepare them for testing.[e] They may also be trained on the job to do point of care testing like phlebotomists. Most laboratory assistants complete an accredited program but are not required to have national or state level certification.

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[a] Mayo School of Health Sciences: Cytogenetics Career Overview. http://www.mayo.edu/mshs/cytogen-career.html (3/11/09)

[b] Lab Tests Online: Who's Who in the Lab: A Look at Laboratory Professionals. http://www.labtestsonline.org/lab/who-2.html (4/27/09)

[c] Mayo School of Health Sciences: Cytotechnologist Career Overview. http://www.mayo.edu/mshs/cyt-career.html (3/11/09)

[d] Ibid: Histology Technician Career Overview: http://www.mayo.edu/mshs/histology-career.html (3/11/09)

[e] Occupational Information Network: http://online.onetcenter.org/link/summary/31-9092.00 (2//9/09)

- **MEIDICAL LABORATORY TECHNICIANS/CLINICAL LABORATORY TECHNICIANS** (**MLT/CLT):** Technicians generally perform less complex tests and laboratory procedures than technologists though under CLIA they may perform any high complexity test for which they have been trained. MLT/CLTs typically prepare specimens and operate automated analyzers, perform manual tests in accordance with detailed instructions. They work under the supervision of medical and clinical laboratory technologists or laboratory managers.[f] Usually, CLTs/MLTs have completed an accredited CLT/MLT program and have an associate degree.[b]

- **MEDICAL TECHNOLOGIST/CLINICIAL LABORATORY SCIENTIST**, **(MT/CLS):** Technologists perform complex tests. They examine blood and other body fluids, and make cultures of body fluid and tissue samples, to determine the presence of microorganisms. Technologists analyze samples for chemical content and type and cross match blood samples for transfusions. They also supervise laboratory personnel and oversee laboratory operations.[g] MT/CLSs are required to have a bachelor's degree in medical technology or the life sciences. Many labs require certification by one of the following organizations: American Medical Technologists (AMT), the American Society for Clinical Pathology (ASCP) Board of Registry, National Credentialing Agency for Medical Laboratory Personnel (NCA), or the National Registry of Microbiologists (NRM).[b]

- **PHLEBOTOMISTS (PBT):** PBTs are trained to draw blood (venipuncture) for laboratory tests or for blood donations. At a blood donation site, a PBT draws blood, performs a finger prick hemoglobin test to determine if the donor is anemic and aids in the recovery of patients with adverse reactions. PBTs do not administer drugs or fluids intravenously or give intramuscular or subcutaneous injections. PBTs often perform waived point of care testing.[h] PBTs need a high school diploma and may be trained on the job or through a program. No certification is required.

- **QUALITY ASSURANCE & COMPLIANCE (QA):** QA professionals insure compliance with governmental and other health care regulatory agency quality assurance requirements. They also develop, validate, implement and evaluate policies and procedures.[i]

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[f] American Medical Technologists: Medical Technologist. Medical Lab Technician. http://www.amt1.com/page.asp?i=158 (3/10/09)
[g] BLS Occupational Outlook Handbook, 2008-2009 Edition: http://www.bls.gov/oco/ocos096.htm (2/9/09)
[h] Health Resources & Service Administration (2005). The Clinical Laboratory Workforce: The Changing Picture of Supply, Demand, Education, and Practice. Department of Health and Human Services: USA
[i] American Society for Clinical Laboratory Science; http://www.ascls.org/jobs/qa_tqi.asp (2/9/09)

Acronyms & Abbreviations

AAB – American Association of Bioanalysts

AMT – American Medical Technology

ASCP – American Society of Clinical Pathology

ARUP – Associated Regional and University Pathologists, Inc.

BLS – U.S. Bureau of Labor Statistics

BOR – Board of Registry

CLA/PLA/MA – Clinical Laboratory Assistant, Pathology Laboratory Assistant, and Medical Assistant

CLIA – Clinical Laboratory Improvement Amendments

CMS – Centers for Medicare & Medicaid Services

COA – Certificate of Accreditation

COC – Certificate of Compliance

COR – Certificate of Registration

CT – Cytologist

CW – Certificate of Waiver

DWS – Utah Department of Workforce Services

HHS – U.S. Department of Health and Human Services

HRSA – The Health Resources & Services Administration

HT – Histologist/Histology Technician

MLT/CLT – Medical Laboratory Technician/Clinical Laboratory Technician

MT/CLS – Medical Technologist/Clinical Laboratory Scientist

NCA – National Credentialing Agency for Laboratory Personnel

PBT – Phlebotomy Technician

PPMP – Provider-Performed Microscopy Procedures

SOC – Standard Occupation Codes

UMEC – Utah Medical Education Council

U of U – University of Utah

Utah DOH – Utah Department of Health, Bureau of Laboratory Improvement

WSU – Weber State University

Executive Summary

The clinical laboratory workforce plays a vital, yet often overlooked role in the health of Americans. According to the American Society for Clinical Pathology, clinical laboratory tests affect an estimated 60 to 70 percent of medical decisions.[1] Laboratory tests are one of the most frequently billed Medicare procedures and it is estimated that more than 10 billion laboratory tests are performed each year in the U.S.[2]

The 2005 Utah Medical Education Council (UMEC) Statewide Laboratory Sciences Scope of Practice Survey was the first attempt to gather in-depth data on the clinical laboratory workforce in Utah. Because this was the inaugural study, it was designed to gather information on a variety of professions within clinical laboratory science, each with their own scope of responsibilities, demographic differences including unique age and wage profiles, and different educational and credentialing requirements.

A total of 6,504[a] surveys were distributed to Clinical Laboratory Improvement Amendments (CLIA) certified laboratories across the state. There were 2,548 survey respondents resulting in a 39.2% overall response rate. The response rate among employees of Intermountain Healthcare (59.6%) and ARUP Laboratories (64.3%) was significantly higher than among other laboratories (13.5%). The response bias towards these two groups is acknowledged by the UMEC and the laboratory workforce committee which is comprised of representatives from the state's laboratory training programs and industry representatives. In reviewing the survey data presented in this report, the laboratory workforce committee determined that in spite of this bias, respondents to the survey were likely typical of the laboratory workforce as a whole.

Survey respondents can be grouped into four broad categories based on scope of responsibility, and educational and credentialing requirements. The categories are:

- Medical Technologist/Clinical Laboratory Scientist (MT/CLS)
- Medical/Clinical Laboratory Technician (MLT/CLT)
- Cytogeneticist and Pathology Cohort (includes: cytotechnologist, histotechnician, histotechnologist)
- Phlebotomist (PBT) and Laboratory /Medical Assistant (CLA/PLA/MA)

Medical Technologist/Clinical Laboratory Scientist (MT/CLS)
Technologists (MT/CLS) can perform complex tests and assist with the diagnosis of diseases such as diabetes and leukemia. Becoming a technologist requires a baccalaureate degree with a major in medical technology, or one of the life sciences. There are no standard certification requirements for technologists. Some laboratories may require registration/certification by a national organization such as American Society for Clinical Pathology (ASCP) or American Medical Technologists (AMT). Professional licensure is not required by the state of Utah.

- There were 744 Technologist survey respondents (*Ref: Pg. 12).*

[a] The actual number of individuals in the Utah laboratory workforce is unknown. The number of surveys distributed was based on information provided to the UMEC by employers, and is an estimate of the clinical laboratory workforce. In addition, the actual number of individuals within each category of the laboratory workforce is also unknown.

- 726 (97.6%) of all technologists had a bachelors' degree or higher (*Ref: Pg. 15)*.
- 89.7% (667) of technologists were certified by one or more national credentialing organizations (*Ref: Pg. 15)*.
- The median income reported by technologists was $48,847 which is 9.1% higher than the national median, but 6.1% less than the median income for the Far West Region[b] (*Ref: Pg. 16)*.
- The mean age among technologists was 43.8, with a median age of 45. A total of 292 (39.2%) were over the age of 50 in 2005 *(Ref: Pg. 13)*. The rural technologist workforce had a higher percentage over 50 (25 or 47.2%). The urban workforce had 232 (38.5%) over 50 in 2005. In several of the rural counties of Utah, 100% of the technologists were 50 years old or older (*Ref: Pg. 14)*.
- The vacancy rate for MT/CLS in Utah was 39.7, compared to 10.4 nationally. The fill rate for vacant MT/CLS positions in Utah was 73.6%. The average length-of-time to fill vacant positions was 1.6 months. (*Ref: p. 36)*
- Utah has three universities which offer bachelors' degrees in Medical Technology or Clinical Laboratory Science. The combined capacity of these programs is 80-90 students *(Ref: p. 39)*.

Medical and Clinical Laboratory Technicians (MLT/CLT)
Technicians perform less complex procedures than technologists. Technicians prepare specimens, operate automated analyzers, and perform manual tests in accordance with detailed instructions. They work under the supervision of technologists or laboratory managers. There are no universal education or certification requirements for technicians, though technicians generally have a minimum of an associate's degree or certification from an accredited organization. Certification requirements are left to the individual employer. Licensure of technicians is not required by the state of Utah.

- There were 166 technician survey respondents (*Ref: Pg. 17)*
- 84 (50.9%) of technicians had an associate's degree, 63 (38.2%) had a bachelor's degree (*Ref: Pg. 19)*.
- 101 (61.2%) were certified by a national credentialing organization *(Ref: Pg. 19)*.
- The median income reported by technicians was $33,357 which is 6.9% less per year than the national average and 14.2% less per year compared to the Far West Region[a] *(Ref: Pg. 20)*.
- The mean age of the technician cohort was 37.7 years, while the median age was 34 *(Ref: Pg. 18)*.
- Utah's vacancy rate for technicians was 21.5%, 3.4 times the national rate of 6.4%. The fill rate of vacant MLT/CLT positions was 64.6% and the average length-of-time to fill was 1.4 months. *(Ref: Pg. 36)*.
- The Weber State University MLT program is the only such active program in the state. It has a training capacity of 35 graduates per year.

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[b] ASCP Far West Region includes the following states: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

Cytogeneticist and Pathology Cohort
Cytogeneticists study chromosomes to diagnose genetic diseases and abnormalities. Cytogenetics training requires a bachelor of science degree and training from an accredited program or on the job training. Most cytogeneticists are certified by the American Board of Medical Genetics and are generally MDs or PhDs.)

The UMEC and laboratory committee categorized cytotechnologists, histotechnicians and histotechnologists into a "pathology cohort" due to demographic similarities and ease of analysis. Another factor leading to the decision to combine these groups was the small number of respondents to the survey from these groups.

Cytotechnologists specialize in the microscopic study of cells for detection of cancer. Usually, cytotechnologists have a bachelor degree and have completed an accredited cytotechnologist program. Individual employers determine education and certification requirements for cytotechnologists.

Histotechnologists process body tissue for examination by a pathologist primarily to identify tumors. Histotechnologists have a bachelor's degree and have completed an accredited program or have on the job training. Individual employers determine education and certification requirements for histotechnologists.

Histotechnicians perform less complex procedures and aid histotechnologists. Histotechnicians have at least a high school diploma and have completed an accredited histology program or have on the job training. Individual employers determine education and certification requirements for histotechnicians.

- 13 cytogeneticists responded to the survey *(Ref: Pg. 29)*. There were 50 survey respondents in the pathology cohort *(Ref: Pg. 30)*.
- 12 cytogeneticists held a bachelor's degree *(Ref: Pg. 29)* and 50% (25) of the pathology cohort had at least a bachelor's degree *(Ref: Pg. 31)*.
- All cytogeneticists were certified by a national organization *(Ref: Pg. 29)* and 90% (45) of the pathology cohort was certified by a national organization *(Ref: Pg. 32)*.
- The average wage for cytogeneticists was $43,110. No national or regional wage data was available for comparison *(Ref: Pg. 30)*.
- 68% (34) of the pathology cohort earned more than $40,000 while 26% (13) earned $40,000 or less, *(Ref: Pg. 31)*.
- The mean age of cytogeneticists was 32.1 and the median age was 30 *(Ref: Pg. 29)*. The mean age for the pathology cohort was 46.3 with a median age of 46. The pathology cohort had a high percentage (42%, 21) over age 50. These individuals are likely to retire by 2015. Only 13 (26%) were under the age of 40 *(Ref: Pg. 31)*.

Laboratory Assistant (CLA/PLA/MA) and Phlebotomist
Laboratory assistants record patients' medical history and vital statistics, and collect, log and prepare laboratory specimens. They may also receive on the job training to perform point of care testing. Laboratory assistants must have a high school diploma and some complete a program but are not required to have national or state level certification or

licensure. As is the case with a number of the other categories, laboratory assistants do not have universal education and certification requirements. Individual employers determine their own qualifications for employment in these positions.

Phlebotomists are trained to draw blood for laboratory tests or for blood donations. They do not administer fluids intravenously or give intramuscular injections. Phlebotomists generally need a high school diploma and may be trained on the job or through a training program. There are no universal certification requirements for phlebotomists.

- The largest number of survey respondents came from the laboratory assistant workforce with 795 survey respondents *(Ref: Pg. 25)*. There were 549 phlebotomist survey respondents *(Ref: Pg. 21)*.
- 53.2% (422) of laboratory assistants have a high school diploma as the highest degree earned *(Ref: Pg. 26)*. Similarly, 51.4% (282) of phlebotomists had a high school diploma as the highest degree earned, *(Ref: Pg. 23)*.
- 51.9% (285) of phlebotomists were not certified *(Ref: Pg. 23)*. 60.5% (480) of laboratory assistants were not certified *(Ref: Pg. 26)*.
- The median income for laboratory assistants was $22,213 per year, 21.3% less than the Far West Region average *(Ref: Pg. 28)*.
- The median income for phlebotomists was $22,868, 6.4% less than the national median and 21.5% less than their Far West Region counterparts *(Ref: Pg. 24)*.
- The mean age of phlebotomists and laboratory assistants was 33.6 years. The median age for phlebotomists was 30.0 and 29 for laboratory assistants *(Ref: Pg. 21 & 26)*.
- Utah's vacancy rate for phlebotomists was 78.7%. 13.3 times the national rate of 5.9%. The fill rate for open phlebotomy positions in Utah was 86.3%. The time to fill a phlebotomist position was one month *(Ref: Pg. 36 &37)*.

Conclusions

- A lack of national and statewide information regarding the laboratory workforce makes assessments of workforce adequacy difficult.
- Attrition among the CLA/PLA/MA, and PBT cohorts is a significant characteristic of the workforce. A large concentration of the workforce in these groups is under the age of 30. There is likely a relationship between the attrition rate and the noted lower than average wages reported for these cohorts.
- Wages that are higher than the national average, coupled with reported vacancy rates, are indicators of an existing shortage of MT/CLSs in the state.
- The older average age of MT/CLS professionals likely contributes to higher wages.
- The anticipated retirement of approximately 40% of the technologist workforce in Utah by 2015, will likely intensify the existing shortage in the state. Retirement will have a greater impact on the rural technologist workforce as nearly half (47.2%) the rural workforce was over the age of 50 in 2005 and are likely to retire by 2015.
- State population growth in general and an increasing population over the age of 65 will be key drivers of demand growth for clinical laboratory services in Utah through 2020.
- Utah's clinical laboratory training programs face a variety of constraints to expanding including: physical training space, clinical rotation sites and lack of interest or awareness from students in clinical laboratory programs.
- Licensure of the certain categories within the clinical laboratory workforce is a significant policy issue with safety and quality, as well as workforce implications that warrants further study and analysis.

Recommendations

- Follow-up studies of the clinical laboratory workforce, particularly the MT/CLS category, should be conducted to develop trend data and improve assessments of workforce adequacy.
- Industry and the state's academic programs should work together to promote awareness of laboratory sciences among students at the junior and high school level, to promote student awareness of clinical laboratory science as a profession.
- Clinical laboratory training programs should explore innovative methods to expand training capacity and work to improve perceptions and awareness of the clinical laboratory sciences as a profession.
- The potential impact of licensure of clinical laboratory science personnel on patient safety and overall quality assurance should be assessed and quantified. The impact of licensure on, wages, and workforce mobility should also be evaluated.

Reference:

[1] American Society for Clinical Pathology (ASCP). Medicare Demo Threatens Care: Repeal for Competitive Bidding Essential. pp1
[2] ASCP. http://www.ascp.org/MainMenu/laboratoryprofessionals/LabWeek/FastFacts.aspx (02/02/09)

Introduction

Utah's Clinical Laboratory Workforce: A Study of the Workforce Characteristics and Training Capacity examines the Utah clinical laboratory sciences workforce, the state's educational training programs, and provides information about issues impacting the clinical laboratory workforce.

This study is a collaborative effort between the Utah Medical Education Council (UMEC) and a Laboratory Committee comprised of professionals in the clinical laboratory industry and training programs with representatives from ARUP Laboratories, Intermountain Healthcare, Utah Department of Health, Bureau of Laboratory Improvement (Utah DOH), University of Utah Department of Pathology (U of U), and Weber State University College of Health Professions (WSU). This report addresses concerns about an apparent shortage of qualified laboratory practitioners in Utah. This is the first state level laboratory workforce study providing information to support remedial action or policy recommendations.

The UMEC previously published a Laboratory Workforce Profile (April 2004) based on national and state labor data, but no survey of laboratory professionals in Utah had been conducted. Identifying and contacting the workforce proved difficult because no national or state agencies keep official records of all laboratory professionals. The U.S. Bureau of Labor Statistics (BLS) provides monthly estimates of the number of Medical Laboratory Technicians/Clinical Laboratory Technicians (MLT/CLT) and Medical Technologists/Clinical Laboratory Scientists (MT/CLS) but does not provide a comprehensive, standardized data tracking system for accurate information of the laboratory workforce.

The clinical laboratory workforce plays a vital, yet often overlooked role in the health of Americans. Physicians and other health care providers rely on laboratory testing to help diagnose patient health status and prescribe and monitor treatment regimens. According to the American Society of Clinical Pathology, clinical laboratory tests affect an estimated 60 to 70 percent of medical decisions.[1] Laboratory tests are one of the most frequently billed Medicare procedures and it is estimated that more than 10 billion laboratory tests are performed each year in the U.S[2]

Federal mandate requires all laboratory facilities be licensed under the Clinical Laboratory Improvement Amendment (CLIA). The level of credentials required for laboratory professionals is under the discretion of individual laboratory facilities.

Methodology

This report is based on data from the UMEC Statewide Laboratory Sciences Scope of Practice Survey (November, 2005).[a] The survey was conducted by the UMEC in conjunction with the Laboratory Committee. UMEC was responsible for the materials and the methodology to conduct the survey. The software programs Microsoft Access, Excel, and SPSS were used to analyze the data.

The voluntary survey targeted the following laboratory professionals.[b] The section, **Workforce Demographics and Characteristics by Title** (pp. 13) provides an in-depth look at the survey results for each of these professions.

- Clinical Laboratory Assistants (CLA)
- Medical Assistants (MA)
- Pathology Laboratory Assistants (PLA)
- Phlebotomy Technicians (PBT)
- Medical Laboratory Technicians/Clinical Laboratory Technicians (MLT/CLT)
- Medical Technologists/Clinical Laboratory Scientists (MT/CLS)
- Cytologists (CT)
- Specialists in Cytogenetics
- Histologists/Histology Technicians (HT)
- Point of Care Testing Personnel

The Laboratory Committee worked closely with the Utah DOH to obtain state regulated laboratory contact information. ARUP and Intermountain Healthcare reported to the UMEC how many surveys each laboratory needed based on the number of personnel employed on site. The survey was distributed to a point of contact in ARUP and Intermountain Healthcare who then distributed the survey to and collected it from the employees.

Laboratories not owned by ARUP or Intermountain Healthcare, as identified through the State Laboratory Office, were contacted via phone by committee members to determine how many surveys to send to the laboratory who then distributed it to corresponding laboratory personnel. Those surveyed were responsible for returning the completed survey. If there were no respondents from a particular laboratory, the UMEC made a follow-up call to encourage employees to fill out and return the survey.

A total of 6,504 surveys were distributed to point of contact personnel at CLIA certified laboratories across the state. Surveys were returned from 27 of 29 Utah counties. There were 2,548 respondents, resulting in a 39.2% response rate.

Surveys sent to Intermountain Healthcare and ARUP laboratories had a response rate of 59.6% and 64.3% respectively, a significantly higher return rate than those distributed to

a A copy of the survey instrument is included in Appendix B.

b See the Glossary for professional title definitions.

smaller or independent laboratories which only had a response rate of 13.5% (407). Surveys received by source are outlined in Table 1.

Table 1: Surveys Received by Source

Laboratory	Surveys Sent	Returned	% Returned	% of Total Returned
Intermountain Healthcare	2,189	1,305	59.6%	51.2%
ARUP	1,300	836	64.3%	32.8%
Other Labs	3,015	407	13.5%	16.0%
Total	**6,504**	**2,548**	**39.2%**	**100.0%**

Scope & Limitations

Scope:

Data from this survey address the composition of Utah's clinical laboratory professionals working in CLIA certified laboratories. The report documents the demographics, geographic distribution, characteristics and perceptions of this workforce and discusses influential factors of workforce supply and demand. This report identifies Utah's current training capacity and compares Utah's workforce with available national workforce data. The Health Resources & Services Administration's (HRSA) July 2005 report[1] was referenced heavily for comparison with Utah data.

Limitations:

- Limited national and state level benchmark or comparison data regarding size and distribution of the clinical laboratory workforce inhibits identifying clinical laboratory professionals. Attempts to accurately determine supply and demand by HRSA's July 2005 report[3] are estimates, not actual figures.[2] The three categories in the Standard Occupation Codes (SOC) of clinical laboratory professionals defined by the BLS appear too broad to make practical comparisons with UMEC survey data.
- A total of 83.7% of survey respondents worked in ARUP or Intermountain Healthcare laboratories, resulting in a survey response bias.[a]
- In accordance with the UMEC Data Protection Policy, every effort has been made to ensure no individual can be personally identified from data presented. For this reason, laboratory professional titles with less than ten respondents have been grouped with other related fields in laboratory science.
    - To preserve anonymity and for ease of analysis, the job titles Laboratory Technologist, Lead Technologist and Technical Specialist are included in the title MT/CLS.
    - Similarly, the job titles Cytologist, Histologist and HTs are included in the title Pathology Cohort.
- Job title definitions often differ between institutions and organizations. In a number of cases, self-reported titles did not match their reported education, certification or training. No definition was offered in the survey instrument as a reference to each job title or the encompassing duties of that title. As a consequence, the Laboratory Committee re-classified these individuals into job titles more consistent with their qualifications. A total of 217 (8.5%) respondents could not be classified due to a lack of information provided. These records have not been included in the report analysis.
- A section in the original questionnaire asking respondents to identify the waived and non-waived testing they performed has not been analyzed for this report due to item non-response.
- Age of respondents was estimated using self-reported high school graduation year.

[a] Refer to Table 1, pp 3

Background

The laboratory workforce in the United States and Utah is estimated by government and non-government agencies, such as the BLS, the American Society of Clinical Pathologists (ASCP), and the Utah Department of Workforce Services (DWS). The BLS divides the laboratory workforce into three Standard Occupation Classifications (SOC): Medical and Clinical Laboratory Technologists, Medical and Clinical Laboratory Technicians, and Residual.[3] While residual figures are not published, estimates are made part of the industry total. The SOC is the system used by the federal government to classify, gather and disseminate information on the various occupations. Table 2 documents national employment based on 2006 BLS data based on SOC.

Table 2: 2006 BLS National[4] and Utah[5] Occupational Employment Statistics[b]

Occupational Title	2006 National Employment	2006 Utah Employment
Medical and Clinical Laboratory Technologists (MT/CLS)	167,000	1,690
Medical and Clinical Laboratory Technicians (MLT/CLT)	151,000	1,330
Residual/Other	1,000[c]	100
Total	**319,000**	**3,120**

More than 10 billion laboratory tests are performed each year in the U.S. Therefore, about 33 laboratory tests are performed per person, per year in the U.S. Laboratory testing in 2004 accounted for almost $3.5 billion in payments from Centers for Medicare & Medicaid Services (CMS) to health care providers. [2,6]

There is growing concern among educators and hospital administrators about the current shortage of clinical laboratory professionals. Some of the principal causes of this shortage appear to be a lack of public recognition and limited wage growth and career advancement.[1]

There are 1,401 CLIA certified laboratories in Utah;[7] The two main employers of laboratory professionals in Utah are Intermountain Healthcare and ARUP. Intermountain Healthcare is the largest health care provider in the state. While ARUP and Intermountain Healthcare employ a large percentage of laboratory professionals, they account for a small number of CLIA certified laboratories.

[b] Numbers are rounded
[c] Number calculation estimated based on Technologist and Technician figures

Regulatory Background

National Facility Regulation

The laboratory industry has been federally regulated since CLIA was updated by congress in 1988. Through CLIA, CMS regulates all laboratory testing (except research) performed on humans in the U.S. According to the U.S. Department of Health and Human Services (HHS), "CLIA covers approximately 200,000 laboratory entities. The Division of Laboratory Services, within the Survey and Certification Group, under the Center for Medicaid and State Operations has the responsibility for implementing CLIA."[9] Each state is mandated under CLIA regulations to oversee every laboratory operating within its borders. Certification of laboratories operating statewide under CLIA has enabled the industry to identify key data concerning laboratory locations and their testing status.[10]

CLIA certification depends on the complexity of tests performed by laboratory personnel and is verified through on-site surveys. CLIA regulation sets minimal requirements regarding training and experience of laboratory directors, technical oversight and quality assurance. CLIA also specifies the qualifications for personnel performing moderate and highly complex tests. Additionally, CLIA requires proficiency testing of laboratory personnel under its purview.[11] There are five certificates administered through the CLIA program: Certificate of Waiver, Certificate for Provider-Performed Microscopy Procedures, Certificate of Registration, Certificate of Compliance, and Certificate of Accreditation. Listed below are CMS definitions of the five types of laboratory certification under CLIA.[12]

Certificate of Waiver (CW)
The Certificate of Waiver permits a laboratory to perform only waived tests. Waived tests are those that have been determined so simple and accurate, there is little risk of error if the test is performed incorrectly. Examples of waived tests include certain testing methods for glucose and cholesterol, pregnancy tests, fecal occult blood tests, and some urine tests. Routine on-site surveys are not required for a CW unless there is a complaint. The laboratory must follow the manufacturer's instructions for test performance.

Certificate for Provider-Performed Microscopy Procedures (PPMP)
A subset of the Moderate Complexity tests, PPMPs are given a unique classification and certification. This certificate is issued to a laboratory in which a physician, midlevel practitioner, or dentist performs no tests other than certain microscopy procedures (a moderately complex procedure which is performed using a microscope; e.g., urine microscopic or KOH smear) and other waived tests. Routine on-site surveys are not required for a PPMP Certificate, but these laboratories are subject to moderate complexity requirements and can be surveyed as part of a routine survey for non-waived tests or if a complaint is alleged.

Certificate of Registration (COR)

A Certificate of Registration is issued to a laboratory that applies for a Certificate of Compliance or a Certificate of Accreditation. A COR enables the laboratory to conduct moderate or high complexity laboratory testing, or both, until it is determined through an on-site survey or verification of accreditation that the laboratory has met all requirements. Laboratories have a choice to achieve their CLIA certification via a CMS survey or a CMS approved accrediting organization.

Certificate of Compliance (COC)

A Certificate of Compliance is issued to a laboratory after an on-site survey finds that the laboratory is in compliance with all applicable CLIA requirements. Laboratories with a COC that perform moderate and/or high complexity testing are required to be surveyed biennially. Surveys are conducted by CMS or its agent and are outcome-oriented. CMS conducts surveys to determine a laboratory's regulatory compliance and assist laboratories in improving patient care through education and by emphasizing those standards that will have a direct impact on the laboratory's quality test performance. The surveyor determines whether the laboratory is meeting the requirements of the CLIA regulations based on: observation of the laboratory's past and current practices; interviews with the laboratory's personnel; and review of the laboratory's relevant documented records.

Certificate of Accreditation (COA)

A laboratory that performs moderate and/or high complexity testing and that meets the standards of a private non-profit accreditation program approved by CMS may file for a Certificate of Accreditation. Approved non-profit accreditation programs are programs that are determined by CMS to have requirements that are equal to or more stringent than those of the CLIA program.[d] The accreditation program inspects the laboratory on a biennial basis. Currently there are six CMS approved accrediting organizations. Periodically, each organization must be re-approved to ensure equivalency is maintained and each year CMS evaluates their performance in enforcing CLIA requirements to verify that it is sustained.

Utah Regulation

All laboratories in Utah are CLIA certified and regulated, with records kept by the Utah DOH. Laboratories require CLIA certification to ensure the quality and accuracy of laboratory testing and patient safety. However, laboratory personnel are not required to be licensed in Utah. Table 3 compares Utah and National CLIA certified laboratories by certificate in 2008. Utah laboratories holding waived and PPMP certificates make up 77.8% while COC and COA certified laboratories combined make up 22.2%.

[d] A list of accrediting agencies is found on page 34 under Utah Licensing and Certification

Table 3: 2008 Utah and National Comparison: Percentage of Laboratories in CLIA Tiers[13]

	Utah Labs		National Labs	
Type of Certificate	**# Labs**	**% Labs**	**# Labs**	**% Labs**
Waived	816	58.2	129,219	63.6
PPMP	275	19.6	38,383	18.9
COC	185	13.2	19,261	9.5
COA	125	9.0	16,238	8.0
Total	**1,401**	**100**	**203,101**	**100**

The number of CW laboratories in Utah has nearly doubled (a 91.5% increase) from the years 2000 to 2008. While the number of PPMP laboratories increased 13.6% (33 new laboratories), COC and COA laboratories decreased 5.8% from 329 laboratories to 310. Table 4 shows percentage distribution of laboratories in Utah by certification from 2000 to 2008.

Table 4: Utah's CLIA Laboratories by Certification, 2000-2008[14]

	CW Certified Labs		PPMP Certified Labs		COC/COA Certified Labs		
Year	**#**	**%**	**#**	**%**	**#**	**%**	**Total Labs**
2008	816	58.2%	275	19.6%	310	22.2%	1,401
2007	716	54.8%	273	20.9%	317	24.3%	1,306
2006	655	52.8%	277	22.3%	308	24.8%	1,240
2005	579	50.0%	270	23.3%	310	26.7%	1,159
2004	521	47.2%	273	24.7%	310	28.1%	1,104
2003	470	44.4%	278	26.3%	311	29.4%	1,059
2002	440	42.7%	270	26.2%	321	31.1%	1,031
2001	425	42.8%	252	25.4%	316	31.8%	993
2000	426	42.7%	242	24.3%	329	33.0%	997

Onsite Surveys

The U.S. Food and Drug Administration (FDA) categorizes testing methods of certified laboratories into three tiers of complexity for inspection purposes.

1. **Waived Complexity –** These are laboratory examinations and procedures so simple they have an insignificant risk of erroneous result. There is no routine oversight or personnel requirement[12].
2. **Moderate Complexity –** These tests require at least on-the-job training and experience to perform. Equipment, reagents, calibration and quality control materials are stable. Interpreting results requires a low level of individual judgment. This category includes PPMP tests, which are performed by a physician, midlevel practitioner or dentist. Labs performing these tests may also perform waived tests.[8]
3. **High Complexity –** These tests require a high level of technical knowledge to perform testing, calibrate equipment, handle reagents, and interpret results.

Labs performing only waived complexity tests are not required to be inspected unless there is a complaint. The Utah DOH conducts an educational visit to 2% of CW laboratories each year. CLIA regulations require laboratories holding COCs or COAs to be inspected by the Utah DOH or a private accrediting agency every two years. PPMP laboratories are not inspected unless there are complaints or funds available. Table 5 shows Utah CLIA laboratory annual test volumes according to laboratory self reported data.

Table 5: Utah CLIA Laboratory Self Reported Annual Test Volumes as of 7/7/2008[14]

Certificate Type	# of Labs	# of Waived Tests performed	# of PPMP Tests Performed	# of Moderate/High Complexity Tests Performed
COA	125	692,156	N/A	49,006,967
COC	185	613,185	1,813	7,410,148
PPMP	275	2,226,981	5,600	N/A
CW	816	2,726,477	N/A	N/A
Total	**1,401**	**6,258,799**	**7,413**	**56,417,115**

Licensure Beyond CLIA

Thirteen states and one US territory (Puerto Rico) have legislation requiring specific laboratory professionals to be licensed or registered with a state licensing board. Licensing allows states to collect actual data, not estimates, which can be used to more accurately project supply and demand and other key demographic information.

Regulations governing licensure of clinical laboratory professionals varies widely from state to state. For example, Georgia mandates American Association of Bioanalysts (AAB) or Board of Registry (BOR) examination for MLT/CLT, MT/CLS, and cytologist certification. However, HTs do not need certification. Similarly, the Office of Laboratory Quality Assurance in Washington states that laboratories are responsible for acquiring a state license for PBTs. Washington is exempt from CLIA regulations because state regulations for laboratory facilities are equivalent to or more stringent than CLIA standards.[15] California is considered to have the most stringent licensing, requiring CLSs, Clinical Laboratory Bioanalysts, MLT/CLT, cytotechnologists (CT) and PBTs to be certified by the Department of Health Services Laboratory Field Services.[16] Tables 6 and 7 list states that require or have considered licensure or certification outside CLIA mandate.

Table 6: States and Territories Mandating Licensure of Laboratory Professionals[17]

California	Maryland	Rhode Island
Florida	Montana	Tennessee
Georgia	Nevada	West Virginia
Hawaii	New York[e]	Puerto Rico
Louisiana	North Dakota	

Table 7: States Currently or Previously Considering Licensure of Laboratory Professionals[18]

Illinois	Massachusetts	Pennsylvania
Indiana	Minnesota	Utah
Iowa	Missouri	Vermont

[e] New York does not have licensure for MT/CLS. The state does, however, have licensure for MLT/CLT, CTs & HTs. Similar to Washington, New York has received exempt status from CLIA regulations.

Workforce Demographics and Characteristics by Title

This section contains demographic data tabulated from survey results for individual job titles. This section also reports on various job characteristics such as hours worked, workplace setting and shift worked. Also included is a brief description of the scope of practice and educational requirements for each job title. Table 8 details the number of survey respondents by job title.

Table 8: Survey Respondents by Title

Job Title	# Survey Respondents	% Survey Respondents
MT/CLS	744	29.2%
MLT/CLT	166	6.5%
PBT	549	21.5%
CLA/PLA/MA	795	31.2%
Cytogeneticist	13	.0.5%
Pathology Cohort	50	2.0%
QA Compliance	14	0.5%
Other	217	8.5%
Total	2,548	100.0%

The majority of respondents (88%) fell into four job title categories:

1) MT/CLS
2) MLT/CLT
3) PBTs
4) CLA/PLA/MA

Medical Technologist / Clinical Laboratory Scientist (MT/CLS)

MT/CLSs perform a full range of laboratory tests from simple blood tests to more complex tests and assist with the diagnosis of diseases such as diabetes and leukemia. Becoming a MT/CLS requires a baccalaureate degree with a major in medical technology, or in one of the life sciences.

Their major focus includes hematology, microbiology, immunohematology, immunology, clinical chemistry, urinalysis, and molecular diagnostics. They use sophisticated automated equipment, microscopes, cell counters and other precision laboratory equipment.[19]

As technology advances laboratory testing, the MT/CLS must have the ability to adapt to and learn new processes and methodologies. Continuing education is vital to stay abreast of new technology. With the use of computer technology, the work of technologists and technicians has become more analytical in addition to being hands-on.

MT/CLS Survey Demographics

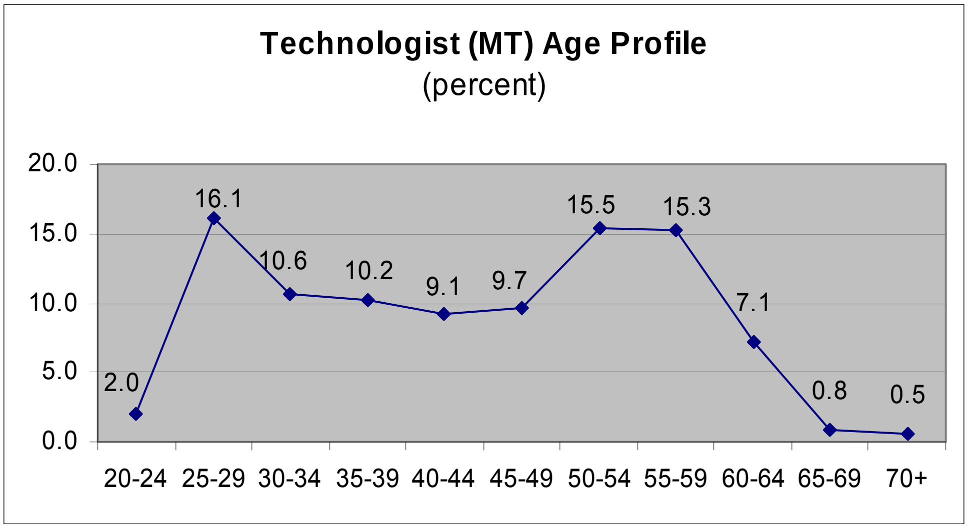
MT/CLSs were the second largest group of laboratory professionals that responded to the survey with 744 (29.2%) respondents. In 2005, the BLS estimated Utah had 1,580 MT/CLSs. Based on the BLS estimate of the number of Technologists, the 744 survey respondents equates to a 47.1% response rate among Utah MT/CLSs. One explanation for this variation could be the BLS's broad categorization of laboratory job titles under the Medical and Clinical Technologist SOC[f], thus inflating the number of MT/CLSs reported in Utah by the BLS.

Among MT/CLS survey respondents, a total of 654 (87.9%) were Caucasian. In addition, 34 (4.6%) were Asian, and another 28 (3.8%) were Hispanic. No other racial or ethnic group constituted more than 1% of the MT/CLS survey respondents. There were eight item non-respondents (1.1%) to the question regarding ethnicity.

The most striking feature of the MT/CLS workforce was age distribution. The mean age among technologists was 43.8, with a median age of 45. In addition to the higher average age, 292 (39.2%) were over the age of 50 in 2005. Utah technologists appear to begin leaving the workforce between the ages of 60 and 64. It is likely Utah will need to replace nearly all 292 of the technologists who were over the age of 50 in 2005 by 2015, in addition to filling positions created due to increased demand and population growth.

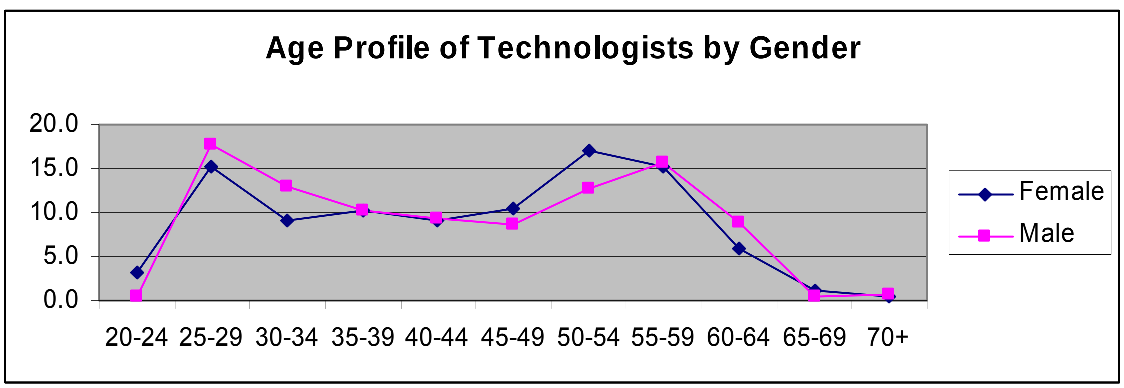
[f] See Table 2, pp 5

Figure 1: MT/CLS – Age Profile



Responses to the survey indicated that 449 (60.3%) technologists were female and 293 (39.4%) were male. When examined side by side, the male technologist workforce had a higher percentage in the younger cohorts (41.3% under age 40) than the female workforce (37.6%). For both males and females, the highest concentration of technologists under the age of 40 was in the 25-29 age cohort. The percentage of females in this cohort was 15.1% (68). The percentage of males in the same cohort was 17.7% (52).

Figure 2: Age Profile of MT/CLS by Gender



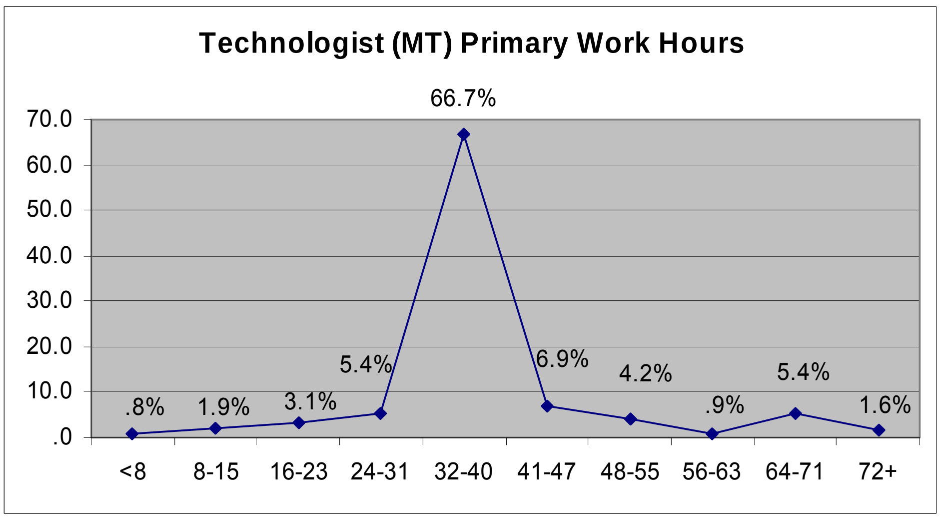
It is worth noting that the rural technologist workforce had a higher percentage who were over the age of 50 (25 or 47.2%) compared to the urban workforce which had 232 (38.5%) over 50 in 2005. In several of the rural counties of Utah, 100% of the technologists were 50 years old or older. The impact of MT/CLSs over the age of 50 leaving the workforce through 2015 will likely have a greater impact on the rural workforce.

Table 9: Age Comparison of MT/CLS in Urban and Rural Utah Counties

	Under 50 Years Old	% Under 50	Over 50 Years Old	% Over 50	Total
Rural	28	52.8%	25	47.2%	53
Urban	370	59.9%	232	37.5%	618

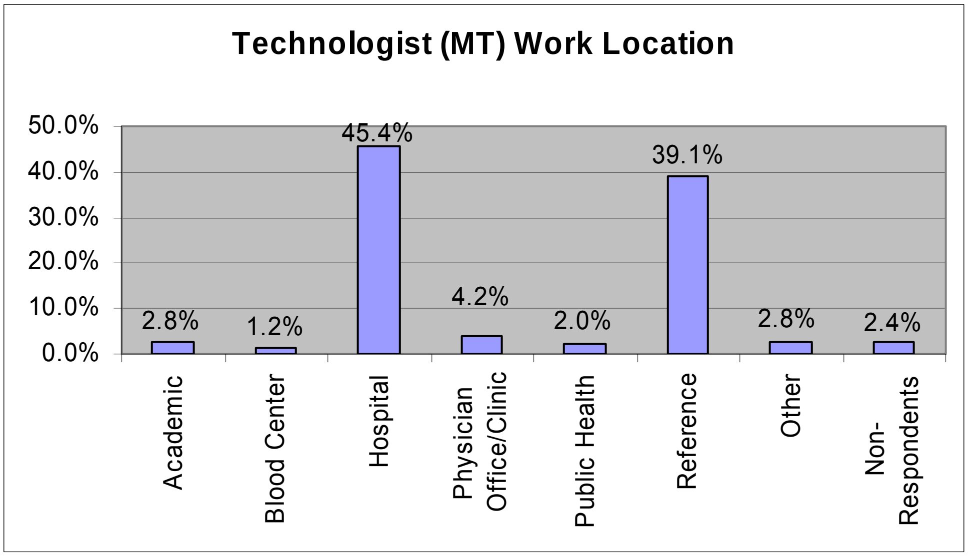
As a group, technologists had the highest percentage of full-time personnel at 637 (85.6%). Full-time employment is considered 32 hours or more per week. Those who worked more than 40 hours/week totaled 141 (19.0%) while 83 (11.2%) were considered part-time. Among respondents, 498 (66.9%) worked the day shift, another 102 (13.7%) worked the evening and night shifts, and almost 12% worked a 7-on/7-off shift. The 7-on/7-off shift is one in which an employee works seven consecutive 10-hour shifts and is off for the next seven days, resulting in 70 hours worked in a bi-weekly pay-period.

Figure 3: MT/CLS – Primary Hours



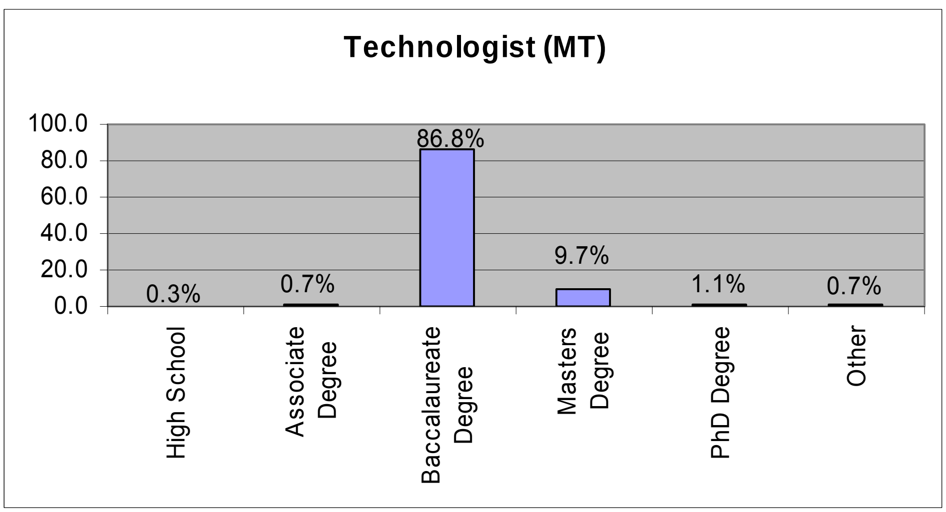
MT/CLS respondents were concentrated into two primary work settings. According to the survey, a total of 338 (45.4%) technologists worked in a hospital setting and another 291 (39.1%) worked in a reference laboratory setting. That constituted approximately 85% of the technologist workforce in those two settings. Technologists had the highest number of urban workers with 618 (83.1%) while only 55 (7.5%) reported working in a rural setting. There were 68 (9.1%) who did not respond to the question regarding work location.

Figure 4: MT / CLS – Work Location



Based on survey responses, a total of 726 (97.6%) technologists had either a Bachelor's, master's or doctorate degree. The number of technologists who had earned a bachelor's degree was 646 (86.8%). Another 72 (9.7%) earned a Master's, and 8 (1.1%) had a doctorate level degree. Only 7 (0.9%) indicated either having an associate's degree or High School Diploma as the highest degree they earned.

Figure 5: MT/CLS – Education Level

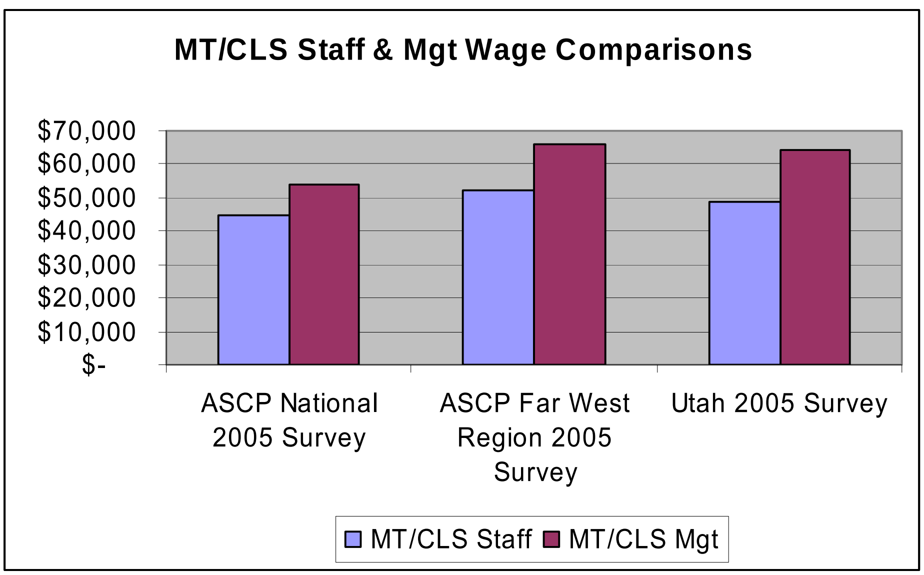


The survey showed 667 (89.7%) of technologists were certified by one or more national organizations while there were 63 (8.5%) who indicated they were not certified by any national organizations, 10 (1.9%) did not respond to the question regarding certification. ASCP certified 523 (70.8%), National Credentialing Agency for Laboratory Personnel (NCA) certified 25 (3.3%). American Medical Technologist (AMT) certified 1.2%, with the rest being certified by multiple organizations.

The median wage for Utah MT/CLS was higher than the national median wage and slightly less than the ASCP Far West Region[g]. From the UMEC Statewide Laboratory Sciences Scope of Practice Survey, MT/CLS full-time staff had a median income of $48,847 and part-time staff had a median income of $42,004 per year. MT/CLS managers in Utah, had a median income of $64,420 per year. When compared to national and western regional ASCP laboratory survey data from 2005, Utah's average MT/CLS staff wages were $4,085 (or 9.1%) more than the national median and $3,154 (or 6.1%) less than the western region median. Technologist managers in Utah earned on average $10,423 (or 19.3%) more than the national median and $1,755 (or 2.7%) less than the western regional MT/CLS managers. The 2005 survey data on technologist wages differed from Utah's DWS May 2006 occupational wage listing. The 2006 DWS wage listing suggests MT/CLS wages were $5,224 (or 9.9%) less than the 2005 UMEC Statewide Laboratory Sciences Scope of Practice Survey.

The large disparity between the national median salary and the median salary in the western region and Utah suggested by the UMEC Survey and the DWS wage data could be an indicator of an existing shortage of MT/CLSs in the Utah market. The average number of years working in a laboratory is 16.3 years; however, 36.2% of the MT/CLS cohort had 20 years or more working in a laboratory in 2005. The fact that Utah has a large percentage of older MT/CLS professionals potentially earning more due to longevity and experience, could also be a contributing factor influencing higher income levels. The implications of an existing shortage, coupled with expected large numbers of MT/CLS leaving the workforce due to retirement between now and 2015 are considerable. The Utah DWS data potentially included many lower paying laboratory jobs due to the use of the broadly categorized SOC from the BLS.

Figure 6: MT/CLS – ASCP and Utah Survey Income Comparisons



[g] ASCP Far West Region is comprised of the following states: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

Medical Laboratory Technicians / Clinical Laboratory Technicians (MLT/CLT)

MLT/CLTs perform procedures that are less complex and require less technical or theoretical knowledge than those performed by the MT/CLS. MLT/CLTs perform routine laboratory procedures, use microscopes, computers, specialized instruments and equipment, evaluate test results, prepare specimens, and operate automated analyzers and perform manual tests following detailed instructions. They work in several areas of the laboratory or specialize in one area and work under the supervision of medical and clinical laboratory scientists or laboratory managers.

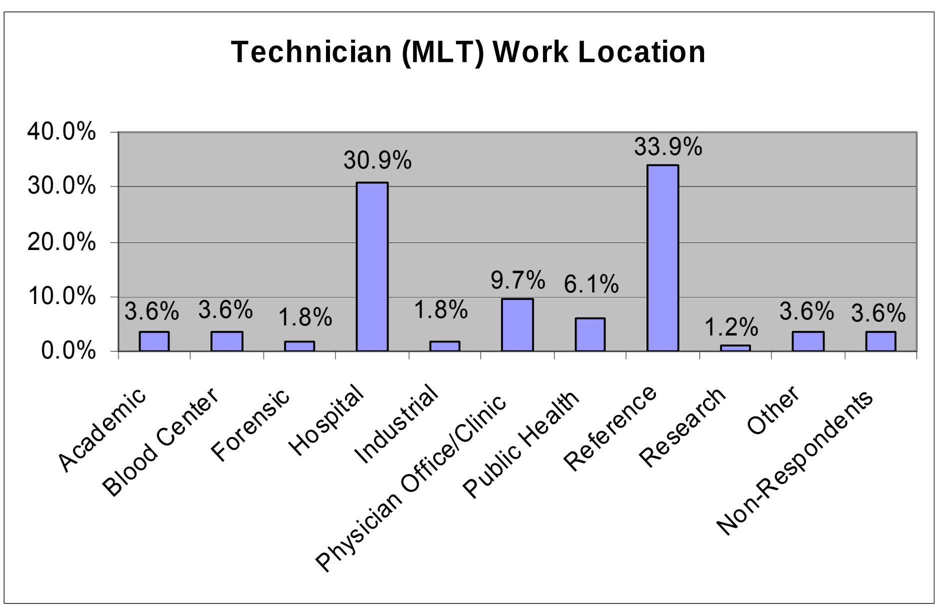
MLT/CLT generally either have an associate's degree from a community or junior college or a certificate from a hospital, vocational or technical school or one of the U.S. Armed Forces. CLIA requires technicians who perform certain complex tests to have at least an associate's degree. Typically, technicians are required to pass an exam to be certified by a specific agency.[20]

MLT/CLT Survey Demographics

A total of 166 technicians responded to the laboratory survey. That represented 6.5% of total survey respondents. In the 2005, the BLS estimated Utah had 1,350 medical and clinical laboratory technicians. If this is correct, the response rate among MLT/CLT was only 12.3%. Again, this variation could be the result of the BLS classifying a variety of laboratory job titles in the SOC heading, thus inflating the numbers reported by the BLS.

Responses to the survey show 56 (33.3%) were employed in reference laboratories, 51 (30.9%) were employed in hospitals, and 16 (9.7%) were employed in physician offices and clinics. A total of 10 (6.1%) reported working in a public health setting. Other work locations for MLT/CLT included academic 6 (3.6%), blood centers 6 (3.6%), forensic 3 (1.8%), industrial 3 (1.8%), research 2 (1.2%) and other 3 (3.6%).

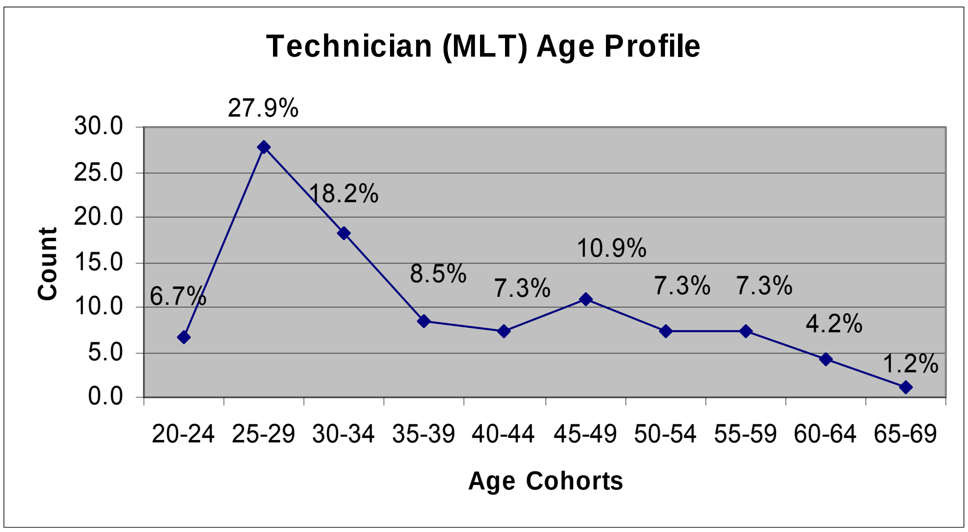
Figure 7: MLT / CLT – Work Location Demographics



Among technician respondents, 106 (64.2%) were female and 59 (35.8%) were male. Also, 147 (89.1%) were Caucasian and 13 (7.9%) were Asian. There were 5 (3.0%) technicians of other ethnicities who responded to the survey.

The mean age of the technician cohort was 37.7 years, while the median age was 34. The largest concentration of technicians was in the 25-29 age cohort with a total of 46 (27.9%) technicians. The next largest concentration (30 or 18.2%) was in the 30-34 age cohort.

Figure 8: MLT / CLT – Age Profile

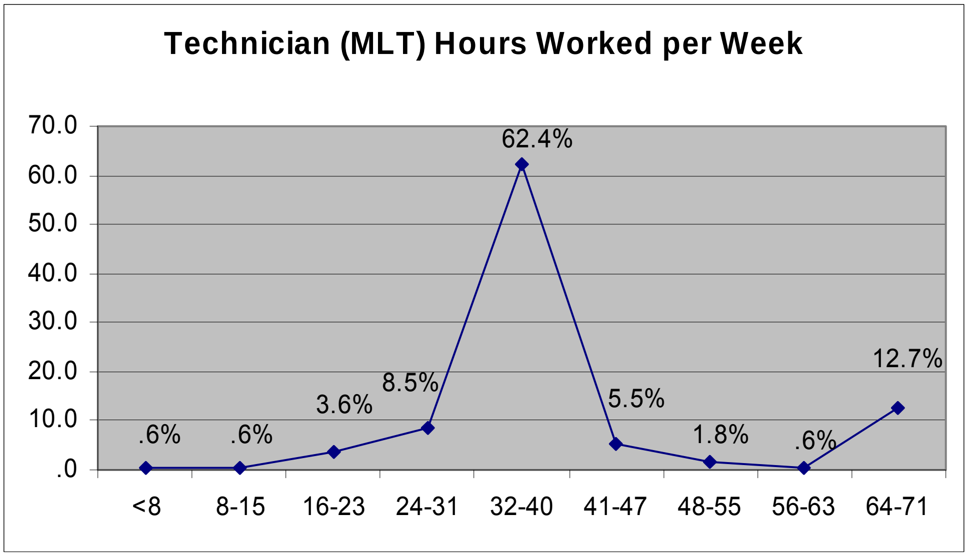


A total of 133 (80.6%) reported working more than 32 hours/week, with 103 (62.4%) reporting they worked between 32 and 40 hours/week. There were 34 (20.6%) who reported working more than 40 hours. The mean number of hours worked per week for technicians was 39.0[h], with a median figure of 40 hours per week.

A total of 83 (50.3%) technicians worked the day shift, while 31 (18.8%) worked the evening shift, and 23 (13.9%) worked a 7-on/7-off shift. A large majority, (135 or 80.1%) of technicians worked mainly in urban areas. Only 15 (9%) reported working in rural settings. The non-response rate to the question on work location was 18 (10.8%).

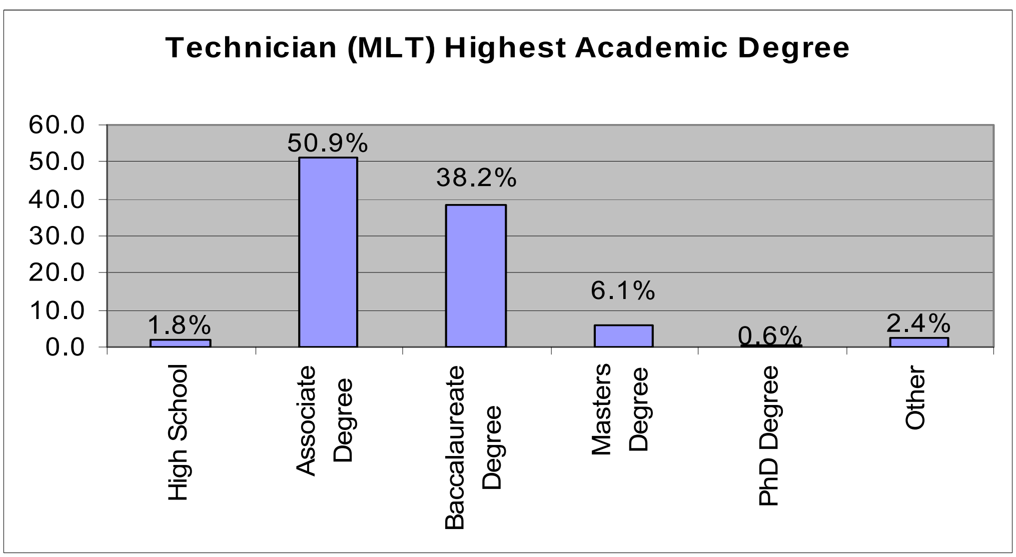
[h] A total of 11 technicians who reported working a 7on/7off shift reported working 70/hrs per week. In calculating the reported mean these hours were averaged at 35 hours per week. If the effect of the 7on/7off technicians is ignored, the calculated mean number of hours worked per week is 41.4.

Figure 9: MLT / CLT – Primary Hours



Just over half, 84 (50.9%), of the technicians who responded to the survey indicated an associate's degree was their highest earned degree. Another 63 (38.2%) indicated they had earned a bachelor's degree, with 10 (6.1%) indicating they had earned a master's degree.

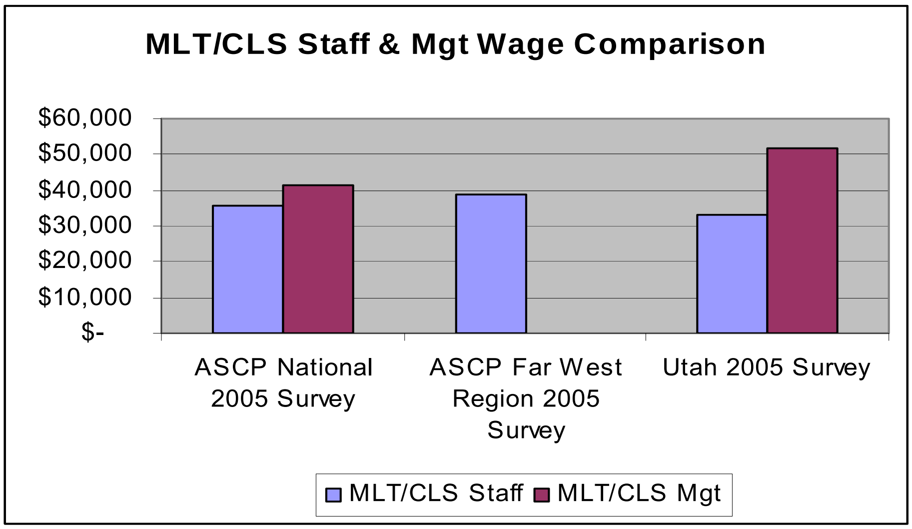
Figure 10: MLT / CLT – Education Level



The survey showed that 101 (61.2%) technicians were certified by one or more national organizations, but 60 (36.4%) indicated they were not certified by any national organization. Some of the uncertified MLT/CLTs may have been technicians in training with a bachelor's degree operating at the technician level. ASCP certified 68 (41.2%) of this cohort while NCA, AMT, and a combination of professional entities made up the other certifying agencies. Four (2.4%) did not respond to the question regarding certification.

At the technician level, Utah's median income was lower than both the National and Far West Region median according to results of the 2005 Utah survey and the 2005 ASCP survey. In 2005, full-time staff technicians in Utah had a median income of $33,357 and part-time staff technicians had a median income of $22,364. Utah technicians in management positions had a median income of $51,557 per year. Utah's full-time technician staff earned $2,481 or 6.9% less per year than the national average. Utah's technician managers had a median income $10,215 or 24.7% more per year than their national counterparts. In the western region, data is available only for technician staff wages. Utah MLT/CLS median income was $5,518 or 14.2% less per year compared to the Far West Region.

Figure 11: Technicians – ASCP and Utah Survey Income Comparisons



Phlebotomist (PBT)

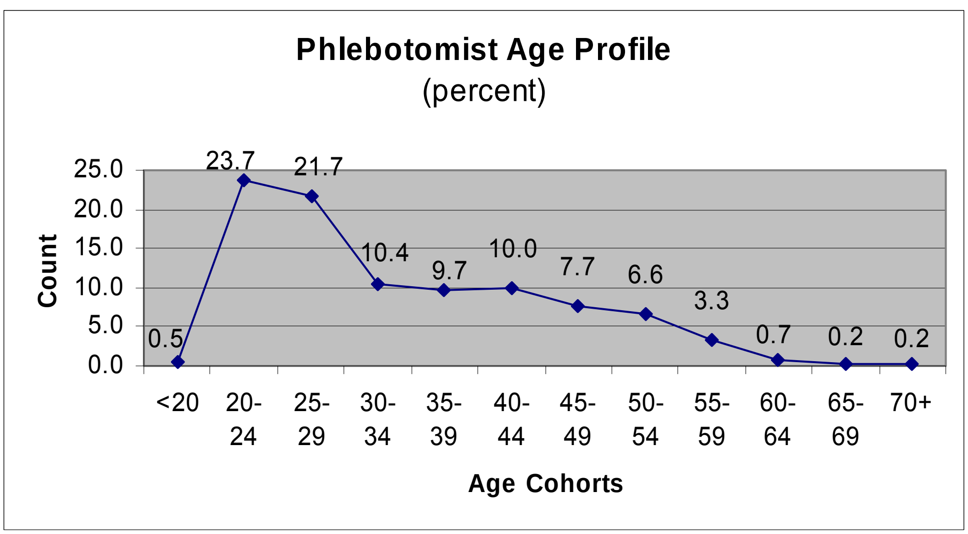
A PBT is an individual trained to draw blood (venipuncture), either for laboratory tests or for blood donations. At a blood donation site, a PBT will draw blood, perform a test to determine if the donor is anemic such as a finger prick hemoglobin test, and may also help recovery of patients with adverse reactions. PBTs do not administer drugs or fluids intravenously or give intramuscular or subcutaneous injections. These tasks must be performed by physicians or nurses. PBTs often perform simple point of care testing (CLIA waived).

Phlebotomy used to be a skill developed almost entirely in on-the-job training. There are still many trained on-the-job; but today, a growing number of PBTs in the United States train approximately four months in a career center or trade school. A prospective PBT should have a high school diploma or GED. They should be able to follow simple directions and procedures and handle blood and other bodily fluids without discomfort. In the United States, PBTs are not required to be certified except in California.[21]

PBT Survey Demographics

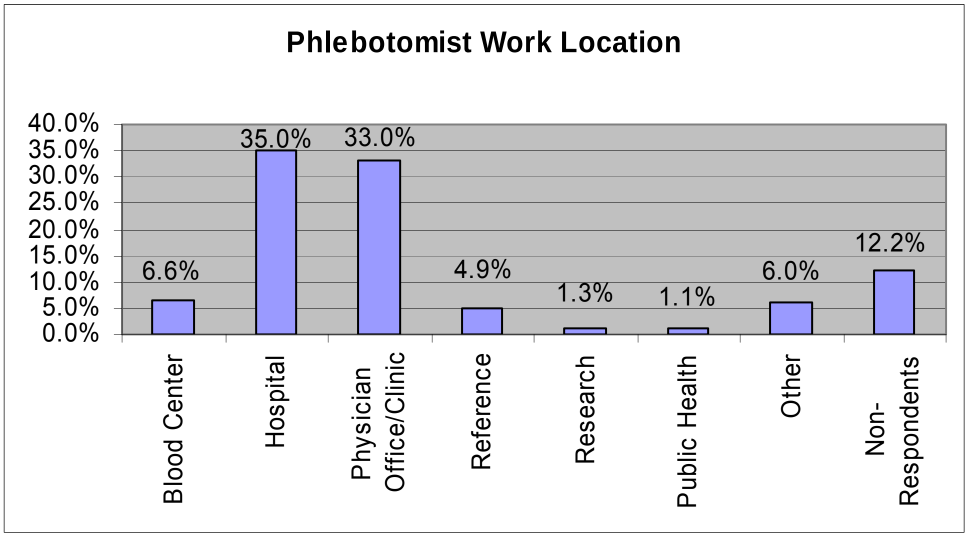
A total of 549 (21.5%) PBTs responded to the survey. Of those, 462 (84.2%) were female and 83 (15.1%) male with 4 (0.7%) not responding to the question regarding gender. An overwhelming majority, 480 (87.4%) of the PBT workforce were Caucasian, and 39 (7.1%) were of Hispanic/Latino origin. The mean age of this cohort was 33.6 years and the median age was 30.0.

Figure 12: PBT Age Profile



Hospitals employed 192 (35%) of PBTs, while 181 (33%) worked in doctor's offices and clinics. There were 36 (6.6%) survey respondents who worked in a blood center, while another 27 (4.9%) worked in a reference laboratory. Two other work locations employed more than 1% of the PBT workforce; research laboratories 7 (1.3%), and public health laboratories with 6 (1.1%).

Figure 13: PBT Work Location Demographics

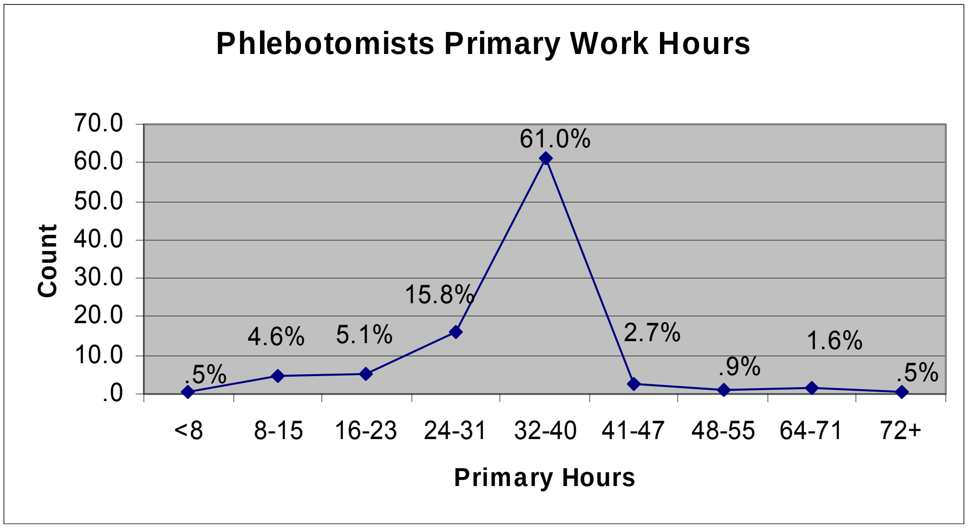


Among PBTs who responded to the survey question regarding the number of hours worked, 335 (61%) reported working between 32 and 40 hours per week. An additional 32 (5.8%) worked more than 40 hours per week. A total of 143 (26%) worked fewer than 32 hours per week. A total of 39 (7.1%) did not respond to the question regarding the number of hours worked per week. Among PBTs, the mean number of hours worked at their primary location was 35.1 and the median hours worked was 40.

Among the PBT cohort, 364 (66.3%) worked day shifts. Another 35 (6.4%) and 36 (6.6%) worked evening and night shifts respectively. In addition, 54 (9.8%) worked various other shifts including a 7-on/7-off shift.

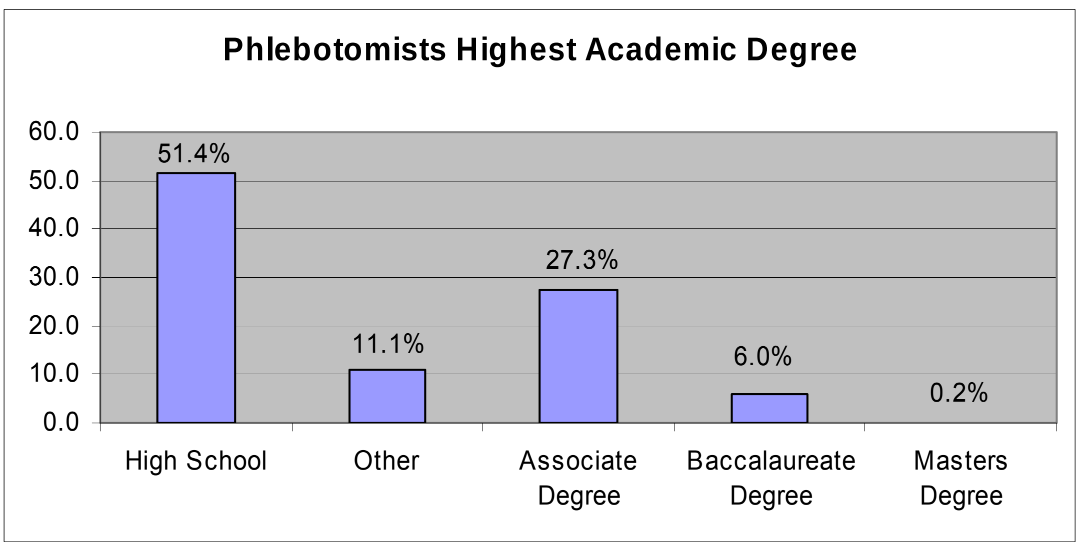
Most PBTs (384 or 69.9%) worked in Utah's urban counties: Cache, Davis, Salt Lake, Utah, Washington and Weber while 55 (10.0%) worked in rural counties. A total of 108 (19.7%) did not answer the question relating to job location.

Figure 14: PBT Primary Hours



A slight majority (282 of 527 or 51.4%) of all PBTs indicated a high school diploma as their highest level of education. A total of 150 (27.3%) reported having an associate's degree, 61 (11.1%) reported receiving additional training beyond high school, either specific training through vocational courses or on-the-job training. Finally, 33 (6%) reported having a bachelor's degree, while 22 (4%) did not respond to this question.

Figure 15: PBT Education

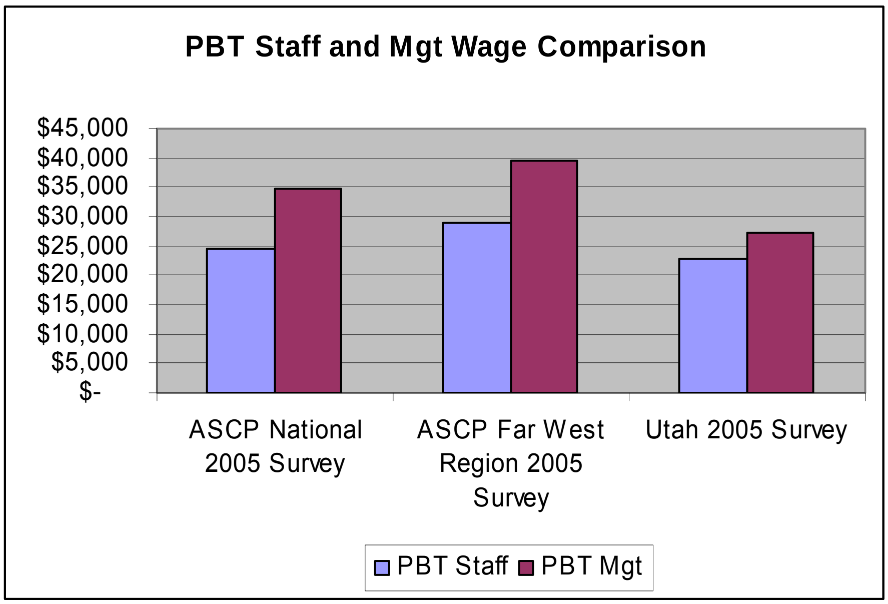


In regards to certification, 285 (51.9%) of those who responded indicated they were not certified by any national credentialing entity. ASCP certified 22 (4%) and NCA certified 11 (2%) of this cohort. Additionally, 118 (21.5%) reported being certified by entities not listed in the questionnaire. There were 105 (19.1%) who did not respond to the questions regarding certification.

PBTs, like CLAs, PLAs, and MAs are at the lower end of the wage scale of the laboratory workforce in Utah. Nearly half (258 or 47%) of PBTs reported an income less than $20,000, an additional 187 (34.1%) earned between $20,000 and $30,000. Combined, 445 (81.1%) reported an income less than $30,000. Managers in this group earn on average $27,257 per year.

The median income for Utah phlebotomists was lower than the median income for phlebotomists nationally. Utah's PBTs reported a median income of $22,868, $1,551 or 6.4% less for full-time staff, and $7,666 or 22.0% less for managers than the national median in 2005. The wage difference was even greater compared to the western region. Utah staff PBT had a median income $6,252 or 21.5% less**,** and managers had a median income $12,263 or 31.0% less than their counterparts in the Western Region.

Figure 16: PBT – ASCP and Utah Survey Income Comparisons



Laboratory Assistants: (CLA/PLA/MA)

MAs perform administrative and clinical tasks to keep the office of physicians, podiatrists, chiropractors, and other health practitioners running smoothly. Clinical duties vary according to state law and include taking medical histories, recording vital signs, explaining treatment procedures to patients, preparing patients for examination, and assisting the physician during the examination. MAs collect and prepare laboratory specimens or perform basic laboratory tests on premises (CLIA waived and/or moderately complex), dispose of contaminated supplies, and sterilize medical instruments.

Some MAs are trained on the job, but many complete 1-2 year programs in vocational-technical high schools, post secondary vocational schools, and community and junior colleges.

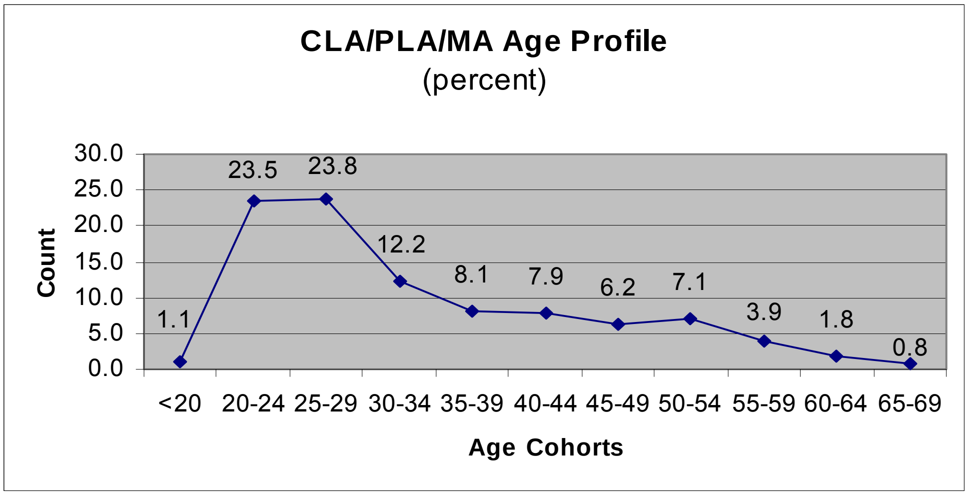
CLAs are responsible for specimen collection and processing, reagent preparation, instrument maintenance, and performance of waived tests. CLAs require a high school diploma or equivalent and on-the-job or vocational training.

Under minimal supervision, the PLA prepares specimens for surgical pathology and cytological examination, operates and troubleshoots equipment, uses Meditech computer system and manual logs for accessioning specimens, and orders supplies when needed. Becoming a PLA requires a high school diploma or equivalent. On-the-job or technical vocational training is required.[22]

CLA/PLA/MA Survey Demographics

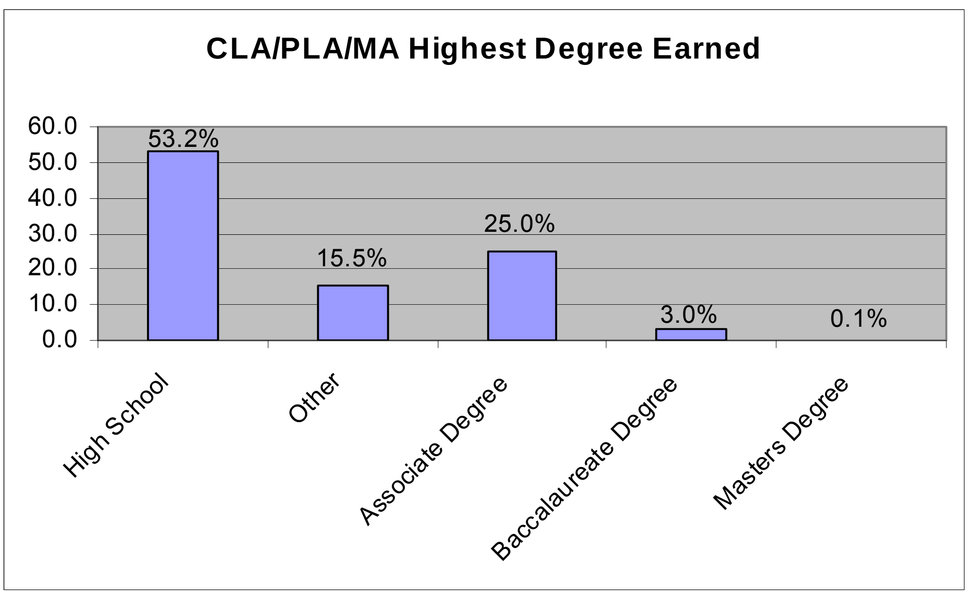
The largest number of survey respondents (795 or 31.2% of total respondents) came from the CLA/PLA/MA workforce. Among the professions included in the laboratory survey, CLA/PLA/MAs reported the highest percentage of females at 86.4% (685) and 13.2% (105) males, with 0.4% (4) item non-respondents. The majority were Caucasian 86.3% (684), with one of the larger percentages of Hispanics 7.8% (62) compared to the other professions included in the survey. The mean age of this cohort was 33.6 years with a median age of 29.

Figure 17: CLA / PLA / MA Age Profile



A majority (422 or 53.2%) of CLA/PLA/MAs reported a high school diploma as the highest degree earned. In addition, 198 (25.0%) reported having an associate's degree and 24 (3.0%) reported having a bachelor's degree. Another 123 (15.5%) received other additional training beyond high school, either specific training through vocational courses or on-the-job training.

Figure 18: CLA/PLA/MA Education Profile



The survey showed that 480 (60.5%) of CLA/PLA/MAs reported they were not certified by any national professional association. A total of 105 (13.2%) were certified by professional associations not listed in the survey questionnaire. The following credentialing associations; ASCP, NCA and AMT, together certified only 16 (2%) of this cohort.

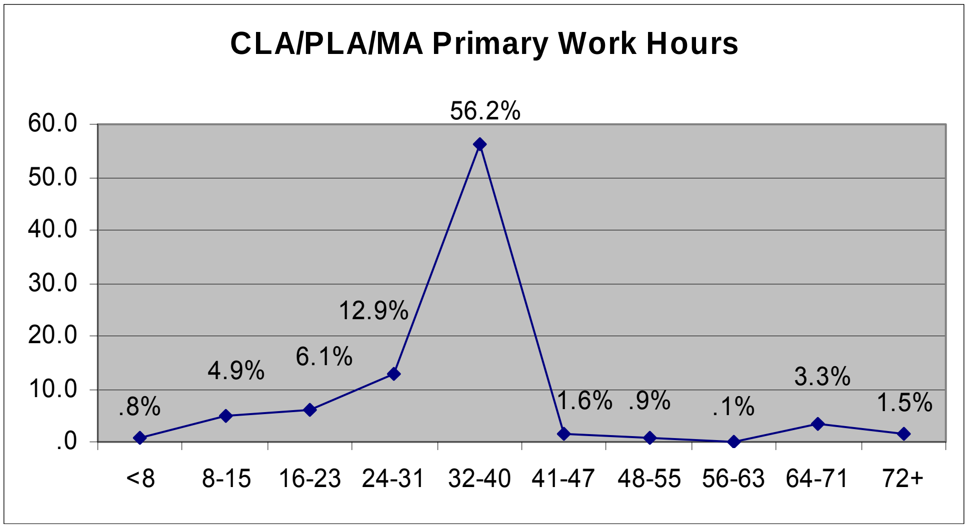
Survey responses indicated that CLA/PLA/MAs worked in a relatively limited number of work settings. A total of 370 (46.7%) worked in a physician's office or clinic, 117 (14.7%) worked in a reference laboratory and 86 (10.8%) worked in a hospital setting. There were 111 (14.0%) non-respondents to the question regarding work setting.

Within the CLA/PLA/MA cohort, 493 (62.2%) worked day shifts and an additional 53 (6.7%) and 36 (4.5%) worked evening and night shifts respectively. Another 60 (7.6%) worked a 7-on/7-off shift. An additional 31 (3.8%) respondents reported working other shifts. There were 120 (15.1%) non-respondents to the question regarding which shift they worked.

Among CLA/PLA/MAs, 446 (56.2%) worked between 32 and 40 hours per week and another 59 (7.4%) reported working more than 40 hours per week at their primary work location. Among respondents, 195 (26.1%) reported working fewer than 32 hours per week. It should be noted that among the clinical-laboratory professions, a 32 to 40 hour workweek is generally considered full-time. Data from the survey appears to confirm this in that the mean number of hours worked was 35.6 and the median hours worked was 36.8. There were 92 (11.6%) who did not respond to the question regarding the number of hours worked.

The majority of this group worked in an urban area 542 (68.3%) while only 51 (6.4%) worked in a rural setting. This group had the largest non-response 200 (25.2%) to the work location question.

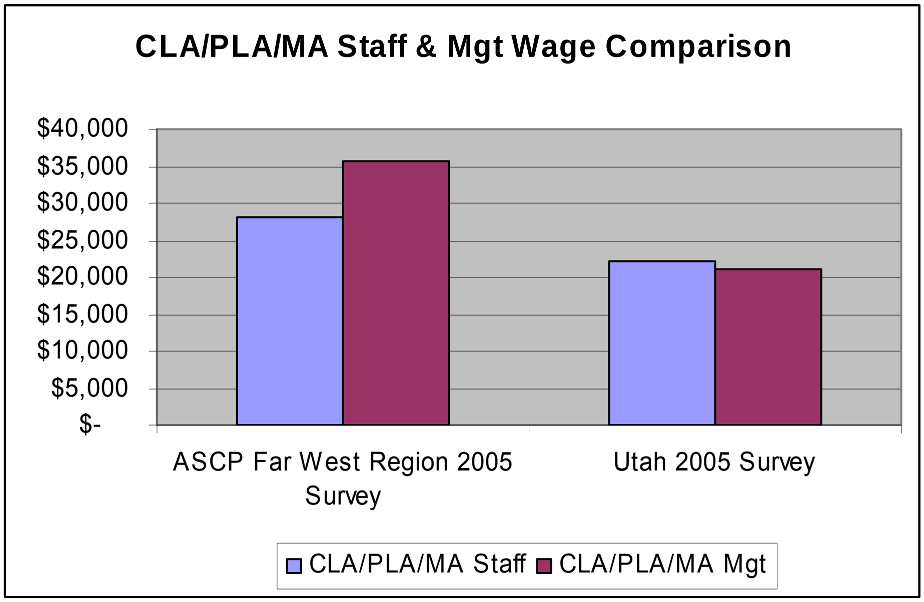
Figure 19: CLA/PLC/MA Hours Worked at Primary Location



CLA/PLA/MAs had the lowest average income of all groups in the survey. Full-time personnel averaged $22,213 per year, while part-time personnel averaged $15,688 per year. Managers in this group averaged $21,091 per year. Survey result comparison with the 2005 ASCP Far West Region wage survey shows Utah's CLA/PLA/MAs earned approximately $6,000 or 21.3% less than the national average and Utah's managers in this group earned almost $14,602 or 40.9% less than the Far West Region average.

The 2005 survey wage data for CLA/PLA/MAs was almost identical to Utah's DWS May 2006 occupational wage listing. The DWS website showed this cohort's wages to be on average $22,200.

Figure 20: CLA / PLA / MA – ASCP and Utah Survey Income Comparisons



Other Laboratory Workforce Groups

Utah's laboratory professionals listed a number of other laboratory job titles, however the number of respondents in each group was relatively small. Regional and national comparisons were not possible for these titles because comparable data were not available. However, having for the first time Utah specific data will provide a base for tracking change and a better understanding of workforce requirements. Each group's data are summarized below.

Cytogeneticist

Cytogeneticists have a bachelor's degree in Life Sciences (Biology, Microbiology, genetics or Biochemistry), Physics or Engineering. Science degrees related to medicine such as Biomedical Science, Medical Physics, Medical Electronics or Biotechnology may also be considered. On completion of a relevant degree, the aspiring cytogeneticist will then pursue a trainee period to qualify in their chosen specialties. Training involves a formal program that can last up to three years.

Clinical cytogeneticists are experts in studying chromosomes from samples of human blood, tissue, bone marrow or other bodily fluids, which is very important in diagnosing genetic diseases. The majority of the cytogeneticists' work revolves around three main categories: analysis of genetic material, prenatal diagnosis, and helping hematologists**.**

Microscopy is the main scientific technique employed. Computer technology is increasingly used in chromosome analysis. Less commonly, they may be involved in DNA analysis.[23]

Cytogeneticist Survey Demographics

A total of 13 cytogeneticists responded to the survey. Their 2005 demographics are as follows: Fifty-six percent were full time, with 10 (76.9%) reporting they worked a minimum of 32 hours/week. A total of 3 (23.8%) worked fewer than 32 hours per week. Eighty-one percent of cytogeneticists worked day shifts and 6.3% work 7-on/7-off shifts.

There was a considerable gender gap in this group. A total of 10 (76.9%) were females, 92.3% were Caucasian. The mean age among cytogeneticists was 32.1 with a median age of 30.

Cytogeneticist survey respondents worked in three primary settings. Among this cohort, 11 of 13 (84.6%) worked in an academic (college/university) setting, the other two worked in hospitals and reference laboratories. All but one had a bachelor's degree as their highest level of degree. Everyone in this cohort was certified by a national organization. ASCP certified 56.3%, while NCA certified 34.4% of this cohort. The remaining 9.3% were certified by a combination of ASCP, NCA and agencies not listed on our survey.

From the UMEC Statewide Laboratory Sciences Scope of Practice Survey, there were enough respondents to show an average wage of $43,110. According to survey responses, a majority earned more than $30,000/year. There was no national or regional wage data available for comparison. The small number of survey respondents in this category limited what can be reported.

Pathology Cohort: Cytotechnologists (CT), Histotechnicians (HT), Histotechnologists (HTL)

For purposes of analysis, CTs, HTs and HTLs were combined to form the Pathology cohort . There were 50 respondents in this combined cohort. The following analysis looks at the combined Pathology cohort.

CTs are specially trained individuals who identify cellular abnormalities in cytology laboratories. They hold a bachelor's degree, are graduates of an accredited school of cytotechnology, and have successfully completed the board certification examination with the ASCP Board of Registry (BOR). The BOR is the arm of the ASCP which governs certification of clinical laboratory professionals by the ASCP.

CTs prepare and analyze cell samples taken from various sites on the body. They perform chromosomal staining, microscopic analysis, and karyotyping (organizing chromosomes according to a standardized ideogram).[24]

Histology is a science dealing with the structure of cells and their formation into tissues and organs. Histotechnology centers on the detection of tissue abnormalities and the treatment for the diseases causing the abnormalities. In a histology laboratory, immunological and molecular (DNA) techniques are frequently utilized to provide accurate tumor identification which will aid the clinician in selecting a mode of therapy that offers the greatest probability of cure. An HTL will prepare very thin slices of human tissue for microscopic examination. This is an important part of the intricate process of scientific investigation used in establishing and confirming patient diagnosis. Certification as an HT or HTL is governed by the BOR. The BOR certifies HTLs upon completion of academic requirements for a Baccalaureate degree. HTs require a two year program.[25]

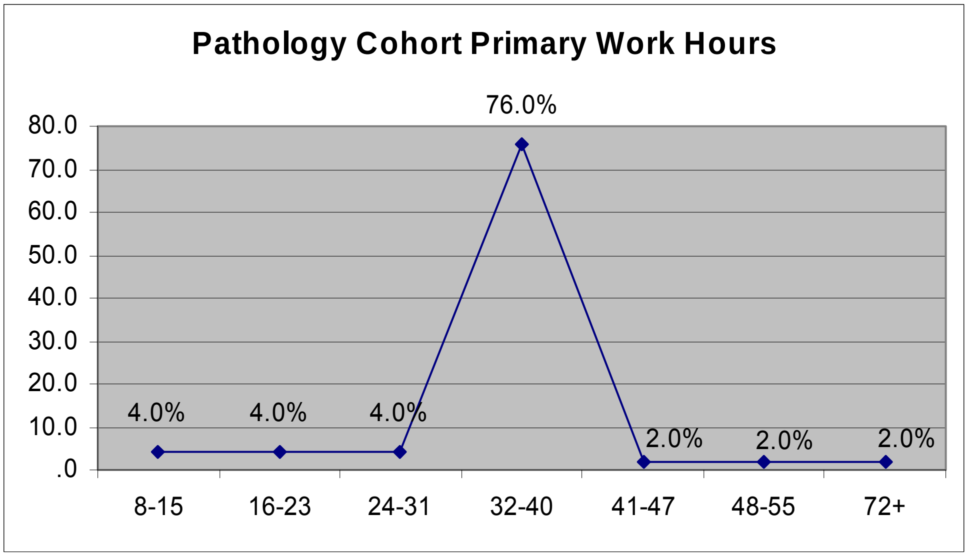
Pathology Cohort Survey Demographics

Responses to the survey in the pathology cohort indicated that 36 (72.0%) were female with the remaining 14 (28.0%) male. Responses also indicated that 36 (72.0%) were white/Caucasian. There were 5 (10.0%) Hispanic respondents, 3 (6%) were Asian.

A total of 41 (82%) in the pathology cohort reported working a minimum 32 hours/week with 6 (12%) reporting fewer than 32 hours worked/week. Three didn't respond to the question regarding the number of hours worked.

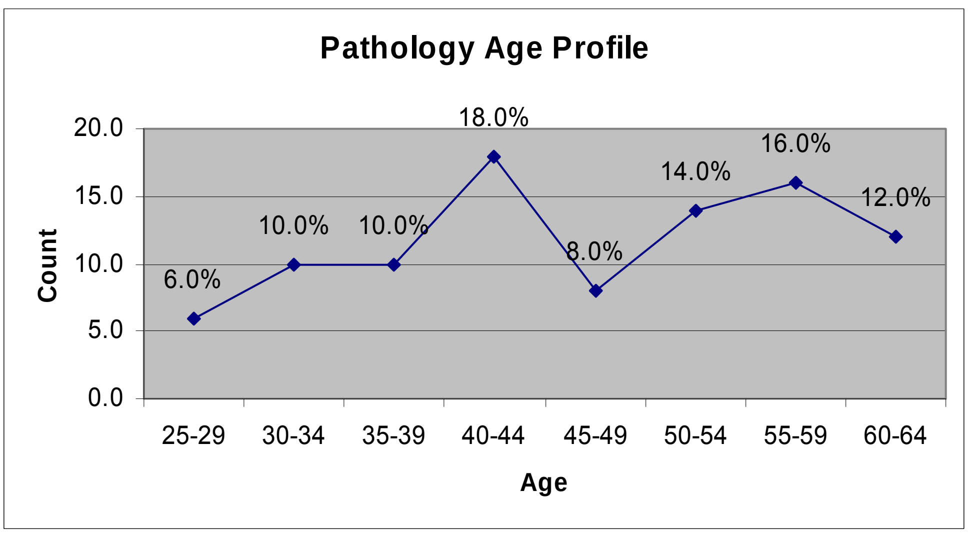
Pathology laboratory professionals worked primarily in two locations. A total of 30 (60%) reported working in a hospital setting with an additional 15 (30%) working in a reference laboratory setting. The majority of survey respondents (45 or 90%) worked day shifts.

Figure 21: Pathology Cohort Primary Hours



Like technologists, the pathology cohort had an older average age. The mean age for the cohort was 46.3 with a median age of 46. A total of 21 (42%) were over age 50 in 2005. Additionally there were only 13 (26%) in this cohort under the age of 40.

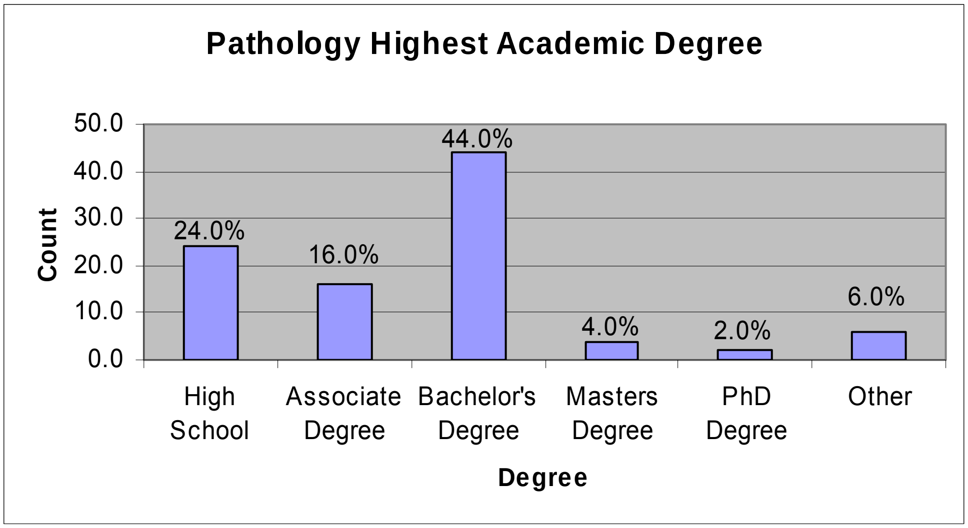
Figure 22: Pathology Cohort Age Profile



Income distribution for the pathology cohort was as follows; 13 (26%) earned $40,000 or less, 34 (68%) reported income greater than $40,000. There were 17 (34%) which reported an income between $40,001 and $50,000.

Within the pathology cohort, 25 (50%) had at least a bachelor's degree, while 36 (72%) had at least some education/training beyond high school. A total of 12 (24%) reported having a high school diploma as their highest level of education.

Figure 23: Pathology Cohort Education Level



In terms of certification, 42 (84%) reported being certified by ASCP, and another 3 (6%) were certified by another certifying body. A total of 4 (8%) reported not being certified by any national certifying body, with 1 (2%) not responding to the question regarding certification.

Quality Assurance (QA)/Compliance Survey Demographics

There were 14 QA/Compliance survey respondents with 9 (64.3%) full time and 3 (21.4%) part time. Eleven (78.5%) were female, 3 (21.4%) male. In terms of ethnic distribution, 12 (85.7%) were Caucasian. The mean age of this cohort was 35.9 years, with a median age of 31. A total of 7 (50.0%) reported working in a reference laboratory, with the balance working in hospitals and a research setting.

The educational background information for those in the Q/A cohort demonstrates a broad distribution. Due to the fact that the numbers in each educational category are so small, specific information on education distribution is not provided. Only 2 (14.3%) were certified by a national organization (ASCP). Another 11 (78.6%) indicated they were not certified by any national certifying body

Demographic Summary

The following section provides summary demographic and workforce characteristics data derived from the UMEC Statewide Laboratory Sciences Scope of Practice Survey. The data presented in this section is not segregated by job title, providing an overview of the laboratory workforce as a whole.

The laboratory survey showed ARUP and Intermountain Healthcare employed 86.5% of clinical laboratory professionals in 2005 and 84% of survey respondents. The survey data identified 135 individuals (5.8%) who worked in more than one location.

Over 75% of the survey respondents were female and over 86% (2,202) Caucasian. A total of 728 (28.6%) worked in hospitals of varying sizes, 668 (26.2%) worked in physician offices/clinics while the third largest group, 528 of the respondents, worked in a reference laboratory (20.7%). Almost 10% (252) did not indicate where they worked.

Table 10: Survey Demographics, Work Location

Work Facility	#	%
Hospitals	728	28.6%
Dr. Office/Clinic	668	26.2%
Reference Lab	528	20.7%
No Response	252	9.9%
Blood Center	90	3.5%
Other	86	3.4%
Public Health	76	3.0%
Academic	56	2.2%
Industrial	23	0.9%
Research Lab	20	0.8%
Environmental	12	0.5%
Pharmacy	6	0.2%
Nursing Home	2	0.1%
Forensic (Private)	1	0.0%
Total	**2548**	**100.0%**

Table 11: Survey Demographics, Ethnicity

Ethnicity	#	%
Caucasian	2202	86.4%
Hispanic	145	5.7%
Asian	94	3.7%
No Response	46	1.8%
Other	30	1.2%
Pacific Islander	15	0.6%
African American	10	0.4%
Asian Indian	6	0.2%
Total	**2548**	**100.0%**

The survey asked for work place zip code; 81.6% (2079) of respondents answered this question, indicating laboratory professionals were in 27 of Utah's 29 counties. Four of the respondents lived or worked outside of Utah (Arizona, Idaho, and Nevada). Table 12 shows the geographic distribution of survey respondents by multi-county district[i].

Table 12: Utah Survey Respondents by Multi-County District

Utah Multi-County District	#	%
Bear River	131	5.2
Wasatch Front	1459	57.3
Mountainland	229	9.0
Central	52	2.1
Southwest	173	6.8
Uintah Basin	14	0.5
Southeast	15	0.6
No ZIP code	471	18.4
Outside Utah	4	.1
Total	**2548**	**100**

Income Comparison

Table 13 summarizes Utah and national wage comparison. The laboratory survey income data by job title below indicates CLA/PLA/MAs and PBTs are paid at a much lower rate than the national average and even lower compared to the western region.

[i] Counties in each district are as follows: Bear River; Box Elder, Cache, Rich, Wasatch Front; Davis, Morgan, Salt Lake, Tooele, Weber, Mountainland; Summit, Utah, Wasatch, Central; Juab, Millard, Piute, Sanpete, Sevier, Wayne, Southwest; Beaver, Garfield, Iron, Kane, Washington, Uintah Basin; Dagget, Duchesne, Uintah, Southeast; Carbon, Emery, Grand, San Juan.

Table 13: Laboratory Professionals – 2005 ASCP and Utah Survey Wage Comparisons[26]

Job Title	Survey Data and Source			Variance in Wages from Utah Survey			
	ASCP 2005 Survey	ASCP Far West Region 2005	UT 2005 Laboratory Survey	ASCP 2005 Survey Variance $	ASCP 2005 Survey Variance %	ASCP 2005 Far West Region Variance $	ASCP 2005 Far West Region Variance %
CLA/PLA/MA Staff	N/A	$28,226	$22,213	N/A	N/A	-$6,013	-21.3%
CLA/PLA /MA Mgt	N/A	$35,693	$21,091	N/A	N/A	-$14,602	-40.1%
PBT Staff	$24,419	$29,120	$22,868	-$1,551	-6.4%	-$6,252	-21.5%
PBT Mgt	$34,923	$39,520	$27,257	-$7,666	-22.0%	-$12,263	-31.0%
Cytogeneticists	N/A	N/A	$36,217	N/A	N/A	N/A	N/A
MLT/CLT Staff	$35,838	$38,875	$33,357	-$2,481	-6.9%	-$5,518	-14.2%
MLT/CLT Mgt	$41,342	N/A	$51,557	$10,215	24.7%	N/A	N/A
MT/CLS Staff	$44,762	$52,000	$48,847[j]	$4,085	9.1%	-$3,154	-6.1%
MT/CLS Mgt	$53,997	$66,175	$64,420	$10,423	19.3%	-$1,755	-2.7%

As of 2005, the median wage in Utah for CLA/PLA/MA and PBTs were lower than the median wage in the ASCP Far West Region. These positions appear to have relatively high turnover which could play a part in the lower than average income. On the other hand, the median income for MT/CLSs in Utah was higher than the national median, but lower than the Far West Region – the region with the highest median income in the ASCP survey. The higher wages in Utah, which may in part be explained by an older, more experienced workforce, are also a strong indicator of a shortage of technologists.

Utah Licensure and Certification

Despite the lack of licensure, many employers use outside certification organizations to verify educational proficiency in several laboratory specialties. There are a number of organizations which provide credentialing for the clinical laboratory workforce, and individuals may be certified by one or more national organization[k]. As Table 14 below shows, the percentage of certified individuals varies among the various classifications.

Table 14: Number and Percent Certified by Classification

Classification	# Certified	% Certified
Cytogeneticist	13	100.0%
Pathology Cohort	45	90.0%
MT/CLS	667	89.7%
MLT/CLT	101	61.2%
PBT	159	29.0%
CLA/PLA/MA	122	15.4%

[j] This number includes respondents who answered they worked more than one job.
[k] Following is a list of national credentialing organizations; American Association of Bioanalysts (AAB), American Medical Technologist (AMT), American Society for Clinical Pathology (ASCP), National Credentialing Agency for Laboratory Personnel (NCA), National Registry of Clinical Chemistry (NRCC), National Registry of Microbiology (NRM), International Society of Blood Transfusion (ISBT)

Workforce Planning

The following section focuses on issues that will affect the adequacy of the Utah clinical laboratory workforce in the coming years, including forces that affect both future supply and demand for laboratory workforce. Data presented in this section was provided by clinical laboratory employers and Utah training programs.

Workforce Shortages

Shortages of clinical laboratory practitioners persist nationally and in Utah. Results from the 2008 ASCP Wage & Vacancy Survey[27] suggest a shortage of laboratory personnel across the nation. Nearly one-half (43%) of the clinical laboratories across the nation reported difficulties hiring personnel. This difficulty was more acute in the Far West region which includes Utah and all of the Mountain West states as well as the Pacific states. A total of 53% of respondents in this region reported hiring difficulties, the highest rate for all regions. The national vacancy rates for certified medical technologists and HTs were particularly high, at 10.4% and 8.0%, respectively. MLT/CLT and phlebotomy national vacancy rates were 6.4% and 5.9% respectively.

Utah Vacancy Rates

As a follow-up to the 2005 UMEC Statewide Laboratory Sciences Scope of Practice Survey, a vacancy questionnaire was sent to both ARUP and Intermountain Healthcare in the summer of 2008, seeking information regarding vacancy rates for various laboratory positions. The results of the questionnaire indicated that vacancy rates vary among job classifications and between institutions. Classifications with the highest vacancy rates were non-certified CLA/PLA/MAs and PBTs with average vacancy rates of 90.3% and 78.7% respectively. MLT/CLTs had the lowest average vacancy rate at 21.5%. The average vacancy rate for MT/CLS was 39.7%. For HTs the average vacancy rate was 43.0.

Table 15: Utah and U.S. Vacancy Rates - 2008[27]

Job Title	Utah %	U.S %	Difference
MT/CLS	39.7	10.4	29.3
MLT/CLT	21.5	6.4	15.1
PBT	78.7	5.9	72.8
HT	43.0	8.0	35.0

The vacancy questionnaire also revealed discrepancies between the fill rates of ARUP and Intermountain Healthcare for various job classifications. The fill rate is defined as the percentage of open positions being filled. The fill rate for certified CLA/PLA/MAs was 66.7% and 76.9% for non-certified CLA/PLA/MAs. For PBTs the average fill rate was 86.3%. The fill rates at the two institutions varied significantly for MLT/CLTs (87.5% and 41.7%), MT/CLSs (85.8% and 61.4%), and HTs (100% and 43.5%). Both institutions reported similar length of time to fill figures for most job classifications. The average length of time to fill (in months) for the various job classifications are as follows, CLA (0.5), PBTs (1.02), MLT/CLT (1.42), MT/CLS (1.62), and HTs (1.1).

Table 16: Fill Rates and Time-to-Fill Utah Laboratory Positions

Job Title	Fill Rate %	Time to Fill (Months)
MT/CLS	73.6	1.6
MLT/CLT	64.6	1.4
PBT	86.3	1.0
HT	71.8	1.1

Factors Influencing Supply

Significant factors influencing the state's supply of laboratory personnel include: the impact of national workforce shortages, Utah's and the nation's training capacity - in particular those job classifications which require higher education, retirement, and attrition. Lack of awareness about clinical laboratory science among students, competing professions, and lower-pay scale impact the workforce as well.

Workforce shortages in the clinical laboratory field at the national level limit Utah based employers' ability to recruit employees from out of state as they compete with employers in other states. Furthermore, they must compete with out-of-state employers over locally trained employees. Based on the wage comparison data cited previously, Utah appears to be paying a premium compared to the national average to retain its technologist workforce. Should the national shortage deepen, Utah employers may need to compete on pay and other benefits to fill the need.

Utah's Training Capacity

In the face of national and state level shortages, the state's capacity to train and retain its own workforce becomes critical in meeting state workforce needs. Three Utah universities have bachelor's degree MT/CLS training programs. Currently, only Weber State University (WSU) has an MLT/CLT program. Following is a summary of the MT/MLT programs in the state, including number of graduates and retention figures. The figures listed were provided by the individual programs.

Brigham Young University (BYU) MT/CLS Program

BYU graduated 102 technologists during 2000-2006 for an average of 14.6 per year. Of these graduates, 44 (43.1%) are employed in Utah and 21 (20.6%) are known to be employed outside of Utah. Twelve (11.8%) of the 102 graduates are not employed. The status and employment information is unknown for 25 (24.5%) of the graduates.

Table 17: BYU Graduates and Employment

Year	June Graduates	December Graduates	Total Graduates	Employed In Utah	Employed Outside Utah	Not Employed	Unknown
2000	9	4	13	3	4	4	2
2001	5	7	12	2	5	4	1
2002	8	7	15	8	3	2	2
2003	7	8	15	8	4	2	1
2004	2	11	13	5	2	0	6
2005	9	7	16	15	1	0	0
2006	5	13	18	3	2	N/A	13
Total	**45**	**57**	**102**	**44**	**21**	**12**	**25**

University of Utah (U of U) MT/CLS Program

The U of U has graduated an average of 18 students per year during the years 2000-2006. The program has increased its numbers for 2007 and 2008, graduating 23 and 25 students respectively. It now accepts 40 students per year and trains 5-10 microbiology categorical students per year. According to the Department of Pathology, 72% of graduates obtain employment in Utah and 13.8% go on to graduate education. The U of U also offers a Bachelor of Science degree for CTs, which accepts 4 students per year.

Table 18: University of Utah Graduates and Employment

Year	Total Graduates	Employed in Utah	Employed Outside Utah	Not Employed	Unknown
2000	13	6	1	6	N/A
2001	14	7	1	6	N/A
2002	12	9	1	1	1
2003	22	15	1	5	1
2004	20	18	1	1	N/A
2005	17	15	N/A	2	N/A
2006	25	19	1	3	2
Total	**123**	**89**	**6**	**24**	**4**

A cooperative MLT program between SLCC and the U of U Department of Pathology existed from 1991 – 2008. During the time period 2000-2006, 40 students graduated, with the number of graduates per year at a high of 9 in 2005 to a low of 1 in 2000. The average number of graduates per year was 6. The program is currently on inactive status with the accrediting body.

Weber State University (WSU) MT/CLS Program and MLT/CLT program
During the past seven years, WSU has graduated on average just over 21 MT/CLSs and about 25 MLT/CLTs each year. In 2006, they accepted 30 students for their MT/CLS program and 43 for their MLT/CLT program. They estimate about 30 of the 43 will earn their MT/CLS degrees. The graduates from WSU's programs will stay in Utah to work about 84% of the time. In addition to its on campus programs, the university also has an on-line program for each of these degrees with an enrollment of approximately 40 students. While a number of students in the on-line program are not in Utah, the program has trained students for rural Utah.

Table 19: Weber State University Graduates and Employment as of May 2007

Year	MLT/CLT	MT/CLS	Total Graduates	Employed in Utah	Employed Outside Utah	Not Employed	Unknown
2000	14	9	23	21	1	0	1
2001	12	10	22	19	3	0	0
2002	13	32	45	38	7	0	0
2003	24	17	41	34	7	0	0
2004	30	26	56	47	9	0	0
2005	43	23	66	56	10	0	0
2006	40	31	71	60	11	0	0
Total	**176**	**148**	**324**	**275**	**48**	**0**	**1**

Salt Lake/Tooele Applied Technology College (ATC) CLA/PLA/MA Program
Capacity for the program is 20 students, with output significantly less (5-10). The program is designed to accept individual students or multiple students. It takes about 80 hours of classroom training and some clinical experience to become certified.

Table 20outlines the overall capacity and output of Utah's clinical laboratory programs as of 2007. The table indicates that the MT/CLS and MLT/CLT programs are operating at full to nearly full capacity. Conversely, the Salt Lake/Tooele ATC CLA program operated at less than full capacity in 2007.

Table 20: Training Capacity of Utah's Schools in 2007

School	Specialty	Capacity	Output
BYU, U of U, Weber	MT/CLS	80 – 90	80
Weber	MLT/CLT	35	35
Tooele ATC	CLA	20	5-10

Representatives from the state's programs identify a number of constraints to increasing training capacity including; a shortage of clinical training sites, laboratory space constraints, shortage of faculty, lack of interest and awareness of clinical laboratory programs among students, and competition from other programs and professions. Programs will need to develop a variety of strategies in order to address these constraints.

National Training Capacity

The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) is responsible for accrediting clinical laboratory education programs in the U.S. According to the NAACLS, there are 219 accredited MT/CLS programs, 201 MLT/CLT programs, 33 HT/HTL programs, and 57 accredited phlebotomy programs nationwide.[28] In 2005 HRSA published a report on the clinical laboratory workforce [1]. Commenting on the decline in the number of educational programs, the report stated: "In 1970, there were 791 MT/CLS programs. By 2003, about 70% of these programs had closed, leaving only 240 programs in the country. The number of MLT/CLT programs (associate's degree or less) increased from 210 in 1970 to a peak of 281 in 1985; and subsequently declined to 210 in 2003." The report concluded, the reason for this decline was "Most of the closed MT/CLS programs were hospital-based. Data from NAACLS indicates that nearly 25 hospital-based programs closed each year from 1995 to 1997. The advent of prospective payment system (PPS) for hospitals, which changed their basic cost and revenue functions, is the most cited reason for the decline of hospital-based clinical laboratory training programs." Declining national training capacity likely contributes to the current clinical laboratory workforce shortage.

Retirement of Current Workforce

The UMEC Statewide Laboratory Sciences Scope of Practice Survey shows 292 (39.2%) of Utah's MT/CLSs were 50 years old or older in 2005. In some areas of the state, over 50% of the MT/CLS workforce is 50 years old or older. Histologists in Utah have a percentage rate of practitioners over 50 years old of 44.8%. As these highly skilled professionals retire, it will markedly affect Utah's laboratory workforce supply in the next decade. For other laboratory practitioners, retirement isn't as significant a factor on workforce supply because they have lower percentages in the over 50 cohort.

Table 21: Medical Technologist 50 years Old or Older by Multi-County District

Multi-County District	All MT/CLS	# 50 or Older	% 50 or Older
Bear River	24	14	58.3%
Wasatch Front	504	182	36.1%
Mountainland	64	30	46.9%
Central	14	2	14.3%
Southwest	46	28	60.9%
Uintah Basin*			
Southeast*			
Not Reported	65	34	52.3%

* Unable to report due to insufficient number of survey respondents in these districts

Attrition

For purposes of this report, attrition is defined as leaving a profession for any reason other than retirement. Within the clinical laboratory workforce, attrition is a primary factor impacting supply. A large concentration of the workforce under age 30 is a likely indication of attrition from the workforce in the older age cohorts. This phenomenon is particularly prevalent in the CLA/PLA/MA (372 or 49.5% under age 30) and PBT (249 or 48.3% under age 30) cohorts. For the MLT/CLT cohort, the percentage under age 30 is 34.6% (57). However, including the 30-34 age cohort raises the percentage to 52.8% (87).

The impact of attrition on the MLT/CLT workforce does not appear as big as on the phlebotomy and MA/CLA/PLA workforce. Likely causes for attrition among these groups include lower pay-scale and competition from other professions. Some attrition could also be attributed to "good turnover" as individuals leave these positions for more technical, better paying jobs within the profession.

Factors Influencing Demand

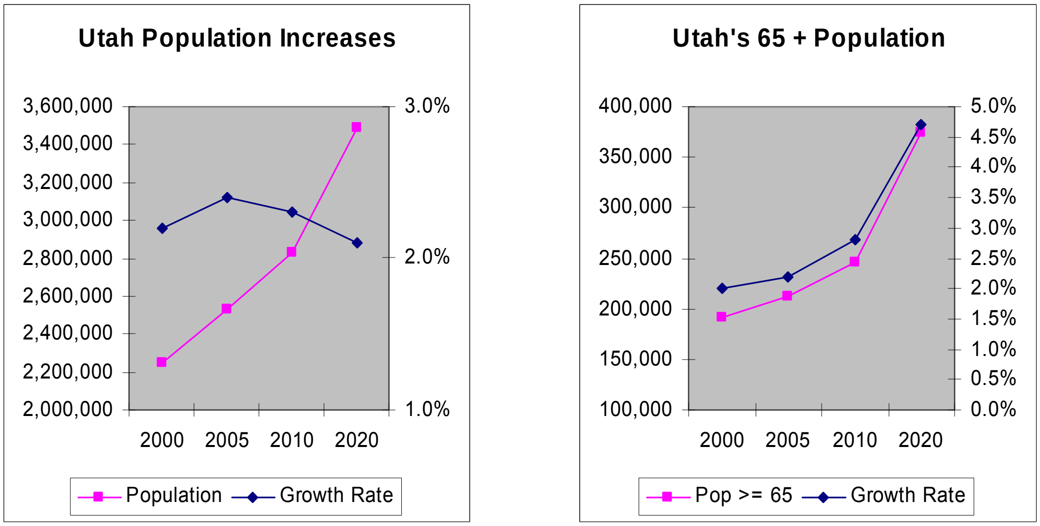
The primary factors influencing the current and future demand for clinical laboratory professionals in Utah include population growth and the state's changing demographics. It is likely that population growth in general as well as growth in certain age cohorts will be key drivers of demand for laboratory services.

Utah's Population Growth & Changing Demographics

Based on U.S. Census Bureau Official Population Estimates, Utah was the third fastest growing state in the nation from 2000-2007.[29] The Governor's Council of Economic Advisors (CEA) estimated Utah's population in 2020 will be 3,486,218 with an annual growth rate averaging 2.3% per year.

The growth in the senior population is also likely to influence the demand for laboratory tests. The age 65 and over population of Utah is projected to nearly double as it increases from 212,582 in 2005, to 374,183 in 2020, an overall increase of 76.0%, with yearly increases ranging from 2.3% to 4.5%.[30]

Figure 24: Utah's Population Increases for the General and Senior Cohorts



Two factors - office visits and hospitalizations- illustrate the impact of the expanding senior population on the demand for healthcare services. The average number of visits by Utah residents to medical caregivers is 3.4 per year. However, people age 65 and over reported 6.0 visits per year to medical care givers.[31] This is a 76.5% increase in visits for seniors over the average number of visits to healthcare providers by those 20-64 years old. Hospitalizations also show the higher utilization by seniors. For Utah residents age 20-64, 3.8% reported an overnight hospital stay, while 19.2% of seniors reported an overnight hospital stay.[31] The increased utilization of health care services by the senior population, coupled with the growth projected in the 65 and older population will result in increased demand for laboratory services through 2020.

Licensure of Clinical Laboratory Practitioners and Workforce Planning

In Utah, clinical laboratory professionals continue to debate the merits of required licensure for laboratory professionals. Proponents of licensure see it as a means to assure the quality of the workforce and to raise professional stature vis-à-vis other licensed health care providers. An ancillary benefit of licensure is that it provides a means to accurately and more easily assess the adequacy of the workforce.

Opponents to licensure believe that CLIA regulation is sufficient to assure the quality of laboratory testing. They also see licensure as a barrier to the movement of the workforce across state lines and as a possible deterrent to joining the workforce.

Licensure of the clinical laboratory workforce is a policy decision with significant implications for the workforce and the state. Licensure would establish a uniform level of competency requirements for the workforce and shift, at least in part, the burden of ensuring the laboratory workforce meets this minimum from the employers to the state. Questions regarding certification and the grandfathering in of the current workforce would need to be resolved, as would questions regarding the financial impact on individuals in the workforce, employers and the state.

Given the important policy implications associated with licensure of the clinical laboratory workforce, an in-depth study of the impact licensure has had on patient safety and other quality assurance measures in those states where licensure has been enacted is warranted. Analyzing the impact licensure has had on clinical laboratory wages and workforce mobility to the extent possible is also warranted. The results of these studies would provide empirical evidence to support a decision on the issue of licensure.

Conclusions

- A lack of national and statewide information regarding the laboratory workforce makes assessments of workforce adequacy difficult.
- Attrition among the CLA/PLA/MA, and PBT cohorts is a significant characteristic of the workforce. A large concentration of the workforce in these groups is under the age of 30. There is likely a relationship between the attrition rate and the noted lower than average wages reported for these cohorts.
- Wages that are higher than the national average, coupled with reported vacancy rates, are indicators of an existing shortage of MT/CLSs in the state.
- The older average age of MT/CLS professionals likely contributes to higher wages.
- The anticipated retirement of approximately 40% of the technologist workforce in Utah by 2015, will likely intensify the existing shortage in the state. Retirement will have a greater impact on the rural technologist workforce as nearly half (47.2%) the rural workforce was over the age of 50 in 2005 and are likely to retire by 2015.
- State population growth in general and an increasing population over the age of 65 will be key drivers of demand growth for clinical laboratory services in Utah through 2020.
- Utah's clinical laboratory training programs face a variety of constraints to expanding including: physical training space, clinical rotation sites, faculty shortages, and lack of interest or awareness from students in clinical laboratory programs.
- Licensure of the clinical laboratory workforce is a significant policy issue with safety and quality, as well as workforce implications that warrants further study and analysis.

Recommendations

- Follow-up studies of the clinical laboratory workforce, particularly the MT/CLS category, should be conducted to develop trend data and improve assessments of workforce adequacy.
- Industry should develop strategies to improve retention of the laboratory workforce. Holding a summit would be one strategy.
- Industry and the state's academic programs should work together to promote awareness of laboratory sciences among students at the junior and high school level, to promote student awareness of clinical laboratory science as a profession.
- Clinical laboratory training programs should explore innovative methods to expand training capacity and work to improve perceptions and awareness of the clinical laboratory sciences as a profession.
- The potential impact of licensure of clinical laboratory science personnel on patient safety and overall quality assurance should be assessed and quantified. The impact of licensure on, wages, and workforce mobility should also be evaluated.

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Appendix A: Sample Survey Instrument

Following is the survey instrument used to collect the 2005 Laboratory Workforce data, including those sections on specific tests performed which were not analyzed for this report.

Utah Medical Education Council

Statewide

Laboratory Sciences Scope of Practice Survey

for

Clinical Laboratory Assistants

Clinical Laboratory Scientists / Medical Technologists

Cytologists

Histologists / Histology Technicians

Medical Assistants

Medical Laboratory Technicians

Pathology Laboratory Assistants

Phlebotomy Technicians

Point of Care Testing Personnel

Specialists in Cytogenetics

Demographics and Scope of Practice Survey – Instructions

Please carefully answer each question in the section according to how often you perform the specific task within the laboratory. Use the numbering system as listed below:

Leave Blank = Never / 0 days per week
1 = Sometimes / 0 – 1 day per week
2 = Often / 2 – 3 days per week
3 = Always / 4 or more days per week

Only complete the sections that apply to the position(s) you currently hold. In the Scope of Practice section, indicate on the line provided after the heading if the group is applicable or not applicable for you.

If you work in more than one facility / position where you perform laboratory testing, complete the answers for both positions using the "1st site" and "2nd site" columns. These are designated as 1st site and 2nd site. If you work in only one facility / position doing laboratory testing, only complete the information under the 1st site heading. Please include your responsibilities for each position under its respective column.

If you perform laboratory testing that is not listed, please list both the task and frequency performed on the last page. Please make sure to respond to the demographic / background information questions at the beginning of the survey. If you have questions or concerns, please feel free to contact any of the individuals indicated on the cover letter.

After you have completed the survey, place it in the envelope provided and seal the envelope. Please make sure you mark your job classification on the outside of the envelope. This will help us ensure the validity of the data.

Your responses will be kept strictly confidential and data gathered from the survey will be presented in a manner which protects individual identity.

Thank you for your time and efforts in completing the survey.

DEMOGRAPHICS / BACKGROUND INFORMATION

1. Gender ☐ Male ☐ Female

2. What is your race/ethnicity?

   ☐ White / Caucasian ☐ Black / African American ☐ Asian
   ☐ Native American ☐ Spanish / Hispanic / Latino ☐ Asian Indian
   ☐ Alaskan Indian ☐ Pacific Islander ☐ Other

3. What year did you graduate from high school?
   ____

4. Where did you graduate from high school?

   State: ________________________ County: ___________________________

5. What is the highest academic degree that you hold?

   ☐ High School ☐ Associate ☐ Baccalaureate
   ☐ Master ☐ Doctorate ☐ Other
   ____

   Major: __________________________ Year Completed: ____________________

6. What was the population of the city or town where you were raised?

   ☐ <2500 ☐ 2500 – 9999 ☐ 10,000 – 49,999
   ☐ 50,000 – 149,999 ☐ 150,000 – 249-999 ☐ >250,000

7. Are you currently working in a Laboratory? ☐ Yes ☐ No

   If no: What industry/field do you work in
   ____

8. How many years have you worked in a laboratory?
   ____

9. What agency are you certified with? (Mark all that apply)

   ☐ ASCP ☐ NCA ☐ AMT ☐ HHS ☐ ISBT ☐ Other ☐ None

10. What certifications do you hold? (Mark all that apply)

☐ Phlebotomist ☐ MT / CLS ☐ Specialist, please specify ______________

☐ HT ☐ CT ☐ Categorical, please specify ______________

☐ DLM ☐ MLT/CLT ☐ Other: ____________________

☐ Cytogenetics ☐ None

11. When do you plan to retire?

☐ < 1 year ☐ 1 – 3 years ☐ 4 – 6 years ☐ 7 – 9 years ☐ > 10 years

12. What is your annual income related to laboratory work?

☐ <$20,000 ☐ $20,001 – $30,000 ☐ $30,001 – $40,000 ☐ $40,001 – $50,000

☐ $50,001 – $60,000 ☐ $60,001 – $70,000 ☐ $70,001 – $80,000 ☐ $80,001 – $90,000

☐ $90,001 – $100,000 ☐ >$100,000

NOTE: If you work at more than one laboratory facility, please answer the following questions for both facilities

13. What is the zip code where you work? *1st site*: ____________ 2nd *site*: ____________

14. Type of Facility

	1st site	*2nd site*
Academic	☐	☐
Blood Center	☐	☐
Environmental	☐	☐
Forensic	☐	☐
Hospital Large (>300 beds)	☐	☐
Hospital Medium (100 – 300 beds)	☐	☐
Hospital Small (<100 beds)	☐	☐
Industrial	☐	☐
Physician Office	☐	☐
Public Health	☐	☐
Reference	☐	☐
Research	☐	☐
Veterinary	☐	☐

Other________________________ ☐ ☐

What shift do you normally work each week? ________ ________

How many hours do you normally work each week? ________ ________

15. What title best represents your position? (Check one for each site)

	1st site	*2nd site*
Administrator	☐	☐
CLA / PLA / MA	☐	☐
Cytogeneticist	☐	☐
Cytologist	☐	☐
Director	☐	☐
Education Coordinator	☐	☐
Educator	☐	☐
Histologist	☐	☐
Lead Tech	☐	☐
LIS Analyst	☐	☐
Manager	☐	☐
Safety Officer	☐	☐
Supervisor	☐	☐
Point of Care Coordinator	☐	☐
Phlebotomist	☐	☐
QA or Compliance	☐	☐
Technical Specialist	☐	☐
Technician	☐	☐
Technologist	☐	☐

16. If you currently manage a laboratory, how many current open positions do you have? What is the average time to fill the empty positions?

	Open Positions	Time to fill positions (weeks)
Clinical Laboratory Assistants	____________	____________
Cytologists	____________	____________
Histotechs/Technicians	____________	____________
MTs	____________	____________
MLTS	____________	____________
Specialist in Cytogenetics	____________	____________
Pathology Laboratory Assistants	____________	____________

Phlebotomy Technicians _____________ _____________
Point of Care Testing Personnel _____________ _____________

17. Do you belong to a professional organization(s)? ☐ Yes ☐ No

    If yes, please list: ____

18. Do you participate in continuing education? ☐ Yes ☐ No
19. Do you have adequate opportunities for continuing education? ☐ Yes ☐ No

20. Does your employer reimburse for continuing education or college courses?
    ☐ Yes ☐ No

21. Does your employer reimburse or pay for professional association memberships?
    ☐ Yes ☐ No

22. What attracted you to the laboratory field? (List all that apply)

    ☐ Pay ☐ Interesting work ☐ Science base ☐ Helping profession
    ☐ Other ______________________________

23. What do you like best about your work?

    ____
    ____
    ____

24. What do you like least about your work?

    ____
    ____
    ____

25. Since there is a great need for those who work in the laboratory profession, what suggestions would you give to attract more people into the field?

    ____
    ____
    ____