

Environmental Scan  
**Health Imaging Occupations**

NORTHERN CALIFORNIA REGION

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## Introduction

The intent of this research study is to assist community colleges in understanding the current challenges related to the supply and projected demand of health imaging occupations in the Sacramento and Northern California regions. This study provides an overview of the health care industry with a specific focus on imaging occupations and potential training gaps. To gather original data for the study, the COE administered an employer survey to assess the following:

- Current occupation levels and short-term employment projections
- Level of difficulty finding qualified entry-level applicants
- Employer recruitment, hiring, and training challenges

The Northern California area includes the following counties:

Alameda	Marin	Santa Cruz
Alpine	Mendocino	Shasta
Amado	Merced	Sierra
Butte	Modoc	Siskiyou
Calaveras	Mono	Solano
Colusa	Napa	Sonoma
Contra Costa	Nevada	Stanislaus
Del Norte	Plumas	Sutter
El Dorado	Placer	Tehama
Glenn	Sacramento	Trinity
Humboldt	San Francisco	Tuolumne
Lake	San Joaquin	Yolo
Lassen	San Mateo	Yuba
Mariposa	Santa Clara	

Within Northern California, the Greater Sacramento region includes the following subset of counties: Sacramento, El Dorado, Placer, San Joaquin, Sutter, Yolo and Yuba Counties. This report provides an overview of trends in health care, industry employment estimates and projections, occupational estimates and projections, educational programs, employer challenges, and a supply and demand gap analysis.

## Industry Overview

### Factors Driving Demand

The Patient Protection and Affordable Care Act (PPACA) is expected to expand basic health care coverage to millions of Americans, increasing the demand for health care services. Enacted in 2010, PPACA is a multi-faceted bill designed to restructure the national health care system. The bill consists of reforms that will expand health care insurance to be inclusive of all American citizens and focuses on prevention and health promotion.<sup>1</sup> While some provisions of the bill become effectively immediately, the majority are scheduled to take effect in different years thru 2020.

One provision expands Medicaid coverage to all individuals under age 65 living below 133 percent of the poverty line. This provision is scheduled to take effect in 2014. However, states were given the option to participate with a reduced federal reimbursement rate: 50 percent until 2014, 100 percent between 2014 and 2016, and 90 percent thereafter. California is one of the first states to opt-in to expand and strengthen

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<sup>1</sup>American Public Health Association. The Affordable Care Act's Public Health Workforce Provisions: Opportunities and Challenges. June 2011.

Medicaid coverage for low income adults. **When fully implemented, the expansion will provide health care coverage to two million uninsured residents throughout the state.**<sup>2</sup>

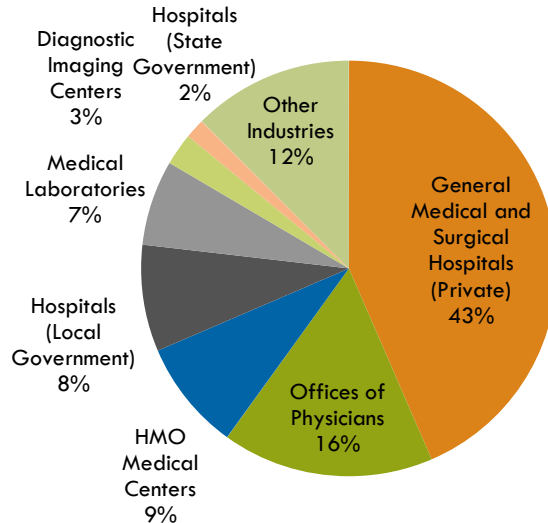
Further, the bill requires that all uninsured individuals purchase and comply with an approved private insurance policy or pay a penalty (effective 2014). Built in to the PPACA are several provisions that require insurance providers to offer the same premium rates for individuals in the same age and geographical location without regard to gender and most pre-existing conditions. **These provisions will increase the demand for health care services and result in growth of the health care workforce, including imaging occupations.**

**In addition, the growing and aging population is creating demand for expanded services.** The Northern California population is projected to grow from 13.7 million in 2012 to 14.7 million in 2022, a seven percent increase. By 2022, health care organizations in the Northern California area will need to expand their operations to serve an additional 960,600 residents.<sup>3</sup> Further the 60 years and older cohort is expected to increase from 19 percent in 2012 to 22 percent in 2022.<sup>3</sup> Since use of health care services increases with age, any increase in numbers of older population cohorts will significantly impact health care demand. Further, the aging of the health care workforce itself is expected to create staffing shortages as workers in key health care occupations become eligible for retirement.

### Industry Distribution

Private medical and surgical hospitals have the largest share of imaging jobs (43%), followed by physician offices (16%), HMO medical centers (9%) and local government hospitals (8%). Diagnostic imaging centers only employ about three percent of the total imaging workforce. Some of the employers with the most job openings include Sutter Health, Kaiser Permanent, Alliance Imaging, American Radiological Services Inc., Pacific Medical Centers, Catholic Healthcare West, and Memorial Medical Centers.<sup>4</sup>

**Exhibit 1: Jobs by Industry, Northern California<sup>5</sup>**



<sup>2</sup>KCPP, Will California Once Again Lead the Nation as Medicaid is Expanded?

<http://www.scpr.org/blogs/economy/2012/06/28/6837/will-california-once-again-lead-nation-medicaid-ex/>. Accessed October 8, 2012.

<sup>3</sup>EMSI Complete Employment and Population Demographics- 2012.3

<sup>4</sup>Burning Glass, Online Job Postings, Accessed February 20, 2013.

<sup>5</sup>EMSI Complete Employment - 2012.4

## Occupational Overview

### Occupations Selected for Study

In partnership with the Health Workforce Initiative (HWI), the COE selected seven imaging occupations to assess training needs in the Greater Sacramento region and Northern California area. The COE utilized an employer survey to assess the current and future need of the seven imaging occupations selected for study. This section of the report provides an overview of the occupations, including employment estimates and projections; wages; and education, training and certification requirements. Below is the list of seven occupations selected for study.

**Table 1: Occupations with Imaging Modalities**

Occupation Title	Definition
Computer Tomography (CT) Technologists	Produces cross-sectional x rays using a rotating x ray unit. A computer then uses these images to create a 3D image used for diagnosis.
MRI Technicians (Magnetic Resonance Imaging)	Use magnetic resonance imaging technology to see soft as well as hard tissues within the human body.
Mammography Technologists	Operates a mammography unit to produce images of the breasts for diagnostic purposes under direction of a physician.
Neurodiagnostic Technologists	Record electrical activity arising from the brain, spinal cord, and peripheral nerves using a variety of techniques and instruments.
Radiologic Technologists with Positron Emission Tomography (PET) Specialty	Inject radioactive substance into a patient's blood stream to detect cancer and examine the effects of cancer therapy.
Radiologic Technologists with Single Photon Emission Computer Tomography (SPECT) Specialty	Inject radioactive substance into a patient's blood stream and operate SPECT machine to scan a specific area of the patient's body.
Radiologic Technologists without a specific specialty	Use radiation to create images used to diagnose patients.

### Occupation Employment Outlook

In Northern California overall, there are approximately 8,600 jobs in the seven imaging modalities selected for this study. Radiologic Technologists without a specific specialty is the largest occupation with about 2,040 jobs, followed by CT Technologists (1,610 jobs), Neurodiagnostic Technologists (1,360 jobs) and MRI Technicians (1,325 jobs). Including growth and replacement needs, Neurodiagnostic Technologists is also expected to have the most job openings over the next 12 months (160 jobs), followed by Radiologic Technologists without a specific specialty (135 jobs), MRI Technicians (105 jobs) and CT Technologists (95 jobs).

In the Greater Sacramento Region, there are approximately 1,885 jobs in the seven imaging modalities. Radiologic Technologists without a specific specialty is the largest occupation with about 436 jobs, followed by CT Technologists (340 jobs), Neurodiagnostic Technologists (315 jobs) and MRI Technicians (280 jobs). MRI Technicians is expected to have the most job openings over the next 12 months (40 jobs), followed by CT Technologists (35 jobs) and Radiologic Technologists without a specific specialty (26 jobs). Over the next 12 months, Greater Sacramento employers do not anticipate the need to replace workers due to retirement or other general separations.

These employment estimates include full-time and part-time employment, but not contractors. Contract workers account for approximately five percent of the imaging workforce in Northern California and seven percent in the Greater Sacramento Region. Appendix B provides additional information on the percent of full-time, part-time and contract workers by occupation and region.

**Table 2: Occupational Outlook (12 Months), Northern California<sup>6</sup>**

	Current Jobs	12-Month Growth	Percent Growth	12-Month Repl.	Percent Repl.	Total Openings
<b>CT Technologists</b>	1,613	76	5%	19	1%	95
<b>MRI Technicians</b>	1,325	83	6%	23	2%	106
<b>Mammography Technologists</b>	1,159	57	5%	27	2%	84
<b>Neurodiagnostic Technologists</b>	1,358	93	7%	68	5%	161
<b>Radiologic Technologists with PET Specialty</b>	723	30	4%	19	3%	49
<b>Radiologic Technologists with SPECT Specialty</b>	360	4	1%	0	0%	4
<b>Radiologic Technologists without a specific specialty</b>	2,041	106	5%	30	1%	136
<b>Total</b>	8,578	449	5%	186	2%	635

**Table 3: Occupational Outlook (12 Months), Greater Sacramento Region<sup>6&7</sup>**

	Current Jobs	12-Month Growth	Percent Growth	12-Month Repl.	Percent Repl.	Total Openings
<b>CT Technologists</b>	342	15	4%	0	0%	15
<b>MRI Technicians</b>	283	17	6%	0	0%	17
<b>Mammography Technologists</b>	247	9	4%	0	0%	9
<b>Neurodiagnostic Technologists</b>	315	13	4%	6	2%	19
<b>Radiologic Technologists with PET Specialty</b>	154	5	3%	2	2%	7
<b>Radiologic Technologists with SPECT Specialty</b>	77	2	3%	1	2%	3
<b>Radiologic Technologists without a specific specialty</b>	436	9	2%	0	0%	9
<b>Total</b>	1,855	70	4%	9	1%	79

<sup>6</sup>COE Health Imaging Survey, December 2012<sup>7</sup>COE health care occupations survey data was utilized to calculate the growth rate and replacement rate; Due to a small sample size, EMSI growth rates and replacement rates replaced the survey data for the following occupations: Neurodiagnostic Technologists, Radiologic Technologists with PET Specialty, and Radiologic Technologists with SPECT Specialty.

## Wages

Imaging workers earn above average wages ranging from \$31 per hour for new hires with less than one year of experience (entry-level) to \$42 per hour for workers with three years on the job (experienced).<sup>8&9</sup> Radiologic Technologists with SPECT specialty are the highest paid occupation with \$34 per hour for new hires and \$42 per hour for experienced workers.

**Table 3: Entry-Level and Experience Average Hourly Wages, Northern California<sup>10</sup>**

	Entry-Level Average Hourly Wage	Experienced Average Hourly Wage
CT Technologists	\$33	\$39
MRI Technicians	\$34	\$41
Mammography Technologists	\$33	\$39
Neurodiagnostic Technologists	\$33	\$37
Radiologic Technologists with PET specialty	\$34	\$41
Radiologic Technologists with SPECT specialty	\$34	\$42
Radiologic Technologists (no specialty)	\$31	\$37

## Education, Training & Certification

The following table displays the education, training and certification requirements for the seven imaging occupations included in this study. To work in the health imaging field, Radiologic Technologists must obtain a diagnostic radiologic technology certificate from the California Department of Public Health, Radiologic health Branch (CDPH-RHB). Applicants for the state licensing/certificate may either (1) obtain a Registered Technologist Certificate in Radiography by the American Registry of Radiologic Technologists (ARRT) or (2) take and pass an examination administered by CHPH-RHB.

MRI, mammography, PET and SPECT are specialties within the radiologic technology field. To work in one of these modalities, there are three career pathways:

- (1) Associate degree in Radiologic Technology plus on-the-job training or an employer-sponsored training program provided post-employment.
- (2) Associate degree in Radiologic Technology plus additional training in the specialty area prior to obtaining employment.
- (3) Associate degree in Radiological Science with a specific imaging modality, accredited by an agency approved by the California Department of Public Health, Radiologic Health Branch, prior to obtaining employment.

In addition, many employers value national credentialing to verify expertise in a specific modality. Recognized as the nation's largest credentialing organization, ARRT offers tests and certificates for CT, MRI, and Mammography Technologists as well as other modalities.

Neurodiagnostic Technologists must obtain an Associate Degree in Electro-Neurodiagnostic Technology. Although state licensing is not required, Neurodiagnostic Technologists may obtain a national credential through the American Board of Registration of EEG & EP Technologists; American Association of Electrodiagnostic Techs [AAET]; and/or Board of Registered Polysomnographic Technologists [BRPT].

<sup>8</sup>Hourly earnings across all occupations in Northern California is \$15.78 at the 10th percentile and \$23.32 at the 50% percentile. EMSI Complete Employment - 2012.4

<sup>9</sup>Due to a low response rate, wage data for the Greater Sacramento Region is not available.

<sup>10</sup>COE Health Imaging Survey, December 2012



**Table 4: Imaging Occupations Education, Training & Certification Requirements<sup>11,12,13,&14</sup>**

<b>Occupation Title</b>	<b>Education, Licensing &amp; Certification</b>
Computer Tomography (CT) Technologists	<ol style="list-style-type: none"> <li>1. Associate degree in diagnostic radiologic technology.</li> <li>2. Additional training in CT.</li> <li>3. ARRT Primary Certification in Radiography.*</li> <li>4. ARRT Post-Primary Certification in Computer Tomography (voluntary)</li> <li>5. Diagnostic Radiologic Technology Certificate from the California Department of Public Health, Radiologic health Branch (CDPH-RHB).</li> </ol>
MRI Technicians (Magnetic Resonance Imaging)	<ol style="list-style-type: none"> <li>1. Associate degree in diagnostic radiologic technology.</li> <li>2. Additional training in MRI.</li> <li>3. ARRT Primary or Post-Primary Certification in MRI (voluntary)</li> <li>4. ARRT Registered Technologist (R.T.) Certification in Radiography.*</li> <li>5. Diagnostic Radiologic Technology Certificate from the CDPH-RHB.</li> </ol>
Mammography Technologists	<ol style="list-style-type: none"> <li>1. Associate degree in diagnostic radiologic technology.</li> <li>2. Additional training in Mammography.</li> <li>3. ARRT Post-Primary Certification in Mammography (voluntary)</li> <li>4. ARRT Registered Technologist (R.T.) Certification in Radiography.*</li> <li>5. Diagnostic Radiologic Technology Certificate from the CDPH-RHB.</li> </ol>
Neurodiagnostic Technologists	<ol style="list-style-type: none"> <li>1. Associate degree in Electro-Neurodiagnostic Technology.</li> <li>2. National credential from American Board of Registration of EEG &amp; EP Technologists; American Association of Electrodiagnostic Techs [AAET]; or Board of Registered Polysomnographic Technologists [BRPT]. (voluntary)</li> </ol>
Radiologic Technologists with Positron Emission Tomography (PET) Specialty	<ol style="list-style-type: none"> <li>1. Same requirements listed for Radiologic Technologists without a specific specialty.</li> <li>2. Additional training in PET.</li> </ol>
Radiologic Technologists with Single Photon Emission Computer Tomography (SPECT) Specialty	<ol style="list-style-type: none"> <li>1. Same requirements listed for Radiologic Technologists without a specific specialty.</li> <li>3. Additional training in SPECT.</li> </ol>
Radiologic Technologists without a specific specialty	<ol style="list-style-type: none"> <li>3. Associate degree or certificate in diagnostic radiologic technology. Education institution must be approved by the CDPH-RHB and a mechanism acceptable to ARRT.</li> <li>4. ARRT Registered Technologist (R.T.) Certification in Radiography or Radiation Therapy.*</li> <li>5. Diagnostic Radiologic Technology Certificate from the CDPH-RHB.</li> </ol>

\*Applicants for the state licensing/certificate may either (1) obtain ARRT certification or (2) take and pass an examination administered by CHPH-RHB.

<sup>11</sup>American Registry of Radiologic Technologists (<https://www.arrt.org/>. Accessed 2/21/2013.

<sup>12</sup>California Department of Public Health, Radiologic health Branch.[www.cdph.ca.gov](http://www.cdph.ca.gov). Accessed 2/21/2013.

<sup>13</sup>ASET, The Neurodiagnostic Society, [www.aset.org](http://www.aset.org). Accessed 2/21/2013.

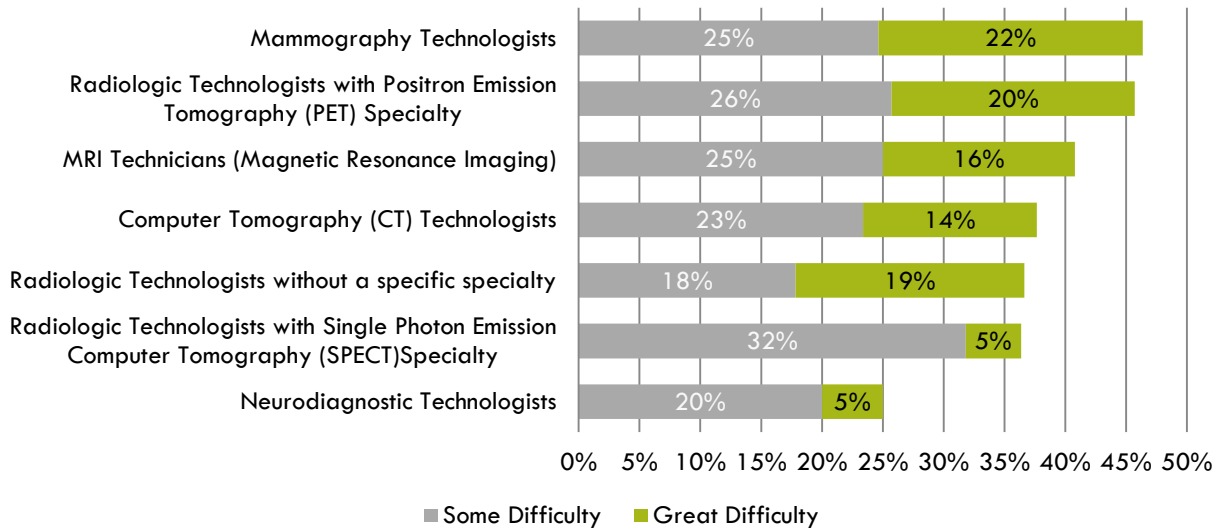
<sup>14</sup>Health Workforce Initiative, [ca-hwi.org](http://ca-hwi.org). Accessed 2/21/2013.

## Employer Needs and Challenges

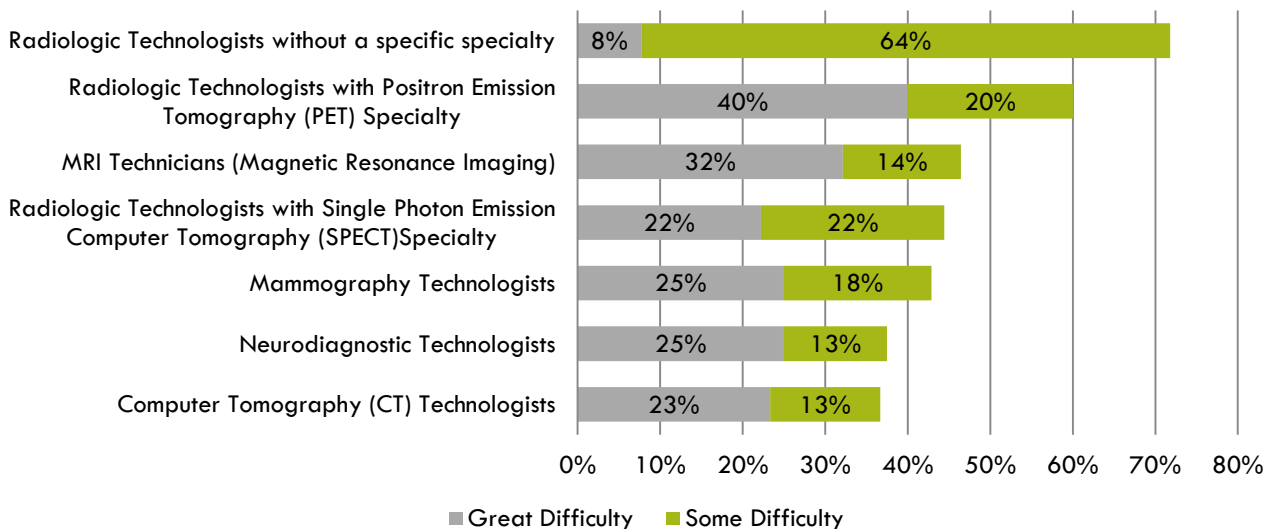
### Level of Difficulty Finding Quality Applicants

Between 25 and 47 percent of Northern California employers reported difficulty finding qualified entry-level imaging workers. As shown below, Northern California employers reported the most difficulty finding Mammography Technologists (47%), followed by Radiologic Technologists with PET specialty (46%) and MRI Technicians (41%). The cluster of employers in the Greater Sacramento Region reported a higher level of difficulty finding entry-level applicants for Radiologic Technologists without a specialty (72%), Radiologic Technologists with PET specialty (60%) and MRI Technicians (46%).

**Exhibit 2: Level of Difficulty Finding Qualified Entry-Level Applicants, Northern California<sup>15</sup>**



**Exhibit 3: Level of Difficulty Finding Qualified Entry-Level Applicants, Greater Sacramento<sup>15</sup>**



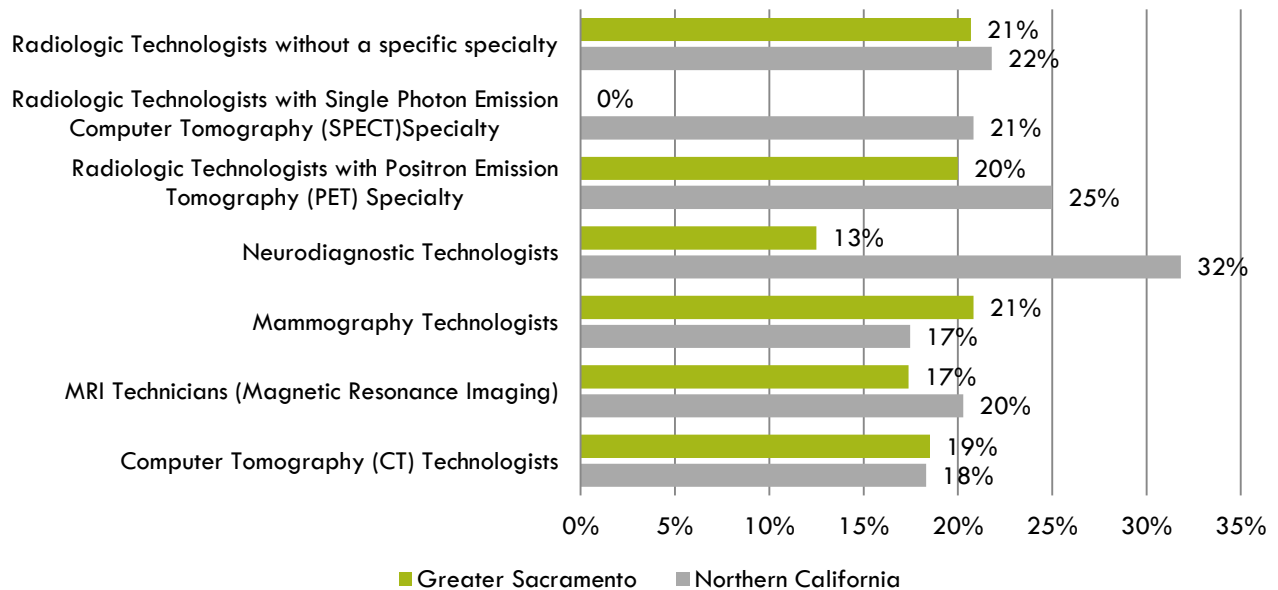
<sup>15</sup>COE Health Imaging Survey, December 2012

### Recruitment Trends

In Northern California, the majority of organizations do not need to recruit workers from outside the area in which their organization is located. As shown in Exhibit 4, Northern California employers recruited Neurodiagnostic Technologists from outside of their county more often than any other imaging occupation. Thirty-two percent of these organizations reported recruiting all, most, or half of Neurodiagnostic Technologists from outside the county in which they are located. The cluster of employers in the Greater Sacramento region reported less challenge in finding Neurodiagnostic Technologists within the region than Northern California employers overall.

Employers in Northern California and the Greater Sacramento region also reported a significant difference in recruiting practices for Radiologic Technologists with SPECT specialty. One-fifth of employers in Northern California, mostly in the Bay Area, reported recruiting all, most or half of Radiologic Technologists with SPECT specialty from outside their county; while no employers reported this practice in the Sacramento region. This may be due to the close proximity of counties within the Bay Area and the relative ease of commuting.

**Exhibit 4: Percent Recruited from Outside the County in which Organization is Located<sup>16</sup>**



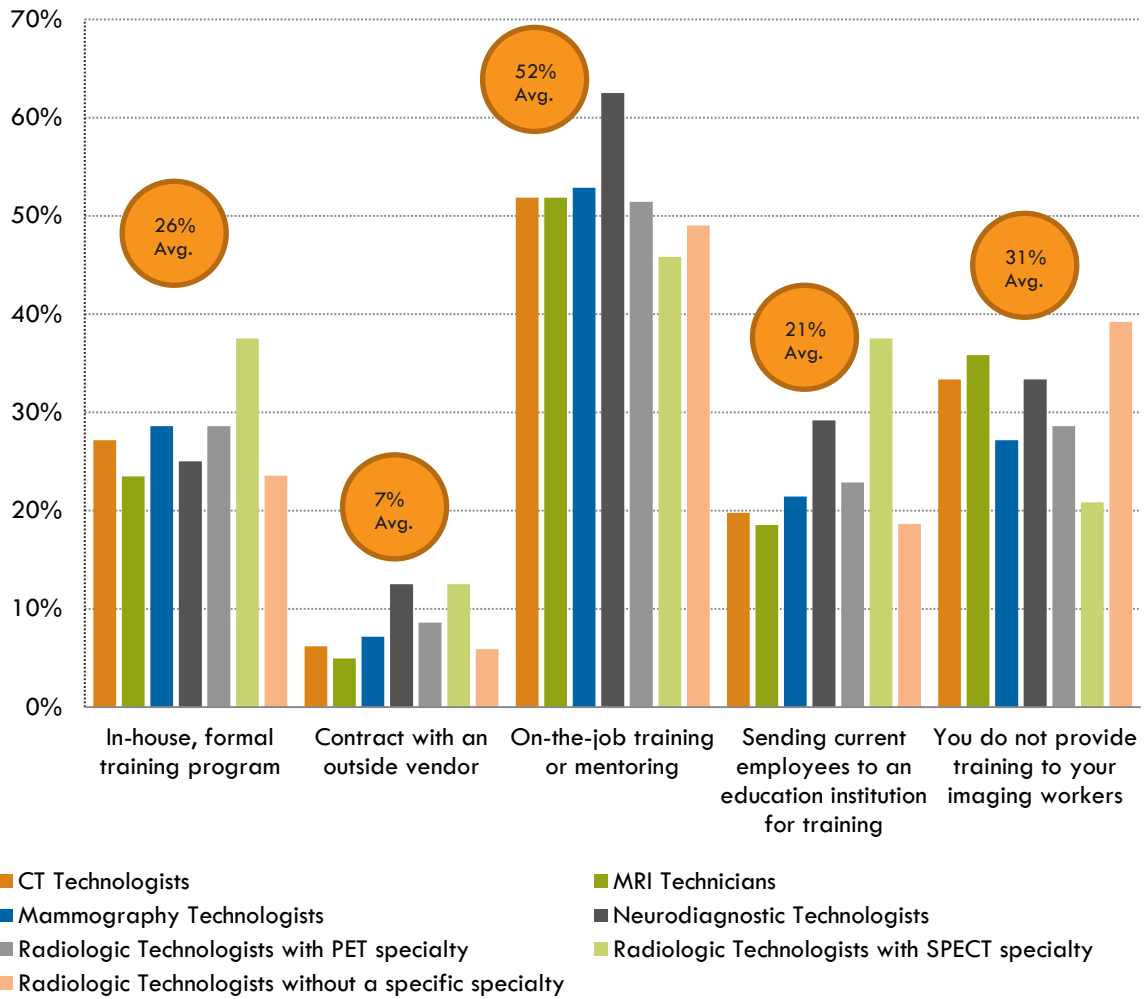
### Training Trends

Exhibit 5 displays the training methods utilized by employers in Northern California. The most common training method is on-the-job training (52%), followed by in-house formal training programs (26%), and sending employees to an education institution for training (21%). Thirty-one percent reported that they do not provide training for their current imaging workers, expecting that they enter the workforce with the appropriate background and know-how. The training trends in Northern California are similar to those in the Greater Sacramento region. Appendix C provides additional detail about training in the Greater Sacramento region.

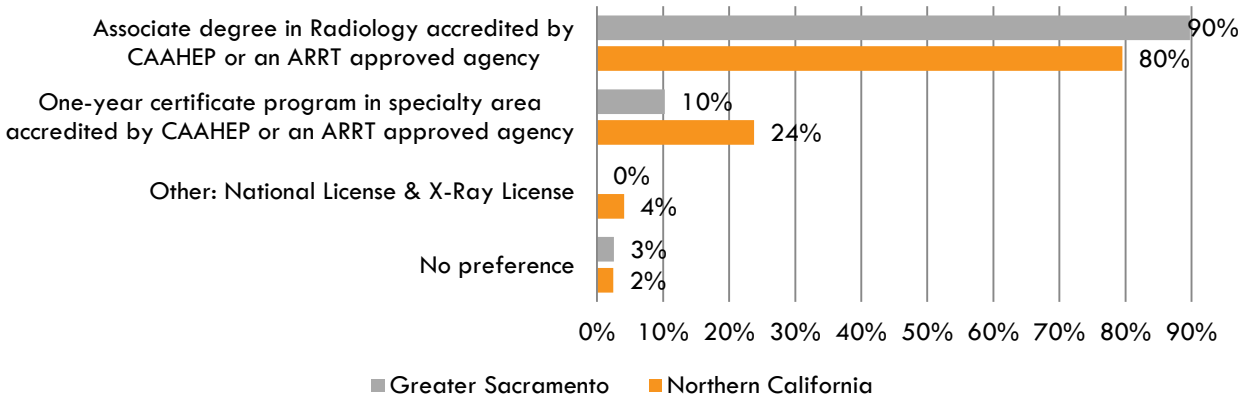
The majority of employers in Northern California and Greater Sacramento only hire imaging applicants if they have an Associate degree in Radiology accredited by CAAHEP or an ARRT approved agency. In addition, one-quarter of employers in Northern California and 10 percent in Greater Sacramento require applicants to have obtained a one-year certificate program in specialty area in which they are applying. Neurodiagnostic Technologists are required to have an Associate degree to qualify for open positions.

<sup>16</sup>COE Health Imaging Survey, December 2012

**Exhibit 5: Training Methods for the Current Imaging Workforce, Northern California<sup>17&18</sup>**



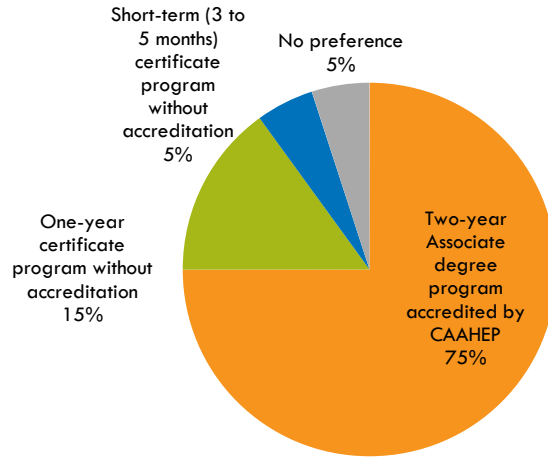
**Exhibit 6: Training Requirements for Entry-Level Imaging Occupations (excl. Neurodiagnostic Techs)<sup>17&18</sup>**



<sup>17</sup>COE Health Imaging Survey, December 2012

<sup>18</sup>Sum of responses will exceed 100 percent as multiple answers were allowed for this survey question.

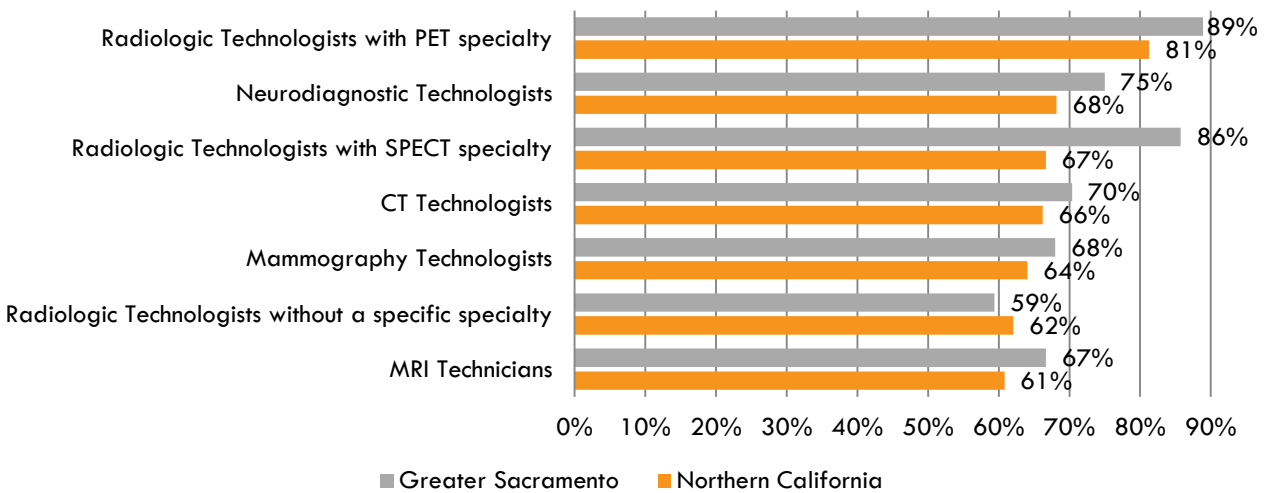
**Exhibit 7: Training Requirements for Entry-Level Neurodiagnostic Technologists, Northern California<sup>19</sup>**



The majority of employers in Northern California and the Greater Sacramento region expressed interest for the development of local, community college training programs for all seven imaging occupations. In Northern California, employers expressed the highest level of interest for a PET specialty training program (81%), followed by Neurodiagnostic Technologists (68%), SPECT (67%) and CT Technology (66%). In the Greater Sacramento region, employers expressed the highest level of interest for a PET specialty training program (89%), followed by SPECT (86%), and Neurodiagnostic Technologists.

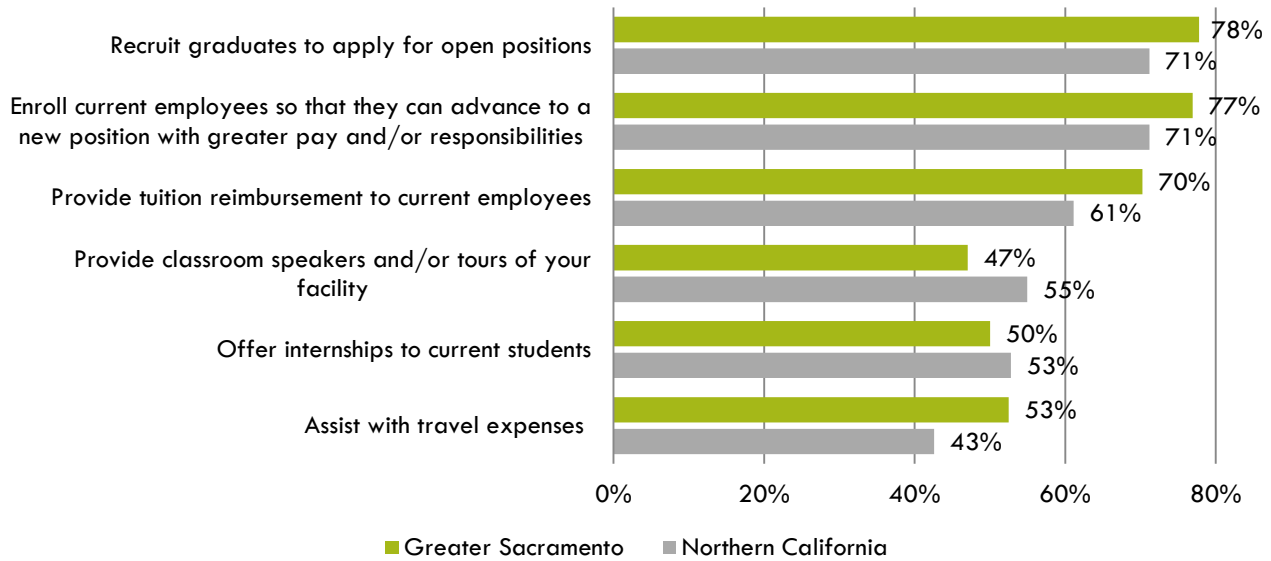
If a community college in Northern California offered a new imaging program, many employers would be either somewhat or very likely to invest or participate in activities that would support its success. Between 61 and 78 percent of the employers surveyed expressed willingness to (1) recruit graduates to apply for open positions; (2) enroll current employees so that they can advance to a new position with greater pay and/or responsibilities; and (3) provide tuition reimbursement to current employees. Half of the employers surveyed expressed willingness to provide internships to current students.

**Exhibit 8: Interest in Community College Training Programs<sup>19</sup>**



<sup>19</sup>COE Health Imaging Survey, December 2012

**Exhibit 9: Willingness to Invest or Participate in Community College Training Programs<sup>19</sup>**



**Regional Training Programs**

In Northern California, 11 community colleges offer training programs in radiologic technology, and no training programs for radiologic modalities (such as CT, SPECT, etc.) or neurodiagnostic technology. In the Sacramento Region, Yuba College and San Joaquin Delta College offer degree programs in Radiologic Technology.

Outside of the community college system, Gurnick Academy of Medical Arts located in the Bay Area, is the only private education institution with an ARRT-recognized Radiologic Technology training program. Gurnick Academy of Medical Arts and the Institute of Medical Education also offer MRI technology training programs.

**Table 4: Community College Training Programs<sup>20&21</sup>**

College	Program/Degree
Cabrillo College	Radiologic Technology, Associate Degree & Certificate
Canada College	Radiologic Technology, Associate Degree
Chaffey College	Radiologic Technology, Associate Degree & Certificate
Contra Costa College (in partnership with Kaiser Permanente)	Radiologic Technology, Associate Degree
Foothill College	Radiologic Technology, Associate Degree (Distance Education)
Merced College	Radiologic Technology, Associate Degree & Certificate
Merritt College	Radiologic Technology, Associate Degree & Certificate
City College of San Francisco	Radiologic Technology, Associate Degree
San Joaquin Delta College	Radiologic Technology, Associate Degree & Certificate
Santa Rosa College	Radiologic Technology, Associate Degree & Certificate
Yuba College	Radiologic Technology, Associate Degree & Certificate

<sup>20</sup>Health Workforce Initiative, ca-hwi.org. Accessed 2/21/2013.

<sup>21</sup>EMSI.

## Supply-Demand Gap Analysis

Table 5 provides an estimate of the gap between the supply of newly trained workers and the projected number of job openings in the next 12 months. The total number of degrees and certificates awarded is an estimate based on data provided by the California Community College Chancellor's Office Data Mart and Economic Modeling Specialists Education Attainment Report.

The total job openings in the next 12 months include growth and replacement estimates. Because replacement estimates include turnover within the industry, the difference between the supply and demand does not reflect an exact shortage or oversupply. In addition, migration data is not available. Though there are several data limitations to supply and demand analysis, it does provide a starting point to assess potential training challenges. Based on the available information, there is a projected shortage of Radiologic Technologists with specialties (CT, MRI, Mammography, PET, and SPECT) as well as Neurodiagnostic Technologists.

The data indicates an oversupply of Radiologic Technologists without a specific specialty. However, because graduates of radiologic technology programs may find employment in a specialty area without additional education, the oversupply in the supply-demand gap analysis is overstated. After accounting for variation in graduate placements, there is insufficient evidence to suggest an oversupply. Rather, the oversupply of Radiological Technologists is helping to meet the demand in the other specialty areas.

**Table 5: Health Occupations Gap Analysis, Northern California and Greater Sacramento<sup>22</sup>**

	Northern California			Greater Sacramento		
	Annual Openings	Annual Completes	Training Gap	Annual Openings	Annual Completes	Training Gap
Computer Tomography (CT) Technologists	95	0	95	15	0	15
MRI Technicians (Magnetic Resonance Imaging)	106	4	102	17	0	17
Mammography Technologists	83	0	83	9	0	9
Neurodiagnostic Technologists	161	0	161	19	0	19
Radiologic Technologists with Positron Emission Tomography (PET) Specialty	49	0	49	7	0	7
Radiologic Technologists with Single Photon Emission Computer Tomography (SPECT) Specialty	4	0	4	3	0	3
Radiologic Technologists without a specific specialty	136	330	-194	9	20	-11

<sup>22</sup>Annual Openings, COE Survey Data; Annual Degrees Conferred, CCCCCO Data Mart, Accessed 2/22/2013 & ESMI Education Attainment Data. Private education institution data is included in the annual completes estimate. Annual completes estimate is based on five years of historic data.

## Conclusion and Recommendations

Health care is one of the fastest growing industries in Northern California. Over the next few years, the industry is expected to add thousands of workers to meet demand created by the Patient Protection and Affordable Care Act, a growing and aging population, and an aging workforce. Within the healthcare sector, diagnostic imaging is a growing field that requires specialized training and education. This study assesses the employment demand and training challenges of seven in-demand imaging occupations/technologies:

- Computer Tomography (CT) Technologists
- MRI Technicians (Magnetic Resonance Imaging)
- Mammography Technologists
- Neurodiagnostic Technologists
- Radiologic Technologists with Positron Emission Tomography (PET) Specialty
- Radiologic Technologists with Single Photon Emission Computer Tomography (SPECT) Specialty
- Radiologic Technologists without a specific specialty

MRI, mammography, PET and SPECT are specialties within the radiologic technology field. To work in one of these modalities, there are three career pathways:

1. Associate degree in Radiologic Technology plus on-the-job training or an employer-sponsored training program provided post-employment.
2. Associate degree in Radiologic Technology plus additional training in the specialty area prior to obtaining employment.
3. Associate degree in Radiological Science with a specific imaging modality, accredited by an agency approved by the California Department of Public Health, Radiologic Health Branch, prior to obtaining employment.

The latter two pathways are uncommon as there is not a single community college that offers training related to a specific imaging specialty in Northern California. Nor is there a college that offers a training program in neurodiagnostic technology. However, there are 11 community colleges that offer training programs in radiologic technology; two of these colleges are in the Greater Sacramento region.

All seven of the imaging occupations are projected to grow between one and seven percent over the next 12 months, adding a total of 450 new jobs: 355 for radiologic technologists and related positions and 95 for neurodiagnostic technology positions. With replacements, the total number of job openings is 635: 475 for radiologic technologists and related positions and 160 for neurodiagnostic technology positions.

Based on the number of job openings and average degrees conferred, there is a projected shortage for all of the positions except Radiologic Technologists without specialties. However, because graduates of radiologic technology programs may find employment in specialty areas without additional education, the oversupply in the supply-demand gap analysis is overstated. After accounting for variation in graduate placements, there is insufficient evidence to suggest an oversupply. To eliminate the training gap for the specialty imaging occupations, the Center of Excellence recommends that Northern California Community Colleges consider the following:

- Develop a distance education program in neurodiagnostic technology to serve the entire Northern California Region; and,
- Add short-term certificate programs to prep students for specific modalities (CT, Mammography, MRI, PET, or SPECT); and/or
- Expand Radiologic Technology programs with additional courses in CT, Mammography, MRI, PET, or SPECT to prepare students for these specialties.

By adding these needed programs, community colleges will play an important role in preparing the future health care workforce.



## Appendix A: How to Utilize this Report

This report is designed to provide current industry data to:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development;
- Promote a future-oriented and market responsive way of thinking among stakeholders; and,
- Assist faculty, Economic Development and CTE administrators, and Community and Contract Education programs in connecting with industry partners.

The information in this report has been validated by employers and also includes a listing of what programs are already being offered by colleges to address those workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

### About the Centers of Excellence

The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts. More information about the Centers of Excellence is available at [www.coecc.net](http://www.coecc.net).

### About the Health Workforce Initiative

The purpose of the Health Workforce Initiative is to provide education and training programs to meet emerging demands for health care industry workers; to determine needs, facilitate development of innovative solutions and to locate resources to implement planned responses; to evaluate and initialize health-related educational programs. More information about the Health Workforce Initiative is available at [www.ca-hwi.org](http://www.ca-hwi.org).

### Sponsors

This research study was supported by Economic and Workforce Development funds awarded to Butte Community College by the California Community Colleges Chancellor's Office (grant agreements: 12-161-001 and 12-342-008), and Perkins Career and Technical Education funds awarded to Los Rios Community College District (grant agreement: 12-C01-028).

### Important Disclaimer

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, Health Workforce Initiative, COE host District, HWI host District, nor the California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

## Appendix B: 2012 Jobs by Employment Type

The following tables provide a breakdown of imaging jobs, including part-time, full-time and contract employment in Northern California and the Greater Sacramento Region. There are about 960 contract positions in Northern California (5% of the total) and 305 positions in the Greater Sacramento region (7% of the total).

**Table B1: 2012 Jobs by Employment Type, Northern California**

	Part-time Employees	PT Percent of Total	Full-time Employees	FT Percent of Total	Contractors	CT Percent of Total	Total Jobs*
CT Technologists	216	13%	1,397	83%	72	4%	1,685
MRI Technicians	208	15%	1,117	81%	53	4%	1,378
Mammography Technologists	205	17%	955	78%	64	5%	1,224
Neurodiagnostic Technologists	187	14%	1,171	85%	17	1%	1,375
Radiologic Technologists with PET Specialty	45	6%	678	91%	19	3%	742
Radiologic Technologists with SPECT Specialty	53	14%	307	80%	23	6%	383
Radiologic Technologists without a specific specialty	386	17%	1,655	74%	204	9%	2,246
Total	1,300		7,280		452		9,032

\* Please note: this total job estimate includes contractors. The employment estimate in the body of the report includes regular part-time and full-time employment and excludes contractors.

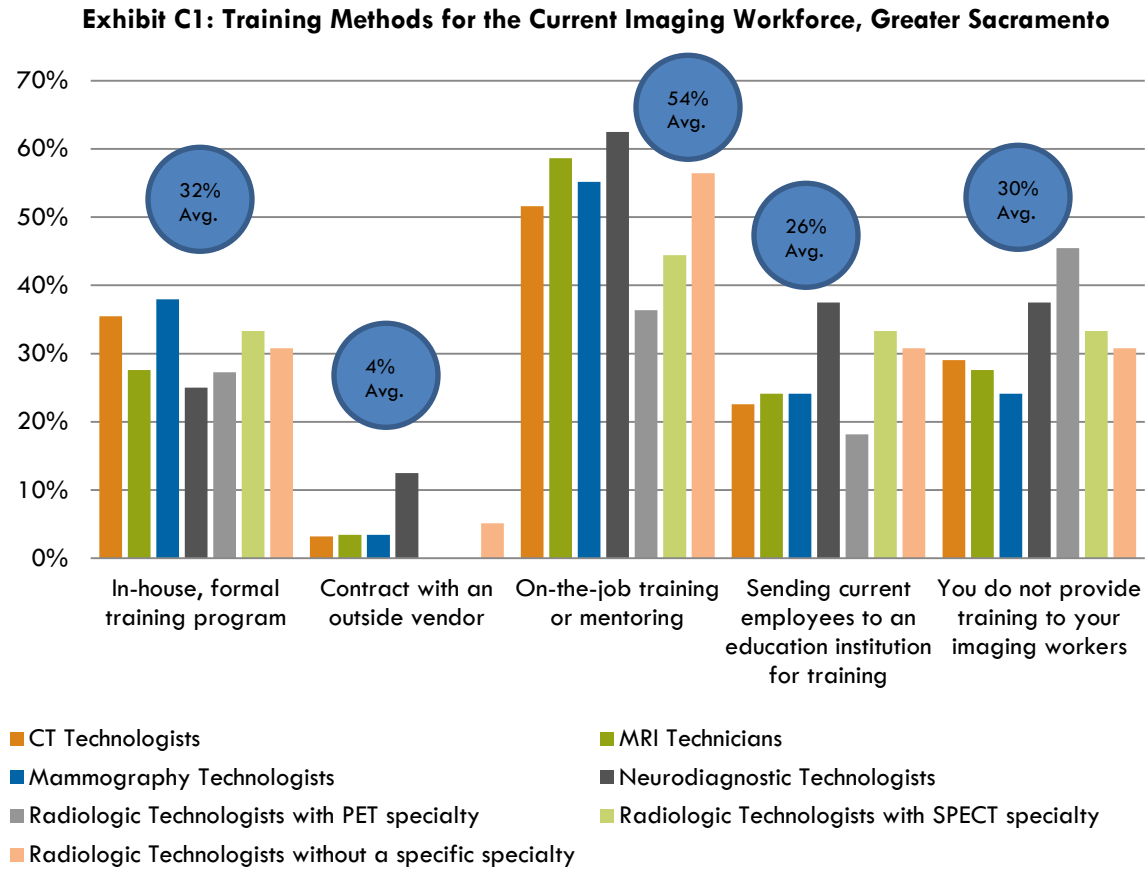
**Table B2: 2012 Jobs by Employment Type, Greater Sacramento Region**

	Part-time Employees	PT Percent of Total	Full-time Employees	FT Percent of Total	Contractors	CT Percent of Total	Total Jobs*
CT Technologists	35	10%	307	83%	27	7%	369
MRI Technicians	28	9%	255	86%	13	4%	296
Mammography Technologists	38	15%	208	82%	7	3%	253
Neurodiagnostic Technologists	77	25%	238	75%	0	0%	315
Radiologic Technologists with PET Specialty	7	4%	147	91%	7	4%	161
Radiologic Technologists with SPECT Specialty	17	20%	60	70%	9	11%	87
Radiologic Technologists without a specific specialty	87	18%	349	71%	55	11%	491
Total	291		1,563		118		1,973

\* Please note: this total job estimate includes contractors. The employment estimate in the body of the report includes regular part-time and full-time employment and excludes contractors.

### Appendix C: Training Methods for Current Imaging Workers, Greater Sacramento

The following exhibit displays the training methods utilized by employers in the Greater Sacramento region. The most common training method is on-the-job training, followed by in-house formal training programs, and sending employees to an education institution for training. Thirty percent reported that they do not provide training for their current imaging workers, expecting that they enter the workforce with the appropriate background and knowledge.



## Appendix D: Survey Methodology

### Methodology

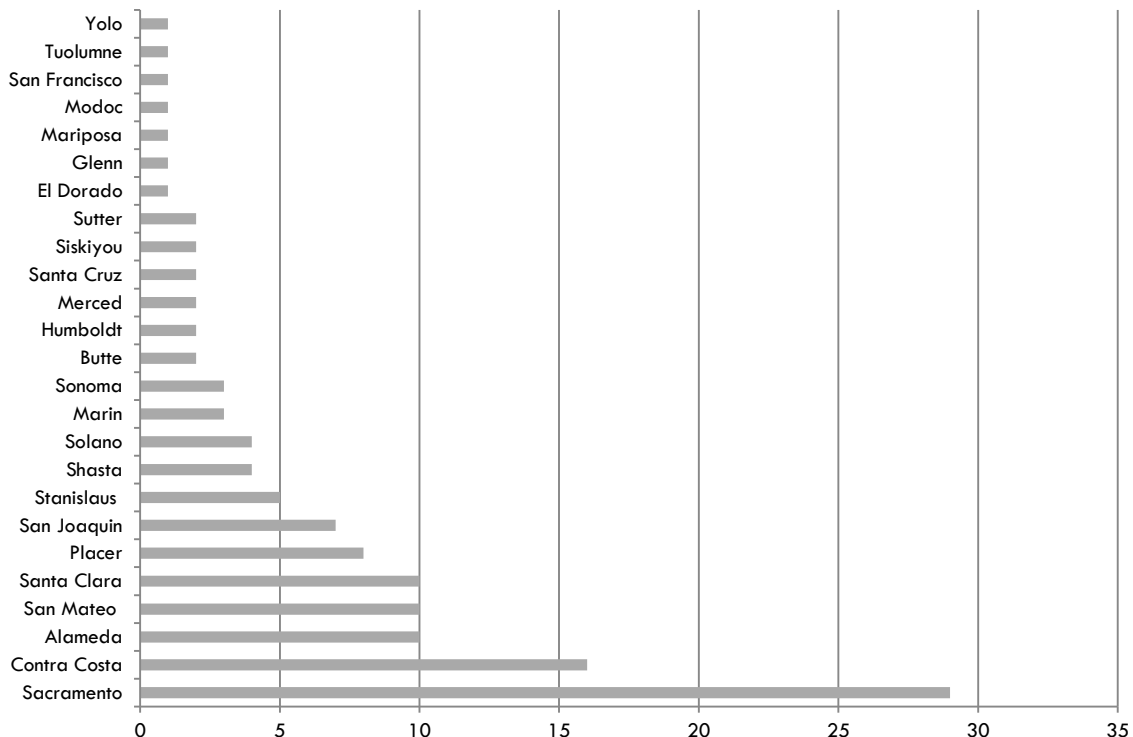
The table below briefly outlines the methodology for this project. The COE conducted a telephone survey of 128 health care employers throughout Northern California. The employer population includes employers from health care sub-sectors that employ the majority of imaging workers: Offices of Physicians (except Mental Health Specialists); Medical Laboratories; Diagnostic Imaging Centers; General Medical and Surgical Hospitals; HMO Medical Centers; and State and Local Government Hospitals.

### Survey Methodology

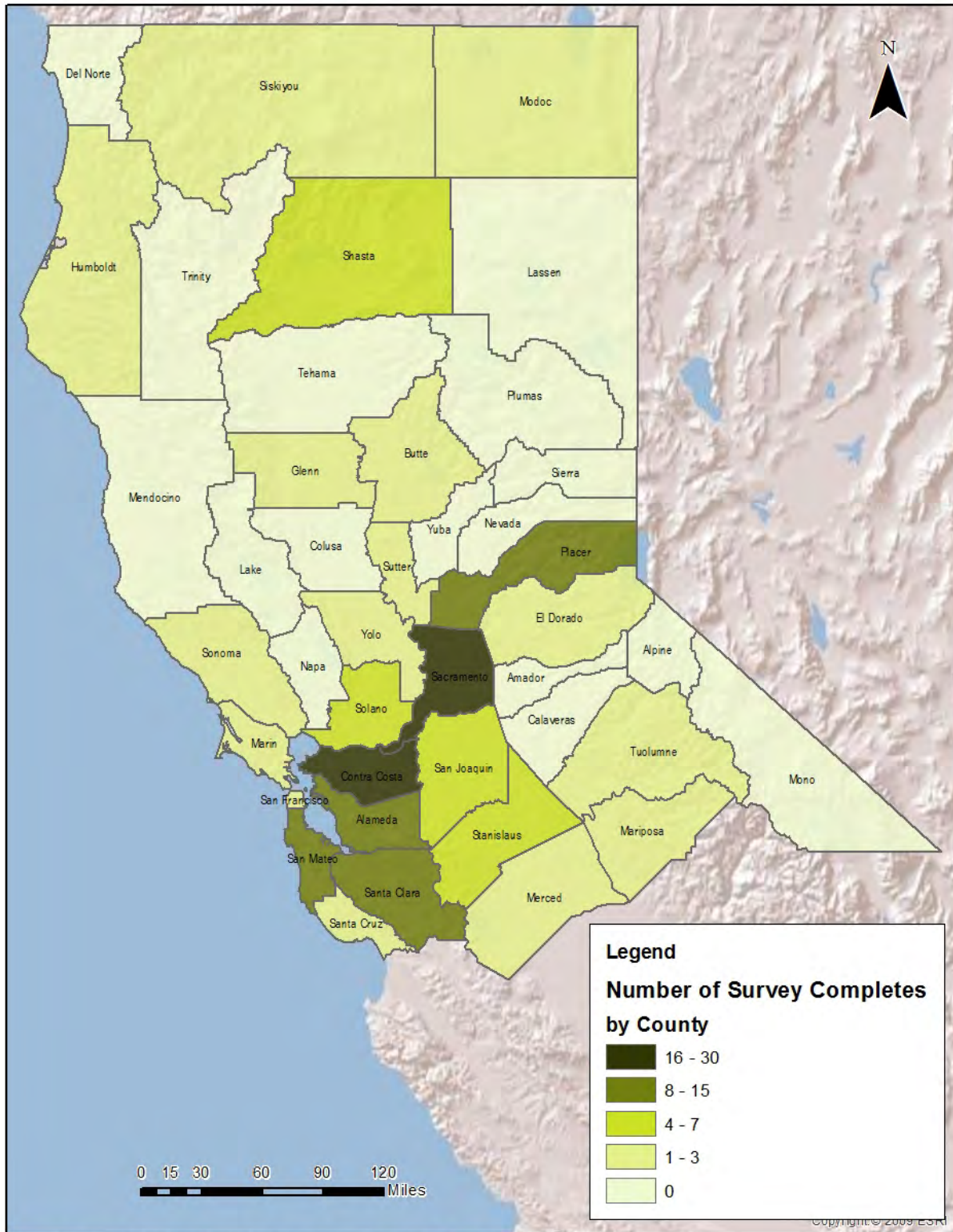
Technique	Telephone survey of health care employers
Population	996 employers (232 Greater Sacramento)
Number of Respondents	128 Responses (48 Greater Sacramento)
Field Dates	December 2012

### Response by County

The survey targeted healthcare employers in Northern California counties: Alameda, Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Mariposa, Marin, Mendocino, Merced, Modoc, Mono, Napa, Nevada, Plumas, Placer, Sacramento, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tuolumne, Yolo and Yuba. The most responses were collected from employers in Sacramento County, followed by Contra Costa, and Alameda counties.



**Map 1: Survey Completes by County**



Sources: Center of Excellence, California Community Colleges. Software and data provided by ESRI.