ENROLLMENT SNAPSHOT OF RADIOGRAPHY, RADIATION THERAPY AND NUCLEAR MEDICINE PROGRAMS

FALL 2005

A Nationwide Survey of Program Directors
Conducted by
The American Society of Radiologic Technologists

Reported January 2006

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In late September and October 2005, a hard copy questionnaire and/or an invitation to complete an online version was sent via e-mail and/or UPSP to the 950 radiography, radiation therapy and nuclear medicine programs listed by the American Registry of Radiologic Technologists. As of Dec. 1, 2005, the return rate was 616 of 950 questionnaires, which represented an overall return of 65 percent. This included 295 (48 percent) program directors who chose to respond by e-mail or online at the ASRT Web site, and the remaining 321 (52 percent) who chose to mail their surveys to the ASRT. Furthermore, 475 of 715 (66 percent) radiography programs, 72 of 113 (64 percent) radiation therapy programs, 70 of 122 (57 percent) nuclear medicine technology programs, and 15 other/unspecified programs responded to the survey.

Summary of Data:

Of the 180 certificate-only programs, 76 (42 percent) indicated that they have an articulation agreement with a community college.

Entering-class radiography, radiation therapy and nuclear medicine enrollment increases noted in the 2003 and 2004 enrollment snapshot were repeated from 2003 to 2005. Information from program directors of almost two-thirds of ARRT-listed educational programs in these specialties estimates fall 2005 first-year enrollments at 16,475 radiography students, 1,382 radiation therapy students and 1,698 nuclear medicine technology students. However, percentage-increase figures were lower than in previous years, with estimated total entering-class enrollment in nuclear medicine programs decreasing by one student from 2004 to 2005.

Overall, 76.7 percent of program directors reported full enrollment in fall 2005 compared to 77.5 percent of program directors who reported full enrollments in fall 2004, about 75 percent in fall 2003, around 66 percent in fall 2002 and 50 percent in fall 2001.

The rate at which directors of programs at full enrollment reported turning away qualified students projects to an unmet national demand of about 31,797 students, while programs not at full enrollment reported unused capacity totaling only 1,419 students. About 12.2 percent of radiography program directors, 12.5 percent of radiation therapy program directors and 18.8 percent of nuclear medicine program directors reported that they plan to increase enrollments.

When asked to rank six factors that limit enrollments, the number and staffing levels of clinical sites emerged as the most important limiting factor, with space and faculty availability as the next most important. Next followed funding, then equipment and qualified applicants.

About 67 percent of the program directors indicated they had difficulty recruiting new faculty for their programs. Overall, salary was the most frequently cited obstacle to recruiting new faculty, followed by degree requirements and availability of interested applicants.

BACKGROUND AND OBJECTIVES

This is the fifth in a series of annual reports from the ASRT on class enrollments in educational programs for radiographers, radiation therapists and nuclear medicine technologists. Given the importance of anticipating trends in the supply of radiologic technologists and the lag between radiologic technology recruitment and education and students sitting for certification exams, the ASRT intends to capture an annual "snapshot" of the earliest stage of the recruitment process by surveying directors of educational programs.

The ASRT Enrollment Snapshot of Radiography, Radiation Therapy and Nuclear Medicine Programs, November 2001[a] provided the first empirical evidence that the downward trend in entering-class enrollments observed since 1994 had reversed. Snapshot 2002[b] verified that this trend continued in the 2002-2003 academic year, and combined these entering-enrollment figures with demographic data for radiologic technologists supplied by the ARRT to provide the first indications of whether current recruitment and retention rates were sufficient to meet U.S. Bureau of Labor Statistics (BLS) demand estimates in these three disciplines. The data indicated that, if nothing changed, the profession would meet the BLS-estimated demand for nuclear medicine technologists and radiation therapists, but would fall far short of the need for additional radiographers. Snapshot 2003[c] added a question as to the percentage of each program's graduates that enter the U.S. work force. The analysis showed further increases in entering enrollments and updated the projections of numbers of new R.T.s, radiation therapists and nuclear medicine technologists that would be added through 2010. Snapshot 2004[d] revealed that the number of students entering increased, though at a lower rate than in the previous four years. Overall, "the best current estimate is that radiation therapy is producing new practitioners substantially above the correct rate to meet the 2012 demand estimated by BLS, while nuclear medicine will nearly triple the estimated need and radiography is likely to come up somewhat short (by about 14 percent) of the projected demand unless enrollments or retention rates are increased."

The 2005 Enrollment Snapshot's primary objective was to document recent trends in the number of students entering educational programs in the primary disciplines of radiologic technology: radiography, radiation therapy and nuclear medicine. Program directors were asked to report their entering class sizes during the past three years. However, entering an educational program doesn't guarantee a student's entry into the R.T. work force. Therefore the survey also asked program directors to report their programs' attrition rates in recent years. Further, graduating from an ARRT-recognized educational program does not guarantee entry into the U.S. radiologic technology labor pool, so program directors also were asked to indicate the country in which their program is located and the approximate percentage of their recent graduates that have taken jobs in the United States. The 2005 Snapshot was the first to ask directors of certificate programs to indicate whether or not their programs have an articulation agreement with a community college.

Program directors were surveyed about the future of their programs, including plans to increase or decrease enrollments and any possibility that the program might close within the next few years. Finally, program directors were asked to share their perceptions of factors that impact enrollments and on the difficulty of recruiting new faculty for their programs.

---

[a] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, November 2001. Available at www.radsciresearch.org. Accessed September 2005.
[b] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, September 2002. Available at www.radsciresearch.org. Accessed September 2005.
[c] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, Fall 2003. Available at www.radsciresearch.org. Accessed September 2005.
[d] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, 2004. Available at www.radsciresearch.org. Accessed September 2005.

METHODOLOGY

On the last day of September 2005, the ASRT e-mailed to every radiography, radiation therapy and nuclear medicine program listed in the ARRT's list of education programs[a] for which we had an e-mail address an invitation to complete an online questionnaire dealing with their entering-class enrollments. In early October 2005, the ASRT mailed a two-page hard copy version of that questionnaire to program directors for whom no e-mail address was available. In mid-October the hard copy version was sent to all program directors who had not responded to the e-mailed invitation (including those for whom the e-mailed invitation had been returned as undeliverable). At about the same time, an issue of the ASRT's online *rEsources* newsletter that included a reminder of the need to participate in the enrollment survey was e-mailed to all program directors for whom an apparently valid e-mail address was available.

The questionnaire asked program directors about recent entering-class enrollments, plans for increases or decreases in program capacity, whether the program might be closed within the next few years, the program's attrition rate during the past few years, what the program director perceived to be the major factors limiting enrollment, whether hiring new faculty for their programs was difficult and, if so, what factors contributed to that difficulty. (See Appendix A for the full questionnaire.)

The intention was to produce a quick "snapshot" of the supply side of the supply and demand balance for radiologic technology disciplines. As with the 2004 Snapshot, this year's questionnaire asked the program director in which country his or program is located and what percentage of recent (past five years) graduates have taken jobs in the United States.

As of Dec. 1, 2005, 475 (66 percent) radiography programs, 72 (64 percent) radiation therapy programs, 70 (57 percent) nuclear medicine technology programs and three programs whose directors did not specify type of program, had responded. The return rate – 616 out of 950 questionnaires – represented an overall response rate of 65 percent.

[a] American Registry of Radiologic Technologists. ARRT-recognized educational programs. Available at http://www.asrt.org/content/RTs/SurveyResults/ProgramEnrollment/Enrollment_Survey.aspx. Accessed September 2005.

DETAILED RESULTS

Source of Data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Online & E-mail	295	47.9	47.9	47.9
	Hard copy	321	52.1	52.1	100.0
	Total	616	100.0	100.0	

Type of Programs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Radiography	463	75.2	75.5	75.5
	Radiation Therapy	66	10.7	10.8	86.3
	Nuclear Medicine	66	10.7	10.8	97.1
	Other	5	.8	.8	97.9
	Radiography & Radiation Therapy	1	.2	.2	98.0
	Radiography and Other	6	1.0	1.0	99.0
	Radiation Therapy & Other	1	.2	.2	99.2
	Radiography, Radiation Therapy & Nuclear Medicine	2	.3	.3	99.5
	Radiography, Radiation Therapy & Other	1	.2	.2	99.7
	Radiography, Nuclear Medicine & Other	1	.2	.2	99.8
	Radiography, Radiation Therapy, Nuclear Medicine & Other	1	.2	.2	100.0
	Total	613	99.5	100.0	
Missing	-9.00	3	.5		
Total		616	100.0		

Overall Number of Programs in Each Discipline (including multiple-level programs)

	N	Percent	Percent of Cases
Radiography	475	75.2%	77.5%
Radiation therapy	72	11.4%	11.7%
Nuclear Medicine	70	11.1%	11.4%
Other	15	2.4%	2.4%
Total	632	100.1%	103.0%

Note: 613 respondents indicated their program's discipline(s).

Other Programs

	Response	Frequency	Percent
	Blank	592	96.1
	12 month, University based	1	.2
	CT/MRI	1	.2
	CT/MRI and ultrasound	1	.2
	Diagnostic Ultrasound	1	.2
	DMS and VAS	1	.2
	Medical Dosimetry	2	.3
	MRT, CT, Sonography, Medical Dosimetry	1	.2
	Nuclear Medicine	1	.2
	Please note that we are a clinical site for The ____ Program in ___, Ontario, Canada. Admission to the program is done through The ___ Institute - as such, we don't admit students into the clinical site unless they are associated with that educational facility.	1	.2
	Post-Associate Certificate in Mammography	1	.2
	Post-Associate Certificate in Medical Sonography	1	.2
	Post Associate Certificate in Computed Tomography	1	.2
	Post Associate Certificate in Magnetic Resonance	1	.2
	RA	1	.2
	RA Program, MSRS Program	1	.2
	Radiography	1	.2
	Radiography and Radiologist Assistant	1	.2
	Radiologist Assistant	1	.2
	Sonography	2	.3
	Sonography (BS)	1	.2
	Two year AAS college-based radiography program	1	.2
	We no longer have a radiography program here -- please note this is supposedly due to budget constraints, but haven't seen those constraints manifest otherwise, so IMHO, it was political and more.	1	.2
	Total	616	100.7

Educational Levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Certificate only	180	29.2	29.5	29.5
	Associate degree only	304	49.4	49.8	79.2
	Bachelor's degree only	63	10.2	10.3	89.5
	Other	12	1.9	2.0	91.5
	Certificate & Associate degree	19	3.1	3.1	94.6
	Certificate & Bachelor's degree	13	2.1	2.1	96.7
	Certificate & Other	4	.6	.7	97.4
	Associate degree & Bachelor's degree	7	1.1	1.1	98.5
	Bachelor's degree & Other	5	.8	.8	99.3
	Certificate, Associate degree & Bachelor's degree	4	.6	.7	100.0
	Total	611	99	100.1	
Missing	-9.00	5	.8		
Total		616	100.0		

Overall Number of Programs at Each Level (including multiple-level programs)

	Responses		Percent of Cases
Educational Level	N	Percent	
Certificate	220	32.8%	35.9%
Associate degree	338	50.4%	55.2%
Bachelor's degree	92	13.7%	15.0%
Other	21	3.1%	3.4%
Total	671	100.0%	109.5%

If yours is a certificate program, do you have an articulation agreement with a community college?

Educational level combo	Articulation Agreement?	Frequency	Percent	Percent of Those Who Answered the Question
-9.00	Missing	5	100.0	
Certificate Only	Yes	76	42.2	46.1
	Explicit No	89	49.4	53.9
	No Response	15	8.3	
	Total Certificate Only	180	100.0	
Certificate & Other Educational Level(s)	Yes	20	50.0	74.1
	Explicit No	7	17.5	25.9
	No Response	13	32.5	
	Total Certif & Other Level(s)	40	100.0	
Certificate Not Offered (e.g., Associate Only or Associate & Bachelor's)	Yes	5	1.3	33.3
	Explicit No	10	2.6	66.7
	No Response	376	96.2	
	Total Not Offering Certificate	391	100.0	
Total		616		

Other Educational Level of Program

	Response	Frequency	Percent
	Blank	567	92.2
	3 year AS leading to BS degree	1	.2
	affiliation with a university for question below	1	.2
	All students must have a minimum of an associate degree	1	.2
	AS - medical radiography BS - radiologic imaging sciences Master of imaging sciences (MIS) - radiologist assistant	1	.2
	Associate degree optional through the University of Akron	1	.2
	Associate if six additional classes taken	1	.2
	At present, we issue a certificate upon graduation, but beginning with the class entering the summer of 2006, we will only issue associate degrees	1	.2
	Bachelor degree program affiliated with the University of Wisconsin - La Crosse	1	.2
	BOTH options are available	1	.2
	BS degree available through university affiliation	1	.2
	CEGEP DEC (Quebec Canada)	1	.2
	Certificate post-BS	1	.2
	Certificate program is [for those who] have a BS degree already and 3 + 1 bachelor's program with affiliated colleges/universities	1	.2
	Certificate program with an articulation agreement with a four-year university. Students may receive baccalaureate degree	1	.2
	College diploma with bachelor's degree option	1	.2
	Converting to a bachelor's in 2007	1	.2
	Diploma	4	.7
	Diploma (22 months)	1	.2

	Formal articulation agreement with [Name] College toward BS in radiological science. Your next question refers ONLY to community college - why not four year college?	1	.2
	Hi, our radiography program starts out at the AS level, with optional continuation into the BS in radiation sciences or BS or post-professional certificate for radiologist assistant. Both our nuclear medicine and radiation therapy programs are one year certificate programs at this time.	1	.2
	Hospital-based certificate program with an affiliation with CSU, Dominguez Hills. Students earn credits (42) toward a BS degree in health science with an option in rad tech.	1	.2
	MAED	1	.2
	Master of imaging sciences	1	.2
	MEd,higher education	1	.2
	Midwestern State University for an articulation agreement	1	.2
	MSRS	1	.2
	Offer both two year AS and one year certificate	1	.2
	Ontario Community College Advanced Diploma	1	.2
	Our certificate program is a post-baccalaureate program	1	.2
	Our students get a certificate in radiologic sciences, along with an associate of science degree from Mineral Area College	1	.2
	Plus diploma	1	.2
	Post-baccalaureate certificate	1	.2
	Proposed masters	1	.2
	RA is post-baccalaureate certificate	1	.2
	Students coming from one of our academic affiliates earn a BS/BA. Students with a current bachelor's earn a certificate.	1	.2
	Technical course at college (three years)	1	.2
	Was baccalaureate	1	.2
	We also have a certificate for rad tech. (Only one or two students a year.)	1	.2
	We are affiliated with the University of Pittsburgh at Bradford. Pitt Bradford offers a BS in radiological science. Within two years, most of our grads will be on the BS track. Note I checked "yes" to the next questions below because we also have an agreement with Jamestown Community College, but very few students have shown interest in the associate degree.	1	.2
	We articulate with a university	1	.2
	We do not articulate with a community college. We have written articulation agreements with a four year college, which gives two years of credit for this program toward the Bachelor's degree.	1	.2
	We do not have an articulation agreement, but certified radiographers can obtain their associate or bachelor's degree at three local state universities	1	.2
	We have an articulation agreement with a university for a BS degree	1	.2
	We require students to be registered technologists.	1	.2
	While we do not have articulation agreements with a community college, we have two separate articulation agreements with four year universities.	1	.2
	Total	615	100.0

Relationship between Discipline and Educational Level of Program

Educational Level Combo	Statistic	Only one program				Total
		Radiography	Radiation therapy	Nuclear Medicine	Other	
Certificate only	Count	135	20	21	4	180
	% within Specialty	29.2%	30.3%	32.3%	80.0%	30.1%
Associate degree only	Count	271	19	12	0	302
	% within Specialty	58.7%	28.8%	18.5%	.0%	50.5%
Bachelor's degree only	Count	24	18	16	0	58
	% within Specialty	5.2%	27.3%	24.6%	.0%	9.7%
Other	Count	9	2	0	1	12
	% within Specialty	1.9%	3.0%	.0%	20.0%	2.0%
Certificate & Associate degree	Count	10	4	5	0	19
	% within Specialty	2.2%	6.1%	7.7%	.0%	3.2%
Certificate & Bachelor's degree	Count	3	2	8	0	13
	% within Specialty	.6%	3.0%	12.3%	.0%	2.2%
Certificate & Other	Count	2	1	1	0	4
	% within Specialty	.4%	1.5%	1.5%	.0%	.7%
Associate degree & Bachelor's degree	Count	5	0	0	0	5
	% within Specialty	1.1%	.0%	.0%	.0%	.8%
Bachelor's degree & Other	Count	0	0	1	0	1
	% within Specialty	.0%	.0%	1.5%	.0%	.2%
Certificate, Associate degree, & Bachelor's degree	Count	3	0	1	0	4
	% within Specialty	.6%	.0%	1.5%	.0%	.7%
Total	Count	462	66	65	5	598
	% within Specialty	99.9%	100.0%	99.9%	100.0%	100.0%

There are two few other-type and combined-discipline programs to meaningfully compare their educational levels with those of the single-discipline programs. Similarly, programs involving a certificate and/or an associate degree in combination with a bachelor's degree were combined into a single category for analysis, and programs with an "other" educational level were not considered. Restricting our attention to the pure programs, the overall chi-square for the differences among them in educational level is highly significant, $\chi^2(8) = 99.239$, $P < .001$. In particular, radiography programs are more likely (60.2 percent) than radiation therapy and nuclear medicine programs (24.6 percent) to offer only an associate degree, $\chi^2(1) = 80.20$, $P < .001$. Conversely, they are less likely (5.3 percent vs. 27.0 percent) to confer only a Bachelor's degree [$\chi^2(1) = 51.27$, $p < .001$].

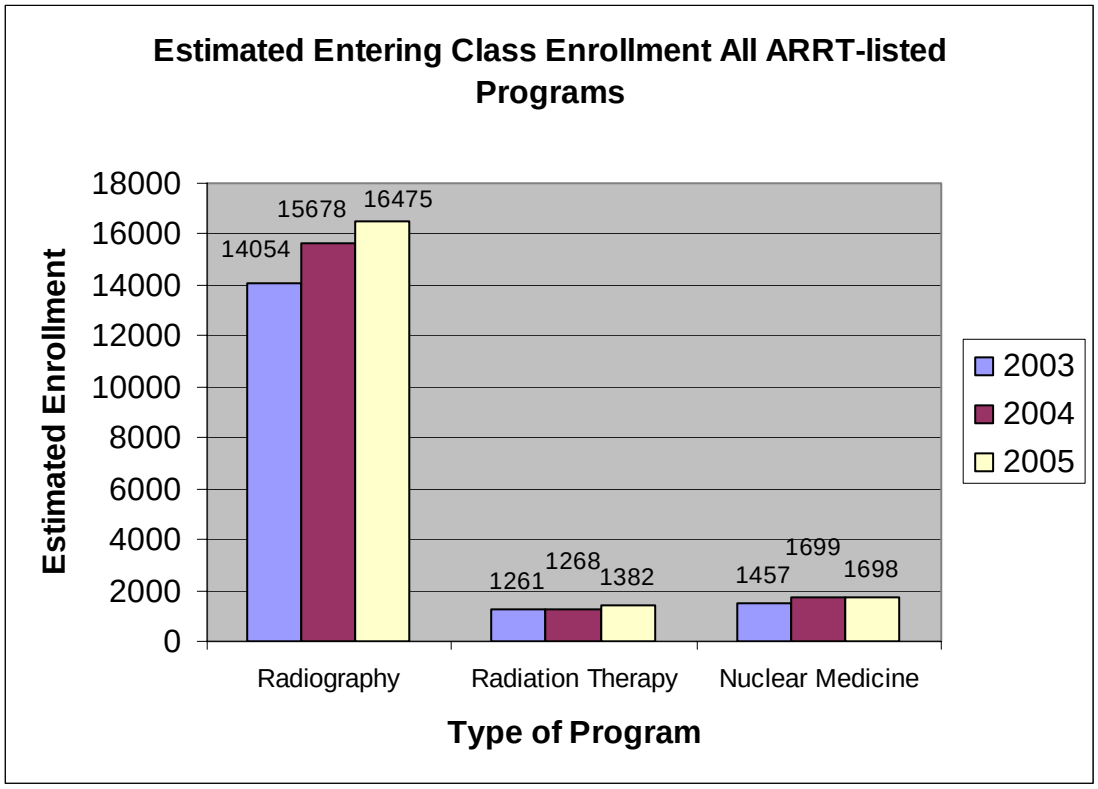
Country in Which Program is Located

Program Discipline(s)		In what country is your program located?			Total
		USA	Canada	Other	
Radiography	Count	453	7	2	462
	% within Radiography	98.1%	1.5%	.4%	100.0%
Radiation Therapy	Count	59	5	0	64
	% within Radiation Therapy	92.2%	7.8%	.0%	100.0%
Nuclear Medicine	Count	65	1	0	66
	% within Nuclear Medicine	98.5%	1.5%	.0%	100.0%
Other Specialty	Count	1	0	4	5
	% within Other Specialty	20.0%	.0%	80.0%	100.0%
Radiography & Radiation Therapy	Count	1	0	0	1
	% within this combination	100.0%	.0%	.0%	100.0%
Radiography and Other	Count	9	0	0	9
	% within this combination	100.0%	.0%	.0%	100.0%
Radiation Therapy & Other	Count	1	0	0	1
	% within this combination	100.0%	.0%	.0%	100.0%
Radiography, Radiation Therapy & Nuclear Medicine	Count	1	1	0	2
	% within this combination	50.0%	50.0%	.0%	100.0%
Total	Count	590	14	6	610
	% within all modalities	96.7%	2.3%	1.0%	100.0%

A significantly higher percentage of radiation therapy-only programs (7.8 percent) were located outside the United States (all in Canada) than was true of nuclear medicine-only and radiography-only programs (1.9 percent), $\chi^2(1) = 8.12$, $P < .01$

ENROLLMENT TRENDS

All three types of radiologic technology programs experienced increased total entering-class enrollments from 2003 to 2005, but the 2003 to 2004 increase for radiation therapy (as estimated from retrospective reports of those years' enrollments) was less than 1 percent, and from 2004 to 2005 nuclear medicine programs showed a slight (one student) *decrease* in estimated total enrollment:



1. What were your freshman enrollment figures for 2003, 2004 and 2005?
5. What was the attrition rate for your program over the past few years?

Program Type (Only single-discipline programs)	Statistic		Freshman enrollment figures for 2003?	Freshman enrollment figures for 2004?	Freshman enrollment figures for 2005?	Attrition Rate (percentage of entering students who did not complete the program)?
Radiography	N	Valid	443	457	455	448
		Missing	20	6	8	15
	Mean		21.993	22.921	23.042	18.1726
	Median[a]		19.212	20.140	19.943	14.0588
	Mode[b]		20.0	14.0	16.0	10.00
	Std. Deviation		12.9474	13.9420	14.8667	18.48466
	Sum		9743.0	10475.0	10484.0	8141.32
	Percentiles[a]	5	6.900	7.106	6.705	.0078
		25	13.221	13.750	13.713	7.4615
		50	19.212	20.140	19.943	14.0588

		75	28.342	29.352	28.881	23.2000
		95	46.567	49.325	49.889	58.8000
Radiation therapy	N	Valid	60	65	64	64
		Missing	6	1	2	2
	Mean		12.483	12.077	12.234	16.8358
	Median[a]		11.000	10.000	10.455	10.2857
	Mode		12.0	8.0	10.0	.00
	Std. Deviation		8.0032	7.9614	7.8087	20.93169
	Sum		749.0	785.0	783.0	1077.49
	Percentiles[a]	5	3.333	2.500	2.700	2.200
		25	7.583	7.250	7.625	3.5333
		50	11.000	10.000	10.455	10.2857
		75	14.800	15.188	15.333	23.4000
		95	31.000	26.250	27.500	60.5000
Nuclear Medicine	N	Valid	62	63	63	65
		Missing	3	2	2	0
	Mean		13.129	14.524	13.921	8.6092
	Median[a]		10.222	11.500	11.667	5.8750
	Mode		10.0	10.0	8.0	.00
	Std. Deviation		9.4842	11.9675	11.9060	14.01460
	Sum		814.0	915.0	877.0	559.60
	Percentiles[a]	5	4.029	4.433	2.767	.0878
		25	7.222	8.083	7.950	.5625
		50	10.222	11.500	11.667	5.8750
		75	17.000	17.625	17.300	10.1667
		95	25.700	27.133	27.400	27.0000

[a] Calculated from grouped data.
[b] Multiple modes exist. The smallest value is shown.

Trends in Mean Entering-class Size as a Function of Discipline and Educational Level

A 3 (discipline) x 5 (educational level) x 3 (year) ANOVA of differences in mean entering-class size was conducted, with the third factor a repeated-measures (within program) factor. (The analysis was restricted to programs that reported enrollment figures for all three years.)

Averaged across disciplines and educational levels, mean reported entering-class size increased from 2003 (19.9 students per program) to 2004 (20.6 students per program – a 3.4 percent increase) and again from 2004 to 2005 (20.7 – a statistically nonsignificant increase of 0.5 percent). $F_{1,535}$ for the increase from 2003 to 2004 = 3.811, $P = .051$ – 9.042, $P < .01$ when we apply the finite-population correction for the fact that at least 58 percent of the population that we wish to generalize to was included in our sample.

This increasing trend in mean entering-class enrollment was not, however, consistent across the three program types:

Discipline	Mean Number of Students in Entering Class			Increase, 2003 - 2004	Increase, 2004 - 2005
	2003	2004	2005		
Radiography only (N = 442)	21.887	22.647	22.844	.760 (+3.5%) *P* < .001	.197 (+0.9%) *P* > .10
Radiation therapy only (N = 60)	12.483	12.367	12.533	-.116 (-0.9%) *P* > .10	.166 (+1.3%) *P* > .10
Nuclear medicine only (N = 63)	12.921	14.381	13.714	1.46 (+11.3%) *P* < .001	-.667 (-4.6%) *P* < .001

Radiography programs showed statistically significant increases in mean reported entering-class enrollments from 2003 to 2004, but the average size of radiography-entering classes did not change significantly from 2004 to 2005. Nuclear medicine programs' mean reported entering-class enrollment increased significantly from 2003 to 2004, but then decreased significantly (though still above 2003 levels) from 2004 to 2005. Radiation therapy entering-class sizes did not change significantly across this three-year period.

The trend did not differ significantly across educational levels.

The analysis also showed that, within and averaging across a year, radiography programs tend to have larger entering-class sizes than do nuclear medicine and radiation therapy programs; and that associate-only programs and programs that offer both a certificate and an associate degree tend to enroll more students than do the other three educational levels.

Number of Programs Experiencing Increase vs. Decrease in Enrollment

"Pure" Program Type	Change in enrollment, 2003 to 2004				Change in enrollment, 2004 to 2005		
	Decreased	Remained the Same	Increased		Decreased	Remained the Same	Increased
Radiography	101	191	152		116	223	117
Radiation therapy	19	19	22		20	21	23
Nuclear Medicine	8	24	31		19	29	16

Many more (specifically, 51 more) radiography programs reported increases in entering-class enrollments than reported decreases from 2003 to 2004, but there was only one (1) more program that reported an increase than decrease from 2004 to 2005. Even more of a deceleration of enrollment growth was reported by nuclear medicine programs: 23 more increases than decreases from 2003 to 2004 but three (3) *fewer* increases than decreases from 2004 to 2005. On the other hand, exactly three more radiation therapy programs reported increases than decreases both from 2003 to 2004 and from 2004 to 2005.

Crucial Results from Previous Tables and Graph:

	Year	Total Reported Enrollment	"Pure" Programs Reporting Enrollments	No. of ARRT-recognized programs	Estimated Total, All Programs	Percent Change	All Programs Reporting Enrollments*	Return Rate (% of that year's PDs who responded)*	Sent this year	No. of Programs Reporting Enrollments for 1 or more years*
Radiography	2003	9743	443	639	14,054	---	456	71.4%	715	470 (65.7% overall response rate)
	2004	10,475	457	684	15,678	11.56%	470	68.7%		
	2005	10,484	455	715	16,475	5.08%	468	65.5%		
Radiation Therapy	2003	749	60	101	1,261	---	66	53.09%	113	71 (62.8% overall response rate)
	2004	785	65	105	1,268	0.58%	71	57.52%		
	2005	783	64	113	1,382	9.02%	70	56.63%		
Nuclear Medicine	2003	814	62	111	1,457	---	67	50.81%	122	68 (58.2% overall response rate)
	2004	915	63	117	1,699	16.60%	68	51.63%		
	2005	877	63	122	1,698	-0.06%	68	51.63%		

The only statistically significant difference among the disciplines in overall return rate was that radiography's 66 percent return rate was significantly higher than the 58 percent return rate for nuclear medicine programs, $\chi^2(1) = 4.536$, $P < .05$.

Reports from the PDs who responded to this year's Snapshot (including their retrospective reports on 2003 and 2004 enrollments) indicate that radiography programs had a modest increase from 2003 to 2004 in average entering-class size that was coupled with a 7 percent increase in total number of programs, which led to a double-digit (12 percent) increase in the total number of students beginning their radiography education. From 2004 to 2005 entering-class size increased very little (1 percent), but the number of programs again increased (by 4.5 percent), leading to a single-digit (5 percent) increase in total number of beginning radiography students.

Nuclear medicine programs reported a large (11 percent) increase in average entering-class size from 2003 to 2004, but then a substantial (5 percent) decrease from 2004 to 2005. Coupling these changes in entering-class size with 5 percent and 4 percent increases in number of NMT programs from 2003 to 2004 and from 2004 to 2005, respectively, led to a double-digit (17 percent) increase in the total number of students beginning their education in nuclear medicine from 2003 to 2004, but almost no change in this total (an estimated drop of one student) from 2004 to 2005.

Radiation therapy programs' mean reported entering-class size was essentially constant over these three years (dropping by about 1 percent from 2003 to 2004, but then increasing by 1 percent from 2004 to 2005), while the number of radiation therapy programs increased by 4 percent and 8 percent from 2003 to 2004 and from 2004 to 2005, respectively, leading to a very slight (< 1 percent) increase in total entering-class enrollment from 2003 to 2004 and a substantial but still single-digit increase (9 percent) from 2004 to 2005.

Comparison with Enrollment Trends Reported in *Snapshot 2004*

The changes in total entering-class enrollments from 2003 to 2004 reported above are generally consistent with those reported in the ASRT's *Enrollment Snapshot 2004* for radiography (12 percent based on 2005's retrospective reports versus 7 percent reported in *Snapshot 2004*) and nuclear medicine (17 percent vs. 11 percent). However, the 1 percent 2003 to 2004 increase in total radiation therapy entering-class enrollments computed from this year's reports seems at least qualitatively at odds with the 9 percent increase from 2003 to 2004 reported last year.

---

* Includes combination programs that contained this discipline (i.e., a program that contained both radiography and radiation therapy components). Other statistics were based only on single-discipline programs for the specific discipline. Also does not include programs that returned questionnaires but did not provide enrollment data for that year.

However, this discrepancy could just be a result of sampling fluctuation -- i.e., it could be due to chance differences between the sample of radiation therapy program directors who responded to this year's *Snapshot* and those who responded to last year's. The 95 percent confidence interval around this year's estimate of the 2004 total-enrollment figure for radiation therapy programs is ± 128 students – i.e., the true total enrollment in the 105 radiation therapy programs that were in operation in 2004 could be as high as 1,396 students, a figure that would have given us an estimated 2003 to 2004 increase of 10.7 percent in total radiation therapy entering-class enrollment. Coupled with a similarly broad confidence interval around the 2004 enrollment reported in *Snapshot 2004*, we can't be sure that the difference between last year's and this year's estimates of the 2003 to 2004 increase for radiation therapy programs isn't simply due to sampling variation.

What does seem clear is that growth in radiation therapy enrollments (as in the other two disciplines) has been at a lower rate in the past two years than was the case in the 2001 to 2003 period.

Attrition Rates by Program Type and Educational Level

5. What was the attrition rate for your program over the past few years?

Attrition as a Function of Educational Level of Program

Educational Level	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Certificate only	177	14.6689	20.83922	1.56637	11.5776	17.7602
Associate degree only	294	20.3687	17.07960	.99610	18.4083	22.3291
Bachelor's degree only	62	8.5968	13.72739	1.74338	5.1107	12.0829
Certificate & Associate degree	19	12.0000	11.60938	2.66338	6.4045	17.5955
Certificate &/or Associate degree & Bachelor's degree	23	12.7652	24.22999	5.05230	2.2874	23.2431
Total	575	16.7642	18.58555	.77507	15.2418	18.2865

Attrition as a Function of Program Type

"Pure" Program Type	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Radiography	449	18.1544	18.46805	.87156	16.4415	19.8672
Radiation therapy	64	16.8358	20.93169	2.61646	11.6072	22.0644
Nuclear Medicine	66	8.5545	13.91347	1.71263	5.1342	11.9749
Total	579	16.9144	18.52183	.76974	15.4025	18.4262

The mean attrition rate, for programs that provided an estimate of that rate, was 16.5 percent. This rate differed significantly as a function of both the modality taught in the program (program type) and educational level of the program, but not their interaction. In particular, bachelor's-only programs reported significantly lower attrition rates (mean = 8.6 percent) and associate degree-only programs, significantly higher attrition (20.4 percent), than the overall mean attrition rate for all educational levels. And nuclear medicine programs reported a significantly lower mean attrition rate (8.6 percent) than did radiography (18.2 percent) and radiation therapy (16.8 percent) programs.

Perceived Variability in Attrition Rate

6. Has this attrition rate varied substantially over the past few years?

Responses to the above questions were combined into a single variable that assesses amount and direction of change in attrition rate, with a "No" response to question 6 coded as zero (no change in either direction), except that answering question 6y overrode a "No" response to question 6. "Increased" was coded as +1, "Decreased" was coded as -1, and "Increases some years, decreased others" was coded as +.01.

A two-way ANOVA of mean differences on this combined variable yielded no statistically significant effects of program type, program educational level or their interaction.

6y. If "yes," how has the attrition rate varied?

Direction of change (if any)		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Stayed the same	414	67.2	69.9	69.9
	Increased	25	4.1	4.2	74.2
	Decreased	73	11.9	12.3	86.5
	Increased some years, decreased others	80	13.0	13.5	100.0
	Total	592	96.2	99.9	
Missing	System[a]	24	3.9		
Total		616	100.1		

[a] Six (6) directors indicated that their attrition rates had varied, but didn't indicate how they varied.

More than two-thirds of the directors reported that their attrition rates have held steady over the past few years.

7. About what percent of your program's graduates over the past five years have taken jobs in the U.S. (including U.S. territories and Puerto Rico)?

Country	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
USA	568	98.7%	5.807	.24365	98.2063	99.1634	10	100
Canada	10	3.5%	3.779	1.19490	.7970	6.2030	.00	10
Other[a]	6	97.5%	4.183	1.70783	93.1099	101.8901	90	100
Total	584	97.0%	13.634	.56417	95.9347	98.1509	.00	100

[a] None of these six (6) programs specified in what "Other" country their programs are located.

Note: Two USA programs reported that 10% and 18% of their graduates took jobs in the U.S. In both cases there was no response to the attrition rate question, so it's possible that these were actually those two programs' attrition rates. Omitting them yields a USA mean of 98.98% of graduates taking U.S. jobs.

While differences among the three modalities taught in these programs were not statistically significant, they are listed below because of their role in estimating the number of students likely to enter the U.S. job market.

"Pure" Program	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Radiography	442	97.2%	12.871	.61220	96.0208	98.4272	.00	100
Radiation therapy	61	94.5%	20.887	2.67437	89.1751	99.8741	2.0	100
Nuclear Medicine	66	98.0%	11.458	1.41032	95.1379	100.7712	8.0	100
Total	569	97.0%	13.803	.57866	95.8828	98.1559	.00	100

Radiation therapy programs' lower percent of entry into the U.S. job market is attributable to the fact that a significantly higher percentage of that discipline's programs (5 of 64 – 7.8 percent, all Canadian) are located outside the U.S. than is true of the other two disciplines (10 of 529 – 1.9 percent). When only U.S.-located programs are considered, the percents are 98.6 percent, 99.2 percent, and 99.3 percent of radiography, radiation therapy and NMT programs, respectively.

Near-term Changes

Capacity for Increase

2a. Is your program currently at full enrollment?

The relationship between likelihood of being at full enrollment and educational level differed among the three disciplines as follows:

2. Is your program currently at full enrollment?

Single Modality Taught by Program	Program's Single Educational Level	N	Proportion Reporting Full Enrollment	95% Confidence Interval	
				Lower Bound	Upper Bound
Radiography	Certificate	134	.716	.64	.79
	Associate Degree	268	.847	.80	.89
	Bachelor's Degree	23	.565	.35	.78
	Total	425	.791	.75	.83
Radiation therapy	Certificate	20	.450	.21	.69
	Associate Degree	19	.737	.52	.95
	Bachelor's Degree	17	.882	.71	1.05
	Total	56	.679	.55	.80
Nuclear Medicine	Certificate	21	.619	.39	.85
	Associate Degree	12	.833	.59	1.08
	Bachelor's Degree	16	.688	.43	.94
	Total	49	.694	.56	.83

Among radiography programs, a higher percentage (85 percent) of those offering an associate degree were at full enrollment than was true of the other two educational levels (69 percent), which did not differ significantly in this respect. Among radiation therapy programs, those offering a certificate were less likely (45 percent) to be at full enrollment than were associate-degree and bachelor's-degree programs (81 percent), which did not differ significantly. Educational level did not significantly affect the percentage of nuclear medicine programs at full enrollment.

2b. Approximately how many additional students could be accommodated by your program?

Single Modality Taught	Mean	Std. Deviation	# of Responses	Total # of Programs in Population	Estimated Total Expansion Capacity[a]
Radiography	7.385	10.4028	96	715	1104
Radiation therapy	3.429	2.5607	21	113	124
Nuclear Medicine	5.118	4.8719	17	122	191
Total	6.478	9.1345	134	950	1419

[a] (# of programs in population) x (proportion not at full enrollment) x (mean # of additional students)

The effects of discipline, educational level and their interaction were statistically nonsignificant.

2c. If "yes," approximately how many qualified students did you turn away this fall?

Single Modality Taught	Mean	Std. Deviation	# of Responses	Total # of Programs in Population	Estimated Excess Demand[a]
Radiography	50.8949	47.61546	314	715	27,131
Radiation therapy	24.5152	25.71614	33	113	1,880
Nuclear Medicine	32.9091	37.22891	44	122	2,786
Total	46.6445	45.86875	391	950	31,797

[a] (# of programs in population) x (proportion at full enrollment) x (mean # of qualified students turned away)

The mean number of qualified students turned away was significantly higher for radiography programs than for the other two disciplines, [$F(1, 389) = 13.47$, $P < .001$], but did not differ significantly across educational levels.

However, radiography programs are, on average, larger than nuclear medicine and radiation therapy programs. To test whether this accounted for the larger mean number of students turned away from radiography programs, the ratio between number of qualified students turned away and fall 2004 entering-class enrollments was calculated, leading to a statistically nonsignificant main effect of program specialty (as well as nonsignificant effects of educational level and its interaction with discipline).

3. Do you plan any changes related to enrollment?

			3. Do you plan any changes related to enrollment?			Total
			Plan to increase	Plan to decrease	Plan to remain the same	
Single modality taught	Radiography	Count	56	28	374	458
		% within program type	12.2%	6.1%	81.7%	100.0%
	Radiation therapy	Count	8	8	48	64
		% within program type	12.5%	12.5%	75.0%	100.0%
	Nuclear Medicine	Count	12	1	51	64
		% within program type	18.8%	1.6%	79.7%	100.0%
Total		Count	76	37	473	586
		% within program type	13.0%	6.3%	80.7%	100.0%

More than three-quarters of the program directors in each of the disciplines plans to hold enrollment levels at about their current level. Among those indicating plans to change, a considerably but nonsignificantly higher percentage (50 percent) of radiation therapy PDs than of radiography and NMT PDs (30 percent) plan to decrease enrollments. The interaction between educational level and program type with respect to net intention to increase enrollments (scored as -1 for "Decrease," 0 for "Remain the same" and +1 for "Increase") was statistically significant at the .05 level (though not at the .01 level), as was the main effect of discipline. The statistically significant interaction appears to reflect the fact that only associate- and bachelor's-level radiation therapy programs showed a net intention to decrease (with three of the four programs at each of those two levels that planned any change in enrollment, planning a decrease).

However, none of the pairwise differences among educational levels nor any of the differences between a single educational level and the other two levels was statistically significant for any of the three disciplines. So it is uncertain whether these sample differences truly represent the relationship between plans for change in enrollment and the educational level of and modality taught by the program that holds for the population of all primary-discipline educational programs.

4. How viable is your program over the next few years?

Single Modality Taught by the Program	Statistic	4. How viable is your program over the next few years?			Total
		Will definitely continue to operate	Possibly will close	Will close	
Radiography	Count	447	8	4	459
	% within Radiography	97.4%	1.7%	.9%	100.0%
Radiation Therapy	Count	61	3	1	65
	% within Radiation Therapy	93.8%	4.6%	1.5%	99.9%
Nuclear Medicine	Count	59	2	0	61
	% within Nuclear Medicine	96.7%	3.3%	.0%	100.0%
Total	Count	567	13	5	585
	% within all three disciplines	96.9%	2.2%	.9%	100.0%

There were no statistically significant differences among the three primary disciplines or among the three educational levels in respect to program viability. Approximately 97percent of the program directors anticipate that their programs will definitely continue to operate, with 2.2 percent indicating the possibility of closing – up a bit from last year's 0.7 percent; a conservative, independent-samples chi-square on this difference = 4.056, $P < .05$. Only 0.9 percent of all programs (four in radiography, one in radiation therapy) indicated they will close.

4y. If your program is closing, how many more years will it continue to operate, including this academic year?

Combined programs	Mean	N	Std. Deviation
Radiography	2.14	7	1.574
Radiation Therapy	2.00	2	.000
Nuclear Medicine	3.00	1	.
Other	.00	1	.
Total	2.00	11	1.414

Among the eleven program directors who provided an estimate of the years of operation left for their programs, that estimate ranged from zero (the program having already discontinued operation) to three years.

FACULTY ISSUES

8a. Rank order the following factors with respect to how seriously they limit enrollments in your program.

	Radiography Programs			Radiation Therapy Programs			Nuclear Medicine Programs			Overall
Factor	% That Mentioned	Mean Rank if Mentioned	Mean Importance[a]	% That Mentioned	Mean Rank if Mentioned	Mean Importance[a]	% That Mentioned	Mean Rank if Mentioned	Mean Importance[a]	Mean Importance[a]
Funding	.5594	3.17	3.9800	.6515	2.74	3.5703	.5758	3.55	4.0656	3.9269
Space	.6803	2.59	3.2967	.5758	3.03	3.9531	.6061	2.88	3.6066	3.4092
Equipment	.5054	3.68	4.3500	.4848	3.72	4.5078	.4697	4.16	4.5820	4.3874
Number Qualified Applicants	.4147	4.55	4.9811	.5606	3.50	4.3047	.4848	4.66	4.8361	4.8882
Availability of faculty	.6371	2.74	3.4922	.6515	2.47	3.3672	.6212	2.29	3.0984	3.4395
Number, staffing of clinical sites	.8013	1.71	2.3156	.7576	2.20	2.8203	.7879	1.69	2.1557	2.3807
Other	.0691	1.88	5.6211	.0909	1.33	5.5781	.0769	1.80	5.6557	5.6067

Averaging across the three program types, program directors rate number and staffing of clinical sites as the most important limiting factor; space, availability of faculty and funding the next most important; equipment, followed by number of qualified applicants and "Other" as the least important factors.

Two-way ANOVAs on the three dependent variables (barrier mentioned or not, rank if mentioned and importance score) revealed only one factor (number of qualified applicants) for which the interaction between modality and educational level was statistically significant after Bonferroni adjustment for the number of dependent variables (i.e., for which the *P* value was .05/8 = .006 or lower). The 20 certificate-level radiation therapy programs rated the number of qualified applicants as a significantly more important barrier to increasing enrollments (mean importance score of 3.125) than did any of the other eight modality/educational level combinations (mean importance scores ranging from 4.53 to 5.06, $F_{1,511}$ for this one difference = 27.900, accounting for 66 percent of the total variation among the nine means).

Separate one-way ANOVAs for differences among disciplines and for differences among educational levels yielded only a few differences that retained statistical significance after Bonferroni adjustment:

- Radiography programs rated amount of assigned space as more important (mean importance score of 3.30) than did the other two programs (3.95 RTT, 3.61 NMT).
- Radiography programs rated the number of qualified applicants as below (4.98) and radiation therapy programs as above (4.30) average in importance. (The average across all three disciplines was 4.84.)
- Similarly, among program directors who mentioned number of qualified applicants as an important barrier, radiation therapy PDs assigned a significantly lower mean rank (3.50) to this factor (i.e., considered it relatively more important) than did the other two programs (4.55 radiography, 4.66 nuclear medicine).

[a] Importance score = rank assigned if mentioned (or average rank in case of ties), average of nonassigned ranks if not mentioned.

	Certificate Programs			Associate-degree Programs			Bachelor's Programs			Certificate and Associate Programs			Bachelor's/Certificate, Bachelor's/Associates Programs		
Factor	% Who Men-tioned	Mean Rank if Mentioned	Mean Impor-tance[a]	% Who Men-tioned	Mean Rank if Mentioned	Mean Impor-tance[a]	% Who Men-tioned	Mean Rank if Mentioned	Mean Impor-tance[a]	% Who Men-tioned	Mean Rank if Mentioned	Mean Impor-tance[a]	% Who Men-tioned	Mean Rank if Mentioned	Mean Impor-tance[a]
Funding	.5333	3.24	4.0901	.5738	3.11	3.8977	.6825	3.21	3.7787	.6842	3.38	3.8333	.5000	3.17	4.0870
Space	.7111	2.26	2.9826	.6426	2.86	3.5671	.6349	3.28	3.9016	.6316	2.42	3.3333	.6250	2.07	3.1087
Equipment	.4833	3.57	4.3576	.5180	3.76	4.3591	.5238	3.97	4.5246	.4211	4.38	4.8611	.4167	3.40	4.3261
Number Qualified Applicants	.4722	3.93	4.6250	.4098	4.72	5.0453	.5079	4.16	4.7541	.5263	4.90	5.0278	.4167	4.60	4.8913
Availability of faculty	.6111	2.74	3.5610	.6459	2.72	3.4497	.7143	2.22	2.9508	.6842	2.46	3.1389	.5000	2.42	3.6522
Number, staffing of clinical sites	.7111	2.06	2.8343	.8525	1.62	2.0789	.8095	1.98	2.4754	.7895	1.67	2.2222	.7500	1.56	2.3043
Other	.0782	1.57	5.5930	.0623	2.00	5.6477	.0952	1.50	5.6148	.1053	2.00	5.6389	.0000	--	5.6739

- Certificate programs rated amount of assigned space as more important (mean importance score 2.98) while programs offering only the bachelor's degree rated this factor as less important (3.90) than the overall average of 3.40 (3.11 to 3.57 among the other three educational levels).
- Similarly, among those mentioning space as an important barrier, bachelor's program directors ranked it as relatively less important (mean rank of 3.28) than did directors in general (overall mean rank 3.40, ranging from 3.11 to 3.57 among the other four educational levels).
- Directors of certificate programs rated availability and staffing of clinical sites as less important (mean importance score 2.83) than did PDs in general (overall mean importance score 2.36, ranging from 2.22 to 2.48 among the other four educational levels).
- None of the 24 program directors offering a bachelor's degree in combination with a certificate or an associate degree mentioned any factor other than the six in the checklist, whereas 6.2 percent to 7.0 percent of the program directors at the other four educational levels mentioned other factors.

The other barriers to increasing enrollments mentioned by the program directors (in response to the request to "please specify") are listed below:

[a] Importance score = rank assigned if mentioned (or average rank in case of ties), average of nonassigned ranks if not mentioned.

8b. Other limiting factors:

		Frequency	Percent
	Blank	544	88.6
	No. 1 - Student/Staff ratio as determined by the JRCEPNMT	1	.2
	2. Number of available jobs in this region	1	.2
	All of the above are factors that we consider, with funding, space and equipment all ranking the same within the institution. We have always considered the availability of jobs in the area as we limit our enrollment. North Carolina has no shortage of graduates, especially with a nearby community college graduating two classes per year.	1	.2
	At this time, the radiography program does not wish to increase its enrollment. We increased enrollment about seven years ago, rising from accepting 30 to 35 students each August. We are pleased to supply the area with about 20 new graduates each spring. This level seems to allow all new graduates the opportunity to find full-time employment in the local area.	1	.2
	California has a restriction in the RAD standards (1983) against two schools sharing the same clinical site, which can hinder program growth, even if the clinical facility can take on more students. The process to work through sharing and seeking a "'variance' to the restriction is arduous."	1	.2
	Community need for radiographers	1	.2
	Competition with other programs	1	.2
	Concern about fewer job opportunities for graduates "We have additional sites for clinical, but do not want to ""flood"" the job market."	1	.2
	Decrease in job opportunities	1	.2
	Departments with CR/DR/PACS are finding they are able to do the same work with fewer technologists. Good for the department, but a challenge to maintain the proper ratio for proper student supervision as defined by JRCERT.	1	.2
	Employment opportunities after graduation are limited. We have an abundance of radiography programs in our region	1	.2
	Exams -- this is relevant to No. 1	1	.2
	Faculty salaries remain undesirable	1	.2
	For several years there has been a shortage for radiographers in northeast Tennessee; however, the market has changed to the point of having insufficient employment opportunities for our graduates. The university wants the program to graduate the same number of students, but the program director feels that we should decrease enrollment to 25 to 30 students per year.	1	.2
	High tuition costs	1	.2
	Hospital Program -- limited clinical space	1	.2
	Information for Nos. 1-9 in this last section is for our radiography program only. Your survey should have gone to our program directors in nuclear medicine and radiation therapy separately, but I will forward this e-mail as well.	1	.2
	It is difficult to know what is meant by a few years. Data reported above represents our five year average. Accreditation standards often require outcomes to be reported over the past five years. I believe this would help achieve consistent and accurate responses.	1	.2
	Job availability for graduates in Houston	1	.2
	Job market	1	.2
	Job market in area	1	.2
	Job market in the greater Houston metro area	1	.2
	Job market locally	1	.2
	Job opportunities. We could expand, but there seem to be fewer job opportunities for our graduates and we don't want to "flood the job market."	1	.2
	Job market-employment	1	.2

	Lack of entry-level radiography jobs in central Illinois. We are at equilibrium between number of graduates and number of jobs available. May not be able to place all of May 2006 graduates.	1	.2
	LIMITATION OF CASELOAD AND QUALIFIED RT CLINICAL INSTRUCTORS AND SUPERVISION ARE THE PRIMARY SOURCE FOR NOT INCREASING ENROLLMENT.	1	.2
	Local employment environment is saturated, clinical affiliates requested lower numbers to increase quality not quantity.	1	.2
	Local job market	1	.2
	Local job market. We reduced the number of applicants accepted into the program based on the projected local/regional job market. We want our graduates to be able to find jobs.	1	.2
	Maintenance of adequate staffing at clinical sites to allow for placement of students	1	.2
	Market is full -- three programs are turning out 90 new techs each year in our area!	1	.2
	Number of clinical sites	1	.2
	On No. 2 above, I don't know how to answer you. We don't turn students away, we have a waiting list. Students end up waiting around two to three years to get into the program. There are over 100 students currently waiting to get in.	1	.2
	Our primary concern is providing an educational environment in the clinical departments by not scheduling too many students to one site. The number of exams has decreased and especially in the first clinical course, students' numbers are too large. We are accredited to take more students and have looked at innovative clinical assignments and more clinical sites, however, this issue remains our largest challenge, therefore we are self-limiting our enrollment.	1	.2
	Part-time faculty	1	.2
	Please note: new program, started in 2004. Thank you.	1	.2
	Political agenda of the institution	1	.2
	Potential job placement. Currently, upward modality movement of graduates is keeping adequate job positions for entry-level radiographers. However, in Mississippi our licensure law allows untrained individuals to work as radiographers (calling them x-ray technicians). This will eventually take its toll on job availability, so radiography programs must be very cautious about increasing enrollment since funding depends on putting the graduate to work.	1	.2
	Qualified students were a problem four to six years ago	1	.2
	Rad exam rooms	1	.2
	Self limited to ensure healthy employment market	1	.2
	Since you have identified a place for some general comments, I will list them here. Enrollment: 1. The class of students who graduated in August 2005, approximately 50 percent have jobs. Of that 50 percent, some are per diem jobs (they have full-time work at least for a few months. 2. In the past five years, we have had almost 100 percent job placement within three months of graduation. This year the percentage will be much lower. 3. The number of jobs and the outlook predicted does not appear to be accurate. I believe that the number of graduates nationally is exceeding the true demand. Again, I realize that the outlook will pick up at some point in the future when predicted retirements start to happen. Possibly in a downside economy and stock market people will continue to work longer. Regarding the question on enrollment. We are accepting fewer applicants because we have seen the trend, at least locally, where there are fewer jobs available.	1	.2
	Student funding resources. The school has funding to service additional students, but the students do not have enough funding sources available to them to allow them to finish the program.	1	.2
	The number of students needed in the field.	1	.2
	The above questions need to be answered by the registrar at the Michener Institute. We don't have access to the details requested above. Thank you.	1	.2
	The availability of quality clinical sites	1	.2
	The hurricanes in our state are causing some very dramatic effects to the budget for the university and the state.	1	.2
	The job market is starting to tighten somewhat. Can accommodate current number, but not likely an increase in graduates.	1	.2

	The market would get flooded	1	.2
	The need for a master's degree will close this program in two years.	1	.2
	The total number of programs in Wisconsin has every viable clinical slot spoken for and in some instances facilities have more than one program trying to use the facility for clinical experiences.	1	.2
	There is a possibility of an affiliation with our community college. If that happens, the class size would increase.	1	.2
	This is to reply to question No. 2. The College has a rolling admissions procedure - the next available class is 2009. I am in the process of trying to change this admissions procedure.	1	.2
	Tuition costs	1	.2
	Very, very few entry-level radiography jobs in our area	1	.2
	We are currently on "Inactive Status" under JRCERT rules. There are no students in the program at this time. The administration will re-evaluate in July 2006.	1	.2
	We do not feel we have any limiting factors. We have a total of 28 students. We feel this total gives the student an excellent didactic and clinical education.	1	.2
	We do not necessarily want to increase enrollment just because we have a large number of students who do not get in. There is certainly a demand for radiographers; however, it is not "critical." Graduates have been steadily going up and meeting the demand overall. Thus, while I might be able to take a few more students, I don't want to because saturation is not good either.	1	.2
	We limit enrollment also to a decrease in jobs available -- which is happening -- ask whether programs will decrease enrollment due to low jobs -- even if # of apps remains high!	1	.2
	We limit enrollment voluntarily to insure an excellent clinical experience for our students. More students equals less clinical experience for each student.	1	.2
	We limit our program to 28 each year even though out capacity is 42. We cannot handle that number at our clinical facilities or with classroom space or faculty. Also, some students are now taking part-time jobs instead of full-time jobs. We feel the shortage is over and do not plan to increase. We may decrease our enrollment during the next couple years. Hospitals are not giving bonuses any longer and salary increases are smaller at this time.	1	.2
	We max at 24	1	.2
	We previously increased the number of acceptances and added a clinical site -- only to find out a few years later that our graduates were committed to staying in our immediate area upon graduation. The market became saturated and they had some difficulty finding jobs. We then decreased our number of admissions and we seem to be doing OK -- all find jobs when they graduate. While there can be a shortage in certain areas -- consideration of where the graduate is going to want to be employed needs to be considered.	1	.2
	We select the number of students to meet the current market demand.	1	.2
	We want to provide at least some local employment opportunities in our region. We are concerned about the class of '06 finding jobs within a 50 mile radius.	1	.2
	We would increase admissions if local job market increases	1	.2
	While the number of general x-ray rooms at the teaching hospitals is declining, every college and university is trying to run a med. rad. program. The teaching hospitals are trying to provide equal access and opportunity to each school, and are decreasing the number of clinical slots per school each year. That is what is mainly limiting enrollments in Bunker Hill Community College in Boston. The quality of clinical education is declining due to chaos in the clinical sites. Students feel abandoned, and so we have decided to limit the number of seats filled. When a hospital has students from five or six different programs, they are spending too much time on paperwork and meetings, and not enough on students. I am trying to find extra support for the students in the clinical setting to counterbalance this trend.	1	.2
	Why do you not ask about the impact master’s degree requirements will have on each program?	1	.2
	Yes there is a shortage of technologists, but we limit enrollment in order not to oversaturate the job market in our area.	1	.2

	Total	615	100.0

9. Do you find it difficult to recruit new faculty for your program?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	195	31.7	32.7	32.7
	Yes	401	65.1	67.3	100.0
	Total	596	96.8	100.0	
Missing	System	20	3.2		
Total		616	100.0		

Faculty Recruitment Difficulty as a Function of Program Type and Educational Level

			9. Do you find it difficult to recruit new faculty for your program?		Total
Discipline		Statistic	No	Yes	
	Radiography	Count	148	303	451
		% within radiography	32.8%	67.2%	100.0%
	Radiation therapy	Count	14	50	64
		% within radiation therapy	21.9%	78.1%	100.0%
	Nuclear Medicine	Count	26	37	63
		% within nuclear medicine	41.3%	58.7%	100.0%
Total		Count	188	390	578
		% within all programs	32.5%	67.5%	100.0%

Across all three program types and all four education levels, about 68 percent of program directors surveyed answered “yes” to question 9. A higher proportion of radiation therapy program directors found it difficult to recruit new faculty (78 percent) than either radiography program directors (67 percent) or nuclear medicine program directors (59 percent), although the difference between radiation therapy and the other two disciplines was significant at only the .05 level ($F_{1,575} = 5.226$, P=.023). Perceived difficulty was also affected significantly by educational level of the program, but not by the interaction between educational level and modality.

Education - 5 levels	Statistic	9. Do you find it difficult to recruit new faculty for your program?		Total
		No	Yes	
Certificate only	Count	70	103	173
	% within Certificate	40.5%	59.5%	100.0%
Associate degree only	Count	82	216	298
	% within Associate	27.5%	72.5%	100.0%
Bachelor's degree only	Count	14	47	61
	% within Bachelor's	23.0%	77.0%	100.0%
Certificate & Associate degree	Count	7	12	19
	% within Certif-Assoc combo	36.8%	63.2%	100.0%
Certificate &/or Associate degree & Bachelor's degree	Count	15	8	23
	% within Bach-(Certif or Assoc) combo	65.2%	34.8%	100.0%
Total	Count	188	386	574
	% within Education - 5 levels	32.8%	67.2%	100.0%

Significantly fewer Associate-only and Bachelor's-only programs (26.7 percent) reported difficulty recruiting faculty than did Certificate-only and Certificate-Associate combination programs (40.1 percent), $\chi^2(1) = 10.37$, $P < .01$. Programs offering both a bachelor's degree and a certificate or an associate degree were the most likely (65.2 percent of the 23 programs) to report difficulty -- $\chi^2(1)$ for the difference between these programs and the Certificate-Only and Certificate-Associate programs = 5.29, $P < .05$.

9. If "yes," what do you believe is the source of the difficulty?

		Responses		Percent of Cases
		N	Percent	
Sources of Difficulty Recruiting Faculty	Salary	232	37.5%	56.2%
	Degree requirements	162	26.2%	39.2%
	Availability of interested applicants	139	22.5%	33.7%
	Other	85	13.8%	20.6%
Total		618	100.0%	149.7%

Note: 413 directors cited one or more sources of difficulty in recruiting new faculty.

The percentage of program directors citing the various sources of difficulty in recruiting new faculty differed significantly as a function of discipline but was not significantly affected by educational level or its interaction with program modality.

Source of Difficulty Broken Down by Program Type*

Source of Difficulty	Statistic	Radiography	Radiation therapy	Nuclear Medicine	Total
Salary	Count	156	39	29	224
	% within progpure	49.5%	78.0%	78.4%	
Degree requirements	Count	131	15	11	157
	% within progpure	41.6%	30.0%	29.7%	
Availability of interested applicants	Count	110	15	11	136
	% within progpure	34.9%	30.0%	29.7%	
Other	Count	65	13	5	83
	% within progpure	20.6%	26.0%	13.5%	
Total	Count	315	50	37	402

Percentages and totals are based on respondents.

Salary was the most frequently cited obstacle to recruiting new faculty, with degree requirements and availability of interested applicants the next two most common, respectively. While salary was mentioned by over three-quarters of the directors of radiation therapy and nuclear medicine programs, it was mentioned significantly less often by radiography program directors (49.5 percent) than by directors of programs in the other two disciplines (79.1 percent), χ^2 (1) = 22.659, $P < .001$. There were no statistically significant differences in the frequency with which the various reasons were cited as a function of educational level of the program or of the interaction between educational level and discipline.

* These figures do not include programs that taught two or more modalities.

Other sources of difficulty in recruiting faculty:

Response	Frequency	Percent
Blank	530	86.3
No. 1 fact is salary. Techs have to take a cut in pay to become an educator.	1	.2
All new faculty are considered PT temporary adjunct and do not qualify for benefits.	1	.2
All of the above contribute to the difficulty. Salaries are low. The college requires a master's degree or obtained within five years for most teaching positions. Fewer technologists appear to be interested in teaching positions b/c of the above. Technologists can earn more as staff radiographers or administrators without degrees than the educators. There is little incentive for technologists to pursue teaching careers.	1	.2
All of the above factors (salary, degree requirements and availability of interested applicants) have an impact. Most new hires have an AA/AS and must work full time and go to school to upgrade their education to a minimum level of BA/BS.	1	.2
All of the above have proven to make recruitment difficult in the past but no recruitment has been necessary over the past five years. The present program officials/faculty have no intention of leaving soon.	1	.2
All previously listed factors influence the ease of recruitment. The order would be: availability of interested applicants, salary, degree requirements.	1	.2
At the present time we do not find it difficult to recruit new faculty for our program. The upcoming master's degree requirement for program directors could cause difficulties finding qualified applicants. Many program directors in our area find it difficult to understand why ONLY program directors in the field of radiology are required to have a master's degree and why programs in good standing with the JRCERT would not be grandfathered in.	1	.2
Attracting people with degrees with little difference in pay, and in most cases techs making more than instructors, have hampered obtaining instructors. While I realize that we want clinical coordinators to have a BA/BS and program directors to now have a master’s, I feel we are hurting ourselves. I believe that 40 percent do not have their degrees and some are going back to obtain them, how many of the 60 percent of those with degrees will retire?	1	.2
Availability of funds for positions	1	.2
Availability of interested applicants	1	.2
Availability of interested qualified applicants with higher education degrees (for a clinical coordinator position, as an example) is limiting.	1	.2
Availability of qualified applicants	1	.2
Benefits packages, our college does not want to employ more than three full-time faculty members. Most of the qualified applicants cannot accept part-time positions with no benefits.	1	.2
But do not lower this. We will get the best people for the job and get them a higher degree.	1	.2
Cannot financially justify additional personnel in such a small program	1	.2
Clinicians are making so much money in the Boston area, that it is very difficult to recruit full-time faculty. We can always find adjuncts, but we prefer full-timers to provide consistency between day and evening classes.	1	.2
Continued from enrollment in the previous textbox: We are planning on accepting 10 or less applicants per year until there is an upswing in the job market. I think that there were not enough questions and choices in this survey to provide an accurate representation of what may be occurring in radiation therapy. Thank you.	1	.2
Degree requirements limit the availability of interested applicants - they go together.	1	.2
Degree requirements of a bachelor's degree to teach. Availability and interest of qualified RTs. Adjunct salary is minimal.	1	.2
Experience	1	.2
Finding applicants with bachelor's degree and salary because of the set salary as determined by faculty union scale. Almost impossible to change starting salary.	1	.2

	For full-time we are limited by the number of authorized positions. For part-time we are limited by the maximum number of work hours per week (16).	1	.2
	Fortunately I have not had to hire anyone lately. However, if I did the salary is lower than a staff therapist. I do not think that I would have anyone interested in teaching. In the past, it was seen as a promotion to go into education. The degree requirements would be the second source of difficulty.	1	.2
	Haven't needed to hire anyone recently, will be a big problem when I retire.	1	.2
	I am the sole full-time faculty member in this program. There is one part-time (30 hr/wk) clinical supervisor. The technologists are voluntary faculty in the clinical affiliates. There is a push in the college for program growth, so I will be looking for another faculty member in the future.	1	.2
	I believe degree requirements may become a problem.	1	.2
	I believe salary is the most difficult but the other factors listed also play a large part.	1	.2
	I have not had an opportunity to recruit new faculty.	1	.2
	I think all three affect the difficulty of obtaining faculty: salary, interest and degree.	1	.2
	Individuals with degrees are apt to take higher paying positions in administration versus low paying positions in higher education.	1	.2
	Insecurity about leaving current full-time employment	1	.2
	Instructors aren't necessarily given time away from their clinical duties in order to fulfill faculty requirements in a hospital-based setting. Many instructors prepare lectures and grade homework/exams once their assigned clinical duties are completed.	1	.2
	It is really a toss up between salary and radiographers with appropriate degrees. If there was interest by staff members who do satisfy the degree requirements, they are not going to go from a salary in the mid $50's to $40,000.	1	.2
	It may be difficult to recruit qualified faculty in the future.	1	.2
	Job requires personal commitment.	3	.5
	Lack of interest in education	1	.2
	Location of program, rural	1	.2
	Many radiographers simply do not want to "teach" and many others do not want to administrate a program due to paperwork, etc. Money is nice in clinical departments and colleges do not necessarily pay any better (or worse). Teaching students is not easy work.	1	.2
	Master’s degree is required at the college level. This has been an ongoing problem with a very limited pool of applicants.	1	.2
	More opportunity for advancement in hospital/imaging center	1	.2
	My college mandates a master’s degree for all full-time teaching faculty and at least a BS for adjunct.	1	.2
	Needing someone as adjunct or part-time for our program could use a part-time instructor, but many technologists are locked into full-time or do not have the flexibility to teach part-time.	1	.2
	No change in 13 years	1	.2
	No encouragement by clinical sites to seek advanced education and training. There is no 8 to 5 when it comes to post-secondary education. Interest is purely OJT when it comes to advancing within the field.	1	.2
	No funding for additional faculty.	1	.2
	No interest	1	.2
	Not able to answer this question very accurately. We have not had to recruit faculty recently ... so I cannot speak to the difficulty of recruitment.	1	.2
	Not sure -- ours is a new program and is small so I have not had the opportunity yet to recruit new staff.	1	.2
	Organization will not increase the number of staff members.	1	.2
	Our college affiliate's requirements are more stringent than JRC's. Clinical instructor needs BA and two years of experience, or AS and six years of experience.	1	.2
	Our community college is surrounded by four year universities, so we are able to recruit new faculty.	1	.2

	Our program has recently reorganized due to financial difficulties. We now offer the program every other year, using one FTE instead of two FTEs.	1	.2
	Our university spent five of last eight years searching for faculty in the radiation therapy program. We recently hired a new graduate for the position.	1	.2
	Part-time status, lack of benefits and decreased need for instructors during summer months	1	.2
	Position is P/T only	1	.2
	Salary and lack of full-time positions	1	.2
	Salary below entry-level instructors, even with years of experience, is below what entry-level NMTs make.	1	.2
	Salary is also a big problem. They aren't paying any more money even though you have more education and it's required to be accredited.	1	.2
	Salary is also a limiting factor that is equivalent in impact to degree requirements.	1	.2
	Salary is number one; however, it is usually because we can't pay to get the qualified individual. Qualified meaning appropriate degree and credentials.	1	.2
	Salary is the biggest issue, but degree requirements keep some people from applying.	1	.2
	Salary is the biggest problem, as techs with experience enough to teach make a good salary in the field. The second major problem is the degree requirements enforced by the JRCERT. I have had interest in teaching from some excellent people who would be great at teaching, but they don't have the degree required by the JRCERT. I think that education is great, but not everyone has the opportunity to complete a bachelor's or master's program.	1	.2
	Salary probably No. 1	1	.2
	Starting salary of educational instructors in schools is low compared to working as a therapist in the field.	1	.2
	Techs can make much more money working at hospitals/clinics than in education. Techs do not require an advanced degree to make the higher pay. Education requires a lot of personal time and attention.	1	.2
	The biggest challenge that I face is recruiting a faculty member that has experience teaching a didactic course. We have a three year waiting list on students, which is why we turned so many down.	1	.2
	The college limits the number of hours per week an adjunct may work to 25 hours. The radiographers can make more money PRN at the local hospitals. Degree requirements play a secondary role as does the availability of interested applicants. The program maintains very high standards by being extremely selective in regard to the adjunct faculty employed by the program to supervise the students.	1	.2
	The job requires personal commitment	1	.2
	The job requires personal commitment	1	.2
	The only recruitment we have done is of adjunct faculty members. Building a good rapport with clinical sites is key to recruiting quality instructors -- particularly with the low salaries we are offering.	1	.2
	The salary offered by our community college is less than new graduates make their first year. Also, most radiographers in our area do not have bachelor's degrees, let alone master's degrees. There is also a lack of interest among the RTs, and some who have applied only want to be involved in education to have weekends and holidays off.	1	.2
	THERE ARE INSUFFICIENT NUMBERS OF RADIOLOGIC TECHNOLOGISTS WITH MASTER'S AND DOCTORATE DEGREES AS A RESULT OF INSUFFICIENT EDUCATIONAL PROGRAMS GEARED TO ALLIED HEALTH PROFESSIONS/ EDUCATION. SALARIES IN EDUCATIONAL INSTITUTIONS ARE APPROXIMATELY 30 PERCENT LESS THAN PROFESSIONAL POSITIONS, THEREFORE IT ALSO DIFFICULT TO ATTRACT QUALIFIED APPLICANTS. I AM A DOCTORATE-PREPARED RT AND AM PAID 20 PERCENT BELOW THE STARTING SALARIES OF MY TWO YEAR GRADUATES.	1	.2

	There is a shortage of qualified individuals interested in teaching in the field of radiology. I think we need to insist on maintaining degree requirements and even increasing them in the future to maintain professional recognition by the education community. Also, salaries for qualified faculty need to be increased as our degree people also are qualified radiographers in more than one modality, unlike the average college instructor in other.	1	.2
	To date we have had no problem, but the pool of qualified and interested applicants is scant. Many do not want to teach or deal with student problems. Others do not want to pursue further education. Salaries in the clinical area and in advanced modalities further decrease interest in becoming faculty.	1	.2
	We're a primarily agriculture area with a depressed economy, and few nearby bachelor programs. All above factors affect our applicant pool.	1	.2
	We are a hospital-based program. It is difficult at times to schedule classes if there is an emergency or we are short-staffed. There are some technologists that prefer the clinical teaching rather than the didactic.	1	.2
	We are finding people who have their BS or their MS but they don't have teaching and/or experience as a program director.	1	.2
	We have been in search for a program director for six months -- although I was qualified to take the position. I preferred the CC position. If we hadn't found anyone qualified in the next month, I would have taken the position out of necessity. We are also lacking for competent adjunct instructors. I think the shortage has been a result of the degree requirement, but also the pay. Considering the educational and time commitment educators are definitely…	1	.2
	We have not had to recruit for radiography, but we had great difficulty locating a sonography instructor. In that search, we found that our area professionals are content with their jobs and are not interested in teaching in any imaging modality. Their concepts of teaching are a combination of things that are not rewarding enough to convince them to change. These include: lower salaries for instructors when compared to actual technologists.	1	.2
	We have not recruited in awhile.	1	.2
	We have only had to hire part-time clinical instructors and we have not had much difficulty. We have not tried to find a full-time faculty member recently.	1	.2
	While we have been fortunate to have a committed faculty, there is a lot of turnover with clinical faculty who often move into better positions. Recruiting qualified clinical instructors who are positive role models and working with them to become compliant with accreditation standards is time consuming. Often these clinical instructors then leave and the entire process must begin again.	1	.2
	Total	615	100.0

WILL THE GAP CLOSE?

To be more specific, if 2004 first-year enrollment figures are maintained, will the profession meet the need for additional R.T.s between 2002 and 2012 projected by the BLS? Answering this question assumes that each of the following factors will remain constant for the three radiologic technology disciplines between now and the end of 2012:

- Total first-year enrollment rates in each discipline.
- Attrition rates, i.e., the percentage of first-year students who ultimately graduate from these programs.
- Pass rates, i.e., the percentage of graduates who pass an ARRT primary certification exam on the first attempt.
- Discipline retention profile, i.e., the ratio of number of R.T.s whose primary sphere of employment is within the discipline to the number of R.T.s who passed the certification exam one to 10 years ago.

In addition, this report assumes that the estimates, which are based on currently available data, are accurate. These assumptions can be referred to collectively as "steady-state" assumptions. The radiography example below shows in some detail how the various statistics were estimated and then combined to predict the 2012 supply of radiographers. Briefer summaries of calculations for the other two disciplines follow. Where multiple estimates of the same statistic are available (e.g., enrollment figures for 2002 as reported directly in the 2002 Snapshot and retrospectively in the 2003 and 2004 Snapshots), the simple average of the estimates is employed.

Radiography

The BLS projects that 72,000 additional radiographers will be needed between 2002 and 2012. Given the estimate of 16,475 students entering radiography programs in 2005, together with the program director estimated attrition rate of 18 percent and an 88.8 percent pass rate for the certification exam, this discipline would appear to be adding new radiographers to the profession at a rate of 12,163 per year.

However, not all new radiographers will still be practicing radiography in 2012. How many of a given year's new radiographer cohort remain in the profession for one to 10 years? An ARRT-supplied database helped determine the number of registered R.T.s who, in early September 2005, listed radiography as the primary area of employment and who had been working in radiography for less than one year, one to three years, etc. The number of R.T.s who passed the radiography certification exam for the first time (a close equivalent to the number of R.T.s who graduated from a radiography program) was profiled each year from 1992 to 2003.[1] This information provides the following estimate of the overall retention profile for radiographers:

[1] American Registry of Radiologic Technologists. 2001, 2002, 2003, 2004 annual reports of examinations. Available at www.arrt.org/website/newsite/Psychometrics/AnnualReportofExams.pdf. Accessed November 2005.

Year	Number of First-time Certificants	Number in Radiography for X Years	Number Years in Radiography as of September 2005	Percent Retained
2005(estimated)	10,565	.333(10,532) + .667(10,565) = 10,237	< 1 year: 6,437	61%
2004	10,532	.667(10,532) = 7,021	1 to 3 years: 15,640	15,640/22,772 = 69%
2003	8,530	8,530		
2002	7,221	7,221		
2001	6,564	6,564	4 to 5 years: 8,335	8,335/12,905 =65%
2000	6,341	6,341		
1995- 1999	40,784	40,784	6 to 10 years: 16,144	= 40%

Similar retention profiles had been computed based on demographic data supplied by the ARRT in early September 2004, late August 2003 and March 2002. Despite being based on somewhat different cohorts of radiographers – about one-third of the radiographers who fell into the one to three years category in March 2002 fell into the four to five years category in August 2003 – the retention percentages were generally comparable to those given above. We therefore averaged the four retention profiles to increase the reliability of the retention-percentage estimates, as follows:

No. of Years in Radiography	Percent of New-Certificant Classes Still in Field After That Many Years
< 1 year	62%
1 to 3 years	75%
4 to 5 years	60%
6 to 10 years	38%

Assuming that this profile holds true for the radiography cohort of 2005 and subsequent cohorts, one would expect that, on average, approximately 38 percent of radiographers who were first-time certificants between 2002 and 2006 would still be practicing radiography as their primary discipline in 2012; 60 percent of the classes of 2007 and 2008 would still be practicing radiography in 2012; about 75 percent of the classes of 2009, 2010, 2011, and 62 percent of the class of 2012, would be practicing at the end of 2012.

The ARRT's 2002 Report of Exams shows that the class of 2002 consisted of 7,221 new certificants; the class of 2003, 8,530; the class of 2004, 10,532; and the class of 2005 should include 10,532 new certificants (14,544 students who entered radiography programs in 2003, decreased by an 18 percent attrition rate and an 11.2 percent exam failure rate). In 2006, about 11,390 new radiographers should enter the market. Further, the new-certificant class of 2007 (and, under steady-state assumptions, each subsequent class) should consist of approximately 12,163 new radiographers. Combining these figures with the above retention profile leads to an estimate that 48,238 (the number of new radiographers certified in 2002 to 2006) x .38 + 24,126 x .60 + 36,190 x .75 + 12,163 x .62 = 67,681 additional radiographers by the end of 2012. However, an average of 1.6 percent of new ARRT radiography-certified technologists take jobs outside the United States (averaging the Snapshot 2003, 2004 and 2005 estimates of that percent), so between 2002 and 2012 a total of about 66,598 radiographers — about 5 percent short of the BLS-estimated need – will add to (and remain in) the U.S. labor pool of radiographers. Of additional note is that 12.2 percent of radiography program directors plan to increase their enrollments.

Radiation Therapy

The BLS projects that 7,000 radiation therapists will be needed between now and 2012. The ARRT's 2003 Report of Exams shows that the class of 2002 consisted of 562 new certificants; that the class of 2003 numbered 679 new certificants; and there were 813 in 2004. In 2005, we expect to see an estimated 966 new radiation therapists (1,308 students who entered radiation therapy programs in 2003, decreased by a 16.8 percent attrition rate and an 11.2 percent exam failure rate). Given the estimate of

1,390.5 students entering radiation therapy programs in 2004, together with the program director-estimated attrition rate of 16.8 percent and an 11.2 percent exam failure rate for the certification exam, this discipline would appear to be adding 1,027 new radiation therapists for 2006. Further, the new-certificant class of 2007 (and, under steady-state assumptions, each subsequent class) should consist of approximately 1,021 new therapists. Combining these figures with the retention profile estimated for radiation therapists leads to an estimate of 4,047 (the number of new radiation therapists certified in 2002 to 2006) x .803 + 2,042 x 1.23 + 3,063 x 1.069* + 1,021 x .81 = 9,707 additional radiation therapists by the end of 2012. However, an average of 4.1 percent of new ARRT therapist certificants take jobs outside the U.S., so between 2002 and 2012 a total of about 9,309 radiation therapists may be added to (and remain in) the U.S. labor pool of radiation therapists, thereby exceeding the BLS-projected need in this discipline by about 33 percent. About 12.5 percent of radiation therapy program directors plan to increase their enrollments – the same percent as plan to decrease them.

Note: The number of ARRT certificants whose primary sphere of employment in September 2004 is listed as radiation therapy and who have been practicing in this discipline for four to five years is 123 percent greater than the number of radiation therapists who passed the radiation therapy certification exam in 1999 or 2000 (i.e., four to five years ago), impacting the calculation of the percent of new radiation therapists who begin practicing in 2007 and 2008 who will still be practicing in 2012. This excess is probably due to repeat examinees and to migration into radiation therapy from other specialties (e.g., radiography) without benefit of ARRT certification in radiation therapy.

Nuclear Medicine Technology

The BLS projects a need for 7,000 nuclear medicine technologists to meet increased demand and attrition between 2002 and 2012. Projecting NMT supply over that period is complicated by the fact that there are two routes to certification as a nuclear medicine technologist: via the ARRT's certification exam, or the exam administered by the NMTCB. Entering-class NMT enrollments are based on all programs, regardless of the percentage of their graduates who take the ARRT certification exam, the NMTCB exam, or both. The actual number of successful first-time examinees for 1992 through 2004 is available both for the ARRT exam (via the ARRT's annual report of examination performance) and for the NMTCB exam (personal communication, NMTCB, Oct. 25, 2004, and Spring 2005 NMTCB newsletter) – but it is unknown how much overlap between the two sets of individuals there was each of those years (i.e., how many individuals passed both exams). We therefore used as our estimate of the total number of successful first-time NMT examinees for a given year the figure predicted from entering-class enrollment two years before (taking attrition and pass rates into account), where available (namely, for 2001 through 2007). This decision is supported by the fact that for 2001 through 2004 that estimate is always between the larger of the known number of new ARRT certificants and the known number of new NMTCB certificants, on the one hand, and the sum of those two numbers, on the other.

The number of current nuclear medicine technologists who have been practicing in this discipline for a given number of years (from which professional retention rates are computed) is available, however, only for ARRT registrants. We therefore calculated the NMT retention rate as the percentage of a given year's (or range of years') total new certificants (both ARRT and NMTCB) who, a given number of years later, are practicing as ARRT-registered nuclear medicine technologists.

On those grounds, we estimate that the certificant class of 2002 consisted of 783 first-time examinees who passed the ARRT and/or the NMTCB exam; 2003, 976 successful first-time examinees; 2004 had 1,121; 2005 had 1,280; and 2006 had 1,385. This year's Snapshot yields an estimated 2005 entering-class enrollment of 1,598 NMT students. Nuclear medicine technology program directors estimate an attrition rate of 8.6 percent, and the pass rate for the 2007 exam will probably be close to the 2004 rate of 92.6 percent, so the new-certificant class of 2007 should consist of about 1,352.5 new nuclear medicine technologists.

Under steady-state assumptions, 1,352.5 individuals should pass their nuclear medicine certification exam(s) for the first time every year from 2007 through 2012. Certificant and years-in-discipline information for nuclear medicine technologists show that the number of ARRT certificants primarily

employed in nuclear medicine technology for less than one year is about 38 percent of the number of first-time certificants (ARRT and NMTCB) in this cohort, that the number after one to three years is about 62 percent of the number in the first-time certificant classes for those years; 73 percent of the number who took the primary exam and passed it for the first time four or five years earlier; and 68 percent of those who have been in the specialty for six to 10 years. Thus, under steady-state assumptions, about 8,845 additional ARRT-registered nuclear medicine technologists would be practicing in the profession by the end of 2012. Since 98 percent of graduates of nuclear medicine programs take jobs in the United States, this suggests that about 8,668 ARRT-registered nuclear medicine technologists will add to the U.S. labor pool between 2002 and 2012. However, a MIRODA-sponsored match of the NMTCB and ARRT databases conducted about four years ago found that 58 percent of NMTCB registrants also are registered with ARRT. This implies that the total number of certified nuclear medicine technologists at that time was more than 50 percent greater than the number of ARRT-registered nuclear medicine technologists. If that ratio continues to hold, the profession will add and retain about 13,000 additional nuclear medicine technologists between 2002 and the end of 2012 – nearly double the BLS-estimated need for additional nuclear medicine technologists.

Uncertainties in Projections

These projections are subject to a high degree of uncertainty. First, there is statistical uncertainty. The 95 percent confidence intervals (CIs) around the estimated total entering-class enrollment for 2005 in these three disciplines are ±591 students for radiography, ±146 for radiation therapy and ±255 students for nuclear medicine technology. (The CIs around enrollment figures for 2002 to 2004 are narrower, since they are averages of estimates from more than one annual snapshot.) There also is statistical uncertainty in the estimate of the attrition rate for each type of program.

Producing even more uncertainty are the possible systematic changes in enrollment rates and attrition rates (e.g., 12.2 percent of radiography program directors plan to increase their enrollments in the near future, potential variations in number of applicants due to changes in reimbursement rates for radiologic procedures, etc.). Moreover, each retention profile (i.e., the ratios between number currently practicing in a discipline and those who passed their initial certification exam in that discipline a certain number of years earlier) are based on calculating backward from a single point in time (March 2002, end of August 2003, or beginning of September 2004) and might not represent what will happen to the 2002 to 2012 new-certificant cohorts.

Overall, however, the best current estimate is that radiation therapy is producing new practitioners substantially above the correct rate to meet the 2012 demand estimated by BLS, while nuclear medicine will nearly double the estimated need and radiography is likely to come up somewhat short (by about 5 percent) of the projected demand unless enrollments or retention rates are increased.

APPENDIX A

QUESTIONNAIRE

asrt
American Society of
Radiologic Technologists

October, 2005

Dear Program Director:

As director of an educational program in radiography, radiation therapy or nuclear medicine, you are both affected by and have a major influence on the supply of radiologic technologists in those professions. For you and your fellow program directors to make informed decisions about enrollment levels in your programs and for the profession to anticipate the effects of those decisions on the number of professionals who will be needed in coming years, it is necessary to have the most accurate possible estimates of educational program enrollments.

In each of the past four years at least two-thirds of program directors participated in ASRT's enrollment surveys. This enabled us to provide the first hard evidence that the downturn in new enrollment had been reversed. It also has helped us to estimate whether current rates of enrollment, attrition and retention within the work force will enable each discipline to meet the need for additional technologists and therapists the Bureau of Labor Statistics projects by 2012. We now need to determine whether the upswing in enrollments has continued or has leveled off, as they appeared to do last year. We also need to update our estimates of how each specialty is doing in meeting the need for its technologists.

I would appreciate your participating in the 2005 enrollment survey at your earliest convenience, so that ASRT can put together a quick, accurate snapshot of enrollment trends. You can do this by completing and returning the enclosed, two-page questionnaire or by surfing your way to http://www.asrt.org/content/surveys/enr_snapshot_2005.html to complete the questionnaire online. Please use the online route if possible; this gets your feedback to us more quickly and minimizes administrative data entry errors. We will summarize the data from programs in each discipline and the results will be made broadly available. Individual programs will not be identified.

We would, of course, be interested in additional comments you might wish to share about these issues or the factors driving recent trends in your program's enrollment figures. However, we would prefer that you respond with the figures requested by the questionnaire as soon as possible and then send additional comments separately to Richard Harris by mail or e-mail at rharris@asrt.org.

Thank you very much for your help in gathering this vital information.

Sincerely,

Sal Martino

Sal Martino, Ed.D., R.T.(R)
Executive Vice President and Chief Academic Officer

15000 Central Ave. SE, Albuquerque, NM 87123-3917 • 505-298-4500 • 800-444-2778 • Fax 505-298-5063 • www.asrt.org

American Society of Radiologic Technologists
15000 Central Ave. SE, Albuquerque, NM 87123-3917 • 505-298-4500 • 800-444-2778 • Fax 505-298-5063 • www.asrt.org

RADIOGRAPHY, RADIATION THERAPY AND NUCLEAR MEDICINE ENROLLMENT SURVEY

FALL 2005

If possible, please respond via an electronic version of the questionnaire at
http://www.asrt.org/content/surveys/enr_snapshot_2005.html

Indicate your type of program.
- O Radiography
- O Radiation therapy
- O Nuclear medicine
- O Other (Please specify_____)

What is the educational level of your program?
- O Certificate
  - If yours is a certificate program, do you have an articulation agreement with a community college?
    O Yes O No
- O Associate degree
- O Bachelor's degree
- O Other (Please specify _____)

In what country is your program located?
- O USA O Australia O Canada
- O Other (Please specify_____)

Please help us document overall trends in enrollment during the past three years.

Note: If yours is a multiple-discipline program, or includes multiple educational levels, please submit responses to questions 1 through 7 below separately for each of the types and educational levels represented within your program. You may make copies of this form for this purpose or, for a small number of subprograms, add lines to a single copy of the questionnaire

1. What were your freshman enrollment figures for the following years, i.e., how many students entered your program each year? (A student is considered to have entered a program once he or she is admitted to that program; this may be after a year or more of general course work.)
   2003 ☐☐☐ 2004 ☐☐☐ 2005 ☐☐☐

2. Is your program currently at full enrollment?
   O Yes O No
   If "no," approximately how many additional students could be accommodated by your program? ☐☐☐
   If "yes," approximately how many qualified students did you turn away this fall? ☐☐☐

3. Do you plan any changes related to enrollment?
   - O Plan to increase
   - O Plan to decrease
   - O Plan to remain the same

[A few more questions are on the back of this page.]

4. How viable is your program over the next few years?

O Will definitely continue to operate
O Possibly will be closing
O Will be closing
If your program is closing, how many more years will it continue to operate, including this academic year? ☐☐

5. What was the average attrition rate for your program over the past few years (percentage of entering students who did not complete the program)?

Attrition rate ☐☐%

6. Has this attrition rate varied substantially over the past few years?

O Yes O No
If "yes," how has the attrition rate varied?
O Increased O Decreased O Increased some years, decreased others

7. About what percent of your program's graduates over the past five years have taken jobs in the U.S. (including U.S. territories and Puerto Rico)?

☐☐☐% **or** O Don't know

Next, please provide any feedback on the following two issues related to education in the radiologic sciences:

8. Rank order the following factors with respect to how seriously they limit enrollment in your program. Write a "1" beside the most limiting factor, "2" beside the second most serious limitation, etc. Leave the space blank if you don't believe the factor limits enrollments.

☐ Funding ☐ Space ☐ Equipment ☐ Number of qualified applicants ☐ Availability of faculty
☐ Number and/or staffing of clinical sites available to your program.
☐ Other (Please specify _____)

9. Do you find it difficult to recruit new faculty for your program?

O Yes O No
If "yes," what do you believe is the source of the difficulty?
O Salary O Degree requirements O Availability of interested applicants
O Other (Please specify _____)

Thank you very much for your help. Please return the survey in the enclosed business reply envelope to:

Richard Harris, Director of Research
ASRT
Research Department
P.O. Box 51060
Albuquerque, NM 87181-9980

APPENDIX B

COMMENTS WRITTEN ON QUESTIONNAIRES OR SENT VIA E-MAIL

Via E-mail

“One comment I have about the survey is that according to JRCERT, our program is not at full enrollment. However, we feel it is based on volume of procedures and staff availability to supervise students at our various clinical education sites. We currently have 11 hospitals and two clinics. I have noticed the trend of programs to increase student capacity and have been concerned that with the competency based system, programs are passing students through clinical experiences with fewer required exams to be performed by the student. (We have noticed this with other programs claiming competence of graduates.) We do not feel that a student is competent just because they completed a procedure on a good patient one time for the instructor. Can they do it again at a later date with a patient who is not a textbook case? We do require more of our students, and as a result dropped our enrollment number by two this last year and will probably drop another position next year to ensure that graduates are truly competent and capable. Flooding the market with graduates just to supply numbers will not solve the problems we have in technology today when we are expecting more complex skills plus critical-thinking abilities as part of the job market. Also, in our area that we are supplying with graduates, we have noticed a leveling off of vacant positions. There seems to be a reluctance of graduates to go to other areas of the country for employment.”

“What limits my enrollment now is job availability. There are not many jobs left in [state] except in the very rural areas and most students, unless they are from this area, do not want to move to such a remote town. Therefore, I do not want to graduate students who do not want to leave [state] but must if they want to find a job!

“In order to fill the jobs in rural areas, I am currently attempting a distance education with another facility. We picked a student who wants to become a radiation therapist, who already lives in the area and has ties there. This will hopefully prevent this person from leaving after they finish the program. This individual cannot leave and come to school here in [city] for a year, so – distance education on a shoestring. I am hopefully addressing this problem in the state because there is no licensure for R.T.(T)s and I am fearful that unqualified individuals will be running linear accelerators!

“The other factor that limits the number of students is program faculty. Since I am a hospital-based program, I am the only faculty member who teaches in the program. All of the other faculty have clinical jobs and they teach basically in between their clinical duties. Therapy is so labor intensive and these people demand high salaries, so we cannot hire faculty just to teach in the program.

“Thank you for your time.”

“And please do not forget that there are still hospital-based programs out there and many of the surveys, recommendations and suggestions do not address my reality!”

Written on Questionnaire

		Frequency	Percent
	Blank	577	93.2
	1. This program takes new students every other year. 2. This program hasn't recruited new staff for over 25 years.	1	.2
	Accented and put stars around "degree requirements" in Q9.	1	.2
	End of questionnaire: Our faculty searches have been limited by a combination of degree requirements and salary. Those, in our area, who hold the necessary degree for program director are usually department managers who are paid about $20,000/yr more than the salary they,,,	1	.2
	Q1: Junior = 1st year in our "professional" discipline-specific program.	1	.2
	Q1: Of the 15, 8 sonography, 7 management	1	.2
	Q2 (students turned away): 80 in 2003, 40 in 2002. Q5 (19% attrition): average 3 years. Q6 (variation in attrn rate): 32% 2004, 6% 2003, 19% 2002	1	.2

	Q2 (not at full enrmnt): Lost 2nd year students.	1	.2
	Q2: Underlined "qualified" Q4: Underlined "definitely" Q6 (No): Not "substantially"	1	.2
	Q3 (Plan to incr enrmnt): Possible affiliation with college	1	.2
	Q3 (plan to remain same): "Or slightly decrease."	3	.5
	Q3 (Plan to increase): If more clinical sites are added.	1	.2
	Q3 (Plan to remain same): May increase by not more than five.	1	.2
	Q3 (Plan to remain same): We overloaded for 2 years and now have "maxed out" clinic sites.	1	.2
	Q5-7: NA; Program started in 2003.	1	.2
	Q5 (84% attrition): Past 5 yrs	1	.2
	Q5 (attrition rate 11%): For current class. Q7 (DK): No graduates yet.	1	.2
	Q6 (blank): New program, no history	1	.2
	Q6 (No): "0-18%	1	.2
	Q7 (blank): New program -- no graduates yet – 2005	1	.2
	Q8 ("Clinical site" # 1 and only): Only limitation	1	.2
	Q9 (blank): Have not needed to recruit new faculty.	1	.2
	Q9 (Checked 1-3): All of these!	1	.2
	Q9 (No): I have been with this program since 1980. We recruited the clinical coordinator from within the facility -- very easy to do. However, if either one of us retired (quit), then I believe it would be very difficult to recruit for a new program director due to degree requirements. However, I fully support the master degree level requirement for the program director position.	1	.2
	Q9 (No): Note all faculty are employees of the hospital; we do not recruit for faculty.	1	.2
	Q9 (No): This answer is misleading since we have not attempted to recruit new faculty.	1	.2
	Q9 (yes): We have been trying to fill a full-time faculty position for the past three years!	1	.2
	Q9, degree reqmnts: At the university level, higher education is required and I fully support this! However, finding college educated & degreed faculty is difficult.	1	.2
	Q9: All 3	1	.2
	Q9: deg #1, salary #2	1	.2
	Q9: I had one opening this past year and only one interested applicant!! [Also ranked Sal, deg, applics 1st, 2nd, 3rd.)	1	.2
	Q9: Salary #1, applic #2, deg #3	1	.2
	Q9:Put a ++ by "Availability of interested applicants"	1	.2
	Qns2&3: We are at full enrollment because we decreased enrollment due to job shortage. I think that your survey should include questions related to job market. Thanks. ___, Program Chair.	1	.2
	Qs 2002,2003,5-7,9: NA -- new program.	1	.2
	Qs5-7: N/A -- new program	1	.2
	Qs5-7: N/A -- program started 2003	1	.2
	Qs5-7: New program began fall 2003	1	.2
	Qs5-7: No graduates at this time.	1	.2
	Ranked Q9 deg, applic, sal	1	.2
	This program will close effective November 2004.	1	.2
	Total	619	100.0

Update to

ENROLLMENT SNAPSHOT OF RADIOGRAPHY, RADIATION THERAPY AND NUCLEAR MEDICINE PROGRAMS, FALL 2005: TECHNOLOGISTS ADDED 2004-2014

A Nationwide Survey of Radiology Department/Facility Managers and Directors
Conducted by
The American Society of Radiologic Technologists

Updated March 2006

TABLE OF CONTENTS

BACKGROUND AND OBJECTIVES

The fifth in a series of annual reports from the ASRT on class enrollments in educational programs for radiographers, radiation therapists and nuclear medicine technologists (http://www.asrt.org/media/pdf/research/enrollmentsurvey05.pdf) provided estimates of the number of technologists in each discipline that would be added to and retained in the U.S. workforce between 2002 and 2012, if fall 2005 trends continued. Since those analyses were completed, the Bureau of Labor Statistics (BLS) released projections for the number of technologists needed between 2004 and 2014 to meet increased demand and to replace technologists who leave the labor force during this time. This addendum provides supply-side projections for comparison with the most recent set of BLS demand-side projections.

WILL THE GAP CLOSE?

Updated to Relate to BLS Demand-Side Projections for 2004-2014

To be more specific, if 2005 first-year enrollment figures are maintained, will the profession meet the need for additional radiologic technologists between 2004 and 2014 projected by the BLS? The following projections for the 2004-2014 period were obtained employing data and methods that are detailed in the original Enrollment Snapshot of Radiography, Radiation Therapy and Nuclear Medicine Programs, Fall 2005, which estimated the number of technologists who would be added to and retained in the work force between 2002 and 2012.

Radiography

The BLS projects that 76,000 additional radiographers will be needed between 2004 and 2014. This is an increase of 4,000 more radiographers than their estimate for the 2002-2012 period.) The ASRT estimates that, if current (fall 2005) enrollments, graduation rates and retention rates continue, 70,941 radiographers – 6.7% short of the BLS-estimated need – will be added to and remain in the U.S. labor pool of radiographers between 2004 and 2014.

Radiation Therapy

The BLS projects that 7,000 additional radiation therapists will be needed between 2004 and 2014. This is the same need BLS projected for the 2002-2012 period. The ASRT estimates that, if current trends continue, between 2004 and 2014 a total of about 10,318 radiation therapists will be added to and remain in the U.S. labor pool of radiation therapists, thereby exceeding the BLS-projected need in this discipline by about 47%.

Nuclear Medicine Technology

The BLS projects a need for 7,000 nuclear medicine technologists to meet increased demand and attrition between 2004 and 2014. This is the same need BLS projected for the 2002-2012 period. As pointed out in the original Enrollment Snapshot 2005 report, projecting nuclear medicine technologist supply over that period is complicated by the fact that there are two routes to certification as a nuclear medicine technologist: the American Registry of Radiologic Technologist certification examination or the exam administered by the Nuclear Medicine Technologist Certification Board. Under the same assumptions that were used in the original report, we estimate that the profession will add and retain

about 14,250 additional nuclear medicine technologists between 2004 and 2014 – more than double the BLS-estimated need for additional nuclear medicine technologists.

Uncertainties in Projections

Readers should re-examine this section of the original report before making any decisions based on the estimates in the original report and in this update.

Overall, however, the best current estimate is that radiation therapy programs are producing new practitioners substantially above the rate to meet the 2004-2014 demand estimated by BLS, while nuclear medicine programs will more than double the estimated need and radiography is likely to come up somewhat short (by about 7%) of the projected demand unless enrollments or retention rates (within educational programs or within the discipline) are increased.