American Society of
Radiologic Technologists

ENROLLMENT SNAPSHOT OF RADIOGRAPHY, RADIATION THERAPY AND NUCLEAR MEDICINE PROGRAMS

2008

Reported January 2009

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Executive Summary

In late September 2008 an invitation to complete an online questionnaire was sent via mail and if possible by e-mail to each of the 1,003 radiography, radiation therapy and nuclear medicine programs listed by the American Registry of Radiologic Technologists (ARRT). As of November 17, 2008, the return rate was 668 of 1003 questionnaires, which represented an overall return percentage of 66%. Furthermore, 527 of 742 (71%) radiography programs, 62 of 125 (50%) radiation therapy programs, 81of 136 (60%) nuclear medicine technology programs, and 16 other/unspecified programs had responded to the survey.

Summary of Data:

Of the 193 certificate-only programs, 99 (51%) indicate that they have an articulation agreement with a community college or with a four-year college or university.

Entering-class enrollments appear to have begun declining. Information from program directors of almost two-thirds of ARRT-listed educational programs in these specialties estimates fall 2008 first-year enrollments at 17,050 radiography students, 1,314 radiation therapy students and 1,660 nuclear medicine technology students. These represent decreases (from 2.6% for radiography and 3.0% for radiation therapy to 9.7% for nuclear medicine technology programs) relative to 2007 enrollments — despite the fact that the number of programs offering education in each of the three disciplines increased. (These program directors' retrospective reports indicate that radiography experienced a small (2.5%) but statistically significant increase in mean reported entering-class enrollments from 2006 to 2007, while nuclear medicine technology and radiation therapy enrollments dropped by about 3% that year.)

Overall, 61.4% of program directors reported full enrollment in fall 2008 compared to 66.4% in 2007. The number of full programs rose from 75% to 77.5% in fall 2003 - 2006, and was about 66% in fall 2002 compared with 50% 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 27,650 students, while programs not at full enrollment reported unused capacity totaling only 2,870 students. The ratio of number of qualified students turned away to total number admitted was about 1.5 among radiography programs, 1.3 in radiation therapy, and .66 in nuclear medicine. About 9.4% of radiography program directors, 11.9% of radiation therapy program directors and 10.4% of nuclear medicine program directors reported that they plan to decrease enrollments, compared with 7.4%of radiography program directors, 10.2% or radiation therapy program directors, and 7.8% of nuclear medicine technology program directors who plan increases. Among radiography and radiation therapy programs offering baccalaureate degrees, however, a substantially higher percent of program directors plan increases than plan decreases in enrollment (26.5% vs. 2.9% among radiography programs; 12.5% vs. 0% in radiation therapy).

We combined information gathered by this year's and previous years' enrollment snapshots on entering-class enrollments, program attrition rates, certification-exam failure rates, percent of graduates taking U.S. jobs, and (for nuclear medicine technology programs) percent of program graduates who take the ARRT vs. the Nuclear Medicine Technology Certification Board (NMTCB) certifying exam with information gleaned from the ARRT's renewal-form database as to the percentage of new certificants in each specialty who are still in that specialty one, two, …, 10 years later to generate projections as to how many additional technologists would be added to and retained in the U.S. labor force between 2006 and 2016. These projections indicate that if all of these factors remain at their fall 2008 levels over that period, all three disciplines will exceed the number of additional radiographers the Bureau of Labor Statistics (BLS) feels will be needed. The number of radiation therapists added to and retained in the U.S. workforce will, under this steady-state assumption, exceed the BLS-estimated need by about 25% in radiography, 50% in radiation therapy and 175% in nuclear medicine.

About one-sixth of the program directors who responded to this survey accepted the invitation (question 9 of the questionnaire) to "Please add any additional comments you have here". Their verbatim comments (edited to avoid identifying individual programs or directors) appear in Appendix B to this report.

BACKGROUND AND OBJECTIVES

This is the eighth in a series of annual reports from 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 R.T. 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[1] provided the first empirical evidence that the downward trend in entering-class enrollments observed since 1994 had reversed. Snapshot 2002[2] 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 demand estimates in these three specialties. 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[3] added a question concerning the percentage of each program's graduates who enter the U.S. workforce. The analysis showed further increases in entering enrollments and updated the projections of numbers of new radiographers, radiation therapists and nuclear medicine technologists that would be added through 2010. Snapshot 2004[4] revealed that the number of students entering increased, although at a lower rate than in the previous four years. Snapshot 2006 added a question about the percentage of the programs' recent nuclear medicine technology graduates who took the ARRT vs. the NMTCB certifying exam (or both). The 2002 – 2006 snapshots were the basis for an analysis of enrollment trends from 1999 through 2006[5] that concluded that "the number of radiologic technologists entering these three disciplines declined steadily from 1995 to 2000, then increased steadily from 2000 to 2005. However, since 2005, entering-class enrollments have begun to level off, especially in radiation therapy and radiography." Snapshot 2007 provided further evidence of this leveling off, including a finding that, for the first time, maintaining that year's enrollment and retention trends would lead to producing more new radiographers than the BLS felt would be needed in its current "window" of 2006 – 2016.

The 2008 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 who have taken jobs in the United States. The 2008 Snapshot, like Snapshots 2005-2007, asked directors of certificate programs to indicate whether or not their programs have an articulation agreement with a community college. This 2008 Snapshot also asked (as did the 2006 and 2007 Snapshots) directors of nuclear medicine programs to estimate the percentage of their recent graduates who have taken the ARRT (N) exam, the NMTCB certifying exam, both exams, or neither. This information gives us a better "handle" on estimating the total number of new certified nuclear medicine technologists (whether NMTCB- or ARRT-registered or both) to expect two years from now.

Program directors were surveyed about the future of their programs, including plans for increasing or decreasing enrollments and any possibility that the program might close within the next few years.

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[1] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, November 2001. Available at: www.asrt.org/media/pdf/enrollment_survey01.pdf. Accessed November 2008.
[2] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, September 2002. Available at: www.asrt.org/media/pdf/enrollment_survey02.pdf. Accessed November 2008.
[3] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, fall 2003. Available at: : www.asrt.org/media/pdf/enrollment_survey_03.pdf. Accessed November 2008.
[4] American Society of Radiologic Technologists. Enrollment snapshot of radiography, radiation therapy and nuclear medicine programs, 2004. Available at: www.asrt.org/media/pdf/enrollment_survey_04.pdf. Accessed November 2006.
[5] Entering-Class Enrollments in Educational Programs in Radiography, Radiation Therapy, and Nuclear Medicine Technology, 1999 to 2006 . Journal of the American College of Radiology , Volume 4 , Issue 12 , Pages 906 - 912 S . Martino , R . Harris , J . Culbertson , J . Chapman

METHODOLOGY

In late September 2008 the ASRT e-mailed to every radiography, radiation therapy and nuclear medicine program listed in the ARRT's list of education programs[1] for whom we had an e-mail address an invitation to complete an online questionnaire dealing with their entering-class enrollments. At the same time the ASRT mailed a hard copy version of that invitation to each of the seven program directors for whom no e-mail address was available. Program directors could request a printed version of the questionnaire if they found online responding inconvenient, but none did. In early October a reminder of the need for participation in the enrollment survey was mailed to all program directors who had not explicitly told us that they had responded to the survey.

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 percent of their nuclear medicine technology graduates took the ARRT certifying exam vs. the NMTCB exam or what percentage took both or neither of those exams, and what percentage of recent graduates took jobs in the United States. (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 through 2007 snapshots, 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. This year's questionnaire asked directors of certificate programs whether the program has an articulation agreement with a community college, as did the 2005 snapshot and subsequent versions. As with the 2006 and 2007 snapshots, this year's questionnaire also asked nuclear medicine program directors what percentage of their recent (past two years) graduates took the ARRT (N) exam, the NMTCB certification exam, or both.

As of November 16, 2008, 527 (71%) radiography programs, 62 (50%) radiation therapy programs, 81 (60%) nuclear medicine technology programs and 16 "other" or unspecified types of program had responded to the questionnaire. The return rate – 668 of 1,003 invitees – represented an overall response rate of 66%.

Statistical and Mathematical Notes

The high response rate (which was at least 50% for each discipline for each of the three years for which enrollment figures were provided) means that the width of confidence intervals around sample means and the likelihood that the direction of a given sample difference matches the corresponding difference in the population are affected not only by absolute sample size (number of program directors responding to the question) but also by the *proportional* sample size. In particular, confidence intervals (the range of values within which there is a 95% chance that the true population value lies) for statistics based on the total sample are narrower by a factor of: $\sqrt{1-\frac{n-1}{N-1}} \approx \sqrt{.334} = .578$ than those that would be calculated without this *finite population adjustment*.

Similarly, standard errors (estimated standard deviations of sampling distributions) are smaller by that same factor, so that *t*-ratios are larger by a factor of 1/.578 = 1.729 and *F*-ratios are larger by a factor of $1/.578^2 = 2.991$ than they would be without the finite population adjustment. In short, having sampled a high percentage of all programs gives us greater confidence that the results are representative of the population of all radiography, radiation therapy and nuclear medicine technology educational programs.

Question 8 asked program directors "approximately what percent of your program's graduates over the past two years have taken the ARRT certification exam in nuclear medicine technology vs. the NMTCB certification exam?" But computing retention profiles for nuclear medicine technology program graduates (see the "Has the Gap Closed?" section) requires estimates of the percent of nuclear medicine technology graduates taking both these certifying exams for individual years. For this year's case, in which we had three "last two years" estimates from which to derive individual-year estimates for each of 2005 through 2008, it turns out the simple average of all four years is completely determined by the three observed "last two years" estimates and that each of the individual-year

[1] American Registry of Radiologic Technologists. ARRT-recognized educational programs. Available at: www.arrt.org/index.html?content=http://www.arrt.org/nd/listOfSchools.ndm/listSchools&iframe=yes . Accessed September 2008.

estimates can be expressed as a simple linear function of the two-year estimates and the (unknown) percent for 2005 (b_{2005}) as follows:

$t_{2006} = (b_{2005} +. b_{2006})/2$; $t_{2007} = (b_{2006} +. b_{2007})/2$; $t_{2008} = (b_{2007} +. b_{2008})/2$; where t_i = the two-year estimate obtained in year *i*, which is the average of the (unobserved) individual-year percents obtained in years *i*-1 and *i* (i.e., the simple average of b_{i-1} and b_i. It follows that:

$b_{2005} = b_{2005;}$ $b_{2006} = 2\ t_{2006} - b_{2005}$;
$b_{2007} = 2t_{2007} - b_{2006} = 2(t_{2007} - t_{2006}) + b_{2005}$; and
$b_{2008} = 2t_{2008} - b_{2007} = 2(t_{2008} - t_{2007} + t_{2006}) - b_{2005}$.

Not surprisingly it is not possible to estimate 4 unknowns (the 4 individual-year percents) on the basis of only three observed percents (the three two-year averages) without invoking an additional constraint. A reasonable constraint is to pick that value of b_{2005} that results in individual-year estimates showing minimal variability from year to year (i.e., we use b_{2005} such that $\sum(b_i - M_b)^2$ is as small as it can be), where:

$M_b = (b_{2005} +. b_{2006} + b_{2007} + b_{2008})/4 = (t_{2006} + t_{2008})/2$.

(Note that M_b *is* completely determined by [two of] the observed two-year averages.)

A bit of algebraic manipulation and even less calculus [setting the first derivative of $\sum(b_i - M_b)^2$ with respect to b_{2005} to zero] reveal that:

The minimum-variance value of $b_{2005} = M_b - (t_{2008} - t_{2007})$.

Substituting the obtained estimate of b_{2005} into the expressions given earlier for each individual-year estimate as a function of the observed two-year estimates and b_{2005} provides that set of individual-year estimates that is consistent with the observed two-year estimates while showing the minimum possible year-to-year fluctuation.

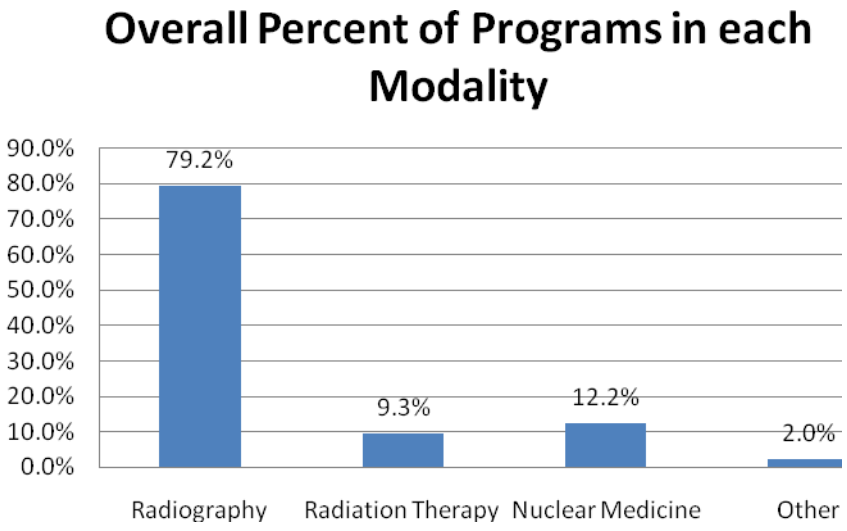
DETAILED RESULTS

Type of Program

	Frequency	Percent	Valid Percent
Radiography	512	76.6%	77.0%
Radiation therapy	59	8.8%	8.9
Nuclear medicine	77	11.5%	11.6%
Other	2	.3%	.3%
Radiography & Radiation therapy	2	.3%	.3%
Radiography & Nuclear medicine	1	.1%	.2%
Radiography and Other	9	1.3%	1.4%
Radiography, Radiation therapy & Nuclear medicine	1	.1%	.2%
Radiography, Nuclear edicine & Other	2	.3%	.3%
Total	665	99.6%	100.0%
Missing	3	.4%	
Total	668	100.0%	

Overall Number of Programs in Each Modality (including multiple-modality programs)

	Responses		Percent of Cases
	N	Percent	N
Radiography	527	77.2%	79.2%
Radiation therapy	62	9.1%	9.3%
Nuclear medicine technology	81	11.9%	12.2%
Other	13	1.9%	2.0%
Total	683	100.0%	102.7%



"Other" Types of Program, Specified

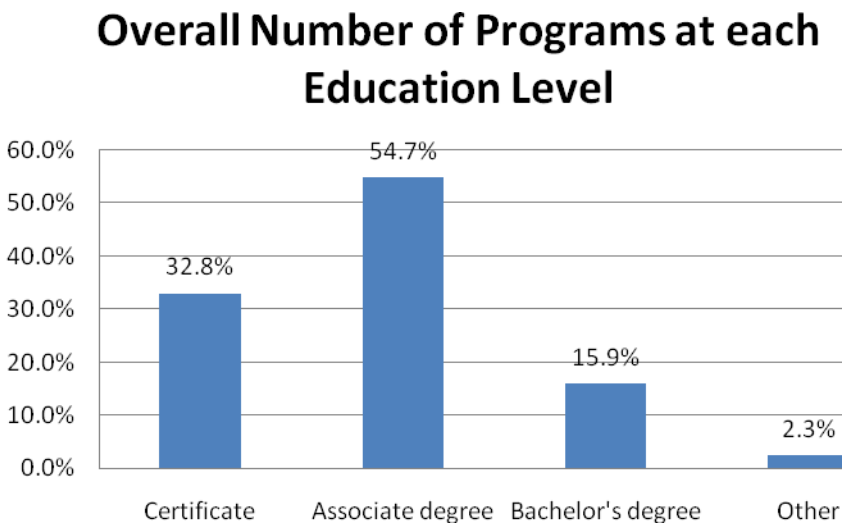
Type of Program	Response to "Please specify" (other type of program) request	Frequency	Percent
Other	Diagnostic medical sonography	1	50.0%
	We have 4 imaging tracts , MR, US, CT, interventional studies	1	50.0%
	Total	2	100.0%
Radiography and radiation therapy	Blank	1	50.0%
	Sonography, MR	1	50.0%
	Total	2	100.0%
Radiography and nuclear medicine	I am program director at [name of college] in radiologic technology and program director for nuclear medicine at [name of college]	1	100.0%
Radiography and other	Advance imaging/degree completion BSRS. We now offer a 2+2 for the rest of the state. We placed our entry level radiography program into a moratorium until further notice as of 2/2007 because of the flooded market.	1	11.1%
	Bachelor of applied science in radiation and imaging sciences	1	11.1%
	Medical dosimetry	1	11.1%
	MR	3	33.3%
	MR, education, management	1	11.1%
	MRT and combined laboratory & x-ray technology (CLXT) diplomas	1	11.1%
	We also have a 2 quarter CT certificate program	1	11.1%
	Total	9	100.0%
Radiography, nuclear medicine and other	Computed tomography and sonography	1	50.0%
	Diagnostic medical sonography	1	50.0%
	Total	2	100.0%

Educational Levels

	Frequency	Percent	Valid Percent
Certificate only	193	28.9%	29.0%
Associate degree only	344	51.5%	51.7%
Bachelor's degree only	78	11.7%	11.7%
Other	11	1.6%	1.7%
Certificate and associate degree	8	1.2%	1.2%
Certificate and bachelor's degree	15	2.2%	2.3%
Certificate and other	1	.1%	.2%
Associate degree and bachelor's degree	9	1.3%	1.4%
Associate degree and other	2	.3%	.3%
Bachelor's degree and other	3	.4%	.5%
Certificate, associate degree and bachelor's degree	1	.1%	.2%
Total	665	99.6%	100.0%
Missing	3	.4%	
Total	668	100.0%	

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

	Responses		Percent of Cases
	N	Percent	N
Certificate	218	31.0%	32.8%
Associate degree	364	51.8%	54.7%
Bachelor's degree	106	15.1%	15.9%
Other	15	2.1%	2.3%
Total	703	100.0%	105.7%

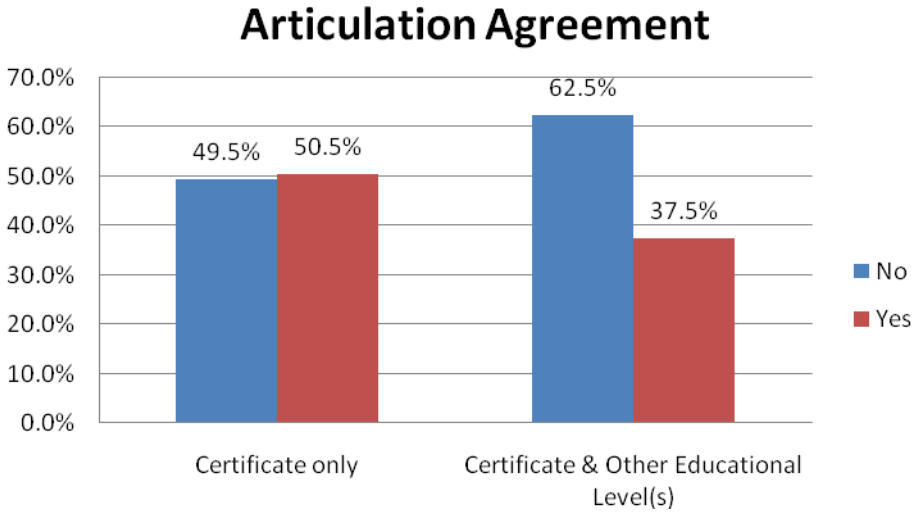


Articulation Agreements

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

Educational level combo	Articulation Agreement with Community College?	Frequency	Percent	Percent of Those Who Answered the Question
Certificate only	No	95	49.2%	49.5%
	Yes	97	50.3%	50.5%
	Total	192	99.5%	100.0%
	Missing	1	.5%	
	Total Certificate Only	193	100.0%	
Certificate and other educational level(s)	No	10	40.0%	62.5%
	Yes	6	24.0%	37.5%
	Total	16	64.0%	100.0%
	Missing	9	36.0%	
	Total Certificate & Other Level(s)	25	100.0%	
Certificate not offered (e.g., associate only or associate and bachelor's)	No	55	12.3%	80.9%
	Yes	13	2.9%	19.1%
	Total	68	15.2%	100.0%
	Missing	379	84.8%	
	Total Not Offering Certificate	447	100.0%	
Total		665[a]		

[a] Three respondents did not indicate their programs' educational levels.



Relationship between Specialty and Educational Level of Program

Educational Level Combo	Statistic	Type of Program (Discipline Taught)[a]				Total
		Radiography	Radiation therapy	Nuclear Medicine	Other	
Certificate only	Count	147	19	25	1	192
	%	28.7%	32.2%	32.5%	50.0%	29.5%
Associate degree only	Count	312	15	15	0	342
	%	60.9%	25.4%	19.5%	.0%	52.6%
Bachelor's degree only	Count	34	16	24	1	75
	%	6.6%	27.1%	31.2%	50.0%	11.5%
Other	Count	5	3	1	0	9
	%	1.0%	5.1%	1.3%	.0%	1.4%
Certificate and associate degree	Count	3	0	3	0	6
	%	.6%	.0%	3.9%	.0%	.9%
Certificate and bachelor's degree	Count	4	5	5	0	14
	%	.8%	8.5%	6.5%	.0%	2.2%
Certificate and other	Count	1	0	0	0	1
	%	.2%	.0%	.0%	.0%	.2%
Associate degree and Bachelor's degree	Count	6	0	0	0	6
	%	1.2%	.0%	.0%	.0%	.9%
Associate degree and other	Count	0	0	2	0	2
	%	.0%	.0%	2.6%	.0%	.3%
Bachelor's degree and other	Count	0	1	1	0	2
	%	.0%	1.7%	1.3%	.0%	.3%
Certificate, associate degree, and bachelor's degree	Count	0	0	1	0	1
	%	.0%	.0%	1.3%	.0%	.2%
Total	512	59	77	2	650	512

[a]Only single-discipline programs included

Restricting our attention to single-discipline programs and collapsing the various combinations of educational levels into those that do and those that don't include an "Other" educational level, we find that radiography programs are more likely (60.9%) than radiation therapy and nuclear medicine programs (22.1%) to offer only an associate degree [χ^2 (1) = 65.172, $P < .001$]. Conversely, they are less likely (6.6%% vs. 29.4%) to confer only a bachelor's degree [χ^2(1) = 55.082, $P < .001$], to offer a combination of two or more of a certificate, associate, and/or bachelor's degree [2.5% vs. 10.3%; χ^2 (1) = 16.184, $P < .001$], or to provide an educational level other than a certificate, associate, or bachelor's degree [1.2% vs. 5.9%, χ^2(1) = 11.280, $P < .001$. Radiation therapy and nuclear medicine technology programs did not differ significantly in any of these respects.

Relationship between Country and Program Modality(ies)

Program Modality(ies)	Statistic	In what country is your program located?				Total
		USA	Australia	Canada	Other[a]	
Radiography only	Count	504	0	5	2	511
	%	77.8%	.0%	41.7%	100.0%	77.1%
Radiation therapy only	Count	53	0	5	0	58
	%	8.2%	.0%	41.7%	.0%	8.7%
Nuclear medicine technology only	Count	77	0	0	0	77
	%	11.9%	.0%	.0%	.0%	11.6%
Other or combination of modalities	Count	14	1	2	0	17
	%	2.2%	100.0%	16.7%	.0%	2.6%
Total	Count	648	1	12	2	663
	%	100.0%	100.0%	100.0%	100.0%	100.0%

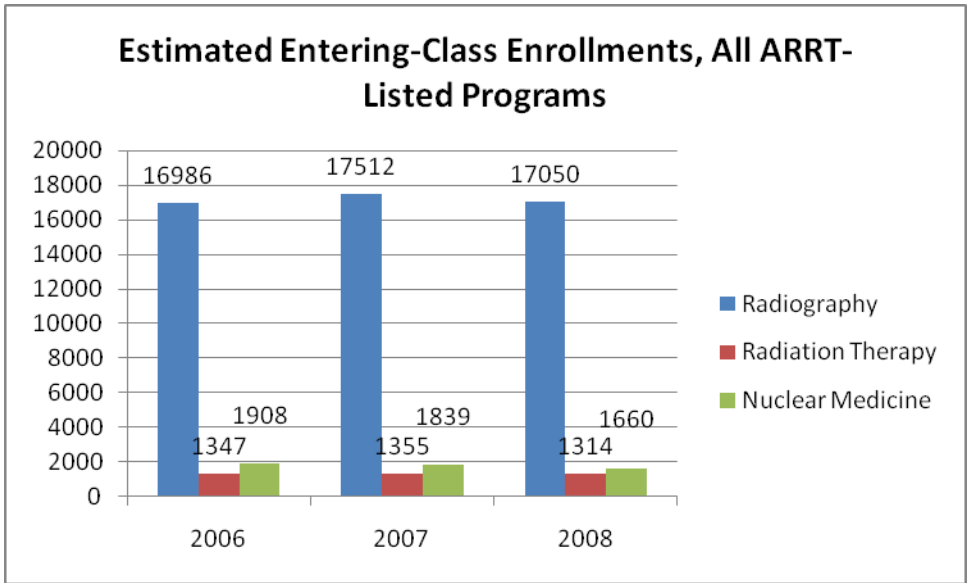
[a] Both of the programs whose directors selected "other" country indicated that their programs are located in Puerto Rico.

A significantly higher percentage of ARRT-recognized radiation-therapy-only programs (8.6%) were located outside the United States (all in Canada) than was true of nuclear-medicine-only and radiography-only programs (0.9%), ($\chi^2(1) = 20.892$, $P < .001$) both by this chi-square test and according to Fisher's Exact Test .

ENROLLMENT TRENDS

Entering-Class Enrollments, All ARRT-listed Programs

All three types of radiologic technology programs experienced decreased total entering-class enrollments from 2007 to 2008 (as estimated from retrospective reports of those years' enrollments), but the 2006 to 2007 change was positive (a slight increase) for radiography and radiation therapy, while nuclear medicine enrollments declined (relative to the previous year's enrollment) both in 2007 and in 2008.

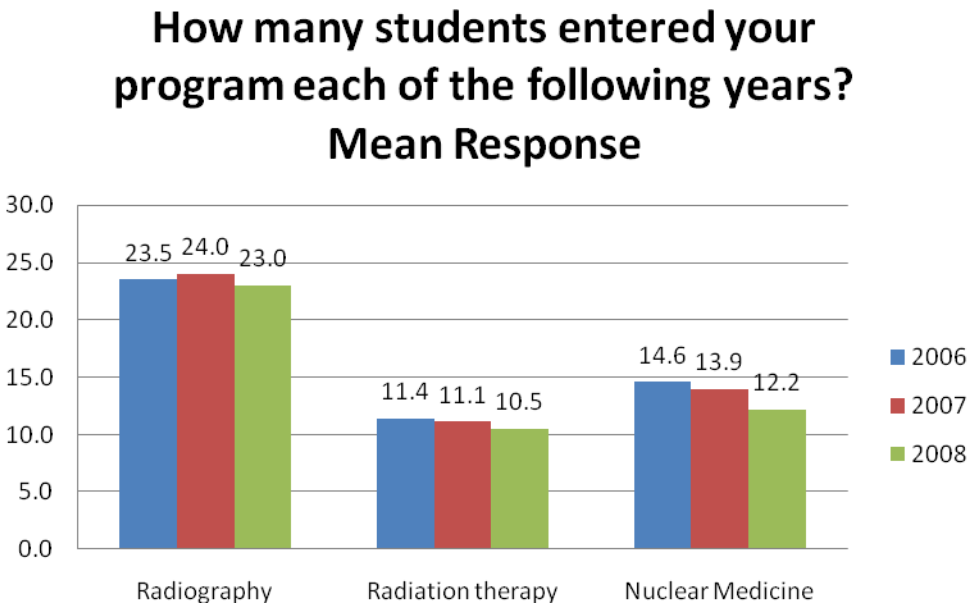


1. What were your freshman enrollment figures for 2006, 2007 and 2008?
5. What was the attrition rate for your program over the past few years?

Only one program			1. (2006) How many students entered your program each of the following years?	1. (2007) How many students entered your program each of the following years?	1. (2008) How many students entered your program each of the following years?	5. Attrition rate (in percent)[a]
Radiography	N	Valid	504	509	506	503
		Missing	8	3	6	9
	Mean		23.5	24.0	23.0	21.1%
	Median[b]		20.6[b]	20.5[b]	20.1[b]	14.3%[b]
	Mode		20.0	20.0	20.0	10.0%
	Sum		11841.0	12227.0	11627.0	10620.4%
	Percentiles[b]	5	6.7	7.3	7.1	.9%
		25	14.4	14.4	14.1	7.8%
		75	29.7	29.9	29.1	24.4%
		95	49.1	47.9	46.5	85.2%
	Std. Deviation		13.8	16.4	13.6	22.8%
Radiation therapy	N	Valid	58	58	59	57

		Missing	1	1	0	2
	Mean		11.4	11.1	10.5	14.4
	Median[b]		8.8	8.7	8.4	8.7
	Mode		8.0	6.0[c]	7.0	.0
	Sum		662.0	644.0	620.0	825.4
	Percentiles[b]	5	2.7	2.8	.7	.12
		25	6.6	5.9	6.0	2.3
		75	13.8	13.2	14.0	18.9
		95	23.3	24.8	21.6	61.8
	Std. Deviation		10.1	9.8	9.2	19.1
Nuclear Medicine	N	Valid	76	77	77	77
		Missing	1	0	0	0
	Mean		14.5	13.9	12.2	12.3
	Median[b]		11.7[b]	11.6[b]	10.0[b]	7.0[b]
	Mode		8.0[c]	8.0	10.0	.0
	Sum		1107.0	1073.0	940.0	951.9
	Percentiles[a]	5	4.3	3.5	2.1	.0
		25	7.7	7.5	6.5	.6
		75	16.8	15.8	14.6	14.1
		95	37.0	33.9	25.3	70.6
	Std. Deviation		12.7	12.0	10.6	19.7

[a]Reported values less than 1 were multiplied by 100 to estimate percent attrition.
[b]Calculated from grouped data.[c] Multiple modes exist. The smallest value is shown.



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

A 3 (modality) x3 (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 the 596 programs that reported enrollment figures for all three years.)

Averaged across disciplines and educational levels, mean reported entering-class size increased from 2006 (21.3 students per program) to 2007 (21.7 students per program – a 2.0% increase) and *decreased* from 2007to 2008 (20.6 – a 5.2% decrease). The increase from 2006 to 2007 is not statistically significant at the .05 level, even when we apply the finite-population correction for the fact that 66% of the population to which we wish to generalize was included in our sample. The decrease from 2007 to 2008 is statistically significant (though only at the .05 level: Finite-population-corrected (t_{587} = 2.509, P = .012).

Although neither the program type by year, the educational level by year nor the three-way interaction was statistically significant, it is of some interest to examine the class-size changes separately for each of the three modalities:

Program Discipline	Mean Number of Students in Entering Class			Increase, 2006 - 2007	Increase, 2007- 2008
	2006	2007	2006		
Radiography only (N = 502)	23.5	24.1	23.0	0.60 (2.5%) (*P* = .020[a])	-1.07 (-4.4%) (*P* < .001)
Radiation therapy only (N = 58)	11.4	11.1	10.6	-0.31 (-2.7%) (*P* = .471)	-.48 (-4.3%) (*P* =.237)
Nuclear medicine only (N = 76)	14.6	14.1	12.3	-.49 (-3.3%) (*P* = .029)	-1.74 (-12.3%) (*P* < .001)

[a] All *P* values in this table include the finite population adjustment.

Radiography programs showed a small (2.5%) but statistically significant increase in mean reported entering-class enrollments from 2006 to 2007, but a highly significant 4.4% decrease from 2007 to 2008. Radiation therapy programs' mean reported entering-class enrollment dropped a statistically nonsignificant 2.7% from 2004 to 2005 and dropped again from 2007 to 2008 – this time by a statistically nonsignificant 4.3%. Nuclear medicine's entering-class sizes dropped 3.3% (*P* < .05) from 2006 to 2007 and by a highly significant 12.3% from 2007 to 2008.

The analysis also showed that, within the year and averaging across year, radiography programs tend to have larger entering-class sizes than do nuclear medicine and radiation therapy programs and that certificate-only programs have a significantly lower mean entering-class size than do associate and bachelor's programs.

Number of Programs Experiencing Increase vs. Decrease in Enrollment

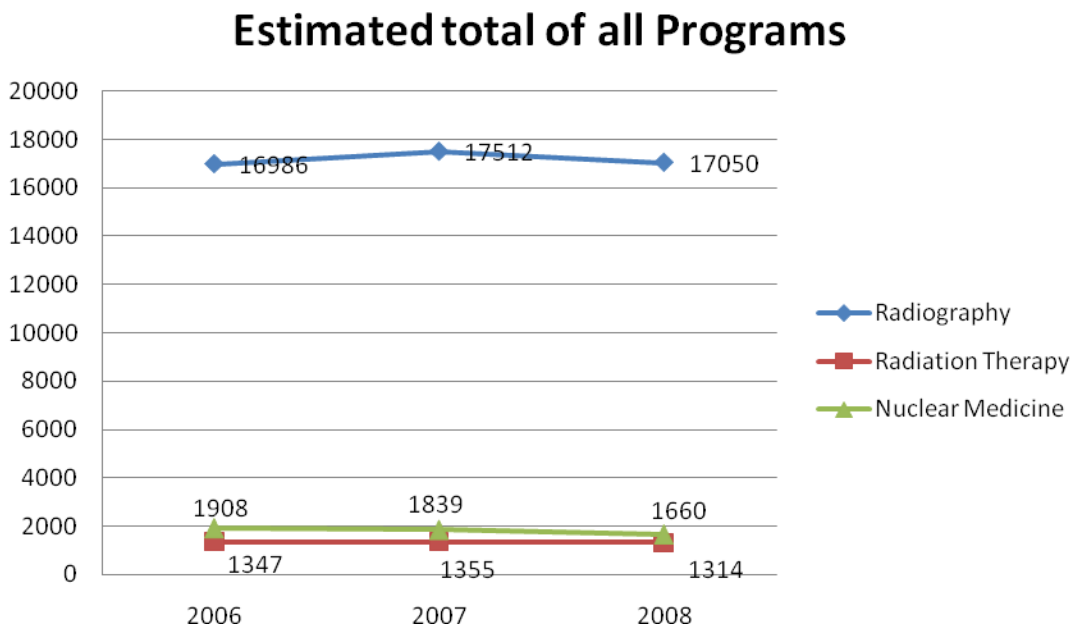
"Pure" Program Type	Change in enrollment, 2006 to 2007				Change in enrollment, 2007 to 2008		
	Decreased	Remained the Same	Increased		Decreased	Remained the Same	Increased
Radiography	137	248	119		171	228	107
Radiation therapy	22	19	17		23	14	21
Nuclear medicine	28	29	19		39	28	10

Within each of the three disciplines, more programs reported decreases than increases in entering-class enrollment, both from 2006 to 2007 and from 2007 to 2008.

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	2006	11,841	504	723	16,986	---	518	71.6%	742	526 (70.9% overall response rate)
	2007	12,227	509	729	17,512	3.1%	523	71.7%		
	2008	11,627	506	742	17,050	-2.6%	520	70.1%		
Radiation Therapy	2006	662	58	118	1,347	---	61	51.7%	125	62 (49.6% overall response rate)
	2007	644	58	122	1,355	0.6%	61	50.0%		
	2008	620	59	125	1,314	-3.0%	62	49.6%		
Nuclear Medicine	2006	1,107	76	131	1,908	---	78	59.5%	136	81 (59.6% overall response rate)
	2007	1,073	77	132	1,839	-3.6%	79	59.8%		
	2008	940	77	136	1,660	-9.7%	79	58.1%		

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



Radiography's 71% return rate was significantly higher than the 55% return rate for nuclear medicine and radiation therapy programs combined ($\chi^2(1) = 22.534$, $P < .001$).

Counts of the number of ARRT-recognized programs in the fall of 2006, 2007 and 2008 reveal that all three program types had increases (by 0.8% to 3.4%) from 2006 to 2007 and from 2007 to 2008 in total number of programs. On the other hand, reports from the PDs who responded to this year's snapshot (including their retrospective reports on 2006 and 2007 enrollments) indicate that average entering-class size decreased from 2006 to 2008 for all three disciplines – although radiography and radiation therapy entering-class sizes increased slightly from 2006 to 2007 before dropping below 2006 levels in 2008. The net effect of these two contrasting overall trends was a decrease in estimated nationwide entering-class enrollments from 2007 to 2008 for all three disciplines and a net overall drop from 2006 to 2008 for radiation therapy and nuclear medicine programs.

Comparison with Enrollment Trends Reported in *Snapshot 2007*

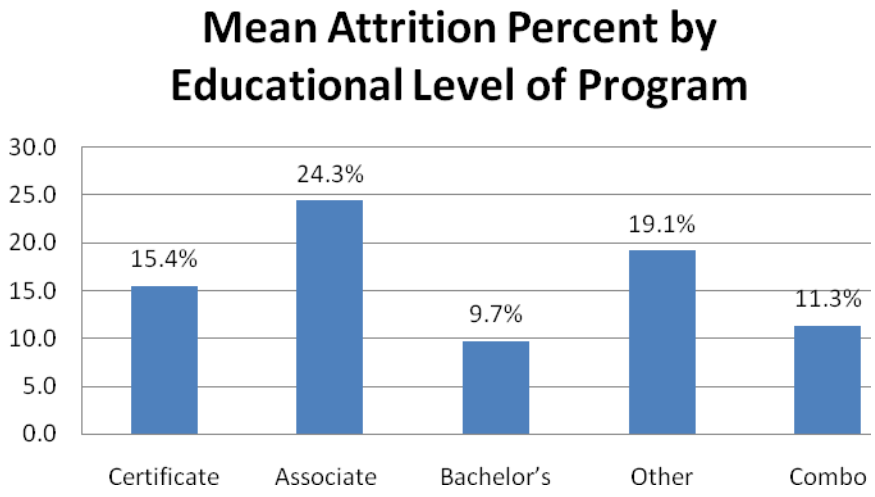
The changes in total entering-class enrollments from 2006 to 2007 reported above are generally consistent with those reported in ASRT's *Enrollment Snapshot 2007* for radiography (3.1% based on 2008's retrospective reports vs. 1.2% reported in *Snapshot 2007*), radiation therapy (0.6% vs. 3.3%) and nuclear medicine (-3.6% vs. -1.3%). These discrepancies could just be a result of sampling fluctuation (i.e., because of chance differences between the sample of program directors who responded to this year's snapshot and those who responded to last year's.) For instance, the 95% confidence interval around this year's estimate of the 2006 total-enrollment figure for nuclear medicine technology programs is ± 247 students. That is,, the true total enrollment in the 131 nuclear medicine technology programs that were in operation in 2006 could be as low as 1,661 students or as high as 2,155 students. Had this year's figure been 1,863, that would have given us an estimated 2006-to-2007 decrease of 1.3% in total nuclear medicine technology entering-class enrollment, matching the Snapshot 2007 estimate.

Attrition Rates by Program Type and Educational Level

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

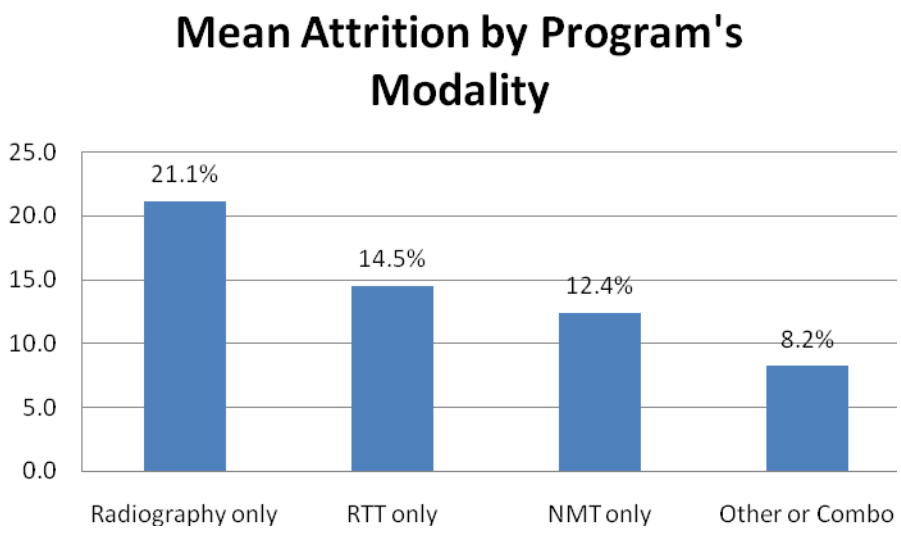
Attrition as a Function of Educational Level of Program

					95% Confidence Interval			
Educational Level	**N**	**Mean**	**Std. Deviation**	**Std. Error**	**Lower Bound**	**Upper Bound**	**Minimum**	**Maximum**
Certificate	189	15.4%	20.6%	1.5%	12.5%	18.4%	0.0%	96.0%
Associate	339	24.3%	23.6%	1.3%	21.8%	26.9%	0.0%	98.0%
Bachelor's	77	9.7%	14.1%	1.6%	6.5%	12.9%	0.0%	94.0%
Other	10	19.1%	29.7%	9.4%	-2.1%	40.3%	0.0%	90.0%
Combo: More than one educational level	37	11.3%	15.5%	2.5%	6.1%	16.4%	0.0%	80.0%
Total	652	19.2%	22.2%	.9%	17.5%	20.9%	0.0%	98.0%



Attrition as a Function of Program's Modality

					95% Confidence Interval			
Modality Taught	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Radiography only	503	21.1%	22.8%	1.0%	19.1%	23.1%	0.0%	98.0%
Radiation therapy only	57	14.5%	19.2%	2.5%	9.4%	19.6%	0.0%	94.0%
Nuclear medicine only	77	12.4%	19.8%	2.3%	7.9%	16.8%	0.0%	93.0%
Other or combination	15	8.2%	7.4%	1.9%	4.1%	12.3%	0.0%	30.0%
Total	652	19.2%	22.2%	.9%	17.5%	20.9%	0.0%	98.0%



The mean attrition rate over the past few years for programs providing an estimate of that rate, was 19.2%. This rate differed significantly as a function of both program type and educational level of the program, but not as a function of their interaction. In particular, programs offering only an associate degree reported significantly higher attrition (24.3%) than did certificate-only programs (15.4%); these programs had significantly higher attrition, although only at the .05 level, than programs offering only a bachelor's degree (9.7%). Program directors of radiography-only programs reported a significantly higher mean attrition rate (22.8%) than did radiation therapy and nuclear medicine program directors (19.5% combined).

Perceived Variability in Attrition Rate

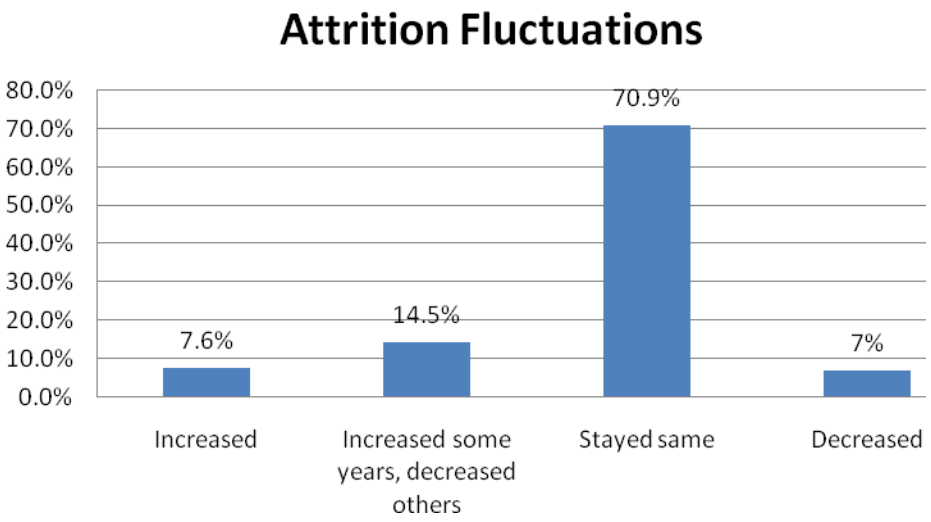
6. Has this attrition rate varied substantially over the past few years?

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

Responses to the above questions were combined into a single variable assessing amount and direction of change in attrition rate, with a "No" response to question 6 coded as zero (no change 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 "increased some years, decreased others" was coded as +.01 .

A two-way ANOVA of mean differences on this combined variable yielded statistically nonsignificant effects of program specialty, program educational level and their interaction, as well as a grand mean change-in-attrition-rate score of +.003.

Direction of change (if any)	Frequency	Valid Percent
Increased	50	7.6%
Increased some years, decreased others	95	14.5%
Stayed same	465	70.9%
Decreased	46	7.0%
Total	656	100.0%
Missing	12	
Total	668	



More than two-thirds of the directors reported that their attrition rates have held steady over the past few years. Among the 14.4% of programs that reported a consistent trend in attrition rates, 52% reported that attrition rates had increased over the past few years; 48% reported that they had decreased.

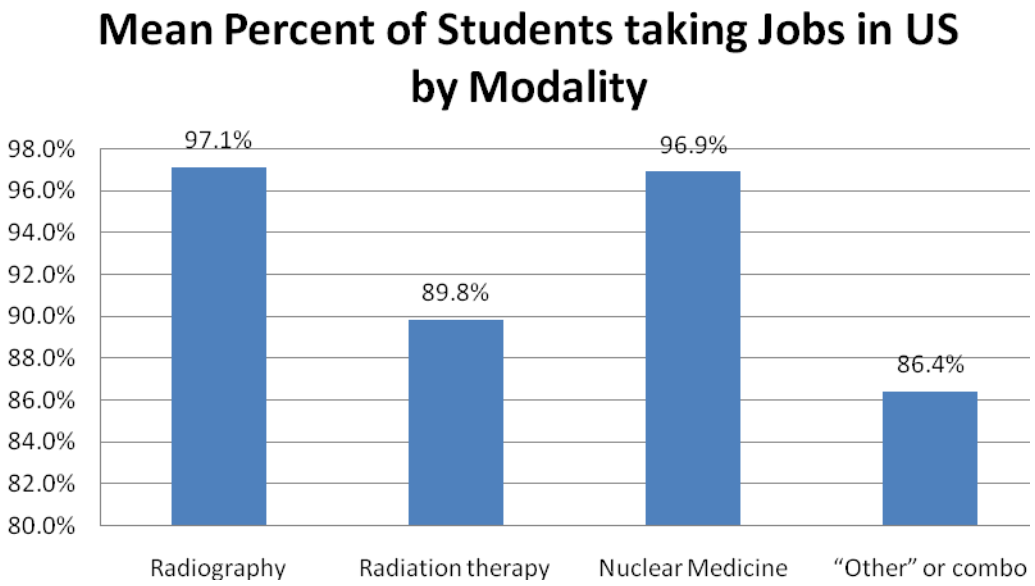
7. About what percent of your program's graduates over the past five years have taken jobs in the U.S. (including U.S. territories and Puerto Rico)?

Country	N	Mean Percent	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
United States	617	96.9%	9.2%	96.2%	97.7%	0.0%	100.0%
Australia	1	0.9%[a]	.	.	.	0.9%	0.9%
Canada	6	2.0%	4.0%	-2.2%	6.2%	0.0%	10.0%
Other[b]	2	93.5%	4.9%	49.0%	138.0%	90.0%	97.0%
USA, including "Other" (PR)	619	96.9%	9.2%	96.2%	97.7%	0.0%	100.0%
Total	626	95.9%	13.6%	94.8%	96.9%	0.0%	100.0%

[a] Response was actually "less than one percent."
[b] Both of these programs specified Puerto Rico as the "Other" country in which their programs are located.
Note: Two U.S. programs reported that 0% of their graduates took jobs in the U.S; one, 2.6%; and a fourth, 5%. (The next lowest percent reported was 53%.) It seems likely that these four program directors were reporting the percent of their graduates who have taken jobs *outside* the U.S. Omitting these four outliers yields a USA (including PR) mean of 97.24% of graduates taking U.S. jobs; treating them as reports of 100%, 100%, 97.4%, and 95% of graduates taking jobs in the U.S yields a USA mean of 97.25% .

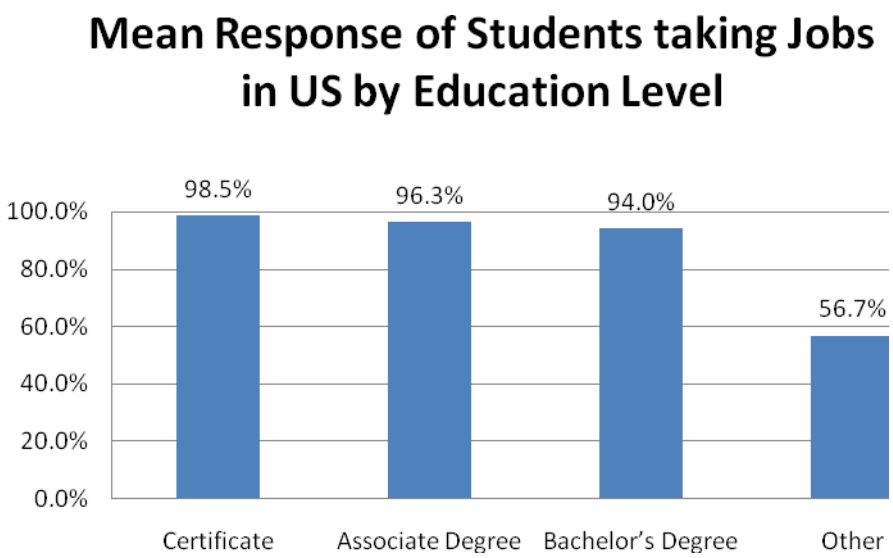
Omitting the four outliers discussed above, a factorial ANOVA yielded a statistically significant difference in mean percentage of students entering the U.S. job market as a function of modality ($F_{3,622} = 9.471$, $P < .001$) and educational level ($F_{3,621} = 29.256$, $P < .001$) but a nonsignificant interaction between program type and educational level.

Discipline	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Radiography	482	97.1%	8.1%	.37%	96.4%	97.9%	0.0%	100.0%
Radiation therapy	56	89.8%	27.7%	3.7%	82.4%	97.2%	0.0%	100.0%
Nuclear medicine	72	96.9%	5.7%	0.7%	95.6%	98.3%	75.0%	100.0%
"Other" or combination	16	86.5%	33.3%	8.3%	68.8%	104.2%	0.9%	100.0%
Total	626	96.2%	12.4%	0.5%	95.2%	97.2%	0.0%	100.0%



Radiation therapy programs had a significantly lower percent of entry into the U.S. job market (89.8%) than did radiography and nuclear medicine technology programs. This can be attributed to a significantly higher percentage of that modality's programs (5 of 58 – 8.6%, all Canadian) being located outside the U.S. than is true of the other two modalities (5 of 558 – 0.9%). When only U.S.-located programs are considered, the mean percents are 97.3%, 96.5%, and 96.9% of radiography, radiation therapy and nuclear medicine programs' graduates, respectively.

Educational Level	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Certificate	185	98.5%	4.0%	.3%	97.9%	99.1%	75.0%	100.0%
Associate Degree	325	96.3%	9.3%	.5%	95.3%	97.3%	2.6%	100.0%
Bachelor's Degree	71	94.0%	20.2%	2.4%	89.3%	98.8%	.0%%	100.0%
Other	9	56.8%	51.1%	17.0%	17.5%	96.1%	0.0%	100.0%
Combo: > 1 level	36	97.2	5.6%	.9%	95.3%	99.1%	75.0%	100.0%
Total	626	96.2%	12.4%	.5%	95.2%	97.2%	0.0%	100.0%



A significantly higher percent (98.5%) of graduates of programs that grant certificates enter the U.S. job market than do associate and bacchelor-level programs (95.9% combined), finite-population-adjusted (t_{621} = 5.066, P < .001). However, the relatively low percentage of graduates with bachelor's degrees taking U.S. jobs is largely attributable to the fact that a substantially higher percentage of bachelor's degree programs (5 of 71 = 7.0%) than of associate and certificate programs (2 of 536 = 0.4%) are housed in Australia or Canada. When only U.S.-located programs are considered, the mean percents are 98.5%, 96.3%, and 98.1% of certificate, associate and bachelor's programs' graduates, respectively. Among U.S. located programs, associate-degree programs' graduates are significantly more likely (3.7%) than graduates of certificate and bachelor programs (1.6% combined) to take jobs outside the U.S., finite-population-adjusted (t_{621} = 5.219, P < .001).

ARRT Vs. NMTCB Certifying Exams

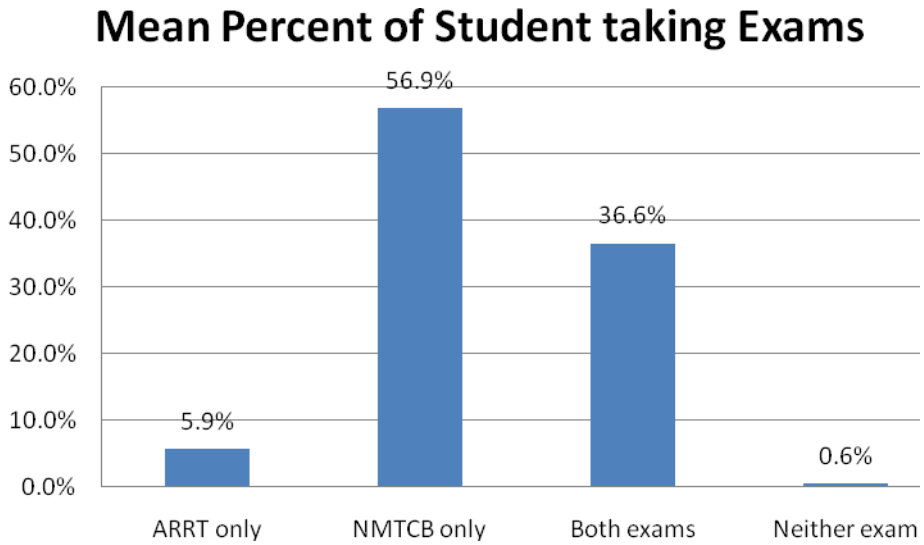
8. If yours is a nuclear medicine program, approximately what percent of your program's graduates over the past two years have taken the ARRT certification exam in nuclear medicine technology versus the NMTCB certification exam?

This question was apparently somewhat confusing for respondents, as only about one-half (51.5%) of the 97 program directors who answered the question (considerably more than the 81 who indicated that their program was – in whole or in part – a nuclear medicine program) gave responses that summed to 100%, and only 59% gave responses that summed to between 90% and 110%. Directors of non-nuclear medicine technology programs probably were reporting the percent of their graduates who took the ARRT certifying exam in their (non-nuclear medicine technology) discipline. (In fact, every non-nuclear medicine technology program director who answered question 8 gave a response of 100% or 1.0 for "ARRT exam only.")

Further, the 19 nuclear medicine technology program directors whose responses to question 8 summed to less than 2.0 probably were reporting proportions, rather than percents. The 19 sets of responses were multiplied by 100 to convert them to the same percent metric as the other 61 sets of responses from nuclear medicine technology program directors. Sets of responses that summed to between 90% and 110% were adjusted (through multiplication by a constant) so that they summed to 100%, and the 14 sets of nuclear medicine technology program directors' responses that summed to less than 90% or more than 110% were treated as uninterpretable and were not included in subsequent analyses.

		Percent taking ARRT (N) only[a]	Percent taking NMTCB only[a]	Percent taking both exams[a]	Percent taking neither exam[a]
N	Valid	61	61	61	61
	Missing	16	16	16	16
Mean		5.9%	56.9%	36.6%	0.6%
Median[b]		5.8%	80.6%	10.8%	0.1%
Mode		0%	0%	0%	0%
Std. deviation		17.7%	41.4%	40.6%	2.2%
Minimum		0%	0%	0%	0%
Maximum		100.0%	100.0%	100.0%	11.46%
Percent zeroes		77.0%	23.0%	21.3%	91.8%

[a] Based only on programs reporting NMT enrollments only
[b] Calculated from grouped data.



b

Near-term Changes

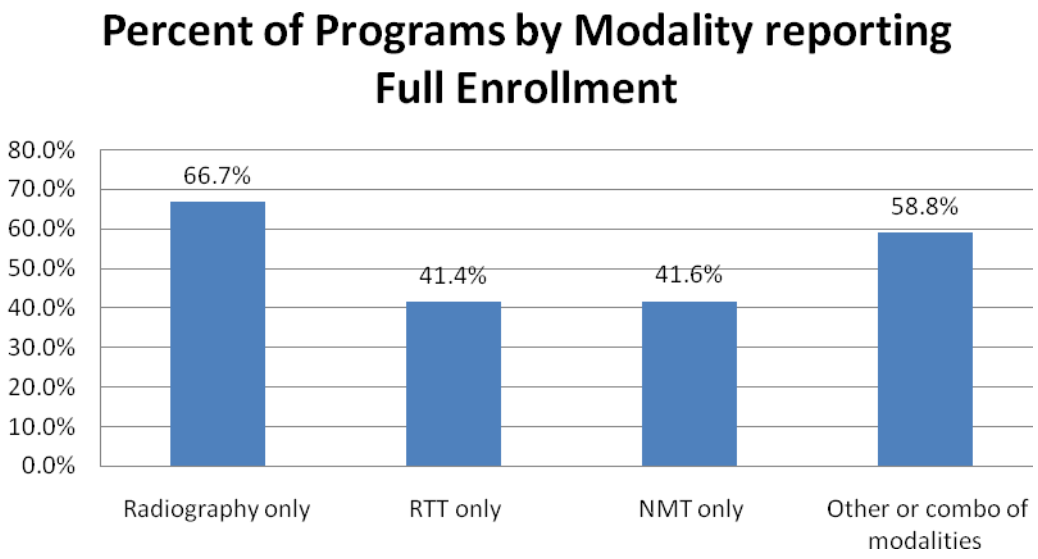
Capacity for Increase

2a. Is your program currently at full enrollment?

Considering only programs reporting enrollments for a single discipline and a single educational level, the likelihood of being at full enrollment differed significantly as a function of modality ($F_{2,597}$ = 6.16, P = .002) and educational level ($F_{2,597}$ = 11.82, P < .001), but not their interaction (F < 1).

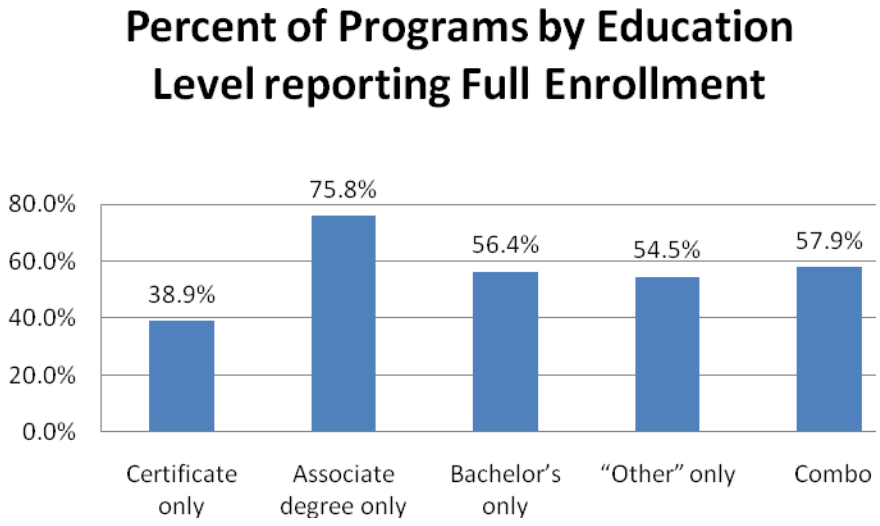
2. Is your program currently at full enrollment?

			95% Confidence Interval	
Program Type (Modality)	N	Percentage "Yes"	Lower Bound	Upper Bound
Radiography only	511	66.7%	62.6%	70.8%
Radiation therapy only	58	41.4%	28.3%	54.4%
Nuclear medicine technology only	77	41.6%	30.3%	52.8%
Other or combo of modalities	17	58.8%	32.7%	84.9%
Total	663	61.4%	57.7%	65.1%



Overall, radiography had a higher percentage of programs with full enrollment (66.7%) than did radiation therapy and nuclear medicine (41.5%), calculated at (t_{659} = 5.423, P < .001). This difference held at every educational level.

			95% Confidence Interval	
Educational Level	N	Proportion "Yes"	Lower Bound	Upper Bound
Certificate only	193	38.9%	31.9%	45.8%
Associate degree only	343	75.8%	71.2%	80.4%
Bachelor's only	78	56.4%	45.2%	67.7%
"Other" only	11	54.5%	19.5%	89.6%
Combo: > 1 educ'l level	38	57.9%	41.4%	74.3%
Total	663	61.4%	57.7%	65.1%

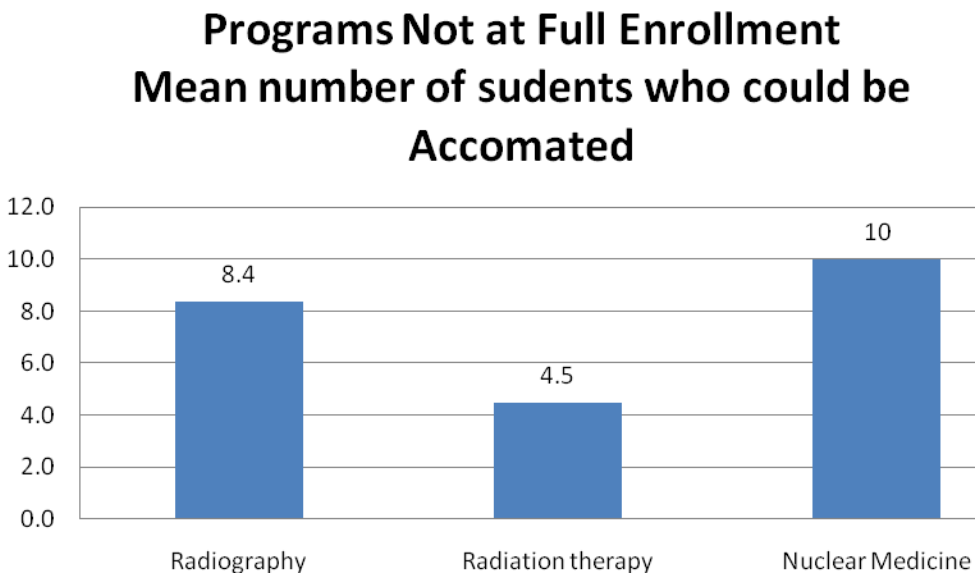


Associate-degree programs were the most fully subscribed (75.8% at full enrollment) – statistically significantly more so than bachelor's programs (56.4%), (t_{658} = -6.188, P < .001). Bachelor's programs were, in turn, significantly more likely to be at full enrollment than were certificate-only programs (38.9%), (t_{658} = -2.836, P < .001).

2b. [If not at full enrollment,] approximately how many additional students could be accommodated by your program?

Only one modality	Mean	Std. Deviation	No. of Responses	Total no. of Programs in Population	Proportion of Programs Not at Full Enrollment	Estimated Total Expansion Capacity[a]
Radiography	8.4	12.7	165	742	.333	2,073
Radiation therapy	4.5	3.3	34	125	.586	330
Nuclear Medicine	10.0	13.2	43	136	.584	794
Total	8.1	12.0	242	1003	.385	2,867

[a] (No. of programs in population) x (proportion not at full enrollment) x (mean no. of additional students)

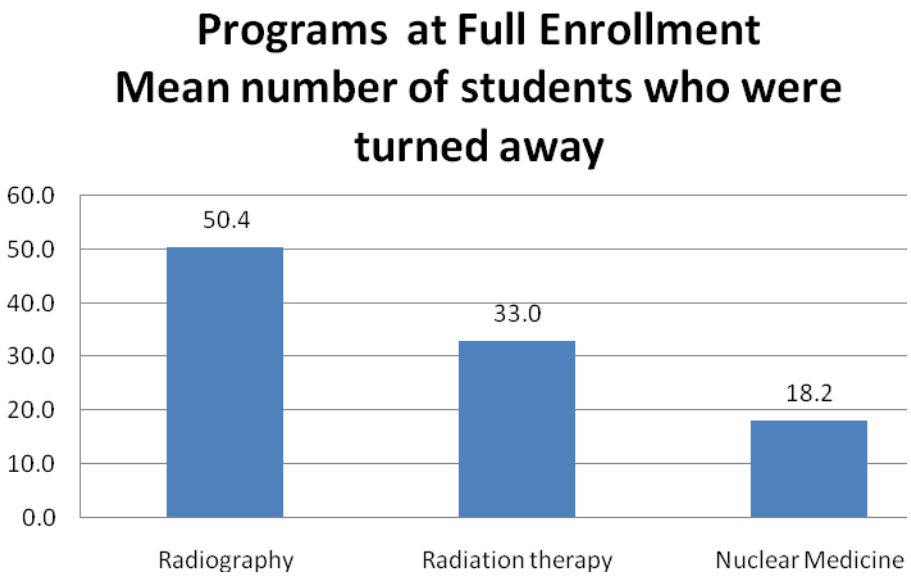


Mean unused capacity was significantly lower for radiation therapy programs (4.5 students per radiation therapy program) than for the other two disciplines (8.7 combined mean), separate-variance ($t_{89.4}$ = -3.745, P < .001). Capacity did not, however, differ significantly as a function of educational level or the modality x educational level interaction.

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

Only one program	Mean	Std. Deviation	No of Responses	Total no. of Programs in Population	Proportion of Programs at Full Enrollment	Estimated Excess Demand[a]	Ratio of Qualified Students Turned Away to Total Admitted
Radiography	50.4	58.5	336	742	0.667	24,914	1.5
Radiation therapy	33.0	79.8	24	125	0.414	1,708	1.3
Nuclear Medicine	18.2	15.8	34	136	0.416	1,032	0.7
Total	46.5	58.4	394	1003	.615	27,654	1.4

[a] (No. of programs in population) x (proportion at full enrollment) x (mean no. of qualified students turned away)



The factorial ANOVA of number of qualified students turned away as a function of modality and educational level examined only reports of single educational level and single discipline taught. Moreover, the distribution of number of qualified applicants turned away was so heavily skewed as to call into question the validity of significance tests based on an assumption of normality, so the analysis was carried out on the square root of number turned away. (For example, one radiation therapy program reported turning away 400 qualified applicants; the second highest number turned away by a radiation therapy program was 80 and the third highest was 35.) The ANOVA on square-root transformed number of applicants turned away yielded statistically significant effects for type of program [finite-population-corrected $F(2, 367) = 11.147$, $P < .001$] and for educational level [finite-population-corrected $F(2, 667) = 7.735$, $P < .001$]. The interaction between these two independent variables also was statistically significant [finite-population-corrected $F(4, 367) = 7.735$, $P < .001$].

As suggested by the statistically significant interaction effect, neither main effect was consistent across levels of the other factor.

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

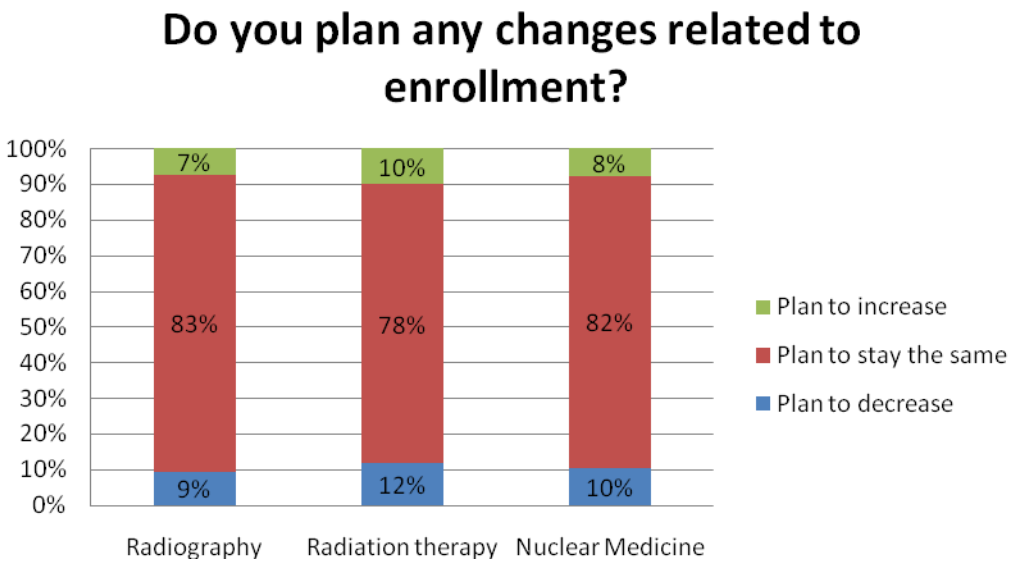
Only one program	Education - 5 levels	N	Mean	Std. Deviation	Minimum	Maximum	Significant Differences
Radiography	Certificate only	99	26.4	32.0	0.0	200.0	A > C, B (< .001, .361)
	Associate degree only	222	59.2	58.2	0.0	300.0	
	Bachelor's degree only	12	20.7	20.0	0.0	75.0	
	Total	333	49.0	53.7	0.0	300.0	
Radiation therapy	Certificate only	5	8.2	6.6	0.0	15.0	B > C, A (.027, .188),
	Associate degree only	6	12.8	6.8	5.0	20.0	
	Bachelor's degree only	10	62.4	120.6	3.0	400.0	
	Total	21	35.3	85.2	0.0	400.0	
Nuclear Medicine	Certificate only	8	10.8	17.3	0.0	50.0	A > C, B (.010, .115); C < A, B (.012, .119)
	Associate degree only	10	21.6	14.4	4.0	50.0	
	Bachelor's degree only	10	16.8	17.0	0.0	50.0	
	Total	28	16.8	16.2	0.0	50.0	

Within radiography programs the associate degree programs turned away substantially more qualified applicants (59 students, on average) than did certificate and bachelor's programs (combined average of 26 applicants). Among radiation therapy programs, bachelor's programs turned away many more applicants (mean of 62.4) than did certificate and associate degree programs (10.7 mean turned away). Among nuclear medicine programs, associate degree programs were significantly higher (21.6 turned away) and certificate programs, lower (at 10.8) than the overall mean of 16.8 qualified applicants turned away.

Radiography programs are, on average, larger than nuclear medicine and radiation therapy programs. However, the ratio between total number of qualified students turned away and total fall 2006 entering-class enrollments was not substantially higher (1.5) for radiography programs than for radiation therapy (1.3) programs, although both ratios were considerably higher than nuclear medicine programs' 0.7 ratio.

3. Do you plan any changes related to enrollment?

			3. Do you plan any changes related to enrollment?			Total
			Plan to decrease	Plan to stay the same	Plan to increase	
Single modality	Radiography	Count	48	425	38	511
		% within program type	9.4%	83.2%	7.4%	100.0%
	Radiation therapy	Count	7	46	6	59
		% within program type	11.9%	78.0%	10.2%	100.0%
	Nuclear Medicine	Count	8	63	6	77
		% within program type	10.4%	81.8%	7.8%	100.0%
Total		Count	63	534	50	647
		% within program type	9.7%	82.5%	7.7%	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. The three disciplines did not differ significantly in any of the three percentages when combining across educational levels. However, 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 [finite-population-corrected $F(4, 597) = 5.618$, $P < .001$]. The main effects of educational level

[finite-population-corrected $F(2, 597) = 11.588$, $P < .001$].and of program type [finite-population-corrected $F(2, 597) = 4.735$, $P = .009$] also were statistically significant when each effect was controlled for the other. Since the pattern of differences across educational levels was not consistent across modalities, as suggested by the statistically significant interaction effect, , those educational-level differences are presented separately for each of the three disciplines in the following table:

3. Do you plan any changes related to enrollment?

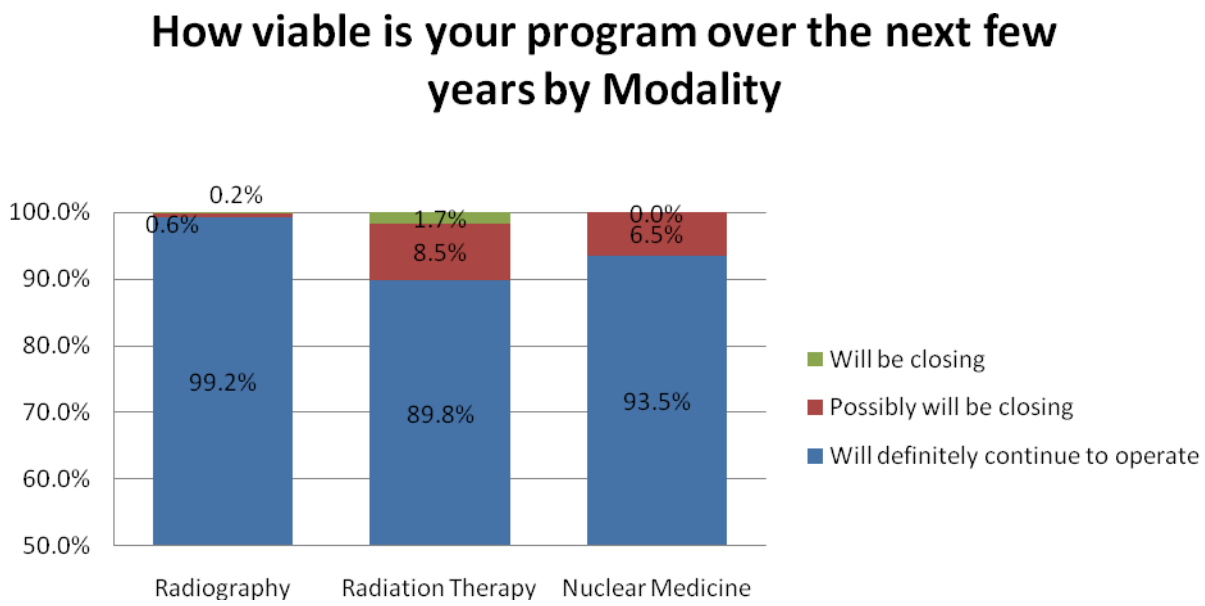
Only one program	Education - 5 levels	N	Mean[a]	Std. Deviation	Percent Planning increase	Percent Planning decrease	Significant Differences
Radiography	Certificate only	147	-.0204	.37870	6.1%	8.2%	B > C, A (< .001, .087)
	Associate degree only	311	-.0579	.40544	5.5%	11.3%	
	Bachelor's degree only	34	.2353	.49597	26.5%	2.9%	
	Total	492	-.0264	.41030	7.1%	9.8%	
Radiation therapy	Certificate only	19	-.1579	.50146	5.3%	21.1%	B > C, A (.009, .829)
	Associate degree only	15	-.1333	.51640	6.7%	20.0%	
	Bachelor's degree only	16	.1250	.34157	12.5%	0.0%	
	Total	50	-.0600	.46991	8.0%	14.0%	
Nuclear Medicine	Certificate only	25	-.0400	.45461	8.0%	12.0%	None
	Associate degree only	15	.0667	.45774	13.3%	6.7%	
	Bachelor's degree only	24	-.0417	.35864	4.2%	8.3%	
	Total	64	-.0156	.41756	7.8%	9.4%	

[a] Scored "Plan to decrease" = -1, "Plan to stay same" = 0, "Plan to increase" = +1.

Among radiography and radiation therapy programs, those offering a bachelor's degree are significantly more inclined to increase their enrollments (26.5% of radiography program directors planning to increase vs. 2.9% planning to decrease enrollments and a 12.5% vs. 0% balance among radiation therapy program directors) than are directors of certificate and associate degree programs (5.7% vs. 10.3% increase/decrease balance among radiography programs; 5.9% vs. 20.6% for radiation therapy programs). However, among nuclear medicine technnology programs the increase/decrease balances for the three educational levels do not vary significantly around the overall 7.8% increase/9.4% decrease ratio.

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

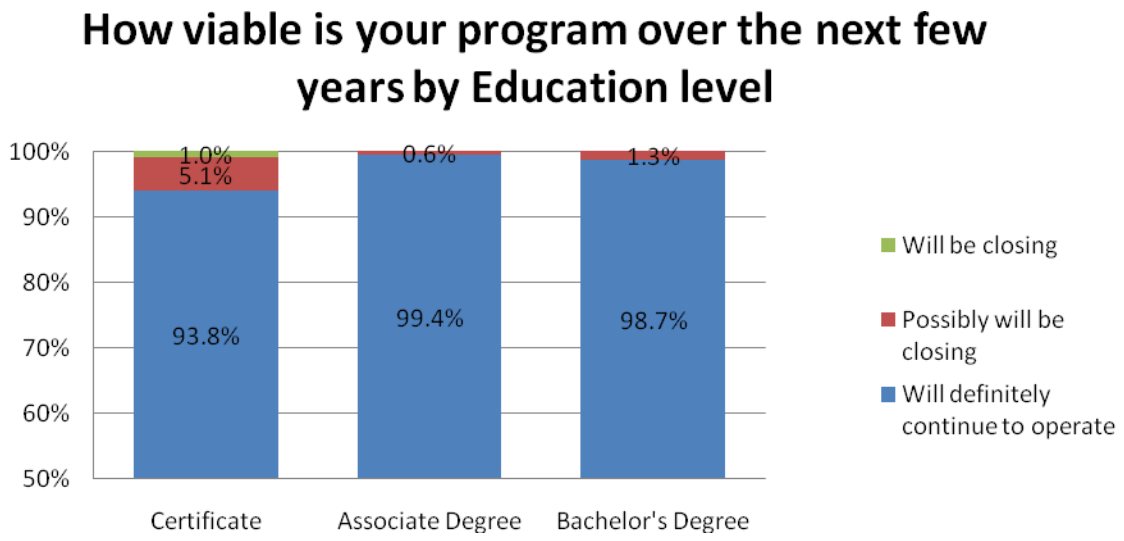
Single Modality of the Program	Statistic	4. How viable is your program over the next few years?			Total
		Will definitely continue to operate	Possibly will be closing	Will be closing	
Radiography	Count	508	3	1	512
	% within radiography	99.2%	.6%	.2%	100.0%
Radiation Therapy	Count	53	5	1	59
	% within radiation therapy	89.8%	8.5%	1.7%	100.0%
Nuclear Medicine	Count	72	5	0	77
	% within nuclear medicine	93.5%	6.5%	.0%	100.0%
Total	Count	633	13	2	648
	% within all three modalities	97.7%	2.0%	0.3%	100.0%



Approximately 98% of the directors who reported enrollments for a single modality anticipate that their programs will definitely continue to operate, with 2% indicating the possibility of closing. (One of the 9 programs offering radiography and other disciplines also indicated the possibility of closing.) Only 0.3% of all programs (one in radiography, one in radiation therapy, and both certificate programs) indicated they will be closing. In fact, in both cases, the programs already have closed. Radiography program directors were significantly more likely (99%) to indicate that their programs would definitely continue to operate ($\chi_1^2 = 25.321$, $P < .001$) and significantly less likely (0.6%) to indicate that their programs might be closing ($\chi_1^2 = 25.030$, $P < .001$) than the other two types of program (91.9% definitely continue; 7.4% might be closing, combining those two disciplines).

Further, program directors of certificate programs were significantly less likely (94%) than directors of associate or bachelor's programs (99.5%) to be definite about continued operation and more likely to report the possibility of closing (5% vs. 1%); both chi-squares were 12.5 or higher ($P < .001$) in each case.

Educational level for programs with only one level	Statistic	4. How viable is your program over the next few years?			Total
		Will definitely continue to operate	Possibly will be closing	Will be closing	
Certificate	Count	183	10	2	195
	%	93.8%	5.1%	1.0%	100.0%
Associate Degree	Count	341	2	0	343
	%	99.4%	.6%	.0%	100.0%
Bachelor's Degree	Count	76	1	0	77
	%	98.7%	1.3%	.0%	100.0%
Total	Count	600	13	2	615
	%	97.6%	2.1%	.3%	100.0%



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

Single Discipline	Mean	N	Std. Deviation
Radiography	2.00	1	0.000
Radiation Therapy	0.67	3	1.155
Nuclear Medicine	0.00	1	0.000
Total	0.80	5	1.095

Only five program directors of the 16 who indicated that their programs had closed or might close provided an estimate of the years of operation left for their programs; the estimate was either zero (those three programs having already discontinued operation) or two years (one radiography and one radiation therapy program).

HAS THE GAP CLOSED?

To be more specific, if 2008 first-year enrollment figures are maintained, will the profession meet the need for additional R.T.s between 2006 and 2016 projected by the Bureau of Labor Statistics (BLS)? In answering this question, we assume that each of the following factors will remain constant for the three radiologic technology disciplines between now and the end of 2016:

- 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, two, …, ten years ago.
- For nuclear medicine, the percentage of program graduates who choose to take the ARRT (N) exam, the NMTCB exam, or both.

In addition, we assume that our estimates, which are based on currently available data, are accurate. These assumptions can be referred to collectively as "steady-state" assumptions. Using radiography as an example, we show in some detail how the various statistics were estimated and then combined to predict the 2016 supply of radiographers. We then give briefer summaries of the calculations for the other two disciplines. Where multiple estimates of the same statistic are available (e.g., enrollment figures for 2004 as reported directly in the 2004 *Snapshot* and retrospectively in the 2005 and 2006 *Snapshot*s), the simple average of the estimates is employed.

Radiography

The BLS projects that 56,000 additional radiographers will be needed between 2006 and 2016. Given the estimate of 17,050 students entering radiography programs in 2008, together with the program directors' estimated attrition rate of 21.1% and a 90.8% pass rate for the certification exam (ARRT 2007 Annual Report of Exams), this discipline would appear to be adding new radiographers to the profession at a rate of 12,215 per year.

However, not all new radiographers still will be practicing radiography in 2016. How many of a given year's new radiographer cohort remain in the profession for one, two, … ten years? We used an ARRT-supplied database to determine the number of registered R.T.s who in September 2008 listed radiography as their primary area of employment and who had been working in radiography for less than one year, one to three years, etc. We used 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) each year from 1998 to 2007. This information gives us the following estimate of the overall retention profile for radiographers:

Year	No. of First-Time Certificants	No. in Radiography for X Years as of 9/2008	No. Reporting ___Years in Radiography as of 9/2008	Percent Retained
2008 (estimated)	12,113	.25(12,841) + .75(12,113) = 12,295	< 1 year: 7682	62.5%
2007	12,841	.75(12,841) = 9,631		
2006	12,725	12,725	1-3 years: 21,474	21,474/34,156
2005	11,800	11,800		= 63%
2004	10,532	10,532	4-5 years: 10,427	10,427/19,062
2003	8530	8,530		= 55%
1998-2002	7356, 6684, 6341, 6564, 7221	34,166	6-10 years: 15,662	15,662/34,166 = 46%

Similar retention profiles were computed based on demographic data supplied by ARRT in late August or September of 2003 – 2008 and March 2002. Despite being based on somewhat different cohorts of radiographers (e.g., about one- third of the radiographers in the 1-3 years category in September 2004 were slotted into the 4-5 years category in September 2005), the retention percentages were generally comparable to those given above. We therefore averaged the seven 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	57%
1-3 years	69%
4-5 years	60%
6-10 years	40%

Assuming that this profile holds true for the radiography cohort of 2008 and subsequent cohorts, we would expect that, on average, approximately 40% of radiographers who were first-time certificants between 2006 and 2010 would still be practicing radiography as their primary discipline in 2016; 60% of the classes of 2011 and 2012 would still be practicing radiography in 2014; about 69% of the classes of 2013, 2014, 2015 and 57% of the class of 2016 would be practicing at the end of 2016. We know from ARRT's 2007 Report of Exams that the class of 2006 consisted of 12,725 new certificants; the class of 2007, 12,841.We estimate that the class of 2008 will include 12,113 new certificants (16,908 students who entered radiography programs in 2006, decreased by a 21.1% attrition rate and a 9.2% exam failure rate), while 2009 will see 12,223 new radiographers. Further, the new-certificant class of 2010 (and, under steady-state assumptions, each subsequent class) should consist of approximately 12,215 new radiographers. Combining these figures with the above retention profile leads to an estimate that 62,117 (the number of new radiographers certified in 2006 – 2010) x .40 + 24,430 x .60 + 36,645 x .69 + 12,215 x .57 = 71,752 additional radiographers by the end of 2016. However, an average of 2.9% of new ARRT (R) certificants take jobs outside the United States (using this year's estimate), so we estimate that between 2006 and 2016 a total of about 69,671 radiographers — almost 25% more than the BLS-estimated need — will have been added to (and remain in) the U.S. labor pool of radiographers. Note that 7% of radiography program directors plan to increase their enrollments; 9% plan to decrease them.

Radiation Therapy

BLS projects that 6,000 radiation therapists will be needed between now and 2016. We know from ARRT's 2007 Report of Exams that the classes of 2006 and 2007 consisted of 963 and 877 new certificants, and we estimate that the class of 2008 will number 1,014 new certificants (1,389 students who entered radiation therapy programs in 2006, decreased by a 14.5% attrition rate and a 14.6% exam failure rate), while 2009 will see 1,070 new radiation therapists. Further, the new-certificant class of 2010 (and, under steady-state assumptions, each subsequent class) should consist of approximately 959 new therapists. Combining these figures with the retention profile estimated for radiation therapists leads to an estimate of 4,883 (the number of new radiographers certified in 2006 – 2010) x .96 + 1918 x 1.12* + 2877 x .98 + 959 x .67 = 10,298 additional radiation therapists by the end of 2016. However, an average of 10.2% of new ARRT (R) certificants take jobs outside the U.S., so we estimate that between 2006 and 2016 a total of about 9,248 radiation therapists will have been added to (and remain in) the U.S. labor pool of radiation therapists, thereby exceeding the BLS-projected need in this modality by about 54%. Note that 10% of

radiation therapy program directors plan to increase their enrollments – slightly fewer than the 12% who plan decreases.

The number of ARRT certificants whose primary sphere of employment in September 2008 was radiation therapy and who have been practicing in this discipline for 4 - 5 years is 12% greater than the number of radiation therapists who passed the radiation therapy certification exam in 2003 or 2004 (i.e., 4 - 5 years ago), therefore we used a multiplier of 1.12 in computing the number of 2011 and 2012 new (T) certificants who will be practicing at the end of 2016. This excess is probably due to repeat examinees and to migration into radiation therapy from other specialties (e.g., radiography).

Nuclear Medicine Technology

BLS projects a need for 6,000 nuclear medicine technologists to meet increased demand and attrition between 2006 and 2016. The ARRT 2006 and 2007 Reports of Exams state that the classes of 2006 and 2007 consisted of 590 and 693 new ARRT certificants, respectively. However, there were also 1,298 and 1,316 individuals who passed their initial NMTCB certification exam in 2006 and 2007 (personal communications from NMTCB, February 16, 2007 and November 6, 2008). Since many prospective nuclear medicine technologists take both certification exams, each year's new-certificant class numbers somewhere between the NMTCB number (since that's been the higher number since at least 1997) and the sum of the NMTCB and ARRT numbers.

Estimating the degree of overlap between ARRT and NMTCB registrants in any given year is difficult. The ratio between number of ARRT and number of NMTCB examinees has changed substantially over the years (dropping from .67 in 1997 to .61 in 1999 and then holding steady at around .40 from 2000 through 2005), suggesting that the degree of overlap has also varied over the years. However, this year as well as in 2006 and 2007, the Snapshot asked nuclear medicine technology program directors to estimate the percentage of their graduates "over the past two years" who have taken the ARRT exam only, the NMTCB exam only, both, or neither. From these figures the percentage of nuclear medicine technology examinees who took both exams was estimated at 28.0% in 2005, 42.1% in 2006, 43.7% in 2007, and 29.5% in 2008. Applied to the known number of the two types of examinees who passed the exam in 2006 and 2007, this provides an estimate that 1,328 nuclear medicine technologists were newly certified in 2006 and 1,398 were certified in 2007. For 2008-2010 the number passing the ARRT and NMTCB exams is not yet known so only reported attrition rates and the 2008 pass rates can be applied to the 2006-2008 entering-class enrollments (estimated from the 2006-2008 Enrollment Snapshots). These calculations lead to an estimate of a 2008 new-certificant class size of 1,549, a calculation of 1,463 newly certified nuclear medicine technologists in 2009, and 1,342 in 2010. Under steady-state assumptions, that same number of 1,342 individuals should pass their nuclear medicine certification exam(s) for the first time in each year from 2011 through 2016.

Before figures from number of ARRT certificants and years in discipline can be used to estimate the retention profile for nuclear medicine technologists, the total number of new nuclear medicine certificants for each year from 1998 through 2003 must be estimated. (These estimates are available for 2004 forward.) It can be shown that the total number of certificants in a given year equals the sum of the ARRT and NMTCB numbers, divided by (1 + proportion of examinees who took both exams). A MIRODA match of the ARRT and NMTCB databases in 2000 showed at that time that the percentage of nuclear medicine technologists certified by both ARRT and NMTCB was about 55% -- considerably higher than the 34% to 46% observed from 2005 through 2007. Assuming (based on the observed pattern of the ARRT to NMTCB ratio) that the percentage of examinees taking both exams was 55% from 1997 through 1999 and was linearly related to the ARRT/NMTCB ratio from 2000 through 2004 enables an estimate of the total number of new nuclear medicine technologist certificants for every year from 1997 through 2008.

Combining these certificant numbers with current ARRT certificant and years-in-discipline information for nuclear medicine technologists provides an estimate of the number of ARRT certificants primarily employed in nuclear medicine technology for less than a year of about 35% of the number of first-time certificants in this cohort. The assumption also reveals that the number after 1-3 years is about 50% of the number in the first-time certificant classes for those years, that the number of ARRT-registered R.T.s who have practiced nuclear medicine for four to five years is about 59% of the number who took the primary exam and passed it for the first time four or five years earlier, and that ARRT registrants who have been in the discipline for 6 to 10 years would be, on average, 61% of first-time certificants in the corresponding 5-year time slot. However, the ratio of total (ARRT and/or NMTCB) new

certificants to ARRT certificants changed considerably over the time period. [That ratio can be shown to equal the ratio of (1 + #ARRT/#NMTCB) to (1 + proportion taking both exams).] Thus to get the best estimate of the percentage of new certificants (ARRT and/or NMTCB) in each cohort (those nuclear medicine technologists who entered the profession 6-10, 4-5, 1-3, or < 1 years ago) who remain in the profession today requires multiplying the above ARRT retention percentages by the average ratio of total certificants to ARRT-registered certificants that remained practicing during that block of years. Doing so leads to estimated retention percentages for all registered nuclear medicine technologists of about 86% the first year, 114% years 1-3, 154% 4-5 years later, and 144% in the 6-10 years post-initial-exam time block.

Thus, steady-state assumptions produce an estimate that 17,292 additional ARRT- and/or NMTCB-registered nuclear medicine technologists would be practicing in the profession by the end of 2016. Since 96.9% of graduates of nuclear medicine technology programs take jobs in the United States, this suggests that about 16,756 registered nuclear medicine technologists (about 7,235 of them ARRT-registered) will have been added to and retained in the U.S. labor pool between 2006 and 2016 – more than 175% of 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 finite-population-corrected 95% confidence intervals (CIs) around the estimated total entering-class enrollment for 2008 in these three disciplines are ± 419 students for radiography, ± 91 for radiation therapy and ± 90 students for nuclear medicine technology. (The CIs around enrollment figures for 2003 - 2007 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., about one-sixth of program directors plan to increase or decrease their enrollments in the near future, potential variations in number of applicants due to changes in reimbursement rates for radiologic procedures, etc.). Moreover, the retention profiles (i.e., 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) calculated each year are based on calculating backward from a single point in time (e.g., September 2008) and might not be representative of what will happen to the 2006 to 2016 new-certificant cohorts.

Overall, however, our best current estimate is that radiography is producing new practitioners at about 25% above the rate needed to meet the 2006-2016 demand for additional radiographers estimated by BLS, while radiation therapy will exceed that discipline's BLS-estimated demand by about 50% and nuclear medicine will exceed the estimated need by more than 175%.

APPENDIX A:

QUESTIONNAIRE AND COVER LETTER

ASRT Logo

October, 2008

Dear Program Director:

As director of an educational program in radiography, radiation therapy, or nuclear medicine technology you are both affected by and have a major influence on the supply of radiologic technologists in those professions. To make informed decisions about your program enrollment levels, you must have accurate estimates of total enrollments in your discipline.

In each of the past seven years at least 65 percent of program directors in radiography, nuclear medicine technology, and radiation therapy 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 projected by the Bureau of Labor Statistics through 2014 and 2016. We now need to determine whether the upswing in enrollments is continuing or has leveled off, as appeared to be the case for radiography and radiation therapy the past two years. We also need to update our estimates of how each specialty is meeting the need for its technologists.

I would appreciate your participating in the 2008 enrollment survey at your earliest convenience, so that ASRT can put together a quick, accurate snapshot of enrollment trends. You can do this by going to asrt.checkboxonline.com/enrollmentsurvey2008.aspx to complete the questionnaire online. Please use this online route if possible; this gets your feedback to us more quickly and minimizes administrative data entry errors. If, however, a hard copy questionnaire would be more convenient for you, please contact Director of Research John Culbertson (800-444-2778, Ext. 1297 or jculbertson@asrt.org) for a printed questionnaire and postage-paid envelope.

We will summarize the data from programs in each discipline and the results will be made broadly available. Individual programs will not be identified.

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

Sincerely,

Sal's signature

Sal Martino, Ed.D.
Executive Vice President and Chief Academic Officer

ASRT Logo

Note: If yours is a multiple-discipline program, or includes multiple educational levels, please complete this online questionnaire once for each discipline or educational level your program represents.

Indicate your type of program.

☐ Radiography

☐ Radiation therapy

☐ Nuclear medicine technology

☐ Other (Please specify below)

If you checked "Other" above, please specify that type of program:

What is the educational level of your program?

☐ Certificate
If yours is a certificate program, do you have an articulation agreement with a community college?
O Yes O No

☐ Associate degree

☐ Bachelor's degree

☐ Other (Please specify below)

If you checked "Other" above, please specify the educational level of your program:

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

O Yes

O No

In what country is your program located?

O USA

O Australia

O Canada

O Other (Please specify below)

If you checked "Other" above, please specify that country:

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

1. How many students entered your program each of the following years? (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.)

	2006	2007	2008
Number of students			

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

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 (in percent)

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. Over the past five years, what percent of your program's graduates have taken jobs in the United States, including U.S. territories and Puerto Rico?

	Percent	Do not know
Students taking jobs		

8. If yours is a nuclear medicine program, approximately what percent of your program's graduates over the past two years have taken the ARRT certification exam in nuclear medicine technology versus the NMTCB certification exam?

	ARRT exam only	NMTCB exam only	Both ARRT and NMTCB exams	Neither
Percent of students taking				

9. Please add any additional comments you have here.

ASRT Logo

Thank you for taking the survey.

APPENDIX B

COMMENTS IN RESPONSE TO QUESTION 9 OR SENT VIA E-MAIL

Via E-mail

“I received the attached e-mail probably since I was identified as the program director of the [Name] School of Radiologic Technology. I am sorry to inform you that this program closed its doors this year due to the master’s degree requirement for program directors passed by the ASRT House of Delegates and implemented by the JRCERT. Please remove the above mentioned school from your list of active programs. We held our last graduation in June of this year..”

9. Please add any additional comments you have here.

Responses to this invitation appeared to cluster around a few themes, which were coded as follows:

Additional comments: Coded

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decrease enrollment/job market saturated	35	5.3	32.4	32.4
	Health program/new program	13	2.0	12.0	44.4
	Attrition rate fluctuations	8	1.2	7.4	51.9
	Concerns over college course requirements/articulation agreements	14	2.1	13.0	64.8
	Program shut down/ on hold	7	1.1	6.5	71.3
	Other	31	4.7	28.7	100.0
	Total	108	16.3	100.0	
Missing	System	555	83.7		
Total		663	100.0		

The verbatim comments (edited to avoid identifying individual programs or directors) appear below:

Comments coded as “Decrease enrollment/job market saturated”
5 years ago, students had employers seeking them out with about 3-5 open positions per person. Now students must actively seek out the fewer open positions, but open positions are still available. Students also seem to have more options regarding continuance of their education in sonography, radiation therapy, CT, nuclear medicine and MRI. Rather than waiting to "pay their dues" as a staff technologist, the students can continue their education and get into the desired area much earlier.
Clinical placement is becoming more difficult as new programs emerge in smaller markets and compete for clinical spots. A new program is starting in our small market and will either impact our growth or our ability to sustain our admission numbers.
Currently the market is saturated in Central Florida.] It has been very difficult for the June 2008 graduates to find jobs as radiographers. Approximately 25% of the graduating class is still looking for a position.
Employment opportunities have declined significantly in the last two years. This may decrease the interest in the profession.
Enrollment is not the issue. My main concern is placement. There has been an influx of proprietary programs and the job market appears to be saturated.
For question #3 the number if students may change after I receive the 6-month survey results. Jobs are becoming tighter this past year.
For the first time, the students graduating this spring had difficulty finding full-time employment. Most got per diem or part-time, and this is a result of the addition of several private programs in the area being added, glutting the market for graduates. [Name of city]-area hospitals are now asking all programs to decrease the number of students coming in the Fall of 2009, so enrollments will decrease.
I'm very concerned about the number of new programs and the number of programs that increased

enrollment over the last few years to satisfy the "shortage". In my region, at least 3 programs have started up in the last 5 years and a 4th program almost doubled its enrollment. Who polices the need for new programs? In a mainly rural region, suddenly we have two and a half times more programs than what we had 10 years ago, turning out 100 more newly graduated technologists every year. Where we had a shortage, we now have a flooded market. This poor planning and cyclical shortage-followed-by-flooding is an irresponsible trend that WE in the profession perpetuate. It's no wonder we can't find respect professionally when we can't even manage our own workforce.
I am concerned that with the huge influx of proprietary schools in urban areas, we will no longer be able to place our graduates in entry level RT positions.
I would like to decrease the size of the program. I would need help convincing a for profit school to decrease also. Thanks – [First name of respondent]
In our area of the southeast United States, job availability is continually declining. I believe it is time for the ASRT and state affiliates to request decreased enrollment in radiography programs and encourage current radiographers to move into other modalities. I believe this is a direct result of overreacting to the manpower shortage a few years ago by the creation of new programs and programs increasing enrollment. I also believe that the ARRT contributed to this deficiency of jobs by acknowledging regional accreditation bodies that do not focus on programmatic accreditation. This has led to academic institutions creating radiography programs which focus on pure numbers of students without being held to graduate success in finding jobs and therefore maintaining adequate placement rates.
In regard to question number 2: The job market is very saturated in the metropolitan area of Minnesota. The majority of the students in my program are second and third career people with commitments to their families, so moving may not be an option. The program I am affiliated with can take up to 20-25 students, however, with the economy, health system/company downsizing and lack of jobs in addition to several programs in the same area putting out too many students for the jobs available, I will not increase my enrollment numbers until I see a definite need in the communities of interest or profession.
Job market currently challenging for new NMT grads.
Job market saturated at present time. Three year wait list for entry remains constant. Attrition increasing approx. 5%/year for past 4-5 years on average.
My numbers include both the associate radiography and the BS Radiation Therapy. We have decreased the numbers, as you can see in question 1, in the associate degree only - from 44 to 40. There are 2 hospitals in our area that might close and if that occurs our numbers will go down again. Not planning on it just yet.
Our graduates have been able to find jobs, but about half of them this year had to string together a couple part-time positions. The ideal full-time position is quickly disappearing. With people retiring at older ages, this market is going to get tough. I don't think the DOL stats take into consideration the market, the technology decreasing positions, nor the possible non-retirement of older techs.
Our number of admitted students per year varies according to demand in the area. We are still experiencing a low demand in southern region of the country
Our program has not changed enrollment numbers for the past 7 - 9 years. We have struggled to maintain this number due to the increase of other programs encroaching on clinical sites.
Radiography Programs need to decrease their enrollments. The job market is flooded.
Some programs need to keep enrollment the same or less since in our area it is becoming flooded with graduates.
Students are not finding their ideal job upon graduation due possibly to the saturation of graduating radiographers in our region. There are 4 radiography programs; 2 programs accept less than 20 students per year and the other 2 programs accept up to 50 students per year which is flooding the market.
The applicant numbers are still at the same levels, over 100 - The program has decided not to take more than 22. This is due to lower exam numbers being performed in diagnostic radiology. Less students gives those enrolled a better clinical education.
The applicant pool has decreased the last two years, at this time it appears as if we will have a larger pool this year from which to choose.
The job market has gotten much tighter in the last year or two. Not all of my graduates from May 2008 have found NMT jobs in the area and most have had to take PRN positions. This is very rare this long after graduation. I suspect it will swing back in a year or two from now. I hope.

The job market in nuclear medicine technology has definitely tightened up in the last year. Planning on keeping the enrollment the same unless this trend gets worse.
The job market is flooded in our area. Graduates are finding jobs although there are few.
The question regarding the number of students turned away has little relevance unless you are intending to increase enrollment- which no one should be doing in light of the job market
We always have hundreds of applicants (200+), usually between 70-90 that are qualified. The job market is changing, however, and so to meet JRCERT accreditation requirements, we may have to reduce our enrollment to keep 75% of our graduates with job opportunities. Not sure yet, but considering it and watching the market.
We are intentionally decreasing our enrollment based on community needs and retirement/reduction in hours of long time staff and the reduction of the length of our program. We have gone from 22 months and no college prerequisites to 18 months with 15 credit hours of prerequisites. I imagine our school will reduce to 25 over the next couple of years unless the demand changes.
We are limiting our enrollment due to the limited availability of clinical sites in the area.
We are not at maximum for students because we chose to voluntarily accept 4 less. We had many qualified candidates but due to market in the area chose to decrease the number slightly.
We have a waiting list of over 2-3 years in length. We are reducing our enrollment from 20 (2 years ago) to 18 starting this summer to ensure 100% employment and quality clinical experiences.
We have seen job postings become more scarce. However, the jobs are out there for those grads who go out and find them! Our area has many programs and seems to favor hiring of new graduates vs. technologists with experience. I am glad that there is an accurate survey forthcoming and I would love to see it followed up by a letter to Program Directors requesting or advising that they temporarily decrease enrollments if that is what needs to happen, many programs would need that to back a decision to cut back on enrollments temporarily.
We reduced enrollment to 30 this past summer due to a decrease in available jobs in the area. We continue to have over 120 qualified applicants each year for our program.
While 100% of our graduates have gotten jobs in that past five years, it has been substantially more difficult.
Comments coded as "Health program/new Program"
My program just started in 2007
New RTT program, just admitted first class!
Our certificate-based program will be moving to a BS program in academic year 2009-10. We will increase enrollment based upon BSRS market need, not radiography needs only. The market is currently flat for radiography-only graduates, regardless whether they have an AS or not. A key determinant is marketable skills of the outcome.
Our enrollment has remained between 12-14 each entering class since 2003, based on clinical spots. We don't see this changing much, but will be staying at the lower end during the next 2 years.
Our program has only been in existence since June 6, 2006. We have had 17 students graduate. Of 8 have found jobs. One is continuing his education, which is 53%.
Our program is doing very well. Our graduates over the last three years have been employed at the [Name] University Hospital. 10 to 20 % go on to Rad Therapy, Nuc Med and our B.S. degree. Some have been accepted in to sonography programs (about 4%). Our students ARRT exam scores over the last 4 years have been at or higher than the national and state of PA levels. We have each year, 40 to 50 applicants that are active in the "pre-radiography" curriculum awaiting the admissions process each year. We accept only 30 for the August startup date. I've been program director here for 30 years and a member of the ASRT since 1977. I missed a year so that initial date of membership is not reflected for 1977. Wish that could be adjusted somehow. I have been published twice in the ASRT Journal. Sincerely, [Name] RT(R)MS Director/Associate Professor, Department of Medical Radiography [Phone #]
Our site is all active duty military. Upon graduation each student is placed in an active duty military hospital or clinic type setting. All students are encouraged to participate in the national registry but [that] is their choice. They are not required by the military to become licensed.
Ours is a new program that started in 2005. We started with 25 students but did not have clinical space for them. We now take 17 per year. Currently the job market is very tight in our area.

This is a brand new program. Questions 5 thru 8 are unanswerable at this time.
This program began in January 2007. The first graduating class will be December 2008.
We are a new program. We do not have a history for enrollment and attrition. The program was started to meet the technologist shortage in our area.
We have a very healthy program with a great applicant pool each year. Our retention rate is around 90-95% each year (the 2007 graduating class was unusual with only an 85% graduation rate for that one class), our applicant pool is usually >93 students for 20 slots i the program, our ARRT pass rate is 100%. In recent years with the addition of our 2 BSIS (bachelor of science in imaging sciences) tracks (one in ultrasound and one an on-line management degree) the number of our students continuing on toward their bachelor's degree has risen significantly. At present we have around 50% of our recent grads and those in the AAS program now, working on their BS degree.
We just started the second year of our program. We are located in a rural area of southwest [Name of State] and this is the first class of our new program.
Comments coded as "Attrition rate fluctuations"
Attrition rate varies 15-25%.
Attrition rate was low until graduating class of 2009. That particular class started with 29 students and now there are 20. This has skewed our outcomes assessment over the past 5-year rolling period.
economics predominantly affecting attrition rates
I am a program director in nuclear medicine too at [Name] University. The reason our attrition rate in the radiology program increased is due to the adoption of an "everyone who qualifies should be placed in a lottery type selection" whereby we can't choose the best students...we have to take the random "pick" required by the California State Department of Education.
My admission criteria changed to a competitive format from a waiting list format in fall 2008. My attrition rate has dropped to zero with this change.
Our largest difference is the increase in admission standards. The attrition rate is not due to academic reasons. We have students applying to medical school and other types of schools that do not require a degree. Or the student decides to change majors. In the past three years only 1 student failed to progress due to academic reasons.
Referring back to question number 6, we had one year (2007) when we had 30% attrition, driving up our overall rate. Our typical attrition rate is typically 5-10%.
The retention rate varies considerably from cohort to cohort -
Comments coded as "Concerns over college course requirements/articulation agreements"
I am concerned about being a hospital based program & recent education requirements i.e. associate degree by 2015 in order to sit for the ARRT exam. We have a long-standing articulation agreement with a private college, but we only get a minimal number of applicants per year from the college. I have been working for 6 months toward an articulation agreement with the local community college & at the present have a commitment from the community college for 8 hrs of "work experience" for the entire program. That is a huge deterrent for our program. My boss said to me 2 weeks ago after I disclosed the article, that if I wanted a job in 7 years I better get something done. Not sure...since I completed by master's degree for this position...I feel like I personally would be better off looking for a job. I feel like a pioneer.
I believe we will continue to operate, however with the new entry level associate degree requirement by 2015, we may have to articulate with a college that has been trying to over take [take over?] our program for the past few years.
I think requiring that R.T.s have Associate degrees by 2015 is too little time with everything else going on in the profession. I think it's probably a good idea, but I think 10 years down the line would certainly make it easier for programs to problem solve this issue without the ARRT getting the reputation of trying to do away with Hospital-based programs.
My certificate program is only for students completing a bachelor's degree, so our affiliation agreements are with four year institutions and not with community colleges.
My question is this: We have an affiliation agreement with [Name] University of [State], it is a two plus two program. We have maintained sponsorship of the final two years and award a certificate. I'm wondering if you are sending this same survey to [Name] University of [State]. They feel they have a B.S.

in Rad Sciences Program, however there students are fed to the local certificate programs. If you have them listed, you would be getting a double count on the figures listed above. Please check this for me, if they are doing this survey, they shouldn't be. Thank you for your time. Respectfully submitted: [Name], B.S., R.T. (R)Program Director
New gen ed requirements have reduced applicant numbers. Also, the students that started in 2008 (with gen ed requirements)do not seem as good.
Since the 15 required college credits for entrance into the radiography program came into existence, we had to turn away qualified applicants. It also leaves High School graduates without a chance to become a radiographer. Poor decision. It will affect the educational process and the profession of radiography.
We are concerned with the possible adoption of the associate degree as a requirement for initial certification via the ARRT. Our general education courses meet the same requirements as would an AS degree. Can you provide feedback regarding where university certificate programs will stand if the ASRT proposal is adopted? [PD's email address.] Thank you for your consideration.
We are in the planning stages of articulation to offer an Associate Degree track and a Baccalaureate Degree track in addition to our certificate program. Note: many applicants to certificate programs today are change of career students who already have degrees.
We are in the process of establishing an affiliation with a community college. When this occurs in approximately 2010/2011 we will increase from 10 students per year to 15.
We do not currently have an associates degree affiliation, but this will be in place very shortly. We also have two 4 year affiliations for a bachelor's degree.
We had a substantial decrease in the raw number of qualified applicants once the 15 college credit requirement became mandatory. However, prior to that, there was a strong preference for related college work (almost all of our accepted students had more than the 15 credits, with some holding a BS or AS) so the quality of the accepted students did not change.
We have an articulation with a baccalaureate program; the University of [name of university]
We will be converting to a BS degree during the next two years (we used to issue an AS degree, but that "went away" 18 yrs ago when the BOR said universities in NV lowest degree to bestow is a BS)
Comments coded as "Program shut down/ on hold"
[Name] School of Radiation Therapy closed upon graduation in August 2008. Not currently operating or taking applications. Thanks
Our program is currently on hold until January due to the state budget crisis. This is not due to enrollment. The program may begin in January or it may be suspended for up to two years if the state budget situation improves. If the budget does not improve then in all likelihood the program will be discontinued permanently. We currently have 20-25 qualified applicants to choose from.
Program on inactive status due to lack of faculty/program director.
The program will be going inactive until a new program director can be hired as the current program director took early retirement.
This year all students were required to apply for both the ARRT and the NMTCB. Our program is currently on hold because we didn't have enough qualified students to begin in the fall. We hope to begin in January. We have 20 qualified students competing for spots. The state budget in Georgia is extremely tight and the technical colleges are having to make major cutbacks. Our program may be put on hold again for a quarter, a year or dissolved completely. This is simply to cut costs.
We are not at full enrollment based on authorized capacity, but we can be considered "full" only because our clinic sites will not accept the number of students they are authorized to accept.
Comments coded as "Other"
#3: Program format change such that students only taken each September rather than every 8 months, but same number of students/class. Results in a 1/3 decrease in enrollment.#8: Not completely sure of the number taking the ARRT exam this year as notification is not given until the following January.
#6 You need to define attrition; there are a number of ways to calculate it.#7 Of all graduates or of the number of graduates seeking employment?
#7 - 11 students graduated but only nine took boards, so is the question board certified graduates or just graduates?
#7 Our graduate survey asks for employment information if that graduate is seeking employment.

Graduates who are continuing their education full-time and are not working are not included in the percentage since they are not seeking employment.
*Average of those seeking employment in Radiography Continue education in CT, MRI, Radiation Therapy, Nuclear Medicine, Echocardiography, or Bachelor's degree
Almost all students take the NMTCB with approximately 30% also taking the ARRT.
Beginning in 2010, all students will be required to take both NMTCB and ARRT. Our program numbers are dropping because we have reworked the curriculum to be somewhat more rigorous but we also expect board exam pass rates to be close to 100% on the first attempt.
I am sorry to have returned this late. I had to have surgery for a detached retina.
I have completed this survey already but received a mailing dated October 2008 asking me to participate. I am doing so again since this did not say to ignore if already done.
I know the above percentages are over 100%, but some have taken and failed one exam or the other.
I think it is the responsibility of the program to flex up or down, depending on the market trends.
In question #2, we did not turn away students, once they meet the requirements for our program they go onto a waiting list and then they begin the program the next year. So, we don't have any students that are required to re-apply over and over, once they meet the requirements they just have to wait until the next year to begin.
In the past few years 1 to 2 of our new MRT grads write ARRT exams & are successful.
It looks like the ASRT and ARRT are trying to phase out hospital based programs.
Need to ensure program students are program ready before they enter.
None
Not enough time to teach the curriculum proposed by the SNM
Our program has experienced a fairly high demand from applicants over the past 7 years. We generally have at least twice and many qualified applicants as there are spots in the program.
Over the past three years our attrition rate was 14%, 43%, 11%. The lower numbers are more typical but the one year with 43% skewed our percentage.
Overall, the applicant pool has increased.
Question - 1 Total students per year fiscal or academic? I answered academic.
Referring to question #7 above: a few students have not sought employment after passing the exam.
Regarding the program enrollment, our fourth year is not full but our other cohorts are full.
Student placement would be 100% for those who really want a job and also are willing to move to that job location.
The difference in our annual enrollment from one year to the next is that we accept a group of students every other year who take their academic courses in the evening.
Too many obstacles with JRCERT
We
We are a university program that issues a "certificate" due to the fact we cannot offer a degree lower than a B.S.
we are focusing on advance imaging, degree completion and degree advancement and letting the other programs focus solely on entry level
We are the only program in the state of [name] and [adjoining state] does not have a program. I cannot account for students who are in the state as "Internet" students. I am not familiar with this program, I just know there are some student(s) in the state doing clinical work. Thanks.
We have a PET program as an advance Certificate and Diploma.
With more than one program, some questions were difficult to answer.
Total