*Results of the 2017 Examinations in Radiography, Nuclear Medicine Technology, and Radiation Therapy**

INTRODUCTION

This report summarizes the results of the 2017 examinations in Radiography, Nuclear Medicine Technology, and Radiation Therapy. All examinations administered in 2017 for these three disciplines were based on content specifications that went into effect in January 2017.

Each exam consists of 200 scored test questions. The major content categories and number of questions in each category are listed below.

Radiography

Section	# Questions
Patient Care (PC)	
Patient Interactions and Management	33
Safety (S)	
Radiation Physics and Radiobiology	22
Radiation Protection	31
Image Production (IP)	
Image Acquisition and Technical Evaluation	21
Equipment Operation and Quality Assurance	29
Procedures (P)	
Head, Spine and Pelvis Procedures	18
Thorax and Abdomen Procedures	21
Extremity Procedures	25

Nuclear Medicine Technology

Section	# Questions
Patient Care (PC)	
Patient Interactions and Management	20
Safety (S)	
Radiation Physics, Radiobiology, and Regulations	22
Image Production (IP)	
Instrumentation	38
Procedures (P)	
Radionuclides and Radiopharmaceuticals	24
Cardiac Procedures	24
Endocrine and Oncology Procedures	28
Gastrointestinal and Genitourinary Procedures	20
Other Imaging Procedures	24

Radiation Therapy

Section	# Questions
Patient Care (PC)	
Patient Interactions	25
Patient and Medical Record Management	22
Safety (S)	
Radiation Physics, Equipment, and Quality Assurance	20
Radiation Protection	29
Procedures (P)	
Treatment Sites and Tumors	26
Treatment Volume Localization	18
Prescription and Dose Calculation	24
Treatments	36

*Results for the primary exams in Sonography and MRI are contained in separate reports.

The *Primary Exam Results* report is no longer mailed to educational programs; it is available on the ARRT website. At this location Exam Statistics you can also review exam results reports dating back to 2001, along with other statistical reports.

INTERPRETATION OF SCORES

Total Scaled Score. The ARRT uses scaled scores to report exam results. A total scaled score can range from 1 to 99, and a total scaled score of 75 is required to pass an examination.

Scaled scores are desirable because they adjust for the difficulty of any new exam compared to earlier versions of the same exam. Raw scores (that is, number correct or percent correct) have limited use because they cannot be compared from one version of an exam to the next, or from one year to the next. This lack of comparability exists because one version of an exam might be slightly easier or slightly more difficult than a previous version. A person's raw score on an exam might be a function of exam difficulty rather than his or her level of performance.

Scaled scores adjust for any differences in difficulty between two or more versions of an exam so that a scaled score of 75 represents the same level of exam performance, regardless of which version of an exam an examinee takes. The use of scaled scores also permits comparison of exam results over time.

Scaled scores are sometimes mistaken for percent correct scores. This confusion probably arises because both scaled scores and percentages have a similar range of values. A scaled score of 75 does <u>not</u> mean that someone correctly answered 75% of the test questions.

Section Scores. Performance on each section of the exam is also reported using scaled scores. The primary purpose of the section scores is to provide information to examinees regarding their strengths and weaknesses in each content category. Pass/fail decisions are <u>not</u> made for individual sections of the exam. The only score that is important for pass/fail decisions is the total scaled score.

Section scores can range from 1 to 9.9 and are reported in one-tenth point intervals (e.g., 8.1, 8.6). Section scores are intentionally placed on a narrower scale because they are often based on a small number of test questions. Therefore, section scores are not as reliable as the total scaled score and should be interpreted with some caution.

Scores from the ARRT exams can be evaluated in two general ways. One interpretation involves a comparison of a given score to the scores obtained by other examinees. This is often referred to as a norm-referenced interpretation. A second type involves evaluating a score in terms of the degree to which the examinee has mastered the content covered by the exam. This is usually referred to as a criterion-referenced interpretation, because the focus is on whether a score meets or exceeds some criterion.

Although both types of interpretations are valuable, the criterion-referenced interpretation is more relevant for the ARRT exams.

Passing Score. A total exam scaled score of 75 or greater is required to pass the Radiography, Nuclear Medicine Technology, and Radiation Therapy exams. This pass-fail point, called the "cut score", is set by ARRT's Board of Trustees by a process called standard setting. During standard setting, the Board receives input from a panel representing a broad constituency of radiologic technologists. The cut score represents the standard of performance required to obtain certification and registration. Those who exceed the standard pass the exam.

Using scaled scores ensures that those taking different forms are not penalized for taking a slightly more difficult form of the exam. The use of scaled scores adjusts for differences in exam difficulty such that a given scaled score corresponds to the same level of competence regardless of exam form.

Educators and examinees occasionally ask how many questions need to be answered correctly to achieve a scaled score of 75. The answer depends on the difficulty of the particular form that was taken. For Radiography forms used in 2017, a scaled score of 75 corresponded to about 68% correct. This passing score was a product of a 2012 standard setting study that reset the Radiography passing standard, beginning in 2013. For more details on this study refer to the attached article: [ARRT - Radiography Cut Score to Increase in 2013](). For Nuclear Medicine Technology a scaled score of 75 corresponded to about 62% correct, and in Radiation Therapy a scaled score of 75 corresponded to about 67% correct.

Readers interested in a more detailed explanation of ARRT's scaling procedures are encouraged to review the brochure, *Settle the Score,* available at the ARRT website at [Settle the Score]()

EXAMINEE RESULTS

Number of Examinees. A total of 12,352 first-time examinations were administered for these three primary exams in 2017. Radiography accounted for 90.4% of the total, Nuclear Medicine Technology for 3.1%, and Radiation Therapy for 6.5%. Table 1 on page 5 presents a detailed breakdown for each exam.

The numbers of examinees for all three exams for the past ten years are shown in the charts on page 4. It can be seen that volumes have been up and down over the 10 years displayed. In 2017 the first-time volume was slightly down from 2016 for all three exams.

Examinee Performance Statistics. The results for regular, first-time examinees are shown in Table 2 on page 5. Data are presented for the total year. The mean and standard deviation are reported in scaled score units.

Table 2 presents the national averages for the total exam and for each of the content areas for all three exams. The content area data provides a frame of reference for evaluating the section scores obtained by individual examinees. If, for example, an examinee received a score of 7.6 on the Patient Care (PC) section of the Radiography exam, that examinee's performance would be below average by 0.8 scaled score units. Note that 0.8 is also the standard deviation for the Patient Care section. In other words, this hypothetical examinee scored one standard deviation (0.8) below the mean on the Patient Care section.

The mean % correct columns also illustrate how well examinees performed on each specific section of the exam. Each number indicates the average percent correct for all first-time examinees in 2017 on that section. If a section has 25 questions and the average percent correct is 80%, then it can be determined that on average, examinees correctly answered about 20 questions on that section (0.80 x 25 = 20).

Table 3 on page 6 presents percentile ranks for total scaled scores. A percentile rank indicates the percentage of examinees that scored below a certain scaled score. To obtain an examinee's percentile rank, simply locate his or her scaled score in the appropriate column (RAD, NMT, or THR) and read off the corresponding percentile rank from the left-most column. For example, an examinee in Radiation Therapy with a scaled score of 87 would be at the 70th percentile. In other words, that individual scored higher than 70% of all 2017 first-time examinees in Radiation Therapy. Table 3 does not provide percentile ranks for all scores; therefore, interpolation may be required for certain values.

PROGRAM AND STATE RESULTS

Mean Scores for Programs. Educators are often interested in comparing the performance of their educational program to that of all programs in the country. The histograms (bar graphs) on page 7 present the distributions of school means for first-time examinees from schools with two or more first-time examinees in 2017. School means ranged from 65 to 93 for Radiography, from 71 to 92 for Nuclear Medicine Technology, and from 72 to 93 for Radiation Therapy. Please note that for historical comparison of the histograms from year to year the range of means is 60 to 94. The graphs may not include all means for 2017.

The histograms show the number of schools with mean scores at a particular level. A histogram allows a program director to compare the mean of his or her school with that of all other schools. To accomplish this, review the Annual Program Summary Report, available at the ARRT website ARRT.org under Educators/Program Directors' website. The summary report indicates the mean score for first-time examinees who graduated from a given educational program.

As an example, consider the histogram for Radiography. If your school mean was 89, you can compare and see that there were about 30 total schools that had means of 89 during 2017. It can also be seen that relatively few schools had means above 89.

One interesting feature of these histograms is that there is a substantial gap between the lowest and highest school means. Much of this variability can be attributed to the small number of graduates from some educational programs. School means for programs with just a few students are very unstable. The extreme example is a program with one examinee. The mean for that program could be very low if the examinee has difficulty, or very high if the examinee happens to be very proficient. For this reason, school means are not included for programs with only one examinee. However, most of the highest and lowest means still correspond to programs with just a few examinees. Because of this, school means should be carefully interpreted.

State Means and Pass Percentages. The mean scaled scores and pass percent (for first-time examinees) for each state in the United States appear on the maps at the end of this report. Mean scores and pass rates are not reported when fewer than three examinees from a state took the examination. This step was taken to help ensure the confidentiality of individual examinees.

CONCLUDING COMMENTS

Data in this report can be used as one source of information for evaluating educational programs. When interpreting school means or state means, it is important to acknowledge that such results are sensitive to several factors. While the quality of the educational program is one of those factors, there are numerous others: the number of examinees on which the means are computed; the characteristics of those examinees; the emphasis of the curriculum; etc.

For more detailed information regarding psychometric properties of ARRT exams, please refer to the Technical Appendix which contains information about exam durations, conversion of raw scores to scaled scores, descriptive statistics for raw section scores, test score reliability (including section and overall test scores), and decision consistency indices. The Technical Appendix is available on the ARRT website at Exam Statistics
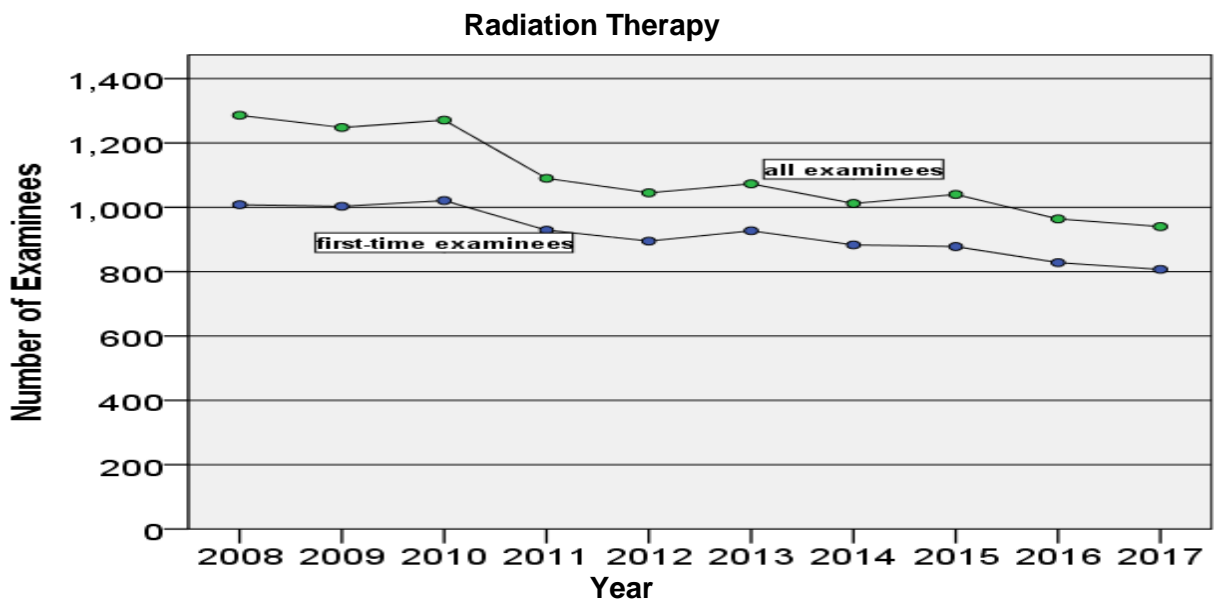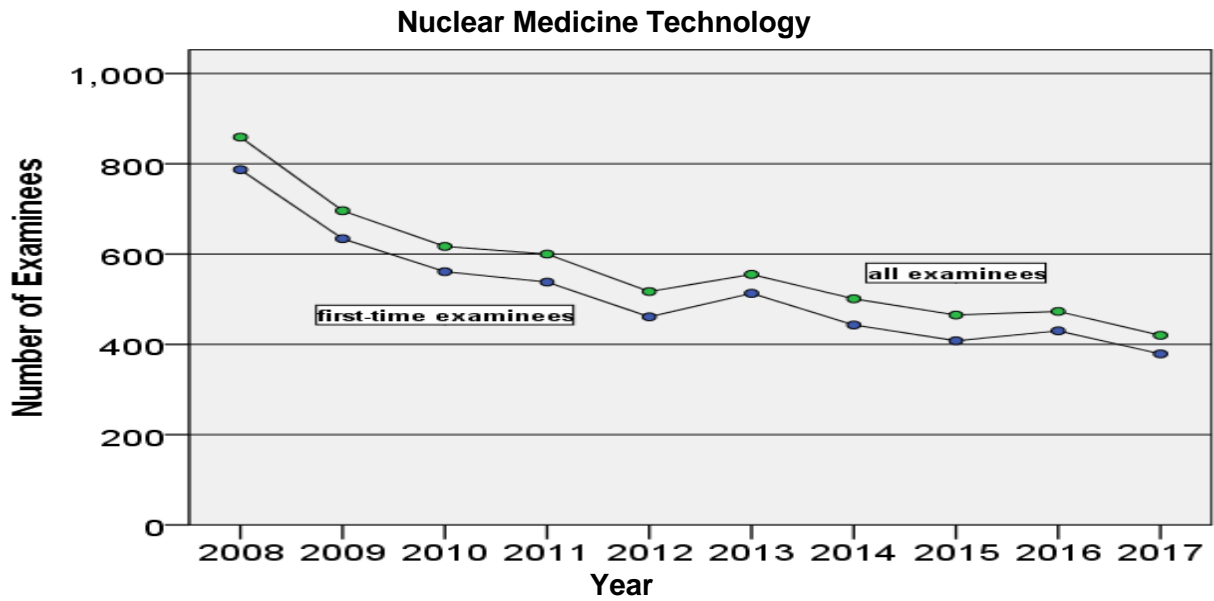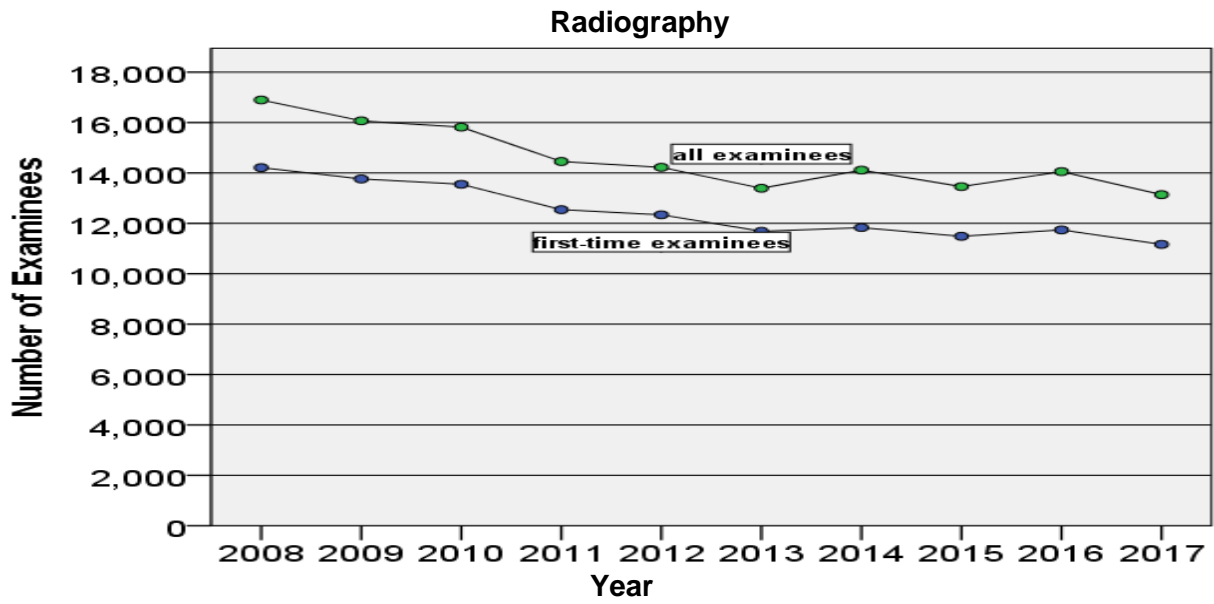
Radiography

Nuclear Medicine Technology

Radiation Therapy

Table 1: Number of Examinees, 2017

Discipline	First Time	Repeat	State	Re-Rex	Total
RAD	11,166	1,603	27	343	13,139
NMT	379	30	0	11	420
THR	807	115	1	17	940
Totals	12,352	1,748	28	371	14,499

Note: The "**State**" category includes non-ARRT examinees who take an exam only for state licensure. The "**Re-Rex**" category includes Re-Rex first-timers and Re-Rex repeaters. Re-Rex is reinstatement by re-examination after non-compliance with the CE requirements.

Table 2: Performance of Regular, First-Time Examinees, 2017

	RAD				NMT				THR		
Section	Mean	Std Dev	Mean% Correct	Section	Mean	Std Dev	Mean% Correct	Section	Mean	Std Dev	Mean% Correct
PC*	8.4	0.8	80	PC*	8.3	0.9	75	PC1*	8.5	0.8	81
S1	8.2	1.0	77	S	8.2	0.9	73	PC2	8.3	0.9	77
S2	8.2	1.0	78	IP	8.3	0.9	75	S1	7.7	1.1	70
IP1	8.2	1.1	77	P1	8.3	0.9	75	S2	8.4	0.9	79
IP2	8.1	1.0	76	P2	8.5	0.9	77	P1	8.4	0.8	79
P1	8.9	0.9	86	P3	8.6	0.9	79	P2	8.2	1.0	77
P2	8.4	1.0	79	P4	8.7	0.9	81	P3	7.9	1.1	72
P3	8.7	0.8	83	P5	8.3	0.9	75	P4	8.4	0.7	79
TOT	**83.6**	**7.2**	**79.2**	**TOT**	**83.8**	**7.3**	**76.2**	**TOT**	**82.4**	**6.7**	**77.1**
% Pass		**89.3**		**% Pass**		**88.7**		**% Pass**		**88.0**	

*Refer to the content specifications on page 1 for a complete description of the content of each section.

Note: Section scores are on a scale ranging from 1 to 9.9 and are reported at one-tenth point intervals (e.g., 7.6, 8.3, and so on).

Total scores are on a scale ranging from 1 to 99, and a scaled score of 75 is required to pass.

Table 3: Percentile Ranks for First-Time Examinees, 2017

Percentile Rank	Scaled Score		
	RAD	NMT	THR
95	93	93	92
90	92	92	91
85	91	91	89
80	90	91	88
75	89	89	88
70	88	88	87
65	87	87	86
60	86	87	85
55	85	86	84
50	85	85	83
45	84	84	82
40	83	83	81
35	82	82	80
30	80	81	79
25	79	79	78
20	78	78	77
15	77	76	76
10	74	74	74
05	71	71	71

If an examinee received a scaled score of 87, he or she scored higher than 70 percent of all examinees taking the THR exam during the year 2017.

Note: A percentile rank indicates the percentage of examinees scoring below a specified scaled score.

Distribution of School Means, 2017
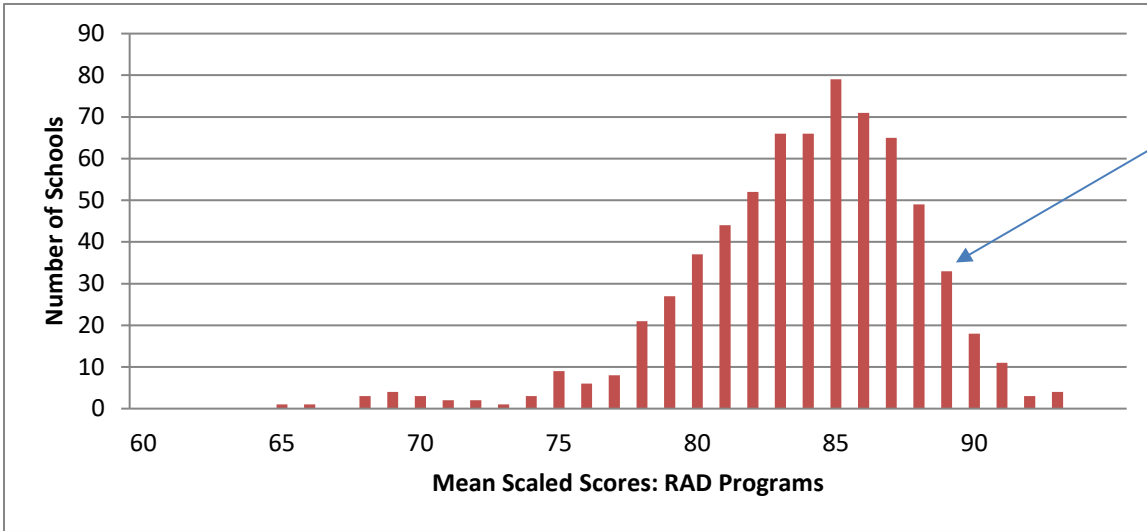
If your school mean was 89 you can compare and see that there were about 30 total RAD schools that had means of 89 during 2017. Relatively few schools had means above 89.
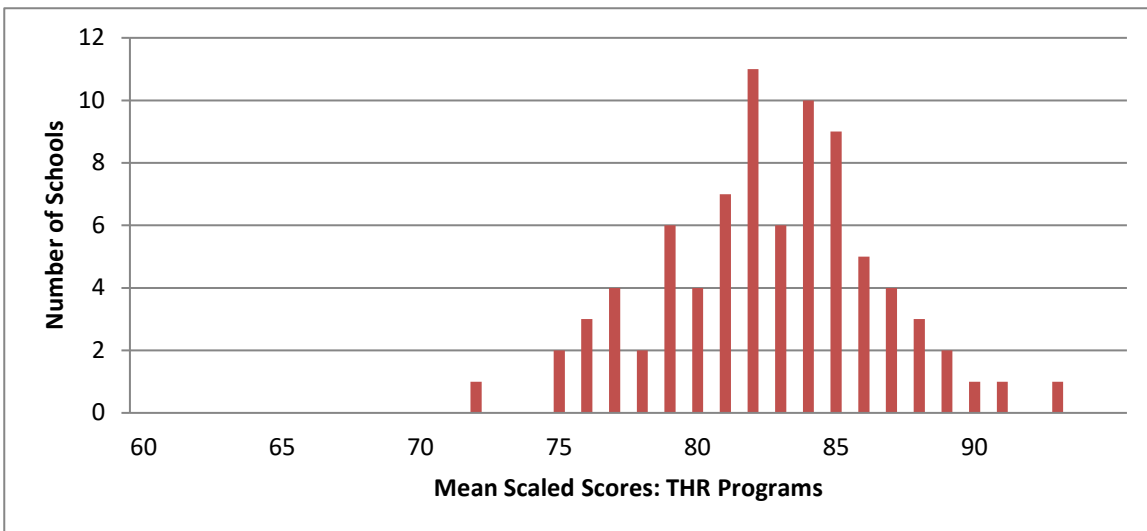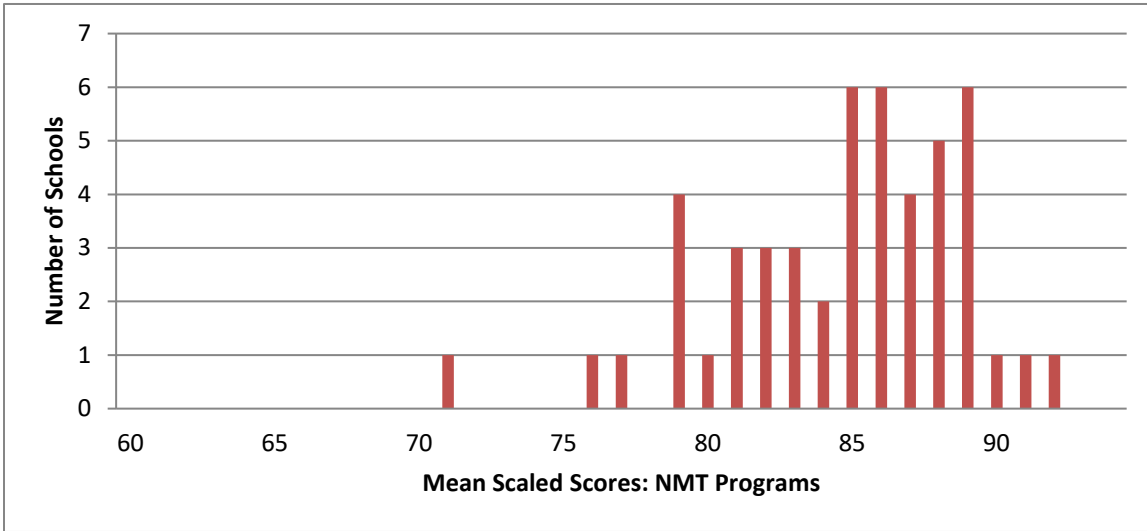
2017 ARRT Radiography
State Number of Examinees, Mean Scaled Score, and Percentage Passing*
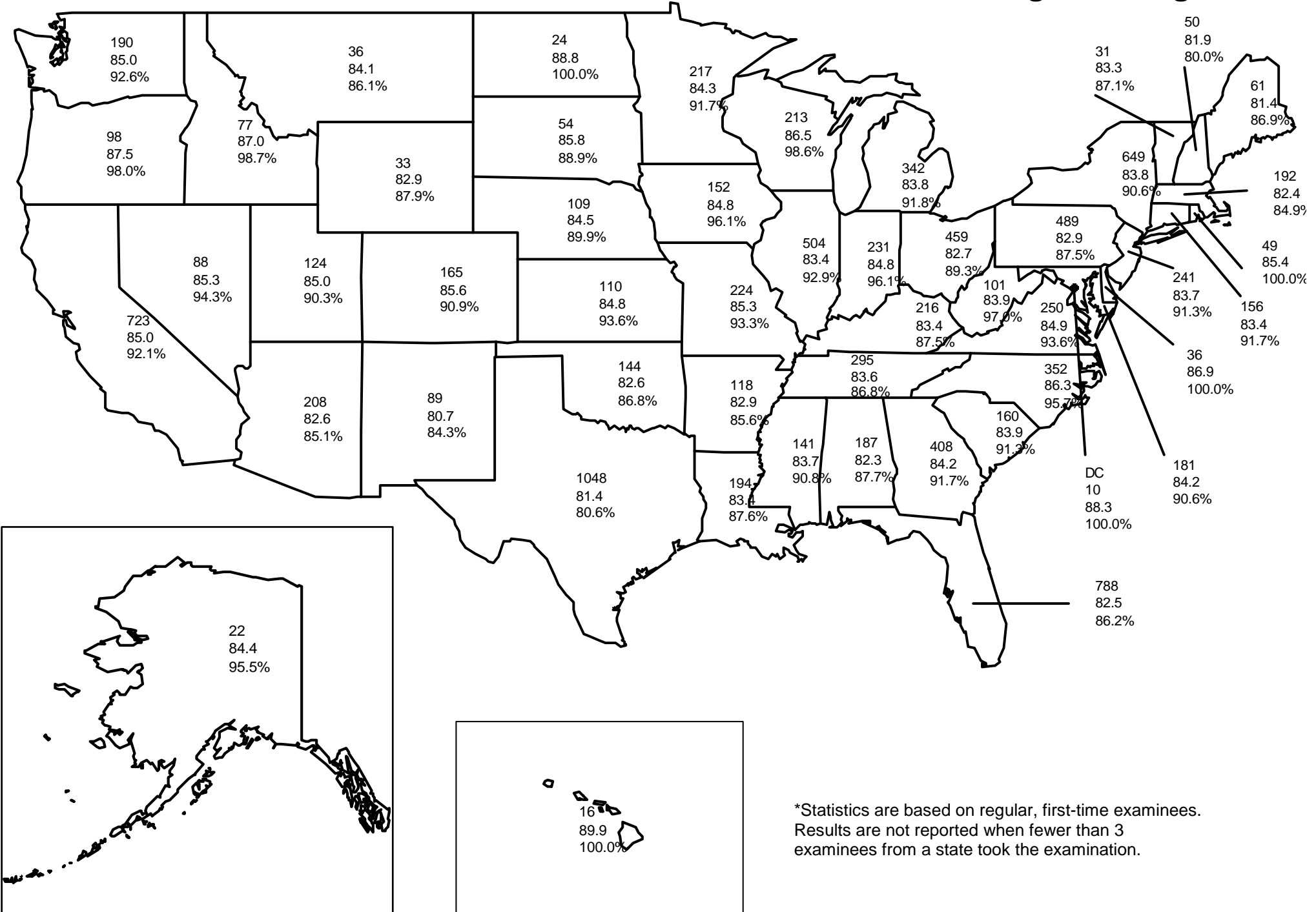
190
85.0
92.6%

36
84.1
86.1%

24
88.8
100.0%

217
84.3
91.7%

50
81.9
80.0%

31
83.3
87.1%

61
81.4
86.9%

98
87.5
98.0%

77
87.0
98.7%

54
85.8
88.9%

213
86.5
98.6%

342
83.8
91.8%

649
83.8
90.6%

192
82.4
84.9%

33
82.9
87.9%

152
84.8
96.1%

489
82.9
87.5%

49
85.4
100.0%

109
84.5
89.9%

88
85.3
94.3%

124
85.0
90.3%

165
85.6
90.9%

110
84.8
93.6%

504
83.4
92.9%

231
84.8
96.1%

459
82.7
89.3%

101
83.9
97.0%

241
83.7
91.3%

156
83.4
91.7%

723
85.0
92.1%

224
85.3
93.3%

216
83.4
87.5%

250
84.9
93.6%

36
86.9
100.0%

144
82.6
86.8%

295
83.6
86.8%

352
86.3
95.7%

208
82.6
85.1%

89
80.7
84.3%

118
82.9
85.6%

160
83.9
91.3%

181
84.2
90.6%

1048
81.4
80.6%

194
83.4
87.6%

141
83.7
90.8%

187
82.3
87.7%

408
84.2
91.7%

DC
10
88.3
100.0%

788
82.5
86.2%

22
84.4
95.5%

16
89.9
100.0%

*Statistics are based on regular, first-time examinees.
Results are not reported when fewer than 3
examinees from a state took the examination.

2017 ARRT Nuclear Medicine Technology
State Number of Examinees, Mean Scaled Score, and Percentage Passing*

0
NA
NA

0
NA
NA

0
NA
NA

2
NA
NA

3
88.7
100.0%

0
NA
NA

0
NA
NA

14
88.6
100.0%

0
NA
NA

2
NA
NA

0
NA
NA

13
79.8
92.3%

22
83.9
81.8%

18
80.8
88.9%

0
NA
NA

7
88.4
100.0%

22
78.1
54.5%

4
87.3
100.0%

0
NA
NA

18
83.9
88.9%

0
NA
NA

14
82.5
85.7%

0
NA
NA

21
79.0
66.7%

10
82.4
90.0%

2
NA
NA

22
84.5
100.0%

4
88.0
100.0%

3
91.7
100.0%

6
81.8
83.3%

2
NA
NA

4
85.8
100.0%

0
NA
NA

2
NA
NA

9
86.8
100.0%

9
85.2
88.9%

7
83.4
100.0%

0
NA
NA

18
80.6
77.8%

5
88.8
100.0%

0
NA
NA

7
80.9
100.0%

7
90.3
100.0%

11
83.5
90.9%

38
86.1
94.7%

4
88.8
100.0%

DC
0
NA
NA

49
84.9
91.8%

0
NA
NA

0
NA
NA

*Statistics are based on regular, first-time examinees.
Results are not reported when fewer than 3
examinees from a state took the examination.

2017 ARRT Radiation Therapy
State Number of Examinees, Mean Scaled Score, and Percentage Passing*

11
88.2
100.0%

0
NA
NA

0
NA
NA

29
82.8
86.2%

16
89.6
100.0%

4
81.3
100.0%

8
83.5
100.0%

0
NA
NA

7
87.0
100.0%

0
NA
NA

0
NA
NA

5
82.2
100.0%

41
81.8
85.4%

59
81.3
81.4%

24
80.3
70.8%

7
85.3
100.0%

40
81.1
80.0%

0
NA
NA

11
82.7
90.9%

20
79.0
85.0%

4
85.0
100.0%

7
86.6
100.0%

32
83.1
90.6%

30
81.0
80.0%

21
85.2
95.2%

11
85.2
100.0%

12
86.8
100.0%

27
85.9
92.6%

34
84.9
100.0%

10
84.5
100.0%

4
83.8
100.0%

4
87.5
100.0%

29
84.7
96.6%

0
NA
NA

12
83.5
83.3%

9
83.0
88.9%

24
81.0
91.7%

29
81.7
93.1%

0
NA
NA

0
NA
NA

0
NA
NA

58
82.3
91.4%

4
87.6
100.0%

0
NA
NA

5
85.8
100.0%

39
78.3
71.8%

0
NA
NA

DC
5
76.4
80.0%

15
80.0
86.7%

80
79.9
80.0%

0
NA
NA

0
NA
NA

*Statistics are based on regular, first-time examinees.
Results are not reported when fewer than 3
examinees from a state took the examination.