



# When to Take the Primary Certification Exam: Sooner or Later?

Tyler J. Sandersfeld, PhD, Steven H. Swerdlow, MD, Mario Levesque, Ty McCarthy, Bonnie Woodworth, Gary W. Procop, MD, MS  
The American Board of Pathology

## Background & Objective

The American Board of Pathology offers its Primary certification examinations (Anatomic Pathology (AP) and Clinical Pathology (CP)) twice each year – once in the Spring, and once in the Fall. The Spring examination takes place near the end of candidates' pathology residency training. It has been our impression that candidates taking the Primary certification exam in the Spring tend to perform better than those taking it in the Fall. We sought to determine if candidates taking the Spring Primary certification exams exhibited significantly better performance than those waiting to take the exam in the Fall.

## Method

It was assumed that the cohorts of candidates who had taken their first Primary exam between 2015 and 2021 (excluding 2020) were a sample of a much larger population of first-time (i.e., initial) Primary exam candidates. To determine whether the trend of candidates taking their initial Primary exam in the Spring performed better than candidates taking their initial Primary exam in the Fall is statistically significant, a difference of proportions test (two-proportion z-test) was conducted. Note that from 2015 to 2021, the same forms were used for each individual years' Spring and Fall exams, and both forms were equated. As this study focused only on initial Primary exam candidates, no repeater candidates (i.e., took the exam before and failed) were included.

The null hypotheses for both the AP and CP exams were that the true pass rate of candidates who take their initial Primary exam in the Spring equals the true pass rate of candidates who take their initial Primary exam in the Fall. An alternative hypothesis for each Primary specialty exam was that the true pass rate for the population of Spring initial candidates would be greater than the true pass rate for the population of Fall initial candidates. Thus,

$$H_0: p_{Spring} = p_{Fall}$$

$$H_A: p_{Spring} > p_{Fall}$$

The following statistics were used to determine whether the difference in pass rates between Spring and Fall initial candidates was significant:

$$SE_{\hat{p}_S - \hat{p}_F} = \sqrt{\frac{\hat{p}_{Spring}(1 - \hat{p}_{Spring})}{n_{Spring}} + \frac{\hat{p}_{Fall}(1 - \hat{p}_{Fall})}{n_{Fall}}}$$

where  $SE_{\hat{p}_S - \hat{p}_F}$  is the standard error of the distribution of differences between sample Spring proportions  $\hat{p}_{Spring}$  and sample Fall proportions  $\hat{p}_{Fall}$ , and  $n_{Spring}$  and  $n_{Fall}$  are the sample sizes for Spring and Fall administrations, respectively.

The test statistic was thus:

$$z = \frac{\hat{p}_{Spring} - \hat{p}_{Fall}}{SE_{\hat{p}_S - \hat{p}_F}}$$

where z is the standardized difference between the sample Spring proportion and the sample Fall proportion. The p-value of the test statistic was represented as:

$$P(Z \geq z | N(0,1)) \leq 0.05$$

where Z represents the distribution of standardized difference to which the sample value z belongs, which has a normal distribution with mean 0 and standard deviation 1.

One requirement for this test is that there are at least 10 observations in each group that are either successes or failures. Because Fall Primary administrations are traditionally much smaller than those of Spring Primary administrations, counts of candidates were compiled from all years between 2015 and 2021 (excluding 2020, which only had one Primary exam administration secondary to the COVID-19 pandemic). Apart from total pass rates over this six-year period, test statistics were calculated for any Primary exam administration with at least ten passes and fails in the Fall.

## Results

For Anatomic Pathology, 90.56% of Spring initial candidates and 74.89% of Fall initial candidates passed the AP exam between 2015 and 2021 (excluding 2020) ( $p < 0.0001$ ). SE = 0.029, 95% CI = (9.99%, 21.35%). The individual years of 2015, 2016, 2017, and 2021 also showed significantly higher pass rates in the Spring than in the Fall.

For Clinical Pathology, 93.66% of Spring initial candidates and 83.42% of Fall initial candidates passed the CP exam between 2015 and 2021 (excluding 2020) ( $p = 0.0001$ ). SE = 0.027, 95% CI = (4.95%, 15.53%). There were no years with enough Fall candidates that failed to properly assess individually.

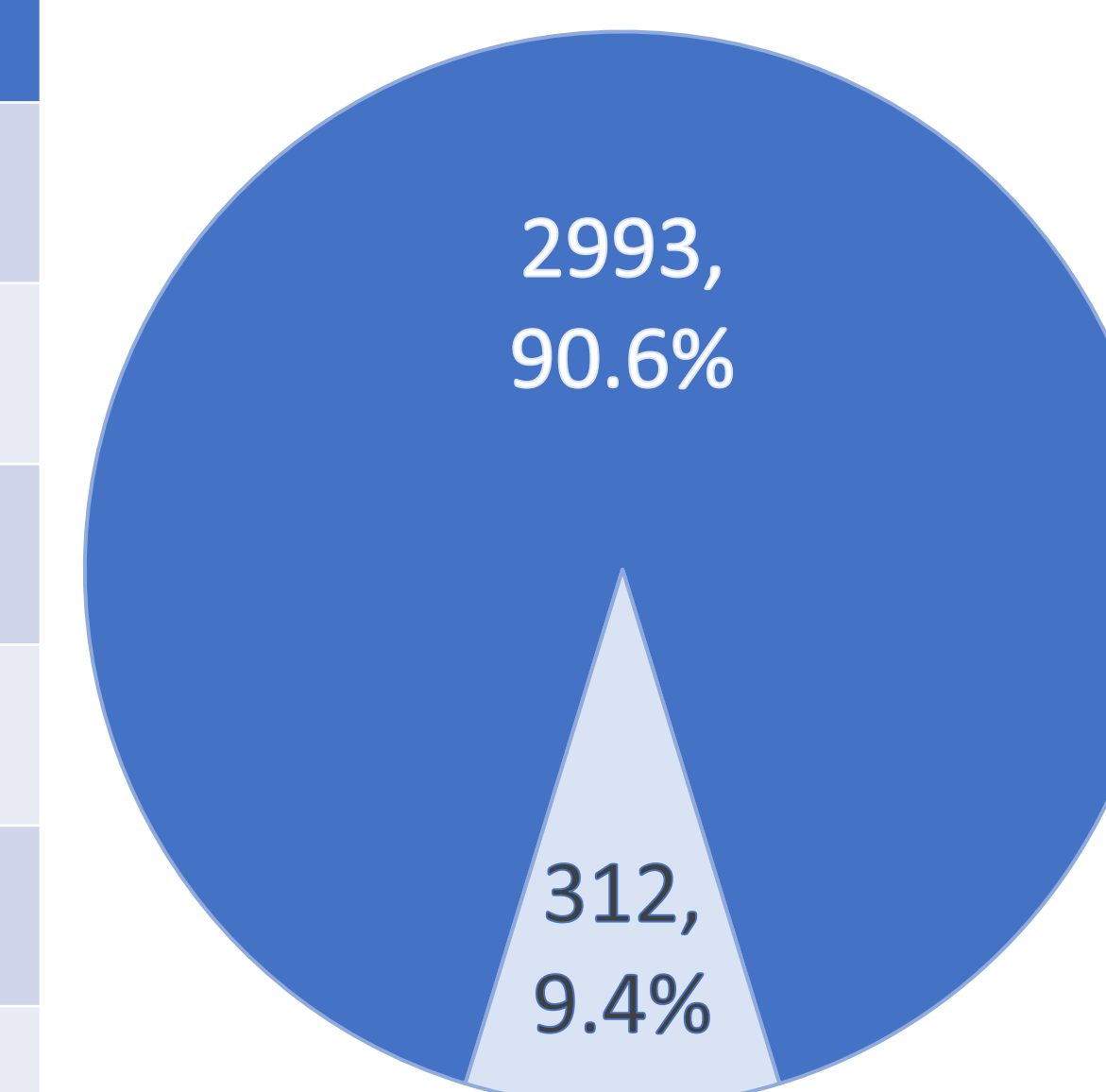
## Discussion

For both exams, there exists enough evidence to conclude that Primary certification candidates who take their initial examination in the Spring have a greater probability of passing than candidates who take their initial examination in the Fall. Did the candidates who took the Spring exam fare better because the material was fresher in their minds (i.e., more access to shorter-term memory)? Did weaker candidates, who did not feel prepared, put off taking the examination to have more time to study? Did the candidates who took the Fall exam fare more poorly because of competing life events that often occur after residency (e.g., moving and starting a new job or Fellowship)? These possibilities and others remain to be investigated, but this data supports a more favorable outcome for candidates who take the examination that is more temporally associated with the end of training (i.e., Spring vs. Fall).

AP	SPRING		FALL		PASS RATE DIFFERENCE TEST		
	PASS (%)	FAIL (%)	PASS (%)	FAIL (%)	% DIFF	% SE	Z (P)
2015	493 (90.6%)	51 (9.4%)	42 (79.2%)	11 (20.8%)	11.4	2.8	4.07 (<0.001)
2016	479 (90.7%)	49 (9.3%)	30 (73.2%)	11 (26.8%)	17.5	7.0	2.50 (0.006)
2017	518 (95.0%)	27 (5.0%)	28 (73.7%)	10 (26.3%)	21.3	7.2	2.96 (0.002)
2018	504 (92.8%)	39 (7.2%)	26 (74.3%)	9 (25.7%)	-	-	-
2019	469 (86.7%)	72 (13.3%)	17 (81.0%)	4 (19.0%)	-	-	-
2021	530 (87.7%)	74 (12.3%)	24 (68.6%)	11 (31.4%)	19.1	8.0	2.39 (0.008)
<b>TOTAL</b>	<b>2993 (90.6%)</b>	<b>312 (9.4%)</b>	<b>167 (74.9%)</b>	<b>56 (25.1%)</b>	<b>15.7</b>	<b>2.9</b>	<b>5.41 (&lt;0.001)</b>

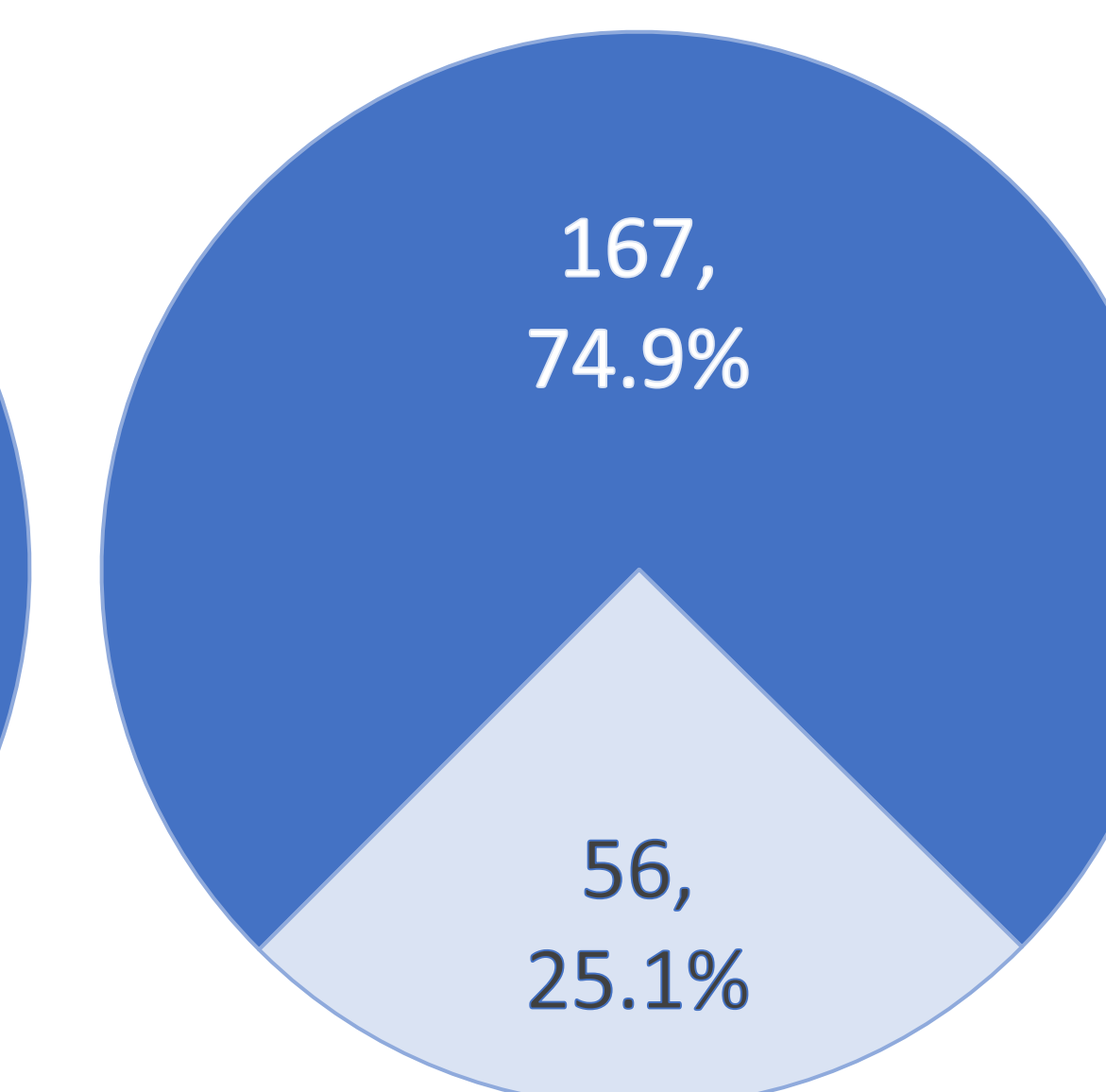
Notes: % SE = Standard error in percent format; Z = standardized difference between Spring and Fall pass rates; P = probability of observed difference or greater if true difference is zero

Spring AP Initial Candidates, 2015-2021



■ Passed ■ Failed

Fall AP Initial Candidates, 2015-2021

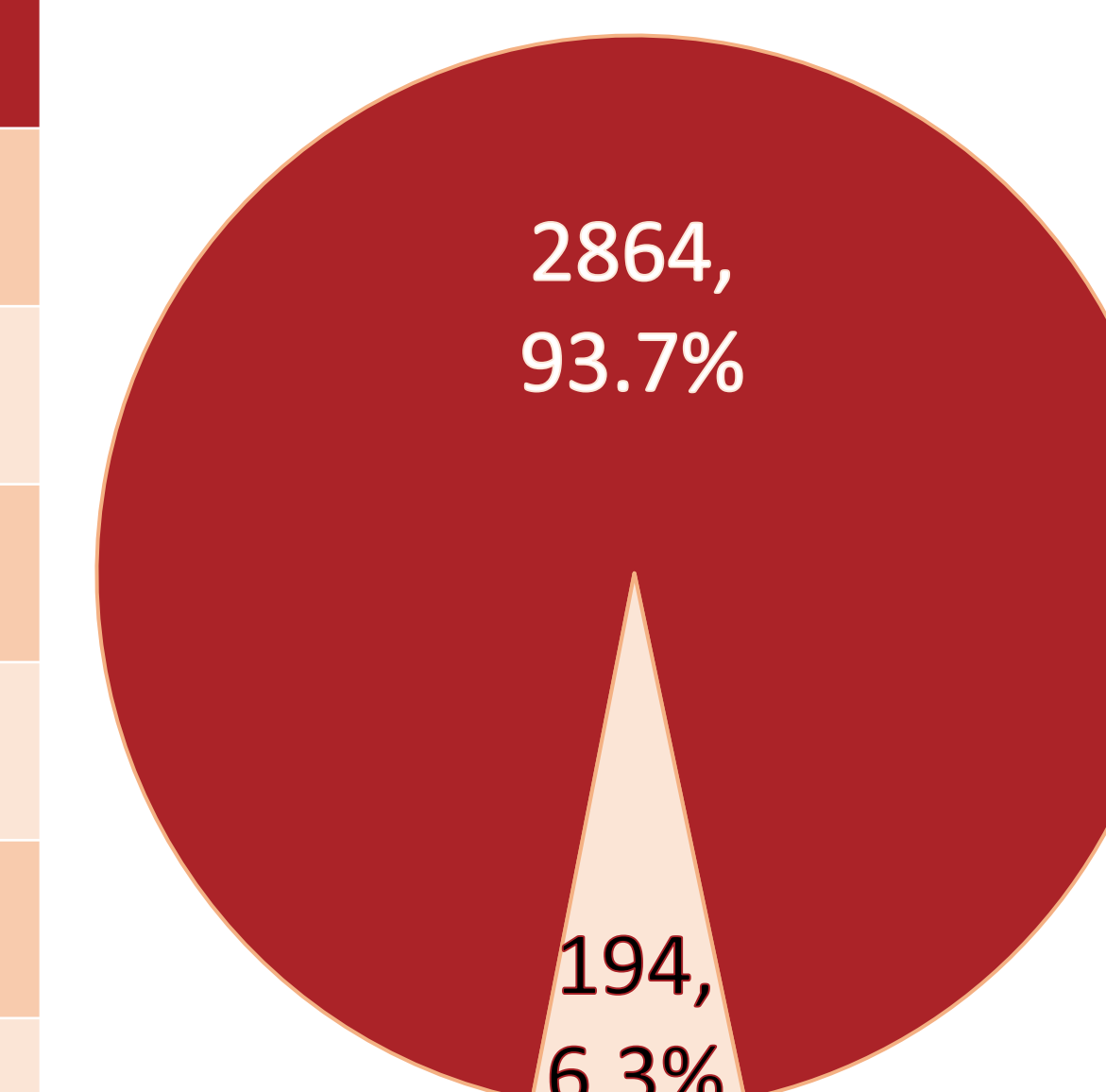


■ Passed ■ Failed

CP	SPRING		FALL		PASS RATE DIFFERENCE TEST		
	PASS (%)	FAIL (%)	PASS (%)	FAIL (%)	% DIFF	% SE	Z (P)
2015	468 (93.6%)	32 (6.4%)	39 (84.8%)	7 (15.2%)	-	-	-
2016	468 (94.4%)	28 (5.6%)	26 (86.7%)	4 (13.3%)	-	-	-
2017	496 (96.7%)	17 (3.3%)	20 (76.9%)	6 (23.1%)	-	-	-
2018	473 (94.4%)	28 (5.6%)	30 (90.9%)	3 (9.1%)	-	-	-
2019	437 (86.4%)	69 (13.6%)	17 (81.0%)	4 (19.0%)	-	-	-
2021	522 (96.3%)	20 (3.7%)	29 (78.4%)	8 (21.6%)	-	-	-
<b>TOTAL</b>	<b>2864 (93.7%)</b>	<b>194 (6.3%)</b>	<b>161 (83.4%)</b>	<b>32 (16.6%)</b>	<b>10.3</b>	<b>2.7</b>	<b>3.81 (&lt;0.001)</b>

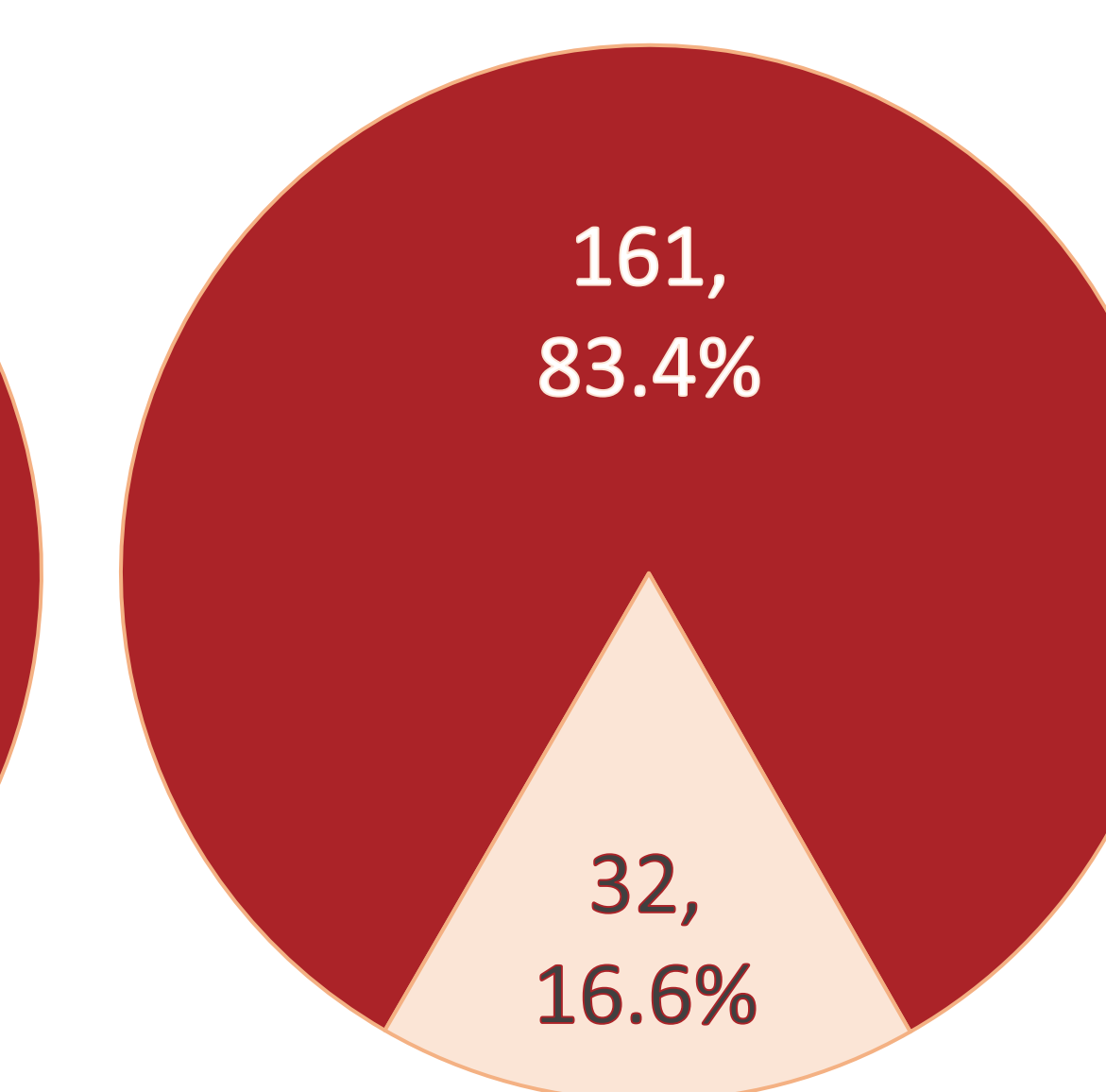
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Spring CP Initial Candidates, 2015-2021



■ Passed ■ Failed

Fall CP Initial Candidates, 2015-2021



■ Passed ■ Failed