




# Entry of Graduates of US Pathology Residency Programs Into the Workforce: Cohort Data Between 2008 and 2016 Remain Positive and Stable

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## Abstract

The pathologist workforce in the United States is a topic of interest to the health-care community as a whole and to institutions responsible for the training of new pathologists in particular. Although a pathologist shortage has been projected, there has been a pervasive belief by medical students and their advisors that there are “no jobs in pathology.” In 2013 and again in 2017, the Program Directors Section of the Association of Pathology Chairs conducted surveys asking pathology residency directors to report the employment status of each of their residents graduating in the previous 5 years. The 2013 Program Directors Section survey indicated that 92% of those graduating in 2010 had obtained employment within 3 years, and 94% of residents graduating in

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2008 obtained employment within 5 years. The 2017 survey indicated that 96% of those graduating in 2014 had obtained employment in 3 years, and 97% of residents graduating in 2012 obtained positions within 5 years. These findings are consistent with residents doing 1 or 2 years of fellowship before obtaining employment. Stratification of the data by regions of the country or by the size of the residency programs does not show large differences. The data also indicate a high percentage of employment for graduates of pathology residency programs and a stable job market over the years covered by the surveys.

## Keywords

pathology employment, pathology graduates, pathology job market, pathology residency, pathology workforce

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## Introduction

The pathologist workforce in the United States is a topic of interest to the health-care community as a whole and to institutions responsible for the training of new pathologists in particular. Several recent studies have looked at this issue from aspects of the supply as well as the demand for new pathologists.

Robboy et al<sup>1</sup> in 2013 developed a model of the supply of pathologists in the workforce based on analysis of 3 key determinants: (1) pathologists in the base year of the analysis (2010), stratified by sex and age; (2) additions to the pathology workforce per year after completion of training; and (3) separations from the workforce due to retirement, mortality, and other causes. The model projected that, for each of the following 20 years, the net balance would be pathologists leaving the field. They concluded that by 2030 the number of pathologists practicing full time will have dropped to about 14 000 full-time equivalent (FTE) practitioners, down from approximately 17 500 in 2010, representing a decline in the per capita ratio of pathologists from 5.7 to 3.7 per 100 000 population. The decline in the number of pathologists between 2007 and 2017 has been independently confirmed by Metter et al<sup>2</sup> using the Association of American Medical Colleges Physician Specialty Data Books, which draw from the American Medical Association master file and which showed a decline to 3.94 pathologists per 100 000 population already by 2017.

In a follow-up study in 2015, Robboy et al<sup>3</sup> addressed the more difficult issue of modeling the future demand for pathologist services. Consideration was given to 3 major determinants: (1) the medical services that pathologists provide and their service settings; (2) new needs, especially the drivers of new demand, such as an aging population; and (3) trends in new technologies and in new professional roles arising from pathologists' dual expertise as physicians and providers of laboratory-based health care. If all factors stayed the same, 10% more pathologists would be needed by 2030 to sustain the current number of pathologists per 100 000 population (19 239 FTE). However, the authors consider the assumption of a simple straight-line projection to be "highly suspect" and merely a starting point for further predictions factoring in the service demands of an aging population, practice behavior, service utilization, health-care mergers, the economy, and so on.

These considerations of trends and the stability of the pathology workforce have taken place in the context of the undocumented but nevertheless pervasive belief by medical students and even their advisors that there are "no jobs in pathology." Although undocumented, this belief is not entirely without justification. The retirement age for pathologists has been rising slowly for decades. Robboy et al<sup>1</sup> in 2013 noted that during recent times, pathologists older than 55 years have reported their planned retirement age will rise by about 4 years from age 67 to 71 years. This trend might well have been reinforced by the negative effect of the recession of 2008 on personal finances. A similar retrenchment may have occurred, or at least may have been made more credible, by employment concerns, not only due to the general economic environment but also because of specific concerns about the future of the American health-care system.

Added to these factors was the very real event of elimination of the credentialing or "fifth" year of primary pathology training, which created the phenomenon of 2 classes of residents emerging as board-eligible simultaneously.<sup>4</sup> The resulting overflow of graduates understandably spilled over into fellowships. To some extent, this phenomenon merely mirrored a preexisting option in which focused subspecialty training equivalent to a fellowship constituted the credentialing year itself, and elimination of 1 year of training for eligibility toward certification was not the sole factor changing the perception of how much training was needed for employment. Nevertheless, while in the 2018 American Society for Clinical Pathology Fellowship & Job Market Surveys, 96% of residents were planning to take at least one fellowship, in the 2006 survey, of the 742 respondents in the fourth year of residency or fellowship, 542 planned to apply directly for jobs; so even assuming all 104 fellows in that survey planned to apply directly for jobs, at most 31% of fourth-year residents planned to take fellowships.<sup>5</sup> Furthermore, by 2016, in a survey by the Program Directors Section (PRODS)<sup>6</sup> asking pathology program directors if, in general, they considered most AP/CP residents adequately prepared to enter practice after 4 years of residency training without further fellowship training, 47% indicated a concern that residents were not adequately prepared, compared to 38% who felt that residents were prepared and 18% who were neutral, although 67% of the program directors felt that their own residents were adequately prepared after 4 years.

Residents responded to these developments by doing fellowships, often more than one, and program directors recognized that employers were coming to expect the additional credential of a fellowship, whether it was truly necessary for competency or not. The data collected on graduating residents by the College of American Pathologists (CAP) Graduate Medical Education Committee for the years 2012 to 2016 documented that 91% of residency graduates responding to the survey had completed at least one fellowship (delaying their entry into the job market by at least 1 year) and 25% had completed 2 or more fellowships (delaying their entry into the job market by 2 or more years).<sup>3</sup> Furthermore, as residents began having to make fellowship commitments earlier and earlier, typically 1½ to 2 years prior to beginning the fellowship, there was often no realistic opportunity to find a job prior to accepting a fellowship. If a job opportunity subsequently became available, the trainee was likely to find himself/herself in the uncomfortably unprofessional situation of having to abandon the prior fellowship commitment in order to secure the job. It was against this background that the PRODS formulated 2 surveys to actually document if recent graduates of pathology residency programs were finding jobs, and how soon after finishing residency they were obtaining them.

## Methods

In 2013, the PRODS of the Association of Pathology Chairs (APC) approached these issues from the standpoint of graduate medical education. A survey instrument was distributed to pathology residency directors between April 8 and June 1, 2013, through an online listserv managed by the APC. The survey asked programs to identify themselves by 10-digit ACGME number and to return the number of graduates from the residency program (not fellowships) in 2008, 2009, 2010, 2011, and 2012. For each of these graduating classes, the programs were asked to then return the number of those graduates who were known to have ever begun a "real" position in pathology, based on personal knowledge, receipt of credential verifications, or other sources. The term "real" job was defined in the survey as "Ever employed as a pathologist or pathology faculty (not a trainee, fellow, postdoc)."

The 2013 PRODS survey of program directors was updated and repeated between April 17 and June 7, 2017. Once again, the survey asked programs to identify themselves by ACGME number, and to return the number of graduates from the residency program (not fellowships) who were known to have ever begun a "real" position in pathology based on personal knowledge, receipt of credential verifications, or other sources, this time for graduates of the years 2012, 2013, 2014, 2015, and 2016. The survey was sent out to the PRODS listserv on April 17, 2017, with a reminder on May 1, 2017. On May 22 and 30, 2017, individual requests were sent to program directors before the survey was closed on June 7, 2017.

## Results

In the 2013 PRODS survey, 97 responses were received. Excluding duplicates and incomplete responses, 87 programs with 1514 currently enrolled residents provided complete responses on 1802 of their graduates from 2008 through 2012. Reconciling the responding programs with the ACGME database, there were 77 programs with 882 currently enrolled residents that were not included in the tabulation of responses (either no response or an incomplete response). However, of those 77 programs, 17 were inactive and without any currently enrolled residents, despite still being listed in the ACGME database. The response rate for active programs was therefore  $87/(87 + 77 - 17)$  or 59.2%. The response rate for representation of current residents was  $1514/(1514 + 882)$  or 63.2%.

In the 2017 PRODS survey, 99 responses were received, three of which required clarification of inconsistent responses. There were no duplicates or incomplete responses. The 99 responding programs, representing 1704 currently enrolled residents, provided complete responses on 2065 of their graduates from 2012 through 2016. Reconciling the responding programs with the ACGME database, there were 65 programs with 654 currently enrolled residents that were not responsive. Of these 65, 23 programs in the ACGME database did not have any enrolled residents (22 closed programs plus one recently approved program that had not enrolled residents). The response rate for active programs was therefore  $99/(99 + 65 - 23)$  or 70.2%. The responding programs represented  $1704/(1704 + 654)$  or 72.3% of current residents.

There were thus 147 active programs in 2013, which dropped to 142 in 2017, although one of those was new and had not by then enrolled any residents. The active programs in 2013 included 2396 residents in 2013; the active programs in 2017 included 2358 residents, for a decline of 38 filled positions between the 2 survey years. The average size of all programs in 2013 was 16.3 residents; the average size of those responding was 17.4. The average size of all programs in 2017 was 16.7, and the average size of those responding was 17.2.

The results of the 2013 PRODS survey for employment by year of graduation are shown in Table 1. The 2013 results broken down by region are shown graphically in Figure 1, and the results broken down by program size are shown in Figure 2. The results of the 2017 PRODS survey for employment by year of graduation are shown in Table 2. The 2017 results broken down by region are shown graphically in Figure 3, and the results broken down by program size are shown in Figure 4. Both surveys document increasing employment with years from graduation as graduating residents pass through one or 2 years of postgraduate fellowships, with an eventual plateau as they exit their fellowships and enter the job market in postgraduate years 2, 3, and 4, when near-full employment is reached. Figure 5 illustrates a comparison between the results for aggregate employment by year in 2013 and 2017. Statistical analysis of the results is shown in Tables 3 and 4.

Table 1. PRODS Workforce Survey 2013.

Total		Responsive Programs			Nonresponsive Programs	Nonresponsive Programs With Residents
Programs	Year	Graduates	Employed	%	Programs	Programs
87	2008	339	320	94%	77	60
Graduates	2009	359	344	96%	Graduates	Graduates
1802	2010	359	329	92%	0	0
Residents	2011	357	262	73%	Residents	Residents
1514	2012	388	124	32%	882	882
By region						
Northeast						
Programs	Year	Graduates	Employed	%	Programs	Programs
26	2008	115	100	87%	23	17
Graduates	2009	124	114	92%	Graduates	Graduates
596	2010	107	92	86%	0	0
Residents	2011	120	74	62%	Residents	Residents
463	2012	130	37	28%	229	229
Midwest						
Programs	Year	Graduates	Employed	%	Programs	Programs
21	2008	74	73	99%	19	13
Graduates	2009	76	74	97%	Graduates	Graduates
395	2010	83	77	93%	0	0
Residents	2011	81	65	80%	Residents	Residents
339	2012	81	26	32%	217	217
West						
Programs	Year	Graduates	Employed	%	Programs	Programs
11	2008	46	46	100%	11	10
Graduates	2009	48	47	98%	Graduates	Graduates
238	2010	50	48	96%	0	0
Residents	2011	43	27	63%	Residents	Residents
226	2012	51	20	39%	142	142
South						
Programs	Year	Graduates	Employed	%	Programs	Programs
29	2008	104	101	97%	24	20
Graduates	2009	111	109	98%	Graduates	Graduates
573	2010	119	112	94%	0	0
Residents	2011	113	96	85%	Residents	Residents
486	2012	126	41	33%	294	294
By number of residents in program						
0 to 14						
Programs	Year	Graduates	Employed	%	Programs	Programs
35	2008	84	81	96%	51	34
Graduates	2009	82	81	99%	Graduates	Graduates
444	2010	97	90	93%	0	0
Residents	2011	85	68	80%	Residents	Residents
377	2012	96	29	30%	336	336
15 to 19						
Programs	Year	Graduates	Employed	%	Programs	Programs
21	2008	68	65	96%	15	15
Graduates	2009	84	83	99%	Graduates	Graduates
396	2010	86	83	97%	0	0
Residents	2011	76	60	79%	Residents	Residents
347	2012	82	41	50%	254	254
20 to 25						
Programs	Year	Graduates	Employed	%	Programs	Programs
18	2008	88	78	89%	7	7
Graduates	2009	98	92	94%	Graduates	Graduates
464	2010	83	76	92%	0	0
Residents	2011	92	63	68%	Residents	Residents
389	2012	103	30	29%	160	160

(continued)

**Table 1.** (continued)

Total	Responsive Programs				Nonresponsive Programs	Nonresponsive Programs With Residents
26 up						
Programs	Year	Graduates	Employed	%	Programs	
13	2008	99	96	97%	4	
Graduates	2009	95	88	93%	Graduates	
498	2010	93	80	86%	0	
Residents	2011	104	71	68%	Residents	
401	2012	107	24	22%	132	

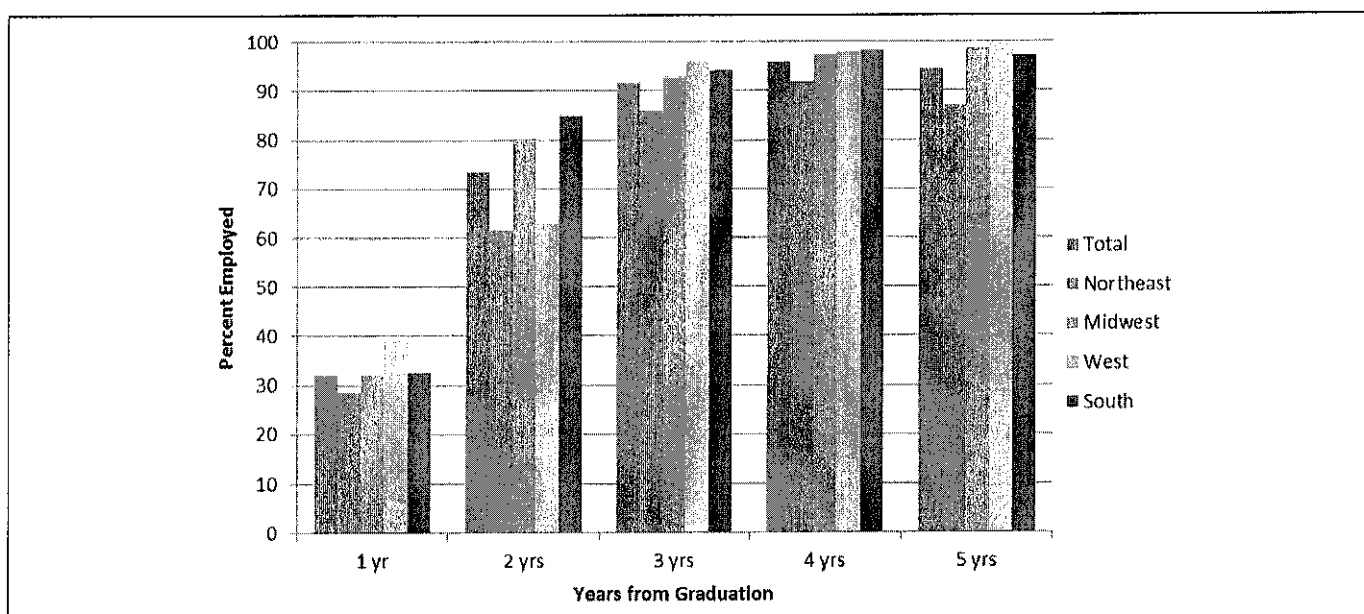
## US Census Regions:

Northeast	Midwest:	West	South
CT	IA	AK	AL
MA	IL	AZ	AR
ME	IN	CA	DC
NH	KS	CO	DE
NJ	MI	HI	FL
NY	MN	ID	GA
PA	MO	MT	KY
RI	ND	NM	LA
VT	NE	NV	MD
	OH	OR	MS
	SD	UT	NC
	WI	WA	OK
		WY	PR
			SC
			TN
			TX
			VA
			WV

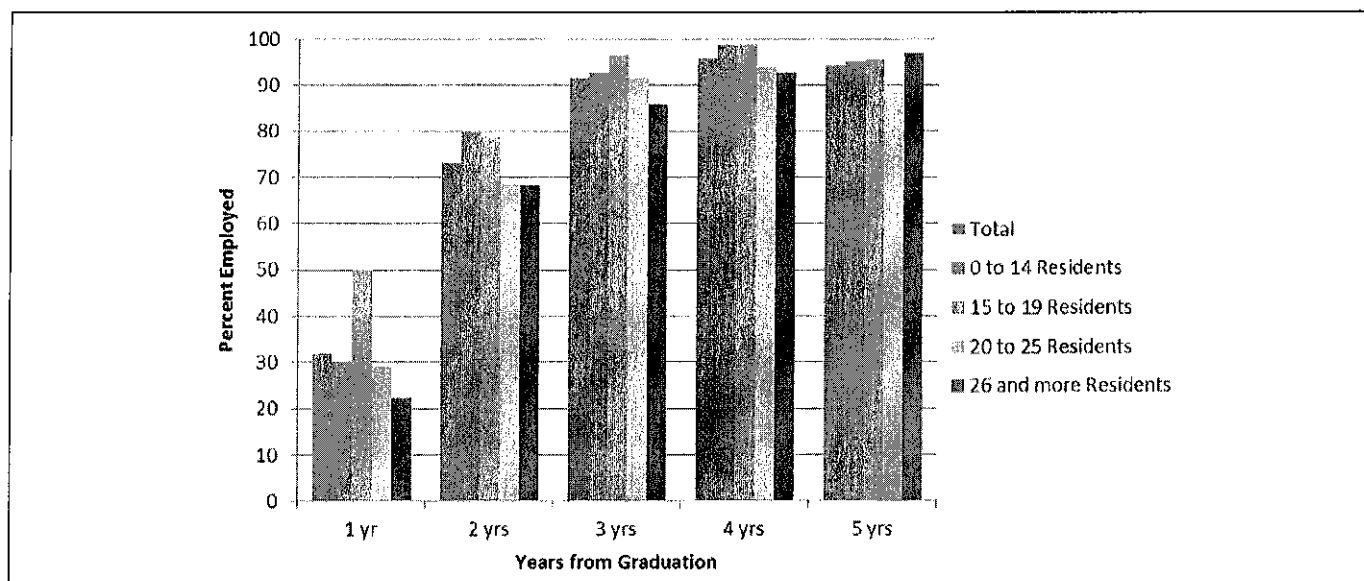
Abbreviation: PRODS, Program Directors Section.

**Discussion**

Data from the 2013 PRODS survey indicated that 94% of residents graduating in 2008 obtained employment within 5 years of graduation from residency, and 92% of those graduating in 2010 had obtained employment within 3 years. Similarly, data from the 2017 survey indicated that 97% of residents graduating in 2012 obtained positions within 5 years of graduation from residency, and 96% of those graduating in 2014 had obtained employment in 3 years. Although the surveys do not represent a single cohort of graduates followed at yearly intervals, comparison of the results for the different cohorts representing 1, 2, 3, 4, and 5 years from graduation suggests that for both surveys the 50% employment point occurs between 1 and 2 years out from completion of residency, and a plateau at the final employment figure is reached at the third year out from graduation. This pattern agrees completely with the results from the CAP survey on job search experience showing delayed entry into the job market, with most graduating residents doing one and about a quarter doing 2 years of postgraduate fellowship.<sup>7</sup> Furthermore, comparing the percentage employed at 3, 4, and 5 years in the 2013 survey (91%, 96%,



**Figure 1.** The 2013 Survey: percent of residents employed by years from graduation and region of training, reflecting the effect of fellowships on percent employed in post-residency years 1 and 2.



**Figure 2.** The 2013 Survey: percent of residents employed by years from graduation and residency size, reflecting the effect of fellowships on percent employed in post-residency years 1 and 2.

**Table 2.** PRODS Workforce Survey 2017.

Total		Responsive Programs			Nonresponsive Programs		Nonresponsive Programs With Residents	
Programs	Year	Graduates	Employed	%	Programs		Programs	
99	2012	419	408	97%	65		42	
Graduates	2013	411	392	95%	Graduates		Graduates	
2065	2014	434	416	96%	0		0	
Residents	2015	414	322	78%	Residents		Residents	
1704	2016	387	95	25%	654		654	
By region								
Northeast								
Programs	Year	Graduates	Employed	%	Programs		Programs	
28	2012	110	106	96%	22		13	
Graduates	2013	106	99	93%	Graduates		Graduates	
551	2014	122	116	95%	0		0	
Residents	2015	117	89	76%	Residents		Residents	
456	2016	96	20	21%	240		240	
Midwest								
Programs	Year	Graduates	Employed	%	Programs		Programs	
21	2012	96	91	95%	15		9	
Graduates	2013	102	96	94%	Graduates		Graduates	
395	2014	105	101	96%	0		0	
Residents	2015	99	74	75%	Residents		Residents	
339	2016	99	17	17%	105		105	
West								
Programs	Year	Graduates	Employed	%	Programs		Programs	
11	2012	77	75	97%	7		4	
Graduates	2013	74	72	97%	Graduates		Graduates	
238	2014	72	68	94%	0		0	
Residents	2015	69	49	71%	Residents		Residents	
226	2016	70	15	21%	70		70	
South								
Programs	Year	Graduates	Employed	%	Programs		Programs	
29	2012	136	134	99%	21		16	
Graduates	2013	129	125	97%	Graduates		Graduates	
573	2014	135	131	97%	0		0	

(continued)

**Table 2.** (continued)

Total		Responsive Programs			Nonresponsive Programs	Nonresponsive Programs With Residents
Residents	2015	129	110	85%	Residents	Residents
486	2016	122	43	35%	239	239
By number of residents in program						
0 to 14						
Programs	Year	Graduates	Employed	%	Programs	Programs
35	2012	98	89	91%	45	22
Graduates	2013	90	85	94%	Graduates	Graduates
444	2014	110	102	93%	0	0
Residents	2015	95	66	69%	Residents	Residents
377	2016	88	22	25%	228	228
15 to 19						
Programs	Year	Graduates	Employed	%	Programs	
21	2012	102	100	98%	11	
Graduates	2013	105	100	95%	Graduates	
396	2014	99	95	96%	0	
Residents	2015	106	90	85%	Residents	
347	2016	103	20	19%	279	
20 to 25						
Programs	Year	Graduates	Employed	%	Programs	
18	2012	140	138	99%	5	
Graduates	2013	135	131	97%	Graduates	
464	2014	138	133	96%	0	
Residents	2015	129	99	77%	Residents	
389	2016	121	32	26%	109	
26 up						
Programs	Year	Graduates	Employed	%	Programs	
13	2012	79	79	100%	1	
Graduates	2013	81	76	94%	Graduates	
498	2014	87	86	99%	0	
Residents	2015	84	67	80%	Residents	
401	2016	75	21	28%	35	

## US Census Regions

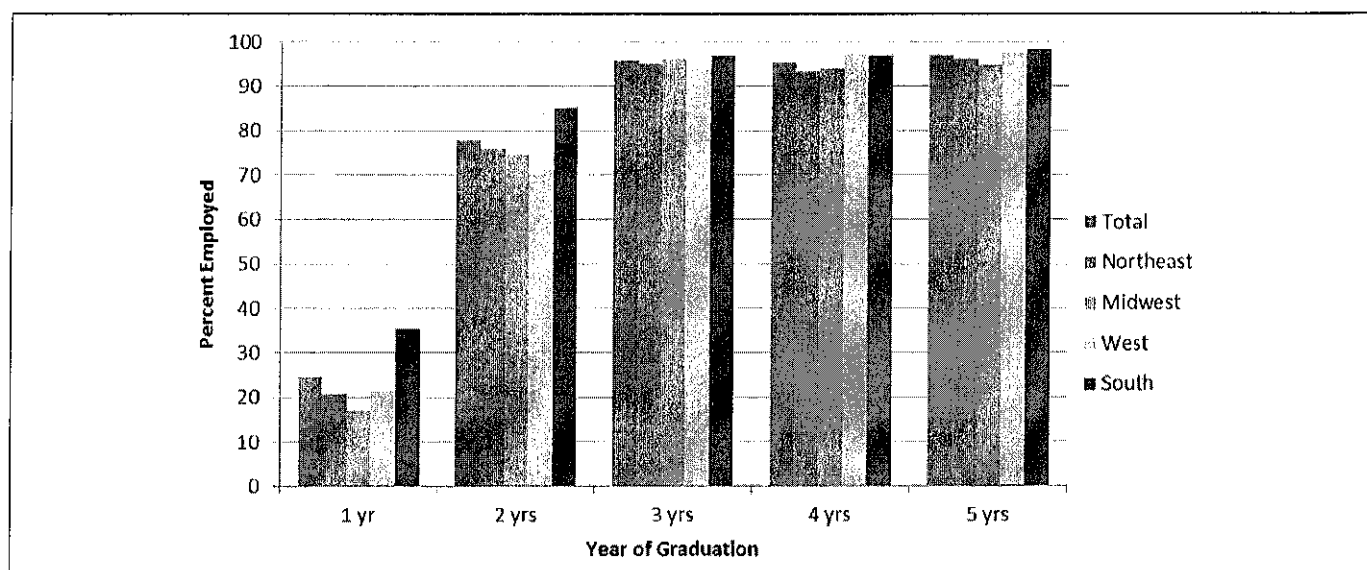
Northeast:	Midwest:	West:	South:
CT	IA	AK	AL
MA	IL	AZ	AR
ME	IN	CA	DC
NH	KS	CO	DE
NJ	MI	HI	FL
NY	MN	ID	GA
PA	MO	MT	KY
RI	ND	NM	LA
VT	NE	NV	MD
	OH	OR	MS
	SD	UT	NC
	WI	WA	OK
		WY	PR
			SC
			TN
			TX
			VA
			WV

Abbreviation: PRODS, Program Directors Section.

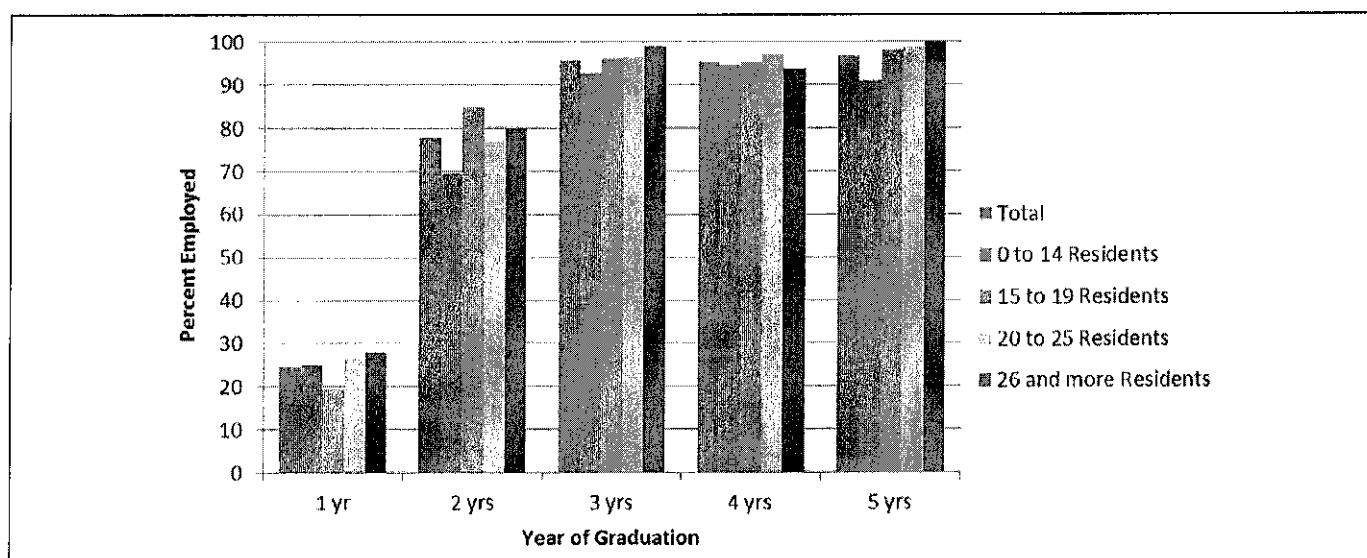
and 94%, respectively) and the percentage employed at 3, 4, and 5 years in the 2017 survey (96%, 95%, and 97%, respectively) indicates not only a high percentage of employment but also stability in the job market over the time period surveyed.

These data are also consistent with surveys of residents and fellows from the American Society for Clinical Pathology. In the 2018 ASCP Fellowship and Job Market Surveys,<sup>5</sup> which queried all residents taking the 2018 ASCP Resident In-Service Examination, 51% of residents indicated an intent to do one fellowship, and 43% indicated an intent to do 2 fellowships. This would also predict average entry into the job market between 1 and 2 years after finishing residency. Additionally, 2% indicated an intent to do three or more fellowships, and 4% did not intend to do a fellowship, a group that includes individuals going into postdoctoral research positions, industry, or other nonclinical positions. These activities probably account for the employment plateau in both the 2013 and 2017 PRODS surveys falling slightly below 100%.

Stratification of the PRODS survey data by US Census Regions (Northeast, Midwest, West, and South) or by the size of the program (as indicated by the number of residents



**Figure 3.** The 2017 Survey: percent of residents employed by years from graduation and region of training, reflecting the effect of fellowships on percent employed in post-residency years 1 and 2.



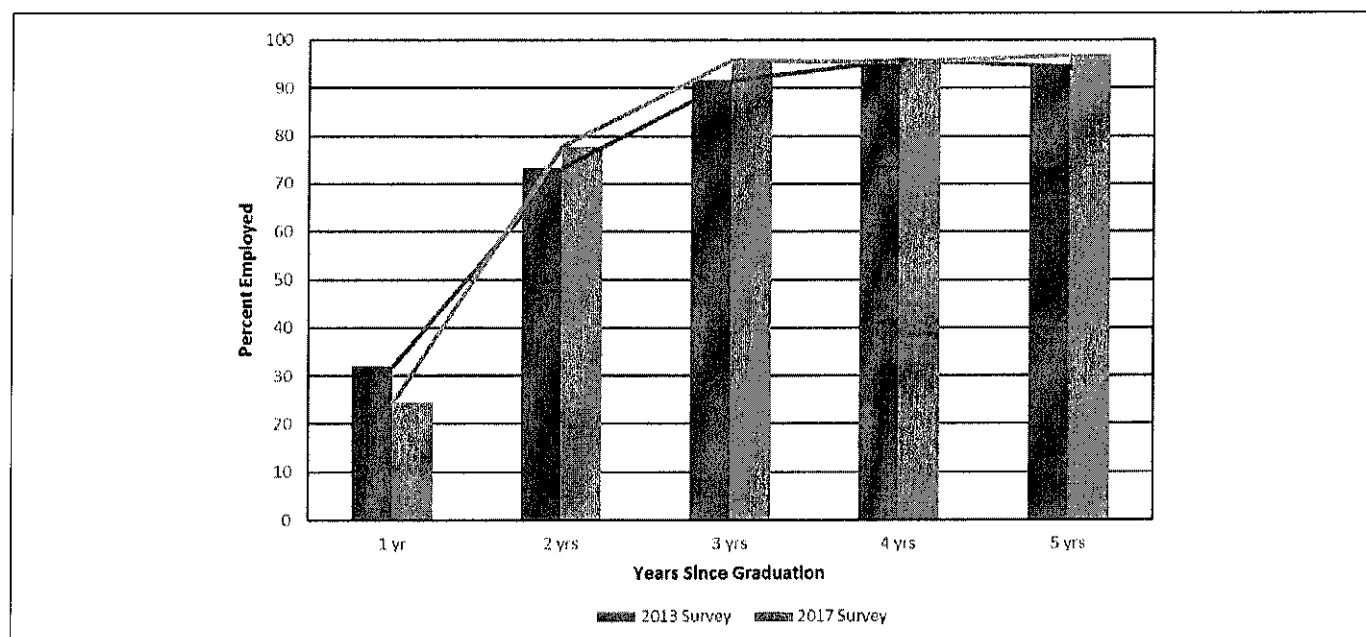
**Figure 4.** The 2017 Survey: percent of residents employed by years from graduation and residency size, reflecting the effect of fellowships on percent employed in post-residency years 1 and 2.

enrolled in the program in 2013 at the time of the survey) did not show large effects of those variables. Stratification of the data by US Census Regions (Northeast, Midwest, West, and South) showed in the 2017 survey a tendency not visible in the 2013 survey for graduates of Southern programs to progress toward the employment plateau slightly sooner than graduates of programs in other regions; however, the region with the most convincing statistical evidence for improvement between the surveys was the Northeast. The surveys did not provide convincing evidence for differences related to the size of the residency programs.

These survey data from the records of pathology residency program directors confirm with larger numbers and more

comprehensive ascertainment the previously gathered survey data of pathology residency graduates,<sup>7</sup> indicating that graduates of pathology residency programs are highly successful in finding employment and refuting impressions to the contrary. Currently, the entry of pathology residency graduates into the job market is not immediate but occurs after a delay that corresponds to the 1 or sometimes 2 subspecialty fellowships typically taken.<sup>5</sup> That the 50% employment point is reached approximately 1.5 years after graduation is also consistent with the observation that almost all residents do one fellowship. Most residents (75%-80%) appear to be employed by 2 years after graduation, and a practice employment plateau at 95% to 96% of residents is achieved by 3 years after graduation.





**Figure 5.** Percent of residents employed by years from graduation, reflecting the effect of fellowships on percent employed in post-residency years 1 and 2: comparison of totals from 2013 and 2017 surveys.

**Table 3.** Employment by Years From Graduation—Variation by Region.\*

	2013 Employed	2013 Graduated	2017 Employed	2017 Graduated	Sum Employed	Sum Graduated	2013 Employed/ Graduated	2017 Employed/ Graduated	Sum Employed/ Graduated	Z	P (2-tailed)
<b>Nationwide</b>											
5 years out	320	339	406	419	726	758	94.40%	96.90%	95.78%	-1.703	.089
4 years out	344	359	392	411	736	770	95.82%	95.38%	95.58%	-0.300	.765
3 years out	329	359	416	434	745	793	91.64%	95.85%	93.95%	-2.474	.013
2 years out	262	357	322	414	584	771	73.39%	77.78%	75.75%	-1.418	.156
1 year out	124	388	95	387	219	775	31.96%	24.55%	28.26%	-2.291	.022
<b>Northeast</b>											
5 years out	100	115	106	110	206	225	86.96%	96.36%	91.56%	-2.537	.011
4 years out	114	124	99	106	213	230	91.94%	93.40%	92.61%	-0.422	.673
3 years out	92	107	116	122	208	229	85.98%	95.08%	90.83%	-2.381	.017
2 years out	74	120	89	117	163	237	61.67%	76.07%	68.78%	-2.392	.017
1 year out	37	130	20	96	57	226	28.46%	20.83%	25.22%	-1.305	.192
<b>Midwest</b>											
5 years out	73	74	91	96	164	170	98.65%	94.79%	96.47%	-1.351	.177
4 years out	74	76	96	102	170	178	97.37%	94.12%	95.51%	-1.035	.300
3 years out	77	83	101	105	178	188	92.77%	96.19%	94.68%	-1.037	.300
2 years out	65	81	74	99	139	180	80.25%	74.75%	77.22%	-0.875	.381
1 year out	26	81	17	99	43	180	32.10%	17.17%	23.89%	-2.337	.019
<b>West</b>											
5 years out	46	46	75	77	121	123	100.00%	97.40%	98.37%	-1.102	.270
4 years out	47	48	72	74	119	122	97.92%	97.30%	97.54%	-0.216	.829
3 years out	48	50	68	72	116	122	96.00%	94.44%	95.08%	-0.391	.696
2 years out	27	43	49	69	76	112	62.79%	71.01%	67.86%	-0.906	.365
1 year out	20	51	15	70	35	121	39.22%	21.43%	28.93%	-2.131	.033
<b>South</b>											
5 years out	101	104	134	136	235	240	97.12%	98.53%	97.92%	-0.760	.447
4 years out	109	111	125	129	234	240	98.20%	96.90%	97.50%	-0.643	.520
3 years out	112	119	131	135	243	254	94.12%	97.04%	95.67%	-1.141	.254
2 years out	96	113	110	129	206	242	84.96%	85.27%	85.12%	-0.069	.945
1 year out	41	126	43	122	84	248	32.54%	35.25%	33.87%	-0.450	.653

Abbreviation: PRODS, Program Directors Section.

\*Statistical comparison of 2013 and 2017 PRODS survey results.

**Table 4.** Employment by Years from Graduation—Variation by Size of Residency Program. Statistical Comparison of 2013 and 2017 PRODS Survey Results.

	2013 Employed	2013 Graduated	2017 Employed	2017 Graduated	Sum Employed	Sum Graduated	2013 Employed/ Graduated	2017 Employed/ Graduated	Sum Employed/ Graduated	Z	P (2-Tailed)
<b>0-14 residents</b>											
5 years out	81	84	89	98	170	182	96.43%	90.82%	93.41%	-1.521	.128
4 years out	81	82	85	90	166	172	98.78%	94.44%	96.51%	-1.548	.122
3 years out	90	97	102	110	192	207	92.78%	92.73%	92.75%	-0.016	.988
2 years out	68	85	66	95	134	180	80.00%	69.47%	74.44%	-1.616	.106
1 year out	29	96	22	88	51	184	30.21%	25.00%	27.72%	-0.788	.430
<b>15-19 residents</b>											
5 years out	65	68	100	102	165	170	95.59%	98.04%	97.06%	-0.927	.354
4 years out	83	84	100	105	183	189	98.81%	95.24%	96.83%	-1.392	.164
3 years out	83	86	95	99	178	185	96.51%	95.96%	96.22%	-0.196	.844
2 years out	60	76	90	106	150	182	78.95%	84.91%	82.42%	-1.041	.298
1 year out	41	82	20	103	61	185	50.00%	19.42%	32.97%	-4.396	.000
<b>20-25 residents</b>											
5 years out	78	88	138	140	216	228	88.64%	98.57%	94.74%	-3.271	.001
4 years out	92	98	131	135	223	233	93.88%	97.04%	95.71%	-1.175	.240
3 years out	76	83	133	138	209	221	91.57%	96.38%	94.57%	-1.528	.126
2 years out	63	92	99	129	162	221	68.48%	76.74%	73.30%	-1.369	.171
1 year out	30	103	32	121	62	224	29.13%	26.45%	27.68%	-0.447	.655
<b>26 or more residents</b>											
5 years out	96	99	79	79	175	178	96.97%	100.00%	98.31%	-1.560	.119
4 years out	88	95	76	81	164	176	92.63%	93.83%	93.18%	-0.314	.754
3 years out	80	93	86	87	166	180	86.02%	98.85%	92.22%	-3.212	.001
2 years out	71	104	67	84	138	188	68.27%	79.76%	73.40%	-1.773	.076
1 year out	24	107	21	75	45	182	22.43%	28.00%	24.73%	-0.857	.391

Abbreviation: PRODS, Program Directors Section.

Perhaps most remarkable is the stability of the employment pattern over the combined time period of the 2 surveys. This indication of stability confirms the independent conclusion of a stable job market by Zynger and Pernick, based on an analysis of pathology job advertisements posted at PathologyOutlines.com from 2013 through 2017.<sup>8</sup>

Will this pattern continue into the future, given the predictions of workforce supply and demand made by the models of Robboy et al?<sup>1,3</sup> The PRODS survey of 2016 asked residency directors if they felt that, given the option of taking a job over a second fellowship, most residents would take the job, and 97% agreed they would.<sup>6</sup> However, queried on the choices of residents seeking a job over a first fellowship, the responses were more mixed; only 48% agreed, 26% were neutral, and 26% disagreed. Thus, it is clearly the view of most program directors that a projected trend toward more plentiful jobs may reduce the number of second fellowships done by residency graduates, but there is less consensus among program directors on the effect such a trend might have on first fellowships. As pathology continues past the point where pathologists leaving the workforce outnumber those entering it, and as the potential trends in demand declare themselves more concretely, it will be interesting to see whether residents and employers alike come to trust that both employment and the competency it requires can be achieved sooner than the present pattern documented above. The phenomenon of late

unexpected openings in fellowship positions may be the first harbinger of that shift.

### Authors' Note

For Drs Brissette and Childs: The views expressed are those of the authors and do not reflect the official policy of the Department of the Army/Navy/Air Force, Department of Defense, or the US Government. The identification of specific products or scientific instrumentation does not constitute endorsement or implied endorsement on the part of the author, Department of Defense, or any component agency.




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## References

1. Robboy SJ, Weintraub MBA, Horvath AE, et al. Pathologist workforce in the United States. I. development of a predictive model to examine factors influencing supply. *Arch Pathol Lab Med*. 2013;137:1723-1732.
2. Metter DM, Colgan TJ, Leung ST, Timmons CF, Park JY. Trends in the US and Canadian pathologist workforces from 2007 to 2017. *JAMA Network Open*. 2019;2:e194337. doi:10.1001/jamanetworkopen.2019.4337.
3. Robboy SJ, Gupta S, Crawford JM, et al. The pathologist workforce in the United States: II. An interactive modeling tool for analyzing future qualitative and quantitative staffing demands for services. *Arch Pathol Lab Med*. 2015;139:1413-1430.
4. Bennett BD. Certification from the American Board of Pathology: getting it and keeping it. *Hum Pathol*. 2006;37:978-981.
5. Genzen J, Kasten J, Wagner J. ASCP fellowship & job market surveys. A report on the 2018 RISE, FISE, FISHE, NPISE, PISE and TMISE surveys. In: Rittershaus AC, ed. *American Society for Clinical Pathology; 2019 Resident Council Fellowship & Job Market Survey*. www.ascp.org/residents.
6. Naritoku WY, Timmons CF. The pathologist pipeline: Implications of changes for programs and post-sophomore fellowships—Program Directors' Section perspective. *Acad Pathol*. 2016;3. doi:10.1177/2374289516646117.
7. Gratzinger D, Johnson KA, Brissette MD, et al. The recent pathology residency graduate job search experience: a synthesis of 5 years of College of American Pathologists job market surveys. *Arch Pathol Lab Med*. 2018;142:490-495.
8. Zynger DL, Pernick N. Understanding the pathology job market: an analysis of 2330 pathology job advertisements from 2013 through 2017. *Arch Pathol Lab Med*. 2019;143:9-10.