The history of optometric education in the United States is interesting and varied. There are schools and colleges that are more than 100 years old, whereas others have not yet graduated a cohort of optometrists. There are programs located at private universities, major research universities, and smaller public universities. Some of the universities host other colocated degree-granting health science disciplines; others house health science disciplines on other campuses in the system. There are independent colleges of optometry, and in recent years, two colleges of optometry have become universities housing other degree-granting health science programs. Table 1 lists the current doctor of optometry programs with brief annotations describing them.

Before 2009, there were no national data on the pool of prospective applicants to optometry schools and colleges. Beginning in July 2009 (for the matriculating class of autumn 2010), the Optometry Centralized Application Service (https://www.optomcas.org/) became the exclusive centralized application service used by prospective students to apply to optometry school. It allows applicants to file one application and send it to multiple optometry programs. It also allows for analysis of the entire prospective student pool relative to both the number of applicants and their academic qualifications (e.g., grade point average and Optometry Admission Test performance) and key demographics (e.g., sex, race, geographic location, undergraduate institution, etc.).

The landscape of optometric education has changed in the last decade in many ways, especially in the area of the number and academic qualifications of applicants vis-à-vis the number of available training slots. Table 1 shows that three new schools and colleges admitted students coincident with the start of Optometry Centralized Application Service (application cycle for autumn 2010 admission), and another three universities established colleges of optometry in more recent years. Two of the colleges have not yet graduated a cohort of optometrists.

This article’s purpose is to supply and analyze data relative to some of the factors influencing key decisions about optometric education and the optometric profession in general. For example, a new institution considering starting an optometry program might assume that a new program is justified and will succeed because there will be a marked influx of applications from its own undergraduates and/or from the surrounding region. Available data on
TABLE 1. Currently accredited schools and colleges of optometry in the United States, as of November 12, 2018

| State: institution | Type of institution ( Carnegie Classification of Institutions of Higher Education) | Optometry program established | Current “target” class size for autumn 2017 | ACOE status | Colocated degree-granting health science programs |
|--------------------|---------------------------------|-----------------------------|------------------------------------------|-----------|-------------------------------------------------|
| Alabama: University of Alabama at Birmingham School of Optometry | Public | 1969 | 50 | Accredited | Dentistry, Medicine, Nursing, Public Health, PA, OT, PT, Clinical Psychology, Vision Rehabilitation |
| Arizona: Arizona College of Optometry at Midwestern University | Private, not-for-profit | 2009 | 56 | Accredited | Osteopathic Medicine, PA, PT, OT, Podiatry, Clinical Psychology, Dentistry, Veterinary Medicine, Audiology, Pharmacy |
| California: Southern California College of Optometry at Marshall B. Ketchum University | Private, not-for-profit | 1904 | 104 | Accredited | PA, Pharmacy |
| California: University of California, Berkeley School of Optometry | Public | 1923 | 66 | Accredited | Public Health, Clinical Psychology |
| California: Western University of Health Sciences College of Optometry | Private, not-for-profit | 2009 | 86 | Accredited | PT, PA, Pharmacy, Nursing, Veterinary Medicine, Dentistry, Podiatry, Osteopathic Medicine |
| Florida: Nova Southeastern University College of Optometry | Private, not-for-profit | 1989 | 105 | Accredited | Clinical Psychology, Audiology, Dentistry, Osteopathic Medicine, Pharmacy, PT, PA, Nursing, OT, Nursing, Medicine |
| Illinois: Chicago College of Optometry, Midwestern University | Private, not-for-profit | 66 | Preliminary approval | Osteopathic Medicine, Pharmacy, PT, OT, PA, Clinical Psychology, Dentistry |
| Illinois: Illinois College of Optometry | Private, not-for-profit | 1872 | 165 | Accredited | None |
| Indiana: Indiana University School of Optometry | Public | 1956 | 68 | Accredited | Medicine, Nursing, Public Health, Dentistry, PA, OT, Audiology |
| Kentucky: University of Pikeville Kentucky College of Optometry | Private, not-for-profit | 2016 | 60 | Preliminary approval | Osteopathic Medicine, Nursing |
| Massachusetts: MCPHS University, School of Optometry | Private, not-for-profit | 2012 | 63 | Accredited | Nursing, Pharmacy, PA, PT, OT, Public Health |
| Massachusetts: New England College of Optometry | Private, not-for-profit | 1894 | 127 | Accredited | None |
| Michigan: Michigan College of Optometry AT Ferris State University | Public | 1975 | 37 | Accredited | Pharmacy, Nursing, Public Health |
| Missouri: University of Missouri at St. Louis College of Optometry | Public | 1980 | 45 | Accredited | Clinical Psychology, Nursing |
| New York: State University of New York College of Optometry | Public | 1971 | 100 | Accredited | None |
| Ohio: The Ohio State University College of Optometry | Public | 1914 | 67 | Accredited | Medicine, Nursing, Pharmacy, Veterinary Medicine, PT, OT, Dentistry, Public Health, Clinical Psychology, Audiology |
| Oklahoma: Northeastern State University Oklahoma College of Optometry | Public | 1979 | 28 | Accredited | OT, Pharmacy, Nursing, PA, PT |
| Oregon: Pacific University College of Optometry | Private, not-for-profit | 1945 | 91 | Accredited | Audiology, Clinical Psychology, OT, Pharmacy, PT, PA, Public Health |

Continued
application trends by region are included here. Likewise, assumptions must be made by existing institutions about their ability to recruit, retain, and educate students for success, both on their licensing examinations and as an optometrist delivering eye care. This work seeks to shed light on those assumptions and rationales to inform future decisions about optometric education.

METHODS

Data on the number and qualifications of applicants through the Optometry Centralized Application Service were derived from the Optometry Centralized Application Service reports, publicly available data from the Association of Schools and Colleges of Optometry, and unpublished data provided by the Association of Schools and Colleges of Optometry. The data include the number of unique applicants across time, the number of matriculants across time overall and by individual institution, and the academic qualifications of the applicants as described by the distribution of grade point average and Optometry Admission Test academic average. These data were used to calculate the applicant-to-matriculant ratio across the years in which the Optometry Centralized Application Service has coordinated the optometry student application process. Data on the number of applicants as a function of their geographic area at the time of application were also calculated.

RESULTS

The number of unique applicants across time relative to the number of available training slots is an important consideration and is depicted in Fig. 1 and Table 2. The range in the number of applicants is from a low of 2503 for the entering class of 2010 to a 10-year high of 2812 for the entering class of 2016. Since 2016, the number of applicants has decreased by 4.44% from 2016 to 2017 and another 5.95% from 2017 to 2018. The number of applicants in 2018 was only 0.95% higher than in 2010, yet the number of matriculants in 2018 compared with 2010 increased by 11.2%.

Table 3 expands the information on matriculants as a function of institution. The three institutions that first enrolled students after 2010 are included in Table 3. The total matriculants in 2016, 2017, and 2018 are worth mentioning. The highest number of matriculants occurred in autumn 2016 (1871) when the University of Pikeville Kentucky College of Optometry enrolled its first class. The addition of the Chicago College of Optometry at Midwestern University in autumn 2017 theoretically should have increased the overall number of matriculants nationally by approximately 60, provided the incumbent institutions maintained their class sizes from 2016. Instead, the number of matriculants in autumn 2017 compared with autumn 2016 decreased by seven (0.37%). In autumn 2018, the overall number of matriculants decreased even further, by 42 (2.25%), compared with autumn 2017. The institution-specific numbers of matriculants, year by year, are depicted in Table 3.

Fig. 2 depicts the available first-attempt Optometry Admission Test performance for verified applicants in terms of academic average Optometry Admission Test score for 2010 to 2018. Note that the Optometry Admission Test data are out of temporal register with the other data presented here, as it is impossible to determine whether these prospective optometry students took the Optometry Admission Test in the same year as they applied to enter optometry school or whether they took it the year before. Repeat test takers’ performance is not included. The Optometry Admission Test taker-to-matriculant ratio ranged from a high of 1.56 in 2011 to lower levels across 2016 to 2018, with a low of 1.33 for the matriculants entering in 2018. The ratio of verified applicants with an academic average Optometry Admission Test score of at least 280 to matriculants for autumn 2018 was 1.10 compared with 1.21 for autumn 2010. The ratio of verified applicants with an academic average
Optometry Admission Test score of at least 300 to matriculants for autumn 2018 was 0.87 compared with 0.93 for autumn 2010.

Fig. 3 depicts the entire verified applicant pool's undergraduate grade point average for 2015 to 2018; grade point average data were not available through the Optometry Centralized Application Service before 2015. The ratio of verified applicants with a grade point average of at least 3.00 to matriculants for autumn 2018 was 1.13 compared with 1.23 for autumn 2015.

Note that the Optometry Admission Test and grade point average data in Figs. 2 and 3 are not linked by individual student. Linked Optometry Admission Test–to-grade point average data are only available for the autumn 2018 cohort. For autumn 2018, there were 1718 applicants who were accepted to at least one program and who also had both grade point average and academic average Optometry Admission Test data available. The matriculant status of the 1718 is not ascertainable. There were 54 individuals of the 1718 with grade point averages of 2.80 or lower. That group's overall academic average Optometry Admission Test score was 310, with a range from 250 to 370. There were 106 individuals of the 1718 with academic average Optometry Admission Test scores of 280 or lower. Their average grade point average was 3.30, with a range from 2.07 to 4.00. These data from 1 year only seem to confirm conventional wisdom that grade point average and Optometry Admission Test data are used in some admission processes to offset one another; for example, a student with a lower grade point average might be expected to need to have higher Optometry Admission Test scores to be admitted, and vice versa.

Table 4 shows the average ± standard deviation for verified applicants for grade point average and academic average Optometry Admission Test scores. Both the averages and their variability across the years are remarkably stable, other than an increase in the Optometry Admission Test standard deviation over the past 2 years. These data indicate that the central tendency indicators of the quality of applicants across these years have not changed.

Results for applicants as a function of year (2010 to 2018) and region4 are shown in Table 5. The Massachusetts College of Optometry Applicant Pool and Matriculants — Zadnik and Reich

![Figure 1](image-url)
Pharmacy and Health Sciences in Worcester, MA, enrolled its first class in autumn 2012. The number of applicants in the northeast increased by 21 (5.1%) during the 2011 to 2012 application cycle; however, the southeast, southwest, and west also increased by a similar number/proportion. The Kentucky College of Optometry at the University of Pikeville in Pikeville, KY, enrolled its first class in autumn 2016, with a corresponding increase in applicants from the southeast of 55 (10.9%), which equilibrated back down by 77 (13.7%) the following year with another decrease of 10 applicants (2.1%) for the entering class of 2018. The Chicago College of Optometry at Midwestern University in Downers Grove, IL, enrolled its first class in autumn 2017, with a corresponding decrease of 35 applicants (5.7%) who hailed from the Midwest. All regions showed a decreased number of applicants for autumn 2018 compared with autumn 2017.

### DISCUSSION

Although the applicant-to-matriculant ratio from 2010 to 2018 decreased from 1.53 to 1.39, 183 more students matriculated to optometry school in 2018 compared with 2010. There are competing hypotheses about the meaning of that increase. Does it mean that there were 183 qualified students in 2010 who could have successfully completed optometric education and passed their licensing examinations, or does it mean that 183 underqualified students were admitted in 2018? The truth is likely somewhere between those two extremes.

Midwestern University’s Chicago College of Optometry admitted its first cohort of students in autumn 2017. Inspection of the data for autumn 2017 compared with autumn 2016 shows a decrease

| Table 3. Matriculants in U.S. schools and colleges from 2010 to 2018 |
|---|
| **Institution** | **Current “target” class size for autumn 2017** | **Entering year (autumn)** |
| | | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** |
| UAB | 50 | 45 | 44 | 44 | 44 | 49 | 50 | 49 | 42 |
| AZCO | 56 | 51 | 49 | 54 | 54 | 53 | 54 | 54 | 56 |
| SCCO | 104 | 102 | 100 | 100 | 102 | 100 | 100 | 98 | 104 | 104 |
| UCB | 66 | 68 | 66 | 67 | 64 | 64 | 69 | 71 | 66 | 63 |
| WUCO | 86 | 86 | 86 | 86 | 91 | 68 | 86 | 88 | 77 | 84 |
| NOVA | 105 | 98 | 102 | 103 | 104 | 100 | 105 | 104 | 105 | 96 |
| CCO | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| ICO | 165 | 161 | 159 | 158 | 174 | 164 | 171 | 166 | 139 | 153 |
| IUSO | 68 | 80 | 77 | 76 | 80 | 75 | 80 | 74 | 68 | 65 |
| KYCO | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| MCPHS | 63 | 73 | 67 | 66 | 68 | 70 | 63 | 59 |
| NECO | 127 | 117 | 118 | 108 | 135 | 135 | 118 | 145 | 127 | 129 |
| MCO | 37 | 37 | 38 | 38 | 36 | 37 | 38 | 38 | 37 | 37 |
| UMSL | 45 | 40 | 46 | 46 | 45 | 45 | 42 | 45 | 49 | 42 |
| SUNY | 100 | 76 | 79 | 87 | 88 | 98 | 96 | 99 | 100 | 95 |
| OSU | 67 | 64 | 64 | 62 | 64 | 66 | 65 | 65 | 67 | 68 |
| NSU | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| PUCO | 91 | 90 | 90 | 91 | 91 | 91 | 92 | 94 | 91 | 93 |
| PCO | 155 | 161 | 162 | 155 | 154 | 165 | 154 | 151 | 155 | 145 |
| IAUPR | 60 | 48 | 53 | 56 | 60 | 60 | 60 | 60 | 53 | 45 |
| SCO | 136 | 119 | 130 | 130 | 131 | 135 | 136 | 136 | 136 | 133 |
| UIW | 67 | 64 | 64 | 67 | 68 | 67 | 67 | 67 | 64 |
| UHCO | 101 | 104 | 103 | 103 | 100 | 100 | 102 | 103 | 101 | 98 |

Matriculants include all first-year, full-time students but do not include any repeat or transfer students. Empty cells represent the years before a program first enrolled students. AZCO = Arizona College of Optometry at Midwestern University; CCO = Chicago College of Optometry, Midwestern University; IAUPR = Inter American University of Puerto Rico School of Optometry; ICO = Illinois College of Optometry; IUSO = Indiana University School of Optometry; KYCO = University of Pikeville Kentucky College of Optometry; MCO = Michigan College of Optometry AT Ferris State University; MCPHS = MCPHS University; NECO = New England College of Optometry; SCCO = Southern California College of Optometry; NOVA = Nova Southeastern University College of Optometry; NSU = Northeastern State University Oklahoma College of Optometry; SUNY = State University of New York College of Optometry; UAB = University of Alabama at Birmingham School of Optometry; UCB = University of California, Berkeley School of Optometry; UHCO = University of Houston College of Optometry; UIW = University of the Incarnate Word Rosenberg School of Optometry; UMSL = University of Missouri at St. Louis College of Optometry; WUCO = Western University of Health Sciences College of Optometry.
In autumn 2017 compared with autumn 2016, the Illinois College of Optometry decreased its number of matriculants from 166 to 139, the Indiana University School of Optometry decreased its number of matriculants from 74 to 68, the University of Pikeville (Table 3). In autumn 2017 compared with autumn 2016, the Illinois College of Optometry decreased its number of matriculants from 166 to 139, the Indiana University School of Optometry decreased its number of matriculants from 74 to 68, the University of Pikeville
Kentucky College of Optometry decreased its number of matriculants from 65 to 60, the New England College of Optometry decreased its number of matriculants from 145 to 127, the Massachusetts College of Pharmacy and Health Sciences School of Optometry decreased its number of matriculants from 70 to 63, and the Western University of Health Sciences College of Optometry decreased its number of matriculants from 88 to 75. Thus, these reductions offset the additional matriculants at the new institution in autumn 2017.

Similarly, the number of matriculants decreased by an additional 42 in 2018 compared with 2017. Decreases in 2018 compared with the year before include the following: the University of Alabama at Birmingham School of Optometry decreased its number of matriculants from 49 to 42; the University of California, Berkeley School of Optometry decreased its number of matriculants from 66 to 63; the Nova Southeastern University College of Optometry decreased its number of matriculants from 105 to 96; the Western University of Health Sciences—College of Optometry decreased its number of matriculants from 68 to 65; the Massachusetts College of Pharmacy and Health Sciences School of Optometry decreased its number of matriculants from 63 to 59; the University of Missouri St. Louis College of Optometry decreased its number of matriculants from 49 to 42; the State University of New York College of Optometry decreased its number of matriculants from 100 to 95; the Salus University Pennsylvania College of Optometry decreased its number of matriculants from 145 to 145; the Inter American University of Puerto Rico School of Optometry decreased its number of matriculants from 53 to 45; the Southern College of Optometry decreased its number of matriculants from 136 to 133; the University of the Incarnate Word Rosenberg School of Optometry decreased its number of matriculants from 67 to 64; and the University of Houston College of Optometry decreased its number of matriculants from 101 to 98.

Some of the smaller fluctuations in the number of matriculants from year to year may reflect challenges in maintaining a target class size as students with multiple admission offers make their final choice for optometry school. The larger, overall decreases in autumn 2017 and autumn 2018 are more likely explained by the inability of some programs to fill their classes because they want to maintain their standards for matriculants’ qualifications. A “flat” applicant pool and maintenance of standards mean every new program cannibalizes qualified applicants from existing programs. These data challenge the assumption that a new program means the creation and influx of large numbers of new and/or more qualified applicants.

The ability to evaluate the quality of matriculants is, of course, ultimately decided by both their doctor of optometry program completion and by their performance on the National Board of Examiners in Optometry examinations. One could assume that there is some predictive value in pre-optometry achievements through primary academic ability markers such as grade point average and performance on the Optometry Admission Test. Those predictors are not perfect, and there are many examples of students with lower entering grade point averages and/or poorer Optometry Admission Test performance who pass licensing examinations and become competent, successful optometrists. It is evident from Fig. 2 that the overall number of Optometry Admission Test takers has decreased from 2010 to 2018. The decrease could be due to less qualified students being admitted to optometry school on their first try, thereby reducing the need for any retakes on the Optometry Admission Test.

Concerns about undergraduate grade inflation with time inform the grade point average–based discussions, and most optometric institutions interpret grade point average with some differential weighting given on the basis of the undergraduate institution(s) of record. Against this backdrop, Fig. 3 confirms that the matriculation of any more than 1200 optometry students annually means that a significant number of students, as much as one-third of the matriculants in autumn 2019, entered with a grade point average lower than 3.40.

Beginning with the graduating class of 2017 (entering class of 2013 for most), the Association of Schools and Colleges of Optometry, in collaboration with the National Board of Examiners in Optometry, prepares an annual report of national licensing examination performance as a function of students’ institutions. The students represented in Table 6 for the class of 2017 are those who graduated with a doctor of optometry degree between October 1, 2016, and September 30, 2017, and who attempted each of the three parts of the National Board of Examiners in Optometry (Part I: Applied Basic Science, Part II: Patient Assessment and Management,

### TABLE 4. OAT scores and GPA (mean ± SD) for verified optometry applicants from 2010 to 2018 (OAT) and 2015 to 2018 (GPA)

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|------|------|------|------|------|------|------|------|------|------|
| OAT mean | 323 | 320 | 321 | 321 | 322 | 325 | 324 | 324 | 318 |
| OAT SD | 34 | 32 | 32 | 32 | 33 | 32 | 36 | 41 | 41 |
| GPA mean | 3.32 | 3.32 | 3.32 | 3.35 | 3.33 | 3.30 | 3.17 | 3.16 | 3.10 |
| GPA SD | 0.37 | 0.37 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |

GPA = grade point average; OAT = Optometry Admission Test.

### TABLE 5. Verified applicants to optometry school by region (unpublished data from ASCO) for the matriculants who entered in 2010 to 2018

| Region/year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------------|------|------|------|------|------|------|------|------|------|
| Northeast   | 387  | 408  | 429  | 431  | 434  | 475  | 494  | 463  | 445  |
| Midwest     | 580  | 567  | 535  | 609  | 579  | 591  | 618  | 583  | 531  |
| Southeast   | 472  | 466  | 501  | 498  | 499  | 506  | 561  | 484  | 474  |
| Southwest   | 244  | 250  | 273  | 315  | 315  | 310  | 330  | 338  | 284  |
| West        | 594  | 553  | 570  | 526  | 561  | 556  | 574  | 534  | 514  |

International applicants and applicants without a specified region are not included. MCPHS University enrolled its first students in autumn 2012. The Kentucky College of Optometry at the University of Pikeville enrolled its first class in autumn 2016. The Chicago College of Optometry at Midwestern University enrolled its first class in autumn 2017. ASCO = Association of Schools and Colleges of Optometry.
TABLE 6. National Board of Examiners in Optometry October 2016 to August 2017 Institutional Yearly Performance Report5

| Institution | No. candidates | Part I: ABS first-timer pass rate (%) | Part II: PAM first-timer pass rate (%) | Part III: CSE first-timer pass rate (%) | Ultimate pass rate (%) |
|-------------|----------------|--------------------------------------|---------------------------------------|----------------------------------------|------------------------|
| UAB*        | 37             | 83.78                                | 97.30                                 | 81.08                                  | 94.59                  |
| AZCO†        | 43             | 90.70                                | 95.35                                 | 83.72                                  | 95.35                  |
| SCCO         | 97             | 72.16                                | 85.57                                 | 89.69                                  | 85.57                  |
| UCB          | 57             | 92.98                                | 98.25                                 | 87.72                                  | 96.49                  |
| WUCO         | 76             | 46.05                                | 67.11                                 | 68.42                                  | 68.42                  |
| NOVA†        | 93             | 86.02                                | 90.32                                 | 81.72                                  | 97.85                  |
| CCO          |                |                                      |                                       |                                        |                        |
| ICO          | 151            | 77.48                                | 88.74                                 | 91.39                                  | 95.36                  |
| IUSO         | 70             | 84.29                                | 97.14                                 | 82.86                                  | 94.29                  |
| KYCO         |                |                                      |                                       |                                        |                        |
| MCPHS        | 59             | 55.93                                | 81.36                                 | 55.93                                  | 74.59                  |
| NECO         | 135            | 84.44                                | 90.37                                 | 77.78                                  | 90.37                  |
| MCO*         | 35             | 97.14                                | 97.14                                 | 57.14                                  | 97.14                  |
| UMSL†        | 41             | 75.61                                | 90.24                                 | 82.93                                  | 87.80                  |
| SUNY         | 88             | 89.77                                | 90.91                                 | 80.68                                  | 96.59                  |
| OSU          | 57             | 91.23                                | 96.49                                 | 80.70                                  | 96.49                  |
| NSU†         | 29             | 82.76                                | 96.55                                 | 89.66                                  | 96.55                  |
| PUCO         | 89             | 91.01                                | 97.75                                 | 79.78                                  | 97.75                  |
| PCO          | 152            | 67.11                                | 84.21                                 | 80.92                                  | 84.21                  |
| IAUPR§       | 34             | 47.06                                | 58.82                                 | 44.12                                  | 82.35                  |
| SCO*         | 127            | 91.34                                | 96.85                                 | 92.91                                  | 100.00                 |
| UIW          | 64             | 60.94                                | 79.69                                 | 89.06                                  | 84.38                  |
| UHCO         | 88             | 87.50                                | 94.32                                 | 81.82                                  | 93.18                  |
| National     | 1644           | 72.93                                | 89.96                                 | 75.97                                  | 92.09                  |

ABS = Applied Basic Science; CSE = Clinical Skills; PAM = Patient Assessment and Management. All pass rates are calculated using only candidates who have graduated during the listed time frame and attempted all three parts at least once. First-timer pass rates are the percentage of the aforementioned referenced candidate group that passed the examination on their first attempt. Ultimate pass rate is the percentage of the aforementioned referenced candidate group that passed all three examinations. *These universities require candidates take and pass Parts I and II for graduation. †These universities require candidates take and pass Part I and take (but not necessarily pass) Part II for graduation. ‡These universities require candidates take (but not necessarily pass) Parts I, II, and III for graduation. §These universities require candidates take and pass Part I only for graduation. AZCO = Arizona College of Optometry at Midwestern University; CCO = Chicago College of Optometry, Midwestern University; IAUPR = Inter American University of Puerto Rico School of Optometry; ICO = Illinois College of Optometry; IUSO = Indiana University School of Optometry; KYCO = University of Pikeville Kentucky College of Optometry; MCO = Michigan College of Optometry AT Ferris State University; MCPHS = MCPHS University, School of Optometry; NECO = New England College of Optometry; NOVA = Nova Southeastern University College of Optometry; NSU = Northeastern State University Oklahoma College of Optometry; OSU = The Ohio State University College of Optometry; PCO = Salus University Pennsylvania College of Optometry; PUCO = Pacific University College of Optometry; SCCO = Southern California College of Optometry at Marshall B. Ketchum University; SCO = Southern College of Optometry; SUNY = State University of New York College of Optometry; UAB = University of Alabama at Birmingham School of Optometry; UCB = University of California, Berkeley School of Optometry; UHCO = University of Houston College of Optometry; UIW = University of the Incarnate Word Rosenberg School of Optometry; UMSL = University of Missouri at St. Louis College of Optometry; WUCO = Western University of Health Sciences College of Optometry.

and Part III: Clinical Skills) examinations at least once. This table indicates that the first-time pass rates for the 1622 included students ranged from 45 to 97% for Part I, 59 to 97% for Part II, and 44 to 90% for Part III. The ultimate pass rate reflects the proportion of designated graduates who had passed all three parts of the National Board of Examiners in Optometry examinations by September 30, 2017, and ranged from 68 to 100%. Data are similarly provided for the 2018 graduates (Table 7).

These data were not compiled in this format before the graduating optometry cohort of 2017, so comparisons are limited. The numbers of graduates who attempted all three parts of the National Board of Examiners in Optometry examination were 1644 in 2017 and 1622 in 2018. National first-time pass rates for Part I: Applied Basic Science increased from 72.93 to 79.04%, Part II: Patient Assessment and Management was stable at 89%, and first-time pass rates for Part III: Clinical Skills increased from 75.97 to 81.26%. The national ultimate pass rate was stable, at 91 to 92%. Some individual institutions’ performances varied more than the overall national performance would indicate.

The Accreditation Council on Optometric Education amended its standard in 2017 to include a requirement related to the quality of matriculants, their attrition, and National Board of Examiners in Optometry examination performance. Specifically, the Accreditation Council on Optometric Education now requires that “within
6 years of initial matriculation, at least 80% of entering students must be (1) licensed to practice optometry or (2) pass all three parts of the NBEO or (3) pass the equivalent Canadian registration examination.

This new, more rigorous standard will undoubtedly influence how optometric institutions make their admissions decisions. The 80% threshold must be cleared while accounting for all sources of student attrition between their first day of optometry school and their status relative to the optometric profession 6 years later. The student who decides that optometry is not the profession for him or her sometime before graduation counts against the 80% threshold, as does the student who is dismissed for poor academic performance. The student who has not passed all three parts of the National Board of Examiners in Optometry examinations or the Canadian registration examination would count against the 80% threshold as well. In short, the Accreditation Council on Optometric Education requires that four of every five matriculants must have been successful in their optometric education and licensing requirements 6 years after initial matriculation.

Predictably, the increase in the number of optometric training slots after many years of stability in the number of trainees has resulted in discussion and debate among educators, students, optometry alumni, and optometric organizations.

### TABLE 7. National Board of Examiners in Optometry

| Institution            | No. candidates | Part I: ABS first-timer pass rate (%) | Part II: PAM first-timer pass rate (%) | Part III: CSE first-timer pass rate (%) | Ultimate pass rate (%) |
|------------------------|----------------|--------------------------------------|---------------------------------------|----------------------------------------|------------------------|
| UAB*                   | 44             | 81.82                                | 95.45                                 | 77.27                                  | 97.73                  |
| AZCO†                  | 50             | 84.00                                | 94.00                                 | 88.00                                  | 96.00                  |
| SCCO                   | 99             | 62.63                                | 88.89                                 | 73.75                                  | 90.91                  |
| UCB                    | 63             | 85.71                                | 96.83                                 | 90.48                                  | 98.41                  |
| WUCO                   | 60             | 55.00                                | 76.67                                 | 56.67                                  | 81.67                  |
| NOVA†                  | 95             | 62.11                                | 95.79                                 | 77.89                                  | 96.84                  |
| CCO                    |                | Not applicable                       |                                       |                                        |                        |
| ICO                    | 149            | 85.23                                | 91.28                                 | 84.56                                  | 92.62                  |
| IUSO                   | 72             | 77.78                                | 91.67                                 | 84.72                                  | 97.22                  |
| KYCO                   |                | Not applicable                       |                                       |                                        |                        |
| MCPHS                  | 52             | 55.77                                | 69.23                                 | 53.85                                  | 67.31                  |
| NECO                   | 118            | 77.97                                | 94.92                                 | 74.58                                  | 94.92                  |
| MCO*                   | 35             | 74.29                                | 91.43                                 | 74.29                                  | 94.29                  |
| UMSL†                  | 39             | 64.10                                | 89.74                                 | 66.67                                  | 84.62                  |
| SUNY                   | 91             | 86.81                                | 94.51                                 | 70.33                                  | 97.80                  |
| OSU                    | 68             | 86.76                                | 97.06                                 | 85.29                                  | 97.06                  |
| NSU‡                   | 26             | 80.77                                | 96.15                                 | 92.31                                  | 96.15                  |
| PUCO                   | 80             | 83.75                                | 95.00                                 | 76.25                                  | 93.75                  |
| PCO                    | 163            | 55.21                                | 85.89                                 | 71.78                                  | 85.28                  |
| IAUPR‡                 | 50             | 40.00                                | 48.00                                 | 40.00                                  | 76.00                  |
| SCO*                   | 130            | 85.38                                | 97.69                                 | 85.38                                  | 100.00                 |
| UIW                    | 60             | 68.33                                | 85.00                                 | 85.00                                  | 88.33                  |
| UHCO                   | 100            | 70.00                                | 92.00                                 | 72.00                                  | 94.00                  |
| National               | 1622           | 79.04                                | 89.33                                 | 81.26                                  | 91.06                  |

ABS = Applied Basic Science; CSE = Clinical Skills; PAM = Patient Assessment and Management. All pass rates are calculated using only candidates who have graduated during the listed time frame and attempted all three parts at least once. First-timer pass rates are the percentage of the aforementioned referenced candidate group that passed the examination on their first attempt. Ultimate pass rate is the percentage of the aforementioned referenced candidate group that passed all three examinations. *These universities require candidates take and pass Parts I and II for graduation. †These universities require candidates take and pass Part I and take (but not necessarily pass) Part II for graduation. ‡These universities require candidates take (but not necessarily pass) Parts I, II, and III for graduation. §These universities require candidates take and pass Part I only for graduation. AZCO = Arizona College of Optometry at Midwestern University; CCO = Chicago College of Optometry, Midwestern University; IAUPR = Inter American University of Puerto Rico School of Optometry; ICO = Illinois College of Optometry; IUSO = Indiana University School of Optometry; KYCO = University of Pikeville Kentucky College of Optometry; MCO = Michigan College of Optometry at Ferris State University; MCPHS = MCPHS University, School of Optometry; NECO = New England College of Optometry; Nova = Nova Southeastern University College of Optometry; NSU = Northeastern State University College of Optometry; OSU = The Ohio State University College of Optometry; PCO = Salus University Pennsylvania College of Optometry; PURO = Pacific University College of Optometry; SCCO = Southern California College of Optometry at Marshall B. Ketchum University; SCO = Southern College of Optometry; SUNY = State University of New York College of Optometry; UAB = University of Alabama at Birmingham School of Optometry; UCB = University of California, Berkeley School of Optometry; UHCO = University of Houston College of Optometry; UIW = University of the Incarnate Word Rosenberg School of Optometry; UMSL = University of Missouri at St. Louis College of Optometry; WUCO = Western University of Health Sciences College of Optometry.
each program to set its target class size makes these data slightly ambiguous. Potential factors affecting target class size could conceivably be the development of international programs as another source of qualified students and/or the unlikely development of new revenue sources that may result in a deliberate decrease in target class size. Again, these factors are largely proprietary and thus outside the scope of these publicly reported data. Pertinent questions include the following: Are the additional matriculants sufficiently academically qualified to successfully complete the doctor of optometry program and/or to pass national and state licensing examinations? Are there enough academically and clinically qualified faculty members to staff all the optometric programs? Are there enough qualified academic administrators for all optometric programs? How might the change in this landscape affect resource considerations like faculty and staff compensation, cost of individual programs, and student debt?

The issue of a flat or declining applicant pool in the face of an increasing number of programs is not unique to optometry. Between academic years 2009 and 2010 and 2015 and 2016, the number of schools and colleges of pharmacy in the United States increased from 86 to 124 (an increase of 44%), whereas the number of applicants decreased from 17,330 in 2009 to 2010 to 16,454 in 2015 to 2016 (a decrease of 5.05%). Between 2008 and 2016, the average number of applicants at the top 14 law schools decreased by 20.6%. For lower-ranked law schools and colleges, the average number of applicants dropped by 52.3% during the same period.

Whether pharmacy, optometry, or law, the factors influencing how many people apply to join a profession compared with how many training slots there are at that profession’s academic institutions are many and varied. They include the student’s abilities relative to the demands of the training programs and the profession, public awareness of the profession, the influence of new technology and new delivery systems for the profession’s services, the availability of post-graduate employment, the potential future income, student debt, and other, less tangible factors such as academic area of interest, passion for the chosen profession, and work-life balance. For optometry, all of these factors are in play.

Some factors are beyond the direct purview of the optometric educational institutions or the Association of Schools and Colleges of Optometry. Those would include expansion of optometric scope on a state-by-state basis, decisions by third-party payers about optometry’s inclusion in their health care plans, and how the optometric profession incorporates new technologies.

Individual schools and colleges of optometry can only influence some of those factors. For example, optometric institutions can control tuition and fees by containing costs and/or by increasing their scholarship portfolio to offset students’ debt. They also control their admission standards and class size. They control their curricular offerings to a certain extent but are guided by the need to educate students who can practice full scope of optometric care in every state.

The Association of Schools and Colleges of Optometry has chosen recently to focus on the issue of public awareness of the profession by planning a social media–based promotion of optometry as a career, emphasizing the satisfaction optometrists get from caring for patients’ eyes. The campaign is designed to educating prospective students about optometry’s significant contribution to patients’ quality of life and the positive work-life balance that comes from being an optometrist.

CONCLUSIONS AND RECOMMENDATIONS

This work presents data to support a necessary, national conversation, similar to experiences other professions have already had. These data are only possible because the Association of Schools and Colleges of Optometry had the foresight to create a national application service. The Association of Schools and Colleges of Optometry has also created various campaigns and resources across optometry programs to promote the profession as an attractive health sciences career option; more work is clearly needed in that regard. The accrediting bodies, both discipline specific and regional, need these data to inform their standards and operating procedures. There is an overarching goal to the interpretation of these data and the discussions and actions that logically follow. Optometric programs must admit students who can succeed in the program, pass their licensing examinations, and become doctors of optometry with the intellectual curiosity and ability to be lifelong learners who can deliver excellent primary eye care and address causes of preventable blindness.