BRIEF

An Exploratory Analysis of PharmD Program Value Using the Tuition: Licensure Index

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Objective. To assess the value of a Doctor of Pharmacy (PharmD) program using the Tuition: Licensure Index (TLI), a de novo metric combining tuition and licensure pass rates.

Methods. The TLI is a ratio of program tuition and licensure pass rates, where separate indices are derived for the North American Pharmacist Licensure Examination or NAPLEX (ie, TLI-N) and the Multistate Pharmacy Jurisprudence Examination (ie, TLI-M). The TLI can be further nuanced depending on use of in-state (ie, TLI-N\textsubscript{i} and TLI-M\textsubscript{i}) or out-of-state (ie, TLI-N\textsubscript{o} and TLI-M\textsubscript{o}) tuition. The TLI-N for the 2018 cohort was used in this analysis. Total program tuition and NAPLEX pass rates were obtained from publicly available sources. Differences in traditional vs accelerated and public vs private programs were examined using the TLI-N categories “one or less” and “greater than one.”

Results. While differences in TLI-N\textsubscript{i} category (ie, “one or less” and “greater than one”) for traditional vs accelerated PharmD programs were not significant, a major difference was found in the TLI-N\textsubscript{i} category for public vs private programs. No differences in the TLI-N\textsubscript{o} category for public vs private or for traditional vs accelerated programs were found.

Conclusion. In-state public (vs private) PharmD programs may be preferable for optimizing value. Prospective students are encouraged to consider a school’s tuition and licensure pass rates when selecting a PharmD program.

Keywords: pharmacy licensure, pharmacy education, program evaluation, educational measurement

INTRODUCTION

Pharmacy education in the United States has experienced unprecedented growth over the past several years. The number of Doctor of Pharmacy (PharmD) programs recognized by the Accreditation Council for Pharmacy Education (ACPE) has more than doubled since 1970, from 74\textsuperscript{1} to 143 as of January 2019.\textsuperscript{2} Likewise, the number of pharmacist graduates has risen apace, from 6956 in 1990\textsuperscript{1} to 14,502 in 2017.\textsuperscript{2} While the growth of new and existing PharmD programs has done much to address previously projected pharmacist manpower shortages, it is now recognized that market opportunity for both academic institutions and newly licensed practitioners has plateaued if not slightly declined nationwide.\textsuperscript{3-5} Average PharmD program tuition has steadily increased disproportionate to pharmacist salaries,\textsuperscript{6,7} and pass rates for the North American Pharmacist Licensure Examination (NAPLEX) have progressively declined since 2014.\textsuperscript{8} Given this unique climate, many in the profession now advocate for a temporary moratorium on new program accreditation.\textsuperscript{9} It therefore becomes essential that both prospective students and program leaders pay special attention to student tuition and successful pharmacist licensure, both of which are components of the program value index used in this analysis.

Practically, PharmD program assessment models can be said to inform the current conceptualization of quality. For example, ACPE evaluates PharmD programs based on a comprehensive 25-factor model (ie, Standards 2016),\textsuperscript{1,10} which includes both educational (eg, student knowledge and professional development) and programmatic (eg, curriculum, progression, financial resources) domains to produce practice- and team-ready graduates.\textsuperscript{10} These factors, of course, are assessed through numerous qualitative and quantitative metrics, including NAPLEX pass rates.\textsuperscript{10,11} Similar to “Standards 2016,” Mattingly and colleagues\textsuperscript{12} propose the use of nine factors (and accompanying metrics), which include, in descending order of importance: postgraduate student placement, student success (eg, grades), testing, curriculum, stakeholder feedback, recruitment,
The Tuition:Licensure Index (TLI), newly introduced in this paper, is a novel tool that combines program-specific tuition and licensure (ie, NAPLEX and MPJE) pass rate data for PharmD program valuation. The TLI does not attempt to challenge the presupposition undergirding existing models\(^{10,12}\); instead, it is intended for use in the current assessment context. Though *de novo*, the TLI is not without some degree of controversy, much of which derives from the now-routine use of NAPLEX data as program outcomes.\(^{8,13-16}\) Popovich and colleagues\(^{17}\) have raised important concerns in this regard, echoing remarks from officials at the National Association of Boards of Pharmacy (NABP) that “licensure examinations were never intended to measure education or pinpoint specific weaknesses in teaching, curriculum, or the program in the college of pharmacy.”\(^{11}\) Nevertheless, by requiring publication of licensure pass rates on program websites, ACPE clearly recognizes the importance of these metrics on program valuation.\(^{11,16,18}\) Thus, an important part of program value can be said to comprise, without being wholly defined by, the TLI. The question of this analysis, therefore, is this: considering publicly available program-specific tuition and licensure pass rates, can the value of accredited pharmacy programs be further quantified and assessed? This research evaluated traditional four-year vs accelerated three-year PharmD programs and public vs private PharmD programs according to the Tuition:Licensure Index.

### METHODS

The TLI is a novel metric designed to evaluate individual PharmD programs in terms of tuition and fees (hereafter referred to as “tuition”) and NAPLEX and the Multistate Pharmacy Jurisprudence Examination (MPJE) pass rates. The TLI for each program can be calculated for both the NAPLEX and MPJE separately as:

\[
\text{TLI} = \frac{\text{Average Total Tuition for All PharmD Programs}}{\text{Average Licensure Pass Rate for All Programs}} - \frac{\text{Individual PharmD Program Total Tuition}}{\text{Individual PharmD Program Licensure Pass Rate}}
\]

In this equation, “licensure” can refer to either the NAPLEX (ie, TLI-N) or MPJE (ie, TLI-M) and “tuition” can refer to either in-state (ie, TLI-N\(_i\) and TLI-M\(_i\)) or out-of-state (ie, TLI-N\(_o\) and TLI-M\(_o\)) tuition. Programs with TLI values of one or less can be considered “good” in terms of program value (with smaller values corresponding to increasingly “good” value), while those with values greater than one may be considered “less than good” (with larger values corresponding to increasingly “less than good” value).

This secondary analysis collected publicly available data from the American Association of Colleges of Pharmacy (AACP) website and the NABP website (ie, the units of observation) to characterize the value of PharmD programs. Data included traditional four-year, accelerated three-year, private, and public PharmD program classifications, tuition and fees (data obtained from the AACP), and NAPLEX pass rates associated with “all attempts” for each ACPE-accredited PharmD program for the 2018 graduating cohort (data obtained from the NABP). “All attempts” was considered the more conservative estimate compared to “first time attempts” because of the association of “all attempts” with comparatively higher pass percentages and larger administration numbers. Program pass rates for the MPJE were not included in this analysis.

Both descriptive and inferential analyses were conducted. Descriptive data included calculating mean, standard deviation, median, and minimum and maximum values for 2018 in-state and out-of-state tuition, NAPLEX pass rate, and TLI-N\(_i\) and TLI-N\(_o\); and the 2018 TLI-N\(_i\) and TLI-N\(_o\) for each ACPE-accredited PharmD program. Inferential analyses comparing the TLI-N for traditional vs accelerated and public vs private PharmD program across categorizations (ie, frequency of institutions with TLI score of “one or less” and “greater than one”) were conducted using the chi-square test at an alpha significance level of 0.0125 (correcting for the potential for committing a Type I error resulting from multiple statistical testing). Where program-specific tuition data were not provided for a specific year within the 2018 graduating sequence (ie, the four years for traditional and three years for accelerated programs leading to 2018 graduation), program-specific averages corresponding to professional year (eg, P1, P2, P3, and P4) were calculated and used to approximate total program tuition for the 2018 cohort. Excel and SAS 9.4 for Windows (Cary, NC) were used for statistical analysis. All data were collected and analyzed by the author.

### RESULTS

A total of 143 ACPE-accredited PharmD programs were initially identified via the AACP website. Nine of these programs were excluded from the study because their NAPLEX pass rates were not reported on the NABP website for the 2018 cohort. Thus, the number of programs included in the analysis was 134. As tuition data were not provided on the AACP website for nine of the...
134 programs in the analysis (corresponding to 24 total time segments), average program-specific tuition corresponding to academic year (ie, P1, P2, P3, or P4) was calculated for each of the nine programs and used to estimate costs. No substantial changes were observed in TLI-N for five of the nine programs after imputation of average values; however, substantial changes were observed in the other four programs, with University of North Carolina Chapel Hill, Ohio Northern University, and Philadelphia College of Pharmacy showing 21% increases (on average) in TLI-Ni and TLI-No, and West Coast University showing a 51% increase in TLI-Ni and TLI-No.

Descriptive statistics for the complete data set are presented in Table 1, with variations noted according to traditional vs accelerated and public vs private program categorizations. The TLI-N data for each of the 134 PharmD programs included in the study are presented in Table 2, with program structure (ie, four-year traditional, three-year accelerated), program type (ie, public vs private), in- and out-of-state tuition, and 2018 NAPLEX pass rates also provided. The results of chi-square analyses comparing traditional vs accelerated and public vs private program classifications according to TLI-N category (ie, TLI-N “one or less” and “greater than one”) are provided in Table 3. The results showed a significantly greater

Table 1. Descriptive Statistics Including the Tuition Licensure Index for Instate and Out-of-State Tuition for 2018 for Doctor of Pharmacy Programs in the United States (N=134)a

| PharmD Program Type | Mean      | Standard Deviation | Median    | Min      | Max      |
|---------------------|-----------|--------------------|-----------|----------|----------|
| Overall Data Set (n=134) |           |                    |           |          |          |
| In-State Tuition, $  | 124,149.28| 39,375.94          | 129,454   | 33,590   | 231,732  |
| Out-of-State Tuition, $ | 155,968.48| 28,225.44          | 157,559.50| 10,445   | 232,532  |
| TLI-Ni              | 0.8804    | 0.0828             | 0.9007    | 0.5843   | 1        |
| TLI-No              | 0.9864    | 0.1837             | 0.9994    | 0.0595   | 1.5179   |
| Public (n=65)       |           |                    |           |          |          |
| In-State Tuition, $  | 93,825.76 | 27,972.23          | 90,675    | 33,590   | 231,732  |
| Out-of-State Tuition, $ | 159,136.02| 31,917.40          | 165,963   | 10,445   | 232,532  |
| TLI-Ni              | 0.738     | 0.2427             | 0.6983    | 0.2452   | 1.9761   |
| TLI-No              | 0.9734    | 0.1954             | 0.9983    | 0.0595   | 1.4706   |
| Private (n=69)      |           |                    |           |          |          |
| In-State Tuition, $  | 152,714.91| 24,272.67          | 151,279   | 80,845   | 218,952  |
| Out-of-State Tuition, $ | 152,984   | 24,099.43          | 151,279   | 80,845   | 218,952  |
| TLI-Ni              | 1.2772    | 0.2226             | 1.2816    | 0.6757   | 1.9446   |
| TLI-No              | 0.9986    | 0.1724             | 1         | 0.5274   | 1.5179   |
| Traditional (n=121) |           |                    |           |          |          |
| In-State Tuition, $  | 121,814.62| 39,424.81          | 123,823   | 33,590   | 231,732  |
| Out-of-State Tuition, $ | 156,351.64| 28,225.89          | 157,800   | 10,445   | 232,532  |
| TLI-Ni              | 0.8863    | 0.088              | 0.9054    | 0.5843   | 1        |
| TLI-No              | 0.988     | 0.3489             | 0.9960    | 0.2452   | 1.9761   |
| Accelerated (n=13)   |           |                    |           |          |          |
| In-State Tuition, $  | 145,879.54| 32,781.74          | 149,029   | 80,845   | 194,674  |
| Out-of-State Tuition, $ | 152,402.15| 29,112.76          | 154,967   | 80,845   | 194,674  |
| TLI-Ni              | 0.8253    | 0.0907             | 0.827     | 0.6875   | 0.9585   |
| TLI-No              | 1.2725    | 0.3317             | 1.3288    | 0.6757   | 1.9446   |

Abbreviations: PharmD=Doctor of Pharmacy, TLI-Ni=Tuition Licensure Index for in-state, TLI-No=Tuition Licensure Index for out-of-state, NAPLEX= North American Pharmacist Licensure Examination

a Although 143 accredited US Doctor of Pharmacy programs were initially identified via the American Association of Colleges of Pharmacy website, nine of these programs were excluded from the study because their NAPLEX pass rates were not reported on the National Association of Boards of Pharmacy website for the 2018 cohort. Thus, the number of programs included in the analysis was 134

b In-state and out-of-state tuition costs are the average tuition cost expressed in US dollars
Table 2. Tuition, Pass Rates, and TLI-N Values for 2018 Cohort

| Program                              | Structure | Type          | In State | Out of State | Pass Rate | All Attempts | TLI-N₁ | TLI-N₀ |
|--------------------------------------|-----------|---------------|----------|--------------|-----------|--------------|--------|--------|
| A&M Schwartz                         | Traditional Private | 172460 | 174500 | 0.816 | 212 | 1.49874 | 1.18369 |
| Albany                               | Traditional Private | 143534 | 143534 | 0.8777 | 229 | 1.15967 | 0.90519 |
| Appalachian                          | Traditional Private | 112300 | 112300 | 0.7568 | 74 | 1.05227 | 0.82135 |
| Arizona                               | Traditional Public | 100109 | 175115 | 0.8155 | 103 | 0.87051 | 1.18859 |
| Arkansas                              | Traditional Public | 76787 | 144067 | 0.9402 | 117 | 0.57915 | 0.84816 |
| Auburn                                | Traditional Public | 90836 | 171786 | 0.8766 | 154 | 0.73482 | 1.08472 |
| Belmont                               | Traditional Private | 143450 | 143450 | 0.9385 | 65 | 1.08391 | 0.84605 |
| Buffalo                               | Traditional Public | 109411 | 186191 | 0.9603 | 126 | 0.80794 | 1.07321 |
| Butler                                | Traditional Private | 166642 | 166642 | 0.9921 | 127 | 1.19112 | 0.92974 |
| California Health Sciences            | Traditional Private | 176581 | 176581 | 0.7541 | 61 | 1.66051 | 1.29612 |
| California Northstate                 | Traditional Private | 190015 | 190015 | 0.8293 | 123 | 1.62481 | 1.26826 |
| California-SD                         | Traditional Public | 138027 | 187010 | 0.9697 | 66 | 1.00938 | 1.06748 |
| California-SF                        | Traditional Public | 136405 | 185385 | 0.9060 | 117 | 1.06765 | 1.1326 |
| Campbell                              | Traditional Private | 145535 | 145535 | 0.9565 | 115 | 1.07897 | 0.8422 |
| Cedarville                           | Traditional Private | 129568 | 129568 | 0.9167 | 36 | 1.0023 | 0.78235 |
| Chapman                              | Accelerated Private | 188530 | 188530 | 0.6875 | 80 | 1.94462 | 1.51788 |
| Charleston                           | Traditional Private | 123492 | 123492 | 0.8261 | 69 | 1.06007 | 0.82744 |
| Chicago State                        | Traditional Public | 107933 | 155238 | 0.5843 | 89 | 1.30992 | 1.4706 |
| Cincinnati                            | Traditional Private | 83787 | 141963 | 0.9091 | 99 | 0.65357 | 0.86436 |
| Colorado                             | Traditional Public | 115983 | 165963 | 0.9671 | 152 | 0.85045 | 0.94988 |
| Concordia                             | Traditional Private | 135950 | 135950 | 0.8791 | 91 | 1.09665 | 0.856 |
| Connecticut                          | Traditional Public | 80674 | 177266 | 0.9263 | 95 | 0.6176 | 0.50927 |
| Creighton                            | Traditional Private | 163733 | 163733 | 0.8919 | 185 | 1.30181 | 1.01613 |
| Drake                                | Traditional Public | 156742 | 156742 | 0.9245 | 106 | 1.20228 | 0.93845 |
| Duquesne                             | Traditional Private | 205032 | 205032 | 0.9239 | 184 | 1.57371 | 1.22837 |
| D'Youville                           | Traditional Private | 129856 | 129856 | 0.7792 | 77 | 1.18179 | 0.92245 |
| East Tennessee State                 | Traditional Public | 143688 | 143688 | 0.8171 | 82 | 1.24702 | 0.97337 |
| Fairleigh Dickinson                  | Traditional Private | 151279 | 151279 | 0.8295 | 88 | 1.29327 | 1.00947 |
| Ferris State                         | Traditional Public | 91460 | 123546 | 0.8042 | 143 | 0.80648 | 0.85035 |
| Findlay                              | Traditional Private | 164321 | 164321 | 0.8772 | 57 | 1.32838 | 1.03687 |
| Florida                              | Traditional Public | 96655 | 174456 | 0.9065 | 278 | 0.75611 | 1.06524 |
| Florida A&M                          | Traditional Public | 40250 | 112309 | 0.7427 | 171 | 0.38431 | 0.83701 |
| Georgia                              | Traditional Public | 80583 | 170955 | 0.9478 | 134 | 0.60291 | 0.99838 |
| Hampton                              | Traditional Private | 131896 | 131896 | 0.6792 | 53 | 1.37709 | 1.07489 |
| Harding                              | Traditional Private | 148379 | 148379 | 0.7736 | 53 | 1.36014 | 1.06166 |
| Hawaii                               | Traditional Public | 91490 | 159722 | 0.8108 | 74 | 0.80018 | 1.09039 |
| Houston                              | Traditional Public | 88519 | 157368 | 0.9746 | 118 | 0.64408 | 0.89376 |
| Howard                               | Traditional Private | 130414 | 130414 | 0.8438 | 64 | 1.096 | 0.85549 |
| Husson                               | Traditional Private | 136665 | 136695 | 0.907 | 43 | 1.06851 | 0.83421 |
| Idaho State                          | Traditional Public | 80134 | 160393 | 0.9344 | 61 | 0.60815 | 0.95013 |
| Illinois at Chicago                  | Traditional Public | 121043 | 185087 | 0.8814 | 194 | 0.97385 | 1.16234 |
| Incarnate Word                       | Traditional Private | 139095 | 139095 | 0.9545 | 88 | 1.03339 | 0.80662 |
| Iowa                                 | Traditional Public | 107931 | 194750 | 0.8860 | 114 | 0.86385 | 1.21668 |
| Kansas                               | Traditional Public | 96308 | 174780 | 0.9928 | 138 | 0.6879 | 0.97445 |
| Keck (KGI)                           | Traditional Private | 183506 | 183506 | 0.7581 | 62 | 1.71653 | 1.33985 |
| Kentucky                             | Traditional Public | 108647 | 195577 | 0.9683 | 126 | 0.79567 | 1.11799 |
| Lake Erie (LECOM)                    | Accelerated Private | 80845 | 80845 | 0.8485 | 297 | 0.67566 | 0.52739 |
| Lebanese American                    | Traditional Private | 89427 | 89427 | 0.8 | 5 | 0.79269 | 0.61874 |
| Lipscomb                             | Traditional Private | 162192 | 162192 | 0.9014 | 71 | 1.27597 | 0.99596 |
| Loma Linda                           | Traditional Private | 176612 | 176612 | 0.9036 | 83 | 1.38602 | 1.08187 |
| Louisiana at Monroe                  | Traditional Public | 94751 | 170659 | 0.9010 | 101 | 0.74574 | 1.04842 |

(Continued)
| Name a | Structure | Type | In State | Out of State | Pass Rate | All Attempts | TLI-Ni | TLI-No |
|--------|-----------|------|----------|--------------|-----------|--------------|--------|--------|
| Manchester | Traditional | Private | 157800 | 157800 | 0.65 | 80 | 1.72155 | 1.34377 |
| Marshall | Traditional | Public | 76819 | 129944 | 0.7778 | 90 | 0.70037 | 0.92474 |
| Maryland c | Traditional | Public | 102351 | 168965 | 0.8411 | 151 | 0.86292 | 1.11194 |
| Maryland Eastern Shore | Accelerated | Public | 90675 | 175469 | 0.9455 | 55 | 0.68007 | 1.02724 |
| MCPHS-Boston | Traditional | Private | 152731 | 152731 | 0.7962 | 260 | 1.36029 | 1.06178 |
| MCPHS-Worcester | Accelerated | Private | 157751 | 157751 | 0.7673 | 318 | 1.45792 | 1.13799 |
| Mercer | Traditional | Private | 139177 | 139177 | 0.7701 | 174 | 1.28158 | 1.00035 |
| Michigan | Traditional | Public | 115160 | 180999 | 0.9494 | 79 | 0.86016 | 1.05526 |
| Midwestern/D. Grove | Traditional | Private | 165059 | 165349 | 0.8352 | 176 | 1.40144 | 1.09583 |
| Midwestern/Glendale | Accelerated | Private | 166715 | 166715 | 0.9301 | 143 | 1.27108 | 0.99215 |
| Minnesota | Traditional | Public | 123823 | 177241 | 0.9353 | 170 | 0.93881 | 1.04892 |
| Mississippi | Traditional | Public | 89619 | 185493 | 0.9528 | 106 | 0.667 | 0.77795 |
| Missouri-KC | Traditional | Public | 85463 | 181097 | 0.9103 | 145 | 0.66576 | 1.10118 |
| Montana | Traditional | Public | 44138 | 116106 | 0.8261 | 69 | 0.37888 | 0.77795 |
| Nebraska | Traditional | Public | 84364 | 163770 | 0.9815 | 54 | 0.60953 | 0.92358 |
| New England | Traditional | Private | 160255 | 160255 | 0.8529 | 102 | 1.33242 | 1.04003 |
| New Mexico | Traditional | Public | 83577 | 168458 | 0.8352 | 91 | 0.70962 | 1.11643 |
| North Carolina | Traditional | Private | 94408.3 | 192566 | 0.9565 | 161 | 0.69993 | 1.11436 |
| North Dakota State | Traditional | Public | 70658 | 174206 | 0.8696 | 92 | 0.57619 | 1.10885 |
| North Texas | Traditional | Public | 70587 | 135881 | 0.8529 | 102 | 1.33242 | 1.04003 |
| Northeast Ohio | Traditional | Public | 97067 | 169855 | 0.9857 | 70 | 0.69832 | 0.95382 |
| Northeastern | Traditional | Private | 181516 | 181516 | 0.9609 | 128 | 1.33956 | 1.04561 |
| Notre Dame | Traditional | Private | 157152 | 157152 | 0.8519 | 54 | 1.30815 | 1.02109 |
| Nova Southeastern | Traditional | Private | 124408 | 140655 | 0.9004 | 241 | 0.97981 | 0.86467 |
| Ohio Northern | Traditional | Private | 139826 | 139826 | 0.9122 | 148 | 1.08699 | 0.88486 |
| Ohio State | Traditional | Public | 96019 | 188342 | 0.9576 | 118 | 0.71105 | 0.98866 |
| Oklahoma | Traditional | Public | 94237 | 176313 | 0.9125 | 80 | 0.73234 | 1.0695 |
| Oregon State | Traditional | Public | 100035 | 166431 | 0.9176 | 85 | 0.77308 | 1.00395 |
| Pacific-CA | Accelerated | Private | 194674 | 194674 | 0.9585 | 193 | 1.44027 | 1.12421 |
| Pacific-OR | Accelerated | Private | 136393 | 136393 | 0.8302 | 106 | 1.16503 | 0.90937 |
| Palm Beach Atlantic | Traditional | Private | 146925 | 146925 | 0.7875 | 80 | 1.32304 | 1.0327 |
| PCOM-GA | Traditional | Private | 146830 | 146830 | 0.8349 | 109 | 1.24712 | 0.97344 |
| Philadelphia | Traditional | Private | 184093 | 184093 | 0.9202 | 163 | 1.41867 | 1.0735 |
| Pittsburgh | Traditional | Public | 124323 | 138328 | 0.9068 | 118 | 0.97151 | 0.84436 |
| Presbyterian | Traditional | Private | 138256 | 138256 | 0.8333 | 78 | 1.17655 | 0.91836 |
| Puerto Rico | Traditional | Public | 33590 | 10445 | 0.9714 | 35 | 0.24521 | 0.05952 |
| Purdue | Traditional | Public | 90503 | 168108 | 0.8411 | 151 | 0.76303 | 1.1063 |
| Regis | Traditional | Private | 164712 | 164712 | 0.9853 | 68 | 1.18545 | 0.92531 |
| Rhode Island | Traditional | Public | 77944 | 141740 | 0.9365 | 126 | 0.5902 | 0.83775 |
| Roosevelt | Accelerated | Private | 149029 | 149029 | 0.8852 | 61 | 1.19387 | 0.93188 |
| Rosalind Franklin | Traditional | Private | 137572 | 137572 | 0.8088 | 68 | 1.20619 | 0.9415 |
| Roseman | Accelerated | Private | 154967 | 154967 | 0.827 | 237 | 1.3288 | 1.03721 |
| Rutgers | Traditional | Public | 77150 | 135112 | 0.8994 | 179 | 0.60829 | 0.9423 |
| Saint Joseph | Accelerated | Private | 141393 | 141393 | 0.7159 | 88 | 1.40056 | 1.09322 |
| Samford | Traditional | Private | 145697 | 145697 | 0.9060 | 117 | 1.14083 | 0.89013 |
| Shenandoah | Traditional | Public | 137540 | 137540 | 0.9136 | 81 | 1.06758 | 0.8333 |
| South Carolina (COP) | Traditional | Public | 73707 | 110061 | 0.9211 | 190 | 0.56745 | 0.66139 |
| South Dakota State | Traditional | Public | 77732 | 122899 | 1 | 76 | 0.55122 | 0.68027 |
| South Florida d | Traditional | Public | 231732 | 117672 | 0.8316 | 95 | 1.97605 | 0.78323 |
| Southern California | Traditional | Private | 218952 | 218952 | 0.9651 | 172 | 1.60881 | 1.25576 |
| Southern Ill. Edwardsville | Traditional | Public | 108367 | 128031 | 0.96 | 75 | 0.80048 | 0.7382 |

(Continued)
DISCUSSION

The Tuition:Licensure Index represents a practical tool for estimating PharmD program value. While differences in TLI-Ni category (ie, “one or less” and “greater than one”) for traditional vs accelerated PharmD programs were not significant (Table 2), a major difference was found in TLI-Ni category for public vs private programs ($X^2 = 93.63, p < .0001$) (Table 2). In other words, significantly more public PharmD programs are associated with a TLI-Ni of one or less, indicating, on a relative basis, that in-state public programs deliver better value than private programs in terms of tuition cost and a successful NAPLEX outcome. No differences in the frequencies of public vs private or traditional vs accelerated programs by TLI-No category were observed, which suggests that all out-of-state program types are of comparable value.

The current student debt crisis in the United States, now topping $1.5 trillion, places considerable importance on the relationship between tuition and successful student outcomes, especially for pharmacy, where
rising program costs and declining market opportunity now constitute the environment into which students transition upon graduation.\textsuperscript{3-7} While little empirical research is available regarding why students choose post-secondary educational programs in general\textsuperscript{21} or PharmD programs in particular, anecdotal evidence from the lay press suggests that tuition and corresponding program outcomes are infrequently considered.\textsuperscript{22-28} Prospective PharmD students should therefore be encouraged to examine program tuition in light of licensure pass rates and consider the importance of these criteria before choosing a program and incurring significant education-related debt. Hopefully, a renewed focus on tuition and successful student outcomes, particularly but not exclusively through use of the TLI-N, will enhance pharmacy market conditions by further empowering prospective students with the data necessary for informed decision-making.

The potential effect of three important variables on the TLI-N is unknown: student academic prowess, program leadership, and faculty qualifications. In other words, do students with greater academic prowess, as measured by grade point average (GPA) and Pharmacy College Admission Test (PCAT) scores, preferentially select in-state public pharmacy programs? Do distinctive characteristics exist regarding the leadership and faculty of programs associated with TLI-N values of one or less vs those of programs with values greater than one? In terms of academic prowess, average (composite) pre-pharmacy GPA and PCAT scores for the 2018 graduating cohort were not available for inclusion in this analysis. Kuncel and colleagues\textsuperscript{29} used meta-analytic methods to suggest that PCAT scores and pre-pharmacy GPA values are positively correlated to NAPLEX scores. However, newer data, although limited by a single institution and pre-NAPLEX outcomes, are not strongly indicative of this relationship.\textsuperscript{30} In terms of leadership and faculty qualifications, Popovich and colleagues\textsuperscript{17} and Brazeau\textsuperscript{31} suggest a link between leadership and program outcomes. Popovich and colleagues\textsuperscript{17} further contest that many programs rely on faculty and administrators with minimal practice knowledge or academic experience to deliver core components of program curricula. However, aside from these reports and periodic, global (ie, non-program-specific) assessments of the educational credentials of leaders and faculty members, little is available in the professional literature linking leadership, faculty members, and program outcomes. Further study should examine TLI-N in light of student academic prowess, leadership qualifications, and faculty qualifications to better characterize PharmD program value.

Inputs used in this analysis may preclude a more precise estimation of program TLI. In terms of cost inputs, the author recognizes that sole use of tuition and fees can oversimplify costs of attending a pharmacy program, especially considering variations in cost of living, scholarship availability, and tuition assistance programs. Likewise, use of NAPLEX pass rates in TLI-N may limit a deeper, perhaps cleaner, conceptualization of value. For instance, while for most programs, “all attempts” rather than “first time attempts” are associated with higher pass rates, “all attempts” may not be representative of the performance of the 2018 graduating cohort. Second, use of average scores (continuous-level data), which are not publicly available, may be preferable to using pass rates (nominal-level data) because they may provide a clearer understanding of graduate performance. Finally, while the sole use of NAPLEX pass rates in the TLI-N may be questioned, this perceived limitation may also represent a strength, bringing into focus the fundamental concern of consumers and producers: value for money. The TLI is intended as an addition to the suite of accepted assessment metrics and not as a single, summative measure.

CONCLUSION

Data from the 2018 graduating cohort suggest that in-state public (rather than private) PharmD programs offer the better value in terms of tuition and licensure pass rates, with no differences found in the TLI-N for traditional vs accelerated (in-state and out-of-state) or public vs private (out-of-state) programs. For students who wish to attend
out-of-state programs, the choice of program does not appear to matter, ie, out-of-state tuition costs for public PharmD programs become comparable to private program tuition. Given current market conditions in pharmacy, prospective students are strongly encouraged to consider tuition and licensure pass rates when selecting a PharmD program.

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