University of Maryland Baltimore Affordability Study

Executive Summary

The issue of college affordability has become increasingly prominent in recent years. For undergraduate students, the cost of an attendance increased 63% between 2006 and 2016, while consumer prices overall increased 21%.[1] At the same time, median household income nationwide increased by less than 3%.[2]

The affordability problem flows from the undergraduate to the graduate and professional school environment, where educational costs are typically far greater. These greater (and increasing) costs may dissuade potential students from seeking an advanced degree. Especially for those fields where supply is expected to fall short of demand (particularly allied health), it is crucial to maintain an adequate pipeline of workers into these areas.

The University of Maryland, Baltimore plays a key role in meeting the workforce demands for the state in health, legal, and social work professions. To maintain this role, it will be important to maintain a level of affordability that allows students from all geographic and socioeconomic areas of the state to participate in its programs. To achieve this goal, it is necessary to define and understand what "affordability" means; provide a mechanism to operationalize it; and provide preliminary estimates and benchmarks for affordability.

In support of these goals, which were articulated in the 2017-2021 UMB Strategic Plan, HelioCampus has provided the foundation to achieve the *Student Success* theme's Strategic Outcome 1, "Academic programs and offerings that are affordable and accessible to Maryland's residents of all races, ethnicities, and income levels." We provide

- a data model that allows rapid, deep, and ongoing analysis of student debt and repayment
- a set of data visualization tools to investigate affordability under various scenarios after graduation (including location, salary, professional field, and repayment amounts)
- an overview of gaps in the data and how these gaps might be alleviated
- a roadmap for future studies to understand affordability.

We find that, in general, UMB professional programs continue to be affordable. Student debt at graduation has increased in recent years at a slower rate than the cost of attendance. School of Pharmacy graduates are most likely to pay down their debt within seven years (the time span used in this study), and School of Dentistry graduates exhibit the highest debt at graduation. Repayment rates (dollars per year) vary widely by program, but repayment ratios (proportion of debt paid per year) is consistent, typically in the high single digits.

Affordability based on expected wages vs. accumulated debt was fairly idiosyncratic. The interplay of accumulated debt, wages at entry into the workforce, and repayment rate makes it unrealistic to generalize. However, for many graduates, relocating to the lower Eastern Shore and western Maryland would be much less affordable than practicing in high-cost/high-earning areas of central Maryland.

While we took advantage of the availability of individual-level characteristics of students up through their graduation and also included post-graduation debt levels, a significant gap still exists in the availability of details of salary and location. Prospective longitudinal tracking of graduates (through surveys or panel studies, for instance) would allow for a full understanding of professional school affordability.

[1] Bureau of Labor Statistics, U.S. Department of Labor, The Economics Daily, College tuition and fees increase 63 percent since January 2006 on the Internet at https://www.bls.gov/opub/ted/2016/college-tuition-and-fees-increase-63-percent-since-january-2006.htm (visited November 1, 2017).
[2] U.S. Bureau of the Census, Real Median Household Income in the United States [MEHOINUSA672N], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MEHOINUSA672N, November 1, 2017.

Introduction

With a successful reaffirmation of MSCHE accreditation following the 2016 Self-Study, UMB intends to align the findings with its next Strategic Planning process. Several priorities were established, one of which is to *Establish "affordability metrics" that form the basis of a financial aid program that ensures UMB's academic offerings remain affordable and accessible to Maryland residents from a diverse range of ethnic and socioeconomic backgrounds.*[i]

Although affordability is a critical component for both the individual student and the long-term health of an institution, defining and parameterizing is an uncommon exercise. To this end, HelioCampus is excited to provide an investigation of potential metrics and how they might be used to reinforce UMB's commitment to educational opportunity for Maryland residents. The approach HelioCampus will take reinforces the idea that goals, objectives, and actions are aligned in service to the vision and mission of UMB.

College Affordability

The issue of college affordability has become increasingly prominent in recent years. For undergraduate students, the cost of an attendance increased 63% between 2006 and 2016, while consumer prices overall increased 21%.[ii] At the same time, median household income nationwide increased by less than 3%.[iii]

The problem of college affordability has become increasingly urgent over the past decade, to the extent that there is now a question as to whether there is sufficient return on investment for attending college. Despite plentiful research on the wage premium of a college degree (and evidence that this wage premium is increasing), the prospects of incurring six figures in debt to realize an earning premium that occurs over decades is still daunting.

For baccalaureate degrees, research aiming at understanding college affordability, the earnings premium of a college degree, and the return on investment of a program of study is fairly plentiful. In fact, affordability issues have been a major focus in the late stages of the Obama administration, leading to policy initiatives such as the College Scorecard, the Financial Aid "Shopping Sheet," and the Net Price Calculator.

Underlying these initiatives is a fairly robust body of research surrounding the benefits of a Bachelor's degree. Perhaps the most widely publicized of this research is Georgetown University's Center on Education and the Workforce 2011 report *What's It Worth? The Economic Value of College Majors,* which estimated median earnings by major across gender and ethnicity using 2009 American Community Survey data. Although dissection of the earnings premium for undergraduate degrees (~84%)[iv] was thorough, graduate degrees were less deeply reviewed, and first-professional degrees were essentially not discussed.

Another widely regarded project was published in 2014 by the Lumina Foundation, who turned the prism of affordability away from the institution and toward the student in *College Affordability: What Is It and How Can We Measure It*?[v] Going beyond the simple measure of unmet need to distinguish between "expensive" and "unaffordable," they propose viewing college affordability by institution prices; graduate earnings; income-based characteristics such as savings rate and discretionary income; and student debt. This led to a subsequent publication, *A Benchmark for Making College Affordable: The Rule of 10*.[vi] Under the "Rule of 10" model, an undergraduate degree could be considered "affordable" if a graduate could pay for college using 10% of discretionary income over 10 years in addition to earnings from working 10 hours per week while in school. It is important to recognize several features of this model. First, it is prospective, and suggests that savings prior to entering college are a major component of avoiding loan debt as a result of attending college. Second, it defines "discretionary income" as 200 percent of the poverty rate. Third, it proposes to provide a benchmark for what students can afford to pay, rather than how much a college education should cost. Finally, this model is focused on the cost of an undergraduate (two year or four year) degree.

By contrast, efforts to understand graduate and professional school affordability have lagged greatly. The most developed of these approaches tends to be for law school. The Access Group, in its 2015 report *A Framework for Thinking About Law School Affordability*[vii], explicitly considered law school differences, geographic and employment differences, and individual differences to conclude that in many cases, the earnings premium does not justify the investment. However, others are more optimistic about the environment for law students, such as Simkovic and McIntyre (2014)[viii], who estimate a lifetime earnings premium for a law degree at $1 million or more. Analyses for other first-professional degrees appear to be inadequate.

To date, this benchmark has not been formally operationalized, even though a recent study by the Institute for Higher Education Policy did use the Rule of 10 to compare affordability for various "typical" student against (typical, aggregated) net prices for institutional sectors. This simulation suggested that for all but the highest-income families, most colleges are unaffordable based on the Rule of 10.[ix] Importantly, IHEP recognized that affordability is not a binary metric, but should be contextualized to estimate individual goals and circumstances, including geography and personal lifestyle. This crucial perspective is also reflected in our study.

We aim to understand the socioeconomic and demographic characteristics of debt accrual and how debt incurred during professional education affects a proposed definition of affordability. HelioCampus' approach to data modeling and analysis allows us to incorporate two novel features into this study. First, using unit record level files allows us to model affordability in a retrospective fashion for individual students, rather than hypothetical or "average" students. Second, we apply this model to professional degree programs, in which students typically and willingly incur very high levels of debt with the expectation that this debt will be dischargeable within a reasonable time based on the high earnings associated with these degrees.

Deliverables

To provide a robust picture of affordability for UMB and its constituent schools, HelioCampus leveraged its expertise in data modeling, analysis, and visualization to provide the following products. The focal programs in all of these products included Nursing (Bachelor's and Master's); Social Work (Master's); Medical, Pharmacy, Law, Dental.

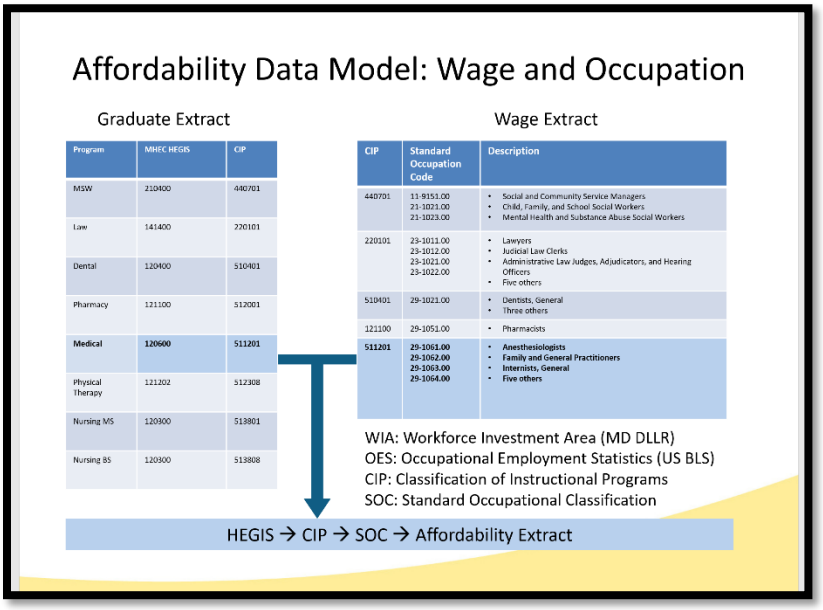
1) Affordability Data Model

In collaboration with subject matter experts at UMB, HelioCampus identified the appropriate data sources and elements therein to support an analysis of debt and affordability. These sources included historical census files (enrollment, degree, and financial aid) and debt at graduation across programs spanning a 10-year time frame. Our data engineers combined these files into a single Graduate Extract that was used to analyze debt characteristics.

We then developed a Wage Extract using Occupational Employment Statistics data from the U.S. Bureau of Labor Statistics (resolved to the state level) and Maryland Department of Labor, Licensing and Regulation Quarterly Census of Employment and Wages, resolved at the county and Workforce Investment Area level, which comprises economically similar counties.

These two data sets were then combined to generate an Affordability Extract (Fig. 1). The critical linking function used to join these two sources was the Classification of Instructional Programs (CIP) code, which links to both instructional programs in the former extract and occupational codes in the latter.

Figure 1. Structure of the Affordability Extract.



2) Dashboards

Following data analysis, HelioCampus developed a series of dashboards that provided an overview of patterns and trends in enrollment, degree recipients, and debt and repayment rates. Details of repayment rate calculations are included in the technical appendix. Understanding student debt and repayment is the foundation on which the Affordability Estimator dashboard is based.

a. Historical Trends of Cost of Attendance, Financial Aid Awards, Student Debt and other UMB key metrics.
b. Benchmarking Metrics for UMB against a selected peer group for Tuition and fees, Financial Aid, Student Debt, Diversity, and other key metrics.
c. Affordability Trends broken out by school, program and student attributes.

3) Project summary & roadmap for future work

At the outset, it was clear that significant roadblocks would be present in the form of sparse or unobtainable data. Defining and articulating these data deficiencies, and suggesting approaches to work around these deficiencies, is a key goal of this work.

The HelioCampus Analytic Strategy

While the Lumina Foundation correctly note that unmet need and Expected Family Contribution are limited in their utility to estimate or parameterize affordability, their work is focused in scope to the cost of education. As their work implicitly recognizes, however, the fundamental driver of affordability is student debt.

We can decompose affordability into two basic equations.
The affordability condition exists where

1) Cost of Education ≤ ([10% of discretionary income] × [10 years]) + [10 hours/week in-school employment]

As shown in the IHEP study, this condition does not hold for the vast majority of college attendees. The difference, then, is accounted for by loans, which means that students graduate with debt. This debt can be defined as

2) Student Debt= [Cost of education] – [financial aid] – [Monetary contributions from work/family].

Knowing accurately at the student level how much debt a graduate has when they begin their career allows us to estimate how they might repay their debt. But we also need to understand how the debt is repaid, and what correlates exist with debt accrual and repayment. Therefore, we use in a three-pronged approach. First, we visually and statistically analyze actual total debt at graduation to understand

-What are debt levels at graduation across programs?
-What student characteristics correspond to debt level?
-How many students graduate without debt, and what features do these graduates exhibit?

Second, we leverage the National Student Loan Data System to capture current debt among a representative subsample of graduates. This provided a cross section of graduates from across programs over a range of time since graduation. We used these data to ask

-What is the typical time to repayment, and how does it vary?
-What is the typical rate of repayment, and does this vary across programs and over time?
-Are rates of repayment constant in terms of amount repaid and proportion of debt repaid?

Third, we used the insights gained from these exercises to develop an Affordability Estimator, incorporating student debt and demographic characteristics with official state and federal wage data to understand under what conditions a degree would be considered affordable. The tool is a robust and flexible, and helps to answer for whom and where a degree is affordable.

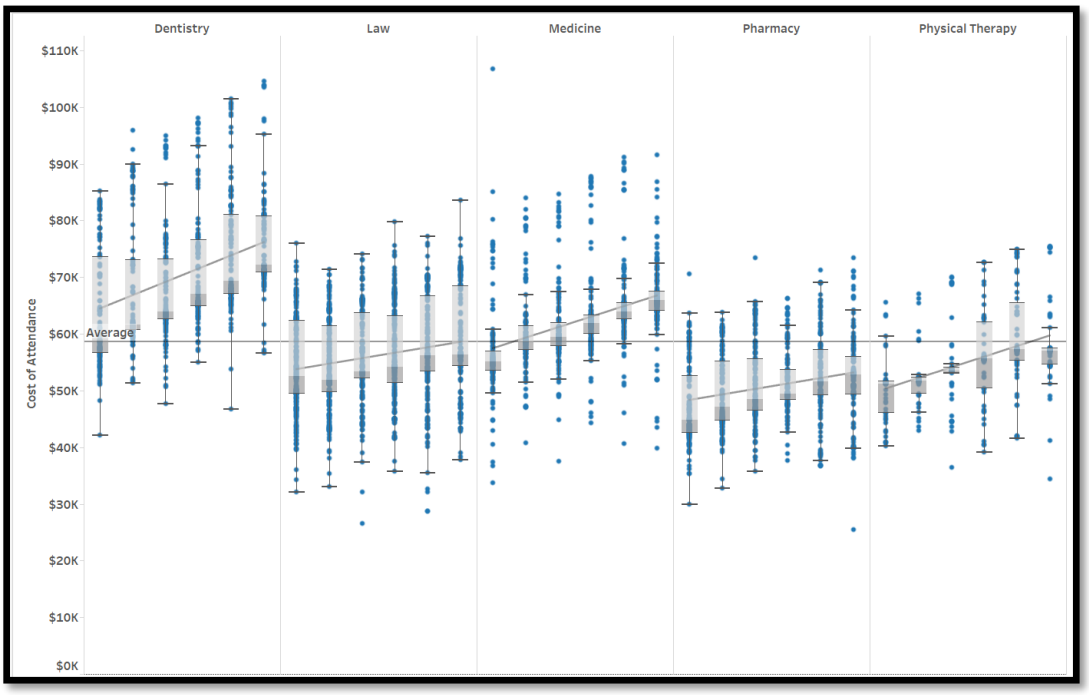
The Foundation of Affordability: Student Debt

College affordability has become a prominent issue because of the rapid increase in the cost of attendance. It has been amply documented that the increase in college tuition has far outpaced wages and inflation over the past few decades. For public four-year institutions, the inflation-adjusted total cost of attendance increased more than half between 2006 and 2016[x]. Even in the state of Maryland, which has historically consistently supported higher education, tuition and fees have increased roughly 3% per year in recent years[xi], compared with median household income that has been consistently lower.

The unique structure of UMB, where individual professional schools have greater autonomy and latitude in cost structure (within the constraints set by USM), results in greater variability in cost structure and potentially greater increases in some Schools than others.

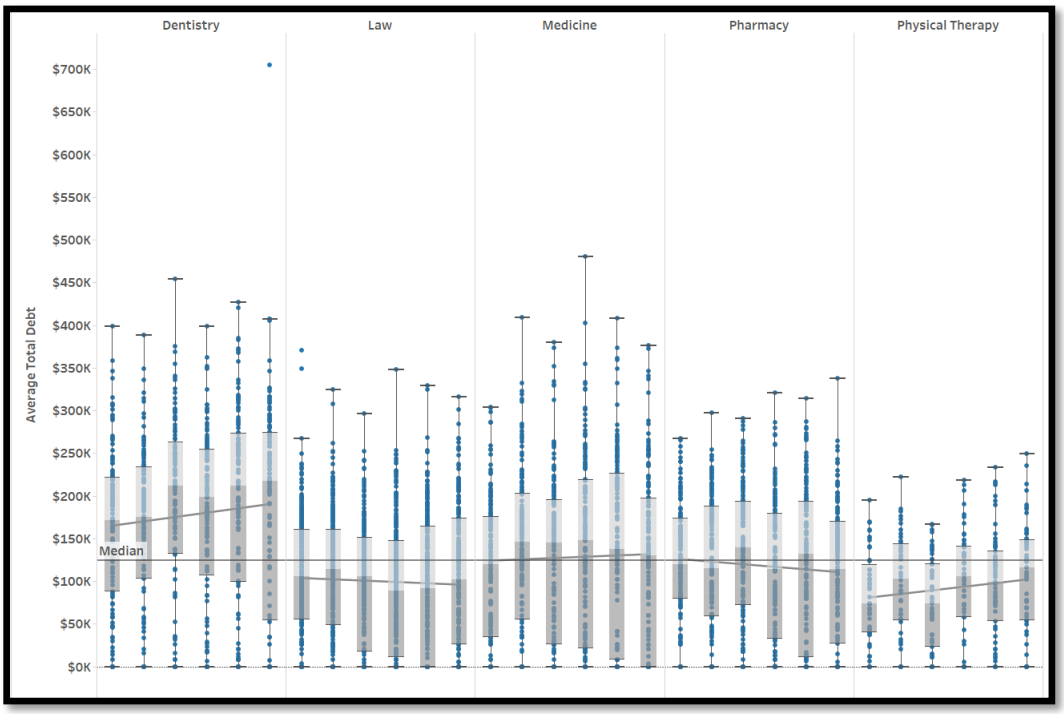
As shown in Fig. 2, the cost of attendance for professional school students has increased at a fairly consistent rate, with the School of Dentistry increasing the most from 2011-2016.

Figure 2. Trends in educational expenses among professional schools.



However, even though the cost of attendance has escalated, average levels of student debt at graduation have increased at a much lower rate, and in a few cases, have actually declined over the same time period (Fig. 3).

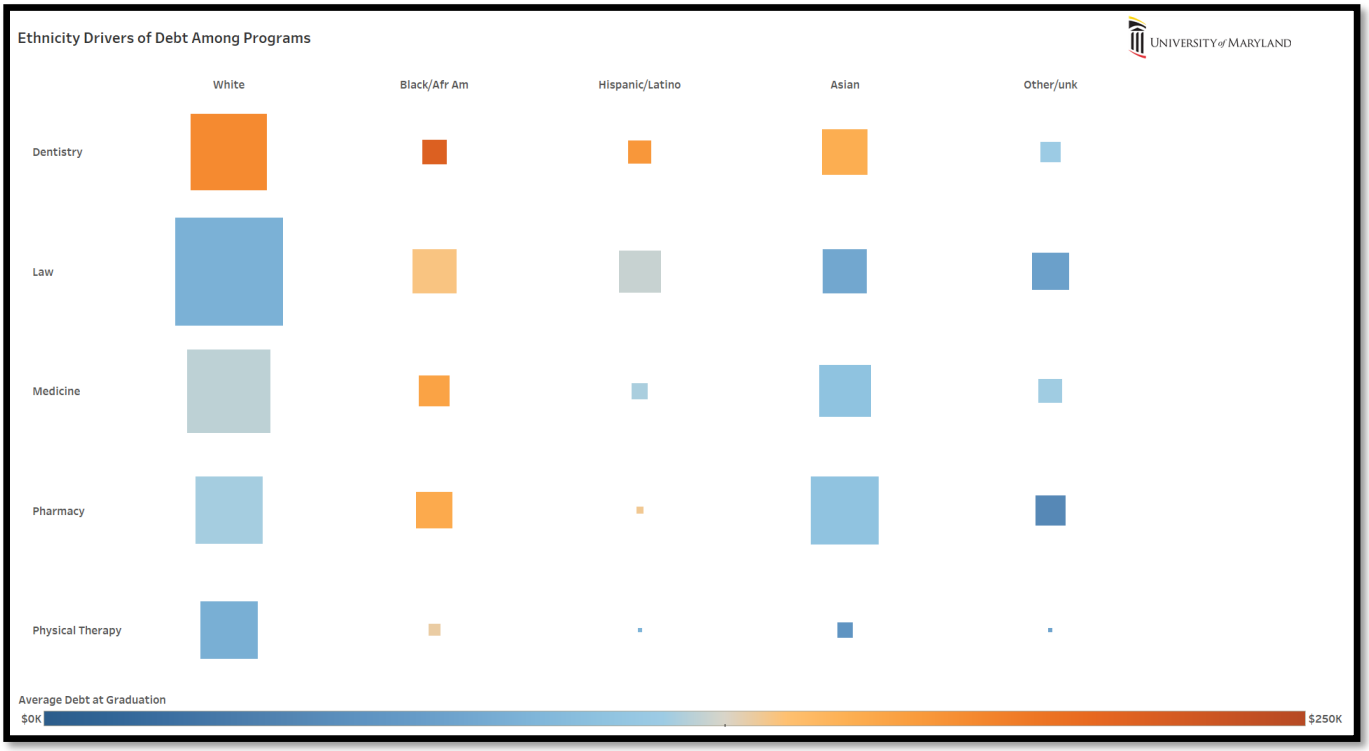
Figure 3. Trends in student debt at graduation.



Still, there is a high level of disparity in which students accrue the most debt. Graduates of the School of Dentristry accumulate significantly more debt than students from any other school. There is little evidence for systematic gender-based difference in debt load.

Conversely, there is a tremendous racial disparity in debt at graduation. Underrepresented minorities, and especially African American graduates have consistently far greater debt level than their fellow graduates. Fig. 4 shows these debt levels by color, with relative number of graduates indicated by the size of each square. The most dramatic disparity occurs for Law School graduates, where African Americans on average can expect to graduate with 55% greater debt than their white counterparts. African American School of Dentristry graduates have the dubious distinction of graduating with the greatest amount of debt, averaging $218,000.

Figure 4. Debt levels at graduation by professional school and ethnicity. Color indicate amount of debt, and symbols size corresponds to the number of graduates in that category.



The other major component of debt levels at graduation is the level of education of the parents. While this effect is small across all schools, it is particularly keen for School of Dentistry students, where graduates whose parents attended college incurred $31,000 less debt on average than their counterparts whose parents did not attend college.

This pattern persisted for those students graduating with no debt: 8% of students whose parents did not attend college graduated with no debt, vs. 13% of students whose parents attended college. Within-program disparities were not notable.

In general, based on raw debt accumulated, Dental School and minority graduates are at the forefront of facing the issue of high debt. Conversely, Pharmacy and Physical Therapy students tend to face much lower debt obstacles upon entering their professional careers.

Operationalizing Affordability: Debt Repayment

Regardless of the total amount of debt a student graduates with, that debt must still be paid down eventually. How a graduate pays down this debt will certainly reflect numerous choices a graduate makes, including geographic, family, and professional considerations. The range of possibilities is vast; before delving into these lifestyle factors, though, it is useful to understand broad patterns of repayment rates, both absolute and relative to total debt.
We submitted ~450 names to NSLDS of graduates with debt from the programs of interest to identify the amount the currently still owe. These 450 graduates were distributed proportionally across the graduating classes of 2011 through 2015 and across the programs of interest. Using these values, we estimated absolute per year repayment

rate as [initial debt - remaining debt]/years since graduation, and proportional repayment rate (repayment ratio) as ([initial debt – remaining debt] /initial debt)/years since graduation.
Within each program, rates of change of repayment rate and repayment ratios were shallow, allowing us to compare these consistent repayment metrics across programs and demographic features. Similar to debt accrued, repayment rate was significantly greater for Dental School graduates; Pharmacy School graduates also repaid debt at higher levels per year than other programs. Notably, the former also had the highest total debt, whereas the latter was similar to other programs.

These disparities in debt and repayment, however, do not extend to repayment behavior; graduates on average repaid their debt at an average of 8-13% per year. Even for those programs where repayment may be delayed due to the professional pathway (e.g. MD graduates progress through residencies and internships) or career choices (many JD graduates obtain employment in the public sector or take on clerkships), there are relatively low amounts of variation. The result of this is that debt clearance among UMB graduates sits at ~30% after 7 years, the longest time period available for this data set. Pharmacy School graduates had a 38% payoff rate at 7 years, highest among all programs.

Finally, we modeled debt "survival" to estimate the predicted interval-specific likelihood of debt fulfillment. Although the number of data points available for residual debt was generally too low for sufficient statistical power to see an effect, patterns were similar to those seen across other analyses. Pharmacy graduates had a 52% predicted expectation of retiring debt at 7 years, and graduates of the dental program had just a 36% likelihood. Other programs hovered ~40%.

Along with total debt and other features, minorities showed a striking (and significant) gap in likelihood to repay. Underrepresented minorities had a predicted likelihood of repayment of just 17%, compared to 47% for non-minorities.

Affordability in Real Life: The Affordability Estimator

Retrospectively, there are consistent and clear patterns in debt accumulation and repayment. For various other stakeholders, a retrospective point of view may not be sufficient. Campus and program leaders are keenly interested in where their students are coming from, and where they go after graduation. Policy makers need to ensure that the critical functions provided by graduates can be filled without regard to geographic constraints. And the most important constituents, students (and prospective students) need to know the extent to which educational debt may constrain them in geographic, professional, and lifestyle choices.

Repayment of debt is based on the amount of discretionary income available to an individual. Estimating repayments prospectively, even using historical data, is difficult because of the uncertainty in defining discretionary income. In the Lumina Foundation model, discretionary income was defined as anything over 200% of poverty level. Certainly, this constraint is unnecessarily narrow for almost all graduated of UMB professional schools. Furthermore, we recognize that, while fairly consistent, there are numerous examples of (non-statistical) outliers for both debt and repayment. It is critical to account for this variation.

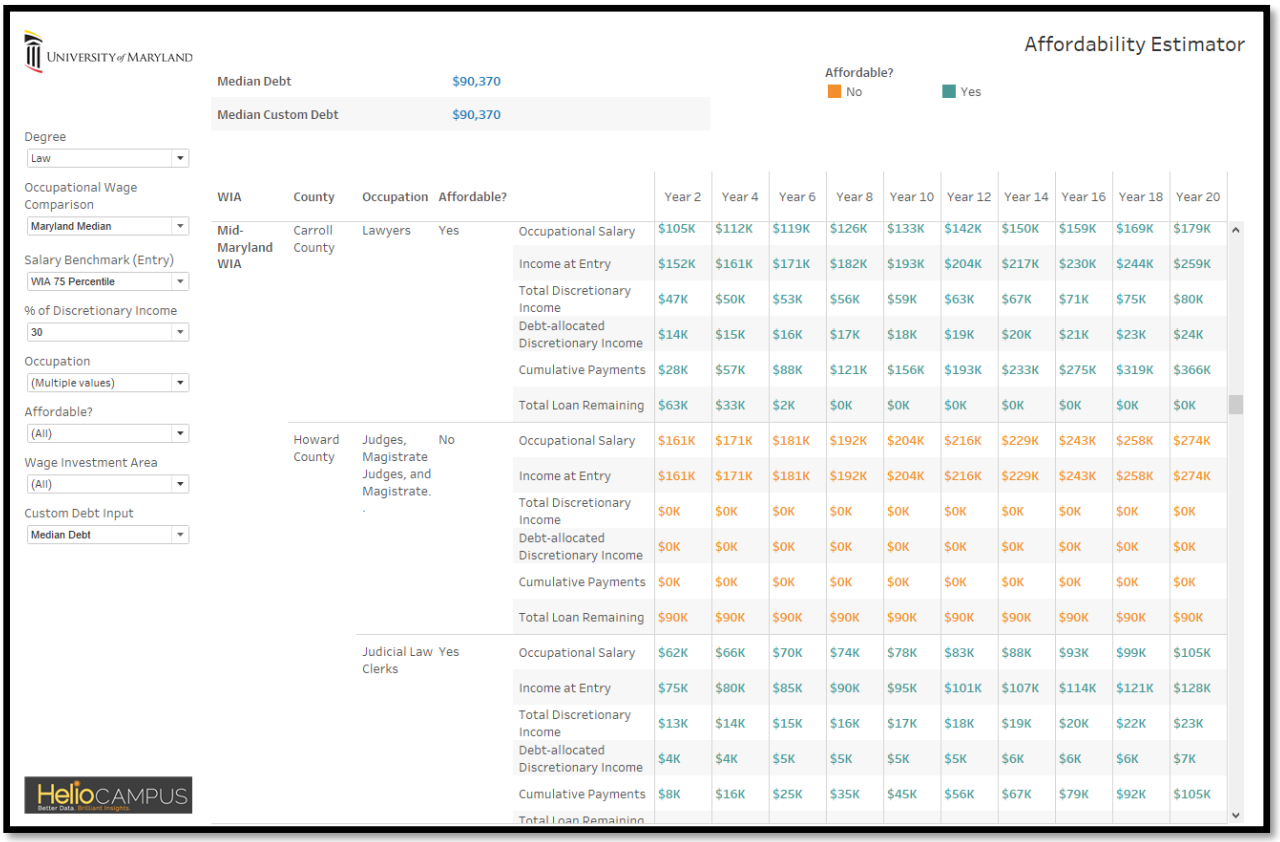
We therefore developed a tool that allows for maximum flexibility. The user is able to choose wage, salary, and discretionary-income levels based on what most accurately reflects their educational plans and professional goals, in addition to using "typical" or custom debt levels.

- Wage Benchmark: Using data from BLS and MD DLLR, the user can choose from a range of wage quantiles (specific for the occupational category of interest) corresponding to national or state-level wages.
- Salary Benchmark: Entry-position benchmark salaries can be selected from quantiles specific to Workforce Investment Area (MD multi-county areas) wages.

- Discretionary Income: We define discretionary income as the difference between the Salary Benchmark and the Wage Benchmark. Selecting low values for the Wage Benchmark and high values for Salary Benchmark results in higher discretionary income, all else being equal. The user selects the proportion of discretionary income to dedicate to debt repayment.
- Debt: The user can select a default debt level reflecting the median debt of the most recent graduating class (for the program in question), or custom debt levels.
- Occupation: The professional degrees offered by UMB typically correspond to multiple federal occupational codes. The Affordability Estimator allows the user to select a single occupation or compare across multiple occupations.

The output (Fig. 5) shows debt paid (yearly and cumulatively) on a biennial basis over 20 years, along with total remaining debt. For scenarios in which remaining debt reaches zero, that set of conditions is classified as "Affordable." The relative affordability of Maryland counties and Workforce Investment Areas is visualized to assist in understanding potential geographic constraints and disparities.

Figure 5. Representative sample output of the Affordability Estimator.



WIA	County	Occupation	Affordable?		Year 2	Year 4	Year 6	Year 8	Year 10	Year 12	Year 14	Year 16	Year 18	Year 20
Mid-Maryland WIA	Carroll County	Lawyers	Yes	Occupational Salary	$105K	$112K	$119K	$126K	$133K	$142K	$150K	$159K	$169K	$179K
				Income at Entry	$152K	$161K	$171K	$182K	$193K	$204K	$217K	$230K	$244K	$259K
				Total Discretionary Income	$47K	$50K	$53K	$56K	$59K	$63K	$67K	$71K	$75K	$80K
				Debt-allocated Discretionary Income	$14K	$15K	$16K	$17K	$18K	$19K	$20K	$21K	$23K	$24K
				Cumulative Payments	$28K	$57K	$88K	$121K	$156K	$193K	$233K	$275K	$319K	$366K
				Total Loan Remaining	$63K	$33K	$2K	$0K	$0K	$0K	$0K	$0K	$0K	$0K
	Howard County	Judges, Magistrate Judges, and Magistrate.	No	Occupational Salary	$161K	$171K	$181K	$192K	$204K	$216K	$229K	$243K	$258K	$274K
				Income at Entry	$161K	$171K	$181K	$192K	$204K	$216K	$229K	$243K	$258K	$274K
				Total Discretionary Income	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K
				Debt-allocated Discretionary Income	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K
				Cumulative Payments	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K
				Total Loan Remaining	$90K	$90K	$90K	$90K	$90K	$90K	$90K	$90K	$90K	$90K
		Judicial Law Clerks	Yes	Occupational Salary	$62K	$66K	$70K	$74K	$78K	$83K	$88K	$93K	$99K	$105K
				Income at Entry	$75K	$80K	$85K	$90K	$95K	$101K	$107K	$114K	$121K	$128K
				Total Discretionary Income	$13K	$14K	$15K	$16K	$17K	$18K	$19K	$20K	$22K	$23K
				Debt-allocated Discretionary Income	$4K	$4K	$5K	$5K	$5K	$5K	$6K	$6K	$6K	$7K
				Cumulative Payments	$8K	$16K	$25K	$35K	$45K	$56K	$67K	$79K	$92K	$105K
				Total Loan Remaining										

Affordability Case Studies

Because of the numerous possible permutations of inputs, we provide examples of how the Affordability Estimator might be used in practice.

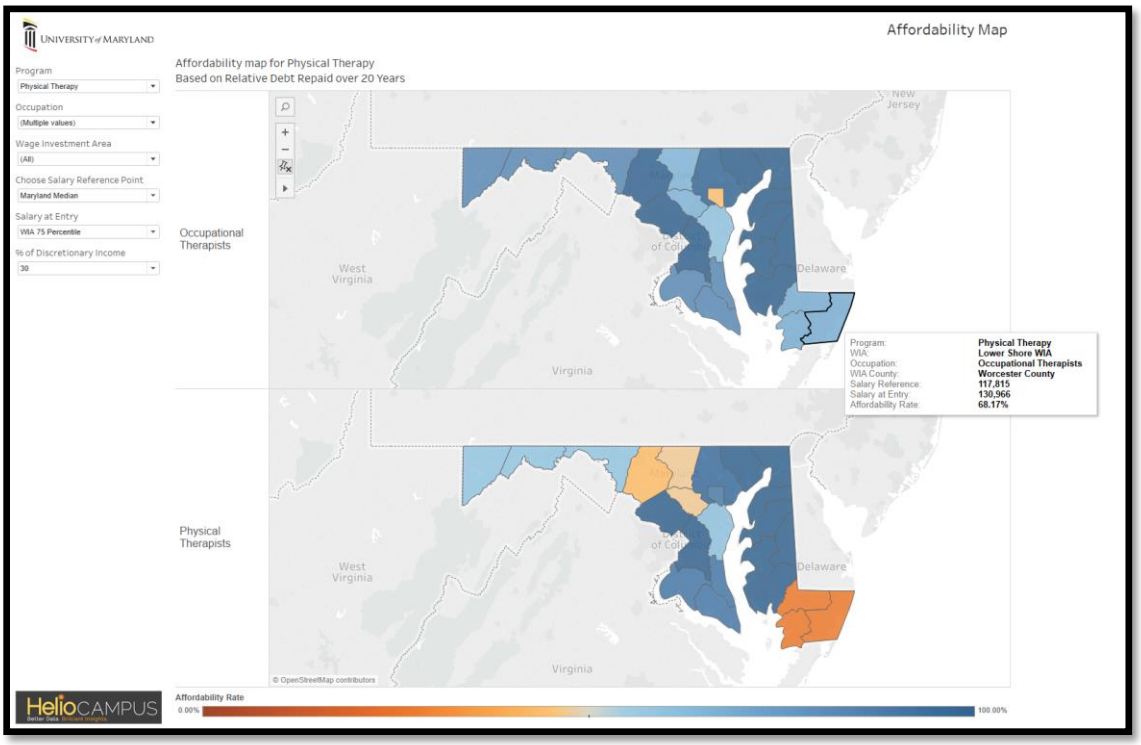
Example 1. Physical Therapy

For a hypothetical graduate with a "typical" debt set at the default amount of $115, 755. As a starting point, we set the Reference Salary to the state median for the occupation. (There are two shown in Fig. x, of five available that align with this degree.) Assuming a somewhat high demand for Occupational and Physical Therapists, the starting salary is set at the 75th percentile. A reasonable first pass for a typical graduate is 30% of discretionary income (depending on the county, this is generally $5,000 per year or less.)
This analysis (Fig. 6) shows that, under these conditions:

- a high degree of geographic variation exists
- occupational therapy is relatively more affordable across a wider geographic range
- the lower Eastern Shore is not particularly affordable, particularly as a Physical Therapist
- the upper Eastern Shore and northern MD are (perhaps surprisingly) affordable
- a large swath of central MD exhibits low affordability

While not shown, increasing the proportion of discretionary income dedicated to debt repayment to 50% reveals that essentially all of MD is now affordable for Occupational Therapists, and most of MD is now affordable for Physical Therapists (with the notable exception of the lower Eastern Shore). The nature of interplay between multiple variables allows us to see nonintuitive patterns that would otherwise be inscrutable without the visual approach used in the Affordability Estimator.

Figure 6. Affordability map for DPT graduates, showing Physical Therapist and Occupational Therapist.

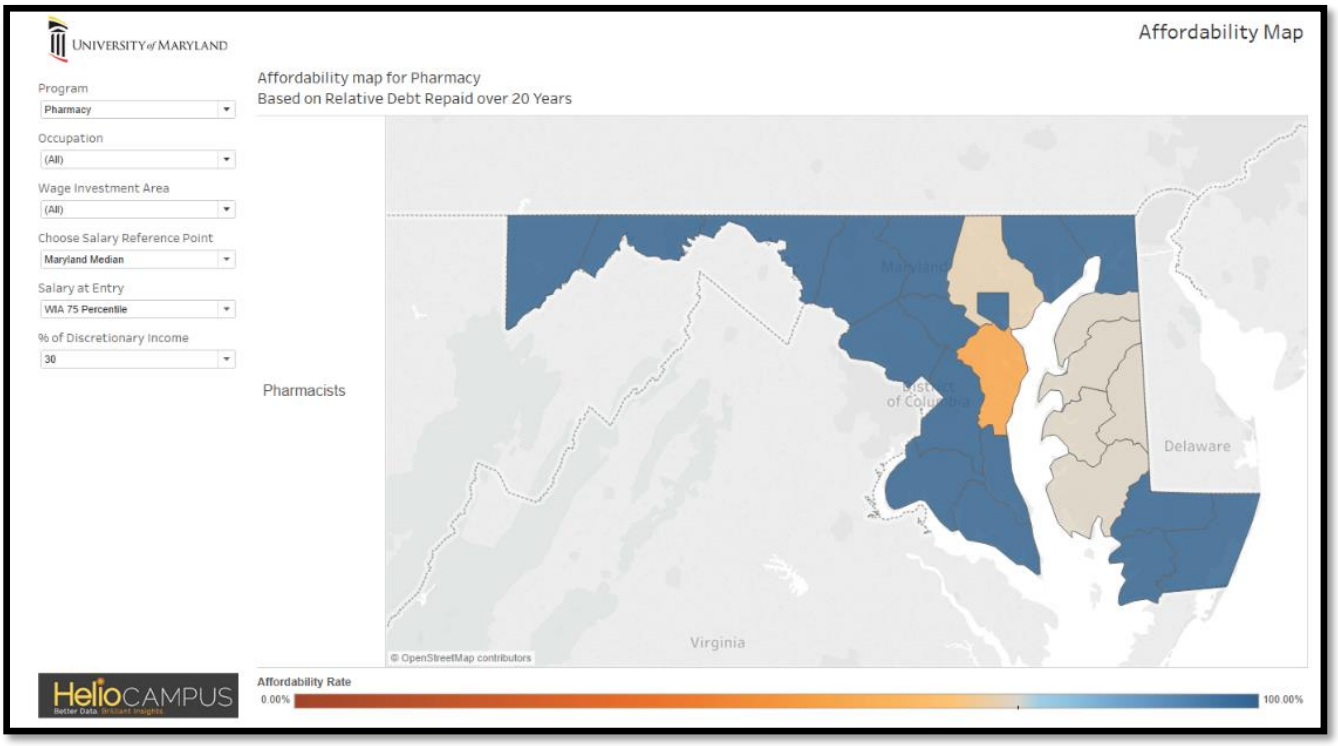


Example 2. Pharmacy

There is a striking disparity between affordability seen for the DPT and for Pharmacy graduates. Under identical conditions of debt levels and repayment rates, most of the state falls into the “affordable” classification (Fig. 7). Both western Maryland and the lower Eastern Shore are now affordable, whereas the upper Eastern Shore is much less so. There are several implications to these patterns:

- Currently affordable areas may experience a glut of graduates seeking to capitalize on this geographic difference in affordability.
- Those areas that are less affordable may conversely see a dearth of pharmacists, resulting in greater demand, higher wages, and eventually greater affordability.
- From an institutional perspective, it may be reasonable to review tuition and fees for this program to normalize a program that appears very affordable, or alternatively highlight program affordability in the long term for recruiting purposes.

Figure 7. Affordability map for Pharmacists in Maryland.

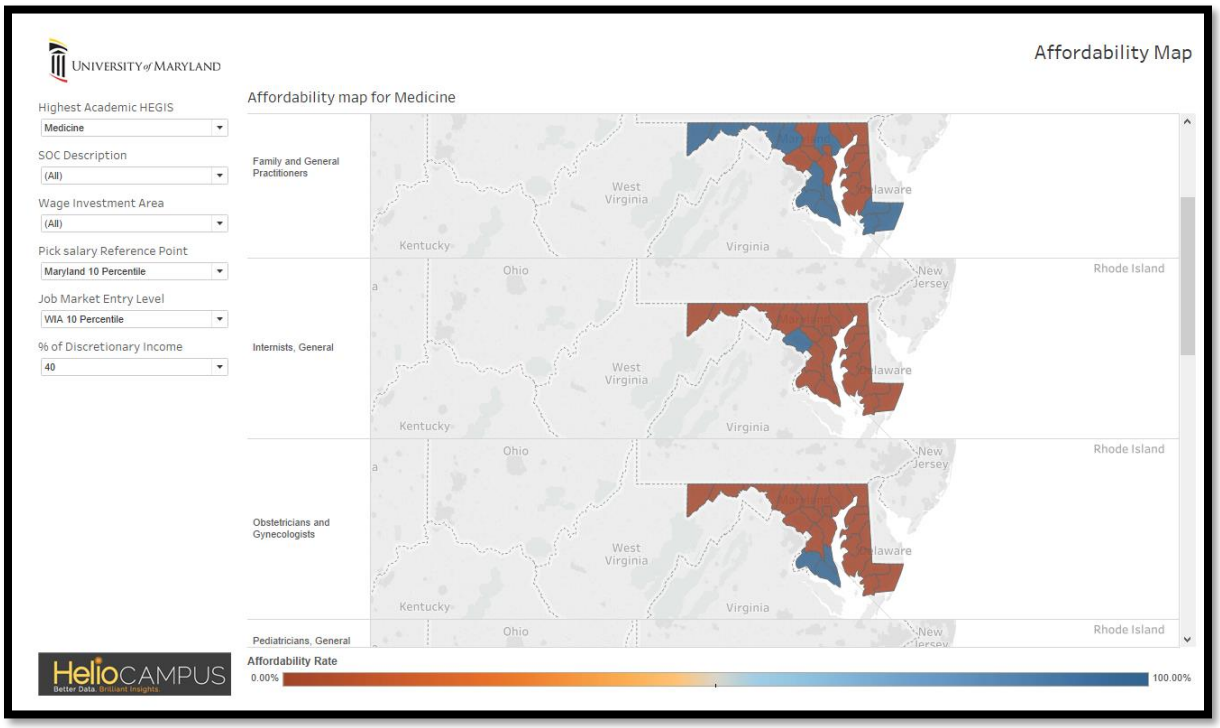


Example 3. Medicine

In the near future, the supply of physicians in Maryland is expected to roughly meet statewide demand. However, there is wide geographic variation in physician supply, such that non-metropolitan areas, particularly the southern Eastern Shore, with shortfalls of over 40%.[xii] Supporting an adequate level of health care manpower requires minimizing barriers to service in these underserved areas; being able to afford to practice in these areas is one potential barrier.

The Affordability Estimator suggests that there is tremendous variability in area-specific affordability for many medical disciplines. Unfortunately, the sparseness of wage data at the state and even national level precludes a full exploration of salary and repayment estimates across the state. In general, given median debt levels for medical school graduates and "typical" salary levels for many subfields, affordability appears to be restricted to pockets of the state in an idiosyncratic manner, and rarely are areas "affordable" when less than 40% of disposable income is dedicated to debt repayment (Fig. 8). Reducing debt levels by ~$20,000 does provide increase affordability somewhat. In some cases, affordability is reasonably good for areas that might be most expected to be unaffordable, e.g. at 40% discretionary income dedication, much of Maryland is affordable for Family and General Practitioners. This is not true for Internists and Ob/Gyn, conversely. In addition, the same southern Eastern Shore counties that are expected to show a deficit in physician supply also appears to be least affordable.

Figure 8. Affordability map for medical school graduates in Maryland.



The case studies used as examples here represent just a very few of the numerous permutations available. At this point, given the completeness and quality of the wage data, it is premature to try to generalize across geographic or professional areas. We can, however, identify specific "hotspots" of (un)affordability, and use this information to formulate policy recommendations as well as providing prospective information to those current and

potential students to provide them a fuller understanding of the implications of debt accumulation, career choice, and geographic options. In this way, the Affordability Estimator service both the institution and the student.

Data Limitations and Future Enhancements

While the results of this project have provided novel and useful insight into the nature of student debt and professional school affordability, we were still hindered in some of our analyses. Knowing that this would likely be the case as the Affordability Study was planned, we included as a component of the project outcomes an articulation of what data would be needed for future work in this area. Each data set used had its idiosyncrasies.

The major shortcoming in the data used was for wages. Wage data are notoriously elusive; to date, only a very few states, such as Texas, have made any headway in using wage data effectively in a higher education context. Our limited options included survey data, much of which were voluntarily submitted. Even these were limited to Nursing BSN graduates and JD recipients. In the future, to improve the quality of wage data, planned longitudinal employment and salary surveys in which participants are incentivized could prove useful. Outside research groups (e.g. The Jacob France Institute) and third-party entities (such as Glassdoor) might also be leveraged, along with unemployment insurance data. These efforts would require a more deliberate collaboration between UMB and HelioCampus. Crucially, though, salary data resolved to the individual level could provide not only salary, but geographic and career path information that could allow the study of not just affordability, but UMB's success in training and retaining graduates for the state.

A related shortcoming was in the federal and state wage data, and how it mapped to educational programs. The one-to-may relationship between many of the CIP educational programs codes and SOC federal occupation codes made sufficient resolution impossible. Moreover, resolution in occupational codes insufficiently reflects many possible subfields that professional school graduates enter. In many cases, response rates to the salary surveys were insufficient to populate a number of sub-occupations, particularly for medical disciplines, requiring us to aggregate at higher levels (either multi-discipline or multi-WIA). Again, an individual-level approach to data collection would eliminate much of this problem.

Debt repayment data is the second crucial set of information whose improvement would greatly enhance the interpretation of our results. We were able to generate a reasonable estimate of debt repayment rates and likelihood of repayment, but our results would be much more robust had we had longitudinal residual debt at the individual level. Similar to wage data, we used point-in-time data to derive rates, integrating over similar graduates. These derived rates assume a constant repayment amount and rate over time; this is an assumption that warrants investigation, particularly for those fields with several years of lower income before fully realizing income levels that better reflect the field as a whole.

Summary and Next Steps

We find that, overall, UMB programs are generally affordable, but this affordability varies depending on the perspective and metrics used. From an institutional perspective, UMB has maintained student debt level increases at a rate lower than the cost of attendance. From the perspective of the individual student, however, affordability is highly context-dependent, and is likely to be keenly sensitive to a lifestyle and geography choices. Broadly, the School of Dentistry consistently exhibits the highest debt levels of the professional schools, whereas School of Pharmacy graduates appear to be most successful in fully repaying their debt rapidly.

The Affordability Estimator can be a useful tool for understanding the implications of debt levels for geographic workforce needs and how to expect changes in the state's ability to satisfy the needs of different areas of the state. It is also a potentially useful tool for helping prospective and current students to set expectations and plan appropriately for future student loan repayment.

However, the most glaring need to make the Affordability Estimator and underlying repayment analyses much more robust is individual-level, longitudinal data relating to where graduates eventually choose to reside, the specific subfield they choose, and their wages and how much of those wages they dedicate to debt. The attainment of these data would put UMB, and the state, at the forefront of understanding and addressing educational affordability.

Endnotes

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Technical Appendix

A tentative affordability definition is

Student Debt ≤ [10% of discretionary income] × [10 years], where

Student debt= [Cost of education] – [financial aid] – [Monetary contributions from work/family]. Because this definition is intended to be prospective (contributions made by student and family prior to undergoing schooling), it is necessary to shift perspective when debt levels and expected wages are expected to be very high. For this reason, we use as our metric of affordability total debt as well as its repayment over time.

To understand total debt and its correlates, we obtained from the UMB Office of Institutional Research and Accountability historical data files submitted annually to the Maryland Higher Education Commission covering the years from 2006 to 2016. These files provided data on enrolled students (Enrollment Information System; EIS), degree recipients (Degree Information System; DIS); and financial aid received by enrolled students (Financial Aid Information System; FAIS). Because the data and its collection has been revised several times since its collection began, we chose our focal group deliberately to maximize data quality, consistency, and coverage. Our focal group consisted of all graduates appearing in the DIS file from 2009 to 2016 (inclusive) for the following academic programs:

School of Nursing: BSN, MSN
School of Social Work: MSW
School of Dentistry: DDS
School of Medicine: MD, DPT
School of Pharmacy: PharmD
School of Law: JD

The undergraduate and graduate degree recipients were included to understand affordability in a more traditional context, even though the primary focus of this work was on the professional degrees. We had a sample size of ~13,000 degree recipients for analysis. Because the granularity of the original data files varied, we typically transformed temporally variable data elements (e.g., county of origin) into earliest reported value, an average value (in cases where values were temporally consistent), or median values (when variability was high). Our analytic file (Graduation Extract) consisted of one record per degree recipient.

The second key data set we incorporated into the Graduation Extract was debt for each graduate by program, maintained by the UMB Office of University Student Financial Assistance. Debt as parsed into total debt, debt incurred while at UMB, and debt incurred prior to attendance at UMB.

The first goal was to understand factors correlating with student debt. We used a multilevel modeling (e.g. Gelman and Hill (2007), Data Analysis Using Regression and Multilevel/Hierarchical Models) to fit a model of the form
Debt = non-UMB debt, UMB debt, total debt ~ f(gender, race, academic program, degree, tuition residency, county, commuter status). Results of these analyses are presented as Tableau workbooks, provided as a deliverable for this project.

We asked what factors contributed to students graduating with no debt using logistic regression.

We also leveraged residual debt data provided by the Office of University Student Financial Assistance though the National Student Loan Data Center. Current residual debt was obtained for ~450 graduates between 2009 and 2015. Graduates were chosen randomly in proportion to graduation year and program, and only in-state students were included in this set of data. Residual debt at various time points allowed us to estimate total absolute amount repaid per year at the program level for the “average” graduate, as well as proportion of total

debt repaid, for time periods spanning between 2 and 7 years. We tested repayment rate and repayment ratio using multiple anova for variables included program, gender, and race.

The likelihood of debt repayment was estimated using Cox regression, a form of survival analysis. We tested separately the effects of program, race, and gender. While similar general patterns of debt "survival" were seen as for debt and repayment (as described in the text), sample sizes were often too low to detect a statistically significant effect. We would need ~1,500 data points to detect a signal with a power of 0.8.

To build the Affordability Estimator, we combined national and state-level Occupational Employment Statistics (OES) data from the Bureau of Labor Statistics. We first summarized the debt detail data from UMB up to median debt levels by HEGIS code. We next used the NCES HEGIS to CIP Code crosswalk data tables to convert the median HEGIS debt to a median CIP debt.

The national data set was obtained from https://www.bls.gov/oes/tables.htm for each year from 2012 to 2016. The OES survey is conducted semiannually, and covers ~200,000 establishments per six-month panel; over the course of a three-year cycle, 1.2 million establishments are surveyed. The OES survey covers all full-time and part-time wage and salary workers in nonfarm industries. Missing from the survey are self-employed, owners and partners in unincorporated firms, household workers, or unpaid family workers. This gap in coverage underlies much of the data shortfalls in the Affordability Estimator.

BLS data sets are published resolved to standard occupation code (SOC). Before we could blend our CIP median debt data, we needed an additional cross walk. We leveraged a BLS crosswalk table that mapped individual CIP codes to all potential SOC. This resulted in one row per HEGIS/CIP Code per potential career path.

Our debt repayment models and anecdotal evidence have suggested that debt will be repaid within 20 years. In order to project potential repayment scenarios based on present median debt levels, we projected current wage statistics out 20 years. On average, in recent years, national wages have increased 3% annually. We used this figure as a starting point for our first round of wage projections on both the state and national wage data. For future iterations of this analysis, a more nuanced approach that more accurately fits future wage trends will be used.

The final caveat to the wage data was the presence of gaps in some SOC codes and percentiles at the state level. In order to fill these gaps, we used the following logic:

1) Wage statistic used if present.
2) If the wage statistic is missing, average the statistic across all WIA regions for the focal year x SOC code combination.
3) If the wage statistic is still missing, average the statistic across all SOC codes for the focal WIA x Year x HEGIS x CIP combination.
4) If the wage statistic is still missing, average the statistic across all SOC codes and WIA for the focal year x HEGIS x CIP combination.

At the end of the above process, all possible combinations of WIA x SOC x percentiles are populated and allow for a more detailed geographic analysis.

The state level data were provided by the Maryland Office of Workforce Information and Performance within the Maryland Department of Labor, Licensing, and Regulation; which develops, in partnership with the U. S. Bureau of Labor Statistics, the Maryland Occupational Employment Statistics (OES), and the Quarterly Census of Employment and Wages (QCEW). Data are provided as three-year rolling averages, and cover the same occupational classification system (SOC) as does the national OES surveys. For these surveys, some data are likewise not reported if certain criteria are not met, e.g. some categories are aggregated, and some data may not meet publication standards. We procured annualized data converting the period 2014-2016. Again, these gaps serve as an area of potential improvement in data quality. Maryland data are aggregated to the level of Workforce Investment Areas, which comprise county or multi-county areas that are economically similar. The WIAs include

- Anne Arundel Workforce Region
- Baltimore City Workforce Region
- Baltimore County Workforce Region
- Frederick County Workforce Region
- Lower Shore Workforce Region (Somerset, Wicomico, & Worcester counties)
- Mid-Maryland Workforce Region (Carroll and Howard counties)
- Montgomery County Workforce Region
- Prince George's County Workforce Region
- Southern Maryland Workforce Region (Calvert, Charles, & St. Mary's counties)
- Susquehanna Workforce Region (Cecil and Harford counties)
- Upper Shore Workforce Region (Caroline, Dorchester, Kent, Queen Anne's, & Talbot counties)
- Western Maryland Workforce Region (Allegany, Garrett & Washington counties)