Modeling the Impacts of COVID-19 on Public Institutions

National Center for Higher Education Management Systems

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The findings, conclusions, and recommendations contained within are those of the authors and do not necessarily reflect positions or policies of the Bill & Melinda Gates Foundation or of SHEEO.

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Executive Summary

The COVID-19 pandemic has injected an unprecedented amount of uncertainty into the postsecondary education industry, making it exceedingly difficult to forecast the impacts it will have on institutions—in terms of enrollments and revenue—and on affordability for students. Perhaps the only certain outcome is that the effects will not be felt equally by all types of institutions and all students; instead, students most vulnerable to having their educational goals derailed—especially those from low-income backgrounds, first-generation students, and underrepresented students of color—as well as the institutions that serve the largest numbers of them, are likely to be at greater risk. While the federal government has provided some stimulus money, only state policymakers control resource allocation policies that are sufficiently flexible to address those disparities effectively. But they will be making decisions about how to allocate funds from the state budget under triage conditions, with reduced revenues and other major priorities like health care and K-12 education to address. A strategic response will be essential; across-the-board cuts will have differential effects in ways that are harmful to students, to institutions, and to the achievement of state goals.

In an effort to provide a rapid-response tool to help states assess the likely impact on public institutions of changing enrollment patterns, state funding levels, federal stimulus dollars, and unbudgeted spending requirements, the National Center for Higher Education Management Systems (NCHEMS), working in partnership with the State Higher Education Executive Officers association (SHEEO) with support from the Bill and Melinda Gates Foundation, has developed a COVID-19 Impact Model. Using heuristics, this model is intended to equip SHEEO agencies (as well as state legislatures and other stakeholders) with estimates of fiscal impact of changing assumptions about enrollments and funding levels. The goal is to give states a planning tool to assess resource allocation strategies and calibrate their responses in ways that limit the damage of the fiscal crisis brought on by the pandemic. This paper accompanies the model and describes its use, presents some example scenarios of how states can use it to inform decision-making, and identifies key principles that that should inform states' allocation of resources in response to the pandemic.

Among the observations surfaced by the modeling are the following:

- Federal stimulus funding, although unlikely to be sufficient to offset losses from state appropriations and tuition revenue in most states, may be especially crucial for broad-access institution in the comprehensive four-year sector if those institutions turn out to be most vulnerable to enrollment impacts and because they tend to be more heavily reliant on state appropriations support.

- A reshuffling of enrollment among residents and nonresidents is likely to have significant impacts on tuition revenue, especially for states and sectors that have come to rely heavily on those funds.
- Although data limitations hamper the ability to precisely estimate impacts on affordability, the modeling provides information about the relative magnitude of the likely impacts, which serves to warn states that the plight of low-income students—who already face the largest barriers to enrolling and succeeding in college—will likely worsen if states fail to purposefully address affordability concerns as they make resource allocation decisions.

Ultimately, the model is valuable for its ability to allow states to plan deliberately in the face of unprecedented uncertainty by roughing out a set of scenarios and "stress-testing" them. It helps answer questions like, "What is the impact on estimated revenue at public comprehensive institutions if enrollment declines vary by X percent versus Y percent?" or "What mix of decisions about tuition prices and state aid appropriations best preserve levels of affordability for low-income students?" The model also links changes in enrollment and spending on instruction and student services to effects on the completion of awards, so states may factor those considerations into their decisions about how to allocate resources.

Finally, the paper provides a set of principles that can guide state policymakers in their allocation strategy. They include:

- Treating state funds as "last dollar" contributions to the overall funding of higher education in light of the best estimates of revenue streams from other sources.
- Prioritizing both affordability for students and funding adequacy for institutions.
- Being mindful that expectations of improvements in institutional productivity should be part of the solution.
- The need to strategically target funding in ways that protect students whose decisions to enroll and ability to complete a credential are most impacted, both directly through pricing and aid policies and indirectly through funding that ensures sufficient resources reach the institutions that serve those students.
- There remains a need to ensure that resource allocation strategies align with state goals, even in tough times.
- A broader view of the utility of the capital budget—one that defines capacity in multiple forms as eligible for support through the capital budget—can help states and institutions meet short-term needs. This is especially true in a crisis that has already amply demonstrated how adequate technology infrastructure provides the capacity needed to serve students effectively when physical facilities are not an option.

An appendix to this paper provides instructions for the use of the model.

Introduction

Only a few short months ago, before the significance of the impact of the COVID-19 pandemic became apparent, most public postsecondary institutions could be cautiously optimistic that their fiscal fortunes were at least stable if not rising. While there certainly were those that faced deep challenges due to declining demographic trends and a limited appetite among policymakers for higher education spending, most of the country's public institutions were seeing revenues grow from appropriations or tuition payments.

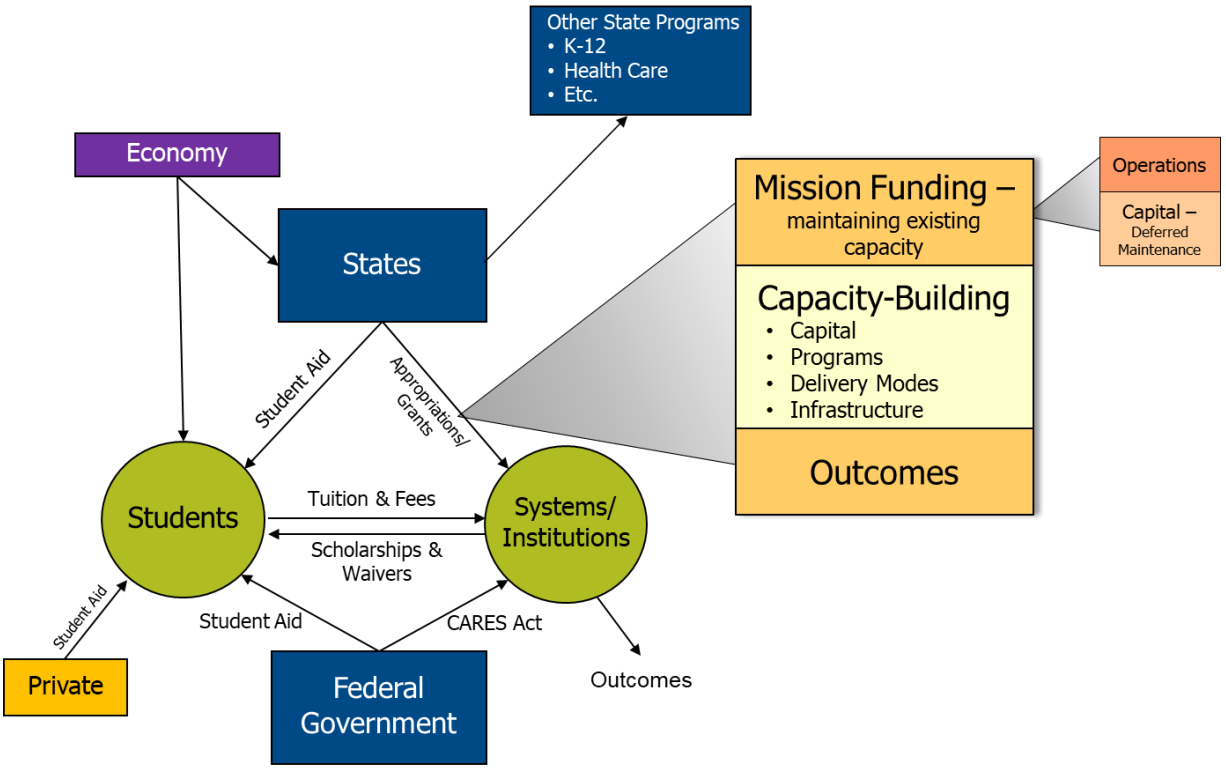
The COVID-19 pandemic quickly imposed a much gloomier outlook. But the unprecedented nature of the crisis has made forecasting the fiscal implications extremely challenging. In an effort to provide a rapid-response tool to help states assess the likely impact on public institutions of changing enrollment patterns, state funding levels, federal stimulus dollars, and sudden spending requirements, the National Center for Higher Education Management Systems (NCHEMS), working in partnership with the State Higher Education Executive Officers association (SHEEO) with support from the Bill and Melinda Gates Foundation, has developed a COVID-19 Impact Model. Using heuristics, this model is intended to equip SHEEO agencies (as well as state legislatures and other stakeholders) with estimates of fiscal impact of changing assumptions about enrollments and funding levels. The goal is to give states a planning tool to assess resource allocation strategies that is based on the most recent publicly available data. This resource will help states calibrate their responses in ways that limit the damage of the fiscal crisis brought on by the pandemic, especially for students who are low-income, under-represented minorities of color, or are otherwise vulnerable to having their educational goals derailed, and for the institutions that serve them.

The Unprecedented Nature of the Challenge

The onset of the COVID-19 pandemic in the Spring of 2020 had enormous impacts on the higher education enterprise in all parts of the country. These impacts have upset normal expectations about enrollment patterns, led to suddenly increased institutional costs in areas as diverse as facilities operations and online education, led to high unemployment and reduced incomes for students and their parents, and wiped out state budgets. The impacts of the pandemic go far beyond higher education into other priority areas receiving state appropriations. Since policymakers and institutional leaders have no prior experience in dealing with issues of this nature and magnitude, the pandemic has injected widespread uncertainty into the budget planning and resource allocation processes. As a result, it has created a triage environment that further complicates the decisions to be made by state policymakers and education leaders.

Figure 1 describes the typical flow of funds that support institutions of higher education and their activities. It recognizes funding from the federal government provided through the CARES Act, which will be insufficient to cover all accumulated losses. The current crisis will disrupt each one of these flows depicted in this Figure and will lead to great uncertainty in the environment in which higher education finance decisions will have to be made. The size and extent of those disruptions is open to much speculation, but postsecondary institutions can safely assume that they will see significant reductions in their overall levels of funding.

Figure 1. Funding Flows in Higher Education



Both institutions and students will have new arguments as to why they deserve preferential treatment in the allocation of state funding. Institutions will claim there is a need for investment in new capacity and to recover unbudgeted expenses that became necessary to mount an effective and immediate response. Institutions quickly transitioned face-to-face instruction to online instruction. While these efforts demonstrated laudable responsiveness, they came with substantial unanticipated costs for hardware and software licenses, professional development, and other associated expenses. Institutions will also be seeking help with covering expenses and lost revenue that have heretofore been outside the realm of general fund support, specifically costs that fall in the realm of auxiliary

enterprises. Institutions with housing operations have given at least partial refunds of room and board payments made by students. And while the revenue stream has dried up, many of the associated expenses have not. This is particularly true of bond payments which institutions are legally obligated to pay whether or not the projected revenues are collected. Similarly, athletic scholarships will continue to be honored in spite of the fact that all event revenues have dried up. Paying these "bills" will inevitably put pressure on general fund revenues typically reserved for core institutional operations.

The typical response to revenue shortfalls—whether from reductions in state support or other reasons—has been to raise tuition in order to fill the revenue gap. But what should be done regarding tuition rates in this climate is particularly fraught with uncertainty surrounding both the number of tuition-paying students and the net tuition revenue those students generate. Economic conditions may force students to forego college—or they could create conditions in which unemployed individuals turn to college in unexpected numbers. Enrollments of nonresident students will almost certainly be significantly reduced. This set of circumstances creates conditions in which institutional decisions about use of their own funds to maintain affordability for students—through either holding the line on rates or waiving tuition—take center stage. There are encouraging signs that some institutions are resisting that impulse for the upcoming academic year partly out of concern that tuition hikes will help drive away students already concerned about the virus and the potential of all or part of the instruction being offered via distance education and partly out of the optics of institutions not being willing to share in the pain being felt by students and policymakers. But it is far from clear whether institutions will be able to maintain that approach beyond the coming year.

Meanwhile, students are also facing a more complicated set of circumstances. Many will be faced with loss of jobs needed to pay college expenses (their own and, for dependent students, their parents'). The likely implication is that more students will be seeking assistance from funds designated for student financial aid.

These are perennial trade-offs confronting institutions and policymakers every year, but the turmoil created by COVID-19 creates unprecedented uncertainties with regard to both the size and the nature of the dislocations. Institutions, systems, and state policymakers have little prior experience relevant to estimating enrollments, predicting the extent of revenue shortfalls, or forecasting the impacts of their decisions under current conditions. How all of this plays out will vary among states and institutions depending on the extent to which the institutions rely on state appropriations as a share of their total revenue, and the price sensitivity of the students that different institutions serve. Those that tend to enroll a higher proportion of low-income students will be more substantially impacted by any tuition hikes imposed in response to reductions in institutional appropriations. These institutions also tend to be more dependent on state support.

Into this stew of complexity is now added another ingredient—federal government funding distributed in accordance with the provisions of the CARES Act. Although the $14 billion in the package (split evenly between institutions and their students) will be helpful in bridging some of the major gaps, four realities remain. First, the level of funding will be insufficient to cover additional costs and lost revenues for the nation's colleges and universities. Second, the distribution of these funds will be such that the remaining needs will vary widely from one state/institution to another. Third, the provisions for the distribution of CARES funds remains murky and may not be targeted at students in the greatest need and the institutions that disproportionately serve them. (To the degree that the allocation formula is focused on full-time equivalent enrollments, institutions that serve relatively more part-time students are at a disadvantage in the CARES funding formula). Fourth, this funding is short-term. It will help to bridge the funding gap in FY 2021, but it is unlikely to be renewed for the subsequent fiscal year. The uncertainties are very likely to persist into FY 2022 and beyond. CARES buys time to develop strategies but it does not alleviate the need to do so. At the end of the day it will be up to state policymakers to bring order out of this chaos.

The nature of the COVID-19 crises has no precedent that would allow states and institutional leaders to assess with confidence the impact on enrollments. This uncertainty applies to nearly all kinds of students—new students enrolling directly from high school, out-of-state students, adults, and returning (or not) students. And the impacts are likely to be different for different types of institutions. If history is a reliable guide, a serious economic slowdown may lead to greater enrollments of out-of-work adults at community colleges. But these circumstances are unparalleled; history may not be a reliable guide. Unfortunately for both policymakers and institutional leaders, the actual short- and longer-term impacts on enrollments are far from clear. Decisions will have to be made in the face of much higher levels of uncertainty than is the norm.

The Needed Response

Institutions and students in different states will face different levels and kinds of financial issues in the months and year(s) to come. And states will have varying capacities to respond to these issues. The task for states will be to strategically utilize whatever resources they will have for higher education in ways that yield the best outcomes—more access and success for students. They will have to approach funding higher education in ways much more nuanced than "business as usual"—ways that don't follow the typical practice of making incremental changes to funding (either positive or negative) for institutions and student aid and taking actions to regulate tuition. A more holistic approach will be required. Unfortunately, there are few, if any, good models for this kind of approach, but the following characteristics may serve as useful criteria:

- An understanding of the needs of both students and institutions. This calculation at minimum should provide an indication of
    - The amount of funding required to maintain support for institutions at a level that could be described as "frugally adequate"—the minimum level of funding required to ensure that different kinds of institutions can continue to fulfill their missions.
    - The levels of unmet need for students of different income levels—and estimates of numbers of students in each of these income categories—in order to ensure the affordability of higher education to the residents of the state.
- Awareness of, and reasonable accommodations to, variation in institutional contexts especially related to demographic conditions in the institution's primary service area, its student body characteristics, the diversity of its revenue sources, and dependence on state appropriations. These and other factors will determine the depth and duration of the pandemic's impact and the institution's capacity to respond.
- A singular focus on the respective missions of public institutions that will, to varying degrees, need to address real fiscal challenges in areas that are ancillary to those missions. This includes recognizing the impact on institutional bottom lines caused by extraordinary short-term expenses and revenue losses from room and board fees and events. States will need to help institutions deal with those dilemmas in constructive ways that may require a reevaluation of the centrality of those services to the pursuit of the institutional mission and the state's needs.
- A recognition that past patterns of enrollments will not be a reliable guide to the short-term future. The ability—and willingness—to break established patterns of allocations to institutions to meet current realities will be required.
- An ability to fund short-term recovery in a way that does not jeopardize support for, and accomplishment of, long-term goals and priorities.
- A capacity to determine the combination of state appropriations to institutions, distribution of federal funding, tuition levels, and allocations for student financial aid that will serve the greater good and produce the best outcomes for both students and society.

Since tuition payments from students and stimulus funding from the federal government through the CARES Act will be directed to specific institutions (which will also support certain types of students), only the allocation of funds from the state can be sufficiently flexible to yield the best possible results. A strategic response by states will be essential; across-the-board cuts, which may be tempting for states wrestling with a myriad of funding challenges across all areas of government, will certainly have differential effects on

institutions in ways that are harmful to students, to institutions, and to achievement of the state's goals.

As an aid to policymakers faced with making difficult decisions in the face of extraordinary environmental uncertainty, the NCHEMS has developed a model that allows policymakers to better understand the needs of both students and institutions and the consequences of different state allocation decisions. The remainder of this document describes that model, provides an introduction to its use, presents some example scenarios describing how states can use the model to inform decision-making about resource allocation, and identifies key principles that should help govern states' allocation of resources in response to the pandemic.

A Description of the Model and its Capabilities

The model created by NCHEMS reflects the elements shown in Figure 1 and has the following important features.

1. It recognizes:
   a. The flow of funds to institutions from state and local governments (through appropriations), students (through tuition and fees), and the federal government (through CARES funding).
   b. The flow of funds to students in the form of student financial aid from the federal government, state government, institutions, and private sources.
1. It includes estimates for the impacts on FY 2021 budgets of unexpected expenses and lost revenues related to auxiliary enterprises such as housing and events.
2. It is heuristic in nature, thus allowing the user to make different assumptions about enrollment levels (of different kinds of students) and to investigate the results of those different assumptions. This feature overcomes the difficulties associated with trying to build enrollment projection methodologies into the model under conditions as unstable as those currently being experienced.
3. It simulates the impact of different allocation strategies on affordability to students in different income categories.[1]
4. It also calculates the impact of different allocation strategies on adequacy of funding for different sectors of public higher education institutions. It does so by providing outputs for institutional expenditures in key categories, especially those related to instruction, student services, auxiliaries, and plant operations and maintenance. While expenditures

[1] The results are broadly indicative of impact in terms of direction and relative magnitude, but are unlikely to be precise due to data limitations. (This model adds to other analyses that convincingly illustrate the need for better data about how students pay for college.)

are institutional decisions not directly subject to state action, the inclusion of expenditure categories in the model recognizes that not all spending is equally malleable in the short term. For example, the need to power, ventilate, maintain and disinfect, and ensure the safety of campus facilities may be more fixed for FY 2021 than other institutional costs, especially if there are substantial added costs for repeatedly disinfecting those buildings.

5. It includes a feature that calculates credential production under different assumptions of enrollment levels and funding strategies.

The model is intended for use by SHEEO agencies, but it may also have value for legislators and their staffs. It is explicitly designed to allow investigation of different "what-if" scenarios—to see what happens to the various outcome variables under different sets of enrollment assumptions and resource allocation strategies.

This makes the model extremely flexible yet produces immediate estimated results. This feature will aid in planning a response that maintains focus on state goals and prompts policymakers to focus their attention on the sectors that serve the most vulnerable populations. It does not make decisions; it is a tool for use by those who do and their staffs. A fuller description of the model and its use are provided in an Appendix to this Policy Brief.

There are three main components involved in using the model:

1. Detail-level dashboard, which is populated with data from publicly available national sources, some of which can be overridden with more up-to-date/accurate data that a state may have. This module is the primary dashboard for the tool where users input values for most of the heuristic variables and is designed for use by staff-level personnel.
2. Output report. This component summarizes the results of the model's calculations. These data are simply reported results and are not adjustable by users.
3. Policy-level dashboard and report. This component mirrors the "Output" report but provides an opportunity for users to make adjustments to the values of high-level inputs, specifically enrollment levels, tuition prices, and state appropriations, through a streamlined interface.

The model is designed for interaction in two different ways. A member of the SHEEO staff—someone who is most attuned to the anticipated changes in enrollment and pricing and familiar with the details of data—will likely want to use detail-level dashboard, where the user can change assumptions about different impacts. For example, in the enrollment section, this module permits the user to enter predictions about how enrollment patterns will change in different institutional sectors among students of different age groups, and for initial, transfer, and continuing enrollment. Within the tuition pricing section, the user can

change prices for in-state vs. out-of-state students and for undergraduate vs. graduate students. Users can also adjust the proportion of student enrollments by residency status, in order to better assess related effects on net tuition revenue.

Executive officers and other policymakers will likely prefer to use the policy-level dashboard, because many of the inputs described in the detail-level dashboard are at a level of detail that will be beyond the level of interest of most policymakers. To accommodate the needs of this set of users, the model has been created in a way that gives staff an opportunity to input the more detailed data that are more reflective of important differences in anticipated enrollments and revenues, while still allowing policymakers to investigate the consequences of changing a limited number of those variables. The variables that can be manipulated at the more strategic level are enrollment levels, tuition rates, and state allocations to institutions and student financial aid. By investigating different values for these variables, policymakers can ascertain the impact of their decisions on affordability and the adequacy of institutional funding of different allocation strategies.

The model is organized into several modules, described briefly below. More detailed information about the data sources, estimation algorithms and assumptions made regarding input variables is contained in an appendix.

1. Enrollments. Student numbers in each institutional sector and by category of student—undergraduate/graduate, in-state/out-of-state, full-time/part-time—have been entered into the model for each state. The user can adjust these headcount numbers in each category based on percentage change from the base year 2018 data (the most current publicly available data). It also allows the user to investigate different enrollment scenarios, a particularly useful feature given the level of uncertainty surrounding enrollment levels in the near term.
2. Federal Stimulus—CARES Act—Funding. The amounts that will be distributed to funding public higher education institutions from the CARES Act, both directly to institutions and through the Governor's discretionary funding pool, as well as any subsequent stimulus funding the federal government may provide.
3. Tuition and Fees. Tuition rates for in-state, out-of-state, undergraduate and graduate students are entered in the model for each institutional sector and can be adjusted by the user by percentage changes to the 2018-19 base data. This rate data is multiplied in the model by enrollments in each category to yield tuition revenues by sector.[2]

[2] This module also makes estimations of the amount of money that institutions ultimately collect from student grants, especially Pell Grants and state grants, and use for instructional purposes. Details about these calculations are also available in the Appendix.

4. State and Local Appropriations. Data for state appropriations to institutions, by sector, and to student financial aid, as well as local appropriations, have been entered into the model. The user can make percentage changes to the values entered in order to update data or to investigate the consequences of policy changes in allocation amounts/distributions by sector.
5. Auxiliaries. Given how the pandemic's impacts may especially affect revenue centers like housing and athletics, the model provides revenue data for each sector. Users can estimate percentage changes in anticipated auxiliary revenue for FY21. (Adjustments to expenditures on auxiliaries, which have had special impacts, and likely will continue, can be adjusted in the next module.)
6. Expenditures. This module reports the expenditures for each sector in categories for instruction-related expenses, student services, auxiliaries, and plant operations and maintenance. For the first three of these, the costs of operating and maintaining the physical plant are removed, while instruction-related expenses includes a portion of the institutional support expenditures. These adjustments to the standard categories give the user some control over the distribution of cuts to expenses most closely tied to students and the instructional mission of the institution. Users can adjust assumptions about varied levels of cuts to specify expenditure categories that will incur relatively larger or smaller cuts than their share of the total. Relatively larger cuts (or increases) in the instruction-related expenses and student services categories will affect the estimated number of completions produced.
7. Completions. Using completions per 100 FTE as the measure of productivity by sector, the model estimates the number of certificates and degrees likely to be awarded based on changes in enrollment and funding.
8. Factors related to Student Affordability. Affordability is calculated as an estimate of unmet need for students in different income bands. This estimate is derived by deducting the following funding amounts from the sector-weighted cost of attendance. Data are delineated separately for each income band.
    a. Student contribution equivalent to 15 hours per week of work for 48 weeks at the state's prevailing minimum wage.
    b. Average Expected Family Contribution (EFC)
    c. Average Pell Grant
    d. Estimated average state grant award. Data about state grants by income band are particularly suspect—no reliable data for this variable are available from national sources for all states or even all state grant programs within a state. Users are encouraged to compile and utilize state-level data for this element in the affordability calculation.

e. Estimated average grants from other sources (principally institutional grants). This number is calculated as what remains from total grants after Pell Grants and state grants, so it reflects weaknesses in the estimation strategy for the state grant average.

It should be noted at this point that the concepts in the affordability module are superior to the data that drive it. It is particularly the case that data about the allocation of state student aid funds to students in different income bands are routinely unreliable as reported in national surveys. This is an area where states in particular need to substantially improve their data capabilities.[3]

Model Applications

To best illustrate the use of the model to estimate FY 2021 revenue impacts, SHEEO developed example scenarios for three states. For each state, SHEEO staff used available data, relevant academic research, results of surveys of students' intentions to enroll, media reporting, and their own best judgment to identify scenarios for student enrollments and funding decisions that are plausible as of June 2020. However, it is important to note that the scenarios are provided purely for instructive purposes and are not meant to be suggestive of reality. Likewise, the scenarios likely do not reflect the most recent decisions made by state and institution leaders. The states selected—labeled A, B, and C to avoid giving the impression that SHEEO staff have precise foreknowledge of likely policy decisions in the selected states—were chosen because they are collectively quite different and embody distinguishing characteristics about financing philosophy and structure.

- State A boasts a robust two-year sector, while public institutions across the state receive relatively low appropriations and charge a relatively low tuition price.
- State B has only a limited two-year sector and its public institutions receive the large majority of their discretionary revenue from student tuition payments rather than state appropriations.
- State C's public institutions are resourced at relatively low levels; they receive low levels of direct support from the state and also embody the Western tradition of low tuition and fees prices. It is also a high-poverty state with a majority-minority population.

Figure 2 captures the critical assumptions about how enrollment patterns and funding levels are likely to be different for FY2021 (relative to FY2018 in most cases, except for

[3] The National Postsecondary Student Aid Survey is expected to include state-representative data as part of a new collection using administrative data sources within the current calendar year, which may shed much needed light on this topic. Nevertheless, many states are likely to maintain more complete data useful for analyses like these.

state appropriations for which FY2020 estimates were available), while Figure 3 shows estimated changes in revenue as a result of those adjustments. Complete output for these scenarios is provided as an appendix.

Figure 2. Assumptions of Selected Model Variables

		State A	State B	State C
Enrollment	Research universities	Overall decline is 5.8%, concentrated among first-time students.	No changes in enrollment patterns anticipated, except for a 5% increase among graduate FTE	6.4% decline due to steep drops in <25yo students, especially direct from high school (-10%); more moderate drops in adults; loss of 7.4% in graduate FTE
	Comprehensive four-year institutions	Overall decline is 6.4%, mostly among first-time students.	Declines in first-time students under 25yo of 5%, partially offset by an increase in first-time and incoming transfer students over 25%, plus a drop of 5% in graduate FTE.	9.1% decline in comprehensive institutions due to steep drops in <25yo students (-13%), especially direct from high school, more moderate declines in adults; sharp drop in graduate FTE (-12%)
	Two-year institutions	Overall decline is 5.8%, concentrated among first-time students.	Declines in first-time students under 25yo of 5%, while increases in students 25+ are assumed to increase significantly among first-time (25%) and by lesser amounts for transfer-in students (10%) and continuing students (5%).	0.9% decline with modest increases in first-time and incoming transfer students offsetting declines in continuing students.
	Mix of residents and non-residents	All sectors see increases in the share of in-state students	A substantial shift away from nonresident students in both four-year sectors.	Slight decreases in domestic non-residents
Tuition Prices		No changes	No changes in the four-year sectors, but a 2.4% increase in the two-year sector.	Significant increases in tuition in all sectors, ranging from 11% in research universities to 4% in two-year institutions for resident undergraduates. Even larger hikes--up to 32% for resident graduates.
State Appropriations		An overall decrease of 30%, with relatively larger cuts in the four-year sectors, and a 10% increase in the state financial aid appropriation.	No change	Loss of 3%, with all sectors receiving a proportional share of the cut, and a 10% increase in the state financial aid appropriation.
Local Appropriations		Not applicable	No change	A 5% improvement in local appropriations to research universities and to two-year institutions.

Figure 3. Model-Generated Estimated Results

		State A	State B	State C
Estimated revenue for instruction and auxiliaries	Research universities	Total instruction-related revenue falls by more than 18%, with a 33% cut in state appropriations and a 10% drop in estimated revenue from tuition and grant aid used to pay tuition expenses.	Total revenue decreases by over 5%, driven by a large reduction in tuition revenue due to shifts away from resident students. Losses grow to about 6% with assumed 10% reduction in auxiliary revenue.	Total revenue for instruction is likely to rise by about 1.7% due to the federal stimulus more than offsetting the expected cut in state appropriations, together with a 3% increase in revenue from tuition and grant aid spent to pay tuition expenses and a boost to local appropriations. Anticipated losses in auxiliaries causes total revenue estimates to be flat.
	Comprehensive four-year institutions	Total revenue falls by about 25.5%, driven by a 39% cut in state appropriations and a 15% loss in estimated revenue from tuition payments and grants.	Federal stimulus helps cushion the 5% loss in tuition revenue from enrollment shifts, so total instruction-related revenue drops by 1.7%, a loss that worsens by nearly about 1.5 percentage points due to an assumed 10% reduction in auxiliary revenue	Total revenue falls by 1%, dragged down by decreases in tuition and appropriations. With losses in auxiliary revenue, total revenue for instruction plus auxiliaries falls by nearly 2%.
	Two-year institutions	Total instruction-related revenue falls by nearly 8% with losses in state appropriations and in tuition more than doubling the funds added by the federal stimulus.	Total revenue rises by nearly 7% due to increased enrollment and prices, although anticipated losses in auxiliary revenue cuts that back by a half percentage point.	Total revenue is up nearly 6%, driven by a bump from local appropriations plus the stimulus.
Completions		Nearly 22,000 fewer completions, with the greatest losses among bachelor's degrees in the research universities and associate's degrees in the two-year sector.	Loss of about 1,250 completions, driven downward by substantial losses in bachelor's degrees in the four-year sector, but gains in sub-baccalaureate awards in the two-year institutions caused by increased spending and additional enrollments.	Completions likely rise by over 900, with nearly 90% of the increase occurring among sub-baccalaureate credentials.

If the reality is similar to the scenarios sketched out for each of the three states by SHEEO staff, the model suggests that the upcoming fiscal year will be especially difficult for institutions in states that have kept a tight grip on funding resources, like State A. The SHEEO staff scenarios also suggest that two-year institutions are likely to fare better, especially if past patterns of counter-cyclical enrollment materialize. Within the four-year sector, states can target investments (and related cuts) to limit the damage done to institutions whose students' enrollment decisions are most tenuous—those that serve students who are less financially well-off, members of an underrepresented racial/ethnic minority, or otherwise face barriers.

Additionally, these scenarios lead to several observations that, while drawn on conditions in each respective state, are fiscal issues that deserve attention by any state as they consider how to respond to the pandemic. These include:

- In most states and sectors, federal stimulus dollars are unlikely to be sufficient to cover likely losses from state appropriations and tuition revenue. This funding may wind up being especially crucial for broad access institutions in the comprehensive four-year sector, since they tend to enroll low-income students in larger numbers and may absorb relatively larger enrollment declines as a result of research universities competing more aggressively for students heretofore served by these institutions. Furthermore, because the actual distribution of funding from the Governor's Emergency Education Relief Fund remains uncertain at this time, SHEEO's scenarios did not include any funds from this source. But these funds can help backstop some of the cuts postsecondary institutions will face; they represent the only portion of the federal stimulus funding so far provided that can be flexibly spent to help address especially acute institutional funding needs.
- A significant reshuffling of enrollment among residents and nonresidents is likely to have big impacts on tuition revenue, especially at the research universities where nonresidents are most plentiful. These impacts are likely to be especially severe in states like State B that enroll large numbers of out-of-state students and also rely heavily on tuition payments for revenue. Public comprehensive institutions that are reliant on tuition from nonresident students are also vulnerable to such changes, and they may be less capable of adjusting especially if their ability to replace those enrollments is uncertain.
- Assuming that credential productivity is related to spending levels for instruction and student services, the federal stimulus funding will play a substantial role in checking the extent to which decreases in enrollment and other funding affect the number of completions, at least in FY21. For example, if the scenario in State A plays out as described above, the state may see the loss of credential production of nearly 22,000. As bad as that seems, the model estimates that the state would lose over

30,000 credentials in the absence of the stimulus money its public institutions are expected to receive.

- While state grant aid to students is impossible to estimate precisely with publicly available data, the model does provide information about the relative magnitude of effects on student affordability. The scenarios reinforce the observation that low-income students face the largest barriers to paying for college, that increases in state grant aid appropriations can help mitigate decreases in affordability, and that the plight of low-income students will likely worsen if states fail to purposefully address affordability concerns as they make resource allocation decisions.

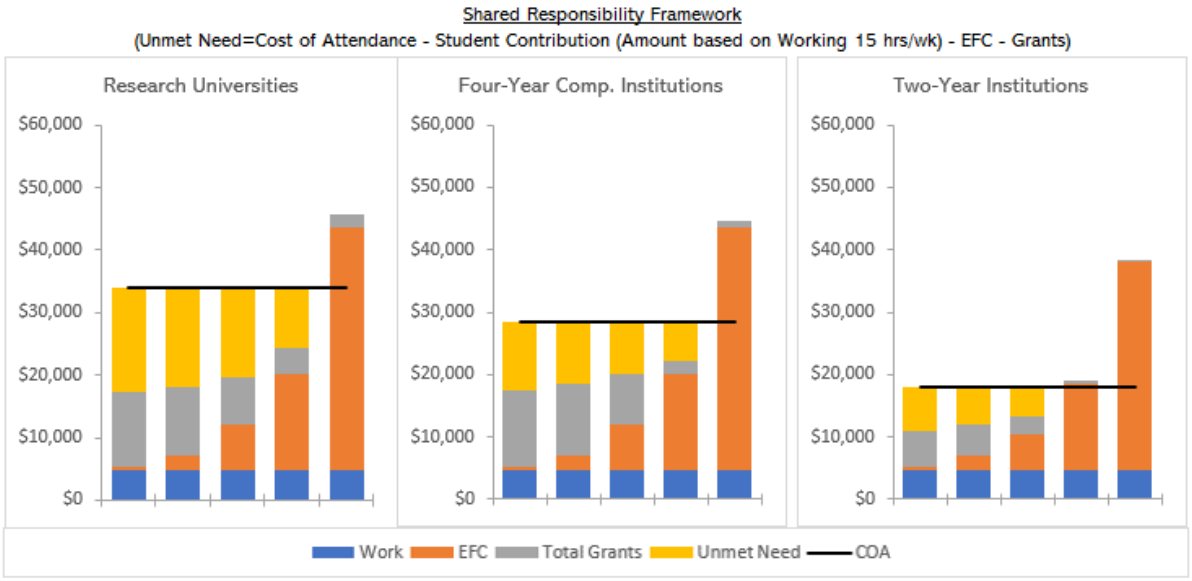
While data are limited in the three selected states—which generally do not report grant aid disaggregated by income level to any national source—it is clear that affordability concerns will only deepen even if tuition prices are held in check. With income levels declining as students and their parents lose jobs, the income profile of student bodies will likely shift, more students will be eligible for more grants under existing distribution formulas, and more rationing will likely be necessary. States must be made aware that institutions vary considerably in how many of their own resources are available to help students close affordability gaps.

SHEEO's efforts to scour available information in order to put forward a set of plausible assumptions about how the pandemic's impact might play out in these three states may prove accurate. But the uncertainty of the moment is such that states may need to be prepared for multiple scenarios. The COVID-19 Impact model offers states a chance to "stress-test" their best assumptions, particularly in order to view each sector's relative vulnerability to substantial fiscal impacts from different disruptive patterns of enrollment and funding. Using State C as an example, SHEEO's assumptions about enrollment declines of 9.1 percent in the public comprehensive sector yielded an estimated loss of $4.4 million in revenue from tuition payments (including grants used for that purpose). If assumed enrollment losses are one percentage point worse, the loss of related revenue deepens to $5.3 million. At the degree productivity rate (completions per 100 FTE) in that sector, the change also costs the state about 10 awards. In that same state, reducing state appropriations from the three percent loss anticipated by SHEEO to a five percent loss corresponds to a loss of about 220 postsecondary awards.

Notwithstanding the limitations in using the publicly available data to manipulate the net prices that students from different income backgrounds face, the model provides information about the orders of magnitude of certain policy choices on affordability. For example, in State B, the model shows estimates of how unmet need may change. Based primarily on FY18 data, unmet need is greatest for the lowest-income students, especially in the public comprehensive institutions (Figure 4).

Figure 4. Affordability in State B, FY18

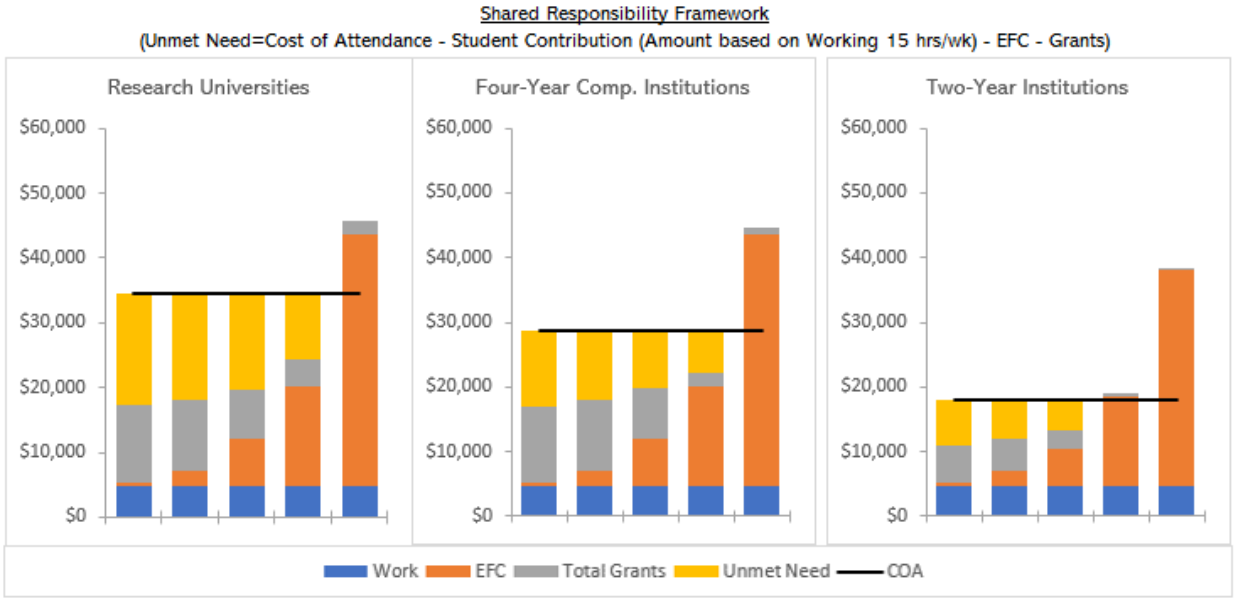
	Estimated Average Unmet Need		
	Research	Four-Year Comp.	Two-Year
Less than $30K	$16,634	$10,938	$6,853
$30-48K	$15,713	$9,937	$5,792
$48-75K	$14,218	$8,237	$4,632
$75-100K	$9,627	$6,141	$0
More than $110K	$0	$0	$0



If State B ultimately determines that tuition increases in the four-year sectors are warranted and increases tuition prices by three percent in the research and public comprehensive sectors and also assumes a shift in the income profile of first-time students—to reflect the likelihood that students will face additional financial barriers of their own due to the pandemic, the model estimates the resulting effects on affordability (Figure 5). Such a change might expect to yield increases in unmet need (among students with need) of about $600 in the public research universities, and $840 in the public comprehensive institutions.

Figure 5. Affordability in State B, FY21, Assuming Increased Tuition

	Estimated Average Unmet Need		
	Research	Four-Year Comp.	Two-Year
Less than $30K	$17,226	$11,778	$6,853
$30-48K	$16,305	$10,777	$5,792
$48-75K	$14,810	$9,077	$4,632
$75-100K	$10,219	$6,514	$0
More than $110K	$0	$0	$0



Similar stress-testing of other model variables is also possible.

Additionally, the model allows for states to test "all other things equal" scenarios in ways that may be useful in shedding light on the relative vulnerability of sectors to disruptive changes. For example, in State B, an across-the-board cut of 5 percent in FTEs paired with a 15 percent reduction in state appropriations to institutions yields an estimated loss of $330 per FTE in instruction-related revenue (not including stimulus funds) for its public research universities, compared to a loss of $404 in the public comprehensive four-year institutions, and just $211 in the two-year sector.

Finally, it is possible to run the model for different states using a common set of assumptions about anticipated changes in enrollment and in funding streams, in order to assess the relative impacts of those assumptions on different sectors in different states. However, the model was not intentionally designed to do this kind of state-by-state comparison since the specific conditions that each state faces will vary dramatically, as will the set of policy options that are feasible or favored for adoption by different states.

These reductions ultimately need to be compared to the level of support that an institution requires in order to effectively carry out its mission. While that threshold amount is one for which no consensus can currently be found, it is surely true that it will be different based

on institutional sector (especially to the degree that sectors gather together institutions with at least some common elements of mission) and specific contexts.

Allocation Principles

In order to bring some focus to application of the model and to help state policymakers construct scenarios that yield the most advantageous results, some principles to guide the allocation strategies are in order:

1. State decisionmakers should treat the funds they allocate (state funds) as "last-dollar" contributions to the overall funding of higher education in their states. This means that state allocations should be made in full knowledge (or in light of best estimates) of the revenue streams from other sources to both institutions and students. Most specifically:
   a. For institutions, revenues include funding they receive from students through tuition, from the federal government via CARES Act subsidies, and through appropriations from local governments, or raised from taxes they are authorized to levy. It should be noted that local government revenues are generally not a consideration except in the cases of locally governed community colleges.
   b. For students, their revenues include funding they receive from the federal government as Pell grants, parental contributions, and moneys they earn by working. Student loans should not be considered as part of the students' revenue streams. Student work revenues should be calculated according to an agreed upon formula to reflect an expectation of contribution whether they actually worked or not. The expectation for student work should be tied explicitly to a work commitment not so onerous that it substantially interferes with academic progress.
2. The allocation of state resources should prioritize two concepts that are central to pursuit of state goals and to the alignment of educational and economic opportunity—"affordability" for students and "funding adequacy" for institutions. In any discussions about higher education funding, both of these terms will be core to the arguments used by proponents to justify additional funding for student financial aid on the one hand or institutions on the other. Unfortunately, clear definitions and applications of these terms remain elusive and, in their absence, debates about how to allocate funds among institutions and students rage on without sufficient grounding. Commonly understood definitions would make it possible to set benchmarks for funding and to ascertain how far from benchmarks different allocation schemes leave the state and its institutions, and to use that analysis to direct state funding in ways that more equitably close gaps across all its institutions and among students who face financial barriers to successfully achieving a postsecondary credential. While different states will likely reach different conclusions regarding these definitions, the following are offered for consideration.

   a. Affordability for students: The policy question is how much of unmet need and for which students (by income, typically) that the state chooses to cover. The portion not covered by the state will most likely be covered either by student debt or by students working additional hours. Research is clear that students risk jeopardizing their academic success by working more than 15-20 hours per week.
   b. Funding adequacy for institutions. A metric that purports to determine how much funding an institution needs is difficult to conceptualize. But as successive economic downturns have gradually chipped away at public institutions' foundational support, the need to better define and calculate such a concept to aid state allocation decisions has grown more acute. The model attempts to advance the development of this concept in small steps through its treatment of expenditures data—in particular by isolating institutional spending on both direct costs of instruction and the portion of institutional overhead necessary to manage instructional activities. Further analysis will build on these steps.
3. Make institutional productivity part of the solution. Most institutions can find ways to improve relative to the most efficient among their peers. While students and the state will be asked to contribute to solutions in one way or another, the contribution institutions can make—their skin in the game—should be improved productivity.
4. In the likely event that sufficient funds will not be available to ensure that unmet needs of students can be reduced to zero and that adequate funding for all institutions cannot be achieved, difficult decisions will have to be made. Priorities will have to be established regarding which students get access to student financial aid and which institutions get protection from the most radical cuts. While each state will have to establish its own priorities, it is suggested that the allocation be done in such a way that
   a. Affordability of college for low- and middle-income students, minorities and adults be given the highest priority. It is these students who must be better served if state attainment goals are to be achieved.
   b. The institutions that serve the majority of these students have sufficient resources to serve them well.
5. The approach to resource allocation—even in tough times—should align with state goals. If the state has a performance funding component to their funding model, this component should not be sacrificed to other funding goals. But that should not preclude states from taking a careful look at how their performance funding policies actually work and to make adjustments to better serve students from populations in need—particularly low-income students, underrepresented students of color, first-generation students, and working adults. As the pandemic's fiscal impact worsens the outlook on state budgets, states cannot afford to maintain resource allocation policies that are poorly targeted and wasteful. As a result, performance funding policies that provide no extra incentives for enrolling and graduating students from these groups should either be revised or eliminated.

6. The capital budget should be viewed as a source of funds to meet short-term needs. It is not necessary to subvert the basic objective of these funds to accomplish this purpose; all that is required is a broader definition of "capital"—one that defines durable capacity in multiple forms as eligible for support through the capital budget. That is, that funds be utilized for such things as building the needed technology infrastructure rather than being confined only to bricks and mortar.

Appendix A. Possible Scenarios for Selected States

Note that key assumptions driving these results are briefly described in Figure 3.

NCHEMS COVID-19 Impact Model

State A

		FY18/FY20			FY21			Difference			Percent Difference		
		Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year
Enrollment	Undergraduate FTE	226,253	30,989	315,824	212,731	28,958	297,651	-13,522	-2,031	-18,173	-6.0%	-6.6%	-5.8%
	Total FTE	280,053	34,389	315,824	263,841	32,188	297,651	-16,212	-2,201	-18,173	-5.8%	-6.4%	-5.8%
Revenue	Federal Stimulus				$149,135,868	$13,246,630	$150,734,608	$149,135,868	$13,246,630	$150,734,608			
	State Appropriations	$2,418,343,168	$293,308,724	$1,107,480,563	$1,616,325,353	$178,734,750	$878,332,616	-$802,017,816	-$114,573,974	-$229,147,947	-33.2%	-39.1%	-20.7%
	Local Appropriations	$0	$0	$0	$0	$0	$0	$0	$0	$0	N/A	N/A	N/A
	Revenue from T&F + Grants Used to Pay T&F	$2,662,804,929	$250,073,166	$1,046,248,261	$2,390,019,190	$212,928,087	$957,799,210	-$272,785,739	-$37,145,079	-$88,449,051	-10.2%	-14.9%	-8.5%
	Total Instruction-Related Revenue	$5,081,148,097	$543,381,890	$2,153,728,824	$4,155,480,411	$404,909,467	$1,986,866,433	-$925,667,686	-$138,472,423	-$166,862,391	-18.2%	-25.5%	-7.7%
	Auxiliaries	$782,613,069	$68,193,859	$68,878,465	$698,178,061	$60,419,987	$61,471,077	-$84,435,008	-$7,773,872	-$7,407,388	-10.8%	-11.4%	-10.8%
	Total Instruction-Related Revenue + Auxiliaries	$5,863,761,166	$611,575,749	$2,222,607,289	$4,853,658,472	$465,329,454	$2,048,337,510	-$1,010,102,694	-$146,246,295	-$174,269,779	-17.2%	-23.9%	-7.8%
Revenue per FTE	Federal Stimulus				$565	$412	$506	$565	$412	$506			
	State Appropriations	$8,635	$8,529	$3,507	$6,126	$5,553	$2,951	-$2,509	-$2,976	-$556			
	Local Appropriations	$0	$0	$0	$0	$0	$0	$0	$0	$0			
	Revenue from T&F + Grants Used to Pay T&F	$9,508	$7,272	$3,313	$9,059	$6,615	$3,218	-$450	-$657	-$95			
	Total Instruction-Related Revenue	$18,144	$15,801	$6,819	$15,750	$12,579	$6,675	-$2,394	-$3,222	-$144			
	Auxiliaries	$2,795	$1,983	$218	$2,646	$1,877	$207	-$148	-$106	-$12			
	Total Instruction-Related Revenue + Auxiliaries	$20,938	$17,784	$7,037	$18,396	$14,457	$6,882	$0	$0	$0			
Expenditures	Instruction-Related Expenses	$3,424,868,140	$333,043,085	$2,012,383,991	$2,772,742,804	$253,402,391	$1,854,597,361	-$652,125,336	-$79,640,694	-$157,786,630	-19.0%	-23.9%	-7.8%
	Student Services	$331,894,971	$54,126,984	$377,123,030	$274,834,004	$41,183,582	$347,553,637	-$57,060,967	-$12,943,402	-$29,569,392	-17.2%	-23.9%	-7.8%
	Auxiliaries	$779,825,388	$70,394,537	$84,748,219	$673,855,021	$53,561,070	$78,103,296	-$105,970,367	-$16,833,467	-$6,644,923	-13.6%	-23.9%	-7.8%
	Plant O&M Allocated to Instruction & Auxiliaries	$195,488,793	$15,749,817	$163,306,849	$195,488,793	$11,983,559	$150,502,316	$0	-$3,766,259	-$12,804,533	0.0%	-23.9%	-7.8%
	Total Instruction-Related Expenses + Auxiliaries	$4,732,077,292	$473,314,424	$2,637,562,089	$3,916,920,622	$360,130,602	$2,430,756,611	-$815,156,669	-$113,183,822	-$206,805,478	-17.2%	-23.9%	-7.8%
Expenditures per FTE	Instruction-Related Expenses	$12,229	$9,685	$6,372	$10,509	$7,873	$6,231	-$1,720	-$1,812	-$141			
	Student Services	$1,185	$1,574	$1,194	$1,042	$1,279	$1,168	-$143	-$295	-$26			
	Auxiliaries	$2,785	$2,047	$268	$2,554	$1,664	$262	-$231	-$383	-$6			
	Plant O&M Allocated to Instruction & Auxiliaries	$698	$458	$517	$741	$372	$506	$43	-$86	-$11			
	Total Instruction-Related Expenses + Auxiliaries	$16,897	$13,764	$8,351	$14,846	$11,188	$8,166	-$2,051	-$2,575	-$185			
Awards	Bachelor's Degrees	58,617	7,172	8,436	47,525	5,466	7,804	-11,092	-1,706	-632	-18.9%	-23.8%	-7.5%
	Associate's Degrees	1,736	1,441	70,831	1,404	1,091	65,298	-332	-350	-5,533	-19.1%	-24.3%	-7.8%
	Undergraduate Certificates	287	0	25,792	233	0	23,820	-54	0	-1,972	-18.9%	NA	-7.6%
	Total Undergraduate Awards	60,640	8,613	105,059	49,161	6,557	96,921	-11,479	-2,056	-8,138	-18.9%	-23.9%	-7.7%

Note that key assumptions driving these results are briefly described in Figure 3.

NCHEMS COVID-19 Impact Model

State B

		FY18/FY20			FY21			Difference			Percent Difference		
		Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year
Enrollment	Undergraduate FTE	102,299	119,713	83,395	102,299	118,535	84,808	0	-1,178	1,413	0.0%	-1.0%	1.7%
	Total FTE	126,516	134,186	83,395	127,727	132,284	84,808	1,211	-1,902	1,413	1.0%	-1.4%	1.7%
Revenue	Federal Stimulus				$41,144,789	$62,795,570	$38,977,203	$41,144,789	$62,795,570	$38,977,203			
	State Appropriations	$406,008,374	$520,254,049	$237,120,931	$406,008,374	$520,254,049	$237,120,931	$0	$0	$0	0.0%	0.0%	0.0%
	Local Appropriations	$0	$0	$123,398,895	$0	$0	$123,398,895	$0	$0	$0	N/A	N/A	0.0%
	Revenue from T&F + Grants Used to Pay T&F	$2,614,152,475	$1,924,197,568	$529,415,169	$2,412,706,942	$1,819,481,580	$549,923,117	-$201,445,533	-$104,715,987	$20,507,948	-7.7%	-5.4%	3.9%
	Total Instruction-Related Revenue	$3,020,160,849	$2,444,451,617	$889,934,995	$2,859,860,105	$2,402,531,200	$949,420,147	-$160,300,745	-$41,920,417	$59,485,151	-5.3%	-1.7%	6.7%
	Auxiliaries	$515,786,908	$566,061,672	$29,531,072	$464,208,217	$509,455,505	$28,054,518	-$51,578,691	-$56,606,167	-$1,476,554	-10.0%	-10.0%	-5.0%
	Total Instruction-Related Revenue + Auxiliaries	$3,535,947,757	$3,010,513,289	$919,466,067	$3,324,068,322	$2,911,986,704	$977,474,665	-$211,879,435	-$98,526,584	$58,008,598	-6.0%	-3.3%	6.3%
Revenue per FTE	Federal Stimulus				$322	$475	$460	$322	$475	$460			
	State Appropriations	$3,209	$3,877	$2,843	$3,179	$3,933	$2,796	-$30	$56	-$47			
	Local Appropriations	$0	$0	$1,480	$0	$0	$1,455	$0	$0	-$25			
	Revenue from T&F + Grants Used to Pay T&F	$20,663	$14,340	$6,348	$18,890	$13,754	$6,484	-$1,773	-$585	$136			
	Total Instruction-Related Revenue	$23,872	$18,217	$10,671	$22,390	$18,162	$11,195	-$1,481	-$55	$524			
	Auxiliaries	$4,077	$4,218	$354	$3,634	$3,851	$331	-$442	-$367	-$23			
	Total Instruction-Related Revenue + Auxiliaries	$27,949	$22,435	$11,025	$26,025	$22,013	$11,526	$0	$0	$0			
Expenditures	Instruction-Related Expenses	$2,484,815,719	$1,934,885,579	$771,469,210	$2,319,633,657	$1,857,118,240	$820,140,769	-$165,182,061	-$77,767,339	$48,671,559	-6.6%	-4.0%	6.3%
	Student Services	$355,484,373	$282,003,465	$123,214,472	$338,966,167	$277,428,915	$130,988,003	-$16,518,206	-$4,574,549	$7,773,532	-4.6%	-1.6%	6.3%
	Auxiliaries	$488,875,041	$447,819,314	$29,837,934	$470,292,059	$440,500,035	$31,720,392	-$18,582,982	-$7,319,279	$1,882,458	-3.8%	-1.6%	6.3%
	Plant O&M Allocated to Instruction & Auxiliaries	$116,623,762	$130,829,867	$46,810,012	$110,429,434	$129,000,047	$49,763,229	-$6,194,327	-$1,829,820	$2,953,217	-5.3%	-1.4%	6.3%
	Total Instruction-Related Expenses + Auxiliaries	$3,445,798,895	$2,795,538,225	$971,331,627	$3,239,321,318	$2,704,047,238	$1,032,612,394	-$206,477,577	-$91,490,987	$61,280,767	-6.0%	-3.3%	6.3%
Expenditures per FTE	Instruction-Related Expenses	$19,640	$14,419	$9,251	$18,161	$14,039	$9,671	-$1,479	-$381	$420			
	Student Services	$2,810	$2,102	$1,477	$2,654	$2,097	$1,545	-$156	-$4	$67			
	Auxiliaries	$3,864	$3,337	$358	$3,682	$3,330	$374	-$182	-$7	$16			
	Plant O&M Allocated to Instruction & Auxiliaries	$922	$975	$561	$865	$975	$587	-$57	$0	$25			
	Total Instruction-Related Expenses + Auxiliaries	$27,236	$20,833	$11,647	$25,361	$20,441	$12,176	-$1,875	-$392	$528			
Awards	Bachelor's Degrees	23,675	23,224	0	21,950	22,511	0	-1,725	-713	0	-7.3%	-3.1%	NA
	Associate's Degrees	47	2,775	14,076	44	2,697	15,173	-3	-78	1,097	-7.3%	-2.8%	7.8%
	Undergraduate Certificates	1,625	570	3,143	1,507	554	3,434	-118	-16	291	-7.3%	-2.7%	9.3%
	Total Undergraduate Awards	25,347	26,569	17,219	23,501	25,762	18,607	-1,846	-807	1,388	-7.3%	-3.0%	8.1%

Note that key assumptions driving these results are briefly described in Figure 3 in the text.

NCHEMS COVID-19 Impact Model

State C

		FY18/FY20			FY21			Difference			Percent Difference		
		Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year	Research	Four-Year Comp.	Two-Year
Enrollment	Undergraduate FTE	27,094	9,248	40,849	25,433	8,486	40,490	-1,661	-762	-359	-6.1%	-8.2%	-0.9%
	Total FTE	34,012	11,918	40,853	31,839	10,836	40,494	-2,173	-1,082	-359	-6.4%	-9.1%	-0.9%
Revenue	Federal Stimulus				$14,275,563	$6,036,005	$22,368,778	$14,275,563	$6,036,005	$22,368,778			
	State Appropriations	$440,988,077	$126,031,128	$188,373,330	$427,758,435	$122,250,195	$182,722,130	-$13,229,642	-$3,780,934	-$5,651,200	-3.0%	-3.0%	-3.0%
	Local Appropriations	$106,054,417	$0	$178,333,146	$111,357,138	$0	$187,249,803	$5,302,721	$0	$8,916,657	5.0%	N/A	5.0%
	Revenue from T&F + Grants Used to Pay T&F	$295,910,606	$86,996,145	$94,486,963	$304,287,656	$82,576,970	$95,058,451	$8,377,050	-$4,419,175	$571,488	2.8%	-5.1%	0.6%
	Total Instruction-Related Revenue	$842,953,100	$213,027,273	$461,193,439	$857,678,792	$210,863,169	$487,399,163	$14,725,692	-$2,164,104	$26,205,723	1.7%	-1.0%	5.7%
	Auxiliaries	$60,592,215	$21,996,843	$14,843,816	$48,473,772	$19,797,159	$13,359,434	-$12,118,443	-$2,199,684	-$1,484,382	-20.0%	-10.0%	-10.0%
	Total Instruction-Related Revenue + Auxiliaries	$903,545,315	$235,024,116	$476,037,255	$906,152,564	$230,660,328	$500,758,597	$2,607,249	-$4,363,788	$24,721,342	0.3%	-1.9%	5.2%
Revenue per FTE	Federal Stimulus				$448	$557	$552	$448	$557	$552			
	State Appropriations	$12,966	$10,575	$4,611	$13,435	$11,282	$4,512	$469	$707	-$99			
	Local Appropriations	$3,118	$0	$4,365	$3,498	$0	$4,624	$379	$0	$259			
	Revenue from T&F + Grants Used to Pay T&F	$8,700	$7,300	$2,313	$9,557	$7,621	$2,347	$857	$321	$35			
	Total Instruction-Related Revenue	$24,784	$17,874	$11,289	$26,938	$19,460	$12,036	$2,154	$1,585	$747			
	Auxiliaries	$1,781	$1,846	$363	$1,522	$1,827	$330	-$259	-$19	-$33			
	Total Instruction-Related Revenue + Auxiliaries	$26,565	$19,720	$11,652	$28,461	$21,287	$12,366	$0	$0	$0			
Expenditures	Instruction-Related Expenses	$532,474,215	$121,026,917	$362,877,790	$534,173,137	$118,779,761	$381,722,588	$1,698,922	-$2,247,156	$18,844,798	0.3%	-1.9%	5.2%
	Student Services	$52,615,605	$20,758,809	$60,570,796	$52,764,261	$20,373,372	$63,716,330	$148,656	-$385,437	$3,145,534	0.3%	-1.9%	5.2%
	Auxiliaries	$119,986,964	$22,764,654	$22,195,938	$120,263,038	$22,341,974	$23,348,607	$276,075	-$422,681	$1,152,669	0.2%	-1.9%	5.2%
	Plant O&M Allocated to Instruction & Auxiliaries	$30,877,662	$6,734,534	$21,809,044	$30,877,662	$6,609,491	$22,941,621	$0	-$125,043	$1,132,577	0.0%	-1.9%	5.2%
	Total Instruction-Related Expenses + Auxiliaries	$735,954,446	$171,284,915	$467,453,567	$738,078,098	$168,104,599	$491,729,145	$2,123,653	-$3,180,317	$24,275,578	0.3%	-1.9%	5.2%
Expenditures per FTE	Instruction-Related Expenses	$15,655	$10,155	$8,883	$16,777	$10,962	$9,427	$1,122	$807	$544			
	Student Services	$1,547	$1,742	$1,483	$1,657	$1,880	$1,573	$110	$138	$91			
	Auxiliaries	$3,528	$1,910	$543	$3,777	$2,062	$577	$249	$152	$33			
	Plant O&M Allocated to Instruction & Auxiliaries	$908	$565	$534	$970	$610	$567	$62	$45	$33			
	Total Instruction-Related Expenses + Auxiliaries	$21,638	$14,372	$11,442	$23,182	$15,514	$12,143	$1,544	$1,142	$701			
Awards	Bachelor's Degrees	6,326	1,880	37	6,408	1,895	39	82	15	2	1.3%	0.8%	5.0%
	Associate's Degrees	20	451	7,958	20	448	8,365	0	-3	407	1.6%	-0.7%	5.1%
	Undergraduate Certificates	47	125	8,126	47	124	8,542	0	-1	416	0.8%	-0.7%	5.1%
	Total Undergraduate Awards	6,393	2,456	16,121	6,476	2,467	16,946	83	11	825	1.3%	0.4%	5.1%

Appendix B. Instructions for Use

The intention of NCHEMS' COVID-19 Impact Model is to estimate likely impacts on institutional finances and student affordability in FY2021 arising from changes in fiscal conditions caused (in part) by the pandemic. The nature of the crisis precipitated by the pandemic is unprecedented, which means that it is extremely difficult to anticipate how events will affect major variables affecting the two principal financial sources for public institutions, namely enrollments (and related tuition revenue) and state appropriations. Additionally, the federal government has already committed stimulus money to fund higher education, and it may yet provide more. The model makes extensive use of heuristic values to allow state policymakers and (especially) SHEEOs develop "what-if" scenarios that help them better assess the likely impacts on the different sectors of public higher education. This makes the model extremely flexible, yet produces immediate estimated results. These results will aid in planning a response that maintains focus on state goals, especially so that the sectors that serve the most vulnerable populations remain at the forefront of state policy responses. While the model is intended for use by SHEEO agencies, but it may also have value for legislators and their staff.

There are three main tabs in the model:

1. **Staff Dash** (in Blue): The principal tab where the most granular adjustments can be made. The tab is organized consistent with the seven primary modules that run the calculations: Enrollment; Federal Stimulus; Tuition & Fees; State & Local Appropriations; Auxiliaries; Expenditures; and Affordability. Sections for each of these modules are arrayed from top to bottom, with each section showing most recently available data and providing space to make adjustments, and then reporting related results. (When all the modules directly affecting revenue estimates have been completed, this tab also shows a summary of revenues.)
2. **Output** (in Red): Collects the results from the model's calculations. There are no places to interact with the data on this tab.
3. **Executive Dash** (in Green): Mirrors the "Output" tab but also provides an opportunity to make adjustments in several high-level inputs, including enrollment, tuition prices, and state appropriations.

The model includes a number of additional tabs where the calculations are actually made. As these tabs are not needed to interact with the model, NCHEMS has hidden these tabs for simplicity, but they may be unhidden and reviewed for details on the calculations.

Users will interact with the model in two primary ways. A member of the SHEEO staff who is most attuned to the anticipated changes in enrollment and pricing will likely want to use the blue "Staff Dash" tab, where the user can make changing assumptions about

different impacts. For example, in the enrollment section, this tab permits the user to enter predictions about how enrollment patterns will change in different institutional sectors among students of different age groups, and for initial, transfer, and continuing enrollment. Within the tuition pricing section, the user can change prices by level and residency and adjust the proportion of student enrollments by residency status, in order to better assess related effects on net tuition revenue.

The SHEEO will likely prefer to use the green tab labeled "Executive Dash." This tab looks like the "Output" tab but offers SHEEOs and their staff a chance to adjust assumptions at a much higher level for overall enrollment, pricing, and state appropriations, with results immediately populating in the table that follows. Additionally, changes to the assumptions in the Executive Dash will maintain the more granular adjustments in enrollment made on the "Staff Dash" tab as weights in the calculations.

On the "Staff Dash" tab, cells are color-coded, as follows:

Green	Cells that provide pre-populated values with the most recently available year's data.
Pale Yellow	Adjustable cells—these are the cells on the "Staff Dash" tab where entries are made, usually in percent change terms, for adjusted assumptions. For example, the yellow fields in the Enrollment module allow you to enter the percent change in enrollment expected in each sector by type of students for the upcoming fiscal year. Some of these cells require percent of total values for all public institutional sectors, and these are accompanied by a separate cell that should always be 100% after all sector adjustments are made. NOTE: The adjustable cells on the "Executive Dash" are shown in pale yellow.
Dark Yellow	Adjustable cells on the "Staff Dash" tab for tuition pricing and state appropriations, but which are linked to the adjustable cells on the "Executive Dash" tab. These adjustments flow through to the "Staff Dash" tab so they can feed the calculations. Adjustments can be made on either tab, but should be set equal to the corresponding yellow cells on the "Executive Dash" if the user wants those to function.
Blue	Cells that report estimated results.

Please take note that most of the data in the model are based on FY 2018, as these were the most recent data available when the model was constructed. Therefore, data and results for enrollments, revenues other than state appropriations the federal stimulus, expenses, and completions will reflect changes between FY 2018 and FY 2021. That means, for instance, care must be taken when inputting a percent change in enrollments and in the corresponding interpretation. For example, putting "–10%" in the anticipated percent change fields for enrollment model means that the user assumes that enrollments in FY

2021 will be 10 percent lower than they were in FY 2018. Thus, it is not a year-to-year change, but the year-to-year change can be calculated by the user and adjust inputs accordingly.

The Modules

Below is a description of each of the modules in the models, including how they should be used, what the underlying data are, and what the key embedded assumptions are.

1. Enrollment

Use	By sector, adjust headcounts of students in each category based on percent change from FY18 data. Separately specify the percent of students enrolled full-time, with that proportion applicable to all students in each age group. Specify the percent change in graduate FTEs.
Data & Method	Data sources for this module all come from IPEDS. Headcounts after adjustments are converted to FTE first based on the full-time plus 1/3 part-time method for age-based data and then converted to an estimated unduplicated FTE based on the ratio of fall enrollment headcounts to unduplicated FTE in FY18.
Key assumptions	All first-time direct-from-high school students are under 25. The conversion of fall enrollment headcounts to unduplicated FTE is consistently accurate for all types of institutions in all states for different age ranges. The likelihood of students attending full-time in the fall is consistent across enrollment as first-time, transfer-in, or continuing students, and also throughout the academic year.

2. Federal Stimulus

Use	Indicate the amount that will go to funding higher education institutions from the governor's discretionary funding in the CARES Act. Indicate any additional stimulus that Congress may approve. The cell for the national amount does not result in any different calculations; it is informational only. A value for the state's stimulus funding in the cells in column E will yield results. These amounts

	should be for allocation to the public institutions. No provision is currently made for stimulus money paid to students in the model.
Data & Method	Data for CARES Act institutional funding come from the U.S. Department of Education.
Key assumptions	Any stimulus money not already specified as going directly to institutions in the CARES Act will be distributed to institutions based on their FTE shares in each state.

3. Tuition Revenue

Use	Adjust the proportions of students enrolled based on residency status. The totals for each sector should equal 100%. Adjust published tuition and mandatory fees prices for students by residency and sector, expressed as percent changes from the 2018-19 published rates. As a default, these values are set equal to the value set in "Executive Dash," which only provides for percent changes in resident and nonresident tuition rates for both undergraduates and graduates simultaneously. It is possible to override those adjustments here in the "Staff Dash," but doing so would break the link between "Executive Dash" and "Staff Dash."
Data & Method	Data sources for this module all come from IPEDS. Data on the residency status of student is from the Fall Enrollment Survey. Data on tuition prices is from Institutional Characteristics. Data on tuition revenue and grants and scholarships are from the Finance Survey. Estimates for FY21 tuition revenue are made first by calculating the ratio of gross tuition revenue to net tuition revenue in FY18 and then multiplying that ratio by the gross tuition revenue amount that is calculated for FY21 based on enrollment and pricing changes. "Revenue from T&F + Grants Used to Pay T&F" is a variable created to estimate the amount of money the institution can access from actual tuition payments made by students as well as grant aid received by its students. To the net tuition revenue amount, the model adds the lesser of two amounts: a) grants from government sources (Pell Grant, other federal grant, and state and local grants, as specified in the Finance Survey), or b) discounts and allowances applied to tuition and fees. Finally, adjustments in the state appropriations to student financial aid gets included in the calculation of "Revenue from T&F + Grants Used to Pay T&F" by distributing the total difference from FY20 estimates to institutions based on each institution's share of the total

state grants amount for all institutions in the state (including privates).

Key assumptions

The residency status of all undergraduates is consistent with the residency status of first-time students. Graduate FTEs are assumed to be half residents and half nonresidents. The share of student FTEs by residency status determines the tuition rates used to calculate gross tuition amounts.

Students in receipt of grant aid spend it on tuition and fees first. Any excess in government grants above the amount specified as discounts and allowances applied to tuition and fees is assumed to be used by students for non-tuition expenses.

4. State Appropriations

Use

In this module, there are cells to adjust on "Staff Dash" and "Executive Dash."

Default data are provided for FY20 based on the Grapevine report, with sector allocations initially based on FY18 shares as reported in IPEDS. Assuming that the FY20 estimates for each sector are not accurate, those amounts should be corrected in row 103 of the "Staff Dash" tab. That is also the place to record any FY20 appropriations that may have happened due to mid-year adjustments.

On the "Executive Dash" tab, users may specify the state appropriation to state financial aid, as well as the percent change for both state appropriations to institutions and to state aid. These inputs will carry over into the "Staff Dash" tab.

Users may also adjust the Local Appropriations amounts by sector in the appropriate cells on the "Staff Dash" tab using percent change from FY18.

Data & Method

Data for state appropriations come from Grapevine/SHEEO SHEF and from IPEDS.

Estimates for FY20 by sector are made by first distributing FY20 total state appropriations to funding for public institutions, state financial aid, and the category of research, agriculture, and medical funding plus state subsidies that go directly to independent institutions proportionally based on the distribution in the FY18 SHEF data. Then funding to public institutions is distributed by sector based on FY18 IPEDS data.

If the user adjusts state appropriations to institutional sectors in FY20 data, or to state financial aid on the "Executive Dash" tab, then

	the difference is taken proportionately out of RAM spending on the public research sector, so that the total FY20 appropriations remain constant.
Key assumptions	Although the user may change this assumption, the default is that the state appropriations for each sector in FY20 matches that sector's relative share in FY18. State grant aid appropriations in SHEF are accurately distributed to institutions based on IPEDS finance data from FY18.

5. Auxiliaries

Use	Users can adjust the amount of revenue by sector from auxiliary enterprises by inputting a percent change from FY18 to FY21.
Data & Method	Data come from IPEDS.
Key assumptions	While some institutions report revenues (and expenses) related to intercollegiate athletics under student services and others report it under auxiliaries, the model assumes that most major Division I sports programs are reporting the data as auxiliaries.

6. Expenditures

Use	The module reports straightforwardly the expenditures categories for each sector in the top part of the relevant section. Below the first "Total" line, a separate collection of expenditure data are reported. These amounts are intended to show operational expenses most closely related to instruction, student services, and auxiliaries, with estimates for the costs of maintaining and operating facilities removed. This is done to give the user some control over the distribution of cuts to expenses most closely tied to the instructional mission of the institution, and to reflect the likelihood that some costs are more or less subject to budget action in the short term than others. For instance, some institutions (or sectors) may find it harder than others to cut into expenses related to Plant Operations and Maintenance, especially given additional costs of disinfecting facilities; heating, cooling, and lighting buildings; and maintaining a safe space. Users can adjust assumptions about potentially varying cuts to expenses in the relevant yellow cells by specifying which expenditure categories will see relatively larger or smaller cuts than their share of the total; data from FY 2018 is provided for reference.

	Changes in the expenses per FTE for instruction-related expenses and student services expenses affect the estimated completions.
Data & Method	Data are from IPEDS. Plant Operations and Maintenance expenses are distributed among the functional classifications (Instruction, Research, Academic Support, etc.) in proportion to each expense category's total. These amounts are subtracted from the category total. That is, if Student Services accounts for 20 percent of total expenses, then the Plant O&M costs allocated to instruction are calculated as total Plant O&M costs times 20 percent. This product is then subtracted from the Student Services expenses. To get "Instruction-related Expenses," we add a portion of Institutional Support expenses to the amount calculated for Instruction after allocating/subtracting its share of the Plant O&M expenses. Institutional Support is a collection of expenses that are related to operating the institution—employing leadership, paying for accounting and auditing, compliance, etc. The portion we add to get "Instruction-related Expenses" is calculated based on Instruction's share of the total of Instruction plus Research plus Public Service (the tri-partite mission of most postsecondary institutions).
Key assumptions	Plant O&M is appropriately allocated to different expenditures categories proportional to each category's share of total expenses. A similar assumption applies to the treatment of Institutional Support expenses.

7. Affordability

Use	Effects of the pandemic are likely to change the income profiles of students who enroll and, accordingly, their levels of affordability. Changes to state appropriations to state grant programs will also be important. This section tries (mightily) to assess impacts on affordability. Users should take especially great care in interpreting the results. In some states, the data are much clearer than in others, but in all cases the calculations required are extensive and complicated. It is probably best to view the results as indicative of relative impacts, rather than relying heavily on the specific values generated by the methodology. The affordability module is included in the model because an indication of how students' ability to pay the costs of college is a critical element to attend to, even if it is uncommonly difficult to measure.

Users can adjust the number of first-time, full-time (FTFT) in-state students who received Title IV aid, as well as the proportion of those students who were counted in each of five income categories.

Data & Method

IPEDS Student Financial Aid Survey for FY18 provided the base data about the number of students who were in each income category, as well as data about total grant aid awarded from the federal government, state government, and institutional sources.

The National Postsecondary Student Aid Study provided data about the average Pell Grant and EFC for full-time in-state students within each income band.

The National Association of State Student Grant and Aid Programs (NASSGAP) provided limited data on the distribution of state funds to students by income. Where these data existed, they were aggregated as closely as possible to match the IPEDS income bands. This aggregation was done at the state level because NASSGAP does not cross its data on the income of grant recipients with their enrollment sector.

Data on the state appropriation to financial aid comes from SHEF. Notably, these data differ dramatically from the NASSGAP totals in some states.

The amount of state grant aid awarded to students by sector was based on the proportion of dollars awarded in FY18 according to the IPEDS Finance Survey. This amount was reduced to represent only the percentage of state dollars per sector awarded to FTFT in-state students who received Title IV aid, as these are the only students with available data by income band. For grant aid programs for which NASSGAP has no income breakdown for state grants (in some states, NASSGAP has no data broken down by income), the pool of state grant aid per sector had to be further divided into dollars to students with known income bands and students with unknown income bands, based on the percent of state dollars awarded to those of known income as reported in IPEDS.

The average state grant award by income band was calculated by distributing the totals dollars to students with known income bands to the five income band groups. This division was based on the share of state grant aid awarded to each income band, which is calculated using data from NASSGAP. This amount was then divided by the number of students identified in IPEDS as belonging to each income band, resulting in an average “known” state grant per student per income band. The “unknown” state grant dollars were distributed by calculating the average award to all FTFT in-state students receiving Title IV aid, regardless of income data availability. The average state/local/institutional grant amount by income band was

determined by subtracting the average Pell and other federal grant dollars (using NPSAS: 16 averages for full-time resident students) from the average grant award by income band, identified using IPEDS. Both the "known" and "unknown" state grand aid amounts were then subtracted from this value, with the remainder identified as institution grants. If the total calculated "known" and "unknown" award amounts were greater than the total estimated state/institution grants, the overage was redistributed to the lower income bands so that all funds were accounted for within the population of students with known income bands.

Estimates of unmet need were made by subtracting the following items from the sector-weighted cost of attendance: an amount roughly equivalent to working 15 hours/week at the prevailing state minimum wage times 48 weeks/year; the average Pell Grant award at each income band; the average EFC at each income band; and the total state / institution grant amount to FTFT in-state students receiving Title IV aid at each income band, calculated as described above. Costs of attendance were provided by IPEDS for on campus living in the four-year research sector and off campus without family in the four-year comprehensive and two-year sectors.

Key assumptions

The national data on Pell Grants and EFC are reasonably consistent across states and sectors because the income bands are bounded, which helps restrict how much variation there will be in the results. It further assumes that the relative presence of dependent and independent students in the student population does not vary across states or sectors.

Total state grant aid was distributed across the three sectors in the same proportion as known from FY 18 and does not account for changes in enrollment between the three sectors.

State grant amounts for which the income level of recipients was unknown were distributed in proportion to the presence of students in the IPEDS income bands. (In some cases, especially where there are limited or no data on the income of state grant recipients, this yields average state grants with no or very small variation across income bands.)

The wide differences between the SHEF and NASSGAP data on state appropriations to state grant aid is immaterial.

With the exception of state grants, average grants remain constant regardless of enrollment assumptions. This is done to isolate the impact of state grant aid funding on affordability.

8. Completions

Use	Reports the FY 2018 and expected FY 2021 undergraduate awards produced by state, sector, and award level.
Data & Method	Data for this module come from IPEDS. Current and estimated completions are based on the ratio of annual awards produced to annual FTES by award level for undergraduate enrollments age < 25 and 25+. Annual undergraduate FTEs by age are extracted from the enrollment module (see section 1 on the Enrollment Module). No heuristic for the completion ratio is provided on the Dashboard as award production based on this ratio is directly dependent upon changes in FTE enrollment and enrollment intensity which are already adjustable within the model. Changes in the number of FTE enrollments directly impact the number of awards that can be produced and changes in enrollment intensity impact time to completion which impact annual award production (a higher percentage of full-time students results in shorter times to completion and a higher production efficiency ratio). Award production is also affected by changes in instruction-related and student services spending which impact ability to support specified levels of award production. Adjustments to these heuristics are applied to the current completions ratio to estimate future changes in annual award production.
Key assumptions	Completers who remain full-time through award completion complete their award within 100 percent of normal program time and completers who remain part-time through award completion complete their award within 200 percent of normal program time. Time to completion is directly proportional to enrollment intensity. Changes in FTE enrollment have immediate impact on award production (changes in enrollment of first-time undergraduates and other student types might not necessarily have an immediate impact on award production but the eventual impact of such enrollment changes is accounted for in the estimated change in annual award production). An individual institution's productivity rate (completions per 100 FTE) is assumed to be related to spending on instruction-related and student services activities. See enrollment assumptions under section 1, Enrollment Module.