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AAMC Economic Impact Analysis Using IMPLAN: Technical Documentation

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Prepared for the AAMC by RTI International

Association of
American Medical Colleges

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The AAMC (Association of American Medical Colleges) is a nonprofit association dedicated to improving the health of people everywhere through medical education, health care, medical research, and community collaborations. Its members comprise all 155 accredited U.S. and 16 accredited Canadian medical schools; approximately 400 teaching hospitals and health systems, including Department of Veterans Affairs medical centers; and more than 70 academic societies. Through these institutions and organizations, the AAMC leads and serves America's medical schools and teaching hospitals and the millions of individuals employed across academic medicine, including more than 191,000 full-time faculty members, 95,000 medical students, 149,000 resident physicians, and 60,000 graduate students and postdoctoral researchers in the biomedical sciences. In 2022, the Association of Academic Health Centers and the Association of Academic Health Centers International merged into the AAMC, broadening the AAMC's U.S. membership and expanding its reach to international academic health centers. Learn more at [aamc.org](https://www.aamc.org).

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Introduction

It has become common today to measure the economic contributions of an organization and its members to the regional economy. The demand for such studies is driven by the desire to give concrete evidence and deliver economic messages to diverse audiences about the value organizations provide to the communities where they operate.

A standard way of thinking about the size of economic contributions is to collect data for an organization's sales or operating expenses. For example, the AAMC's analysis of data from the Medicare Healthcare Cost Report Information System indicates that in 2019, member teaching hospitals' annual operating expenses totaled about \$303 billion, while AAMC data shows that member medical schools' operating expenses totaled \$147 billion. These are economically significant figures, amounting to about \$1,372 per U.S. resident. But focusing on only these direct expenses misses the value of other secondary economic activity brought about by AAMC-member medical schools and teaching hospitals. Economists at the U.S. Bureau of Economic Analysis (2013) describe the secondary impacts in this way:

An initial change in economic activity results in other rounds of spending — for example, building a new road will lead to increased production of asphalt and concrete. The increased production of asphalt and concrete will lead to more mining. Workers benefiting from these increases will spend more, perhaps by eating out at nicer restaurants or splurging more on entertainment. (p. 1-1)

Economists often point out that secondary impacts should be estimated because they provide an indicator of the additional value of an organization's regional economic contributions. In other words, including secondary impacts provides a more complete picture of the full economic contributions of an organization.

The full economic contribution is frequently summarized by a ratio called a “multiplier.” The ratio relates the total change in the economy to the initial change brought about by industry spending. For example, an employment multiplier of 2 indicates that the creation of a job in one sector will create an additional job in another sector of the local economy; in other words, it has a total effect of 2 jobs.

Goals of Technical Documentation

The goal of this technical documentation is to describe how RTI International measured the full economic contribution, both direct and secondary impacts, of AAMC-member operations to the United States and individual states. To achieve this goal, we used a commercially available regional economic impact model called IMPLAN to estimate the size of secondary impacts.

To help readers understand how the economic impact analysis was conducted, we use the “question and answer” format below, which is recommended by the U.S. Bureau of Economic Analysis. The format was adapted from a publication provided by staff economists at the U.S. Bureau of Economic Analysis

who are experts in regional economic impact modeling, including university impacts (Ambargis *et al.*, 2014).

General Questions¹

What economic model is used to estimate the economic impacts?

To illustrate an economic story and provide estimates of the size of the economic contributions made by AAMC-member medical schools and teaching hospitals, this analysis used commercially available economic data and software called IMPLAN.

The IMPLAN model uses publicly available economic data to calculate all economic multipliers and to estimate and break down the total impact into three separate effects:

1. Direct effects: AAMC-member spending.
2. Indirect effects: AAMC-member suppliers' spending.
3. Induced effects: Direct and indirect effects of spending by employees of AAMC members and suppliers.

The direct effect is associated with AAMC-member medical schools and teaching hospitals that provided patient care, research, education, and collaborative community programs. To support these missions, AAMC-member medical schools and teaching hospitals incur expenses in two broad areas: (1) expenses related to purchases from other local businesses, and (2) payroll expenses for medical school and teaching hospital employees. The first expense area creates a series of “indirect effects,” while the second expense area contributes to a series of “induced effects.”

Direct effects represent the money spent by individuals, businesses, and other institutions for the patient care, research, education, and community collaborations that AAMC-member medical schools and teaching hospitals provide. Indirect effects represent first-round money spent by AAMC members, and subsequent rounds of money represent money spent among local businesses. The first-round money includes the money spent on items such as medical devices, lab equipment, computer supplies, and public relations campaigns. Subsequent rounds of money (or indirect effects) include the money spent further upstream on items such as electronic parts for medical devices and computers.

The last effect, the induced effect, includes all money spent by the employees who receive salaries and benefits from jobs created by AAMC members and local businesses on purchases such as those from retail clothing stores, restaurants, movie theaters, and other local businesses.

Breaking out and examining the two types of secondary effects (indirect and induced effects) helps illustrate the types of economic relationships in a large economy and the stories behind the multiplier. For example, industries that hire many employees or pay higher than average wages tend to create larger

induced effects and smaller indirect effects. In contrast, industries that are not as “labor intensive” and instead spend money on materials, energy, and other supplies tend to create larger indirect effects.

What is the direct effect included in the analysis?

We evaluated the direct economic impact using the total value of operating expenses for AAMC-member medical schools using the fiscal year (FY) 2019 medical school expenditure and teaching hospital expenditure data. Medical school expenditures came from the Liaison Committee on Medical Education Part I-A Annual Financial Questionnaire and included the total amount of operating expenditures from medical schools for FY 2019 from sources such as tuition and fees, government and parent university support, grants and contracts, faculty practice plans, affiliated hospital support, gifts and endowments, and others. These expenditures are based on the sum of recorded expenditures and not-recorded expenditures. Recorded expenditures are recorded in medical school accounts. Not-recorded expenditures materially benefit the medical school but are not recorded in medical school accounts (i.e., the medical school does not have direct control over these expenditures). Not-recorded expenditures may appear on the accounts of, for example, the medical school’s parent university.

Medical school expenses are attributed to the state of the main campus for those medical schools that may have out-of-state programs. The reason for this approach is that the data does not exist at the program level. For example, the jobs and economic impact for the state of Washington reflect the University of Washington School of Medicine’s regional WWAMI programs in Washington, Wyoming, Alaska, Montana, and Idaho. Despite this data limitation, it should be acknowledged that each out-of-state program has its own local impact on jobs and the economy. FY 2019 hospital total direct expenses included inpatient, outpatient, and other hospital-based expenditures such as home health aides, as well as the direct costs of providing graduate medical education, conducting research, and running physicians’ offices. Direct expenses came from the Healthcare Cost Report Information System database, assembled by the Centers for Medicare & Medicaid Services, which contains actual expense data.

The economic contributions associated with universities (IMPLAN code 481 and North American Industry Classification System [NAICS] 611210-611310) and hospitals (IMPLAN code 490 and NAICS 622110-622310) were measured with a commercially available input-output (IO) model. For this study, we used the IMPLAN 51-state data package for 2018 (50 U.S. states and the District of Columbia). For Puerto Rico, we used the 2015 data package purchased with resources provided by the AAMC under this project. Given that the level of expenditures is determined by our input data to the IMPLAN model, this difference in data source years did not bias our results for Puerto Rico.

Total expenses were treated as a change in industry output activity. We applied output multipliers exported from the IMPLAN software and report the results in 2021 dollars using the gross domestic product implicit price deflator from the U.S. Bureau of Economic Analysis. The model results include a spreadsheet that shows how the total expenses were included in the model.

In addition, IMPLAN job numbers are presented as full-time equivalents (FTEs). An FTE is assumed to work 2,080 hours in a standard year. The number of FTEs was calculated from the IMPLAN data using the IMPLAN 2020 FTE and Employee Compensation Conversion Table.²

These ratios are based on national averages from the U.S. Bureau of Economic Analysis. For the state-level analysis, we applied average ratios to all sectors.

Are any contributions to the local economy that are measured by something other than an I-O model (e.g., downstream benefits, returns to human capital, cultural amenities) separately identified?

No. The economic value of items such as human capital and cultural amenities is not included in this analysis. Examples of human capital include skills, knowledge, and experience obtained by individuals through education, mentoring, and other training.

How are the “indirect” impacts defined (e.g., upstream, downstream, or a combination of upstream and downstream)?

We included upstream effects, referred to by IMPLAN as indirect effects, which measure the impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added. The impacts are calculated by applying direct effects to the type I multipliers. The indirect effects were added to the direct and induced effects to calculate the total effect.

What geographic region is used to measure the university’s contribution?

The primary analysis considered the entire contribution to the United States. RTI completed independent supplemental analyses using individual state-level IMPLAN models to estimate state-level contributions. These state-level analyses included Washington, D.C., and Puerto Rico but excluded states that do not have an AAMC-member medical school or teaching hospital: Wyoming, Idaho, and Alaska.

Are the results reasonable given the size and structure of the regional economy?

The AAMC, in partnership with RTI International, found that in 2019, education, research, and patient care work contributed about \$728 billion in gross domestic product (GDP), a common measure of the size of the economic value added of the United States. This nationwide value is roughly \$2,218 per person or about 3.2% of GDP.

Operating Expenses

Are expenses used to measure the general operations of the university, and are these expenses used with a single multiplier for universities?

Yes, we applied the operating expenses as a measure of general operations and used a single multiplier for universities associated with IMPLAN code 481. The state-level multipliers vary based on the state's specific industry production function.

Do the operating expenses include spending by the university related to student services (e.g. on-campus housing, cafeterias, university-run bookstores, and sports programs)?

Yes, the data sources for medical school operating expenses do include these spending categories. According to a survey on medical schools conducted by the AAMC, the “All Other Medical School Operating Expenditures” data include expenditures from all fund sources including tuition and fees, government and parent university support, grants and contracts, faculty practice plans, affiliated hospital support, and other sources.

Are expenses related to the operation of a university hospital separately identified, and are these expenses used with a single multiplier for hospitals?

Yes, expenses related to the operation of a university hospital were separately identified. Yes, these expenses were used with a single multiplier by state for hospitals.

Capital Investment

Is the impact of university spending on new construction, equipment, and software separately estimated?

No. Capital investment expenditures were not available in sufficient detail to model these effects accurately. As a result, the aggregate capital expenditures were included in total expenses for the IMPLAN model runs.

Student Spending

Is the impact of student spending based on survey data that separately identify the types of goods or services that students purchase, and was this information applied to the appropriate multiplier?

No. The impact of student spending was not estimated in this analysis because detailed survey data was not available. In other words, data could not be obtained for the types of goods and services students buy. However, to the extent that payrolls include students, the analysis did estimate the induced impacts brought about by the student spending of this income based on general consumption patterns for the state. That is, the IMPLAN model used the average expenditure patterns of households in the economy to determine the types of goods and services purchased.

Visitor Spending

Is visitor spending on only long-term or frequently recurring events included in the analysis?

No, the impact of visitor spending was not estimated in this analysis because detailed survey data was not available. In other words, data was not available to identify the number of visitors from outside the local economy, the duration of their stay, and the amount of money spent on each good and service within the local economy. Omitting this effect understates the local economy impacts because it excludes this additional visitor spending. For the national model, the excluded visitors would live outside the United States. For the state-level models, the excluded visitors would live outside the state. In the state-level analyses, visitor spending had a positive effect on the state being visited but also an offsetting negative effect on the state where the visitor resides.

Notes

1. Some of these questions are from a report by Ambargis et al. (2014).
2. Clouse C. IMPLAN to FTE and Income Conversions. IMPLAN. <https://support.implan.com/hc/en-us/articles/115002782053-IMPLAN-to-FTE-Conversions>. Updated June 29, 2021. Accessed April 17, 2022.

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Appendix: Technical Glossary

Definitions of Effects

direct effect: The total output, value added, labor income, and jobs associated with the money spent by individuals, businesses, and other institutions for patient care, research, and education that is provided by AAMC-member medical schools and teaching hospitals.

indirect effect: The additional total output, value added, labor income, and jobs created by the first-round money spent by AAMC members and the subsequent rounds of money spent among local businesses. The money could be spent in the first round on items such as medical devices, lab equipment, computer supplies, and public outreach campaigns. Subsequent indirect effects include the money spent further upstream on items such as electronic parts for medical devices and computers.

induced effect: The additional total output, value added, labor income, and jobs created as employees at AAMC-member institutions spend labor income at retail clothing stores, restaurants, movie theaters, and other local businesses. Other additional induced effects occur because other jobs are created for other local businesses; the new employees at those businesses spend their labor income at retail clothing stores, restaurants, movie theaters, and other local businesses.

Definitions of Economic Impact Variables

full-time equivalent (FTE): Full-time equivalent employees equal the number of employees on full-time schedules plus the number of employees on part-time schedules converted to a full-time basis. The number of full-time equivalent employees in each industry is the product of the total number of employees and the ratio of average weekly hours per employee for all employees to average weekly hours per employee on full-time schedules. An industry's full-time equivalent employment will be less than the number of its employees on full- and part-time schedules, unless it has no part-time employees.

jobs: The annual average full-time and part-time jobs supported by AAMC-member medical schools and teaching hospitals. As with effects, jobs are classified as direct, indirect, or induced. A job in IMPLAN = the annual average of monthly jobs in that industry (this is the same definition used by the Quarterly Census of Employment and Wages, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis nationally). Thus, 1 job lasting 12 months = 2 jobs lasting 6 months each = 3 jobs lasting 4 months each. A job can be either full time or part time. IMPLAN jobs can be converted to FTEs.

labor income: All types of employment income such as employee salaries, employee retirement and health benefits, payroll taxes, and proprietor income. As with effects, labor income is classified as direct, indirect, or induced.

total federal tax impact: All federal taxes generated by economic activity.

total output: Output represents the value of industry production. In IMPLAN, these are annual production estimates for the year of the data set and are in producer prices. For manufacturers, this would be sales plus/minus the change in inventory. For service sectors, production = sales. For retail and wholesale trade, output = gross margin and not gross sales. As with effects, outputs are classified as direct, indirect, or induced.

total state and local tax impact: All state and local taxes generated by economic activity.

total value added: This variable is the contribution to the state and U.S. gross domestic product. Total value added includes employee salaries, employee retirement and health benefits, and all payroll taxes. In addition, certain sales and property taxes and other operational fees are included. Total value added is distinguished from total output because it excludes nonsalary, tax, and operational fee–related operating expenses. Examples of these expenses include supplies and equipment, heating and air conditioning, and other maintenance expenses. As with effects, value added is classified as direct, indirect, or induced.

Sources: Definitions are based on IMPLAN documentation. IMPLAN. IMPLAN Glossary.

<https://support.implan.com/hc/en-us/categories/1500000107962-Glossary>. Accessed April 15, 2022.

Clarifications and details provided by RTI with text from the U.S. Bureau of Economic Analysis. U.S. Bureau of Economic Analysis. What are full-time equivalent employees?

<https://www.bea.gov/help/faq/368#:~:text=Full%2Dtime%20equivalent%20employees%20equal,to%20a%20full%2Dtime%20basis>. Published April 2, 2007. Accessed April 15, 2022.