



Tomorrow's Doctors, Tomorrow's Cures®

# The Economic Impact of AAMC-Member Medical Schools and Teaching Hospitals

2012

Conducted for the AAMC by Tripp Umbach

December 2012

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## Executive Summary

In March 2012, the AAMC (Association of American Medical Colleges) retained Tripp Umbach to measure the economic impact<sup>1</sup> of AAMC-member institutions on the 46 individual states and the District of Columbia<sup>2</sup> in which they are located, as well as the nation as a whole. This report presents results of the combined economic impact that AAMC members have on states, and the country as a whole. Tripp Umbach has conducted this research for the AAMC since 1995, with five economic impact studies completed to date.

During 2011, the combined economic impact of AAMC members totaled more than \$587 billion.<sup>3</sup> AAMC members accounted for nearly 3.5 million full-time jobs, meaning that one in every 40 wage earners in the U.S. labor force works either directly or indirectly for an AAMC-member institution. This is an increase in economic impact of nearly 15 percent from 2009. Health care continues to be a positive sector in national employment. Despite the national unemployment levels remaining relatively high in the last few years because of the recession, health care has been an industry segment that has continued to grow and add jobs through the last few years and is expected to rise by employing an additional 340,000 during the current year. Additionally, AAMC-member institutions generated more than \$34 billion in total state tax revenue through income taxes and sales tax, corporate net income tax, and capital stock/franchise taxes produced by businesses that receive revenue from AAMC members.

AAMC-member organizations have substantial economic and social impacts on their multi-county regions and within the counties and cities where they have operations. Substantial local and regional tax impacts, while beyond the scope of this study, are estimated to be in the billions. Communities in all regions of the country typically rely on these organizations for job creation, high-quality medical care, advanced research, new business development, and education of medical professionals.

Table 1 presents total national impacts, as well as individual state totals for economic, employment, government revenue, and out-of-state medical visitor impacts for each of 24 states and the District of Columbia in which AAMC members' total economic impact is highest.

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<sup>1</sup> For the purposes of this report, "economic impact" includes both the direct and indirect business volume generated by an institution. Direct impact includes items such as institutional spending, employee spending, and spending by visitors. The indirect impact, also known as the multiplier effect, results from the re-spending of dollars generated directly by the institution.

<sup>2</sup> Although the AAMC does have member medical schools in Puerto Rico, those schools were not included in this research.

<sup>3</sup> This study measures the impact of AAMC-member institutions only. The total number of medical schools included in this study is 133; and the total number of teaching hospitals is 255. There are medical schools (osteopathic) and teaching hospitals in the United States that are not members of the AAMC; therefore, the total impact of all medical schools and teaching hospitals on the nation is higher than the impact presented in this report.

**Table 1**

Summary of Economic, Employment, and Government Revenue Impact For AAMC Members, 2011

States	Rank	Total Economic Impact	Total Employment Impact	Total Government Revenue Impact
New York	1	\$74,151,538,606	430,743	\$4,819,032,979
California	2	\$49,201,512,761	264,046	\$2,921,073,540
Pennsylvania	3	\$47,033,121,373	272,640	\$2,882,702,406
Massachusetts	4	\$38,760,110,682	195,154	\$2,234,308,702
Texas	5	\$35,825,649,773	228,513	\$1,327,689,312
Ohio	6	\$32,314,079,590	209,047	\$1,884,550,734
Illinois	7	\$28,732,944,479	155,233	\$1,478,370,705
Florida	8	\$24,490,233,642	166,676	\$1,211,629,554
Michigan	9	\$23,051,327,122	133,120	\$1,585,794,455
North Carolina	10	\$17,330,838,088	120,578	\$942,220,251
New Jersey	11	\$15,413,836,889	94,961	\$1,001,558,411
Maryland	12	\$14,611,835,125	81,944	\$861,726,043
Missouri	13	\$12,442,654,552	78,390	\$605,050,899
Georgia	14	\$12,359,469,277	83,483	\$554,084,789
Tennessee	15	\$11,959,611,610	74,553	\$543,903,310
Connecticut	16	\$11,768,111,887	65,915	\$724,790,589
Minnesota	17	\$10,276,917,979	65,208	\$734,519,205
Virginia	18	\$9,794,616,363	63,145	\$441,567,020
Arizona	19	\$9,783,041,405	51,897	\$489,246,458
Wisconsin	20	\$9,619,603,739	44,244	\$639,287,761
Indiana	21	\$9,030,962,138	55,456	\$569,725,984
South Carolina	22	\$8,251,462,603	38,242	\$448,599,521
Louisiana	23	\$7,593,762,705	42,602	\$383,823,662
District of Columbia	24	\$7,320,921,118	49,290	\$1,041,793,206
Washington	25	\$5,745,608,783	34,474	\$309,279,038
All Other States		\$60,429,232,449	389,881	\$3,666,397,182
<b>U.S. Total</b>		<b>\$587,293,004,740</b>	<b>3,489,435</b>	<b>\$34,302,725,713</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

Compared with the last study, which was completed in 2009, it is interesting to note that 24 of the 25 states in Table 1 remain unchanged. The top 25 individual states remain, with the exception of Alabama, which has been replaced by Washington, at number 25. Also, some states, such as California, Florida, Connecticut, Arizona, and Louisiana have moved up in the list, while others have moved back.

## Introduction

### Goals of the Economic Impact Study of AAMC Members

In 1995, the AAMC identified a need to provide benchmark data to continue to assess the status of its members' current economic impact on states' economies, employment, and government revenue. Specifically, Tripp Umbach was commissioned to perform research that:

- Measures the direct economic impact on individual states' and the nation's economy as a result of the education, research, and clinical services of AAMC-member medical schools and teaching hospitals.
- Measures the direct and indirect employment generated in the United States as a result of AAMC-member medical schools and teaching hospitals.
- Measures government revenues that are generated by the presence and operations of AAMC-member medical schools and teaching hospitals. (Medical schools and hospitals that are public and not-for-profit indirectly generate government revenue through income taxes paid by staff, employed physicians, and medical residents; sales tax revenues paid by businesses providing goods and services to medical schools and hospitals; corporate net income taxes paid by businesses providing goods and services to medical schools and hospitals; and other selective business taxes such as gross receipts taxes, public utility realty taxes, insurance premium taxes, motor vehicle taxes, and financial institutions taxes.)
- Measures the economic impact of publicly funded research, which has a significant effect on the state and local economy. In 2009, this impact was \$44.9 billion.<sup>4</sup>

### Methodology Employed in the Economic Impact Study

This report analyzes AAMC-member impact on the national economy. AAMC members employ individuals in their home states, and therefore, generate personal income for state residents. Businesses operating within each state in the wholesale, retail, service, and manufacturing sectors benefit from the direct expenditures of AAMC-member institutions and their staff on goods and services. In addition, businesses in each state are recipients of spending by hospital patients, patients' visitors, medical students, and their visitors.

All of these "direct" expenditures are recirculated in the economy, as recipients of the first-round of income "re-spend" a portion of this income with other businesses and individuals within each state. This re-spending is often termed the "multiplier" or "indirect" effect. Tripp Umbach's research has determined a medical school/teaching hospital business volume multiplier effect of 2.3. Therefore, for every dollar directly spent by a medical school or teaching hospital, an additional \$1.30 is indirectly generated for a total impact of \$2.30. The methodology used for this study measures the effect of both direct and indirect business volume, employment, and government revenue impacts for states containing an AAMC member.

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<sup>4</sup> "Economic Impact of Public Research Funding Received by AAMC Member Institutions," conducted for the AAMC by Tripp Umbach, 2010.

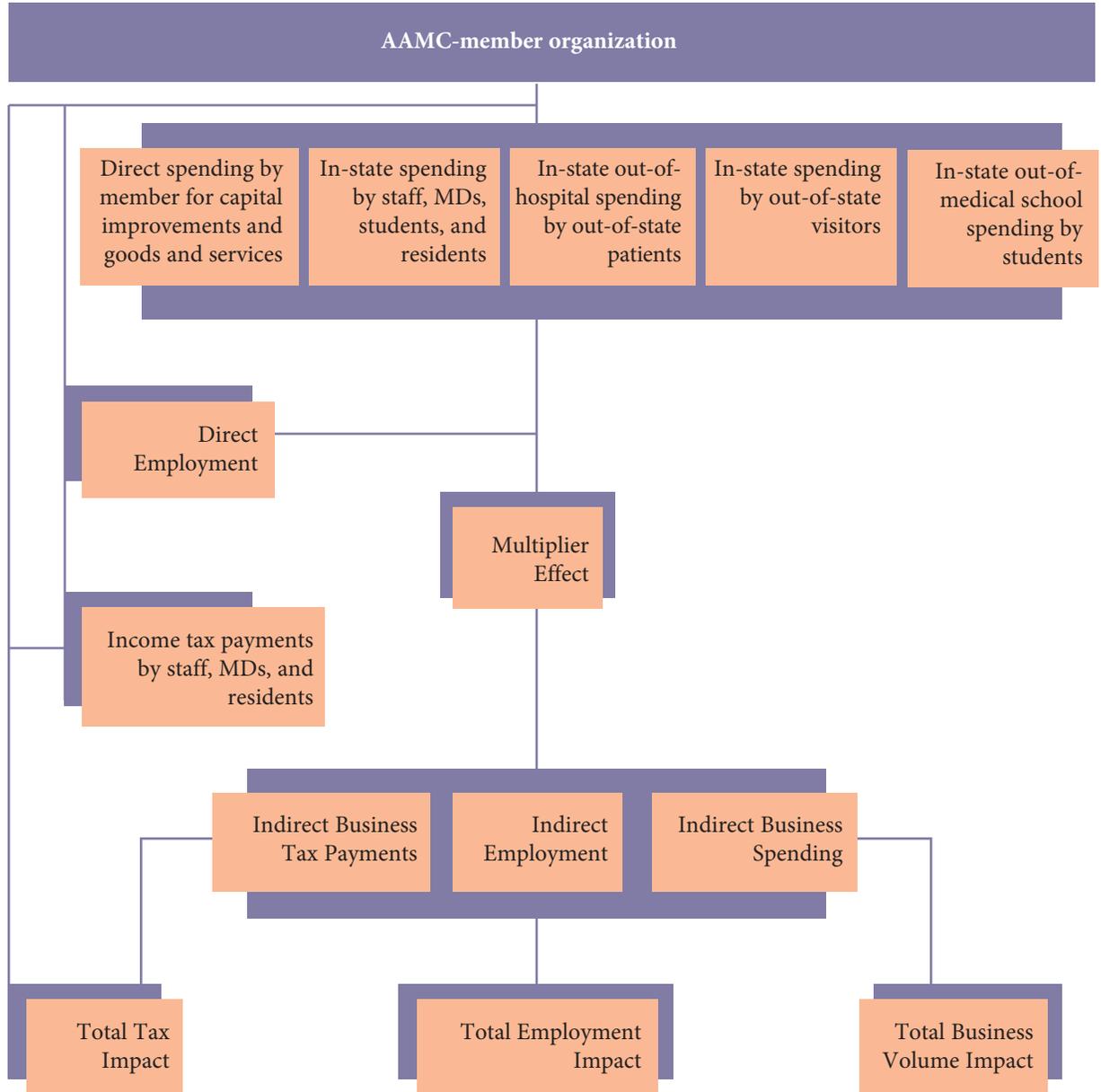
Not included in Tripp Umbach's impact model is patient spending at the hospital itself, or economic benefits that result from AAMC members' provision of community health improvement activities, preventive and primary care, access to care, and physician training. Additionally, this study does not include the impact generated by the existence of non-employed physicians with privileges at AAMC-member institutions.

The Tripp Umbach methodology generally employed in these studies was originally derived from a set of research tools and techniques developed for the American Council on Education (ACE).<sup>5</sup> The ACE-based methodology employs linear cash flow modeling to track the flow of institution-originated funds through a delineated spatial area. Tripp Umbach modified the ACE model to accommodate the complexities of AAMC-member organizations (see Figure 1).

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<sup>5</sup> Caffrey, John and Isaacs, Herbert, *Estimating the Impact of a College or University on the Local Economy*, American Council on Education, 1971.

**Figure 1**  
 AAMC-Member Economic Impact Model



To complete the economic impact model outlined above, Tripp Umbach researchers worked closely with representatives from the AAMC to collect the required data. The following data were used to perform this research:

### 1. Academic Medical Center Data

The AAMC maintains a number of databases of information necessary for the performance of the impact research. These databases were utilized to supply the following information:

- Capital budget (hospital only)
- Payroll expenditures (hospital only)
- FTE staff (hospital only)
- FTE physician employees
- FTE residents and interns
- FTE contract physicians
- Faculty payroll
- FTE faculty
- Outpatient visits
- Inpatient admissions
- Medical students
- Research grants and contracts
- Clinical fellows

For data needed for the impact study, but not supplied by the AAMC, Tripp Umbach used extrapolations derived from recently performed Tripp Umbach impact studies. Tripp Umbach has found that such extrapolation-based models provide an acceptably accurate measure of economic impact.<sup>6</sup> For some sources, the most recent data represented 2010 information rather than 2011 information. To help ensure the comparability of information, the 2010 data were aged by one year, assuming a 3 percent growth rate for inflation.

### 2. Tripp Umbach Impact Study Data

Using secondary research and the company's national database of medical school and teaching hospital information (constructed from medical schools and teaching hospitals that have completed individual economic impact studies with Tripp Umbach<sup>7</sup>), Tripp Umbach supplied additional data to supplement those supplied by the AAMC. Data provided by Tripp Umbach included the following:

- Capital budget (medical schools only)
- Goods and services spending
- Payroll expenditures (medical schools only)
- FTE staff (medical schools only)
- Visitor spending
- Employee spending
- Physician spending
- Government revenue data
- Business multiplier
- Employment multiplier

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<sup>6</sup> In the Pennsylvania Medical Centers of Excellence study cited in this report, models were built for more than 25 individual teaching hospitals. Two hospitals supplied data late for the study and extrapolation-based models were built. When the hospitals' actual completed data forms arrived, the data were entered into the model and the overall results obtained by the extrapolations were found to be within +/-5 percent of actual.

<sup>7</sup> Tripp Umbach has completed more than 100 economic impact studies for various medical schools and teaching hospitals over the last 20 years; more than 20 of these studies were conducted within the last two years.

## Economic Impact Findings: Total Impact of AAMC Members, 2011

### Business Volume Impact

#### **The Direct and Indirect Expansion of the Nation's Economy Attributable to AAMC Members**

Direct economic impact stems from the spending of AAMC medical school and teaching hospital members. These impacts fall within seven principal groups: institutional expenditures for capital improvements, goods, and services; spending of employees; spending of independent contractor physicians; spending of medical residents; spending of medical and other health sciences students; spending of patients (external to the hospital); and spending of visitors. In addition, these direct, first-round expenditures, received as income by businesses and individuals in the state, recirculate through the economy in successive rounds of re-spending. The end result is a multiplied economic impact that is a linear result of AAMC members' presence and their spending patterns.

The results of this analysis include:

#### **Total Business Volume Impact**

In 2011, AAMC medical school and teaching hospital members had a combined total economic impact on the United States of \$587,293,004,740. This economic impact comprised \$255,344,784,670 in direct business volume impact, and a further \$331,948,220,070 in indirect economic impacts accruing to the economy through the multiplier.

Table 2 lists the business volume impact (economic impact) for the country and each of the 24 states and the District of Columbia in which AAMC members' total economic impact is highest.

**Table 2**

Total State Business Volume Impact of AAMC-Member Institutions, 2011

States	Rank	Total Economic Impact	Direct Economic Impact	Indirect Economic Impact
New York	1	\$74,151,538,606	\$32,239,799,394	\$41,911,739,212
California	2	\$49,201,512,761	\$21,391,962,070	\$27,809,550,691
Pennsylvania	3	\$47,033,121,373	\$20,449,183,206	\$26,583,938,168
Massachusetts	4	\$38,760,110,682	\$16,852,222,036	\$21,907,888,646
Texas	5	\$35,825,649,773	\$15,576,369,466	\$20,249,280,306
Ohio	6	\$32,314,079,590	\$14,049,599,822	\$18,264,479,768
Illinois	7	\$28,732,944,479	\$12,492,584,556	\$16,240,359,923
Florida	8	\$24,490,233,642	\$10,647,927,670	\$13,842,305,971
Michigan	9	\$23,051,327,122	\$10,022,316,140	\$13,029,010,982
North Carolina	10	\$17,330,838,088	\$7,535,146,995	\$9,795,691,093
New Jersey	11	\$15,413,836,889	\$6,701,668,213	\$8,712,168,676
Maryland	12	\$14,611,835,125	\$6,352,971,794	\$8,258,863,332
Missouri	13	\$12,442,654,552	\$5,409,849,805	\$7,032,804,747
Georgia	14	\$12,359,469,277	\$5,373,682,295	\$6,985,786,983
Tennessee	15	\$11,959,611,610	\$5,199,831,135	\$6,759,780,475
Connecticut	16	\$11,768,111,887	\$5,116,570,386	\$6,651,541,502
Minnesota	17	\$10,276,917,979	\$4,468,225,208	\$5,808,692,771
Virginia	18	\$9,794,616,363	\$4,258,528,853	\$5,536,087,510
Arizona	19	\$9,783,041,405	\$4,253,496,263	\$5,529,545,142
Wisconsin	20	\$9,619,603,739	\$4,182,436,408	\$5,437,167,331
Indiana	21	\$9,030,962,138	\$3,926,505,277	\$5,104,456,861
South Carolina	22	\$8,251,462,603	\$3,587,592,436	\$4,663,870,167
Louisiana	23	\$7,593,762,705	\$3,301,635,959	\$4,292,126,746
District of Columbia	24	\$7,320,921,118	\$3,183,009,182	\$4,137,911,936
Washington	25	\$5,745,608,783	\$2,498,090,775	\$3,247,518,008
All Other States		\$60,429,232,449	\$26,273,579,326	\$34,155,653,123
<b>U.S. Total</b>		<b>\$587,293,004,740</b>	<b>\$255,344,784,670</b>	<b>\$331,948,220,070</b>

Note: Tables include impacts of the 24 individual states and the District of Columbia in which AAMC members' impact is highest plus "All other states" total which reflects the impact of the remaining 22 states where AAMC members are located.

The direct impact comprised the following impact components:

**Direct spending for capital improvements, goods, supplies, and services**

This category of impact includes the spending by AAMC members for improvements to their facilities and capital equipment purchases. In addition, the category includes the purchase of goods, services, and supplies. These may include a broad range of purchases such as laundry services, food and beverage supplies, drugs, medical disposables, computer consulting, etc. AAMC medical school and teaching hospital members' spending for capital improvements, goods, supplies, and services totaled \$156,641,725,585 in 2011.

Table 3 lists the top 24 state and District of Columbia totals.

**Table 3**

AAMC Members' State Spending for Capital Improvements, Goods, Supplies, and Services 2011

States	Rank	Direct Spending for Capital Improvements
New York	1	\$18,611,084,621
California	2	\$13,467,801,741
Pennsylvania	3	\$13,411,412,738
Massachusetts	4	\$10,294,962,931
Texas	5	\$9,778,233,811
Ohio	6	\$8,577,873,046
Illinois	7	\$7,744,330,977
Florida	8	\$6,619,119,559
Michigan	9	\$6,358,864,160
North Carolina	10	\$4,667,185,021
Maryland	11	\$3,944,179,636
New Jersey	12	\$3,775,995,940
Georgia	13	\$3,415,362,687
Missouri	14	\$3,308,107,757
Tennessee	15	\$3,172,892,025
Connecticut	16	\$2,975,887,449
Wisconsin	17	\$2,822,783,234
Arizona	18	\$2,807,001,095
South Carolina	19	\$2,478,130,338
Indiana	20	\$2,454,010,610
Virginia	21	\$2,426,643,263
Minnesota	22	\$2,371,621,869
Louisiana	23	\$2,233,180,064
District of Columbia	24	\$1,713,902,194
Alabama	25	\$1,548,272,759
All Other States		\$15,662,886,064
<b>U.S. Total</b>		<b>\$156,641,725,585</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Direct spending by staff employed by AAMC members<sup>8</sup>

While AAMC members spend a substantial amount of money on goods and services, one of their biggest benefits to the economy is their direct payroll. AAMC medical school and teaching hospital members have a combined payroll and benefits obligation to staff (administrators, nurses, aides, etc.) that generates significant direct and indirect impacts through staff spending. Spending by staff employed by AAMC members totaled \$56,762,384,680.

Table 4 lists the top 24 state and District of Columbia totals for staff spending.

**Table 4**  
AAMC Members' Staff Spending, 2011

States	Rank	Direct Spending by Staff
New York	1	\$8,258,610,762
California	2	\$4,929,363,936
Pennsylvania	3	\$3,995,749,550
Texas	4	\$3,554,344,540
Massachusetts	5	\$3,242,460,403
Ohio	6	\$2,968,079,985
Illinois	7	\$2,805,623,010
Florida	8	\$2,584,790,921
Michigan	9	\$2,127,962,490
New Jersey	10	\$1,952,415,978
North Carolina	11	\$1,677,476,251
Connecticut	12	\$1,398,806,221
Missouri	13	\$1,162,049,835
Georgia	14	\$1,145,736,017
Maryland	15	\$1,136,046,186
Minnesota	16	\$1,077,550,512
Virginia	17	\$1,016,135,350
Tennessee	18	\$977,664,145
Arizona	19	\$940,039,405
Indiana	20	\$885,886,966
District of Columbia	21	\$790,291,424
Wisconsin	22	\$733,248,502
Washington	23	\$592,351,708
Louisiana	24	\$590,364,962
South Carolina	25	\$588,491,681
All Other States		\$5,630,843,941
<b>U.S. Total</b>		<b>\$56,762,384,680</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

<sup>8</sup> For the purposes of this report, "staff" does not include physicians or faculty employed by AAMC members.

### Direct spending by AAMC- employed and contract physicians and faculty

As with payroll to general staff, the pay provided to physicians directly employed by or contracted with AAMC members has a substantial positive impact on the economy through physician spending. Adjustments were made to include only the impact of income received by employed and contract physicians as a result of the services provided at AAMC-member hospitals. Spending by AAMC-employed and contract physicians totaled \$19,558,429,338.

Table 5 lists the top 24 state and District of Columbia totals for physician and faculty spending.

**Table 5**

AAMC Members' Physician (Employed and Contract) and Faculty Spending, 2011

States	Rank	Direct Spending by Physicians/Faculty
New York	1	\$2,532,402,729
Massachusetts	2	\$2,067,306,692
Pennsylvania	3	\$1,357,968,755
California	4	\$1,318,027,150
Ohio	5	\$1,193,981,802
Texas	6	\$927,048,899
Illinois	7	\$819,098,314
Maryland	8	\$763,882,659
Michigan	9	\$670,931,456
Minnesota	10	\$624,259,616
Tennessee	11	\$541,271,799
Florida	12	\$517,707,519
North Carolina	13	\$458,175,148
Missouri	14	\$401,318,581
Virginia	15	\$371,813,746
District of Columbia	16	\$347,589,439
New Jersey	17	\$333,211,943
Wisconsin	18	\$327,541,775
Georgia	19	\$323,290,015
Washington	20	\$276,876,885
Oregon	21	\$276,331,545
Connecticut	22	\$270,249,402
Colorado	23	\$263,522,362
South Carolina	24	\$233,566,592
Indiana	25	\$230,324,234
All Other States		\$2,110,730,280
<b>U.S. Total</b>		<b>\$19,558,429,338</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Direct spending by residents, medical, and health sciences students

As institutions of excellence in research, medical, and health sciences education, AAMC members attract students from inside and outside the United States to study at their schools and hospitals. Spending by residents and students for housing, food, supplies, entertainment, and other items and services comprise their direct impact on the nation's economy. Only resident and student spending that is made off campus is included in the impact calculations. Spending by residents and students totaled \$4,742,208,916.

Table 6 lists the top 24 state and District of Columbia totals for resident/student spending.

**Table 6**  
AAMC Members' Resident and Student Spending, 2011

States	Rank	Direct Spending by Resident/Student
New York	1	\$712,307,897
California	2	\$375,317,087
Pennsylvania	3	\$347,421,101
Illinois	4	\$271,516,702
Massachusetts	5	\$257,881,954
Ohio	6	\$249,035,276
Texas	7	\$178,708,836
North Carolina	8	\$168,886,806
Michigan	9	\$168,719,500
Missouri	10	\$138,449,557
Florida	11	\$128,997,165
Connecticut	12	\$127,786,780
New Jersey	13	\$127,401,385
Virginia	14	\$112,525,891
Tennessee	15	\$109,988,676
Georgia	16	\$88,376,216
Maryland	17	\$86,864,900
District of Columbia	18	\$79,963,184
South Carolina	19	\$77,885,794
Indiana	20	\$68,896,171
Wisconsin	21	\$64,230,421
Kentucky	22	\$61,801,308
Rhode Island	23	\$60,378,050
Louisiana	24	\$59,984,951
Minnesota	25	\$58,420,993
All Other States		\$560,462,317
<b>U.S. Total</b>		<b>\$4,742,208,916</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

**Direct spending, outside of the medical schools and teaching hospitals, by patients from out of state**

Spending by patients for medical services is not included in the direct impact. Only the spending of these patients (both inpatients and outpatients) outside of AAMC members is included. Spending outside of AAMC-member institutions by patients totaled \$1,388,774,251.

Table 7 lists the top 24 state and District of Columbia totals for out-of-state patient spending.

**Table 7**  
AAMC Members' Out-of-State Patient Spending, 2011

States	Rank	Out-of-State Patient Spending
New York	1	\$142,722,420
California	2	\$108,330,759
Texas	3	\$98,249,812
Pennsylvania	4	\$96,551,627
Ohio	5	\$96,115,252
Illinois	6	\$91,714,600
Michigan	7	\$78,226,235
Massachusetts	8	\$75,236,995
New Jersey	9	\$53,488,463
Louisiana	10	\$42,962,453
Florida	11	\$38,412,820
North Carolina	12	\$34,915,287
Indiana	13	\$33,256,896
Missouri	14	\$32,050,287
Tennessee	15	\$29,664,389
Virginia	16	\$28,629,268
Connecticut	17	\$28,231,608
Minnesota	18	\$22,091,957
Maryland	19	\$20,275,777
Georgia	20	\$20,173,808
Wisconsin	21	\$20,088,197
Arizona	22	\$19,739,992
South Carolina	23	\$17,840,146
Washington	24	\$14,771,970
District of Columbia	25	\$13,157,603
All Other States		\$131,875,631
<b>U.S. Total</b>		<b>\$1,388,774,251</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Direct spending by out of state patient visitors

As any person working at a hospital could confirm, medical centers and teaching hospitals are substantial visitor destinations. Visitors come to see patients who are friends and family, and they create spending in the economy through accommodations, gifts, services, and other items. Spending by out-of-state patient visitors totaled \$1,795,954,871.

Table 8 lists the top 24 state and District of Columbia totals for patient visitor spending.

**Table 8**  
AAMC Members' Patient Visitor Spending, 2011

States	Rank	Patient Visitor Spending
New York	1	\$217,205,852
Pennsylvania	2	\$134,412,937
California	3	\$112,145,524
Ohio	4	\$103,842,493
Texas	5	\$101,176,383
Florida	6	\$99,387,717
Illinois	7	\$98,917,016
Massachusetts	8	\$80,369,940
New Jersey	9	\$77,108,327
Michigan	10	\$72,637,980
Connecticut	11	\$52,164,023
Tennessee	12	\$48,609,209
North Carolina	13	\$47,430,898
Maryland	14	\$44,624,655
Arizona	15	\$43,089,426
Missouri	16	\$39,653,664
Georgia	17	\$39,398,072
Minnesota	18	\$38,903,656
Virginia	19	\$33,777,202
Louisiana	20	\$32,515,291
Indiana	21	\$29,289,129
South Carolina	22	\$24,925,859
Wisconsin	23	\$24,349,279
District of Columbia	24	\$19,492,790
Rhode Island	25	\$15,650,524
All Other States		\$164,877,023
<b>U.S. Total</b>		<b>\$1,795,954,871</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

**Direct spending by conference and meeting visitors and visitors to staff, employed physicians, residents, and students**

AAMC members are major sponsors of meetings, seminars, and symposiums in the state. These events draw significant numbers of delegates, who, like delegates to other conferences and trade shows, provide a major boost to the economy through their fresh influx of dollars. In addition to the conference delegates, the hospital physicians, employees, and students also attract substantial numbers of visitors. Spending by all of these visitors totaled \$14,477,178,148.

Table 9 details the top 24 state and District of Columbia totals for AAMC members' conference and meeting visitors and visitors to staff, employed physicians, residents, and students.

**Table 9**  
Spending by Visitors to AAMC Members' Conferences, Staff, Physicians, Residents, and Students, 2011

States	Rank	Spending by Visitors to Conference
New York	1	\$1,765,465,112
Pennsylvania	2	\$1,105,666,498
California	3	\$1,080,975,874
Texas	4	\$938,607,186
Ohio	5	\$860,671,969
Massachusetts	6	\$834,003,121
Illinois	7	\$661,383,938
Florida	8	\$659,511,970
Michigan	9	\$544,974,318
North Carolina	10	\$481,077,583
New Jersey	11	\$382,046,177
Maryland	12	\$357,097,980
Georgia	13	\$341,345,479
Missouri	14	\$328,220,124
Tennessee	15	\$319,740,893
Minnesota	16	\$275,376,606
Virginia	17	\$269,004,133
Connecticut	18	\$263,444,903
Indiana	19	\$224,841,272
District of Columbia	20	\$218,612,548
Arizona	21	\$206,327,803
Wisconsin	22	\$190,195,000
Louisiana	23	\$186,091,411
South Carolina	24	\$166,752,027
Washington	25	\$150,090,729
All Other States		\$1,665,653,494
<b>U.S. Total</b>		<b>\$14,477,178,148</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Additional business impacts allocable to AAMC members

In addition to the annual, recurring impacts of the spending categories outlined above, businesses in the country have invested heavily to support the business volume generated by AAMC members. The Tripp Umbach impact model calculates the two principal components of business investments: business real property development and business inventories committed to academic medical center-related business. Table 10 includes the top 24 state and District of Columbia totals for AAMC members' real property investments and business inventories.

**Table 10**  
AAMC Members' Business Real Property Investments and Business Inventories, 2011

States	Rank	Business Real Property Investments	Business Inventories
New York	1	\$10,974,427,714	\$9,194,790,787
California	2	\$7,281,823,889	\$6,100,987,582
Pennsylvania	3	\$6,960,901,963	\$5,832,107,050
Massachusetts	4	\$5,736,496,381	\$4,806,253,725
Texas	5	\$5,302,196,166	\$4,442,380,572
Ohio	6	\$4,782,483,779	\$4,006,945,869
Illinois	7	\$4,252,475,783	\$3,562,885,115
Florida	8	\$3,624,554,579	\$3,036,788,972
Michigan	9	\$3,411,596,414	\$2,858,364,563
North Carolina	10	\$2,564,964,037	\$2,149,023,923
New Jersey	11	\$2,281,247,860	\$1,911,315,774
Maryland	12	\$2,162,551,599	\$1,811,867,556
Missouri	13	\$1,841,512,874	\$1,542,889,165
Georgia	14	\$1,829,201,453	\$1,532,574,190
Tennessee	15	\$1,770,022,518	\$1,482,991,840
Connecticut	16	\$1,741,680,559	\$1,459,245,874
Minnesota	17	\$1,520,983,861	\$1,274,337,829
Virginia	18	\$1,449,603,222	\$1,214,532,429
Arizona	19	\$1,447,890,128	\$1,213,097,134
Wisconsin	20	\$1,423,701,353	\$1,192,830,864
Indiana	21	\$1,336,582,396	\$1,119,839,305
South Carolina	22	\$1,221,216,465	\$1,023,181,363
Louisiana	23	\$1,123,876,880	\$941,626,575
District of Columbia	24	\$1,083,496,326	\$907,794,219
Washington	25	\$850,350,100	\$712,455,489
All Other States		\$8,943,526,402	\$7,493,224,824
<b>U.S. Total</b>		<b>\$86,919,364,702</b>	<b>\$72,824,332,588</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

## Impact on State Government Revenues

### Revenues to the states attributable to AAMC members

A major misconception held by business leaders, elected officials, and the general public is that medical schools and teaching hospitals do not generate government revenue. While AAMC members are generally not-for-profit institutions, state governments receive substantial revenues as a result of both the direct and indirect influence of these medical schools and teaching hospitals. AAMC medical school and teaching hospital members provide significant revenue in state income taxes. In addition, the substantial spending with state business generates large-scale revenues for each state in the form of sales tax, corporate net income tax, and capital stock/franchise taxes. The Tripp Umbach model calculated the revenue benefits accruing to the state from these sources. The results of this analysis follow.

### Total state government revenue

AAMC medical school and teaching hospital members generated a total of \$34,302,725,713 in revenues for state governments in 2011. Table 11 includes the top 24 state and District of Columbia totals for AAMC-member government revenue.

**Table 11**

AAMC Members' Government Revenue Impact, 2011

States	Rank	Total Government Revenue Impact
New York	1	\$4,819,032,979
California	2	\$2,921,073,540
Pennsylvania	3	\$2,882,702,406
Massachusetts	4	\$2,234,308,702
Ohio	5	\$1,884,550,734
Michigan	6	\$1,585,794,455
Illinois	7	\$1,478,370,705
Texas	8	\$1,327,689,312
Florida	9	\$1,211,629,554
District of Columbia	10	\$1,041,793,206
New Jersey	11	\$1,001,558,411
North Carolina	12	\$942,220,251
Maryland	13	\$861,726,043
Minnesota	14	\$734,519,205
Connecticut	15	\$724,790,589
Wisconsin	16	\$639,287,761
Missouri	17	\$605,050,899
Indiana	18	\$569,725,984
Georgia	19	\$554,084,789
Tennessee	20	\$543,903,310
Arizona	21	\$489,246,458
South Carolina	22	\$448,599,521
Virginia	23	\$441,567,020
Louisiana	24	\$383,823,662
Kentucky	25	\$335,764,584
All Other States		\$3,639,911,636
<b>U.S. Total</b>		<b>\$34,302,725,713</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

These revenues comprise the following:

**Income taxes paid by medical school and hospital staff, employed physicians, independent contractor physicians, and medical residents**

The state income tax payments of personnel employed by the medical centers and teaching hospitals and the independent contractor physicians (on the portion of their income attributable to AAMC members) generates substantial revenue for each state. Income tax revenues totaled \$12,578,369,120.

Table 12 includes the top 24 state and District of Columbia totals for AAMC-member income taxes.

**Table 12**  
Individual Income Tax Revenues Generated by AAMC Members' Employees, 2011

States	Rank	Individual Income Tax Revenue Generated
New York	1	\$2,741,554,555
California	2	\$1,282,747,031
Massachusetts	3	\$1,202,139,389
Pennsylvania	4	\$915,510,963
Ohio	5	\$654,937,054
Illinois	6	\$464,344,767
North Carolina	7	\$438,863,202
Michigan	8	\$408,106,052
New Jersey	9	\$392,859,097
Maryland	10	\$365,211,631
Connecticut	11	\$334,336,683
Minnesota	12	\$297,385,812
Missouri	13	\$280,234,953
Georgia	14	\$268,847,613
District of Columbia	15	\$268,437,258
Wisconsin	16	\$264,223,412
Virginia	17	\$244,463,118
South Carolina	18	\$165,201,217
Indiana	19	\$164,927,768
Kentucky	20	\$114,279,456
Arizona	21	\$113,178,769
Louisiana	22	\$110,634,401
Rhode Island	23	\$110,165,301
Oregon	24	\$99,830,645
Iowa	25	\$98,712,697
All Other States		\$777,236,265
<b>U.S. Total</b>		<b>\$12,578,369,120</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Sales tax revenues received by the states

As noted above, AAMC members generate substantial sales for businesses in the state. This spending also generates sales and other consumption tax revenue in the state. Sales tax revenues totaled \$15,854,821,740.

Table 13 shows the top 24 state and District of Columbia totals for AAMC members' sales and gross receipts tax revenues.

**Table 13**

Sales and Gross Receipts Tax Revenues Generated by AAMC Members' Spending, 2011

States	Rank	Sales/Gross Receipts Tax Revenues Generated
New York	1	\$1,506,099,306
Pennsylvania	2	\$1,447,181,616
California	3	\$1,052,126,045
Texas	4	\$1,037,085,263
Florida	5	\$1,019,387,688
Ohio	6	\$956,003,126
Michigan	7	\$871,306,185
Illinois	8	\$794,513,401
Massachusetts	9	\$693,329,211
New Jersey	10	\$431,988,930
Tennessee	11	\$417,083,024
North Carolina	12	\$387,212,930
Maryland	13	\$350,817,642
Indiana	14	\$338,613,255
Connecticut	15	\$323,409,007
Minnesota	16	\$315,114,847
Arizona	17	\$294,861,823
Wisconsin	18	\$294,146,103
District of Columbia	19	\$290,853,774
Missouri	20	\$270,094,856
Washington	21	\$247,135,868
Georgia	22	\$241,276,171
South Carolina	23	\$239,572,605
Louisiana	24	\$195,747,027
Kentucky	25	\$160,760,421
All Other States		\$1,679,101,605
<b>U.S. Total</b>		<b>\$15,854,821,740</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Corporate net income tax received by the states

The business volume generated by AAMC members and their related spending is received as revenue by a broad range of businesses in the states. This revenue, in the case of corporations, generates corporate net income tax receipts for individual states. Corporate net income tax revenues totaled \$1,906,714,634.

Table 14 includes the top 24 state and District of Columbia totals for AAMC-member corporate net income taxes.

**Table 14**

Corporate Net Income Tax Generated by AAMC Members' Spending, 2011

States	Rank	Corporate Net Income Tax
New York	1	\$329,497,999
California	2	\$275,765,967
Massachusetts	3	\$202,969,610
Pennsylvania	4	\$166,851,980
New Jersey	5	\$88,323,343
Illinois	6	\$86,096,063
Florida	7	\$69,405,474
Michigan	8	\$49,003,377
Tennessee	9	\$42,553,570
Maryland	10	\$42,225,055
North Carolina	11	\$41,380,379
Ohio	12	\$41,024,330
District of Columbia	13	\$38,034,757
Minnesota	14	\$33,344,262
Indiana	15	\$32,076,458
Wisconsin	16	\$29,066,457
Connecticut	17	\$26,467,950
New Hampshire	18	\$26,274,449
Arizona	19	\$26,020,738
Georgia	20	\$23,941,620
Louisiana	21	\$23,045,565
West Virginia	22	\$20,313,581
Alabama	23	\$17,867,549
Virginia	24	\$16,843,480
Missouri	25	\$16,365,777
All Other States		\$141,954,832
<b>U.S. Total</b>		<b>\$1,906,714,634</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

### Other selective business taxes received by the states

A number of other taxes apply to various business enterprises around the country. These include gross receipts tax, public utility realty tax, insurance premiums tax, motor vehicle tax, and the financial institutions tax. Revenues from these taxes totaled \$3,962,820,218.

Table 15 includes the top 24 state and District of Columbia totals for AAMC-member spending on other selective business taxes received by the states.

**Table 15**  
Other Tax Revenue Generated by AAMC Members, 2011

States	Rank	Other Tax Revenues
District of Columbia	1	\$ 444,467,416
Pennsylvania	2	\$ 353,157,845
California	3	\$ 310,434,496
Texas	4	\$ 290,604,048
Michigan	5	\$ 257,378,840
New York	6	\$ 241,881,117
Ohio	7	\$ 232,586,223
Massachusetts	8	\$ 135,870,491
Illinois	9	\$ 133,416,473
Florida	10	\$ 122,836,391
Vermont	11	\$ 111,229,190
Maryland	12	\$ 103,471,713
Minnesota	13	\$ 88,674,282
New Jersey	14	\$ 88,387,040
North Carolina	15	\$ 74,763,737
Tennessee	16	\$ 72,709,765
Washington	17	\$ 62,143,169
Arizona	18	\$ 55,185,126
Louisiana	19	\$ 54,396,668
Wisconsin	20	\$ 51,851,788
Delaware	21	\$ 49,164,870
Kentucky	22	\$ 47,294,172
New Mexico	23	\$ 40,840,915
Connecticut	24	\$ 40,576,947
Oklahoma	25	\$ 39,563,266
All Other States		\$ 459,934,229
<b>U.S. Total</b>		<b>\$ 3,962,820,218</b>

Note: Tables include impacts of the 24 individual states and the District of Columbia in which AAMC members' impact is highest plus "All other states" total which reflects the impact of the remaining 22 states where AAMC members are located.

## Impact on Employment

### The direct and indirect expansion of employment attributable to AAMC members

Perhaps the benefit that comes closest to home is the sheer number of United States citizens who depend on AAMC members, either directly or indirectly, for their jobs and livelihoods. A total of 3,489,435 jobs in the United States in 2011 were directly or indirectly attributable to AAMC members.

Even on a direct employment basis (i.e., only counting those directly paid by AAMC members such as regular staff, faculty, independent contractors, or residents receiving training), AAMC members are responsible for a substantial component of national employment. During 2011, AAMC members employed a total of 1,938,575 full-time equivalent (FTE) people. This includes staff, physician employees, and independent physician contractors. It also includes residents who are paid a stipend while they continue their graduate medical education.

While direct employment is significant, the actual extent of employment impact on the state stemming from AAMC members is considerably larger. The business volume generated by AAMC members creates jobs in a broad range of sectors throughout the nation's economy. These jobs are proportionate to the need to service the AAMC members themselves and their related populations (staff, physicians, students, etc.). In addition, the tax revenues generated at the state and local levels by AAMC members and their business volume also create government employment opportunities.

Table 16 includes the top 24 state and District of Columbia totals for AAMC employment impact.

**Table 16**

AAMC Members' Total Employment Impact in FTEs, 2011

States	Rank	Total Employment Impact
New York	1	430,743
Pennsylvania	2	272,640
California	3	264,046
Texas	4	228,513
Ohio	5	209,047
Massachusetts	6	195,154
Florida	7	166,676
Illinois	8	155,233
Michigan	9	133,120
North Carolina	10	120,578
New Jersey	11	94,961
Georgia	12	83,483
Maryland	13	81,944
Missouri	14	78,390
Tennessee	15	74,553
Connecticut	16	65,915
Minnesota	17	65,208
Virginia	18	63,145
Indiana	19	55,456
Arizona	20	51,897
District of Columbia	21	49,290
Wisconsin	22	44,244
Louisiana	23	42,602
South Carolina	24	38,242
Washington	25	34,474
All Other States		389,881
<b>U.S. Total</b>		<b>3,489,435</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

## Appendix A: Definition of Terms

Direct Employment	Total employees based on full-time equivalents (FTEs)
Direct Tax Payments	Direct tax payments made by an institution to a unit of government
Indirect Employment	The additional jobs created as a result of the institution's economic impact. Local companies that provide goods and services to an institution increase their number of employees as purchasing increases, creating an employment multiplier.
Indirect Tax Payments	Government revenue that is collected by governmental units in addition to those paid directly by an institution, including taxes paid directly by employees of the institution, visitors to the institution, and vendors who sell products to the institution.
Multiplier Effect	The additional economic impact created as a result of the institution's direct economic impact. Local companies that provide goods and services to an institution increase their purchasing, creating a multiplier.
Total Business Volume	Total sales receipts generated within a given geographic area. Business volume includes wholesale, retail, and service sector spending, as well as value-added in the manufacturing process.
Total Economic Impact	The total economic impact of an institution includes both the direct economic impact and the indirect economic impact generated in the economy as a result of the direct impact. Direct impact includes items such as institutional spending, employee spending, and spending by visitors to the institution. Indirect economic impact, also known as the multiplier effect, includes the re-spending of dollars within the local economy.
Research Commercialization	Research can be commercialized in a number of ways. In all cases, though, it typically involves defining the nature of the research being commercialized, for instance, in a patent or intellectual property agreement, establishing a commercial relationship with another party such as in a sale or license, and negotiating a contract, or specifically, the details of compensation.

## Appendix B: Data Sources and Assumptions\*

Input	Data Source/Assumption
Total economic impact business volume multiplier	Standard state multiplier as recommended by the American Council on Education
Capital account expenditures	AAMC database for hospital expenditures Tripp Umbach national average rate for medical school expenditures based on the hospital and medical school budget
Spending on goods, services, and supplies, (non-capital account and non-payroll expenditures)	Tripp Umbach national average rate for medical school and hospital expenditures based on hospital and medical school budgets
Proportion of staff renting housing	Tripp Umbach national average
Percent of staff residing in the state	Tripp Umbach national average
Number of staff	AAMC database for hospital staffing Tripp Umbach national average rate for medical school staffing
Average expenditure by a staff member for rental housing	Tripp Umbach national average
Proportion of the staff residing in the state	Tripp Umbach national average
Proportion of total non-housing expenditures that an individual is likely to make in the state	Tripp Umbach national average
Total institution-related income of staff	AAMC database for hospital expenditures Tripp Umbach national average rate for medical school expenditures
Proportion of a consumer's total expenditures spent on non-housing items	Tripp Umbach national average
Proportion of the staff not residing in the state	Tripp Umbach national average
Average expenditures in the state by each staff person not residing in the state	Tripp Umbach national average
Proportion of physician employees residing in the state	Tripp Umbach national average
Proportion of physician employees renting housing	Tripp Umbach national average
Number of physician employees	AAMC database
Average expenditure by a physician employee for rental housing	Tripp Umbach national average

Input	Data Source/Assumption
Average income of physician employee	Tripp Umbach national average
Average expenditures in the state by each physician employee not residing in the state	Tripp Umbach national average
Proportion of independent contractor physicians residing in the state	Tripp Umbach national average
Proportion of independent contractor physicians renting housing	Tripp Umbach national average
Number of independent contractor physicians	Tripp Umbach national average inflation added to a historical AAMC datapoint
Average expenditure by an independent contractor for rental housing	Tripp Umbach national average
Proportion of total non-housing expenditures that an individual is likely to make in the state	Tripp Umbach national average
Average amount paid by hospitals to hospital independent contractor physicians	Tripp Umbach national average inflation added to a historical AAMC datapoint
Average expenditures in the state by each independent contractor not residing in the state	Tripp Umbach national average
Total number of admissions/discharges	AAMC database
Percent of admissions/discharges by out-of-state patients	Tripp Umbach national average
Total number of outpatient visits	AAMC database
Percent of outpatient visits by out-of-state patients	Tripp Umbach national average
Average expenditures in the state, excluding expenditures at hospital, by out-of-state patients	Tripp Umbach national average
Number of out-of-state visitors per patient	Tripp Umbach national average
Average spending per visitor per day in state	Tripp Umbach national average
Average length of stay by visitor (days)	Tripp Umbach national average
Number of out-of-state visits to hospital by conference attendees	Tripp Umbach national average
Average number of days in state hotels and motels by conference attendees	Tripp Umbach national average
Average cost per night for a hotel/motel room in state	Tripp Umbach national average
Average daily expenditures by conference attendees exclusive of lodging	Tripp Umbach national average
Average number of visitors to each staff member	Tripp Umbach national average
Average length of stay (days) for visitors to staff	Tripp Umbach national average
Daily expenditures in the state by each visitor to hospital staff	Tripp Umbach national average
Number of enrollees (students)	AAMC database
Average number of visitors per enrollee	Tripp Umbach national average
Average length of stay (days) for visitors to students	Tripp Umbach national average

Input	Data Source/Assumption
Daily expenditures in the state by each visitor to students	Tripp Umbach national average
Total number of medical residents	AAMC database
Average number of out-of-state visitors to each resident	Tripp Umbach national average
Average length of stay (days) for visitors to medical residents	Tripp Umbach national average
Daily expenditures in the state by each visitor to residents	Tripp Umbach national average
Average number of visitors per physician	Tripp Umbach national average
Average length of stay (days) for visitors to physician employees	Tripp Umbach national average
Daily expenditures in the state by each visitor to physician employees	Tripp Umbach national average
Number of visits to hospital independent contractor physicians	Tripp Umbach national average
Average length of stay (days) for visitors to physician independent contractors	Tripp Umbach national average
Daily expenditures in the state by each visitor to independent contractor physicians	Tripp Umbach national average
Proportion of medical school enrollees from in the state	AAMC database
Proportion of students living in medical-hospital housing	Tripp Umbach national average
Average non-housing expenditures made in the state by medical students	Tripp Umbach national average
Proportion of students living off-campus	Tripp Umbach national average
Average cost of off-campus rent	Tripp Umbach national average
Proportion of medical residents renting housing in the state	Tripp Umbach national average
Average expenditure by a medical resident for rental housing	Tripp Umbach national average
Proportion of medical residents residing in the state	Tripp Umbach national average
Average income of a medical resident allocable to the medical school/hospital	AAMC database
Average expenditures in the state by each medical resident not residing in the state	Tripp Umbach national average
State business volume	U.S. Bureau of Economic Analysis
Sales and gross receipt taxes received by the state	U.S. Census Data
Individual income taxes received by the state	U.S. Census Data
Corporate net income taxes received by the state	U.S. Census Data
Other taxes received by the state	U.S. Census Data

\*Tripp Umbach's national averages are derived from surveys conducted with faculty at medical colleges and teaching hospitals. Some of the AAMC data were from the previous study and appropriate increases were applied for the 2011 research.

## Appendix C: Publicly Funded Research Tables

### Total State Business Volume Impact of Publicly Funded Research Conducted at AAMC-Member Institutions, 2009

States	Rank	Total Economic Impact	Direct Economic Impact	Indirect Economic Impact
California	1	\$5,360,125,905	\$2,061,586,886	\$3,298,539,018
Massachusetts	2	\$4,666,938,397	\$1,794,976,306	\$2,871,962,090
New York	3	\$4,532,330,490	\$1,743,204,035	\$2,789,126,455
Pennsylvania	4	\$2,892,439,702	\$1,112,476,808	\$1,779,962,893
Texas	5	\$2,496,576,899	\$960,221,884	\$1,536,355,014
North Carolina	6	\$2,158,422,741	\$830,162,593	\$1,328,260,148
Ohio	7	\$2,045,422,508	\$786,700,965	\$1,258,721,543
Maryland	8	\$1,785,291,194	\$686,650,459	\$1,098,640,734
Washington	9	\$1,777,062,201	\$683,485,462	\$1,093,576,739
Illinois	10	\$1,599,980,668	\$615,377,180	\$984,603,488
Missouri	11	\$1,159,651,627	\$446,019,857	\$713,631,771
Michigan	12	\$1,115,569,675	\$429,065,259	\$686,504,415
Connecticut	13	\$1,044,055,338	\$401,559,745	\$642,495,593
Tennessee	14	\$987,400,090	\$379,769,265	\$607,630,824
Minnesota	15	\$944,632,296	\$363,320,114	\$581,312,182
Georgia	16	\$936,334,559	\$360,128,677	\$576,205,883
Florida	17	\$853,058,512	\$328,099,428	\$524,959,085
Wisconsin	18	\$801,488,179	\$308,264,684	\$493,223,495
Virginia	19	\$714,777,147	\$274,914,287	\$439,862,860
Colorado	20	\$710,221,195	\$273,161,998	\$437,059,197
Oregon	21	\$606,657,791	\$233,329,920	\$373,327,871
Alabama	22	\$597,519,638	\$229,815,245	\$367,704,392
District of Columbia	23	\$507,709,004	\$195,272,694	\$312,436,310
Rhode Island	24	\$411,336,816	\$158,206,468	\$253,130,348
Iowa	25	\$407,826,860	\$156,856,485	\$250,970,375
All Other States		\$3,834,500,328	\$1,474,807,818	\$2,359,692,509
<b>U.S. Total</b>		<b>\$44,947,329,758</b>	<b>\$17,287,434,522</b>	<b>\$27,659,895,236</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.

## Appendix D: Impact of AAMC-Member Research

While previous Tripp Umbach studies of AAMC members did not cover the impact of medical research, this report examines the impact of the publicly funded research conducted by AAMC-member medical schools and teaching hospitals. As noted in *Science*,<sup>9</sup> “Periodic bursts in medical knowledge have always been tied to the intensity of attention and support for research. The explosion of new medical knowledge during the past three decades, emanating largely from the research in the medical centers of excellence [AAMC members], has achieved prodigious progress in controlling many disabling and even fatal diseases.” Investment in medical center-based research in the United States has brought immeasurable gains in identifying, curing, and preventing disease and alleviating the suffering of millions worldwide. Such research has provided cures and treatments for diphtheria, tetanus, pertussis, poliomyelitis, and other infectious diseases; significantly improved survival rates for heart disease, cancer, stroke, and diabetes; and developed life-saving equipment and techniques, such as the heart-lung machine, arterial substitutes for diseased arteries, transplantation of organs, diagnosis imaging machines, and genetic engineering techniques.<sup>10</sup>

The economic impact of medical research on the U.S. economy is an important and timely topic as the federal government, in the current climate of budget struggles, contemplates cutting funding to the National Institutes of Health (NIH) and other federal research programs. Additionally, medical research funding is in danger of experiencing cuts at the state budget level. In 2009, research funding at the national and state level received by medical schools and teaching hospitals added more than **\$44.9 billion** to the U.S. economy annually,<sup>11</sup> and supported nearly **300,000** full-time, high-paying jobs—or more than **one in every 500 jobs**.<sup>12</sup>

### Economic Impact of Publicly Funded Research

Direct economic impact stems from the spending by AAMC medical school and teaching hospital members from federal and state funds allocated for research. In addition, these direct, first-round expenditures, received as income by businesses and individuals in the state, re-circulate through the economy in successive rounds of re-spending. The end result is a multiplied economic impact that is a linear result of AAMC members’ presence and their research spending patterns.

Nationwide, the economic impact generated by state and federal funding for research consists of nearly \$17.3 billion in direct spending, and an additional \$27.6 billion in indirect economic impacts accruing to the economy through the re-spending by AAMC vendors, suppliers, staff, researchers, and visitors.

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<sup>9</sup> DeBaakey, Michael E., “Medical Centers of Excellence and Health Reform,” *Science*, Vol. 262 (22 October, 1993), pp. 523-525.

<sup>10</sup> Ibid.

<sup>11</sup> For this report, Tripp Umbach utilized the RIMS II multiplier for industry code 541700 on scientific research and development services on the national level. This multiplier was used to measure the impact on the U.S. economy and not on each individual state.

<sup>12</sup> Association of American Medical Colleges, “The Economic Impact of Medical Research on the U.S. Economy,” May 2011.

## The Expansion of Research Employment Attributable to AAMC Members

The research operations of AAMC members create a significant number of jobs, both directly and indirectly, in a multitude of industry segments within their state of operation, as well as the nation. A total of **299,649 jobs** in the United States in 2009 were directly or indirectly attributable to AAMC-member research derived from federal and state sources.

While reviewing the total employment impact, it is important to note that this is more than merely the number of individuals engaged in the support of research efforts, such as faculty, postdoctoral students, graduate students, residents and fellows, and technical and administrative support staff who are paid directly through the research funding of AAMC members. These mostly high-skilled jobs are significant to the economy because of the higher wages that tend to be paid, in addition to the benefits provided to those who are employed in these positions.

While the number of direct employees is significant, the true measure of the employment impact on the state and the nation stemming from AAMC members' research is significantly larger. The operational impact generated by AAMC members as a result of their research enterprise sustains jobs in a wide variety of industries throughout the U.S. economy. These indirect jobs, including staff, physicians, researchers, students, supply purchases, capital construction projects, etc., are created in industries that support the research enterprise of the member institutions. Finally, the research operations of AAMC-member institutions generate tax revenues at the state and local levels.

Appendix C includes tables listing the total economic and employment impacts generated at the national and state levels by state and federal funding for research in the top 24 states and the District of Columbia with AAMC-member medical schools and teaching hospitals.

### *Just the Tip of the Iceberg*

While impressive, these economic impact and employment data are the tip of the iceberg, as they represent only the spending of research dollars received by medical schools and teaching hospitals from federal and state sources as they ripple through the U.S. economy. Not included in Tripp Umbach's impact model are those economic impacts of the medical school and teaching hospital research missions that are more difficult to measure. The economic impact resulting from commercial application and cost-savings to society from medical progress is many times higher than operational impacts. The size of these additional downstream economic and employment benefits demands further study and more accurate and ongoing quantification. Previous studies by Tripp Umbach and others suggest that these additional measures (outputs) may be as high as seven times greater than operational impacts (inputs).<sup>13</sup> Currently, we are unable to measure the evidence of programs and services that lead to measurable societal cost-savings as a result of discovery and bringing research to market. It is also important to note that these impacts are in addition to the operational impacts described in the initial sections of this report.

<sup>13</sup> Cost Savings Resulting from NIH Research Support, NIH Publication No. 93. Silverstein, H.H. Garrison and S.J. Heinig, 1995.

At the time of publication, it is not possible to fully quantify the total cost savings as a result of research discovery and bringing research to market. However, the narrative below seeks to highlight a few examples of how research is transforming modern health care and having an impact on the bottom-line, while at the same time improving the health of the nation's citizens.

### *Economic Impact of Medical Advances and Health Care Cost-Savings*

These research-led advances in medicine have a positive impact not only on human health and quality of life; they also have substantial economic advantages. A historical study<sup>14</sup> conducted by the Centers for Disease Control and Prevention estimates that the polio vaccine averted \$30 billion per year in treatment costs for the disease. Further, were it not for the tuberculosis vaccine, the American health care system would continue to incur the costs of long-term care for 250,000 patients, without improving their health. Other such cost-savings include an estimated \$145 billion of savings in hospitalization costs in less than 25 years as a result of the discovery of lithium treatment for manic depression; \$400 million to \$870 million annually in savings as a result of potassium citrate treatment for the prevention of kidney stone recurrence; and \$350 million to \$450 million annually in savings as a result of a new vaccine developed to prevent haemophilus influenzae Type B disease, the leading cause of bacterial meningitis in the United States (not to mention the number of deaths and cases of neurological damage among infants and children averted by this vaccine).<sup>15</sup>

Some critics have argued that biomedical research is expensive. However, while biomedical innovation often begins with relatively expensive, invasive treatments or therapies, continued research has often led to highly cost-effective prevention via vaccines. According to Kirschner et al., the typical progression of biomedical innovation is such that “an incurable and expensive disease is initially treated with invasive surgery, then by progressively effective drug therapy, and finally by an inexpensive cure or vaccine. It would have been a mistake to freeze the process of discovery at an expensive intermediate stage by not investing in the next discovery.”<sup>16</sup>

Addressing this growing burden of rising health expenditures continues to be a major policy priority. Health expenditures in the United States approached \$2.6 trillion in 2010, more than 10 times the \$256 billion spent in 1980.<sup>17</sup> Chronic disease is the main driver of mortality in the United States, and the costs to the U.S. economy both directly and indirectly are staggering. According to a study completed by the NIH,<sup>18</sup> the economic costs of illness in the United States are approximately \$3 trillion annually, representing 31 percent of the nation's GDP. This includes “direct” costs of public and private health care spending of \$1.3 trillion, and “indirect” illness costs from reduced

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<sup>14</sup> Kirschner, Marc W., Marincola, Elizabeth, and Teisberg, Elizabeth Olmstead, “The Role of Biomedical Research in Health Care Reform,” *Science*, October 7, 1994.

<sup>15</sup> U.S. Congressional Record – House, H5268. Appropriations Committee, Labor, Health and Human Services, Education, and Related Agencies Subcommittee; Rep. John Porter (R-IL). June 28, 1994.

<sup>16</sup> Kirschner, Marc W., op. cit.

<sup>17</sup> U.S. Health Care Costs Background Brief. [www.http://www.kaiseredu.org/en/Issue-Modules/US-Health-Care-Costs/Background-Brief.aspx](http://www.kaiseredu.org/en/Issue-Modules/US-Health-Care-Costs/Background-Brief.aspx).

<sup>18</sup> The Benefits of Medical Research and the Role of the NIH. Office of the Chairman, Connie Mack <http://jec.senate.gov>. May 2000.

ability to work and premature death of \$1.7 trillion.<sup>19</sup> The importance of advancing the science of medicine through research cannot be understated. In addition to reducing the direct costs of care, medical advances cut illness costs by reducing lost economic output from disability and premature death. Through these medical advances, the United States has made considerable gains in health and longevity. A major driver behind this progress has been medical research.

By extending the life and improving the health of the patient, medical research generates value, while simultaneously lowering the economic costs of illness (both directly and indirectly). U.S. citizens are living almost 30 years longer than they did in 1900. These gains in longevity have enhanced the lives of individuals and families, and have added an estimated \$3.2 trillion annually to the U.S. economy since 1970. Moreover, people are staying active longer, which helps to improve overall health. The proportion of older people with chronic disabilities has dropped by nearly one-third in the last 25 years.<sup>20</sup>

Major health advances achieved through research have had an impact on the lives of many patients suffering from chronic diseases. Medical advances through research have reduced the prevalence of many acute conditions and increased life expectancy. These medical advances save lives and money.

#### ***Cancer Research Leads to Increased Longevity and Medical Cost-Savings***

U.S. cancer death rates are currently decreasing by approximately one percent annually. Each one percent decline in the death rate saves about \$500 billion. In addition, tremendous progress treating childhood cancers, such as acute lymphocytic leukemia, has resulted in the five-year survival rate reaching 90 percent.<sup>21</sup>

#### ***Personalized Medical Advances***

Personalized medicine in the treatment of breast cancer allows patients to avoid unnecessary chemotherapy while reducing costs in the overall health care system. Previously, women diagnosed with breast cancer and negative lymph nodes faced a difficult decision regarding follow-up treatment with chemotherapy. NIH studies have shown that following a lumpectomy and radiation, most women are cured of the disease, but a small percentage are not; thus many women choose the chemotherapy route to improve their cure rate. As a result of the Human Genome Project, molecular testing of the breast cancer cells, using a gene-based diagnostic tool makes it possible to see which genes are turned on or off in an individual tumor, thereby helping women decide if they need chemotherapy. The pattern of gene activity allows prediction of the chance of recurrence at high accuracy. According to the NIH, this genomic test will be utilized by approximately 50,000 women annually and a large percentage will be found not to need chemotherapy. As a result of this medical advancement, women will avoid unnecessary chemotherapy, and the U.S. health care system will be spared \$100 million in costs.<sup>22</sup>

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<sup>19</sup> Ibid.

<sup>20</sup> Cost Savings Resulting from NIH Research Support, NIH Publication No. 93. Silverstein, H.H. Garrison and S.J. Heinig, 1995.

<sup>21</sup> <http://www.nih.gov/about/impact/health.htm>.

<sup>22</sup> Examples of NIH Research Advances and Economic Benefits: Advances Related to Genomics. October 21, 2011. [http://www.nih.gov/about/director/10212011\\_advances.pdf](http://www.nih.gov/about/director/10212011_advances.pdf).

*Advances in Treating Cardiovascular Disease as a Result of Research Saves Lives*

Advances against the biggest killer of Americans, cardiovascular disease, further illustrates the benefits of medical research. The death rate from cardiovascular disease and stroke has fallen by more than 60 percent in the last 50 years. In part, the decline is the result of advances in medical technology.<sup>23</sup>

Statins are enormously effective drugs that, coupled with a decrease in cigarette smoking, have been responsible for a huge decrease in the incidence of cardiac death, especially in young men. Statins have been effective at lowering mortality since 1994. Statins have proven to be a cost-effective medication in the treatment of cardiovascular disease. The availability of generic medication has reduced the cost of statins to consumers, allowing more affordable access to treatment. Findings of a study conducted by Harvard University show that the cost of a Quality-Adjusted Life Year (QALY)<sup>24</sup> for a 55-year-old man with a 5 percent 10-year risk of a heart attack was nearly \$170,000.<sup>25</sup> The cost to save lives with specific statins is quite modest in many instances, especially over the longer time periods. For example, it cost only \$6,600 dollars for each QALY for a 55 year-old man at a 30 percent risk for a vascular event over a 10-year period. As a result of statins, positive health outcomes are achieved at a reasonable cost.<sup>26</sup>

Research and medical advances are key to containing medical costs and improving the quality of life for patients. Continuing to invest in research and quantifying the impact of advances is critical to demonstrating the value of research. It is important to note that while the studies above serve to highlight the financial benefits of medical research, the detailed measurement of the economic impact of medical research requires specialized research tools and long-term temporal studies that are significantly beyond the scope of the research performed here.

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<sup>23</sup> Statins Remain Cost-Effective, Not Cost Saving. November 26, 2011. <http://managinghealthcarecosts.blogspot.com/2011/11/statins-remain-cost-effective-not-cost.html>.

<sup>24</sup> The quality-adjusted life year (QALY) is a measure of disease burden, including both the quality and the quantity of life lived. It is used in assessing the value for money of a medical intervention. The QALY model requires utility independent, risk neutral, and constant proportional tradeoff behavior. The QALY is based on the number of years of life that would be added by the intervention. Each year in perfect health is assigned the value of 1.0 down to a value of 0.0 for death. If the extra years would not be lived in full health, for example if the patient would lose a limb, or be blind or have to use a wheelchair, then the extra life-years are given a value between 0 and 1 to account for this.

<sup>25</sup> Statins Remain Cost-Effective, Not Cost Saving. November 26, 2011. <http://managinghealthcarecosts.blogspot.com/2011/11/statins-remain-cost-effective-not-cost.html>.

<sup>26</sup> Ibid.

**AAMC Members' Total Research Employment Impact in FTEs, 2009**

States	Rank	Total Employment Impact
California	1	35,734
Massachusetts	2	31,113
New York	3	30,216
Pennsylvania	4	19,283
Texas	5	16,644
North Carolina	6	14,389
Ohio	7	13,636
Maryland	8	11,902
Washington	9	11,847
Illinois	10	10,667
Missouri	11	7,731
Michigan	12	7,437
Connecticut	13	6,960
Tennessee	14	6,583
Minnesota	15	6,298
Georgia	16	6,242
Florida	17	5,687
Wisconsin	18	5,343
Virginia	19	4,765
Colorado	20	4,735
Oregon	21	4,044
Alabama	22	3,983
District of Columbia	23	3,385
Rhode Island	24	2,742
Iowa	25	2,719
All Other States		25,563
<b>U.S. Total</b>		<b>299,648</b>

Note: Tables include the 24 individual states and the District of Columbia in which AAMC members' impact is highest, plus an "all other states" total, which reflects the impact of the remaining 22 states where AAMC members are located.





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