



The Economic Impact of Lincoln Memorial University- DeBusk College of Osteopathic Medicine on the State & Regional Economies

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Osteopathic Medicine on the State and Regional Economies**

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The Economic Impact of Lincoln Memorial University-DeBusk College of Osteopathic Medicine on the State and Regional Economies

EXECUTIVE SUMMARY

Everyone is aware that Lincoln Memorial University-DeBusk College of Osteopathic Medicine, hereafter referred to as LMU-DCOM, provides an outstanding quality educational program to its students. However, many are not aware of the huge economic contributions that LMU-DCOM makes to the State of Tennessee and to its primary impact region. The objective of this study is to measure the economic contributions that LMU-DCOM provides to the state and region. The economic contributions are measured in employment, income (wages, salaries, and benefits) and retail sales.

The College creates economic impact from four different activities. These include activities from (1) operations, (2) construction projects, (3) student non-university spending, and (4) visitor spending. The annual operations of the College involve the number of employees and the resulting wages, salaries, and benefits paid. In FY 2008, projected employment for LMU-DCOM is 52 full and part-time employees and a payroll of \$4.9 million.

Construction activities occur only during the year the construction occurs. In FY 2008, the projected construction costs are \$6.2 million. This generates 68 full and part-time jobs and \$2.7 million in payroll.

Students spend money off campus for such items as housing, food, gasoline, entertainment, etc. It is estimated that annual non-university spending will be almost \$1.7 million in FY 2008. This will create 16 full and part-time jobs and over \$657,000 in payroll. Finally, visitors come to the campus and spend money in the region while visiting. Total visitor spending for FY 2008 is estimated at \$386,852. These expenditures will create 6 full and part-time jobs with a payroll of \$135,398.

Using a computer program developed specifically to measure the economic impact of the college, the study measured the direct economic contribution of LMU-DCOM activities and calculated the jobs and income that would be created in other businesses in FY 2008. The model was able to measure the economic impact of LMU-DCOM on the State of Tennessee as well as on its primary impact region. The impact results for the State of Tennessee are presented in **Executive Table 1**.

College operations create 52 full and part-time jobs. This activity has an employment multiplier of 1.61 which means that for every job created, another 0.61 job is created in other businesses due to the College and the its employees spending money. The total estimated impact of the LMU-DCOM operations is 84 jobs in FY 2008.

Likewise, the model can measure the economic impact of income (wages, salaries and benefits) on the economy. Projected payroll is \$4.9 million in FY 2008. The higher education sector income multiplier is 1.54 which means that for every \$1 of income paid by LMU-DCOM, another \$0.54 of income is generated in other businesses. Thus, the total income impact of LMU-DCOM's payroll will be almost \$7.5 million. The model also estimates retail sales and state sales taxes generated from this income. From LMU-DCOM operational activities, over \$2.3 million in retail sales will be generated and about \$162,414 in state sales taxes will be collected.

When all of the activities are included, the FY 2008 total estimated impact of LMU-DCOM on the State of Tennessee economy is 240 full and part-time jobs, \$13.4 million in income (wages, salaries and benefits,) \$4.2 million in retail sales and \$292,313 in sales tax collections.

The model was also applied to what was identified as the primary impact region. This included three counties in Virginia, ten counties in Kentucky and 14 counties in Tennessee. The economic impact in the region was slightly less than the state impact. Total estimated economic impact for FY2008 on the primary impact region was 233 jobs, \$13.2 million income and \$3.1 million in retail sales subject to state sales tax.

These 2008 estimates only represent the first operating year with the initial class of students. LMU-DCOM will not be fully operational until 2011 when the first class graduates. To better estimate the total impact, operational costs along with student and visitor spending were projected for FY 2011. The total impacts on both the State of Tennessee and the primary impact region's economy were measured using the same methodology. The estimated total impact for FY 2011 on Tennessee is 354 jobs and \$20.3 million in income. Estimated retail sales are \$5.9 million with \$411,161 in sales tax. Again, the regional impacts were only slightly less.

Finally, most of Tennessee is designated as medically underserved due to the need for more practicing physicians. Many of the LMU-DCOM graduates will remain in Tennessee and some will practice in rural areas of the state. Previous research estimated the impacts of a typical primary care physician practice. These results were applied to a typical graduating class of LMU-DCOM. With 70 percent of the graduates expected to practice in Tennessee, it was estimated that the first class of graduates would have an employment impact of 3,675 jobs and generate \$114.5 million in wages, salaries and benefits from their practices and the increased activities at relevant hospitals. The impact of the 45 physicians (30 percent) who will start practices in rural Tennessee can be of significant importance to the areas. There is a shortage of physicians in many of these areas and these new physicians will not only improve the availability of health services, their practices will stimulate new economic activity. The bottom line is that

LMU-DCOM contributes greatly to the economies of the State of Tennessee and to its primary impact region. LMU-DCOM is extremely important for educational reasons as well as economic reasons.

Executive Table 1
Economic Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee, FY 2008

Sector	Direct	Employment Multiplier	Total Impact	Direct	Income Multiplier	Total Impact	Sales Tax	
							Retail Sales	7 Cent Tax
College Operations	52	1.61	84	\$4,850,701	1.54	\$7,470,080	\$2,320,207	\$162,414
Construction	68	1.72	117	\$2,666,620	1.70	\$4,533,254	\$1,408,029	\$98,562
Student Spending ¹	16	1.85	30	\$657,394	1.83	\$1,203,031	\$373,661	\$26,156
Visitor Spending	<u>6</u>	1.44	<u>9</u>	<u>\$135,398</u>	1.76	<u>\$238,300</u>	<u>\$74,016</u>	<u>\$5,181</u>
TOTAL	142		240	\$8,310,113		\$13,444,665	\$4,175,913	\$292,313

¹Total expenditures include non-university spending only. Revenue from campus spending such as tuition, campus housing costs and books purchased at the campus bookstore are captured in LMU-DCOM auxiliary revenue.

Source: Employment, spending and income data from LMU-DCOM; Multipliers and coefficients from 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce, Bureau of Economic Analysis.

The Economic Impact of Lincoln Memorial University DeBusk College of Osteopathic Medicine on the State and Regional Economies

INTRODUCTION

Colleges and universities are many things to many people. Viewed through the lens of economics, however, they are key to the viability of local, state, regional and national economies. From this perspective, they are sources of jobs and income to their employees and students. They are also large consumers which create additional jobs and income to suppliers of materials, services, equipment and capital structures. They provide entertainment and cultural opportunities. They produce skilled labor, enhance the lifetime income of graduates and increase the productive capacity of the economy. They contribute to the fund of knowledge through extension and technology transfer activities. They also spin off and attract research and industrial enterprises (**Appendix A.**)

The objective of this study is to estimate the impact that Lincoln Memorial University DeBusk College of Osteopathic Medicine, hereafter referred to as LMU-DCOM, has on various levels of the economy. More specifically, the report will:

1. Present financial, student and other data reflecting LMU-DCOM activities,
2. Measure the economic impacts that LMU-DCOM operational and construction activities as well as student and visitor spending have on the State of Tennessee's economy through increased;
 - employment
 - wages, salaries and benefits
 - retail sales

3. Measure the economic impacts that LMU-DCOM operational and construction activities as well as student and visitor spending have on the primary economic impact region including parts of Tennessee, Kentucky and Virginia through increased;
 - employment
 - wages, salaries and benefits
 - retail sales
4. Measure the economic impacts that the LMU-DCOM graduating physicians have on Tennessee's economy as they enter into practice through increased;
 - employment
 - wages, salaries and benefits
 - retail sales

RESEARCH METHODOLOGY

This report focuses primarily on the impacts to jobs and income (wages, salaries and benefits) created on an annual basis by the LMU-DCOM, its employees, its students, and its visitors to the campus. A review of previous literature relative to impact studies is given in **Appendix A**. Data for this study are projections for FY 2007 - 2008 to represent the first year of operation. These impacts are concentrated on the local community, but also spill over to the surrounding counties and to the state. Much of the revenue is used to hire faculty, staff and maintenance employees. Most of the income provided directly through these jobs is spent and re-spent, creating additional jobs and income. As a result, the total number of jobs and the total income attributable to LMU-DCOM are larger than the number of jobs and wages and salaries that come directly from the system itself. The

revenue that is not used to hire employees is used to procure various goods and services. The businesses use this revenue to hire employees, pay salaries and purchase materials. This additional economic activity is called the multiplier effect.

To calculate the economic impacts noted above, a widely-accepted input-output model and data from IMPLAN were utilized to estimate the direct, secondary and total impacts of LMU-DCOM on the economy of the State of Tennessee and a primary impact region including parts of Tennessee, Kentucky and Virginia. The economic impact in this report will be quantified as total employment including direct, secondary and total jobs and the associated wages, salaries and benefits. Detailed information on the model used in this report can be found in **Appendix B**. This study is directed by Dr. Gerald A. Doeksen, a renowned economist from Oklahoma State University, who is widely recognized for his research regarding economic impact studies of universities, health systems and industrial changes (**Appendix C**).

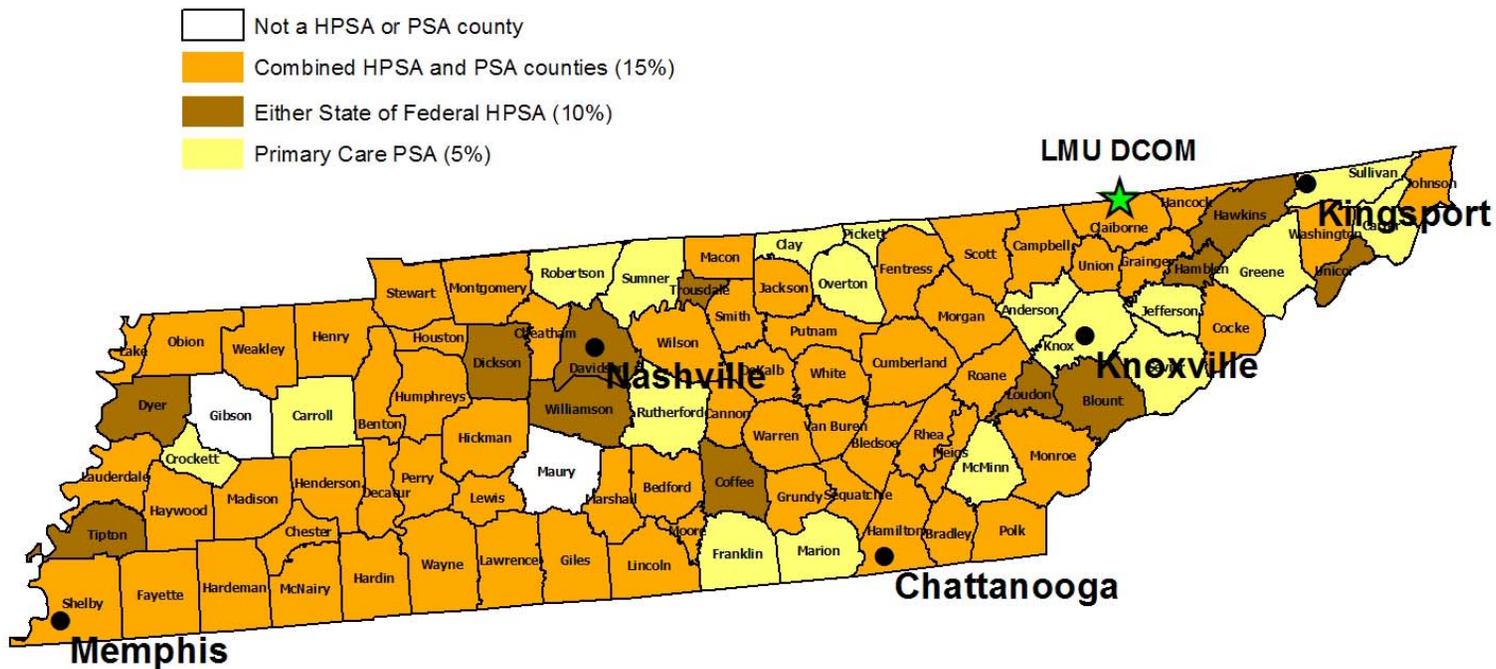
NEED FOR MEDICAL PROFESSIONALS

LMU-DCOM is serving a critical medical shortage area in the state and in the primary impact region. The need for medical personnel and the medical college are clearly illustrated on **Figures 1** and **2**.

Figure 1 illustrates the underserved areas in Tennessee. The immediate region surrounding LMU-DCOM that receives the greatest impact was identified by college officials. **Figure 2** presents the data for this primary impact region. These maps include the Health Professional Shortage Areas (HPSAs) and Physician Scarcity Areas (PSAs)^a.

^a For more information on HPSAs and PSAs, see Whitacre, Brian et al., "Bonus Payment for Health Care Professionals", Oklahoma Cooperative Extension Service, AGEC-999, 2007.

Figure 1
Tennessee Primary Care Physician
Shortage Designation Reimbursement Areas*

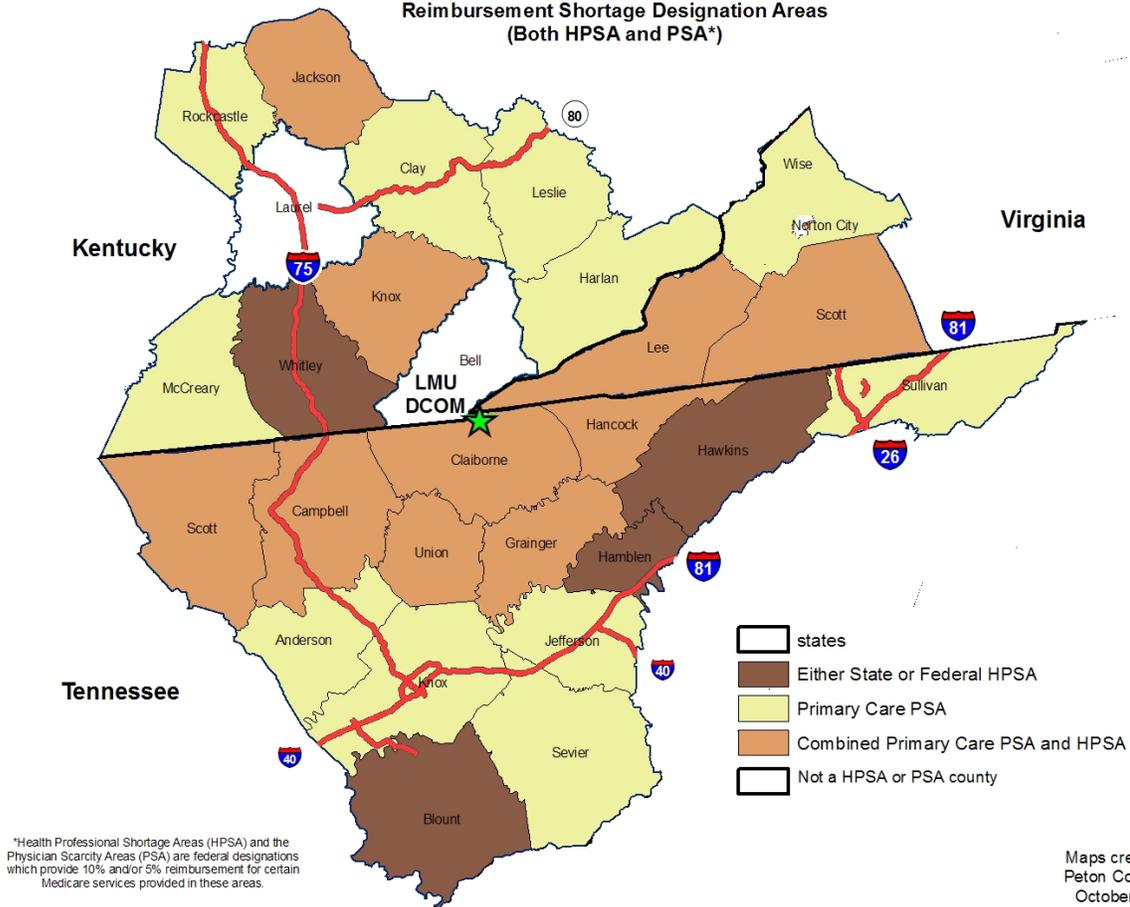


*Primary Care Physicians providing eligible Medicaid services in these areas are eligible for a bonus payment in accordance with the two federal shortage designation programs: Health Profession Shortage Areas (HPSA) and the Physician Scarcity Areas (PSA). Primary care physicians include: FP, GP, IM and OB/GYN.

Data Sources: 2007 HHS Bureau of Health Professions (BrHP) (HPSA & PSA) and 2006 Tennessee Primary Care Office for the state Designated Physician Shortage Areas

Maps Created by Peton Consulting October 2007

Figure 2
Primary Impact Region
Reimbursement Shortage Designation Areas
(Both HPSA and PSA*)



These are two designations by the federal government indicating an insufficient number of health professionals to care for the area's population.

Two distinct types of quarterly incentive bonuses are currently available to eligible health care providers in certain areas throughout Tennessee and the primary impact region for specific medical services rendered in those areas. Known as HPSA and PSA bonus payments, these two incentive programs were created by Congress out of concern for Medicare beneficiaries. They provide 10 percent and five percent bonuses,

respectively, as a way to recruit and retain both primary care and specialty physicians who provide services to Medicare beneficiaries in certain qualified areas.

From **Figure 1**, it is clear that almost the complete State of Tennessee is experiencing medical professional shortages. All but two counties are in either a HPSA or PSA. From **Figure 2**, it is again evident that LMU-DCOM is serving a region with a significant shortage of medical professionals.

OVERVIEW OF LMU-DEBUSK COLLEGE OF OSTEOPATHIC MEDICINE

With the continuing shortage of primary care physicians in the Appalachian region, Lincoln Memorial University (LMU) leaders had a vision to open a state-of-the-art medical college. The goal was to train new doctors of osteopathic medicine (D.O.s) to serve the people of Appalachia. According to college officials, many D.O.s will work in underserved areas, and approximately 65 percent of D.O.s will practice in primary care medicine. On May 5, 2006, LMU broke ground on the facility that would house the DeBusk College of Osteopathic Medicine (LMU-DCOM). After working through the accreditation process for two years, LMU received notification in September 2006 that LMU-DCOM had been granted provisional accreditation. The notification allowed the college to start accepting applications for its inaugural class to begin in the fall of 2007. The inaugural class has an enrollment of 150 students.

LMU-DCOM's curriculum is a four-year, full-time academic and clinical program leading to granting the degree of Doctor of Osteopathic Medicine. The curriculum stresses the interdependence of the biological, clinical, behavioral and social sciences. Emphasis will be on educating physicians for primary care medicine, employing the distinctive osteopathic principles for the maintenance of health and treatment of disease.

College Revenues

LMU-DCOM finances its day-to-day operations with revenues derived primarily from tuition and fees. Student fees include registration, information technology, student activities, etc. Total revenues for LMU-DCOM by major funding source are shown in **Table 1**. Because this is the initial year of LMU-DCOM, only first year students are attending. Projected revenues will continue to increase each year with additional enrollment. In FY 2008, the system's projected income will be almost \$4.9 million.

Table 1
Sources of Operating Revenues for LMU-DeBusk College of Osteopathic Medicine, FY 2008 Projections¹

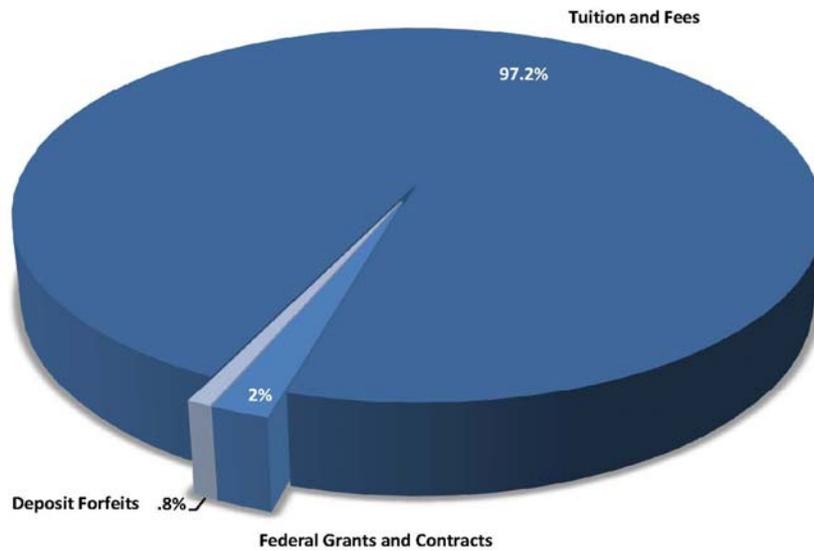
Source	Revenue	Percent
Tuition and Fees	\$4,725,000	97.2
Federal Grants and Contracts	\$96,000	2.0
Deposit Forfeitures	\$40,000	0.8
State Appropriations	<u>\$0</u>	<u>0.0</u>
TOTAL Operating Revenue	\$4,861,000	100.0

¹First year of operations only. Annual revenues will increase with additional enrollment

Source: LMU-DCOM financial reports

Figure 3 further illustrates the revenue sources for LMU-DCOM. Over 97 percent of projected FY 2008 revenues will be generated from tuition and fees. Two percent will come from federal grants and contracts and the remaining revenues will come from deposit forfeitures.

Figure 3
Estimated Sources of Operating Revenues for
LMU-DeBusk College of Osteopathic Medicine
Fiscal Year 2008 Projections



College Expenditures

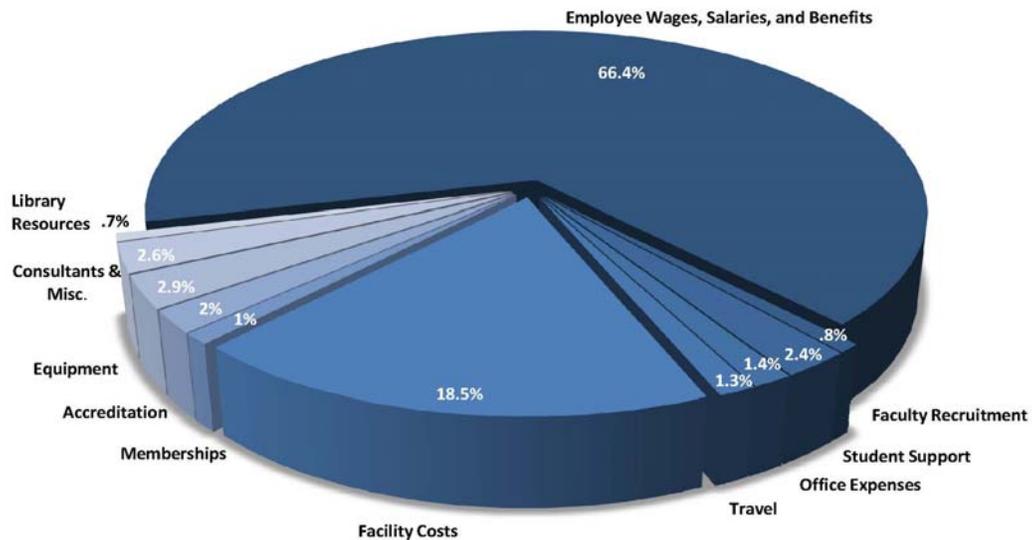
Total expenditures by category projected for FY 2008 are given in **Table 2**. **Figure 4** illustrates the proportions of college expenditures by category. Employee wages, salaries and benefits is the largest category utilizing 66.4 percent of total expenditures. Projected expenditures for facility costs are 18.5 percent. Student support expenditures including scholarships and federal assistance will be about 2.4 percent or \$175,875. Total expenditures projected for FY 2008 are \$7.3 million.

Table 2
Total Expenditures by Category for LMU-DeBusk College of Osteopathic
Medicine, FY 2008 Projection

Funding Category	Expenditures	Percent
Employee Wages Salaries and Benefits	\$4,850,701	66.4
Faculty Recruitment	\$57,500	0.8
Student Support	\$175,875	2.4
Office Expenses	\$102,612	1.4
Travel	\$93,200	1.3
Facility Costs	\$1,353,000	18.5
Memberships	\$72,391	1.0
Accreditation	\$148,500	2.0
Equipment	\$209,947	2.9
Consultants and Misc.	\$192,343	2.6
Library Resources	<u>\$50,950</u>	<u>0.7</u>
TOTAL Expenditures	\$7,307,019	100.0

Source: LMU-DCOM financial reports

Figure 4
Estimated Total Expenditures by Category for
LMU-DeBusk College of Osteopathic Medicine
Fiscal Year 2008 Projections



College Employment and Salaries

Employment and wages, salaries and benefits are detailed below in **Table 3**. There will be 44 full-time faculty and other professionals on the payroll in FY 2008. Wages, salaries and benefits for professionals totaled \$4.5 million. In addition wages, salaries and benefits for 8 full-time staff were estimated at \$255,952. Total projected employee expenses for the 52 professional and support staff are \$4.9 million.

College Construction Expenditures

Construction is another important activity, particularly with the opening of the new LMU-DeBusk College of Osteopathic Medicine. Approximately \$24.0 million were spent on new construction and building improvements in the last three fiscal years (**Table 4.**) For this FY 2008 analysis, only the last \$6.2 million are included. Construction operations impact the local community and surrounding region as contractors purchase building materials and employ construction workers, many of whom travel from other towns and spend part of their wages on food, drink and lodging.

Table 3
Estimated Number of Faculty, Staff and Student Employees at LMU-DeBusk College of Osteopathic Medicine, FY 2008 Projection

	Full-time Employment	Wages Salaries & Benefits
Professional	44	\$4,594,749
Staff	8	\$255,952
Students	<u>0</u>	<u>\$0</u>
TOTAL Employment	52	\$4,850,701

Source: LMU-DCOM officials

Table 4
Total Construction Expenditures for LMU-DeBusk College of Osteopathic Medicine
from FY 2006 to 2008

Fiscal Year 2006	\$1,095,242
Fiscal Year 2007	\$16,703,315
Fiscal Year 2008 (Estimated)	<u>\$6,201,443</u>
TOTAL Construction Expenditures	\$24,000,000

Source: LMU-DCOM officials

Student Enrollment and Non-university Spending

LMU-DCOM welcomed its first class of students in the 2007-2008 academic school year. There are 150 students enrolled for this first class (**Table 5**). LMU-DCOM will continue to accept 150 students each year resulting in a total enrollment of 600 students in four years. Approximately 50 percent of first-year students will live on campus. When all the classes have arrived the estimated total percent of students living in LMU housing will be 12.5.

Student spending can be a challenge to estimate due to the wide-range of spending patterns and number of commuter students. Estimated total student spending is provided in **Table 6**. These costs represent only the non-university portion of student spending for the first class of students enrolled in the Fall and Spring semesters. Tuition, fees, campus housing costs and a large portion of book purchases are paid directly to the college and are captured through college revenues. This method was believed to best approximate student expenditures. Those students that enroll in the summer will spend additional money in the community during that time. It was estimated that the 150 full-time students spent \$842,813 per semester for a total of \$1,685,626.

Table 5
Estimate Student Enrollment for LMU-DeBusk College of Osteopathic Medicine

First Class	150
Second Class (Estimated)	150
Third Class (Estimated)	150
Fourth Class (Estimated)	<u>150</u>
TOTAL Annual Student Enrollment	600
First-year Students Living in Campus Housing	50%
All Students Living in Campus Housing	12.5%

Source: LMU-DCOM officials

Table 6
Components of LMU-DeBusk College of Osteopathic Medicine Non-university Student Spending for School Year 2007-2008¹

	Fall 2007	Spring 2008
Students Living in Campus Housing		
Full-time Students	75	75
Spending per Student	<u>\$3,413</u>	<u>\$3,413</u>
Total Student Spending	\$255,938	\$255,938
Students Living Off-Campus		
Full-time Students	75	75
Spending per Student	<u>\$7,825</u>	<u>\$7,825</u>
Total Student Spending	\$586,875	\$586,875
TOTAL Student Expenditures	\$842,813	\$842,813

¹Total expenditures include non-university spending only. Revenue from campus spending such as tuition, campus housing costs and books purchased at the campus bookstore are captured in LMU-DCOM auxiliary revenue.

Source: Based on proposed student budget available on LMU website, <http://www.lmunet.edu>

Visitor Days and Spending

Colleges attract a large number of visitors each year for various events and activities. Parents bring their sons and daughters to enroll, help them with their living arrangements and attend some of their activities. Alumni revisit the campus for athletic events and to attend banquets and other special events. In addition, several visitors are brought to campus by administrators and faculty to attend conferences and other miscellaneous meetings. Each time a visitor comes to campus, they spend money at the local restaurants and often buy gas before they leave. Some of the activities require an overnight stay which generates revenue for the local motels. These are all local expenditures that occur due to the college's presence. Data in **Table 7** show that in 2008, the estimated 3,612 visitors to LMU-DCOM will spend \$386,852 while participating in on-campus activities.

Table 7
Estimated Annual Expenditures from Visitors to LMU-DeBusk College of Osteopathic Medicine, FY 2008

	Visitors	Daily Spending	Total Expenditures
Student Visitors and Parent Activities	604	\$143	\$86,372
Alumni Activities	0	\$100	\$0
College Activities	3000	\$100	\$300,000
Faculty and Staff Visitors	<u>8</u>	\$60	<u>\$480</u>
TOTAL Visitor Expenditures	3,612		\$386,852

Source: Visitor days was obtained from LMU Enrollment Management and Student Services and estimated daily spending was based on University of Arizona research and LMU-DCOM officials.

THE IMPACT OF LMU-DCOM ON THE TENNESSEE ECONOMY IN FY 2008

As stated earlier, this report focuses on the economic impact as it relates to jobs, and wages, salaries and benefits resulting from activities associated with LMU-DCOM.

These activities are divided into the following categories

1. Operations;
2. Construction;
3. Student Non-university Spending; and
4. Visitor Spending.

The previous section clearly documents that the direct activities of these categories are significant. However, this does not tell the complete story. Secondary economic impacts are created when the medical college and its employees, construction firms and their employees, students, and visitors all spend money. These secondary benefits are measured by economic multipliers.

The Multiplier Effect

To further illustrate the multiplier effect, consider the opening of a new medical school. The medical school purchases goods and services from other businesses and the dollars flowing to those businesses increase. Likewise, the medical school will hire employees who purchase goods and services locally. The purchases of the medical school and its employees will create additional jobs and wages and salaries throughout the local economy.

A multiplier from an input-output model such as IMPLAN can measure the effect created by an increase or decrease in economic activity. For example, an employment multiplier of 1.75 indicates that if one job is created by the medical school, then an

additional 0.75 job is created in other businesses due to the medical school and employee spending. The model calculates employment and income multipliers.

Economic Impact from Operational Activities

The economic impact from activities related to operations is presented in **Table 8**. Employment (full and part-time) and income (payroll including wages, salaries, and benefits) from operational activities were obtained from LMU-DCOM. These activities occur every year. Projected LMU-DCOM employment was 52 employees in FY 2008 (**Table 4**). The higher education sector employment multiplier is 1.61. This means that for every job in the college, another 0.61 job is created in other businesses in the state. The secondary employment generated in the state from LMU-DCOM is estimated at 32 jobs. LMU-DCOM will have a total impact of 84 jobs in the State of Tennessee in FY 2008.

Projected data on the income from employees are also presented in **Table 8**. Data from LMU-DCOM indicate that total income will be \$4.9 million from operational activities. Using the higher education sector income multiplier of 1.54, LMU-DCOM will generate secondary income of \$2.6 million for a total impact of \$7.5 million.

Income also has an impact on retail sales. The retail sales capture ratio can be used to estimate the impact of operational activities on retail sales. This ratio indicates the percent of personal income spent on items that generate sales tax. Data from the Tennessee Department of Revenue indicate that 31.06 percent of the income is spent in retail stores that collect state sales taxes. Thus, it is estimated that \$2.3 million would be generated in retail sales from operations. Given the current 7.0 percent state sales tax rate

in Tennessee, an estimated state sales tax collection of \$162,414 will occur as a result of the retail sales from operational activities.

Table 8
Employment, Income and Retail Sales Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee from Operational Activities, FY 2008

Category	Amount
Employment Impact	
LMU Employment	52
Higher Ed. Sector Employment Multiplier	1.61
Secondary Employment Impact	<u>32</u>
TOTAL Employment Impact	84
Income Impact	
LMU Income	\$4,850,701
Higher Ed Sector Income Multiplier	1.54
Secondary Income Impact	<u>\$2,619,379</u>
TOTAL Income Impact	\$7,470,080
Retail Sales and Sales Tax Impact	
Retail Sales	\$2,320,207
State Sales Tax (7%)	\$162,414

Source: Employment and income data from LMU-DCOM; 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

Economic Impact from Construction Activities

LMU-DCOM spends a significant amount on construction activities. This impact is often overlooked. It must be remembered that these impacts only occur during the year of construction and are not recurring. In FY 2006, LMU-DCOM spent over \$1.0 million on construction projects and in FY 2007 the amount increased to over \$16.7 million. The projected costs for construction in 2008 are \$6.2 million. From IMPLAN, the statewide ratios for employment and wages generated per million dollars of construction were used

to estimate employment and income for each fiscal year. Because this analysis was for the first year of operation, the FY 2008 construction activities will be highlighted. In FY 2008, the capital investment of \$6.2 million is estimated to create 68 full and part-time jobs and over \$2.6 million in wages, salaries and benefits (**Table 9**).

The total employment impact from LMU-DCOM construction activities is presented in **Table 10**.

Table 9
Employment and Income Generated from LMU-DeBusk College of Osteopathic Medicine Capital Investment Projects, FYs 2006-2008

Year	Capital Investment	Full-time and Part-time Employees	Wages, Salaries and Benefits
FY 2006	\$1,095,242	12	\$470,954
FY 2007	\$16,703,315	182	\$7,182,425
FY 2008	\$6,201,443	68	\$2,666,620

Source: LMU-DCOM, 2007; 2006 IMPLAN Data, Minnesota Implan Group Inc.

Table 10
Employment Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee from Construction Activities, FY 2006-2008

Year	Direct Employment	Construction Employment Multiplier	Secondary Employment Impact	Total Employment Impact
FY 2006	12	1.72	9	21
FY 2007	182	1.72	131	313
FY 2008	68	1.72	49	117

Source: 2006 IMPLAN Data, Minnesota Implan Group Inc.

The construction employment multiplier of 1.72 indicates that 0.72 job will be created in other businesses in the state due to construction activities. Those jobs in other businesses are referred to as secondary jobs. The estimated secondary employment impact for FY 2008 will be 49 jobs, resulting in a total employment impact of 117 jobs from construction activities.

The impact on income is presented in **Table 11**. The construction income multiplier is 1.70, which means that for each dollar of wages and salaries paid to construction workers, another \$0.70 of wages will be generated in other businesses in the state. The estimated secondary income for FY 2008 is almost \$1.9 million and the total income from construction activities is \$4.5 million. Retail sales are estimated at \$1.4 million with a 7.0 percent state sales tax generating \$98,562 from construction activities.

Table 11
Income and Retail Sales Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee from Construction Spending, FYs 2006-2008

Year	Direct Income	Construction Income Multiplier	Secondary Income Impact	Total Income Impact	Retail Sales	Sales Taxes
2006	\$470,974	1.70	\$329,668	\$800,622	\$248,673	\$17,407
2007	\$7,182,425	1.70	\$5,027,698	\$12,210,123	\$3,792,464	\$265,473
2008	\$2,666,620	1.70	\$1,866,634	\$4,533,254	\$1,408,029	\$98,562

Source: Construction data from LMU-DCOM; 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

Economic Impact of Student Non-university Spending

When students attend classes at the medical school, they spend money for housing, food, entertainment, etc. The money they spend locally, outside of the

university, stimulates additional economic activity that in turn generates jobs and income in other businesses. Student non-university expenditures were estimated in a previous section. Using ratios of expenditures to employment and income from IMPLAN, the employment and income generated from non-university spending were estimated. **Table 12** contains the estimates.

Jobs created from this student spending were estimated at 16. The employment multiplier for retail trade and services was utilized to measure the multiplier impact. The employment multiplier for this sector was 1.85. Thus, 14 secondary jobs were created in other businesses and the estimated total employment impact from student non-university spending is 30 jobs.

Table 12
Employment, Income and Retail Sales Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee from Student Spending, FY 2008

Category	Amount
Employment Impact	
Jobs from Student Non-university Spending	16
Retail Trade and Services Employment Multiplier	1.85
Secondary Employment Impact	<u>14</u>
TOTAL Employment Impact	30
Income Impact	
Income from Student Non-university Spending	\$657,394
Retail Trade and Services Income Multiplier	1.83
Secondary Income Impact	<u>\$545,637</u>
TOTAL Income Impact	\$1,203,031
Retail Sales and Sales Tax Impact	
Retail Sales	\$373,661
State Sales Tax (7%)	\$26,156

Source: Student spending data from LMU-DCOM; 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

Income generated from these student expenditures is estimated at \$657,394. The income multiplier for retail trade and services was utilized to estimate the secondary income impact of \$545,637. The total income impact from student non-university spending was \$1.2 million. This income generates \$373,661 in retail sales and \$26,156 in state sales tax.

Economic Impact from Visitor Spending

LMU-DCOM activities attract many visitors to campus. These visitors spend dollars that contribute to the local economy. Data in **Table 7** estimates that 3,612 visitors spent \$386,852 in FY 2008. These data were converted to jobs and income based on ratios of expenditures to jobs and income from IMPLAN. The impact of visitor spending is presented in **Table 13**.

Jobs created in businesses due to visitor spending were estimated at six. The employment multiplier of 1.44 estimated that three secondary jobs were created. The total impact on employment was nine jobs generated due to visitor spending at LMU-DCOM.

Income generated from visitor spending was estimated at \$135,398. The estimated secondary impact was \$102,902 using the retail trade and services sector income multiplier of 1.76. This yielded a total income impact from visitor spending of \$238,300. This income resulted in retail sales of \$74,016 and state sales taxes of \$5,181 with a 7.0 percent rate.

Table 13
Employment, Income and Retail Sales Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee from Visitor Spending, FY 2008

Category	Amount
Employment Impact	
Jobs from Visitor Spending	6
Retail Trade and Services Employment Multiplier	1.44
Secondary Employment Impact	<u>3</u>
TOTAL Employment Impact	9
Income Impact	
Income from Visitor Spending	\$135,398
Retail Trade and Services Income Multiplier	1.76
Secondary Income Impact	<u>\$102,902</u>
TOTAL Income Impact	\$238,300
Retail Sales and Sales Tax Impact	
Retail Sales	\$74,016
State Sales Tax (7%)	\$5,181

Source: Visitor data from LMU-DCOM; 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

Summary of LMU-DCOM Impacts

In summary, LMU-DCOM's total impact as it relates to jobs, income, retail sales and sales tax on the State of Tennessee economy is presented in **Table 14**. Total estimate for FY 2008 was 142 direct jobs. When including the secondary impacts, the total employment impact will be 240 jobs. The direct income activities were estimated at over \$8.3 million with the total income impact from LMU-DCOM on the State of Tennessee of over \$13.4 million. These dollars resulted in over \$4.2 million in retail sales and \$292,313 in state sales taxes.

Table 14
Economic Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee, FY 2008

Sector	Direct	Employment Multiplier	Total Impact	Income			Sales Tax	
				Direct	Multiplier	Total Impact	Retail Sales	7 Cent Tax
College Operations	52	1.61	84	\$4,850,701	1.54	\$7,470,080	\$2,320,207	\$162,414
Construction	68	1.72	117	\$2,666,620	1.70	\$4,533,254	\$1,408,029	\$98,562
Student Spending ¹	16	1.85	30	\$657,394	1.83	\$1,203,031	\$373,661	\$26,156
Visitor Spending	<u>6</u>	1.44	<u>9</u>	<u>\$135,398</u>	1.76	<u>\$238,300</u>	<u>\$74,016</u>	<u>\$5,181</u>
TOTAL	142		240	\$8,310,113		\$13,444,665	\$4,175,913	\$292,313

¹Total expenditures include non-university spending only. Revenue from campus spending such as tuition, campus housing costs and books purchased at the campus bookstore are captured in LMU-DCOM auxiliary revenue.

Source: Employment, spending and income data from LMU-DCOM; Multipliers and coefficients from 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

THE IMPACT OF LMU-DCOM ON THE PRIMARY IMPACT REGION ECONOMY IN FY 2008

LMU-DCOM is located on the extreme northern border of Tennessee. Thus, it was decided to measure the economic impact of the medical school on its primary impact region. Most of the economic impact will occur in this region (**Figure 5**). The region consists of three counties in Virginia, ten counties in Kentucky, and 14 counties in Tennessee as identified by LMU-DCOM.

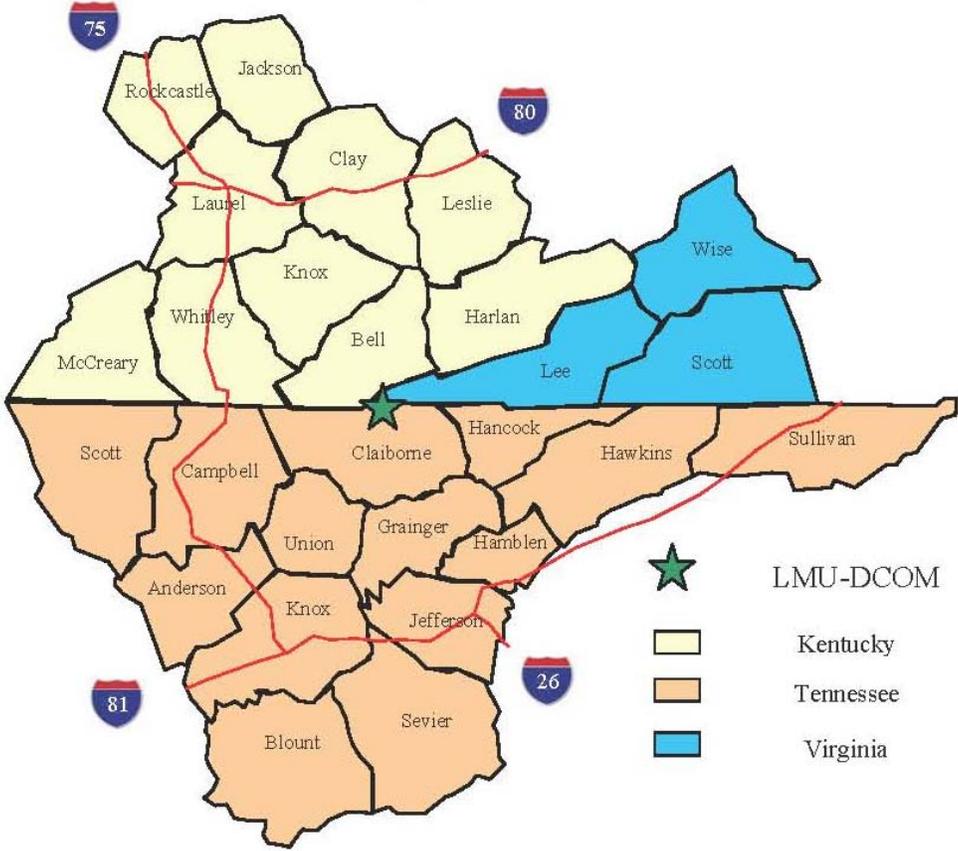
The methodology presented in the previous section was utilized to estimate the economic impact of LMU-DCOM on the impact region. Again, the study analyzed the impact relative to four activities. These include the economic activity resulting from LMU-DCOM:

1. Operations;
2. Construction;
3. Student Non-university Spending; and
4. Visitor Spending.

Construction activity only occurs during the construction year, whereas the other activities occur every year. Since the same methodology was used as in the previous section, only the summary impact table is presented. Data relative to the employment, income, and retail sales are presented in **Table 15**.

LMU-DCOM is expected to have 52 employees and the regional higher education sector employment multiplier is 1.51. This means that for each job created at LMU-DCOM, another 0.51 jobs will be created in other businesses due to LMU-DCOM and its employees spending money in the primary impact region. The total estimated employment impact from LMU-DCOM operations is 79 jobs.

Figure 5
Primary Impact Region for Lincoln Memorial University-Debusk College of Osteopathic Medicine



Source: LMU-DCOM officials.

Table 15
Economic Impact of LMU-DeBusk College of Osteopathic Medicine on the Primary Impact Region, FY 2008

Sector	Employment			Income			Retail Sales
	Direct	Multiplier	Total Impact	Direct	Multiplier	Total Impact	
College Operations	52	151	79	\$4,850,701	1.52	\$7,373,066	\$1,731,933
Construction	68	1.70	116	\$2,666,620	1.68	\$4,479,922	\$1,052,334
Student Spending ¹	16	1.84	29	\$657,394	1.82	\$1,196,457	\$281,048
Visitor Spending	<u>6</u>	1.42	<u>9</u>	<u>\$135,398</u>	1.73	<u>\$234,239</u>	\$55,023
TOTAL	142		233	\$8,310,113		\$13,283,684	\$3,120,337

¹Total expenditures include non-university spending only. Revenue from campus spending such as tuition, campus housing costs and books purchased at the campus bookstore are captured in LMU-DCOM auxiliary revenue.

Source: Employment and income data from LMU-DCOM; Multipliers and coefficients from 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

The economic impact of construction, student spending and visitor spending activities was also measured and yielded a total impact of 233 jobs in the region. Projected FY 2008 income for LMU-DCOM operations is \$4.9 million. With the region's higher education sector income multiplier of 1.52, the total impact on income in the primary impact region due to operational activities will be \$7.4 million. In total, when including all activities of LMU-DCOM, the total estimated income impact in the region is \$13.3 million.

The regional sales capture ratio will be smaller than the state's due to purchases outside the region. By applying the regional sales capture ratio of 23.49 percent to the income impacts generated from all four activities, it was estimated that the impact on retail sales was over \$3.1 million. Impact on sales tax collection was not estimated due to the different tax rates throughout the region.

When comparing the state impacts to the regional impacts, the impact of LMU-DCOM on the primary impact region is only slightly less than the impact on the entire State of Tennessee. These results illustrate that most of the spending activity occurs in the region and only a small proportion of the secondary impacts are generated beyond this region.

Everyone understands the tremendous educational contributions that LMU-DCOM provides to the State of Tennessee and to its primary impact region. This study clearly documents that LMU-DCOM also has a significant economic impact on both the State of Tennessee and the school's primary impact region.

THE IMPACT OF LMU-DCOM ON THE TENNESSEE AND PRIMARY IMPACT REGION ECONOMIES IN 2011

LMU-DCOM just admitted its first class in 2007-2008. Therefore, the FY 2008 impact analysis in the previous section does not reflect the entire impact of the medical school when fully operational. Thus, an impact analysis was completed for FY 2011 when four classes will be attending the medical college and the college will be completely staffed. Again, the impact of LMU-DCOM will be measured on the State of Tennessee and on the primary impact region.

Many assumptions had to be made for these estimates. LMU-DCOM professionals provided an estimate of employment and payroll. Projected construction activities were \$3.0 million per year over the next three years. In addition, it was assumed that student and visitor spending would increase fourfold from the FY 2008 estimates. These cost estimates are likely conservative as they are based on 2006 numbers and have not been inflated. Adjustments can be made if required.

The impact on the State of Tennessee is presented for FY 2011 in **Table 16**. From college personnel, the estimated number of employees in FY 2011 is 75 with an estimated payroll of \$8.0 million. Thus the operating impact of the college can be obtained by using the multipliers. The state higher education sector employment multiplier is 1.61 which means that for each job created in the college another 0.61 job is created in other businesses due to LMU-DCOM and its employees spending money. The total impact from college operations will be 121 jobs. Likewise, the total income (wages, salaries, and benefits) impact can be estimated with the higher education sector income multiplier of 1.54. The total income impact to the state from college operations is

forecast at \$12.4 million in FY 2011. Of this income, it is estimated that \$3.8 million in retail sales and \$268,681 in state sales taxes will be generated in Tennessee.

In total, 197 jobs will be created in direct activities in FY 2011. When including the secondary impacts, the total impact on jobs due to LMU-DCOM will be 332 jobs in FY 2011. Likewise, the total impact in income will be over \$20.3 million, \$5.9 million retail sales will be generated and \$411,161 will be collected if the 7.0 percent state sales tax rate remains the same.

The economic impact of LMU-DCOM in the primary impact region is presented in **Table 17**. The impacts are only slightly less than the state impacts. This means that the bulk of LMU-DCOM's impacts are occurring in the primary impact region. The total economic impact in the region is estimated at 323 jobs and over \$20.1 million in income.

Table 16
Economic Impact of LMU-DeBusk College of Osteopathic Medicine on the State of Tennessee, FY 2011

Sector	Employment			Income			Sales Tax	
	Direct	Multiplier	Total Impact	Direct	Multiplier	Total Impact	Retail Sales	7 Cent Tax
College Operations	75	1.61	121	\$8,024,470	1.54	\$12,357,684	\$3,838,297	\$268,681
Construction	33	1.72	57	\$1,290,000	1.70	\$2,193,000	\$681,146	\$47,680
Student Spending ¹	64	1.85	118	\$2,629,577	1.83	\$4,812,126	\$1,130,368	\$79,126
Visitor Spending	<u>25</u>	1.44	<u>36</u>	<u>\$541,593</u>	1.76	<u>\$953,204</u>	<u>\$223,908</u>	<u>\$15,674</u>
TOTAL	197		332	\$12,485,640		\$20,316,014	\$5,873,719	\$411,161

¹Total expenditures include non-university spending only. Revenue from campus spending such as tuition, campus housing costs and books purchased at the campus bookstore are captured in LMU-DCOM auxiliary revenue.

Source: Employment and income data from LMU-DCOM; Multipliers and coefficients from 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

Table 17
Economic Impact of LMU-DeBusk College of Osteopathic Medicine on the Primary Impact Region, FY 2011

Sector	Direct	Employment Multiplier	Total Impact	Direct	Income Multiplier	Total Impact	Retail Sales
College Operations	75	151	113	\$8,024,470	1.52	\$12,197,194	\$788,448
Construction	33	1.70	56	\$1,290,000	1.68	\$2,167,200	\$673,132
Student Spending ¹	64	1.84	118	\$2,629,577	1.82	\$4,785,830	\$1,124,191
Visitor Spending	<u>25</u>	1.42	<u>36</u>	<u>\$541,593</u>	1.73	<u>\$936,956</u>	\$220,091
TOTAL	197		323	\$12,485,640		\$20,087,180	\$5,805,862

¹Total expenditures include non-university spending only. Revenue from campus spending such as tuition, campus housing costs and books purchased at the campus bookstore are captured in LMU-DCOM auxiliary revenue.

Source: Employment and income data from LMU-DCOM; Multipliers and coefficients from 2006 IMPLAN Data, Minnesota Implan Group Inc., Retail sales data from Tennessee Department of Revenue, U.S. Department of Commerce Bureau of Economic Analysis.

THE IMPACT OF LMU-DCOM GRADUATES ON TENNESSEE AND RURAL TENNESSEE

Graduates of LMU-DeBusk College of Osteopathic Medicine will contribute to the health of many residents in Tennessee. The class will also contribute to the economies of the State of Tennessee and many rural Tennessee communities. The medical need was clearly identified in an early section of this paper. This section will estimate the economic impact a typical class will have on the economy. Based on placement data from Pikeville, Kentucky College of Medicine, LMU-DCOM estimated that 70 percent of the graduating class will practice in Tennessee and 30 percent will practice in rural Tennessee. Pikeville has exceeded these rates with very similar demographics and recruitment efforts.

Data from previous research^b estimates the jobs and income (wages, salaries, and benefits) that are generated per physician. The study estimated the impact of primary care physicians in underserved rural areas of Oklahoma. Since most of Tennessee is underserved, it is assumed that this research is typical of what will occur in Tennessee and rural Tennessee. The income estimates are conservative as urban wages, salaries, and benefits are often higher than rural areas. The research study found that each physician employs approximately four people (including the physician) and has an annual payroll of \$287,700 for the practice office (**Table 18**). The research also estimated hospital inpatient and outpatient services that are attributed to a physician. Results show that each physician generates 13 jobs and \$435,000 of annual payroll in the hospital. In total, each physician creates 17 jobs and generates income of \$722,000. It should be noted that the impact on the pharmacy and nursing homes were not included in this study.

^b For more information, see [6] Appendix A.

Table 18
Employment and Income Generated by Physicians from
Physician Practice and Hospital Activity

	Employees	Wages, Salaries Benefits
Physician Practice	4	\$287,700
Hospital Activity	<u>13</u>	<u>\$435,000</u>
TOTAL	17	\$722,000

Source: Eilrich, Fred et al., "The Economic Impact of a Rural Primary Care Physician and the Potential Health Dollars Lost to Out-migrating Health Services," National Center for Rural Health Works, Oklahoma State University, 2007.

The activities of the physician practice and hospital business create secondary benefits in the State of Tennessee. The employment and income impacts per physician are presented in **Table 19**. The state physician sector employment multiplier is 2.06. This says that for each job created by a physician, another 1.06 jobs are created in other businesses in the state. Using this multiplier, the secondary employment created in Tennessee per physician was 18 for a total employment impact per physician of 35 jobs.

Income (wages, salaries, and benefits) per physician were \$722,000. The state physician sector income multiplier of 1.51 estimates secondary income of \$368,220. Total annual income generated per physician in Tennessee is estimated at \$1,090,220. It is estimated that this amount of income will generate \$338,622 in retail sales and \$23,704 in state sales tax collections.

Data in **Table 20** estimate the annual economic impact of a typical medical class on the State of Tennessee's economy. The results simply take the physician estimates from **Table 19** and multiply times the estimated number of physicians projected to work in Tennessee. These impact estimates reflect an established physician practice. In some instances, it might be two or three years before the impact is fully realized. However,

Table 19
**Employment, Income and Retail Sales Impact of Typical LMU-DeBusk College of
Osteopathic Medicine Graduate on the State of Tennessee**

Category	Amount
Employment Impact (per graduate)	
Jobs from Physician Practice and Hospital	17
Physician Sector Employment Multiplier	2.06
Secondary Employment Impact	<u>18</u>
TOTAL Employment Impact	35
Income Impact (per graduate)	
Income from Physician Practice and Hospital	\$722,000
Physician Sector Income Multiplier	1.51
Secondary Income Impact	<u>\$368,220</u>
TOTAL Income Impact	\$1,090,220
Retail Sales and Sales Tax Impact	
Retail Sales	\$338,622
Sales Tax (7%)	\$23,704

Source: Eilrich, Fred et al., "The Economic Impact of a Rural Primary Care Physician and the Potential Health Dollars Lost to Out-migrating Health Services," National Center for Rural Health Works, Oklahoma State University, 2007
IMPLAN Data, Minnesota IMPLAN Group, Tennessee Department of Revenue, U.S. Dept. of Commerce, Bureau Economic Analysis.

physicians locating in health professional shortage areas will typically fill their practice quickly.

It is estimated that 70 percent of the first graduating class or 105 graduates will practice in the State of Tennessee. By remaining in Tennessee, the total impact from these graduates will be 3,675 jobs, over \$114 million in income, \$35.6 million in retail sales and over \$2.4 million in sales tax collections given the current 7.0 percent sales tax rate.

Many of these graduates will practice in the rural areas. Data in **Table 21** estimate the expected economic impact in rural Tennessee from a typical medical class. As previously stated, 30 percent of a typical class of LMU-DCOM graduates are

expected to practice in rural Tennessee. These 45 new physicians will have a significant impact on the rural economy.

Table 20
Employment, Income and Retail Sales Impact of Typical LMU-DeBusk College of Osteopathic Medicine Graduating Class on the State of Tennessee

Category	Amount
Employment Impact	
Total Jobs per Physician Practice	35
Estimated Number Practicing in Tennessee	<u>x 105</u>
TOTAL Employment Impact	3,675
Income Impact	
Total Income per Physician Practice	\$1,090,220
Estimated Number Practicing in Tennessee	<u>x 105</u>
TOTAL Income Impact	\$114,473,100
Retail Sales and Sales Tax Impact	
Retail Sales	\$35,555,345
Sales Tax (7%)	\$2,488,874

Source: Eilrich, Fred et al., "The Economic Impact of a Rural Primary Care Physician and the Potential Health Dollars Lost to Out-migrating Health Services," National Center for Rural Health Works, Oklahoma State University, 2007
 IMPLAN Data, Minnesota Implan Group, Tennessee Department of Revenue, U.S. Department of Commerce,. Bureau Economic Analysis.

The total impact of a typical graduating class from LMU-DCOM on the economy of rural Tennessee is 1,575 jobs and \$49.1 million in income. This income will generate an estimated \$15.2 million in retail sales and over \$1.1 million in state sales tax.

Summary of LMU-DCOM Graduate Impacts

In summary, the number of Tennessee counties currently identified as medical shortage areas clearly indicate the need for physicians. In addition to the LMU-DCOM graduates providing much needed medical services, they will also contribute significantly to the economic strength of rural Tennessee and to the entire state. Although the impacts might be slightly smaller in sparsely populated areas and/or some of the practices will

require more than a year to achieve full patient schedules, these results suggest that LMU-DCOM graduates will certainly impart economic benefits to the communities.

Table 21
Employment, Income and Retail Sales Impact of Typical DeBusk College of Osteopathic Medicine Graduating Class on the Rural Tennessee Economy

Category			Amount
Employment Impact			
Total Jobs per Physician Practice		35	
Estimated Number Practicing in Tennessee		<u>x 45</u>	
TOTAL Employment Impact			1,575
Income Impact			
Total Income per Physician Practice	\$1,090,220		
Estimated Number Practicing in Tennessee		<u>x 45</u>	
TOTAL Income Impact			\$49,059,900
Retail Sales and Sales Tax Impact			
Retail Sales			\$15,238,004
Sales Tax (7%)			\$1,066,660

Source: Eilrich, Fred et al., "The Economic Impact of a Rural Primary Care Physician and the Potential Health Dollars Lost to Out-migrating Health Services," National Center for Rural Health Works, Oklahoma State University, 2007
 IMPLAN Data, Minnesota Implan Group, Tennessee Department of Revenue, U.S. Department of Commerce,. Bureau Economic Analysis.

Appendix A

Review of Literature Relative to Impact Studies

Appendix A

Review of Literature Relative to Impact Studies

For many years, researchers have been interested in quantifying the benefits, beyond the provision of degrees, of universities and colleges. One of the first detailed guides to measure the economic benefits of a college or university to the local community was requested by the American Council on Education (ACE) in 1968.^[2] Based on some previous impact studies, Caffrey and Isaacs identified four primary groups that generated economic activity through spending. These four categories were: 1. the college, 2. faculty and staff, 3. students, and 4. visitors to the college. They developed several models and sub-models to estimate the spending. These models have provided the foundation for numerous economic impact studies since and are still being adopted today. For example, the Association of American Medical Colleges has been measuring the economic impact of their member institutions on the individual states in which they were located for a number of years. The results are based on adaptations of the ACE models with the latest study completed in 2006.^[3]

Since the development of the ACE models, technology has simplified the process for deriving multipliers. The original ACE model depends upon numerous surveys to faculty, staff, students, local businesses and community residents and relies heavily upon proportional spending calculations to estimate indirect economic impact. It is a difficult model to implement and is less applicable to some colleges such as community colleges.^[4] The proportion of money spent locally can be difficult to estimate. More recently, computer models have been created utilizing input-output analysis that not only make estimating the multiplier effect more reasonable, but allow different multipliers to be created for local, regional or state impacts (**Appendix B**). Two frequently used

computer models are the Regional Input-Output Modeling System (RIMS II) published by the U.S. Bureau of Economic Analysis and MicroIMPLAN developed by the United States Forest Service. These computer models have been used to estimate the impact of universities, medical schools, hospital construction and physician clinics, just to name a few.^[5-11] For example, a detailed study estimating the impacts of the University of Nevada School of Medicine (UNSOM) on the Nevada economy was complete using the IMPLAN model.^[5] The study includes estimates of the employment and payroll impacts of UNSOM medical education, patient care activities and construction in 2006. In 2001, the National Association of State Universities and Land-Grant Universities surveyed its members for their most recent economic impact reports. They published a summary analysis based on data from 96 member institutions and 10 member university systems.^[12]

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Appendix B

Model and Data Used to Estimate Employment and Income Multipliers

Appendix B

Model and Data Used to Estimate Employment and Income Multipliers

A computer spreadsheet that uses state IMPLAN multipliers was developed to enable community development specialists to easily measure the secondary benefits of the health sector on a state, regional or county economy. The complete methodology, which includes an aggregate version, a disaggregate version, and a dynamic version, is presented in Measuring the Economic Importance of the Health Sector on a Local Economy: A Brief Literature Review and Procedures to Measure Local Impacts (Doeksen, et al., 1997). A brief review of input-output analysis and IMPLAN are presented here.

A Review of Input-Output Analysis

Input-output (I/O) (Miernyk, 1965) was designed to analyze the transactions among the industries in an economy. These models are largely based on the work of Wassily Leontief (1936). Detailed I/O analysis captures the indirect and induced interrelated circular behavior of the economy. For example, an increase in the demand for health services requires more equipment, more labor, and more supplies, which, in turn, requires more labor to produce the supplies, etc. By simultaneously accounting for structural interaction between sectors and industries, I/O analysis gives expression to the general economic equilibrium system. The analysis utilizes assumptions based on linear and fixed coefficients and limited substitutions among inputs and outputs. The analysis also assumes that average and marginal I/O coefficients are equal.

Nonetheless, the framework has been widely accepted and used. I/O analysis is useful when carefully executed and interpreted in defining the structure of a region, the interdependencies among industries, and forecasting economic outcomes.

The I/O model coefficients describe the structural interdependence of an economy. From the coefficients, various predictive devices can be computed, which can be useful in analyzing economic changes in a state, a region or a county. Multipliers indicate the relationship between some observed change in the economy and the total change in economic activity created throughout the economy.

MicroIMPLAN

MicroIMPLAN is a computer program developed by the United States Forest Service (Alward, et al., 1989) to construct I/O accounts and models. Typically, the complexity of I/O modeling has hindered practitioners from constructing models specific to a community requesting an analysis. Too often, inappropriate U.S. multipliers have been used to estimate local economic impacts. In contrast, IMPLAN can construct a model for any state, region, county, or zip code area in the United States by using available state, county, and zip code level data. Impact analysis can be performed once a regional I/O model is constructed.

Five different sets of multipliers are estimated by IMPLAN, corresponding to five measures of regional economic activity. These are: total industry output, personal income, total income, value added, and employment. The total impact of a change in the economy consists of direct, indirect, and induced impacts. Direct impacts are the changes in the activities of the impacting industry such as the addition of another physician and corresponding medical staff to the medical service area. The increased purchases of inputs by the new physician clinic as a result of the direct impact are the indirect impact on the business sectors.

Two types of multipliers are generated. Type I multipliers measure the impact in terms of direct and indirect effects. However, the total impact of a change in the economy consists of direct, indirect, and induced changes. Both the direct and indirect impacts change the flow of dollars to the state, region, or county's households. Subsequently, the households alter their consumption accordingly. The effect of the changes in household consumption on businesses in a community is referred to as an induced effect. To measure the total impact, a Type II multiplier is used. The Type II multiplier compares direct, indirect, and induced effects with the direct effects generated by a change in final demand (the sum of direct, indirect, and induced divided by direct). IMPLAN also estimates a modified Type II multiplier, called a Type SAM multiplier, which also includes the direct, indirect, and induced effects. The Type SAM multiplier further modifies the induced effect to include spending patterns of households based on a breakdown of households by nine different income groups.

Minnesota IMPLAN Group, Inc. (MIG)

Dr. Wilbur Maki at the University of Minnesota utilized the I/O model and database work from the U. S. Forest Service's Land Management Planning Unit in Fort Collins to further develop the methodology and to expand the data sources. Scott Lindall and Doug Olson joined the University of Minnesota in 1984 and worked with Maki and the model.

As an outgrowth of their work with the University of Minnesota, Lindall and Olson entered into a technology transfer agreement with the University of Minnesota that allowed them to form MIG. At first, MIG focused on database development and provided data that could be used in the Forest Service version of the software. In 1995,

MIG took on the task of writing a new version of the IMPLAN software from scratch. This new version extended the previous Forest Service version by creating an entirely new modeling system that included creating Social Accounting Matrices (SAMs) – an extension of input-output accounts, and resulting SAM multipliers. Version 2 of the new IMPLAN software became available in May of 1999. For more information about Minnesota IMPLAN Group, Inc., please contact Scott Lindall or Doug Olson by phone at 651-439-4421 or by email at info@implan.com or review their website at www.implan.com.

Appendix B References

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Appendix C

Dr. Doeksen's Professional Accomplishments

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Dr. Doeksen's Professional Accomplishments

Dr. Doeksen has 40 years of experience working with economic impact models. He has applied impact models to a variety of situations and also has advanced the theory of impact models. Dr. Doeksen's Master's thesis and Ph.D. dissertation both utilized input-output analysis, which is the most frequently used impact model. Both his thesis and dissertation received national awards.

Dr. Doeksen's early work in input-output analysis is referenced in textbooks such as Harry W. Richardson's book titled Input-Output and Regional Economics. He is given credit for groundbreaking work related to aggregation and size of multipliers.

Over the years, Dr. Doeksen has over 50 journal articles and publications regarding impact analysis. He has been involved with over 300 economic impact studies. These include such applications as to measure the economic impact of a university hospital, critical access hospital, golf course, manufacturing plant, large urban health clinic, medical program on a state's economy, dental practices, recreational facility, hotel, agricultural services, agricultural programs, etc. Results were used by local, state and federal policy makers to influence and justify political action. In addition, Dr. Doeksen is constantly being invited to speak at state, regional, national, and international conferences. He makes over 30 speaking engagements each year.

Dr. Doeksen's latest work with impact models is the founding of the National Center for Rural Health Works. The Center has been in operation over 10 years and its primary purpose is to train professionals in other states to measure the impact of health services on the rural economies. The Center is funded by the Federal Office of Rural Health Policy. Programs have been started in over 30 states. Dr. Doeksen continues to

operate as Director and is continually developing new applications of the economic impact models.

In summary, Dr. Doeksen is nationally known for his economic impact studies and research applications. These applications relate to rural economies, many of which focus on various segments of the health sector.