



*The* LEWIN GROUP

# Economic Impact of University of Mississippi Medical Center

*Prepared for:*

**Center for Mississippi Health Policy**

*Prepared by:*

**Al Dobson, Ph.D.**

**Paul Gallese, MBA**

**Namrata Sen, MHSA**

**Justin Bowers, MHA**

**Ushma Patel**

**Raiza Kolia, Ph.D.**

*January 2, 2007*

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	I
PURPOSE OF THE STUDY .....	I
OVERVIEW OF UNIVERSITY OF MISSISSIPPI MEDICAL CENTER.....	I
KEY FINDINGS OF THE STUDY .....	II
CURRENT ECONOMIC IMPACT OF UMMC.....	II
UMMC AS A MAJOR SAFETY NET AND TERTIARY CARE PROVIDER .....	III
UMMC IS A MAJOR CONTRIBUTOR TO THE HEALTHCARE WORKFORCE .....	V
UMMC AS A MAJOR ECONOMIC ENGINE FOR THE FUTURE.....	V
EXPANSION OF CANCER CARE SERVICES AT UMMC .....	V
EXPANSION OF KIDNEY TRANSPLANT PROGRAM AT UMMC.....	VI
CREATION OF A BIOTECHNOLOGY RESEARCH PARK .....	VII
CONCLUSION.....	VIII
<b>1 INTRODUCTION.....</b>	<b>1</b>
1.1 WHAT IS AN ACADEMIC MEDICAL CENTER? .....	1
1.2 UMMC AS AN ECONOMIC ENTERPRISE .....	2
1.3 ACADEMIC MEDICAL CENTERS FACE AN ARRAY OF UNIQUE CHALLENGES IN A CHANGING AND COMPETITIVE MARKETPLACE.....	3
<b>2 UMMC’S ECONOMIC IMPACT ON THE JACKSON MSA AND MISSISSIPPI.....</b>	<b>7</b>
2.1 CURRENT ECONOMIC IMPACT .....	10
2.2 METHODOLOGY OF ECONOMIC IMPACT MODEL .....	10
2.2.1 <i>Economic Impact on the Jackson MSA</i> .....	12
2.2.2 <i>Economic Impact of UMMC on Mississippi</i> .....	15
2.3 ECONOMIC IMPACT OF AN EXPANSION OF CANCER CARE SERVICES .....	17
2.4 ECONOMIC IMPACT OF EXPANSION OF TRANSPLANT CARE SERVICES.....	18
<b>3 THE POTENTIAL FOR THE ALLIANCE BETWEEN BIOTECHNOLOGY INITIATIVES AND ACADEMIC MEDICAL CENTERS.....</b>	<b>22</b>
3.1 CASE STUDIES OF ALLIANCES BETWEEN ACADEMIC MEDICAL CENTERS AND BIOTECHNOLOGY RESEARCH PARKS.....	22
3.2 EVALUATION OF UMMC’S POTENTIAL TO ENHANCE ITS RESEARCH ACTIVITIES AND DEVELOP A BIOTECHNOLOGY RESEARCH PARK.....	24
3.3 STATE SUPPORT TO TRANSFORM UMMC INTO AN OUTSTANDING HEALTH SCIENCES RESEARCH CENTER.....	26
<b>4 THE UMMC MARKET .....</b>	<b>29</b>
4.1 REGIONAL DEMOGRAPHICS .....	29
4.2 HEALTH INSURANCE COVERAGE .....	30
4.3 HEALTH STATUS INDICATORS .....	31
4.4 MARKET SHARE ANALYSIS .....	32

<b>5 UMMC OPERATIONS, FINANCES, AND CRITICAL SERVICES .....</b>	<b>35</b>
5.1 UMMC INSTITUTIONAL SERVICES .....	35
5.2 UMMC PHYSICIAN SERVICES .....	40
5.3 GRADUATE MEDICAL EDUCATION AND HEALTH SCIENCES EDUCATION .....	40
5.4 RESEARCH .....	45
<b>6 UMMC AS A SAFETY NET PROVIDER .....</b>	<b>48</b>
6.1 FINANCIAL OVERVIEW .....	48
6.2 UMMC, THE REGION’S SAFETY NET RESOURCE, IS FACING INCREASING FINANCIAL PRESSURES .....	50
6.3 MISSION RELATED COSTS OF UMMC .....	57
6.4 COST SHIFT IN RELATION TO UMMC .....	59
<b>7 CONCLUSION .....</b>	<b>62</b>
<b>APPENDIX I: ECONOMIC IMPACT TABLES.....</b>	<b>65</b>
<b>APPENDIX II: GRADUATE MEDICAL EDUCATION .....</b>	<b>70</b>

## TABLE OF FIGURES

Figure 1: UMMC Enterprise Components.....	2
Figure 2: The New Health System Alignment .....	4
Figure 3: Cycle of Sustainable Preeminence.....	6
Figure 4: Jackson MSA and Mississippi Economy Profile from IMPLAN.....	7
Figure 5: Population Estimate and Percent Change of Selected Southern MSAs .....	8
Figure 6: Personal Income Percent Change 2000-2004.....	8
Figure 7: Employment by Private Industries in Jackson MSA* .....	9
Figure 8: Employment Growth 2001-2004 .....	9
Figure 9: Financial Data of UMMC.....	11
Figure 10: Summary of Estimated Impacts on Output, Employment, Labor Income, and Tax Revenue in the Jackson MSA Attributable to UMMC .....	12
Figure 11: Estimated Impacts on Output in the Jackson MSA Attributable to UMMC.....	13
Figure 12: Summary of Estimated Impacts on Labor Income in the Jackson MSA Attributable to All UMMC Components .....	14
Figure 13: Summary of Estimated Impacts on Employment in the Jackson MSA Attributable to All UMMC Components .....	14
Figure 14: Summary of the Estimated Impacts on Output, Employment, Labor Income, and Tax Revenue in the Jackson MSA Attributable to UHC .....	15
Figure 15: Estimated Impacts on Output, Employment, Labor Income, and Tax Revenue in Mississippi Attributable to UMMC.....	16
Figure 16: Estimated Impacts on Output in Mississippi Attributable to UMMC.....	16
Figure 17: Economic Impact of Infusion of \$50 Million to Expand Cancer Care Services at UMMC on Jackson, MSA .....	17
Figure 18: UMMC Heart and Kidney Transplants 2001-2005.....	18
Figure 19: Mississippi Organ Recovery Agency (MORA) Kidney Recoveries, Transplants and UMMC Transplants .....	19
Figure 20: Kidney Transplant Program Volume for 2005 Transplant Centers in UNOS Region 3 .....	20
Figure 21: Economic Impact in the Jackson MSA Attributable to Growth in Kidney Transplant Volume at University Hospital and Clinics .....	21
Figure 22: Economic Impact of UMMC Based Biotechnology Research Park on the Jackson MSA at the End of 10 years.....	26
Figure 23: Biotechnology in Mississippi Compared to Other Southern States .....	27
Figure 24: Demographics of Jackson MSA, Mississippi, and the U.S. 2005 .....	30
Figure 25: Sources of Health Insurance Coverage for the Jackson MSA, Mississippi and U.S. 2000 .....	31
Figure 26: Health Status Indicators Mississippi & the U.S. 2004.....	31
Figure 27: Leading Causes of Death for U.S., Mississippi, and Jackson MSA .....	32
Figure 28: Acute Care Discharges UHC vs. Other MSA Hospitals 2005.....	32
Figure 29: Adult and Pediatrics and Special Care Units Patient Days .....	33
Figure 30: Medicare Case Mix Index for UHC vs. Other Jackson MSA Hospitals 2002-2006 .....	34
Figure 31: Medicare and Medicaid Discharges UHC vs. Other Jackson MSA Hospitals FY 2005 .....	34

Figure 32: UHC Admissions by Type (FY 2002-2006).....	36
Figure 33: UHC Patient Days by Service/Entity (FY 2002-2006) .....	36
Figure 34: UHC Adult and Pediatrics Average Daily Census and ALOS FY 2002-2006 .....	37
Figure 35: UHC ED and Outpatient Clinic Visits FY 2002-2006.....	37
Figure 36: UHC ED Department Visits by Payer FY 2005.....	39
Figure 37: UHC Trauma and Other ED Visits FY 2005.....	39
Figure 38: Student Enrollment by Program FY 2002-2006 .....	41
Figure 39: Physician Supply Non-Federal Physicians per 1000 .....	42
Figure 40: Federally-Designated HPSAs & MUAs in Mississippi .....	43
Figure 41: Physician Demand and Supply per 100,000 Persons in the State of Mississippi.....	44
Figure 42: Annual Economic Impact of Physician Community that Received GME in UMMC and Practiced in UMMC .....	45
Figure 43: UMMC Research Award Sources FY 2002-2006.....	46
Figure 44: Research Award Distribution & Sources (FY 2006).....	47
Figure 45: UHC Total Revenue and Expenses FY 2002-2006 .....	48
Figure 46: UHC Net Total Margin FY 2002-2006.....	49
Figure 47: UHC Payer Mix by Setting FY 2005 .....	50
Figure 48: Characteristics of Safety Net Providers.....	51
Figure 49: UMMC Un-recovered Medicaid and UCC Costs Funds Flow, FY 2006.....	53
Figure 50: UMMC Un-recovered Medicaid and UCC Costs FY 2002-2006 .....	54
Figure 51: UMMC Medicaid Transfer Program FY 1995-2006 .....	55
Figure 52: UMMC Un-recovered Medicaid and UCC Costs Adjusted for Deficits from the Medicaid Transfer Program FY 2002-2006 .....	56
Figure 53: Mission Related Costs of Teaching Hospitals .....	58
Figure 54: IME Payments and Uncompensated Care Costs as a Percent of UMMC Operating Costs.....	59
Figure 55: Cost Shift Hydraulic for the Nation’s Hospital.....	60
Figure 56: Cost Shift Hydraulic for UMMC .....	61

# EXECUTIVE SUMMARY

## Purpose of the Study

The Lewin Group (Lewin) was commissioned by The Center for Mississippi Health Policy to inform the Mississippi legislature about the economic impact of The University of Mississippi Medical Center (UMMC) on the Jackson metropolitan statistical area (Jackson MSA) and Mississippi. In addition, the study also explores UMMC's potential to expand its biosciences research capability. The intent of the study is to inform policymakers and community leaders about the potential role that UMMC could play in future health care provision, research, medical education, and economic development.

## Overview of the University of Mississippi Medical Center

UMMC is a diverse \$849 million enterprise directly providing approximately 7,200 jobs for Mississippi residents. UMMC's workforce comprises approximately 13 percent of the 58,455 employees of Mississippi hospitals in fiscal year 2005.

UMMC is engaged in a range of missions for the benefit of Mississippi residents and the Jackson MSA.

- An **educational mission** providing undergraduate and graduate level programs in biosciences including a School of Medicine, School of Nursing, School of Allied Health Professions, School of Dentistry, and graduate programs in biosciences. UMMC also supports a large Graduate Medical Education (GME) program of approximately 447 resident physicians.
- A **clinical mission** providing clinical services through the University Hospitals and Clinics (UHC) and the University of Mississippi Physicians Practice Plan. UHC includes an adult acute care hospital, a dedicated critical care hospital, a rehabilitation center, the children's hospital, Holmes County critical access hospital and the Durant Nursing Home. The practice plan is the clinical "home" for the UMMC faculty and provides a business mechanism for the faculty to provide, bill, and collect for clinical services.
- A **research and scholarly** mission that includes basic and applied research, as well as the full range of scholarly activities necessary to support the GME programs.
- A **social and community mission** that encompasses UHC and the UMMC faculty's role as primary "safety-net" providers for the state and UMMC's role as a significant source for the state's biomedical and scientific workforce.

In addition to the above mentioned missions, UMMC provides a number of complex medical and surgical services. UMMC is the sole provider of organ and bone marrow transplant

services, trauma services through its Level 1 Trauma Center, and comprehensive children's health services including a Level III Neonatal Intensive Care Unit.

## Key Findings of the Study

The key findings of the study include the following:

- UMMC is a critical component of the State's health care system. The health care system in the state relies greatly on the tertiary care services provided by UMMC.
- UMMC is currently a major economic engine for metropolitan Jackson and the rest of the state providing for enhanced economic output, employment, and tax revenues.
- UMMC serves as a provider of last resort for the entire state. However, as a major safety net provider, it has limited ability to cost shift to commercial payers making extensive state support necessary.
- UMMC plays a critical role in building the health care workforce in Mississippi; a state suffering from an acute shortage of physicians and high incidence of chronic diseases.
- With substantial initial investment from the public and private sectors, UMMC could reap significant returns by pursuing the following objectives:
  - Expansion of cancer care services and a transplant program;
  - Enhancement of biomedical research; and,
  - Creation of a biotechnology research park.

## Current Economic Impact of UMMC

The economic impact of UMMC is the result of expenditures on education, research, clinical services, and health improvement activities conducted at UMMC. To estimate the current economic impact of UMMC on Jackson MSA and Mississippi, Lewin employed the IMPLAN software and database, commonly used for economic impact analyses.<sup>1</sup>

Exhibit ES-1 provides a summary of the estimated impact of UMMC on Jackson MSA and the state. UMMC generates a total output impact of \$1.44 billion, \$556 million in labor income, 13,803 jobs, and \$187 million in tax revenue for metropolitan Jackson. The total output impact of \$1.44 billion represents 10 percent of Jackson MSA's economy. For the state, UMMC generates a total output impact of \$1.38 billion, \$538 million in labor income, 13,232 jobs and \$175 million in revenue. The total output impact of \$1.38 billion represents at least 2 percent of Mississippi's economy.

---

<sup>1</sup> IMPLAN is a product of Minnesota IMPLAN Group, Inc. which uses data sources from U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor, and Census.

## Exhibit ES-1: Estimated Economic Impacts of UMMC on Jackson MSA

	Direct	Indirect	Induced	Total
Output Impacts (\$)	848,754,587	281,101,816	310,540,833	1,440,397,261
Labor Income Impacts (\$)	370,297,952	89,513,709	96,107,643	555,919,293
Employment Impacts (jobs)	7,197	3,180	3,425	13,803
Tax Revenue (\$)	-	-	-	191,107,463

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTES:**

**Direct Effect** represents the impact (e.g. change in employment or revenues) for the expenditures and/or production values specified as direct final demand changes.

**Indirect Effect** represents the impact (e.g. change in employment) caused by the iteration of industries purchasing from industries resulting from direct final demand changes.

**Induced Effect** represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

**Total impact** is the sum of the direct, indirect and induced effects.

**The tax impact includes taxes from the following:**

**Employee Compensation** describes the total payroll costs of each industry in the region. It includes the wages and salaries of workers who are paid by employers, as well as benefits such as health and life insurance, retirement payments and non-cash compensation.

**Proprietary Income** consists of payments received by self-employed individuals as income. Any income received for payment of self-employed work, as reported on Federal tax forms, is counted here. This includes income received by private business owners, doctors, lawyers and so forth.

**Indirect business taxes** consist of excise taxes, property taxes, fees, licenses and sales taxes paid by businesses. These taxes occur during the normal operation of businesses but do not include taxes on profit or income. They are derived from US Bureau of Economic Analysis Gross State Product Data.

## UMMC as a Major Safety Net and Tertiary Care Provider

Given that UMMC is a public academic medical center, it is a critical safety net provider for the community. By statute, Mississippi Code stipulates UMMC’s primary purpose:

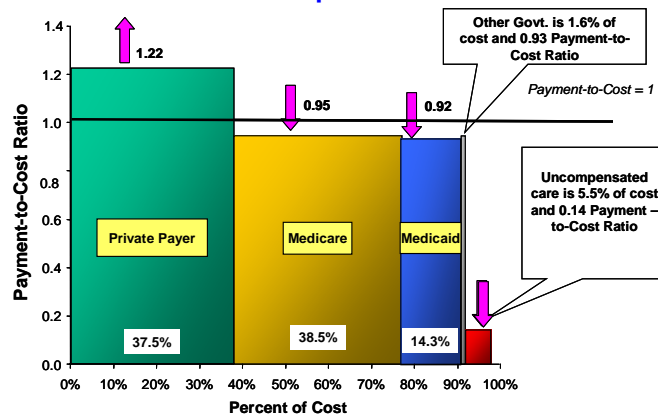
*“...All University of Mississippi Medical Center locations shall provide in the aggregate not less than fifty percent (50%) of their services to indigent persons including qualified beneficiaries of the State Medicaid Program.”<sup>2</sup>*

Compared to the nation’s hospitals, UMMC faces relatively higher cost shifting pressures due to Medicare and Medicaid payment shortfalls and relatively high levels of uncompensated care (refer to Exhibit ES-2 and ES-3). In these exhibits, payments less than costs (payment-to-cost ratio < 1) must be offset with payments greater than costs (payment-to-cost ratio > 1). In Exhibit ES-3, overall payments are substantially lower than overall costs. Hence, persistent external funding is required to keep UMMC financially viable. This is not atypical of the financial situation of academic medical centers (AMCs) where, typically, extensive costs or direct subsidies are required to support AMC missions.

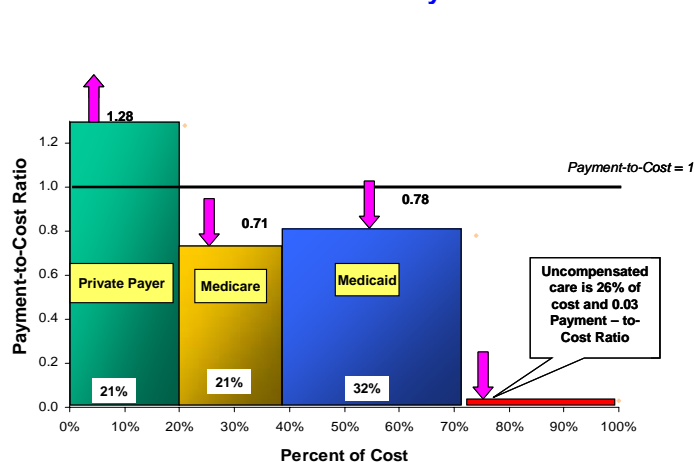
<sup>2</sup> Mississippi Code/TITLE 37 EDUCATION/CHAPTER 115 UNVIERSITY OF MISSISSIPPI/SCHOOL OF MEDICINE/§ 37-115-27. Location of school and hospital.



**Exhibit ES-2: Cost Shift Hydraulic for the Nation's Hospitals**



**Exhibit ES-3: Cost Shift Hydraulic for UMMC**



Source: Al Dobson, Joan DaVanzo and Namrata Sen, "The Cost-Shift Payment 'Hydraulic': Foundation, History, and Implications," Health Affairs, January/February 2006, volume 25.

Source: The Lewin Group analysis of the 2005 AHA Annual Survey data provided by University of Mississippi Medical Center

Thus, UMMC has a payment shortfall from public payers and indigent care which is not adequately compensated for by the commercial payers through the cost shift process. The payer mix of UMMC and the associated payment shortfalls due to Medicare, Medicaid and uncompensated care could be cross subsidized by the private payers if they paid three times the cost of care, i.e., a private payer payment to cost ratio of 3.0. Such a funding strategy is clearly not feasible, and additional support from the State is required to fund indigent care at UMMC.

The State appropriated \$19.4 million in state funds to UMMC in fiscal year 2005, and Medicaid paid UMMC approximately \$210.1 million for care provided to Medicaid and uninsured patients. UMMC also received \$2.5 million in Katrina Relief funds. In the same fiscal year, however, UMMC was required to transfer \$34.4 million to Medicaid to pay for state matching funds and UHC incurred approximately \$232.7 million in costs for Medicaid patients and the uninsured. UMMC, therefore, applied approximately \$35 million to underwrite un-recovered costs for care of Medicaid patients and the uninsured at UHC. It should be noted that since 2001, UMMC's transfers to Medicaid to pay for state matching funds have exceeded the state appropriations to UMMC for this purpose by almost \$60 million. Thus UMMC, in addition to its direct patient care responsibilities and community mission has funded over \$60 million in under compensated and uncompensated care statewide since 2001.

Given the level of UMMC's financial shortfalls, the State needs to decide the degree to which it will provide adequate state funds to cover uncompensated care and the extent to which it will allow UMMC to aggressively market itself and compete for services to the insured population.

## UMMC is a Major Contributor to the Healthcare Workforce

UMMC is the leader in educating and training Mississippi's health care workforce, supporting several postgraduate health science programs. Enrollment in virtually every program has grown over the last five years, especially in the School of Health Related Professions, and the School of Graduate Studies in the Health Sciences. About 67 percent of the students educated and trained at UMMC, especially physicians, remain in Mississippi and provide a major source of health care workers for the state. Each physician that graduates from the UMMC GME program and subsequently practices in the region results in 5.1 jobs in any given year.

A majority of the students educated and trained at UMMC remain in Mississippi, providing a major source for the state health care workforce. The School of Nursing has the highest regional retention rate (90 percent), followed by the School of Health Related Professions (83 percent), the School of Dentistry (73 percent), and finally the School of Medicine (65 percent).

Mississippi's per capita physician rate is well below the national average, and lowest amongst peer states;<sup>3</sup> Mississippi ranked 50<sup>th</sup> compared to all states and the District of Columbia. This chronic physician shortfall elevates the significance of the teaching and GME component provided by UMMC to ensure that the State meets its responsibility to provide adequate access to clinicians and other health care services.

## UMMC as a Major Economic Engine for the Future

UMMC could strive to be a major economic engine for the future by focusing on three areas:

- Expansion of cancer care services;
- Expansion of a kidney transplant program; and
- Creation of a biotechnology research park.

In the following section, we discuss the feasibility and economic impact of these key strategic objectives.

### ***Expansion of Cancer Care Services at UMMC***

Based on Lewin's discussions with UMMC management and the Cancer Division, we understand that UMMC plans to expand the cancer care services, as well as make them more hospital based. The expansion of cancer care services is critical for the state as it has relatively high incidence rates for certain types of cancer. Research indicates that early prevention and treatment of cancer can decrease cancer related deaths. This is particularly critical in a state where cancer is the second leading cause of death. We understand that UMMC is seeking an infusion of \$50 million from the state to expand cancer care services.

---

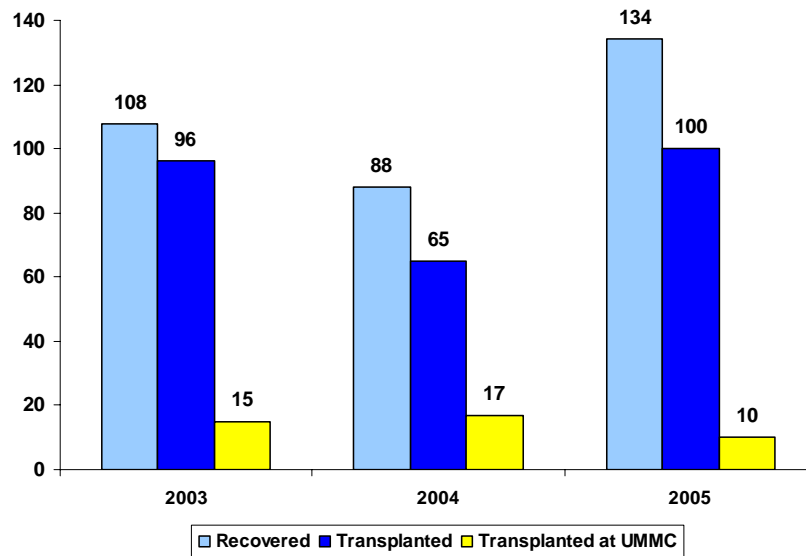
<sup>3</sup> Peer states defined according to the U.S. Census's definition of those in the East South Central, and include Mississippi, Alabama, Kentucky, and Tennessee.

The infusion of \$50 million to expand cancer care services at UMMC would result in a total output of approximately \$114 million and will provide almost \$11.4 million in taxes. Most importantly, it is likely to improve access to cancer care services in the state for the vulnerable populations that UMMC serves.

### **Expansion of Kidney Transplant Program at UMMC**

UMMC is the sole provider of heart, kidney, and bone marrow transplants in Mississippi. The transplant program is not achieving anticipated volume considering organ availability. As demonstrated in Exhibit ES-4 below, Mississippi appears to be a net exporter of kidneys for transplant. For example, in 2005, there were 35 donors at UMMC; and in total from the region, there were approximately 134 kidneys for transplant. Of the total kidneys available for transplant, 90 were exported to centers outside the state of Mississippi.<sup>4</sup> UMMC plans to reinvigorate the program through physician recruitment and material improvements in transplant program infrastructure and physician staffing.

**Exhibit ES-4: Mississippi Organ Recovery Agency (MORA) Kidney Recoveries, Transplants and UMMC Transplants**



**Source:** Mississippi Organ Recovery Agency (MORA) historical data.

Our analysis of the economic impact of the growth in transplant services at UHC assumes that UMMC will increase the number of kidney transplants based on the United Network for Organ Sharing’s (UNOS) expected average rate of kidney transplantation. Based on our analysis, the

<sup>4</sup> Sources include [ustransplant.org](http://ustransplant.org): Report for the Mississippi Organ Recovery Agency for 2005, and direct communication with MORA. Transplant data accessed at <http://www.ustransplant.org/csr/current/publicData.aspx?&facilityID=MSOPOP1XX&t=02>

total output in the Jackson MSA due to the increase in the number of kidney transplants is more than \$11 million.

A robust kidney transplant program would establish a significant resource to the local and regional market and could result in significant revenues for UMMC and the faculty. Most importantly, such a thriving kidney transplant program improves access to critical services for the patients in need of transplants in the state of Mississippi. Based on our discussions with UMMC transplant program physicians, we understand that a substantially large proportion of patients continue to receive hemodialysis without reasonable access to renal transplant.

## ***Creation of a Biotechnology Research Park***

UMMC ranks 98 out of the 123 medical schools that receive National Institute of Health (NIH) funding. This suggests an area of opportunity for UMMC. UMMC has focused on expanding its research programs in recent years. Research is a strategic priority for the institution as it strives to evolve into a leading biomedical center. It is worth noting that UMMC has conducted some unique research areas.

- The Jackson Heart Study - This long-term, single-site epidemiologic study of cardiovascular disease in the African American population has been active at UMMC for the last nine years.
- Neuroscience area - UMMC has received \$10 million in NIH funding from the NIH Center for Psychiatry neuroscience.
- Obesity - UMMC is conducting a study for the Delta Health Alliance, whereby it is evaluating some of the diabetes and obesity related disease management programs.
- Health Care Disparities - Department of Health and Human Services has contracted with UMMC to assess the differences in health care utilization.

Consistent with the NIH Roadmap for Medical Research,<sup>5</sup> UMMC is reacting to the recent NIH mandate that prioritizes translational research through application for a Clinical and Translational Service Award planning grant. UMMC is also actively pursuing the creation of a biotechnology research park. As a beginning, UMMC has been able to secure a planning grant for a biotechnology research park. UMMC has secured development funding of approximately \$100,000 through public and private enterprises to evaluate the development project. UMMC will develop a feasibility study, create a concept plan, and conduct initial marketing. UMMC has also approached the state's Congressional delegation to secure "seed" funding from the federal government. Currently, there is a commerce bill pending in the House to secure

---

<sup>5</sup>The National Institutes of Health developed the NIH Roadmap for Medical Research in 2002 based on three broad themes. These themes include: New Pathways to Discovery representing investment in fundamental basic science research; Research Teams of the Future supporting partnerships supporting research including public-private partnerships, and; Re-engineering the Clinical Research Enterprise which involves "harmonization" efforts between regulatory policies, training for researchers, and the development of academic homes for translational research. Funding priorities have been reorganized along these thematic lines. Information about the NIH roadmap can be accessed at: <http://nihroadmap.nih.gov/>

approximately \$25 million in federal appropriations. UMMC also foresees substantial additional investment from other public sources and private sources, particularly the anchor tenants. Some of the potential tenants in the biotechnology research park would focus on molecular biology, medical device development, and vaccine development.

In this report, we estimated the economic impact of the initial \$25 million federal appropriations for the development of a biotechnology research park over a proposed 10-year span. This analysis found that the creation of a biotechnology research park with initial federal appropriations of \$25 million would generate the following substantial economic impact over ten years:

- Increase in annual revenues to \$54 million
- Provision of almost \$3.5 million in annual tax revenues

In addition, a biotechnology research park would greatly enhance UMMC's ability to build a knowledge base that could be leveraged by entrepreneurs in developing new science spin-offs and startups.

## Conclusion

UMMC represents a significant economic, clinical, and safety net asset for Jackson MSA and the state of Mississippi. With substantial initial investments and leadership from the State, UMMC could expand its research and clinical abilities to evolve into a stronger economic engine for the Jackson MSA and Mississippi.

We observe that investment in certain clinical programs serving recognized community needs could yield substantial additional economic and tax benefit, as well as greater access in a region with a high demand for these services. Academic medical centers that apply their intellectual capital to the development of regional programs such as UMMC can become increasingly more self-sustaining as growth engines, and thus better able to apply public funds to the benefit of their community missions. In order to fulfill its mission, UMMC needs to either gain additional state support or become the provider of choice for private payers.

# 1 Introduction

The University of Mississippi Medical Center (UMMC) is, among its other corporate entities, an academic medical center (AMC). AMCs are unique and typically complex businesses that pursue closely intertwined scholarly and clinical missions. In this section, we describe some of the characteristics of AMCs. This discussion should provide background for understanding the complexities of UMMC in its varied missions and businesses. We also describe the unique challenges that AMCs, such as UMMC, face in an increasingly demanding social and business environment. We discuss the funding mechanisms supporting the clinical enterprise including recent changes in funding for the support of uncompensated care, a mainstay of UMMC's mission.

## 1.1 What is an Academic Medical Center?

Traditionally, an AMC has been defined as a set of educational and clinical components associated with "allopathic schools of medicine and their owned or closely related educational and clinical institutions."<sup>6</sup> AMCs are complex entities that have evolved to assume varied forms that includes:

- A variety of biomedical education programs including schools of medicine, nursing, allied health professions, and basic science;
- Clinical services, with the requisite personnel and infrastructure, directed toward the care of the most complex medical problems that include, for example, solid organ transplant, Level I trauma services, burn care, and complex pediatric care;
- Maintenance of stand by capacity for medically complex patients<sup>7</sup> and for the delivery of care to primarily publicly funded and uninsured patients;
- Extensive ambulatory facilities, often located throughout the community and, frequently, distant to the main clinical and educational campus;
- Medical staff that are typically associated with a school of medicine and are organized in a business format that closely aligns physicians to the teaching mission and to the AMC;
- Biomedical research and development enterprises and a range of scholarly activity;
- Unique dedication to the community including care for the uninsured, public health services, and population based research missions (frequently, the social missions are poorly compensated and funded through an assortment of operating and other external revenue), and;

---

<sup>6</sup> "Envisioning the Future of Academic Health Centers, Final Report of The Commonwealth Fund Task Force on Academic Health Centers", The Commonwealth Fund, February 2003.

<sup>7</sup> Stand by capacity includes, for example, sub-specialty tertiary and quaternary care resources for medically complex patients, emergency response capacity, clinical capacity for un-insured patients, and other services that would not typically be maintained in other hospitals.

- Other health care institutional assets that might include, skilled nursing facilities, rehabilitation facilities, health plans, children’s hospitals and other services.

In the wake of market demands to remain commercially competitive and a social mandate to increase physician supply<sup>8</sup>, AMCs have continued to evolve beyond the traditional teaching hospital toward a more comprehensive “Health Sciences Center” (HSC) concept. The HSC concept leverages clinical and biomedical research assets beyond the traditional AMC setting and the development of strategies and tactics directed toward developing greater financial self-sufficiency. The HSC model frequently contemplates close cooperation with industry, the community, and other academic enterprises to develop and commercialize innovative diagnostic and therapeutic approaches to disease. Through such comprehensive approaches, HSCs strive to develop sufficient business models to develop and assert their brand equity in the community. UMMC might further evolve in this role if directed by the legislature.

## 1.2 UMMC as an Economic Enterprise

UMMC is, in total, an \$849 million business, providing approximately 7,200 jobs to Mississippians. For example, UMMC employed 7,206 individuals full-time in FY 2005, which is 8.9 percent of the approximately 45,700 full-time employees of Mississippi hospitals<sup>9</sup>. The UMMC workforce accounted for approximately 13 percent of the 58,455 people employed by all hospitals in Mississippi in fiscal year 2005.

UMMC is comprised of components described in Figure 1 below:

**Figure 1: UMMC Enterprise Components**

UMMC Enterprise	Employees (FTE's)
University of Mississippi Academic Programs	1,337
University of Mississippi Hospital and Clinics <sup>10</sup> (UHC)	3,830
Durant Nursing Home	100
Scientific research and development (R&D)	1,182
The University Faculty Practice Plans	757
Education	Enrollees
The School of Medicine	465
The School of Nursing	280
The School of Health Related Professions	345

<sup>8</sup> AAMC Statement on the Physician Workforce, The Association of American Medical Colleges, Washington, DC, June 2006. Accessed at <http://www.aamc.org/workforce/>. In response to data that appear to indicate nationwide physician shortages, the AAMC has called for schools of medicine nationally to increase their undergraduate enrollment by 30%.

<sup>9</sup> “UHC Stats,” UHC Financials, FY 05 Jun05, and “Report on Hospitals”, Mississippi Department of Health, 2005.

<sup>10</sup> The University of Mississippi Hospital and Clinics does not include the 84 bed hospital located in Holmes county

The School of Dentistry	123
Graduate Programs	307
<b>Total</b>	<b>1,520</b>
<b>Research</b>	<b>Award Distribution (\$ thousand)</b>
The School of Medicine	30,985
The School of Nursing	1,045
The School of Health Related Professions	342
The School of Dentistry	1,501
Teaching Hospital	404
Office of Strategic Research Alliances	4,962
Academic Affairs	11
<b>Total</b>	<b>\$39,254</b>

Source: UMMC 2004-2005 Fact Book; 2006 Institutional Annual Report on Research and Sponsored Programs

### 1.3 Academic Medical Centers face an array of unique challenges in a changing and competitive marketplace

Expectations about the structure, process and outcome of health care are changing. Payers and purchasers have traditionally been the dominant forces in the health care delivery system. Changes in the amount of personal responsibility for health care costs; increasing attention to health care quality measures; and several other market factors, have spawned the “activated” consumer as a new force in health care. Consumers, increasingly asserting themselves as health care purchasers, are beginning to exercise retail behaviors around health care decisions. In response, providers are beginning to position themselves based on consumer value, a strategy that will become increasingly important as price and quality transparency become a more competitive focus.<sup>11</sup>

Expectations about *how* health care is delivered have placed the issue of effective health care system-community alignment at the forefront of strategy and tactics for health systems nationally. The traditional voluntary medical staff model is rapidly giving way to models that combine physicians and institutions in close collaboration or partnership. Overall, we observe a number of emerging factors that define effective health care system-community alignment.

Among these factors are:

- Services and programs that effectively address community needs;
- Service and process transparency including public reporting of quality, pricing and clinical outcomes; and,
- Acceptance and implementation of evidence-based care--the application of science and proven pathways to the care process as the standard governing health care delivery.

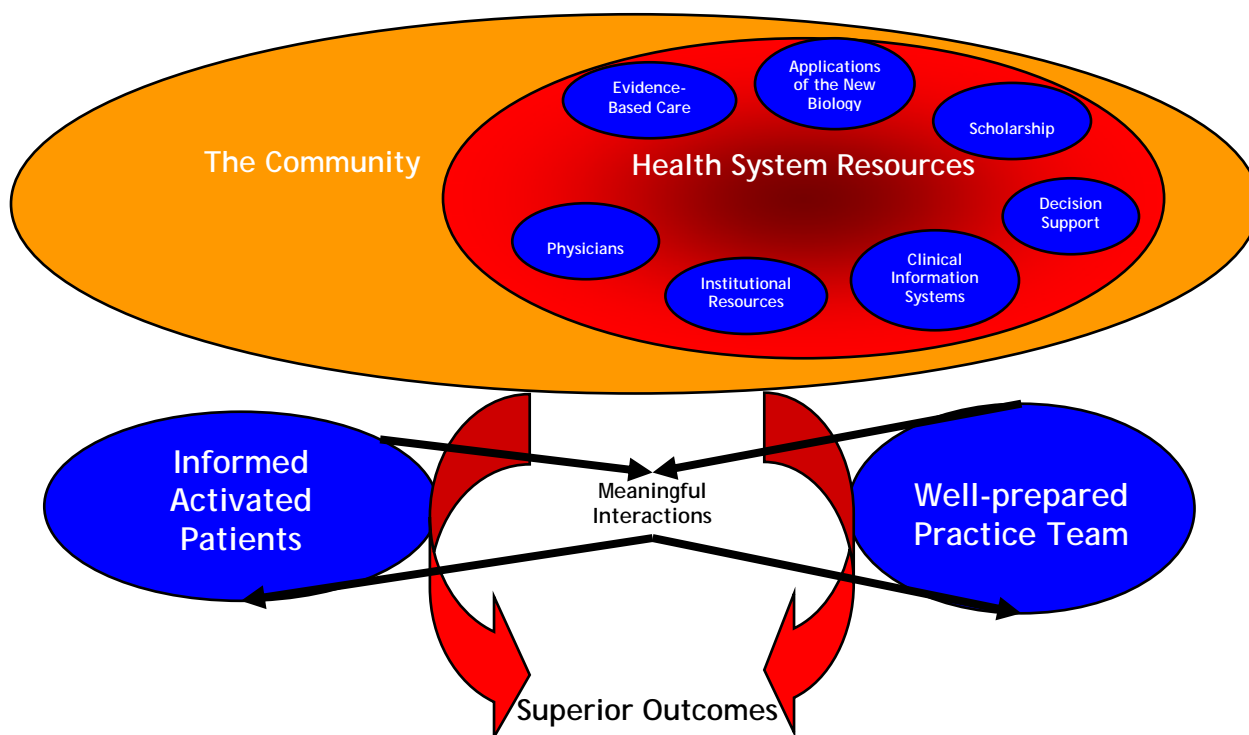
<sup>11</sup> See, for example: “Consumer Directed Health Plan Report--Early Evidence Is Promising”, McKinsey & Company, June 2005.



Growing consumer and payer mandates<sup>12</sup> are forcing alignment of previously separate elements of the health care delivery system. Such close alignment is becoming synonymous with success for health care delivery systems. Physicians, hospitals, and other health care system components must coalesce into a single health care resource that seeks strategic direction based on community needs. As we demonstrate in Figure 2, alignment of the traditionally separate components of a health care system into a single set of community resources would be necessary to meet contemporary market demands.

AMCs are particularly sensitive to such market forces. AMCs are generally more integrated as compared to their community hospital counterparts. The presence of teaching and research as pivotal service and cultural components frequently invites the development of so-called “captive” medical group practices (called, in most cases, “clinical practice plans”) that are, generally, financially and operationally aligned with their institutions.

**Figure 2: The New Health System Alignment**



Adapted from Wagner's Chronic Care Model

<sup>12</sup> For example, response to payer initiated pay for performance incentive contracts requires a high degree of alignment between institutional resources and physician practices. The voluntary medical staff model does not lend itself well to such necessary alignment as most independent physician practices are not well suited to coordinate and to meet the financial commitments of developing and integrating electronic medical records, treatment protocols, and effective patient flow for diagnostic and institutional services. It should be noted that pay for performance for Medicare patients is currently under development as an initial array of approximately 16 separate demonstration projects will culminate in a payment system based on a group of quality measures that will have to be met to ensure Medicare reimbursement increases.

AMCs face the specter of becoming less competitive in their local and regional markets absent commitment to improve to service quality that is consistent with consumers' growing expectations. Academic medicine faces challenges that parallel those faced by non-academic competitors in addition to challenges incumbent with their teaching and other missions. Consider the following range of challenges representative of faculty practice and academic medical centers nationally:

- **Competition for Volume** - Market dynamics increasingly place AMCs in direct competition with community providers for patient volume. Community hospitals have invested significantly in capital and human assets and are providing, in many markets nationally, services that compete effectively with local and regional academic centers. Failure to create a sustainable and durable gateway for patient volume magnifies the risk of compromised training programs and effective recruitment and retention of adequate faculty.
- **Increasing scrutiny of training programs by accrediting bodies** - Undergraduate medical education (UME) and GME accrediting bodies are enforcing increasingly stringent requirements governing the qualifications of teaching faculty. Such increased requirements include increased degrees of scholarly activity that many voluntary staff (many of whom have been materially involved in GME and UME support) cannot sustain. This places increasing pressure on department chairs to maintain larger complements of full time staff.
- **Shifting Research Priorities** - Competition for research dollars is increasing in the face of current and projected future flattening of the NIH budget and the expansion of focus to include translational research, the application of basic research to direct patient care challenges.<sup>13</sup>
- **Unique Mission** - AMCs provide a variety of mission related services including providing standby capacity for trauma care as well as financial and operational support for other types of services, support for GME and UME, and support for research. These mission related costs can be considerable and must be increasingly supported by clinical revenue placing AMCs in direct competition with community hospitals and physicians, many of whom can have long standing relationships with the training sites that are now competing with them for patient volume.
- **Physician Shortage** - In addition to the myriad of challenges faced by AMCs and training programs, the American Association of Medical Colleges (AAMC) has asked medical schools to increase their enrollment by 30 percent to address a national physician shortage. Many medical schools will be challenged to do so as previous forecasts called for flat enrollment given predictions of managed care penetration which never came to fruition in many parts of the country<sup>14</sup>.

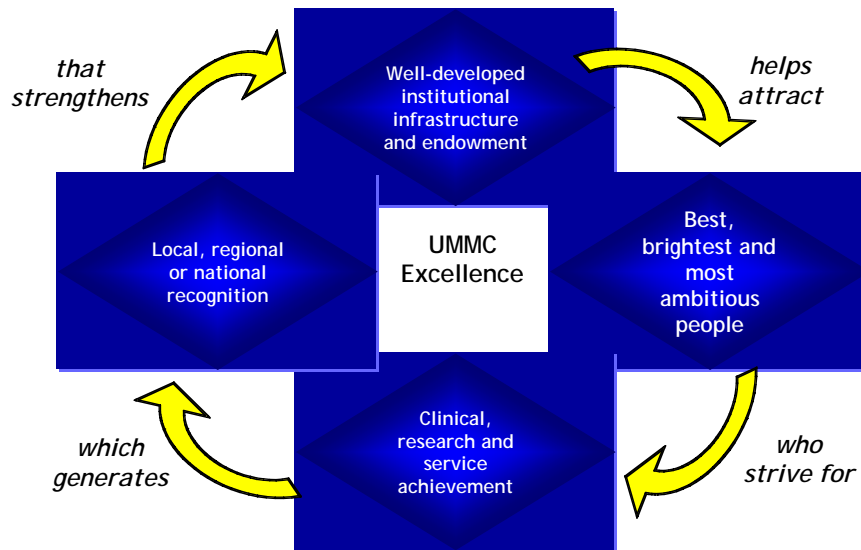
---

<sup>13</sup> See section 2.4 for a further discussion of translational research.

<sup>14</sup> 2006 American Association of Medical Colleges (AAMC) Statement on Physician Workforce.

- Chronic reinvestment in the scholarly mission-** By purpose, culture and, frequently, organizational charter, AMCs reinvest, chronically and consistently, in the growth and development of their faculty who, in turn develop scientific advances and innovations in health care that, in turn attract research investments. This cyclical reinvestment is described graphically in Figure 3 below as a continual quest for sustainable preeminence in their regional markets. The determined re-investment in scientific advancement and renewal makes AMCs unique among health care institutions nationally.

**Figure 3: Cycle of Sustainable Preeminence**



We note that UMMC is particularly vulnerable to the range of AMC challenges given the mandate requiring 50 percent of services to indigent persons<sup>15</sup> and the increasingly competitive environment in Jackson MSA and throughout the State. Providers that choose not to harmonize with evolving community standards risk losing substantial market momentum and position. As consumers increasingly drive health care decisions on a personal level, failure to keep pace with consumer expectations could result in a medical group and hospital that become progressively less relevant in the face of increasing consumer choice. Prevailing market conditions leave little room for error in the execution of effective physician hospital relationships. AMCs must adapt and evolve to remain competitive in the new market context. In this sense, UMMC is typical of the AMC industry.

<sup>15</sup> See section 6.2 for further discussion on this mandate.

## 2 UMMC’s Economic Impact on Jackson MSA and Mississippi

In this section, we provide a high level profile of the economy of the Jackson MSA and Mississippi followed by our analysis of the economic impact of UMMC on the economy of Jackson MSA and Mississippi.

Figure 4 below provides a high level profile of economic and demographic characteristics of the Jackson MSA and the state of Mississippi derived from the IMPLAN software<sup>16</sup>. Approximately 18 percent of the state’s population is in the Jackson MSA, which is comprised of five counties: Copiah, Hinds, Madison, Rankin, and Simpson. Twenty-two percent of the total employment in Mississippi is found in the Jackson MSA. The average income per household is \$69,837 in the Jackson MSA, which is higher than Mississippi’s average income per household (\$55,980).

**Figure 4: Jackson MSA and Mississippi Economy Profile from IMPLAN**

Economic Indicators	Jackson MSA	Mississippi
Population	510,265	2,882,594
Area (sq miles)	3,729	46,914
Employment	313,000	1,442,277
Number of industries	285	429
Households	205,544	1,208,331
Income per Household	\$69,837	\$55,980
Total Personal Income	\$14,354,590,000	\$67,642,650,000

\*Note: These values represent pre-Katrina Jackson MSA and Mississippi.

Figure 5 shows the population growth in the Jackson MSA from 2000 to 2005, compared to other MSAs in the south. Jackson falls in the middle of the distribution with an approximate a 5 percent change in population within a five year timeframe.

---

<sup>16</sup> IMPLAN (Impact Analysis for PLANning) was originally developed by the USDA Forest Service in cooperation with the Federal Emergency Management Agency and the USDI Bureau of Land Management to assist the Forest Service in land and resource management planning.

**Figure 5: Population Estimate and Percent Change of Selected Southern MSAs**

MSA	2000	2005	% change
Nashville-Davidson--Murfreeseboro, TN	1,317,256	1,422,544	8.0%
Huntsville, AL	343,791	368,661	7.2%
Knoxville, TN	617,454	655,400	6.1%
Hattiesburg, MS	124,302	131,871	6.1%
Little Rock-North Little Rock, AR	611,962	643,272	5.1%
<b>Jackson, MS</b>	<b>498,343</b>	<b>522,580</b>	<b>4.9%</b>
Memphis, TN-MS-AR	1,208,331	1,260,905	4.4%
Baton Rouge, LA	707,386	733,802	3.7%
Louisville-Jefferson County, KY-IN	1,165,137	1,208,452	3.7%
Gulfport-Biloxi, MS	246,645	255,383	3.5%
Birmingham-Hoover, AL	1,053,390	1,090,126	3.5%
Shreveport-Bossier City, LA	376,106	383,233	1.9%
Mobile, AL	400,093	401,427	0.3%

The Jackson MSA falls in the top tier for the average annual income growth rate between 2000 and 2004 (4.8 percent). Hattiesburg, another metropolitan area located in Mississippi, has the highest growth rate among all the regions listed below with a 5.2 percent average annual growth rate from 2000-2004. In the aftermath of Hurricane Katrina, Mississippi has been infused with federal funds that have ushered in economic activity in this area.

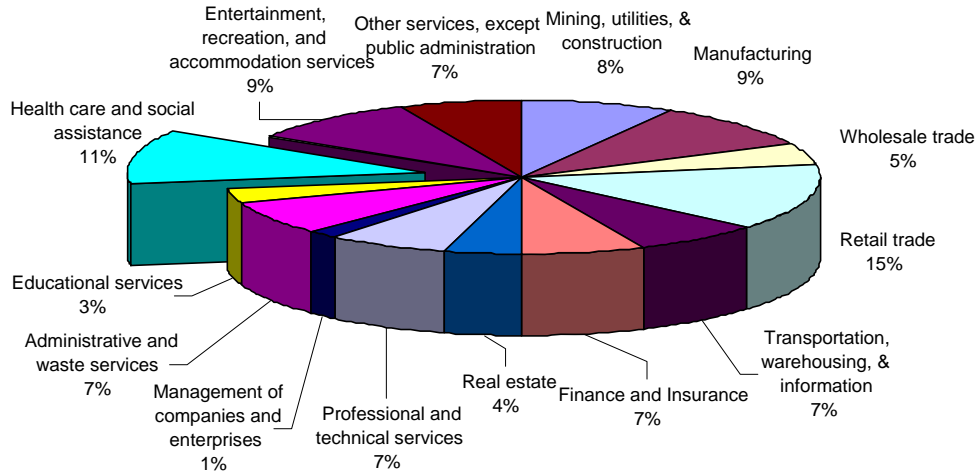
**Figure 6: Personal Income Percent Change 2000-2004**

MSA	2000-2001	2001-2002	2002-2003	2003-2004	Average Annual Growth Rate 2000-2004
Hattiesburg, MS	7.9	4.5	1.3	6.9	5.2
Shreveport-Bossier City, LA	5.9	2.7	4.4	7.2	5.1
Huntsville, AL	3.4	4.5	6.5	5.3	4.9
Nashville-Davidson--Murfreeseboro, TN	4.3	3.6	5.1	6.4	4.9
<b>Jackson, MS</b>	<b>4.8</b>	<b>2.3</b>	<b>5.2</b>	<b>7.0</b>	<b>4.8</b>
Little Rock-North Little Rock, AR	5.2	4.6	2.9	6.5	4.8
Birmingham-Hoover, AL	4.9	3.8	3.4	6.3	4.6
Memphis, TN-MS-AR	5.2	3.2	3.2	5.9	4.4
Knoxville, TN	3.4	3.0	4.1	6.3	4.2
Baton Rouge, LA	4.3	3.3	3.3	5.6	4.1
Louisville-Jefferson County, KY-IN	3.9	2.9	2.6	5.5	3.7
Gulfport-Biloxi, MS	1.7	3.4	4.5	4.6	3.6
Mobile, AL	2.0	1.7	2.2	4.1	2.5

Figure 7 displays the breakdown of employment (number of jobs) within the various industries in the Jackson MSA. The retail trade industry has the highest number of jobs within the Jackson

MSA (35,290 or 14 percent), whereas health care and social assistance has the second highest number of jobs (28,636 or 11 percent).

**Figure 7: Employment by Private Industries in Jackson MSA\***



**Source:** Bureau of Economic Analysis, 2004

\*Data in this pie chart does not incorporate employment from government enterprises or public administration.

Jackson is also in the top tier for highest employment growth from 2001 to 2004 (4.3 percent). Only Knoxville, TN and Huntsville, AL have higher growth rates of 5.3 percent and 4.5 percent, respectively.

**Figure 8: Employment Growth 2001-2004**

MSA	2001	2002	2003	2004	% change
Knoxville, TN	396,486	399,968	405,419	417,506	5.3%
Huntsville, AL	227,724	227,039	231,817	237,970	4.5%
<b>Jackson, MS</b>	<b>309,883</b>	<b>310,604</b>	<b>315,204</b>	<b>323,288</b>	<b>4.3%</b>
Nashville-Davidson--Murfreesboro, TN	911,388	910,974	919,332	946,375	3.8%
Hattiesburg, MS	70,303	71,377	71,904	72,681	3.4%
Shreveport-Bossier City, LA	212,901	210,549	213,561	218,756	2.8%
Baton Rouge, LA	415,883	416,429	422,127	427,023	2.7%
Little Rock-North Little Rock, AR	396,585	394,673	397,881	404,249	1.9%
Gulfport-Biloxi, MS	150,749	150,001	152,554	153,389	1.8%
Birmingham-Hoover, AL	625,834	625,671	626,549	636,180	1.7%
Memphis, TN-MS-AR	766,271	762,747	762,410	768,660	0.3%
Louisville-Jefferson County, KY-IN	736,479	729,627	729,563	737,159	0.1%
Mobile, AL	216,081	214,221	212,973	214,233	-0.9%

**Source:** Bureau of Economic Analysis

We assess the economic impact of UMMC on three dimensions – mission related costs of UMMC, cost shift in relation to UMMC, and the economic impact of UMMC on the community.

## **2.1 Current economic impact**

In this subsection, we will focus on the current economic impact of UMMC on Jackson MSA and the Mississippi. The economic impact is the result of expenditures on education, research, clinical services, and health improvement activities conducted at UMMC. We define “economic impact” as total direct, indirect, and induced demand dollars considering an economic multiplier. Direct financial impact results from UMMC’s direct spending and the spending of its employees. The re-spending that subsequently re-circulates through the local economy represents the indirect effect. Induced effect represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

## **2.2 Methodology of Economic Impact Model**

To estimate the current and future economic impact of UMMC in total (including specific calculations for the UMMC business components as described below) and its facilities on the Jackson MSA and the state of Mississippi, Lewin employed the IMPLAN (IMpact Analysis for PLANning) software and database, commonly used for economic impact analyses. IMPLAN was first developed by the US Department of Agriculture Forest Service and is now a product of the Minnesota IMPLAN Group, Inc. This input-output model incorporates data for 508 industry sectors to estimate the economic impact on a county, state, or region. Data files were purchased both for the counties that comprise the Jackson MSA, as well as t Mississippi.

Due to the recirculation of funds within the region, dollars are spent and re-spent to create a multiplier effect. The economic impact on the Jackson MSA and Mississippi can be illustrated by three distinct effects: direct effect, indirect effect, and induced effect.

- Direct effect is the generated revenue, earnings, or employment for a particular industry. The direct effect prompts the purchase of additional inputs to meet the increased demand.
- Indirect effects are the changes in inter-industry purchases as they respond to the new demands of the directly affected industries. The indirect effect results when local businesses gear up to provide these inputs.
- Induced effect is the change in the spending pattern of households caused by the change in household income from the direct and indirect effects. This tertiary increase in economic activity is a reflection of the increase in the area’s household incomes.

The direct effect refers to the dollar value of UMMC and its facilities. The indirect effect refers to additional changes in the regional economy caused by the direct effect. As provider A purchases more goods from firms B and C, they, in turn, expand their purchases of intermediate goods from industries D and E. The sum of all the second and higher round effects is the indirect effect. Finally, the induced effect refers to changes in economic activity caused by changes in household income resulting from the original stimulus.

There are two components of the input-output analysis, the descriptive model and the predictive model. IMPLAN software was used for both models. The descriptive model describes the flow of money between industries and institutions in the region. In comparison, the predictive model consists of the input-output multipliers which are used in order to estimate the regional economic impact due to a change in consumption.

For our analysis, we used the IMPLAN Type SAM (Social Account Matrix) multiplier to estimate the economic impact on the Jackson MSA and Mississippi. Type SAM multipliers are part of the predictive model and include the direct, indirect, and induced effects where the induced effect is based on information in the social account matrix, not income. We used the Type SAM multiplier as it accounts for social security and income tax leakage, institution savings and commuting. It also accounts for inter-institutional transfers such as the payment of taxes by people and businesses, the transfer of government funds to people and businesses, as well as the transfer of funds from people to people. Lastly, the Type SAM multiplier is flexible so that it can include households as well, however many institutions are needed in order to capture the entire economic impact on a region.

Figure 9: Financial Data of UMMC

Figure 9 displays the figures used for calculating the economic impact of UMMC on the Jackson MSA and Mississippi. We received financial data in the form of net revenues, total wages, and employment from the medical center for fiscal year 2006 (July 1, 2005 to June 30, 2006). The data provided to us was given for the various entities of UMMC, 1) the University; 2) UHC; 3) Durant Nursing Home which is affiliated with UMMC; 4) UMMC's scientific research and development services (R&D); and 5) UMMC Practice Plan which consists of the offices of physicians, dentists, and other health practitioners affiliated with the medical center. These values were used to calculate the direct, indirect, and induced effects on both regions.

Figure 9: Financial Data of UMMC

UMMC Enterprise Components	FYTD 2006 (7/1/05 - 6/30/06) Financial Data		
	Net Revenues (\$)	Total Wages (\$)	Employment (# of FTE's)
University of Mississippi Academic Programs	262,365,524	83,691,817	1,337.0
University of Mississippi Hospital & Clinics (UHC)	419,520,000	199,093,000	3,830.0
Durant Nursing Home	5,042,195	2,330,252	100.0
Scientific research and development (R&D)	69,850,000	44,444,005	1182.1
The University Faculty Practice Plans	91,976,886	56,028,887	757.0
<b>Total</b>	<b>848,754,605</b>	<b>385,587,961</b>	<b>7,206</b>



## 2.2.1 Economic Impact on the Jackson MSA

Figure 10 is a summary of the estimated impact on output, labor income, employment, and tax revenue in the Jackson MSA for all UMMC components including the academic programs, hospital and clinics, nursing homes, research and development services, as well as the offices of physicians, dentists, and other health practitioners affiliated with UMMC. Although UHC is a public hospital, the indirect and induced output results in tax revenue for the state and the federal government. The output impact for all five components is approximately \$1.4 billion with \$191 million generated in tax revenue. The injection of \$848 million from all of the UMMC components rippled through the Jackson MSA's economy, sparking a chain of economic activity. This inflow of \$848 million generates an output impact (indirect and induced effects) of \$592 million. The total output of \$1.4 billion reflects 10 percent of the output of the Jackson MSA area.

**Figure 10: Summary of Estimated Impacts on Output, Employment, Labor Income, and Tax Revenue in the Jackson MSA Attributable to UMMC**

	Direct	Indirect	Induced	Total
Output Impacts (\$)	848,754,587	281,101,816	310,540,833	1,440,397,261
Labor Income Impacts (\$)	370,297,952	89,513,709	96,107,643	555,919,293
Employment Impacts (jobs)	7,197	3,180	3,425	13,803
Tax Revenue (\$)	-	-	-	191,107,463

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTES:**

**Direct Effect** represents the impact (e.g. change in employment or revenues) for the expenditures and/or production values specified as direct final demand changes.

**Indirect Effect** represents the impact (e.g. change in employment) caused by the iteration of industries purchasing from industries resulting from direct final demand changes.

**Induced Effect** represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

**Total impact** is the sum of the direct, indirect and induced effects.

**The tax impact includes taxes from the following:**

**Employee Compensation** describes the total payroll costs of each industry in the region. It includes the wages and salaries of workers who are paid by employers, as well as benefits such as health and life insurance, retirement payments and non-cash compensation.

**Proprietary Income** consists of payments received by self-employed individuals as income. Any income received for payment of self-employed work, as reported on Federal tax forms, is counted here. This includes income received by private business owners, doctors, lawyers and so forth.

**Indirect business taxes** consist of excise taxes, property taxes, fees, licenses and sales taxes paid by businesses. These taxes occur during the normal operation of businesses but do not include taxes on profit or income. They are derived from US Bureau of Economic Analysis Gross State Product Data.

Figure 11 provides further detail on the output impacts on the Jackson MSA for the five components of UMMC. The top three industries that are affected by the economic activity of UMMC are health and social services, educational services, and finance, insurance, real estate, and rental.

**Figure 11: Estimated Impacts on Output in the Jackson MSA Attributable to UMMC  
(All 5 Components)**

NAICS Industry	Direct	Indirect	Induced	Total
<b>TOTAL IMPACT</b>	<b>848,754,587</b>	<b>281,101,816</b>	<b>310,540,833</b>	<b>1,440,397,261</b>
Agriculture, forestry, fish & hunting	-	1,247,077	2,492,141	3,739,218
Mining	-	1,702,279	2,830,365	4,532,643
Utilities	-	8,031,177	8,520,254	16,551,432
Construction	-	8,603,456	2,300,920	10,904,376
Manufacturing	-	26,165,067	18,776,296	44,941,365
Transportation & warehousing	-	15,574,852	7,113,932	22,688,784
Trade*	-	16,672,339	58,048,910	74,721,250
Information	-	12,108,122	10,415,688	22,523,808
Finance, insurance, real estate, & rental	-	107,374,237	44,763,491	152,137,729
Professional- scientific & tech services	69,850,000	29,570,789	9,555,001	108,975,785
Management of companies	-	4,594,862	1,706,032	6,300,894
Administrative & waste services	-	21,213,613	3,580,253	24,793,867
Educational services	262,365,504	3,127,894	5,111,457	270,604,856
Health & social services	516,539,083	850,092	46,100,741	563,489,911
Arts- entertainment & recreation	-	1,171,539	3,964,847	5,136,386
Accommodation & food services	-	9,732,496	21,925,400	31,657,896
Other services	-	9,294,948	15,382,827	24,677,775
Government & non NAICs	-	4,066,978	47,952,279	52,019,258

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure 10 for discussion of economic impact terms.

Figure 12 gives the estimated impact on labor income in the Jackson MSA for the 5 components. The labor income impact for all 5 entities equals nearly \$555 million.

**Figure 12: Summary of Estimated Impacts on Labor Income in the Jackson MSA Attributable to All UMMC Components**

UMMC Components	Direct (\$)	Indirect (\$)	Induced (\$)	Total (\$)
University Academic Programs	83,691,816	35,627,015	25,704,106	145,022,934
UHC	183,802,992	39,667,836	47,147,254	270,618,075
Durant Nursing Home	2,330,252	564,111	601,092	3,495,454
R&D	44,444,000	5,144,333	10,685,834	60,274,168
UMMC Practice Plan	56,028,892	8,510,414	11,969,357	76,508,662
<b>TOTAL IMPACT</b>	<b>\$370,297,952</b>	<b>\$89,513,709</b>	<b>\$96,107,643</b>	<b>\$555,919,293</b>

Source: The Lewin Group analysis of the IMPLAN model.

NOTE: See Figure 10 for discussion of economic impact terms.

Figure 13 gives the estimate impact on employment in the Jackson MSA for the 5 components. Total impact on employment is estimated to be 13,803.2 jobs.

**Figure 13: Summary of Estimated Impacts on Employment in the Jackson MSA Attributable to All UMMC Components**

UMMC Components	Direct (jobs)	Indirect (jobs)	Induced (jobs)	Total (jobs)
University Academic Programs	1,337.0	1,364.0	903.2	3,604.1
UHC	3,823.0	1,359.7	1,667.0	6,849.6
Durant Nursing Home	98.0	23.1	21.1	142.3
R&D	1,182.0	164.3	377.8	1,724.1
UMMC Practice Plan	757.0	269.8	456.3	1,483.1
<b>TOTAL IMPACT</b>	<b>7,197.0</b>	<b>3,180.8</b>	<b>3,425.4</b>	<b>13,803.2</b>

Source: The Lewin Group analysis of the IMPLAN model.

NOTE: See Figure 10 for discussion of economic impact terms.

Although UHC is a public hospital, the indirect and induced output results in tax revenue for the state and the federal government. Lewin also analyzed the economic impact of UHC using the Type SAM multiplier and the findings are shown below in Figure 14. The injection of \$419 million from UHC rippled through the Jackson MSA's economy, sparking a chain of economic activity. This inflow of \$419 million generates an output impact (indirect and induced effects) of \$288 million. The total impact of the direct, indirect, and induced effects equals \$708 million, which generates tax revenue of \$88 million. In addition, 7,099 jobs are supported by this impact and lastly, labor income reaches \$293 million. UHC comprises almost 50 percent of UMMC's revenue and about 53 percent of the UMMC labor force. In comparison, the college or university comprises 31 percent of the revenue and about 20 percent of the labor.

**Figure 14: Summary of the Estimated Impacts on Output, Employment, Labor Income, and Tax Revenue in the Jackson MSA Attributable to UHC**

	Direct	Indirect	Induced	Total
Output Impacts (\$)	419,520,000	128,989,839	159,204,602	707,714,470
Labor Income Impacts (\$)	199,090,000	42,634,106	51,283,888	293,007,983
Employment Impacts (jobs)	3,830	1,461	1,807	7,099
Tax Revenue (\$)	-	-	-	88,506,006

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure 10 for discussion of economic impact terms.

Among the southern metropolitan areas, Jackson MSA is one of the fastest growing metropolitan areas, where health care and social assistance is one of the key industry players. Given that UMMC is the only AMC in the Jackson MSA and a major safety net provider, it has a significant role in the community – in terms of provision of services and economic impact.

## 2.2.2 Economic Impact of UMMC on Mississippi

UMMC also represents a strong economic force for the state. UMMC’s revenue of \$848 million generates an impact on output at \$1.38 billion, \$538.5 billion in labor income, 13,232 jobs, and \$175.11 million in tax revenue for the state (Figure 15). As indicated in the previous section, the impact on output on the Jackson MSA is \$1.44 billion, which is slightly higher than that of the state level (\$1.38 billion).

After consulting with the Minnesota IMPLAN Group, data experts provided a technical explanation for the difference in final demand for the state and the Jackson MSA. First, UMMC’s economic activities are heavily concentrated in the local economy. In addition, the state’s output impact includes an average of all counties which downplays the output per worker in Jackson MSA. Lastly, Jackson MSA is the most urbanized and populated metropolitan area of the state which also explains how the impact on Mississippi could closely resemble the impact on the Jackson MSA. Furthermore, other economic impact studies have shown similar findings where the state impact is comparable to that of the metropolitan area. In conclusion, it is reasonable to assume that the UMMC state economic impact is somewhat larger than the number presented here (\$1.38 billion) but the available technology does not allow us to determine the magnitude.

**Figure 15: Estimated Impacts on Output, Employment, Labor Income, and Tax Revenue in Mississippi Attributable to UMMC**

	Direct	Indirect	Induced	Total
Output Impacts (\$)	848,754,568	271,288,904	262,273,415	1,382,316,911
Labor Income Impacts (\$)	385,587,960	81,455,292	71,443,258	538,486,520
Employment Impacts (jobs)	7,206	3,058	2,969	13,232
Tax Revenue (\$)	-	-	-	175,112,697

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure 10 for discussion of economic impact terms.

Of the total impact of \$1.38 billion, Figure 16 shows that the industries with the highest impact on Mississippi after health and social services, scientific and tech services and educational services, were finance, insurance, real estate and rental (\$116.0 million) and manufacturing (\$77.7 million). Detailed tables of impact on labor income and employment for Mississippi can be found in Appendix I.

**Figure 16: Estimated Impacts on Output in Mississippi Attributable to UMMC (All 5 Components)**

NAICS Industry	Direct (\$)	Indirect (\$)	Induced (\$)	Total (\$)
<b>TOTAL IMPACT</b>	<b>848,754,568</b>	<b>271,288,904</b>	<b>262,273,415</b>	<b>1,382,316,911</b>
Agriculture, forestry, fish & hunting	-	1,850,170	3,694,920	5,545,090
Mining	-	1,524,151	1,821,777	3,345,928
Utilities	-	8,078,690	8,280,828	16,359,518
Construction	-	8,029,106	1,992,969	10,022,075
Manufacturing	-	46,523,312	31,199,576	77,722,888
Transportation & warehousing	-	16,039,782	7,257,315	23,297,096
Trade*	-	13,439,615	50,203,295	63,642,908
Information	-	12,004,968	9,858,926	21,863,894
Finance, insurance, real estate & rental	-	81,819,910	34,213,832	116,033,744
Professional- scientific & tech services	69,849,992	24,853,186	7,783,558	102,486,736
Management of companies	-	4,918,275	1,612,839	6,531,114
Administrative & waste services	-	20,649,834	2,797,580	23,447,412
Educational services	262,365,504	2,928,462	3,560,564	268,854,528
Health & social services	516,539,072	680,596	12,135,446	529,355,136
Arts- entertainment & recreation	-	1,022,323	4,517,696	5,540,019
Accommodation & food services	-	11,370,244	21,518,736	32,888,980
Other services	-	9,502,276	13,854,645	23,356,922
Government & non NAICs	-	6,054,005	45,968,916	52,022,924

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure 10 for discussion of economic impact terms.

In the next few sections, we explore potential avenues of growth for UMMC in terms of expansion of current specialty services, such as cancer care center and transplant services and the creation of biotechnology research park.

## 2.3 Economic impact of an expansion of cancer care services

The Division of Oncology focuses on the management of patients with solid tumors and malignancies. Activities of the division fall into one of three categories: patient care, clinical research, and teaching. With regard to patient care, most patient management takes place in the ambulatory setting. The inpatient service is typically reserved for complications of both disease and treatment and for oncologic surgical services.

The opening of the Oncology Clinic in the new Cancer Institute in January 2004 enhanced the ability to care for patients with solid tumors using state-of-the-art resources for the administration of systemic therapy. The division oversees activities of three National Cancer Institute-sponsored cancer research groups at UHC: the Gynecologic Oncology Group, the Southwest Oncology Group, and the Cancer Treatment Support Unit. A wide range of clinical trials also are underway. In addition, the Cancer Institute contains dedicated basic research space for individuals involved in laboratory research to collaborate with clinical oncologists.

Based on our discussions with UMMC management and the Cancer Division, we understand that UMMC plans to expand the cancer care services as well as make them more hospital based. The expansion of cancer care services is critical for the state as it has relatively high incidence rates for certain types of cancer. Research indicates that early prevention and treatment of cancer can decrease cancer related deaths. This is particularly critical in a state where cancer is the second leading cause of death. Based on our discussion, we understand that UMMC is seeking an infusion of \$50 million from the state to expand cancer care services.

**Figure 17: Economic Impact of Infusion of \$50 Million to Expand Cancer Care Services at UMMC on Jackson, MSA**

	Direct (\$)	Indirect (\$)	Induced (\$)	Total (\$)	Tax (\$)
<b>Current Impact</b>					
Current Cancer Center	9,972,687	5,030,277	2,248,514	17,251,478	1,827,683
<b>Proposed Impact</b>					
Proposed Cancer Center (Hospital Based)	9,878,679	4,834,679	2,047,825	16,761,183	1,710,167
Proposed Cancer Center (Hospital Based) with infusion of \$50 million	67,047,924	33,133,915	13,567,977	113,749,815	11,388,831

**Source:** The Lewin Group analysis of the IMPLAN model.

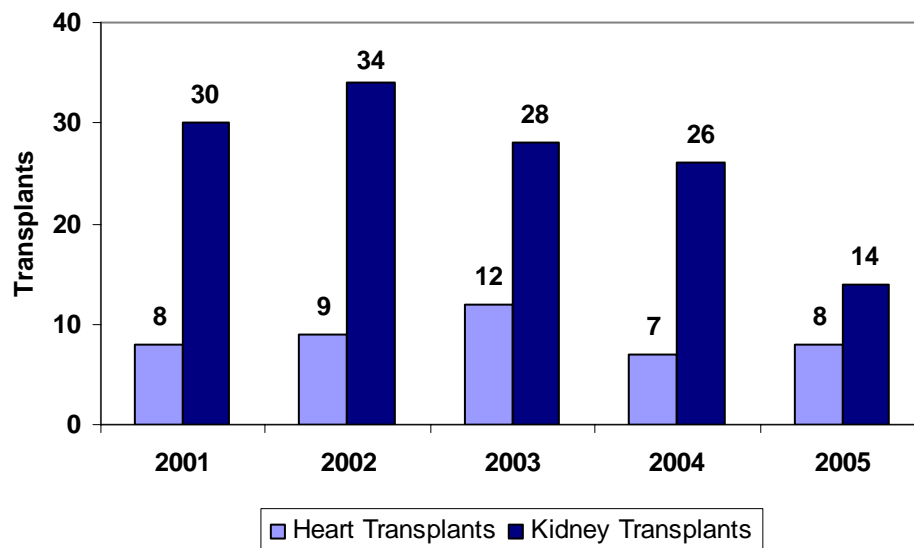
**NOTE:** See Figure 10 for discussion of economic impact terms.

The infusion of \$50 million to expand cancer care services at UMMC would result in a total demand of approximately \$114 million and will provide almost \$11.4 million in taxes. Most importantly, it will improve access to cancer care services in the state and improve access to cancer care for the vulnerable populations that UHC and UMMC serve.

## 2.4 Economic impact of expansion of transplant care services

UMMC is the sole provider of heart, kidney, and bone marrow transplants in Mississippi. The transplant program is not achieving anticipated volume considering organ availability. Transplant programs at UMMC have suffered decreasing volume over the past three years. The number of heart transplants peaked at 12 in 2003, while the number of kidney transplants peaked at 34 in 2002. Kidney transplants declined further in 2003-2005, whereas heart transplants stabilized at around the same value in 2004 and 2005 (Figure 18). In 2005, UMMC performed the fewest transplants since 1989. UMMC plans to reinvigorate the program through physician recruitment and staffing and material improvements in transplant program infrastructure.

**Figure 18: UMMC Heart and Kidney Transplants 2001-2005**

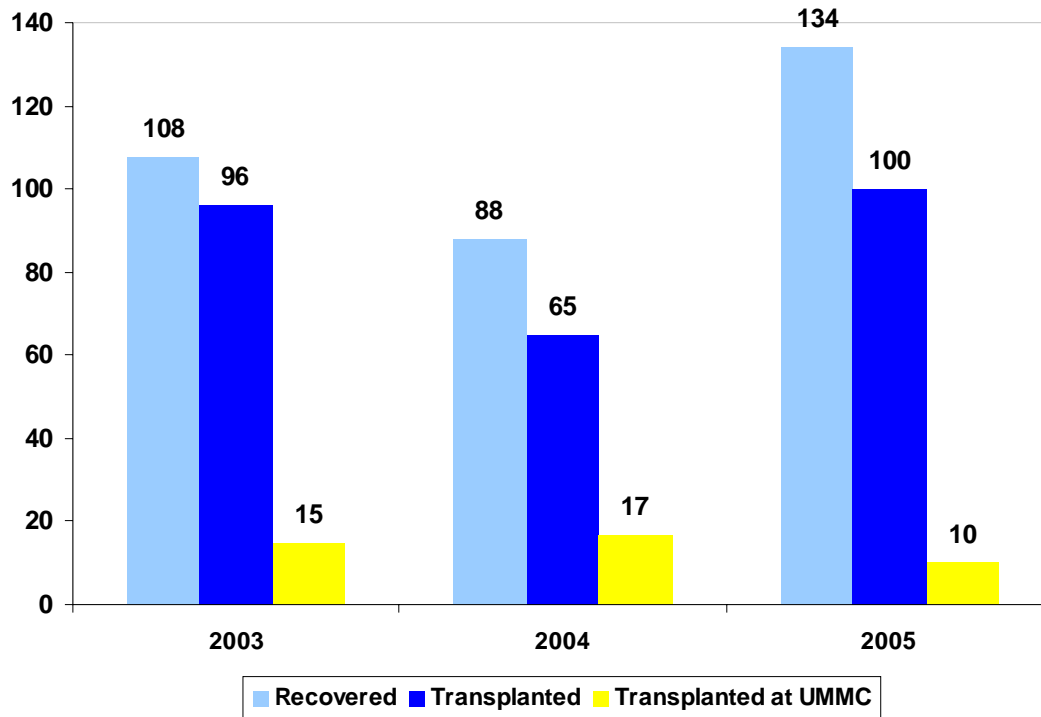


**Source:** Organ Procurement and Transplantation Network

Currently, UMMC does not support a living related kidney transplant program. Transplant programs at UMMC have suffered decreasing volumes over the past three years. The kidney transplant program, supported currently by one transplant nephrologist and one transplant surgeon, is understaffed and hard pressed to grow. There appears to be an ample supply of organs for transplant, although few are currently utilized at UMMC. As demonstrated in Figure 19, below, Mississippi appears to be a net exporter of kidneys for transplant. For example, in 2005, there were 35 donors at UMMC and, in total from the region, approximately 134 kidneys

for transplant. Of the total kidneys available for transplant, 90 were exported to centers outside the state.<sup>17</sup>

**Figure 19: Mississippi Organ Recovery Agency (MORA) Kidney Recoveries, Transplants and UMMC Transplants**



**Source:** Mississippi Organ Recovery Agency (MORA) historical data

The kidney transplant program at UMMC receives most of its referrals from dialysis centers within Mississippi. UMMC operates its transplant program in a competition with surrounding centers that claim significantly higher volume as demonstrated in Figure 20 below. With strong competitors in the region and a significant kidney and related disease burden, UMMC plans to focus transplant and related kidney disease program development on the regional market.

A report commissioned by UMMC in June of 2006 identifies a number of areas for program improvement that would materially improve the performance and increase program volume.<sup>18</sup>

<sup>17</sup> Sources include [ustransplant.org](http://ustransplant.org): Report for the Mississippi Organ Recovery Agency for 2005, and direct communication with MORA. Transplant data accessed at <http://www.ustransplant.org/csr/current/publicData.aspx?&facilityID=MSOPOP1XX&t=02>

<sup>18</sup> Report to the University of Mississippi Medical Center from Transplant Management Group, LLC, June 30, 2006.



Furthermore, UMMC faculty do not make themselves available to participate in organ recovery for MORA.<sup>19</sup>

**Figure 20: Kidney Transplant Program Volume for 2005 Transplant Centers in UNOS Region 3**

<b>NAME OF PROGRAM</b>	<b>2005</b>
University of Alabama	298
Jackson Memorial Hospital (FL)	202
Tampa General Hospital	195
Florida Hospital Medical Center	139
Shands Hospital (FL)	137
Piedmont Hospital (GA)	117
Auxilia Mutua Hospital (PR)	109
Tulane University Medical Center	106
Medical College of Georgia	82
University Hospital of Arkansas	77
St. Luke's Hospital (FL)	76
Shands Jacksonville (FL)	59
Ochsner Foundation(LA)	56
Wills Nighton Medical Center (LA)	53
Bert Fish Medical Center (FL)	51
Baptist Medical Center (AL)	46
SW Florida Regional Medical Center	41
Lindy Boggs Medical Center (LA)	38
University of South Alabama	33
Children's Healthcare (GA)	27
<b>UMMC</b>	<b>14</b>
Arkansas Children's	9
Children's Hospital (LA)	7
University Medical Center (LA)	4
All Children's Hospital (FL)	3

**Source:** Report to the University of Mississippi Medical Center from Transplant Management Group, LLC, June 30, 2006, pg 42.

A robust kidney transplant program would offer a significant resource to the local and regional market and could result in significant revenues for UMMC, UHC, and the faculty. Transplant programs are typically limited by cadaver organ availability. Kidney transplant programs can build clinical reach and volume by offering living related donor transplants, a service not currently offered by UMMC. Based on the expected rate of kidney transplantation per million persons, Mississippi should generate approximately 156 kidney transplants. Thus, kidney transplantation demand is either not being fulfilled or is being satisfied outside of the state.

<sup>19</sup> UMMC program and faculty interviews, personal communication.

In order to analyze the economic impact of the growth in transplant services at UHC, we posit two scenarios. In the first scenario, we have analyzed the revenues based on utilization of transplant services that were performed at UMMC in 1998. In 1998, UMMC had the highest volume of transplants. In the second scenario, we have simulated the revenues due to the increase in the number of transplants based on the expected average rate of kidney transplantation.

Figure 21 indicates that the economic impact of the increase in transplant services almost doubles the revenue impact on the community. Most importantly, it improves access to transplant services for the patients in need of transplants in Mississippi. Based on our discussions with UMMC transplant program physicians, we understand that a substantially large proportion of patients continue to receive hemodialysis without reasonable access to renal transplants.

**Figure 21: Economic Impact in the Jackson MSA Attributable to Growth in Kidney Transplant Volume at University Hospital and Clinics**

	Direct	Indirect	Induced	Total	Tax Impact
<b>1998 Utilization</b>					
Revenue	3,899,784	1,200,480	1,444,134	6,544,399	877,996
<b>2006 Potential (156)</b>					
Revenue	6,824,622	2,100,840	2,527,235	11,452,697	1,536,492

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure 10 for discussion of economic impact terms.

Several studies have indicated that transplantation offers superior quality of life compared with dialysis in patients with end stage renal failure.<sup>20,21</sup> Research has also demonstrated that a relatively inexpensive intervention such as hemodialysis may not be cost effective in the long run. The cost effectiveness of hemodialysis remained within a narrow range of \$55,000 to \$80,000/Life Year in most studies whereas the cost effectiveness of kidney transplants is greater over time, approaching \$10,000/Life Year.<sup>22</sup>

A comparison of transplant center staffing benchmarking data validates the need for additional surgeons, nephrologists, cardiovascular surgeons and financial coordinators/social workers. An expansion of the current volume will create demand for this range of highly specialized professional support staff.

<sup>20</sup> Jassal, Sarbjit, Krahn, Murray, et.al., "Kidney Transplantation in the Elderly: A Decision Analysis," *Journal of American Society of Nephrology*, volume 14, 2003, pp. 187-196.

<sup>21</sup> Manns, B., Meltzer, D., Taub K., and Donaldson, "Illustrating the impact of including future costs in economic evaluations: an application to end-stage renal disease care," *Health Economics*, November 2003, volume 12, number 11, p. 949 - 958.

<sup>22</sup> Winkelmayr, WC, Weinstein, MC, et.al., "Health Economic Evaluations: The Special Case of End-Stage Renal Disease Treatment," *Medical Decision Making*, September-October 2002, volume 22, number 5, pp. 417 - 430.

### **3 The Potential for the Alliance between Biotechnology Initiatives and Academic Medical Centers**

The biotechnology industry has been prominent and expanding in many regions of the country for many years. Biotechnology is the use of cellular and biomolecular processes to address problems or make useful products. The biotechnology sector includes basic production functions, such as agricultural and food production and the application of more complicated technologies such as vaccine development and genetic engineering. In the United States, the biotechnology industry is primarily regulated by three entities, the U.S. Food and Drug Administration, the Environmental Protection Agency, and the Department of Agriculture.

There are approximately 1,473 biotechnology companies in the United States which employed 198,300 people by the end of 2003. Among them, 314 are public companies. The sector has grown rapidly in the past decade, with U.S. health care biotechnology revenues alone quadrupling from \$8 billion in 1992 to \$39 billion in 2003. Research is vital to the expansion of the biotechnology industry; the nation spent approximately \$17.9 billion on biotechnology research and development in 2003.<sup>23</sup>

The life sciences industry sector includes biotechnology, pharmaceuticals, medical devices, and associated research and development activities and supporting infrastructure (e.g., research universities, teaching hospitals, medical laboratories and sector-specific venture-capital firms). Biotechnology and genomics have contributed to a range of scientific promises. The field's potential for the development of new and effective approaches to the early diagnosis and treatment of diseases could reduce the suffering of patients globally and result in significant health care system cost savings.

In the following section we:

- Describe recent trends in the life science industry;
- Evaluate the nature, extent, and common elements of select state and multi-institutional partnerships;
- Assess the potential for UMMC to engage in life science research; and,
- Quantify the economic benefit and long term health care benefits and cost savings for Mississippi related to investing in life science research in UMMC.

#### **3.1 Case Studies of Alliances Between Academic Medical Centers and Biotechnology Research Parks**

AMCs offer a valuable economic foundation for a geographic region that aspires to develop a life science cluster. AMCs maintain capital and human investments, such as wet-lab space and highly skilled scientists and technicians. This critical infrastructure is applied by university-based researchers, and, through research collaborations and direct grants and contracts, by

---

<sup>23</sup> Biotechnology Industry Organization (BIO) 2005-2006 Guide to Biotechnology

private sector researchers and entrepreneurs. Most importantly, an academic medical center brings critical human capital to the region. AMC faculty members perform cutting edge research that provides the intellectual and scientific foundation for additional R&D. R&D expenditures are often used to estimate a region's capacity to innovate. The Association of University Technology Managers data indicate that research expenditures for universities with medical schools are significantly higher than those without medical schools.<sup>24</sup> The median annual research expenditure by universities without medical schools was \$75.3 million between 2001 and 2003. On average, universities with medical schools invested \$224.8 million. Universities with medical schools that include life science clusters, such as Duke University, University of Arkansas for Medical Sciences, and Virginia Commonwealth University spend considerably higher in R&D than universities with medical schools that do not have life science clusters.

Many regions with a research based college of medicine are competing for biotechnology research parks as there is substantial long term economic potential associated with them. Biotech research parks provide the promise of valuable production industries and jobs, and also promote innovation in science and technology, which invariably leads to sustained economic growth.

Below, we have provided three case studies of universities with medical schools that have received substantial support from the state and have become leaders in the biotechnology industry.

### **Case Study 1: Duke University**

Duke University's research expenditures topped \$490 million in 2004. In 2002-2003, Duke had the highest growth rate in NIH funding of the country's top 15 medical schools, receiving more than \$245 million. As a state, North Carolina has been at the forefront in designing public policy to support the development of biotechnology. The state established the North Carolina Biotechnology Center in 1981 to promote biotechnology research. The center supports start-ups and growing companies by providing grants and seed monies for biotechnology research, helping to recruit faculty to the state's university system, and encouraging informal collaboration among university and industry researchers. The center also has a \$26 million Bioscience Investment Fund, created in 1998, to provide early-stage capital for promising biotech companies.

### **Case Study 2: University of Arkansas for Medical Sciences (UAMS)**

UAMS has been a catalyst for most of the growth in the life science industry through its biotechnology initiatives. In 1994, UAMS formed the Biomedical Biotechnology Center (BBC). The primary objectives of the BBC include promoting technology transfer, fostering biotech business acceleration, nurturing Arkansas alliances, providing state-of-the-art training and research programs, and providing technical assistance in management, research and finance to facilitate biotechnology start-up companies in Arkansas. Arkansas has targeted the needs of the

---

<sup>24</sup> Milken Institute, "Economic Benefits of Proposed Central Florida College of Medicine," March 12, 2006,

life sciences industry with the Consolidated Incentives Act of 2003. The incentives for the life science industry include:

- Job Creation Tax Credits: Income tax credits equal to 10 percent of annual payroll, not to exceed \$100,000 annually, for up to five years;
- Sales and Use Tax Refunds: Sales and use tax refunds for taxable materials, machinery, and equipment purchased in conjunction with the project, and;
- R&D Tax Credits: Incomes tax credits up to 33 percent of eligible R&D expenditures.

### **Case Study 3: Virginia Commonwealth University**

The Virginia BioTechnology Research Park is a joint venture of Virginia Commonwealth University, the city of Richmond, and the commonwealth of Virginia and is home for over fifty bioscience companies and research institutions. Planning for the park began in January 1992 and within three years, the park officially opened. Since that time, in only ten years, development of the park has continued to expand with the completion of the Philip Morris Research and Technology Center and the Virginia Biosciences Development Center. As a whole, the downtown park is close to a \$500 million capital investment which encompasses 1.5 million square feet of research, office, and laboratory space with over a dozen buildings. Furthermore, the park employs approximately 3,000 scientists, researchers, engineers and technicians, with a focus on a variety of biotechnology fields such as drug development, medical diagnostics and devices, and environmental biosciences.

### ***3.2 Evaluation of UMMC's potential to Enhance its Research Activities and Develop a Biotechnology Research Park***

UMMC has produced many research achievements during its 49-year history. In the past few years, there has been considerable expansion of research program and physical facilities, that have led to increased extramural research funding. In order to understand UMMC's research agenda and assess its potential to pursue biotechnology research initiatives, we interviewed Dr. John Hall and Dr. David Dzielak, associate vice chancellors for research.

#### **The Current Research Agenda for UMMC**

Given the high prevalence of certain chronic conditions in Mississippi, UMMC had targeted four core areas for research program growth: cancer care, cardiovascular care, obesity, and diabetes. Consistent with the clinical and scientific priorities, UMMC has enjoyed success in several areas.

- The Jackson Heart Study - This long term, single-site epidemiologic study of cardiovascular disease in the African American population has been active at UMMC for the last nine years. The study includes basic science and population based components.

- Neuroscience area – UMMC has received \$10 million in NIH funding from the NIH Center for Psychiatry neuroscience.
- Obesity – UMMC is conducting a study for Delta Health Alliance, whereby it is evaluating some of the diabetes and obesity related disease management programs.
- Health Care Disparities – Department of Health and Human Services has contracted with UMMC to assess the differences in health care use and utilization.

UMMC is also actively pursuing the creation of a biotechnology research park which seems promising as it experiences population growth and boasts research universities, laboratory space, medical schools, hospitals, infrastructure, developable land, state and private investment and a desirable quality of life. UMMC has already secured a planning grant and envisions creating a biotechnology research park on a 23-acre space adjacent to UMMC. Currently, this space includes a railroad yard, the old farmer’s market and a stadium. UMMC believes that this area could be developed as the Mississippi Biotechnology Research Park that would stimulate new economic activity in a neighborhood with high crime and few other economic opportunities. The planning of this biotechnology research park is nascent. Thus far, UMMC has secured development funding of approximately \$100,000 through public and private enterprises to evaluate the development project and will develop a feasibility study, create a concept plan, and conduct initial marketing.

UMMC has also approached the state’s Congressional delegation to secure “seed” funding. Currently, there is a commerce bill pending in the House to secure approximately \$25 million in funding for the development project. About \$13 - 14 million of the projected \$25 million would be applied to the research park and remaining dollars would be applied to fund initial operating expenses. In addition to the “seed” money, the state would transfer the land from the state to UMMC.

Dr. Dzielak indicated that 60 percent of the space in the biotechnology research park is planned for wet lab space and the remainder for research administration and development. UMMC also foresees additional investment from federal and anchor tenants. Some of the potential tenants in the biotechnology research park would focus on molecular biology, medical device development, and vaccine development.

Dr. Dzielak also mentioned that the state is one of the finalists for the federal lab for biodefense and bioterrorism research efforts. He foresees that it will take five years to create the biotechnology research park and less than ten years for it to mature into a renowned biotechnology research park.

It is evident that the addition of a biotechnology research park would greatly enhance UMMC’s capability in building a knowledge base that could be leveraged by entrepreneurs in developing new science spin-offs and startups. In the long run, these companies will grow and create incentives for other companies to locate. Furthermore, it will also attract government sponsored research funding, such as NIH funding.

Figure 22 describes the estimated economic impact of the UMMC based biotechnology research park with only an initial federal support of \$25 million. This only includes the impact of the

initial funding and does not include the impact of any private investment. It is very likely that the UMMC based biotechnology research park will continue to receive additional funding from public and private resources after the inception of the biotechnology research park. The creation of a biotechnology research park with federal funding would increase revenue to almost \$54 million for Jackson MSA.

**Figure 22: Economic Impact of UMMC Based Biotechnology Research Park on the Jackson MSA at the End of 10 years**

	Federal Funding only (\$)
Government Cost	25,000,000
Tax Revenue	3,545,647
Total Economic Impact	53,726,912

**Source:** The Lewin Group analysis of the IMPLAN model.

### **3.3 State support to transform UMMC into an Outstanding Health Sciences Research Center**

In this subsection, we evaluate the nature and extent of other state and multi-institutional partnerships. In addition, we also explore the mechanisms by which states have supported the development of research avenues for academic health centers, such as partnerships, fund commitment, etc.

Across the United States, California and Massachusetts appear to lead in biotechnology industry development with the large number of companies within each state and the provision of significant state financial support. For our purposes, we compare Mississippi to a range of selected states. Figure 23 compares characteristics of the biotechnology industry for states in the same region as Mississippi, assessing factors such as the number of research parks within the state, amount of NIH support to state institutions, as well as university R&D life science expenditures. Mississippi is ranked low in NIH support to institutions, with only \$36 million in fiscal year 2004. University R&D life science expenditures are also low in Mississippi compared to other states.<sup>25</sup>

<sup>25</sup> Growing the Nation’s Bioscience Sector: State Bioscience Initiatives 2006, Battelle Technology Partnership Practice and SSTI

**Figure 23: Biotechnology in Mississippi Compared to Other Southern States**

State	Encourage university/industry research partnership	# of biotechnology companies	NIH Support to Institutions, FY 2004 (\$ thousands)	Ranking	University R&D life sciences expenditures	Research clusters/park
<b>North Carolina</b>	Collaborative Funding Grants, North Carolina Small Business and Technology Development Center Strategic Applied Research Program	88	\$985,447	7	\$1,049,850	Research Triangle Park, Centennial campus of NC State University, Piedmont-Triad Research Park
<b>Georgia</b>	Georgia Research Alliance innovation fund	63	\$372,236	18	\$652,431	Technology Enterprise Park, University Science Park
<b>Alabama</b>	UAB major driver for building life science sector, USA development of Cancer Institute	N/A	\$323,113	21	\$395,825	Cummings Research Park, UAB Research Park at Oxmoor, USA Research and Technology Park, Auburn University Research Park
<b>Louisiana</b>	Technology Commercialization Tax Credit - companies partnering with LA universities can claim an annual 15% tax credit	N/A	\$153,408	28	\$336,726	InterTech Science Park
<b>Oklahoma</b>	Applied Research Support Program, OCAST STTR Program	N/A	\$87,856	35	\$140,816	Presbyterian Health Foundation Research Park,
<b>Mississippi</b>	Mississippi Technology Alliance's Strategic Biomass Initiative	N/A	\$36,265	44	\$154,450	University of Mississippi Research Park, USM Innovation and Commercialization Park, Thad Cochran Research



Below, we provide an in-depth analysis of the initiatives undertaken by select southern states to support the creation of biotechnology research parks.

### **North Carolina**

In the South, North Carolina is one of the leading states in biotechnology in the South with the presence of two reputable institutions, Duke University and University of North Carolina, as well as Research Triangle Park. Research Triangle Park is home to several well-known biotechnology companies, as well as the state-sponsored North Carolina Biotechnology Center. Establishment of the North Carolina Biotechnology Center in 1981 helped promote development of the industry over the past 25 years. Specifically, the center plays a significant role by supporting start-ups and growing companies with grants and financial support for research, recruiting faculty to the State's university system, as well as encouraging collaboration and cooperation between university and industry researchers. Other state initiatives include substantial funding for a cancer center and bioinformatics research center, as well as research programs that provide funding and grants for projects jointly conducted by universities and the industry.

### **Georgia**

Georgia is also a leader in biotechnology efforts. In 2006, the state invested in several facilities across Georgia which has helped enhance their R&D initiatives. Many of these facilities incorporate the university system in Georgia such as the University of Georgia's new Biomedical and Health Sciences Center which was opened this year. The state and federal government provided \$10 million each for this project. Other facilities that had substantial state support include an Animal Health Research Center Biocontainment Facility, also opened at the University of Georgia, Georgia Tech's Nanotechnology Research Center, and the Medical College of Georgia's new Cancer Research Center.

Another major state initiative has been the Georgia Research Alliance (GRA) Innovation Fund. The Georgia Research Alliance was created in 1990 to help build economic growth for the state based on university research. The Innovation Fund seeks to create partnerships between companies in Georgia and GRA-affiliated universities by supporting projects in several topics such as biosciences, nanotechnology, and advanced materials. Approximately \$2.2 million was awarded by the state to projects in partnership with 30 companies. Two research parks are also under construction in Georgia – the Technology Enterprise Park developed by Georgia Tech and the University Science Park, developed by Georgia State University. The Technology Enterprise Park is an 11-acre facility to house new and established biotechnology companies. These initiatives are only a few examples of how Georgia is fostering the collaboration between universities, the state, and private companies to enhance the biotech industry.

### **Alabama**

Similar to North Carolina and Georgia, much of the efforts in Alabama are also driven by universities such as the University of Alabama at Birmingham (UAB) and the University of Southern Alabama. The state has committed \$50 billion to support the construction of a not-for-profit Hudson-Alpha Institute for Biotechnology in Huntsville. This facility will be located in

Cummings Research Park, the second largest research park in the United States. The State has also proposed another \$50 billion investment for bioscience research at UAB.

## **Mississippi**

While biotechnology has been recently booming in states like Georgia and North Carolina, initiatives in Mississippi have just begun. The Mississippi Technology Alliance (MTA), a nonprofit organization devoted to promoting technology-based economic development for the state, has developed a Strategic Biomass Initiative for Mississippi. This initiative is funded primarily by the U.S. Department of Energy (DOE) and is the focus for the State's technology-based economic development. The mission of this initiative is to create commercial enterprises based on the state's biomass resources and involve university-based research and development. Funding is also provided by private companies. This is only one of the many initiatives to encourage interaction between academics and biotechnology industry.

As we earlier described in section 4.2, development of a research park is underway at the University of Mississippi. The research park will strengthen the partnership between the university, private companies, and federal agencies, as well as provide expertise in four areas: health care, information management, defense/security, and remote sensing technologies. Two other parks are also being developed in the state – University of Southern Mississippi Innovation and Commercialization Park and Mississippi State University's Thad Cochran Research Technology and Economic Development Park. Other initiatives in Mississippi include the establishment of Mississippi State University's Life Sciences and Biotechnology Institute. This research space will help fuel the growth of the biotech industry in the state of Mississippi.

## **4 The UMMC market**

In this section, we describe UMMC's primary service area: the Jackson MSA. This section discusses population demographics, health insurance status, health status indicators, and capacity and care seeking patterns of residents in UHC's primary service area.

### ***4.1 Regional demographics***

The Jackson MSA includes Copiah, Hinds, Madison, Rankin, and Simpson counties. UMMC is located in the city of Jackson, in Hinds County. In 2006, the U.S. Census Bureau estimated that Mississippi had a population of 2,921,088 persons. The Jackson MSA comprises about 17 percent of the state's population with 48 percent of the Jackson MSA population concentrated in Hinds County. UMMC serves a regional population of approximately 495,000,<sup>26</sup> of which approximately 20 percent of the total population are below 100 percent of the Federal Poverty Limit. In contrast, the number living below the poverty limit nationally is approximately 12 percent.<sup>27</sup>

---

<sup>26</sup> See the appendices to this report for additional detail about the regional demographics.

<sup>27</sup> "Income, Poverty, and Health Insurance Coverage in the United States: 2005, The United States Department of Commerce, Economics and Statistics Administration for the United States Census Bureau, Report issues August 2006.

The Jackson MSA has similar demographics to Mississippi; however, the population varies from the U.S. profile. Residents of the Jackson MSA are more diverse, and a greater proportion live in poverty.

**Figure 24: Demographics of Jackson MSA, Mississippi, and the U.S. 2005** <sup>28</sup>

Demographics	Jackson MSA	Mississippi	U.S.
<b>Total Population</b>	497,168	2,824,156	288,378,137
<b>Age</b>			
0-19 yrs	29.1%	29.0%	27.8%
20-44 yrs	35.8%	34.6%	35.1%
45-64 yrs	24.9%	24.4%	25.0%
65+ yrs	10.1%	11.9%	12.1%
<b>Gender</b>			
Male	47.7%	48.1%	49.0%
Female	52.3%	51.9%	51.0%
<b>Race/Ethnicity</b>			
White	51.1%	60.8%	74.7%
Black or African American	46.4%	36.5%	12.1%
American Indian and Alaska Native	0.2%	0.4%	0.8%
Asian	0.9%	0.8%	4.3%
Native Hawaiian & Pacific Islander	0.03%	0.02%	0.1%
Other Race Alone	0.5%	0.7%	6.0%
Two or more races	0.8%	0.9%	1.9%
Hispanic or Latino	1.1%	1.5%	14.5%
<b>Poverty</b>			
Earnings less than 100% FPL	20.7%	21.8%	13.9%
100%-200% FPL	23.5%	22.8%	17.9%
200%-400% FPL	32.0%	32.2%	31.2%
Above 400% FPL	23.9%	23.3%	37.0%

## 4.2 Health insurance coverage

Health insurance coverage in the Jackson MSA is similar to that of Mississippi; however, the MSA has a higher proportion of the population relying on safety net providers. The uninsured comprise 16 percent, and coverage by other public insurance (e.g., Medicaid) comprises 18 percent of the Jackson MSA population, versus approximately 15 percent and 12 percent, respectively, for the U.S. (Figure 25). The regional insurance characteristics offer an additional

<sup>28</sup> For 2005, only the last four months of data collection reflected the impact of the hurricanes. As a result, the regular ACS data products will be affected only to a limited extent by changes taking place in that four-month period.

financial challenge to UMMC as the enterprise cannot rely on more widely available third party payer sources to finance operations.

**Figure 25: Sources of Health Insurance Coverage for the Jackson MSA, Mississippi and U.S. 2000**

Source of Health Insurance	Jackson MSA	Mississippi	U.S
Medicare	57,213	370,545	36,638,594
Other Public Insurance	89,561	533,747	33,715,119
Private Insurance	272,110	1,487,880	169,576,253
Uninsured	78,314	452,486	41,491,940
<b>Total</b>	<b>497,198</b>	<b>2,844,658</b>	<b>281,421,906</b>
Percent of Source of Health Insurance			
Medicare	12%	13%	13%
Other Public Insurance	18%	19%	12%
Private Insurance	54%	52%	60%
Uninsured	16%	16%	15%

**Source:** The Lewin Group Health Benefits Simulation Model, based on U.S. Census 2000.

### 4.3 Health status indicators

UMMC operates in a region that compares unfavorably to national averages across several key health status indicators. The infant and overall mortality rates are significantly higher than the U.S population. Additionally, lifestyle indicators correlated with poorer health status, such as the obesity and smoking rate, are higher for Mississippi residents (Figure 26).

**Figure 26: Health Status Indicators Mississippi & the U.S. 2004**

Health Status Indicator	Mississippi	United States
Childhood Immunization Rate	84%	81%
Overweight/Obesity Rate	61%	56%
Smoking Rate	24%	21%
Violent Crime Occurrence (per 100,000)	326	475
Overall Mortality Rate (per 100,000)	1,014.0	832.7
Infant Mortality Rate (per 1,000)	10.2	7.0

**Source:** Kaiser State Health Facts, 2004.

There are also certain health disparities between the Jackson MSA and the rest of the state. Mortality rates for heart disease and stroke are consistently higher than national averages and cancer mortality is higher in 2 of 5 counties in the MSA (Figure 27). Population health status is determined by a confluence of factors including poverty rates, insurance status, and lifestyle decisions that affect health.

**Figure 27: Leading Causes of Death for U.S., Mississippi, and Jackson MSA  
Average from 2002-2004  
(Rates per 100,000)**

Area	Heart	Cancer	Stroke
U.S.	235.1	192.4	54.4
Mississippi	299.6	207.2	60.9
Jackson MSA	265.7	185.2	54.1

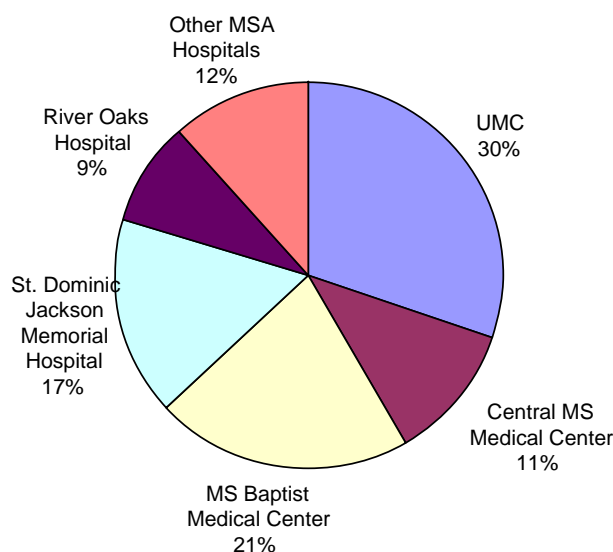
Source: MSDH Vital Statistics, National Vital Statistics Report, U.S. Census Bureau.

#### 4.4 Market share analysis

UHC<sup>29</sup> is one of eleven acute care hospitals in the Jackson MSA. The majority of MSA hospitals are in Hinds and Rankin counties where the region’s population is concentrated. The hospitals in outlying counties are smaller, community hospitals. With its 648 staffed beds, UHC represents approximately 25 percent of the acute bed capacity in the Jackson MSA, and serves as a major referral center for both the Jackson MSA and the state.

UHC provided the highest volume of inpatient care out of all hospitals in the Jackson MSA. In 2005, UHC discharged 28,516 patients which accounted for 30 percent of all discharges by hospitals in the Jackson MSA (Figure 28).

**Figure 28: Acute Care Discharges UHC vs. Other MSA Hospitals 2005**



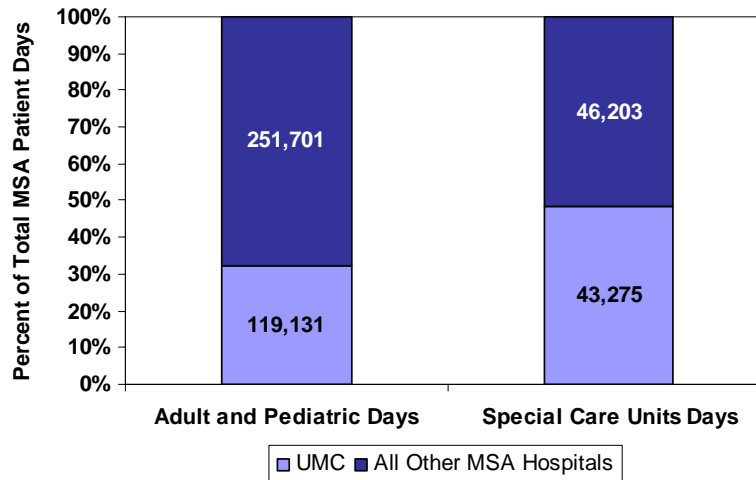
Source: American Hospital Directory data, 2005 MS DOH Hospital Report.<sup>30</sup>

<sup>29</sup> UMMC also operates a hospital in Holmes County (UHC-Holmes County), however the market share analysis reflects patient services provided by UMMC at University Hospitals and Clinics in Jackson.

<sup>30</sup> Market share was determined by comparing the total volume of a given hospital in the Jackson MSA to the total volume demanded by patients at all hospitals in the Jackson MSA. Patient origin data was not made available for hospitals other than UMMC.

UHC accounts for 32 percent of all acute adult and pediatric patient days in the Jackson MSA. UHC delivered nearly half (48 percent) of all special care unit (e.g., ICU, CCU, NICU) patient days in MSA hospitals, substantiating UHC’s role as a tertiary and quaternary care provider (Figure 29).

**Figure 29: Adult and Pediatrics and Special Care Units Patient Days UHC vs. Other Jackson MSA Hospitals FY 2005**

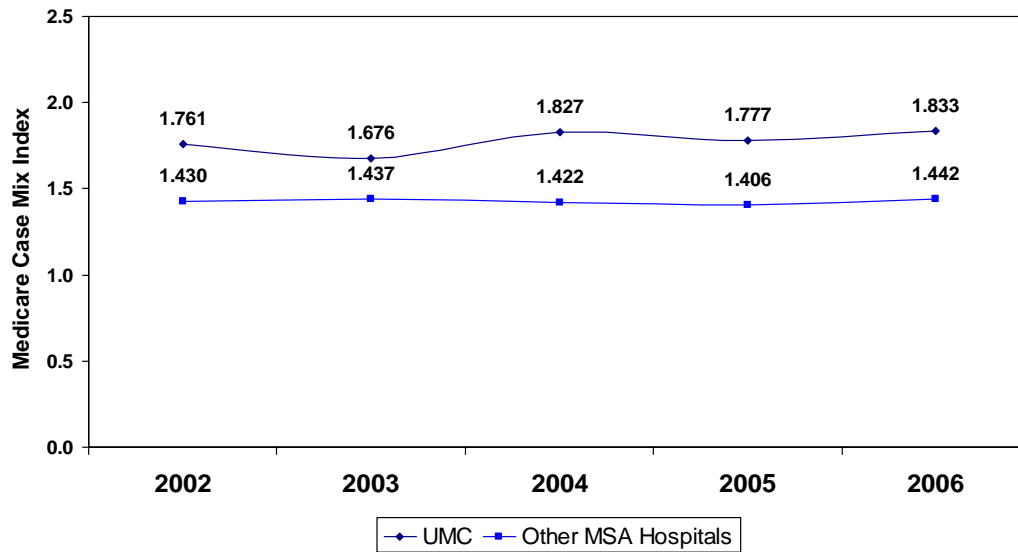


**Source:** Medicare Cost Report 2005, PPS 21 (3/31/06). Note: reflects market share by hospital location.

UHC has a higher Medicare case mix index (CMI)<sup>31</sup> than the overall market. This trend has proved consistent over the last five years; the Medicare CMI has increased at UHC at a greater rate than other hospitals in the Jackson MSA. This trend indicates that the complexity of Medicare cases at UHC is greater than at other Jackson MSA hospitals, and that the complexity of these patients has increased relative to the overall market (Figure 30).

<sup>31</sup> Each Medicare inpatient acute case discharged from the hospital is assigned a CMI. CMI is a measure established by the CMS to indicate the amount of resources required for a given case. CMI estimates the average acuity or complexity of a given case; thus a higher CMI correlates with a higher case complexity.

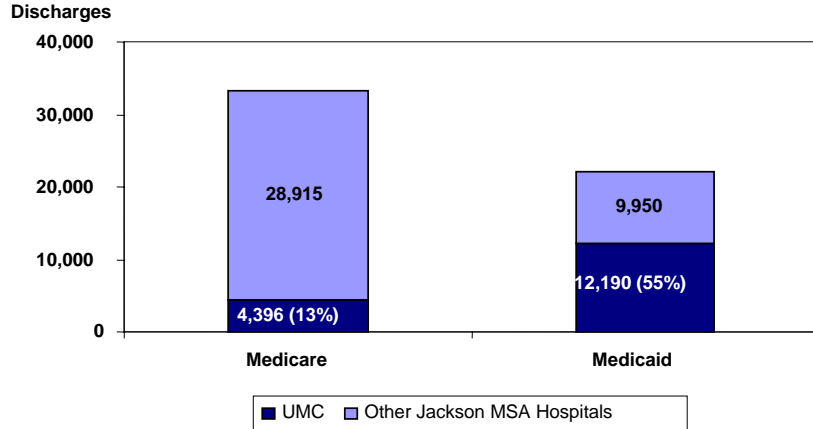
**Figure 30: Medicare Case Mix Index for UHC vs. Other Jackson MSA Hospitals 2002-2006**



Source: Medicare Impact File, 2002-2006.

Consistent with its safety net role, UHC served a disproportionate share of Medicaid patients in the Jackson MSA (55 percent). Its share of Medicare discharges was substantially lower, at 13 percent compared to other facilities in the Jackson MSA (Figure 31).

**Figure 31: Medicare and Medicaid Discharges UHC vs. Other Jackson MSA Hospitals FY 2005**



**Source:** Medicare Cost Reports, 2005, PPS 21 (3/31/06). Note: reflects market share by hospital location.

## 5 UMMC Operations, Finances, and Critical Services

UMMC operates a significant breadth of services that include: clinical services provided by University of Mississippi Hospitals and Clinics (UHC); health sciences education; biomedical research and scholarly activity; undergraduate medical education, and; graduate medical education. This section of the report offers an overview of UMMC’s operations, finances, and critical services.

### 5.1 UMMC institutional services

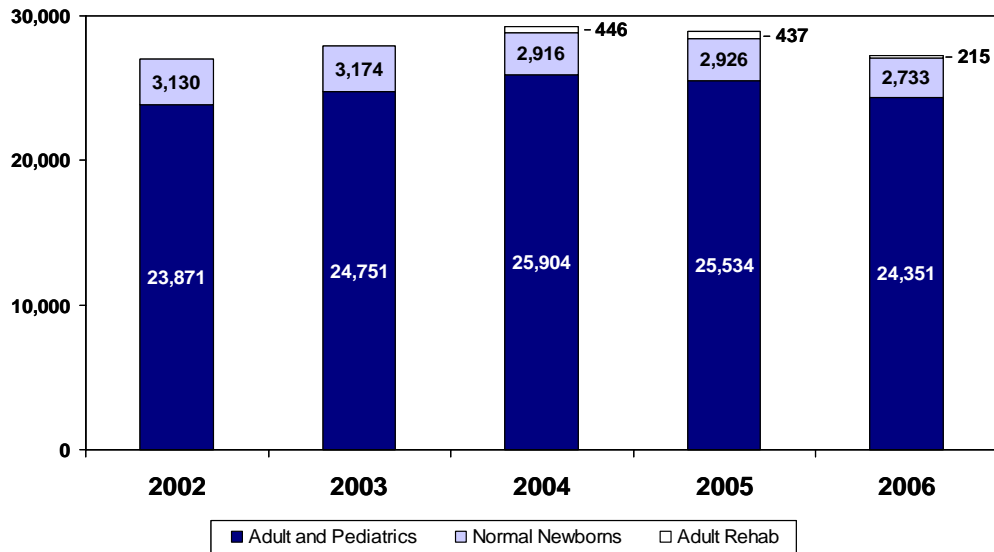
UMMC provides a number of complex medical and surgical services at UHC, its flagship clinical campus. UHC is the sole provider of several critical services including:

- Trauma services through its level I Trauma Center
- Comprehensive children’s health services
- Level III Neonatal Intensive Care Unit (NICU)
- Solid organ and Bone Marrow Transplant programs.

The wide geographic range of UMMC’s market represents patient care seeking patterns typical of AMCs of similar size and service scope. By providing specialized services combined with research and scholarly assets, UHC attracts Mississippians from across the entire state. Approximately 47 percent of UHC’s patients resided outside its immediate service area and the remaining 51 percent of its patients resided in the Jackson MSA. About 2 percent of UHC patients seeking inpatient services were from out-of-state. As shown in Figure 32, the number of admissions at UMMC have remained relatively constant from FY 2002 to FY 2006.



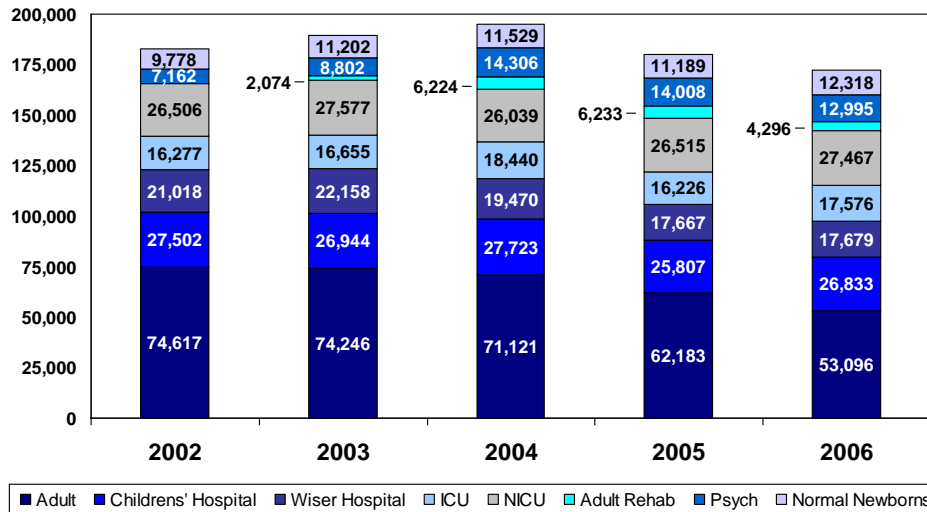
**Figure 32: UHC Admissions by Type (FY 2002-2006)**



**Source:** University Hospital and Clinics, Operating Statistics, FY 2002-2006.

Total patient days at UHC have trended downward since 2004. Adult bed days declined by 25 percent from 2004 to 2006; this appears to be the primary determinant of the patient day decline (Figure 33).

**Figure 33: UHC Patient Days by Service/Entity (FY 2002-2006)**

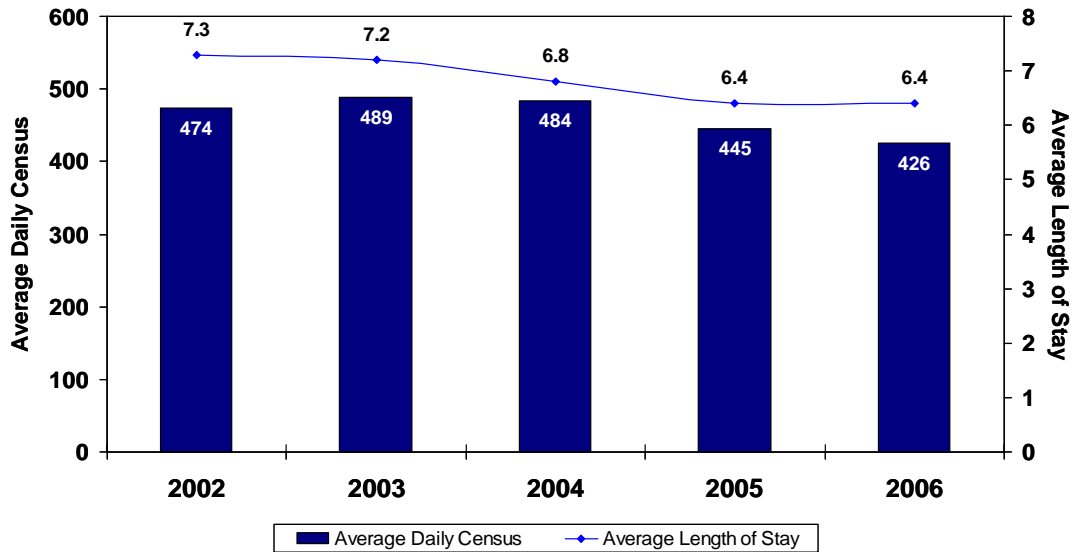


**Source:** University Hospital and Clinics, Operating Statistics, FY 2002-2006. Note: Adult rehab introduced at beginning of FY 2003 and Wisser Hospital offers tertiary health services for women throughout the life cycle and for newborns in the first few months of life.

The average daily census (ADC) at UHC has declined by more than 10 percent from 2002 to 2006. This trend is consistent with a reduction in the average length of stay (ALOS) of almost one day during the same period (Figure 34). Typically, a decreasing ALOS should correlate with increased institutional efficiency. This is particularly important in an environment where the

primary form of payment is based on lump sum remittances or annual payments and adjustments from public sources.

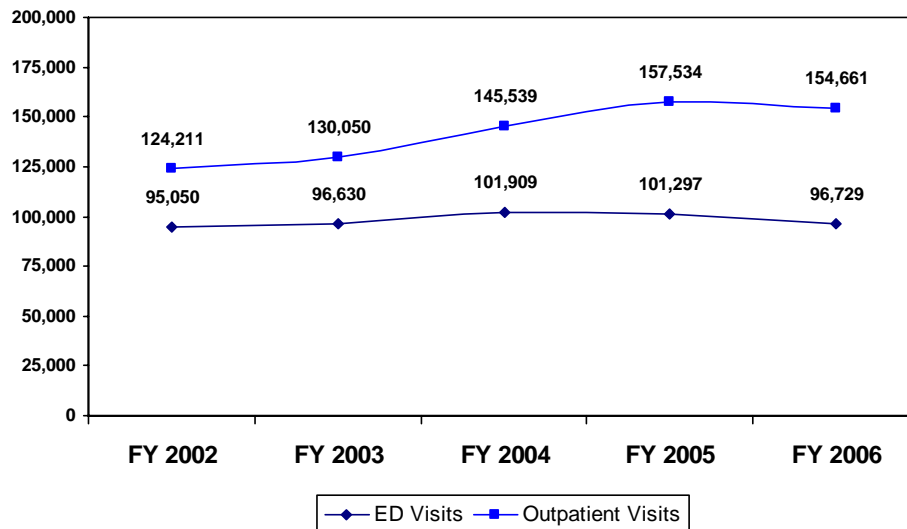
**Figure 34: UHC Adult and Pediatrics Average Daily Census and ALOS FY 2002-2006**



**Source:** University Hospital and Clinics, Operating Statistics, FY 2002-2006.

UHC has created a robust ambulatory services network. Outpatient visits to UHC clinics have grown by 24.5 percent since FY 2002; while emergency department (ED) visits have grown at a much slower rate over the same period, 1.8 percent (Figure 35). Current outpatient services at UHC include Adult, Pediatric, and the Children’s Cancer Clinic. Improved access to outpatient clinic services could have contributed to curtailed growth in ED visits at UHC.

**Figure 35: UHC ED and Outpatient Clinic Visits FY 2002-2006**



**Source:** University Hospital and Clinics, For Periods Ended June 30, 2006, Operating Statistics.

UHC plays a pivotal role in providing emergency services for the Jackson MSA. The majority of patients using UHC's emergency services reside in zip codes within Hinds County. UHC also serves patients from Madison, Simpson, Copiah, and Yazoo counties. The majority of patients using UHC's emergency services are uninsured or covered by Medicaid. Medicaid patients represented 39 percent of visits, and the self-pay category resulted in an additional 37 percent of visits in FY 2005. This is substantially higher than the national average (Medicaid and self-pay comprise about 36 percent of emergency department visits<sup>32</sup>) but consistent with higher emergency services use rates by the safety net population<sup>33</sup>.

High utilization of emergency services at UHC could be attributed to a number of factors that the Institute of Medicine (IOM) identified in a recent study, *Hospital-Based Emergency Care at the Breaking Point*:

- UMMC is a statutorily defined safety net hospital. The Emergency Department is the “safety net of the safety net” for patients who are uninsured or lack access to a regular provider.
- Safety net patients typically encounter many barriers seeking routine care in the community. Community physician practices typically direct patients to UHC's ED for routine services since the institution has developed a reputation among community physicians as the region's primary safety net provider.
- Community physicians and clinics have been increasingly directing patients to the UHC ED for convenience after regular hours, reluctance to take complicated cases, the need for diagnostic tests, and liability concerns.
- Patient preferences including the need for immediate care, established care seeking patterns, and perceptions that the ED is the best place to seek specialized care.

The high proportion of ED visits with Medicaid and self-pay payment sources places additional financial pressure on the institution since it receives negligible payment for self-pay visits, and net Medicaid payments do not cover the cost of care.<sup>34</sup>

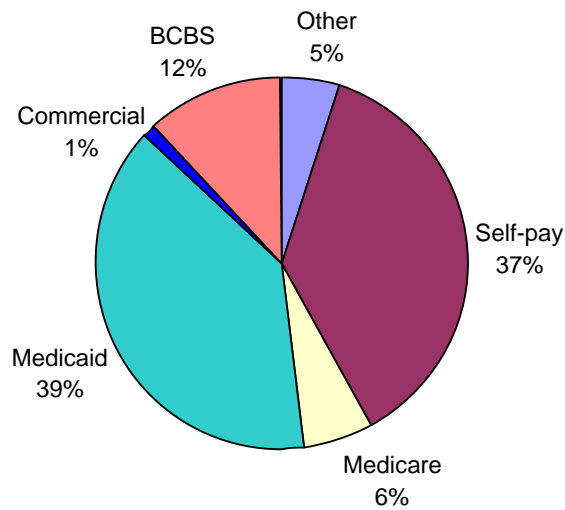
---

<sup>32</sup> McCaig and Burt, 2005; as cited in *Hospital-Based Emergency Care at the Breaking Point*. Institute of Medicine; 2006.

<sup>33</sup> The ED use rate (per 100) for Medicaid beneficiaries (81.0) and the uninsured (41.4) is four times and twice the average for persons with private insurance (21.5). Source: McCaig and Burt, 2005; as cited in *Hospital-Based Emergency Care at the Breaking Point*. Institute of Medicine; 2006.

<sup>34</sup> The AHA reported that 73% of hospitals lose money providing emergency care to Medicaid patients (AHA, 2002); as cited in *Hospital-Based Emergency Care at the Breaking Point*. Institute of Medicine; 2006.

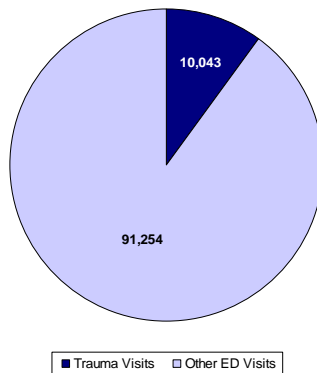
**Figure 36: UHC ED Department Visits by Payer FY 2005**



**Source:** UMMC Provided ED Report, 2005

UHC's ED is the gateway for high-level trauma services in the state. UHC is the only Level I Trauma Center in Mississippi covering the fourteen counties that comprise the Central Mississippi trauma region. It serves a patient base of over 663,000 people and covers a geographic area of 9,616 square miles<sup>35</sup>. In FY 2005, UHC provided services to over 10,000 trauma visits in the ED, which accounted for 10 percent of its total ED visits. Additionally, UHC treated 5,700 trauma cases in other outpatient settings (Figure 37).

**Figure 37: UHC Trauma and Other ED Visits FY 2005**



**Source:** UHC Provided ED Report, 2005

<sup>35</sup> Central Mississippi Trauma Region Regional Trauma Plan - revised 7/31/03.

## **5.2 UMMC Physician Services**

AMCs require physician services to provide clinical care and to fulfill educational requirements for GME and UME programs. It is through their physician staff that AMC discharges its community mission. At UHC, the AMC relies on a closely allied physician organization called a “faculty practice plan” for the primary component of its institutional medical staff. The physicians at UMMC are currently organized in several separate specialty practice plans that together comprise the UHC medical staff. The organizational structure of the UMMC physicians has evolved over the past two decades as a business mechanism that allows faculty physicians the opportunity to conduct clinical practice on behalf of, but in a separate business structure from, UMMC and UHC.

Practice plans represent a source of income from faculty physicians; in the case of UMMC, it is external to state salaries and other support from UHC. The salaries paid to faculty from the State are not adequate to meet generally accepted national salary standards for faculty or private practicing physicians. The clinical activity of the faculty provides access to legitimate clinical income that allows UMMC to retain and renew its faculty. Absent external income sources, it is unlikely that UMMC would be able to recruit or retain physicians given the current local and national physician supply and prevailing local economic conditions.

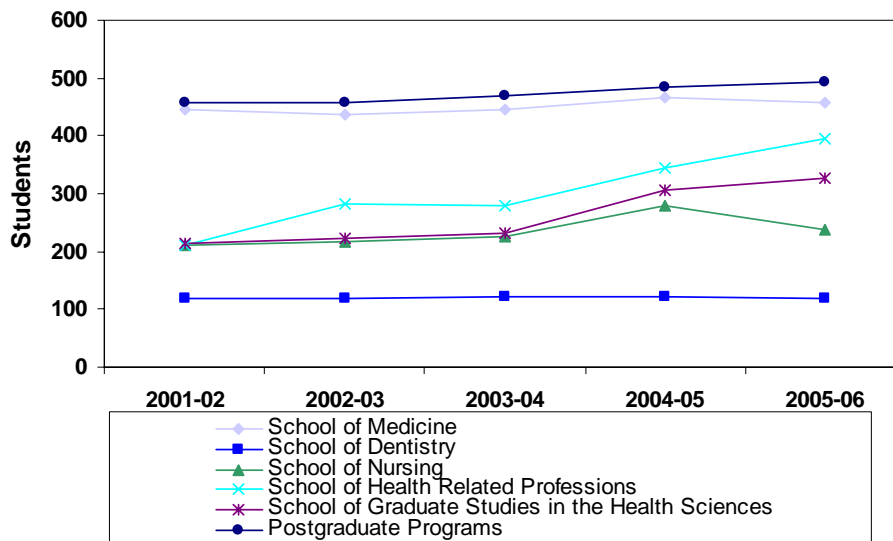
The UMMC practice plan is in the process of consolidating the 17 individual practice plans into a single business entity. The administrative and support services provided, in part by the individual plans and in part by certain existing central administrative services, would be consolidated for efficiency and economy.

This consolidation process is consistent with other national practice plan organizations. Academic physicians are beginning to understand and embrace the importance of effective clinical operations and business support functions as a strategy to increase access to their services and improve the financial performance of the academic enterprises with whom they are associated. In general, an economically healthy practice plan organization provides less financial support burden for the associated hospital and offers consumers a business system that allows them reasonable and ready access to the intellectual capital typically available within the academic faculty.

## **5.3 Graduate Medical Education and Health Sciences Education**

UMMC is the leader in educating and training Mississippi’s health care workforce, supporting several postgraduate health science programs. Enrollment in virtually every program has grown over the last five years, especially in the School of Health Related Professions, and the School of Graduate Studies in the Health Sciences. Enrollment in the School of Nursing declined slightly in FY 2006 after three consecutive years of positive growth (Figure 38).

**Figure 38: Student Enrollment by Program FY 2002-2006**



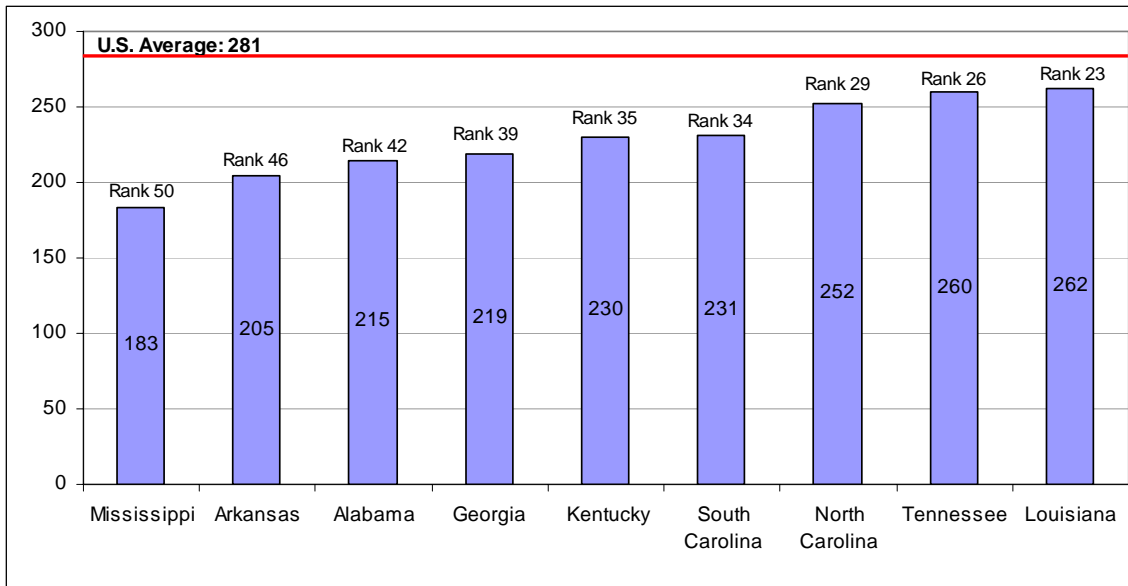
**Source:** UHC Provided GME Data

A majority of the students educated and trained at UMMC remain in Mississippi, providing a major source for the state health care workforce. The School of Nursing has the highest regional retention rate (90 percent), followed by the School of Health Related Professions (83 percent), the School of Dentistry (73 percent), and finally the School of Medicine (65 percent).

Mississippi’s population-adjusted supply of physicians is well below the national average, and lowest amongst peer states.<sup>36</sup> Mississippi ranked 50<sup>th</sup> compared to all states and the District of Columbia (Figure 39). This elevates the significance of the teaching and GME component provided by UMMC to ensure that the State meets its responsibility to provide adequate access to clinicians and other health care services.

<sup>36</sup> Peer states defined according to the U.S. Census’s definition of those in the East South Central, and include Mississippi, Alabama, Kentucky, and Tennessee.

**Figure 39: Physician Supply Non-Federal Physicians per 1000**



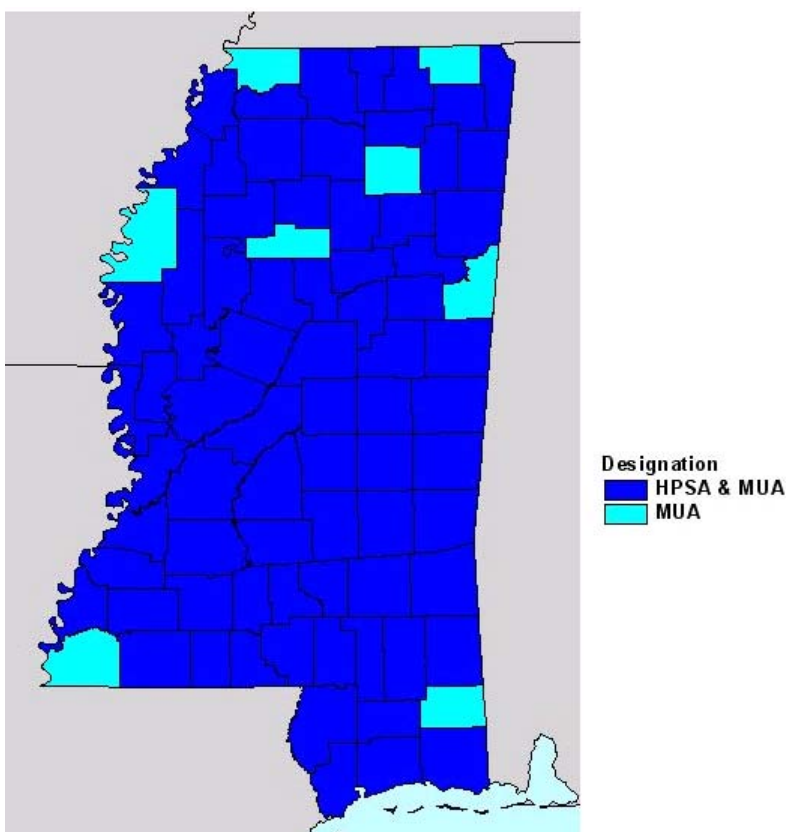
**Source:** American Medical Association (AMA), 2004.

While the Jackson MSA has benefited from the health care resources made available to residents by UMMC, access issues persist throughout the region. For example, three counties (Copiah, Hinds, and Simpson) are Health Professional Shortage Area (HPSA), and all three counties in the Jackson MSA have Medically Underserved Area (MUA) designations.<sup>37</sup> The magnitude of the physician workforce development challenge is increasing. Adding sufficient physician workforce and, eventually, stabilizing the workforce represents a challenge that only UMMC can fill. In order to appreciate the magnitude of this challenge, we have estimated the number of full time equivalent physicians needed to meet market needs through 2020 using a proprietary model developed by Lewin.

<sup>37</sup> Health Professional Shortage Areas (HPSA) and Medically Underserved Areas (MUAs) are federal designations established by the Bureau of Health Professions at HPSA. These designations establish initial eligibility for federal and state programs to improve access to health care services. Designation is granted based on the evaluation of criteria established through federal regulation to identify geographic areas or population groups based on demographic data. Designation criteria include: an urban or rural area (which need not conform to the geographic boundaries of a political subdivision and which is a rational area for the delivery of health services); a population group; or a public or nonprofit private medical facility.

All five counties in the Jackson MSA are MUAs based on the evaluation of criteria established through federal regulation to identify geographic areas or population groups based on demographic data.

**Figure 40: Federally-Designated HPSAs & MUAs in Mississippi**



**Source:** HRSA. Lewin Analysis.

The Lewin Group developed and maintains a simulation model, The Physician Supply and Demand Model (PSDM), which is used to project current and future supply of and demand for physicians and physician services. Lewin developed the original version of this model for the federal Bureau of Health Professions to forecast supply of and demand for individual physician specialties at the national level under alternative forecasting scenarios. Over time, Lewin continued to refine this model and now uses the PSDM to help professional associations, hospital systems, health plans, and states with physician workforce planning. To estimate demand for physician services, the PSDM combines market area population estimates (by age, sex, race/ethnicity, and insurance status) with estimates of annual utilization of physician services by medical specialty and health care delivery setting (office visits, outpatient and emergency visits, inpatient rounds, surgical procedures, other visits).

Combining projections of patient-physician encounters with estimates of physician productivity (weeks worked per year, patient care hours worked per week, average time per patient encounter) produces estimates of the number of full-time equivalent physicians required to meet the expected level of physician services demanded. The PSDM can be used to estimate demand for physician services for a subset of the population – such as the population age 18 and younger, or the elderly population – or for the entire population in a geographic area.



Based on the results of the PDSM model the demand for physician workforce in the State of Mississippi is significantly higher than the current supply of physicians (refer to Figure 41). The supply of physicians at approximately 170 persons per 100,000 persons would have to increase by 40 percent to meet the demand for physicians in 2005. The demand for physicians is expected to increase by approximately 27 physicians per 100,000 persons from 2005 to 2020. The current supply of physicians per 100,000 persons would have to increase by 56 percent to meet the demand for physicians per 100,000 persons in 2020. Based on the distribution of physician specialties, we find that the gap in demand and supply is higher for some of the specialties, such as General Internal Medicine, emergency medicine and internal medicine subspecialties.

**Figure 41: Physician Demand and Supply per 100,000 Persons in the State of Mississippi**

Specialty	Supply of Physicians per 100,000 Persons	Demand for Physicians per 100,000 Persons in Mississippi				Gap in Demand and Supply	
	2005	2005	2010	2015	2020	2005 - 2005	2005 -2020
<b>Total Physicians</b>	170.11	238.15	251.44	258.73	264.70	40%	56%
<b>Total Patient Care Physicians</b>	159.39	223.80	236.29	243.13	248.73	40%	56%
<b>General Primary Care</b>	56.95	83.54	87.03	89.29	91.22	47%	60%
GP & FP	26.19	32.03	34.23	35.16	35.83	22%	37%
General Internal Med.	17.96	35.19	37.54	39.20	40.68	96%	126%
Pediatrics	12.80	16.32	15.27	14.93	14.71	28%	15%
<b>Medical Specialties</b>	19.86	33.31	37.02	39.01	40.68	68%	105%
Cardiovascular Disease	4.36	6.81	7.71	8.21	8.67	56%	99%
Gastroenterology	2.88	3.44	3.84	3.99	4.09	19%	42%
IM Subspecialties	5.94	13.91	15.43	16.27	16.96	134%	185%
Nephrology	2.11	2.88	3.12	3.35	3.56	37%	69%
Pulmonology	2.32	2.99	3.41	3.58	3.73	29%	61%
Other Medical Spec.	2.25	3.27	3.52	3.61	3.67	45%	63%
<b>Surgery</b>	43.20	44.41	46.63	47.95	49.08	3%	14%
General Surgery	10.09	7.91	8.67	9.05	9.38	-22%	-7%
Ob/Gyn	11.18	12.86	11.93	11.64	11.34	15%	1%
Ophthalmology	4.78	5.61	6.34	6.76	7.17	17%	50%
Orthopedic Surgery	6.12	6.65	7.42	7.68	7.90	9%	29%
Otolaryngology	3.23	2.93	3.11	3.20	3.26	-9%	1%
Thoracic Surgery	1.58	1.16	1.28	1.34	1.39	-27%	-12%
Urology	2.95	3.38	3.59	3.81	4.01	14%	36%
Other Surgical Spec.	3.27	3.91	4.29	4.47	4.61	20%	41%
<b>Other Patient Care</b>	39.37	62.55	65.60	66.88	67.76	59%	72%
Anesthesiology	8.47	11.60	12.25	12.63	12.95	37%	53%
Emergency Medicine	6.01	11.84	11.83	11.88	11.90	97%	98%
Neurology	2.95	3.86	4.25	4.40	4.52	31%	53%
Pathology	4.50	5.20	5.56	5.73	5.85	16%	30%
Psychiatry	6.71	14.70	14.98	14.96	14.83	119%	121%
Radiology	7.63	8.79	9.27	9.56	9.81	15%	29%
Other Specialties	3.09	6.57	7.46	7.71	7.90	112%	155%
<b>Non Patient Care Physicians</b>	10.72	14.34	15.16	15.60	15.97	34%	49%

**Source:** Demand of physicians from the Lewin PDSM model. Supply of physicians from AMA.

From past experience, we have learned that residency training location is a material determinant of eventual first practice location. Surveys conducted with UMMC residents indicate that 67 percent of those surveyed will begin their professional careers in a location near or at the site at which respondents performed a residency or fellowship. The residency

proximity factor appears to outweigh undergraduate location and medical school location in this cohort of approximately 100 respondents. Given the importance of the Graduate Medical Education experience as a determinant of eventual first practice location, UMMC stands as a vital resource to grow and renew the State’s physician workforce.<sup>38</sup>

Even considering UHC’s high GME and nursing retention rates, the training activities are not, as a sole source, adequate to meet the future needs of the entire biomedical workforce. It is important to note that one of the significant rate-limiting factors in GME is the inability of hospitals, even in geographic shortage areas, to increase the size of their graduate medical education programs. Hospitals receive payments from Medicare to partially underwrite the costs associated with the extraordinary requirements of GME training. Each hospital with GME programs has established a “residency cap” based on the number of individuals in training after a three-year accumulation period. Once established, caps cannot be increased even if community demands indicate a profound physician shortage. A recent one-time redistribution of unfilled residency slots did not yield additional residency positions for UMMC.

The physician workforce serves the important role of meeting the health care needs of the Mississippi community and plays an equally important role as an economic entity within the state. To measure the impact of the physician community that received GME training from UMMC, we applied direct effect IMPLAN multipliers. As shown in Figure 42, each physician that graduated from the UMMC GME program and subsequently practiced in the region resulted in 5.1 jobs in any given year.

**Figure 42: Annual Economic Impact of Physician Community that Received GME in UMMC and Practiced in UMMC**

	Direct	Indirect	Induced	Total
Output (\$)	\$194,747,584	\$67,545,538	\$67,202,172	\$329,495,294
Labor Income (\$)	\$85,119,896	\$24,665,608	\$19,119,889	\$128,905,396
Employment (jobs)	313	836	780	1,928

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure 10 for discussion of economic impact terms.

In addition to the direct economic impact of the physician workforce, the physician workforce also contributes economically by alleviating the cost burden of diseases, diminishing the loss in productivity and helping to maintain a healthy workforce.

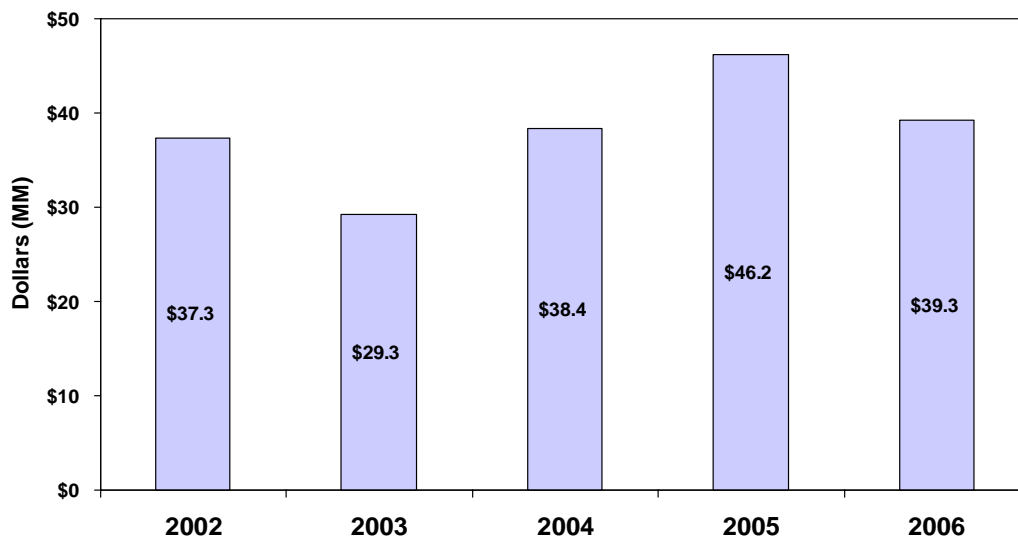
## 5.4 Research

UMMC has focused on expanding its research programs in recent years. Total research award sources have trended upward since 2003 (Figure 43). Research is a strategic priority for the institution as it strives to evolve into a leading biomedical center. The scholarship activities

<sup>38</sup> “Factors Affecting Choice of Practice Location”, results of the 2004-2005 residency year survey conducted by the UMMC Department of Institutional Research.

pursued at an AMC generally conveys substantial benefits to the AMC enterprise and to the state and regional market in which the AMC operates. A high degree of research and scholarly activity also contributes significantly to the ability to recruit and retain top-flight faculty and their associated clinical and research programs.

**Figure 43: UMMC Research Award Sources FY 2002-2006  
(in millions)**



**Source:** Institutional Annual Report on Research and Sponsored Programs FY 2002-2006.

UMMC has been successful in securing external research funding to support its mission. UMMC attracted over \$39 million in funding from all sources in 2006. Of the \$39 million in awards for 2006, approximately \$5.8 million are from non-Federal sources.

Consistent with the NIH Roadmap for Medical Research,<sup>39</sup> UMMC is reacting to the recent NIH mandate that prioritizes translational research through application for a Clinical and Translational Service Award planning grant. Given the flat NIH budget, competition for federal biomedical research dollars is increasing nationally. The emphasis on translational research will provide UMMC the opportunity to maintain its competitive status for NIH funding. The NIH established the Clinical and Translational Science Award (CTSA) to replace the more traditional General Clinical Research Center (GCRC) model. According to the NIH,

“Scientists are increasingly aware that this bench-to-bedside approach to translational research is really a two-way street. Basic scientists provide clinicians with new tools for

<sup>39</sup> The National Institutes of Health developed the NIH Roadmap for Medical Research in 2002 based on three broad themes. These themes include: New Pathways to Discovery representing investment in fundamental basic science research; Research Teams of the Future supporting partnerships supporting research including public-private partnerships, and; Re-engineering the Clinical Research Enterprise which involves “harmonization” efforts between regulatory policies, training for researchers, and the development of academic homes for translational research. Funding priorities have been reorganized along these thematic lines. Information about the NIH roadmap can be accessed at: <http://nihroadmap.nih.gov/>

use in patients and for assessment of their impact, and clinical researchers make novel observations about the nature and progression of disease that often stimulate basic investigations. Translational research has proven to be a powerful process that drives the clinical research engine. However, a stronger research infrastructure could strengthen and accelerate this critical part of the clinical research enterprise.”<sup>40</sup>

The research portfolio is primarily sponsored and operated by The School of Medicine. The UMMC research portfolio includes notable national programs including The Delta Health Alliance and The Jackson Heart Study.

**Figure 44: Research Award Distribution & Sources (FY 2006)**

Research Entity	Award Distribution (\$ in thousands)
The School of Medicine	30,985
The School of Nursing	1,045
The School of Health Related Professions	342
The School of Dentistry	1,501
Teaching Hospital	404
Office of Strategic Research Alliances	4,962
Academic Affairs	11
<b>TOTAL</b>	<b>\$39,254</b>
Source	Award Source (\$ in thousands)
<b>Federal</b>	
Department of Agriculture	433
Department of Health and Human Services	30,442
National Science Foundation	142
National Aeronautics and Space Admin.	1,107
Department of Defense	183
<b>Subtotal, Federal</b>	<b>32,307</b>
<b>Total State Agencies</b>	<b>1,192</b>
<b>Total Foundations and Professional Org.</b>	<b>2,238</b>
<b>Total Business and Industry</b>	<b>3,517</b>
<b>TOTAL</b>	<b>\$39,254</b>

**Source:** 2006 Institutional Annual Report on Research and Sponsored Programs, FY 2006.

The Jackson Heart Study represents the expansion of the Atherosclerosis Risk in Communities Study (ARIC) that focused on four geographically diverse communities in the United States; Jackson, Mississippi among them. The Jackson Heart Study is examining factors that lead to the development of heart disease in African-American men and women. As the study progresses, it will include up to 6,000 subjects and is expected to yield insights similar to those that have

<sup>40</sup> The NIH Roadmap For Medical Research: Re-engineering the Clinical Research Enterprise, Translational Research. Accessed at: <http://nihroadmap.nih.gov/clinicalresearch/overview-translational.asp>

emanated from notable studies such as the Framingham Heart Study in Boston. The Jackson Heart Study is a collaborative effort among the National Heart Lung and Blood Institute of the NIH, Jackson State University, Tougaloo College, and UMMC.

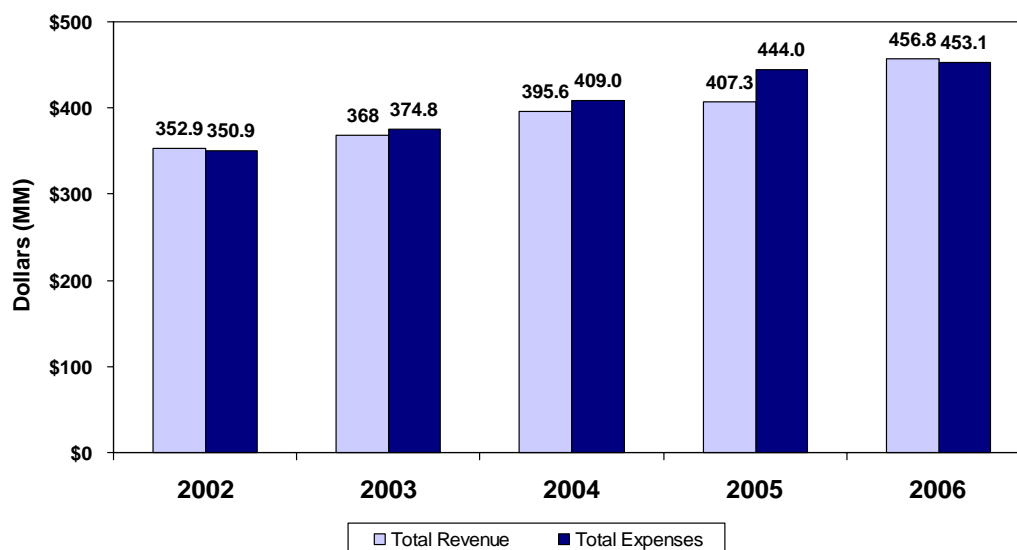
In 1999, Dr. Marshall Bouldin began the development of a series of diabetes treatment clinics that have been funded by the Delta Health Alliance. Given the prevalence of diabetes and the paucity of resources for diabetes management in the Delta region, Dr. Bouldin has developed a unique model for diabetes care that dedicates a diverse team of health professionals to the diabetes management task. The care system is delivered in concert with a clinical outcomes measurement system. The clinical results of this program have been excellent and the program has attracted significant federal funding.

## 6 UMMC as a Safety Net Provider

### 6.1 Financial overview

In this section, we provide a financial assessment of UHC. UHC has experienced expense growth in excess of revenue since FY 2003. In FY 2006, UHC revenue exceeded expense for the first time since FY 2002, representing a substantial turnaround for the organization. Improved financial performance was due, in part, to the alterations in the State’s DSH formula as mandated by the Centers for Medicare and Medicaid Services. We describe the impact of the change on Mississippi’s DSH program to both UHC and the State later in this section.

**Figure 45: UHC Total Revenue and Expenses FY 2002-2006**  
(in millions)

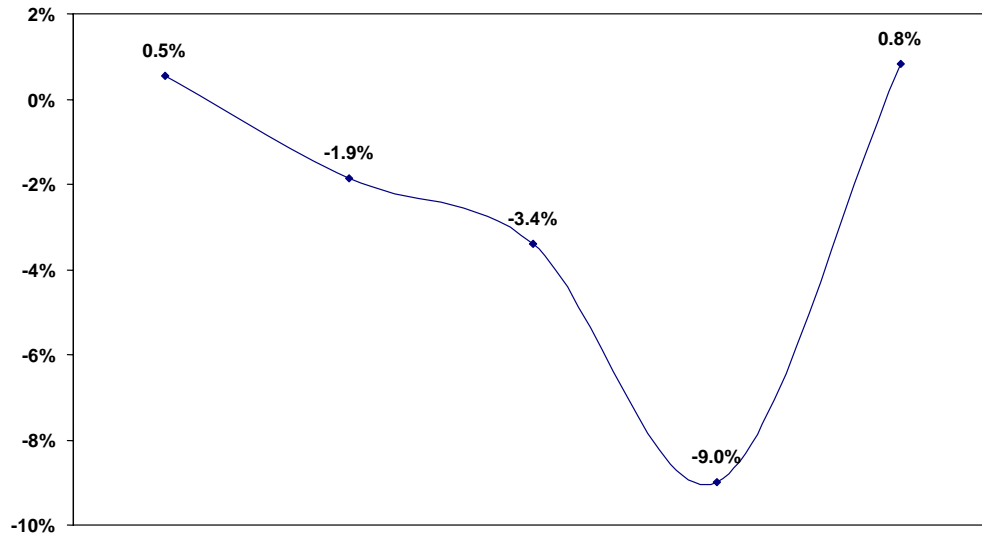


**Source:** University Hospital and Clinics, Statement of Revenue and Expenses, FY2002-2006.

From FY 2001 to FY 2004, UHC’s net margin eroded substantially, decreasing by more than 9 percentage points during the period. Recent financial results have been positive. However,

UHC still remains under the critical threshold for net margin. Hospitals minimally need at least a minimum of 2 to 4 percent<sup>41</sup> net total margin in order to fund working capital, meet current obligations, and reinvest in capital to continue to providing to mission critical services. Over the past twenty years, hospital total margins are in the 4 to 5 percent range.

**Figure 46: UHC Net Total Margin FY 2002-2006**



**Source:** University Hospital and Clinics, FY 2002-2006, Statement of Revenue and Expenses.<sup>42</sup>

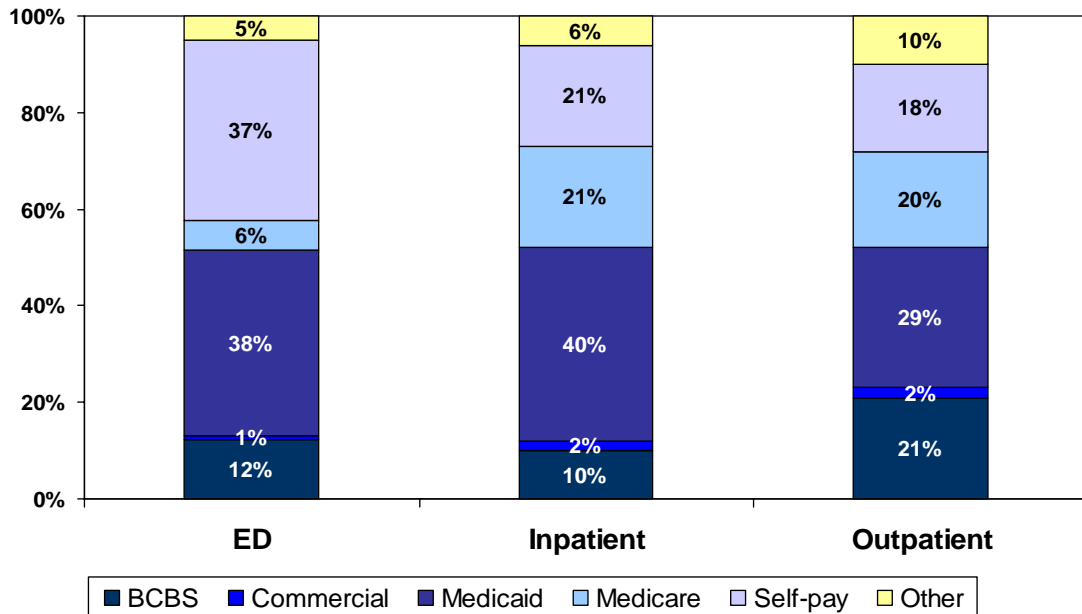
Given the large proportion of Medicaid and uninsured patients receiving UHC services, it is difficult to achieve a positive margin through cross-subsidies from more robust payer sources such as Medicare and other commercial payers. Since the safety net population represents a majority of the medical center’s patient volume, UHC would have to generate a margin on non-safety net patients practically unattainable given expected non-public payer reimbursement. As we highlighted in Figure 47, UMMC services the majority of Medicaid patients in the Jackson MSA, compared to a small proportion of Medicare patients.

UHC’s payer mix plays a material role in the financial operations of the clinical enterprise and UMMC in total. For example, a portion of the funding for GME is paid to AMCs based on their Medicare volume. AMCs with relatively low Medicare volume find themselves more dependent on public and other third party payer sources to afford the cost and benefit of GME activities.

<sup>41</sup> National Association of Public Hospitals (NAPH) Hospital Characteristics Survey, 2002.

<sup>42</sup> Net Margin calculated with following formula:  $[(\text{Total Revenues} - \text{Total Expenses}) / \text{Total Revenues}]$

**Figure 47: UHC Payer Mix by Setting FY 2005**



Source: University Hospital and Clinics, FY 2002-2006, Statement of Revenue and Expenses.

## **6.2 UMMC, the region’s safety net resource, is facing increasing financial pressures**

UMMC provides clinical services; trains and educates Mississippi’s biomedical workforce; and represents the State’s principal locus for bioscience research and scholarly activity. It has been argued that UMMC “plays a crucial role in providing clinical services for the area, through its integrated network of four hospitals and eleven offsite clinics, as well as research, education, and training medical and clinical workforce.”<sup>43</sup>

UMMC exercises a vital role for the most vulnerable Mississippians as the primary safety net provider. IOM’s 2000 report, *America’s Health Care Safety Net: Intact but Endangered*, describes safety net providers as having two distinguishing characteristics:

1. By legal mandate or explicitly adopted mission they maintain an “open door,” offering access to services to patients regardless of their ability to pay; and

<sup>43</sup> Janis Quinn, *Promises Kept: The University of Mississippi Medical Center*. Jackson: University Press of Mississippi, 2005.

2. A substantial share of their patient mix is uninsured, Medicaid, and other vulnerable patients.<sup>44</sup>

By the role it has traditionally accepted, and by the IOM’s definition, UMMC fulfills the criteria that distinguish safety-net providers. By statute, Mississippi Code stipulates UMMC’s primary purpose:

*“...All University of Mississippi Medical Center locations shall provide in the aggregate not less than fifty percent (50%) of their services to indigent persons including qualified beneficiaries of the State Medicaid Program.”<sup>45</sup>*

Furthermore, The National Association of Public Hospitals (NAPH) describes common governance, financing, and services delivered by safety net hospitals.<sup>46</sup> UMMC shares all of these characteristics, as summarized in the following figure:

**Figure 48: Characteristics of Safety Net Providers**

Characteristics of Safety Net Providers	Does UMMC Meet Criteria?
Legally mandated role	Yes
Serve a high volume of low income patients	Yes
Provide high levels of uncompensated care	Yes
Receive state and local funding	Yes
Operates at low margins	Yes
Operates a level I trauma center	Yes
Delivers a large volume of births	Yes
Provides NICU services	Yes
Provides PICU services	Yes
Trains health care workforce	Yes

**Source:** Lewin analysis and NAPH.

Payments made to hospitals for the provision of uncompensated care costs (UCC) come from a number of Federal, State, and local sources. Resources supporting UMMC’s uncompensated care include:

- **Medicaid Disproportionate Share Hospital (DSH) payments:** Medicaid DSH payments, intended to provide additional institutional funding for hospitals with a large share of Medicaid patients, are funded from a combination of Federal and State sources. Mississippi has one of the highest Federal Medical Assistance Percentages (FMAP) among all states, at 76 percent. This means that for each dollar that Mississippi contributes to DSH, Federal sources contribute \$3.17 to the State’s DSH pool. Eligible hospitals in Mississippi include government, state, and private hospitals. To qualify for

<sup>44</sup> Marion Lewin and Stuart Altman, eds. Institute of Medicine, *America’s Safety-Net: Intact but Endangered* (Washington, DC: National Academy Press, March 2000).

<sup>45</sup> Mississippi Code/TITLE 37 EDUCATION/CHAPTER 115 UNVIERSITY OF MISSISSIPPI/SCHOOL OF MEDICINE/§ 37-115-27. Location of school and hospital.

<sup>46</sup> NAPH: [http://www.naph.org/template.cfm?Section=About\\_Our\\_Members](http://www.naph.org/template.cfm?Section=About_Our_Members).



DSH payment consideration, hospitals must have a Medicaid Inpatient Utilization (MIU)<sup>47</sup> of at least 15 percent, and provide inpatient obstetrical (OB) services. DSH payments are made to eligible hospitals based on their proportion of uncompensated care provided as compared to other hospitals statewide.

- **Katrina Relief:** Under S. 1932, UMMC is also eligible to receive one-time funding for services it provided to eligible patients under the Katrina Relief Fund. Eligible patients must have resided in one of 43 eligible counties in Mississippi determined by the Department of Medicaid (DOM).
- **State Appropriations:** Mississippi appropriates funds annually to support UMMC's clinical, and scholarly missions. UMMC delivers a certain portion of the state appropriation to the hospital each year to defray certain un-recovered safety net care costs and to cover some of the funds needed to transfer to the Division of Medicaid for matching purposes.
- **Mississippi Trauma Care Trust Fund:** In 1998, (HB 966) established permanent funding for the Trauma Care Trust Fund. The legislation provides funding assistance for hospitals' uninsured trauma care costs. Current funding is approximately \$8 million. The State distributes these funds to eligible hospitals based upon their share of uncompensated trauma care provided. The hospitals only receive a fraction of their cost because of the limited funding available. Hospital reimbursement in 2005 was equivalent to approximately 4.8 percent of gross charges.

Funding from state and local municipalities is critical to maintaining the viability of mission-driven providers, such as UMMC, that have a high-uncompensated care burden. State and local entities finance a significant portion of uncompensated care costs incurred by safety net providers. State and local subsidies suffice approximately 15 percent of net hospital revenue, and finance approximately 39 percent of un-reimbursed care, at safety net hospitals nationwide.<sup>48</sup> Absent these critical sources of funding, the mission-related activities of safety net providers would be further compromised.

In FY 2006, UMMC incurred approximately \$35.1 million in un-recovered costs for clinical services provided to Medicaid and uninsured patients. The total cost for treating these patients was approximately \$232 million, offset by approximately \$197 million from various State and Federal funding sources. Under the Medicaid Transfer Program<sup>49</sup> UMMC returned \$34.4 million in Medicaid assessment and transfer payments to the Mississippi Department of Medicaid (DOM), nearly the equivalent amount of its un-recovered costs in FY 2006 (**Error! Reference source not found.**<sup>49</sup>).

UMMC has absorbed mounting losses for care provided to its safety net population. In Figure 49, below, we demonstrate the trend in UCC and un-recovered UCC costs for the past five fiscal years. The total uncompensated care UMMC provided grew from \$175 million in FY 2002 to

---

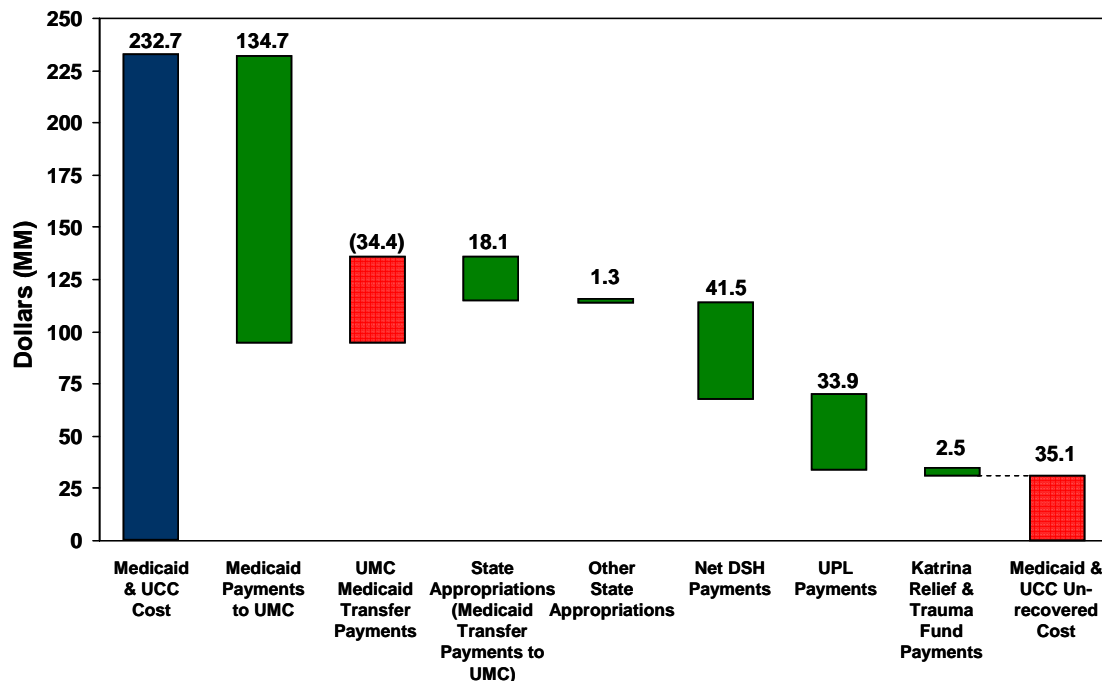
<sup>47</sup> Medicaid Inpatient Utilization=Medicaid Inpatient Days/Total Inpatient Days

<sup>48</sup> NAPH Issue Brief: How are safety-net hospitals financed? Who pays for "free care"? September, 2004.

<sup>49</sup> Explain the program in this footnote

\$232 million in FY 2006 as a result of high Medicaid and uninsured patient volume and the overall increase in cost of care. Payments and funding for the UMMC's uncompensated care burden have not increased apace the cost of care.

**Figure 49: UMMC Un-recovered Medicaid and UCC Costs Funds Flow, FY 2006**



**Source:** Lewin analysis of University Hospital and Clinics financial statements, FY 2006.

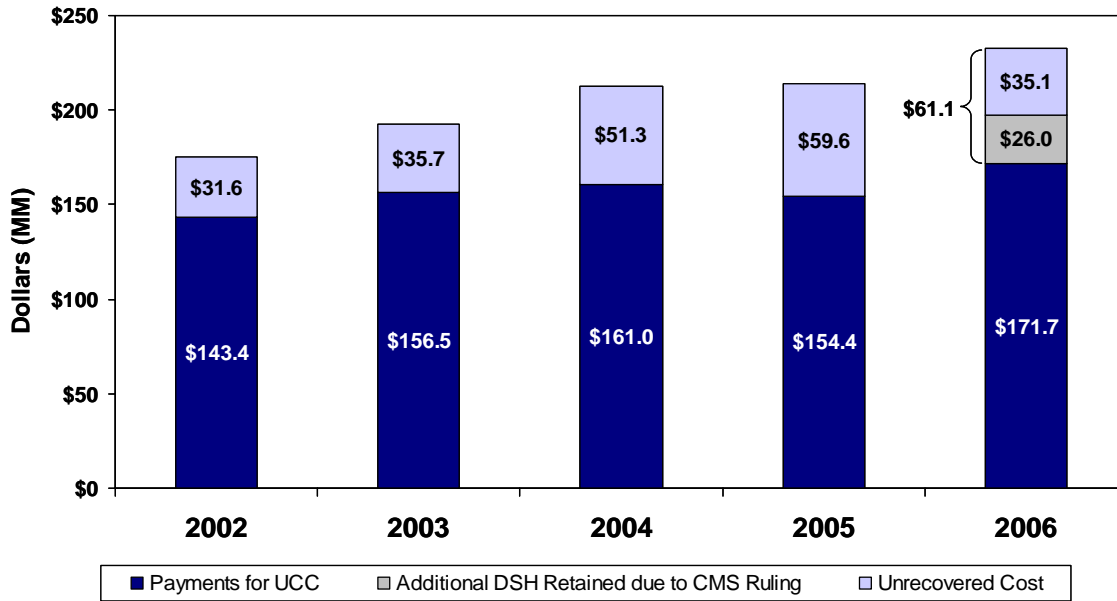
Note: Blue shading indicates the total cost of services delivered to Medicaid and uninsured patients prior to any payment. Green shading indicates payments to UHC to offset the cost of these services; Red shading indicates payment outflows made by UHC, which increase its un-recovered costs.

UMMC benefited from the Centers for Medicare & Medicaid (CMS) ruling altering the funding mechanism for Mississippi's DSH program.<sup>50</sup> The ruling allowed UMMC to return a lower percentage (24 percent versus 72 percent) of its total DSH payments to the DOM. Prior to CMS's ruling, UMMC would have returned about \$39.0 million (72 percent) of its total DSH payments versus \$13.0 million (24 percent) under the current program. Thus, the ruling enabled UMMC to apply \$26.0 million (48 percent) of its total qualifying DSH payments to further offset its un-recovered UCC, rather than channeling this amount to the DOM. Absent the change in the DSH program, UMMC would have lost approximately \$61.1 million in un-recovered UCC for 2006 (

). The impact of the changes to Mississippi's DSH program is discussed further in this report.

<sup>50</sup> A discussion of the changes to the Mississippi DSH program resulting from the CMS ruling can be found at: <http://www.governorbarbour.com/news/2006/jul/Medicaidmemo.htm>

**Figure 50: UMMC Un-recovered Medicaid and UCC Costs FY 2002-2006**



**Source:** Lewin analysis of University Hospital and Clinics financial statements.

Since the Medicaid Transfer Program’s inception in 1995, UMMC has incurred increasing deficits. Under this financing mechanism, the State appropriates an annual amount to UMMC in Medicaid Transfer Payments. UMMC then returns an amount to the Mississippi DOM that is equivalent to the State match of UMMC’s Medicaid service payments for the year. Under the current State match of 24 percent, UMMC returns \$0.24 to the DOM for each dollar it receives, netting \$0.76 as payment for services it provides to Medicaid beneficiaries. Under this payment scenario, UMMC actually provides the State match for Medicaid payments it receives from the DOM. Participation in the Medicaid Transfer Program has resulted in \$60.4 million in accumulated deficits since 1995.

**Figure 51: UMMC Medicaid Transfer Program FY 1995-2006**  
(in millions)

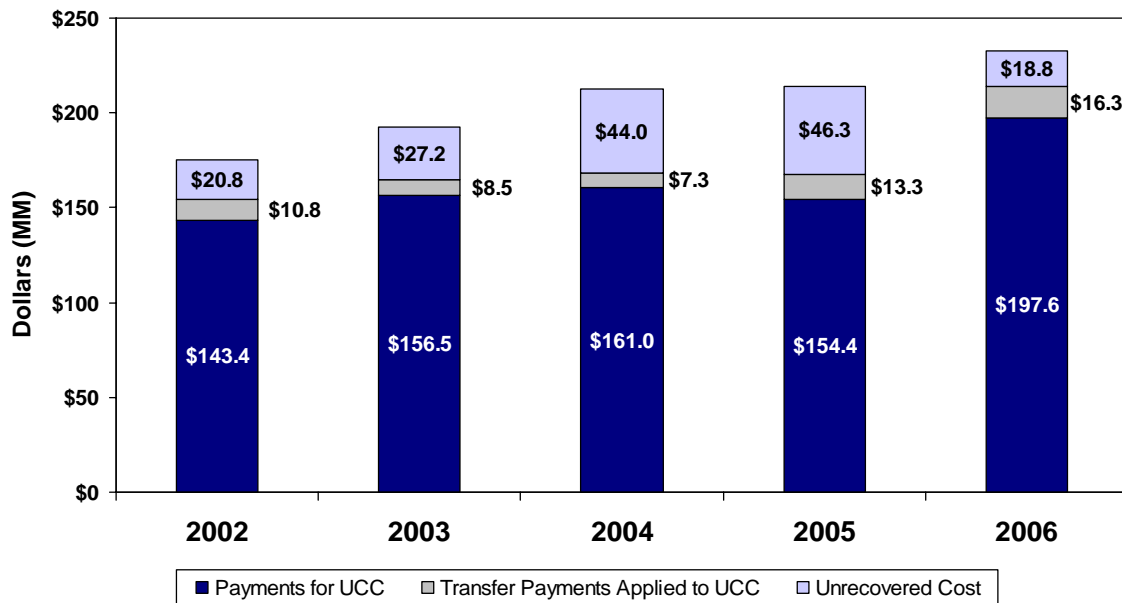
Year	State Funds Appropriated to UMMC for Match	UHC Transfer Payments to Medicaid	Annual Surplus (Deficit) Due to Transfer Program
1995	\$12.4	\$12.4	\$0.0
1996	\$13.3	\$13.5	\$(0.2)
1997	\$13.3	\$15.9	\$(2.6)
1998	\$15.5	\$13.5	\$2.0
1999	\$16.8	\$17.6	\$(0.8)
2000	\$18.2	\$17.8	\$0.4
2001	\$18.6	\$21.6	\$(3.0)
2002	\$19.1	\$29.9	\$(10.8)
2003	\$20.1	\$28.6	\$(8.5)
2004	\$18.1	\$25.3	\$(7.3)
2005	\$18.1	\$31.4	\$(13.3)
2006	\$18.1	\$34.4	\$(16.3)
Total	\$201.5	\$261.9	\$(60.4)

**Source:** Lewin analysis of University Hospital and Clinics financial statements.

Inflows to UMMC have lagged the increase in the cost of care to Medicaid beneficiaries. Under the current funding arrangement, UMMC returns more funds to the DOM as its payments for Medicaid services increase. Appropriations the University receives under this program have remained relatively flat since 2000.

Figure 52 describes the incremental impact on UMMC's finances if the Medicaid Transfer Program was budget-neutral to the University (e.g., payments made to the UMMC equaled the transfer payments UMMC makes to the DOM).

**Figure 52: UMMC Un-recovered Medicaid and UCC Costs Adjusted for Deficits from the Medicaid Transfer Program FY 2002-2006**



**Source:** Lewin analysis of University Hospital and Clinics financial statements.

CMS mandated changes on the Mississippi DSH program have material impact on the Medicaid and DSH programs in the State. The impact of the CMS ruling and the State’s proposal to fill a funding gap estimated at approximately \$82 million are summarized below.

Under the prior DSH program, public facilities returned 72 percent (\$123 million) of their total DSH funding (\$171 million) to the DOM via an intergovernmental transfer (IGT), which was applied to obtain matching funds from Federal sources.

- The DOM used the DSH funds (\$123 million) to secure Federal matching funds at the state’s FMAP (76 percent). This formula yielded an additional \$390 million in Federal funds for Medicaid DSH payments and medical service claims.

- CMS ruled that the DOM could only use 24 percent (\$41 million) of public facilities' DSH funds as the state share to draw down Federal matching funds (\$130 million), equivalent to the total funding pool (\$171 million) for high DSH providers.
- The ruling allowed public hospitals to retain 48 percent of their DSH funding (72 percent minus 24 percent), or \$82 million to cover the cost of services to indigents; however, it reduced the dollars available for the State to pay Medicaid medical service claims by \$342 million (\$82 million now retained by public hospitals, and the \$260 million matched in Federal dollars).

The State has proposed the following financing mechanism to fill the \$342 million GAP in DOM funding as a result of CMS's ruling:

- Two sources of funding would fill the \$82 million GAP that would be used as State matching dollars: 1) State general funds; and 2) An assessment on all (government state-owned, government non-state owned, private) providers' gross revenues of approximately 0.9 percent. Each source would generate \$41 million, or \$82 million in total
- The \$82 million would then be applied as State match dollars to draw down \$260 million in Federal matching funds, effectively filling the \$342 million GAP.
- Under this proposal, three sources could provide the \$123 million as State match, and would generate \$390 in additional Federal matching dollars for the DOM, a total of \$513 million. This would be the equivalent amount of funding administered by the DOM prior to the changes Mississippi's DSH program.

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) legislated annual reporting and audit requirements for the DSH program beginning in fiscal year 2004. Based on an audit of selected states' Medicaid DSH programs, Office of Inspector General found that nine of the ten states reviewed did not comply with the hospital-specific DSH limits.<sup>51</sup> Consequently, DSH payments exceeded the hospital-specific limits by approximately \$1.6 billion.

UMMC fulfills a number of roles. The clinical operations match the characteristics of a "safety net" provider. UMMC delivers a high volume of care in a reimbursement environment that falls short of paying the cost of care by approximately \$35 million in fiscal year 2005. Recent alterations in the funding mechanism for Medicaid and uninsured patients have resulted in UMMC's ability to retain an increased amount of its revenue to suffice costs. Future changes in reimbursement policy that would decrease the amount of revenue UMMC retains would put further downward pressure on UMMC's finances.

### **6.3 Mission related costs of UMMC**

In this sub section, we assess UMMC's current mission and provide an estimate of mission-related costs relative to the overall operating costs. Academic health centers and other teaching

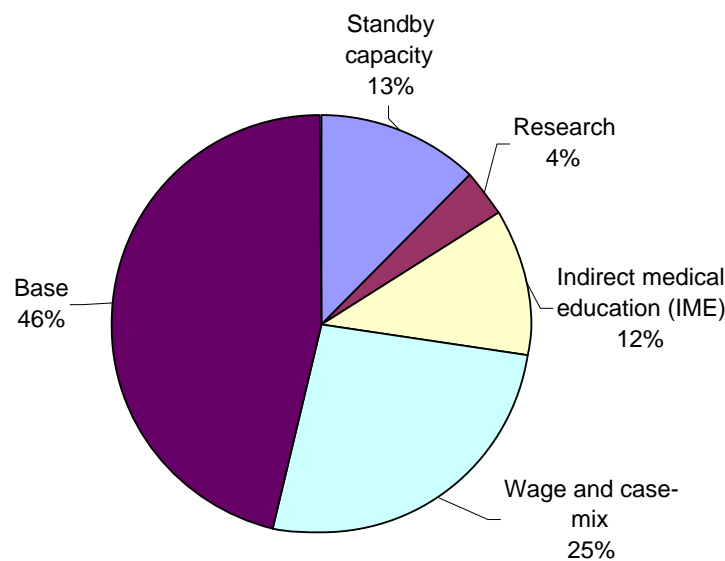
---

<sup>51</sup> Department of Health and Human Services, Office of Inspector General, "Audit of Selected States' Medicaid Disproportionate Share Hospital Programs," March 2006.

hospitals face higher patient care costs than non-teaching community hospitals, because of their commitment to missions of GME, biomedical research and the maintenance of standby capacity for medically complex patients. The high cost of academic health centers and other teaching hospitals has been attributed to the unique missions these institutions pursue.

Since its inception in 1983, the Medicare inpatient hospital prospective payment system has made separate payments to teaching hospitals to cover the “direct” and “indirect” costs associated with GME. Medicare’s policy of establishing payments for indirect GME costs was made in recognition of the relatively higher patient care cost at teaching hospitals. Research indicates that after adjusting for case mix differences, average Medicare costs per case at teaching hospitals were 27 to 39 percent higher than for non-teaching hospitals in 1999, depending on the number of medical students per bed.

**Figure 53: Mission Related Costs of Teaching Hospitals**

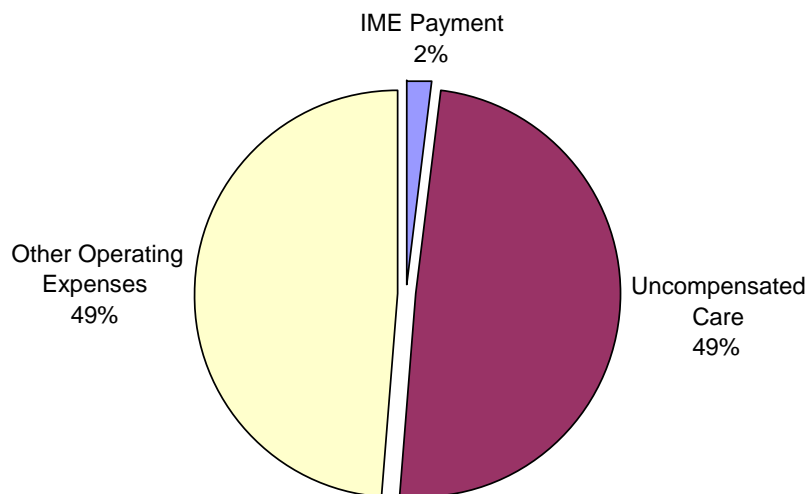


**Source:** Lane Koenig, Allen Dobson, Silver Ho, Jonathan M. Siegel, David Blumenthal, and Joel S. Weissman, Estimating The Mission-Related Costs Of Teaching Hospitals, Health Affairs, Vol 22, Issue 6, 112-122.

To estimate these indirect costs, researchers have historically used teaching intensity as measured by a hospital’s ratio of interns and residents to beds (IRB), which is correlated with academic activities, such as increased use of diagnostic or ancillary services and the availability of “state of the art” treatment technologies. As the IRB is correlated with other teaching hospital missions, estimates of the relationship between teaching intensity and patient care costs by MedPAC and others likely overstate the indirect costs associated with the pure teaching mission and understate the full cost of all the other missions pursued by teaching hospitals.

With an IRB of 0.42, UMMC classifies as a major teaching hospital.<sup>52</sup> As shown in Figure 54, IME payments comprise approximately 2 percent of the hospital's operating expenses and the uncompensated care comprises almost 47 percent of the hospital's operating expenses.

**Figure 54: IME Payments and Uncompensated Care Costs as a Percent of UMMC Operating Costs**



## **6.4 Cost shift in relation to UMMC**

Given that UMMC is a public AMC, it is a critical safety net provider for the community. In this subsection, we will document how the provision of uncompensated and under-compensated care by UMMC might have resulted in a “cost shift payment hydraulic” in the community if public support were not provided. Cost shift is defined as systematically higher prices paid by one payer group to offset lower prices paid by another. As a public hospital, UHC provides uncompensated and under-compensated care primarily through public funding sources. The public funding mechanism does not require UHC to attempt price offsets by seeking higher

---

<sup>52</sup> Major teaching hospitals are defined as short term acute care hospitals with an IRB of 0.25 and above.

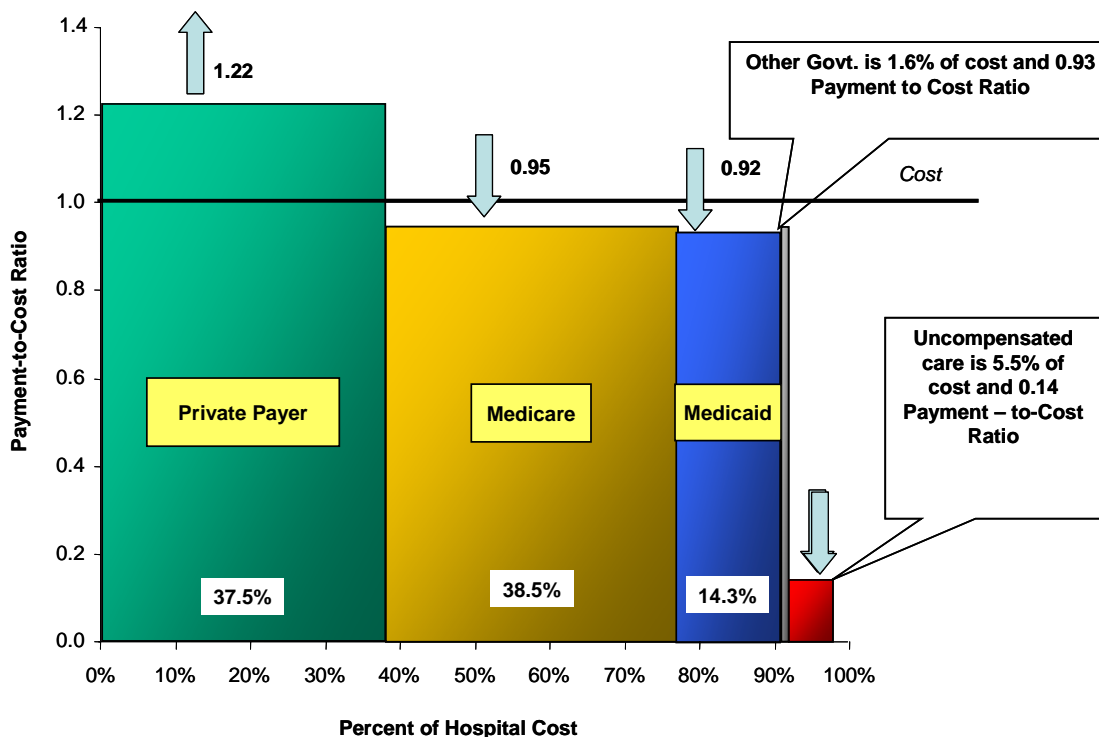


prices from other payer groups, i.e. commercial payers. The public funding mechanism, therefore, indirectly results in cost savings to the commercial payers.

Figure 55 shows the cost-shift payment hydraulic for U.S. term acute care hospitals in 2004. The vertical axis indicates the payment-to-cost ratio. For every dollar of cost, this ratio indicates that the payment to cost ratio of 1.22 for private payers means that for each dollar of cost, hospitals receive \$1.22 from private payers. Payments in excess of cost from private payers cover shortfalls by other payers and uncompensated care and contribute to positive hospital margins. The horizontal axis indicates the percentage of hospital costs associated with each payer. For instance, private payers accounted for approximately 37.5 percent of costs in 2004.

The intersection between the two axes provides useful information. A payer representing a large proportion of the cost base with a payment to cost ratio less than one could be detrimental to a hospital's finances. For example in 2004, Medicare paid 95 cents on the dollar and accounted for 38.5 percent of costs. In aggregate, Medicare thus reduced total hospital margins by 1.93 percentage points. This analysis illustrates the inverse relationship between payment-to-cost ratios for below cost payers (Medicare, Medicaid and uncompensated care) and the level of cross-subsidizing or cost shifting to above cost payers (private payers). The differences in payment to cost ratios between public and private payers exert "hydraulic" pressures for cost shifting on the nation's hospitals.

**Figure 55: Cost Shift Hydraulic for the Nation's Hospital**

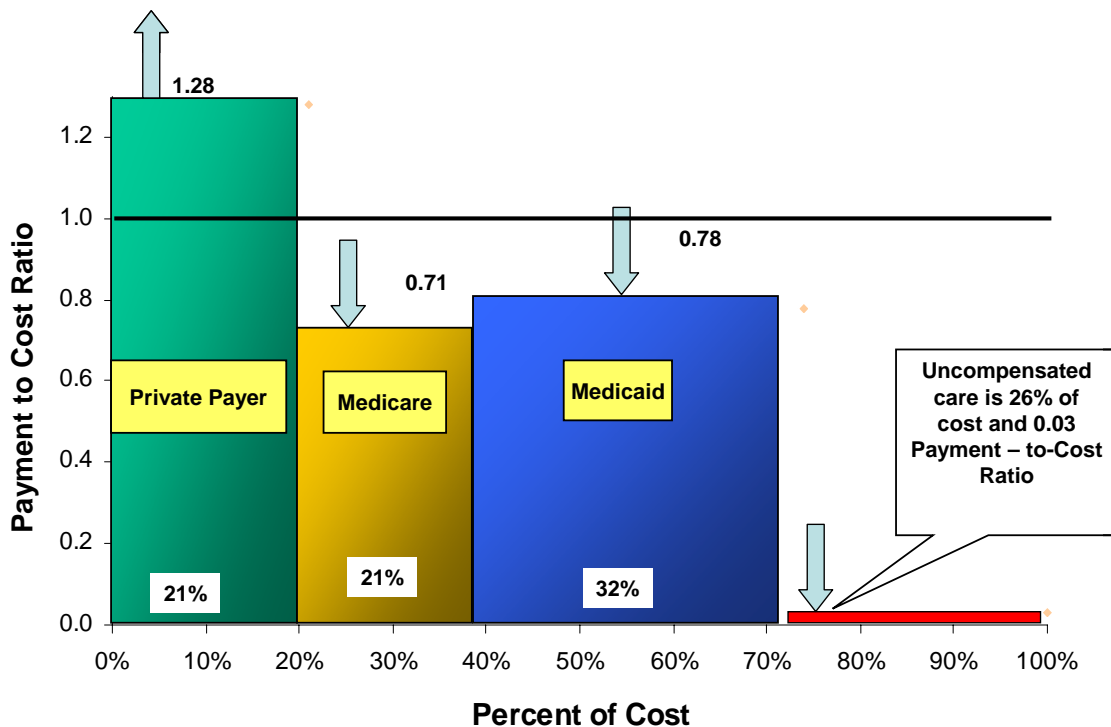


**Source:** Al Dobson, Joan DaVanzo and Namrata Sen, "The Cost-Shift Payment 'Hydraulic': Foundation, History, and Implications," Health Affairs, January/February 2006, volume 25, number 1, Exhibit 1, p.24.

Compared to the nation’s hospitals, UHC is subject to greater higher cost shifting pressures due to Medicare and Medicaid payment shortfalls and relatively high levels of uncompensated care (refer to Figure 56). The UHC payer mix indicates that Medicaid is the largest payer for UMMC at 32 percent of hospital expenses, followed by uncompensated care at 26 percent of hospital expenses. Although, the private payer payment to cost ratio for UMMC is higher than the private payer payment to cost for the nation’s hospitals by six percentage points, the percentage of costs associated with private payer patients is substantially lower. The payment shortfall due to underpayment by Medicare, Medicaid and uncompensated care creates substantial financial pressure on UMMC.

Despite the relatively high private payer payment to cost ratio for UMMC, the low proportion of private payer costs does not allow UMMC to offset some of the payment shortfalls through private payer “overpayment”. In the aggregate, Medicare, Medicaid and uncompensated care collectively reduce the hospital margins by 38 percentage points and the private payer increase the hospital margins by six percentage points. Hence, UMMC clearly suffers a payment differential that is not fully overcome by the commercial payers. The payer mix of UMMC and the associated payment shortfalls due to Medicare, Medicaid and uncompensated care can only be cross subsidized by the private payers if they pay approximately three times the cost of private payer patients, i.e., a private payer payment to cost ratio of 3. Such a funding strategy is clearly not feasible and the private payers will be unwilling to pay this “sick tax.”

**Figure 56: Cost Shift Hydraulic for UMMC**



Source: The Lewin Group analysis of the 2005 AHA Annual Survey data provided by University of Mississippi Medical Center

As noted above, this payment shortfall is made up by public funds in the form of state appropriations. These public funds reduce the need to cost shift to other local hospitals thereby reducing premiums in the community.

## 7 Conclusion

As an AMC, UMMC is a complex and unique enterprise comprised of the following components: the University academic programs, UHC, Durant Nursing Home, scientific and research development services, and lastly, the University of Mississippi Physicians Practice Plan. UMMC represents a significant economic, clinical, tertiary care, and safety net asset for the Jackson MSA and the state. UMMC provides many health care services that are not otherwise available in the state, such as organ and bone marrow transplant services, trauma services through its Level I Trauma Center, and comprehensive children's health services including a Level III Neonatal Intensive Care Unit. UMMC also plays a critical role in workforce development in light of the acute care shortage of physicians and the state's relatively high incidence of chronic disease.

Overall, UMMC represents approximately \$1.4 billion in total economic activity for the Jackson MSA and the state. UMMC generates an estimated \$556 million in labor income, 13,803 jobs, and \$187 million in tax revenue for Jackson MSA. With substantial initial investments and leadership from the State, UMMC could expand its research and clinical abilities to evolve into an even stronger economic engine for the Jackson MSA and Mississippi.

As an AMC, UMMC has accepted certain responsibilities for fulfilling its mission and business purpose that are entirely unique from other hospitals in the state. UMMC plays a material role in maintaining a scholarly environment supporting its mission to:

- Provide clinical services for any and all patients without regard for compensation;
- Educate and otherwise prepare the biomedical workforce;
- Provide stand by capacity;
- Develop meaningful scientific advances; and,
- Translate the best application of scientific advances to the immediate benefit of Mississippi residents.

UMMC faces an array of significant challenges as it works to fulfill its responsibilities. Among these challenges are: significant public health status concerns, substantial disease burden in areas such as cancer and cardiovascular disease, high poverty levels, high numbers of uninsured in the region, an overall unfavorable payer mix biasing Medicaid and uninsured, and a payment system for uncompensated care that results in UHC as a net payer of uninsured care for the hospitals in the state. It is also worth noting that UMMC's margin has increased to 0.8 percent after a period of negative total margin.

In conclusion, this is a study of the economic impact and economic future of UMMC, as a self sustaining growth engine. As policymakers consider the future of UMMC to evolve into an economic asset to the state, there are three primary decision points to consider.

First, the State must decide how to support the essential missions of UMMC as an AMC, such that it does not continually need to underwrite the cost of clinical care with funds that could otherwise have been applied to education and scholarship. Currently, UMMC receives a large annual subsidy from the State to cover operations and missions. While all AMCs require subsidies to cover missions, UMMC's subsidy is disproportionately state funded as compared to other AMCs. This is in large part due to the State mandate requiring 50 percent charity and Medicaid care. If this requirement was retracted and UMMC was encouraged to compete more aggressively in the private market force, UMMC could fund a large share of its missions and seek to achieve a greater degree of financial self sufficiency through the development of competitive clinical programs.

Second, the State should consider the degree to which UMMC can serve as an economic driver in the state's biotechnology industry. In the near term, subsequent investment in certain clinical programs that would serve recognized community needs could yield substantial additional economic and tax benefit, as well as greater access to such services in a region with a high demand for these services. Concerning the long term, UMMC has the potential to emulate the success that other states have found in the biotechnology industry, by their strong commitments to these types of activities. Although the time frames are lengthy and the outcome is somewhat uncertain, the rewards can commensurate with the risks if appropriate commitments are made and financial and administrative skills are directed toward a common goal.



## Appendix I: Economic Impact Tables

**Figure A1: Estimated Impacts on Output in Jackson MSA Attributable to UHC**

NAICS Industry	Direct (\$)	Indirect (\$)	Induced (\$)	Total (\$)
<b>TOTAL IMPACT</b>	<b>419,520,000</b>	<b>128,989,839</b>	<b>159,204,602</b>	<b>707,714,470</b>
Agriculture, forestry, fish & hunting	-	903,865	1,273,882	2,177,746
Mining	-	1,028,635	1,447,031	2,475,666
Construction	-	3,737,029	1,182,879	4,919,908
Manufacturing	-	14,976,709	9,607,452	24,584,162
Transportation, warehousing & utilities	-	12,824,393	7,997,492	20,821,885
Trade*	-	9,512,636	29,660,094	39,172,730
Information	-	3,322,498	5,325,497	8,647,994
Finance, insurance, real estate, & rental	-	40,642,453	23,000,730	63,643,186
Professional- scientific & tech services	-	15,105,530	4,911,821	20,017,350
Management of companies	-	3,621,955	868,757	4,490,713
Administrative & waste services	-	10,190,330	1,822,117	12,012,448
Educational services	-	455,694	2,506,450	2,962,144
Health & social services	419,520,000	239,977	23,997,824	443,757,824
Arts- entertainment & recreation	-	224,295	2,027,667	2,251,962
Accommodation & food services	-	6,297,296	11,202,933	17,500,228
Other services	-	3,936,528	7,857,342	11,793,870
Government & non NAICs	-	1,970,017	24,514,636	26,484,654

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTES:**

**Direct Effect** represents the impact (e.g. change in employment or revenues) for the expenditures and/or production values specified as direct final demand changes.

**Indirect Effect** represents the impact (e.g. change in employment) caused by the iteration of industries purchasing from industries resulting from direct final demand changes.

**Induced Effect** represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Total impact is the sum of the direct, indirect and induced effects.

**Figure A2: Estimated Impacts on Labor Income in Jackson MSA Attributable to UHC**

NAICS Industry	Direct (\$)	Indirect (\$)	Induced (\$)	Total (\$)
<b>TOTAL IMPACT</b>	<b>199,090,000</b>	<b>42,634,106</b>	<b>51,283,888</b>	<b>293,007,983</b>
Agriculture, forestry, fish & hunting	-	143,186	229,780	372,966
Mining	-	181,389	254,960	436,349
Construction	-	1,484,406	441,477	1,925,883
Manufacturing	-	2,621,549	1,459,637	4,081,186
Transportation, warehousing & utilities	-	5,422,148	2,403,151	7,825,300
Trade*	-	4,147,061	13,595,944	17,743,005
Information	-	790,796	1,076,352	1,867,148
Finance, insurance, real estate, & rental	-	8,742,802	5,519,568	14,262,369
Professional- scientific & tech services	-	7,791,739	2,428,969	10,220,708
Management of companies	-	1,658,718	397,858	2,056,576
Administrative & waste services	-	5,365,387	838,960	6,204,347
Educational services	-	235,760	1,299,931	1,535,691
Health & social services	199,090,000	81,129	13,179,137	212,350,256
Arts- entertainment & recreation	-	88,538	770,715	859,253
Accommodation & food services	-	2,005,658	3,543,202	5,548,859
Other services	-	1,403,074	3,379,628	4,782,702
Government & non NAICs	-	470,767	464,619	935,386

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure A1 for discussion of economic impact terms.

**Figure A3: Estimated Impacts on Employment in Jackson MSA Attributable to UHC**

NAICS Industry	Direct (jobs)	Indirect (jobs)	Induced (jobs)	Total (jobs)
<b>TOTAL IMPACT</b>	<b>3,830.0</b>	<b>1,461.4</b>	<b>1,807.5</b>	<b>7,098.8</b>
Agriculture, forestry, fish & hunting	-	11.3	14.2	25.4
Mining	-	2.3	3.3	5.6
Construction	-	43.9	13.0	56.8
Manufacturing	-	67.0	41.3	108.3
Transportation, warehousing & utilities	-	113.42	52.2	165.6
Trade*	-	99.79	481.2	581.0
Information	-	12.2	17.1	29.3
Finance, insurance, real estate, & rental	-	387.68	184.3	572.0
Professional- scientific & tech services	-	168.8	56.0	224.8
Management of companies	-	22.9	5.5	28.4
Administrative & waste services	-	294.3	44.5	338.9
Educational services	-	9.0	59.2	68.3
Health & social services	3,830.0	2.0	320.7	4,152.7
Arts- entertainment & recreation	-	8.3	48.7	57.0
Accommodation & food services	-	149.6	265.7	415.3
Other services	-	57.5	189.3	246.8
Government & non NAICs	-	11.4	11.3	22.7

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure A1 for discussion of economic impact terms.



**Figure A4: Estimated Impacts on Labor Income in Mississippi Attributable to UMMC**

<b>NAICS Industry</b>	<b>Direct (\$)</b>	<b>Indirect (\$)</b>	<b>Induced (\$)</b>	<b>Total (\$)</b>
<b>TOTAL IMPACT</b>	<b>385,587,960</b>	<b>81,455,292</b>	<b>71,443,258</b>	<b>538,486,520</b>
Agriculture, forestry, fish & hunting	-	392,948	791,437	1,184,385
Mining	-	275,475	327,522	602,997
Construction	-	3,014,839	734,038	3,748,877
Manufacturing	-	8,760,390	4,128,702	12,889,092
Transportation, warehousing, & utilities	-	10,081,390	4,473,890	14,555,279
Trade*	-	5,861,631	23,041,646	28,903,277
Information	-	2,780,989	1,951,900	4,732,889
Finance, insurance, real estate & rental	-	15,869,654	8,108,655	23,978,309
Professional- scientific & tech services	44,444,000	12,036,642	3,796,305	60,276,944
Management of companies	-	2,102,938	689,612	2,792,550
Administrative & waste services	-	10,196,183	1,198,893	11,395,075
Educational services	83,691,816	1,191,207	1,569,085	86,452,112
Health & social services	257,452,144	237,765	5,640,691	263,330,608
Arts- entertainment & recreation	-	374,033	1,696,013	2,070,046
Accommodation & food services	-	3,710,662	6,633,295	10,343,957
Other services	-	3,171,527	5,487,112	8,658,638
Government & non NAICs	-	1,397,021	1,174,465	2,571,486

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure A1 for discussion of economic impact terms.

**Figure A5: Estimated Impacts on Employment in Mississippi Attributable to UMMC**

<b>NAICS Industry</b>	<b>Direct (jobs)</b>	<b>Indirect (jobs)</b>	<b>Induced (jobs)</b>	<b>Total (jobs)</b>
<b>TOTAL IMPACT</b>	<b>7,206.1</b>	<b>3,057.5</b>	<b>2,968.7</b>	<b>13,232.3</b>
Agriculture, forestry, fish & hunting	-	30.4	58.1	88.5
Mining	-	3.8	4.5	8.2
Construction	-	101.5	24.5	126.1
Manufacturing	-	214.7	113.1	327.9
Transportation, warehousing & utilities	-	224.0	102.63	326.63
Trade*	-	162.8	922.01	1,084.39
Information	-	62.6	39.0	101.6
Finance, insurance, real estate, & rental	-	806.7	288.4	1,095.1
Professional- scientific & tech services	1,182.1	278.5	94.0	1,554.6
Management of companies	-	35.6	11.7	47.2
Administrative & waste services	-	599.7	69.8	669.4
Educational services	1,337.0	47.8	68.0	1,452.8
Health & social services	4,687.0	5.5	202.7	4,895.2
Arts- entertainment & recreation	-	40.7	87.1	127.8
Accommodation & food services	-	250.7	508.7	759.4
Other services	-	156.7	344.2	500.9
Government & non NAICs	-	36.4	30.2	66.6

\*Trade includes wholesale trade and retail trade.

**Source:** The Lewin Group analysis of the IMPLAN model.

**NOTE:** See Figure A1 for discussion of economic impact terms.

## Appendix II: Graduate Medical Education

UMMC filled approximately 80 percent of its approved residency slots in 2005-2006.

Program Name	Approved Positions 05-06	Number of Residents 05-06
Anesthesiology	21	32
Pain Medicine	1	0
Emergency Medicine	30	27
Family Medicine	48	33
Sports Medicine	0	0
Internal Medicine	105	64
Allergy & Immunology	4	2
Cardiovascular Disease	12	11
Interventional Cardiology	2	2
Endocrinology, diabetes, and metabolism	2	2
Gastroenterology	9	6
Hematology/Oncology	9	9
Infectious Disease	4	2
Nephrology	8	6
Pulmonary/Critical Care Medicine	7	7
Rheumatology	4	3
Internal Medicine/Pediatrics	0	9
Neurological Surgery	8	8
Neurology	12	14
Child Neurology	3	2
Clinical Neurophysiology	3	1
Obstetrics and Gynecology	36	24
Maternal Fetal Medicine	0	4
Ophthalmology	9	12
Orthopedic Surgery	20	20
Ortho-Hand Surgery	1	1
Otolaryngology	10	10
Pathology-Anatomic and Clinical	12	12
Cytopathology	2	1
Pediatrics	58	31
Pediatric Hematology/Oncology	2	2
Psychiatry	24	23
Psychiatry-Child & Adolescent	4	1
Psychiatry - Sleep Medicine	1	1
Radiology-Diagnostic	21	22
Neuroradiology	0	0
Vascular and Interventional Radiology	2	0
Surgery-General	57	27
Plastic Surgery	4	4
Thoracic Surgery	2	2
Urology	8	10
<b>TOTAL</b>	<b>565</b>	<b>447</b>

Source: ACGME 2005-2006 Data, UMMC Data.