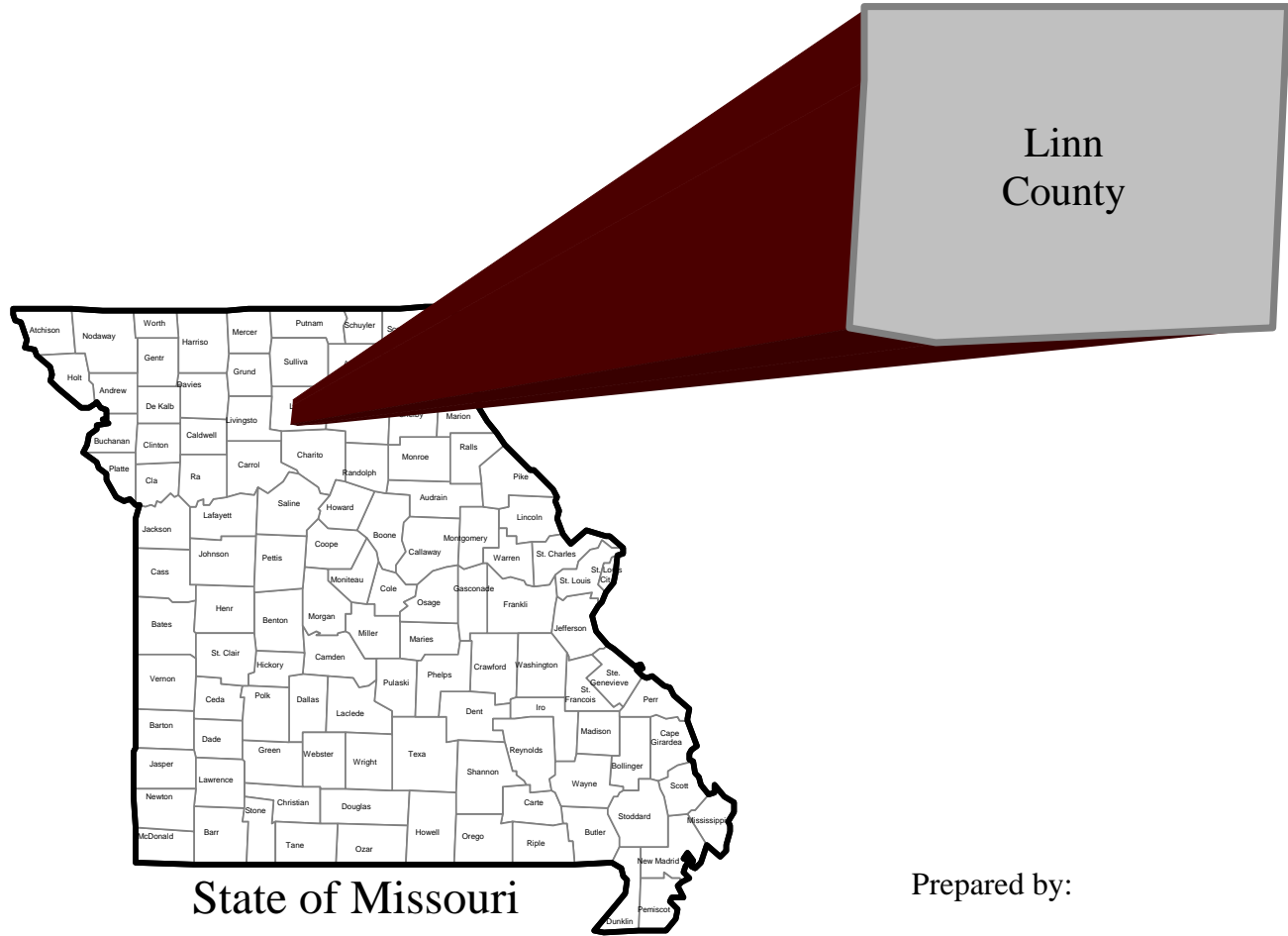


# Linn County, Missouri - Economic Impact of the Health Sector



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The Economic Impact of the Health Sector  
on the Economy of Linn County, Missouri

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Linn County, Missouri

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## **The Economic Impact of the Health Sector on the Economy of Linn County, Missouri**

Medical facilities have a tremendous medical and economic impact on the community in which they are located. This is especially true with health care facilities, such as hospitals and nursing homes. These facilities not only employ a number of people and have a large payroll, but they also draw into the community a large number of people from rural areas who need medical services. The overall objective of this study is to measure the economic impact of the health sector on the economy of Linn County. The specific objectives of this report are to:

1. discuss national trends in health care;
2. review county demographic and economic data;
3. summarize the direct economic activities of the health sector;
4. review concepts of community economics and multipliers;
5. estimate the economic impact of the health sector on Linn County's economy; and
6. illustrate the economic impact of the current capital improvement project at Pershing Health System.

No recommendations will be made in this report.

### **National Trends in the Health Care Industry**

*The health care sector is an extremely fast growing sector, and based on the current demographics, there is every reason to expect this trend to continue.* Data in **Table 1** provide selected health expenditures and employment data for the United States; highlights include:

- Health expenditures increased from \$75 billion in 1970 to almost \$2 trillion in 2005;
- Health care services as a share of the national gross domestic product (GDP) were 7.2 percent in 1970 and increased to 16.0 percent in 2005;
- Per capita health expenditures increased from \$356 in 1970 to \$6,697 in 2005;
- Employment in the health sector increased 250 percent from 1970 to 2002;

**Table 1**  
**United States Health Expenditures and Employment Data**  
**1970-2005; Projected for 2008, 2012 & 2016**

United States Data						
Year	Total Health Expenditures (\$\$ Billions)	Per Capita Health Expenditures (\$\$)	Health as % of GDP (%)	Health Sector Employment (000)	Ave. Yrly. Increase in Employment (%)	
1970	\$74.9	\$356	7.2%	3,052		
1980	253.9	1,102	9.1%	5,278	7.3%	Employment Based on SIC <sup>1</sup>
1990	714.0	2,813	12.3%	7,814	4.8%	
2000	1,353.3	4,790	13.8%	10,103	2.9%	
2001	1,469.6	5,148	14.5%	10,381	2.8%	
2002	1,602.8	5,559	15.3%	10,673	2.8%	
2003	1,733.4	5,952	15.8%	11,817	N/A	
2004	1,858.9	6,322	15.9%	12,055	2.0%	
2005	1,987.7	6,697	16.0%	12,314	2.1%	
Projections						
2008	2,420.0	6,683	16.5%			
2012	3,173.4	9,148	17.9%			
2016	4,136.9	12,320	19.6%			

SOURCES: Bureau of Labor Statistics; Bureau of Economic Analysis; Centers for Medicare & Medicaid Services, National Health Expenditures 1970-2005 and National Health Expenditure Projections 2006-2016, website: <http://www.cms.hhs.gov/NationalHealthExpendData>, data as of March 2007

N/A - Not Available

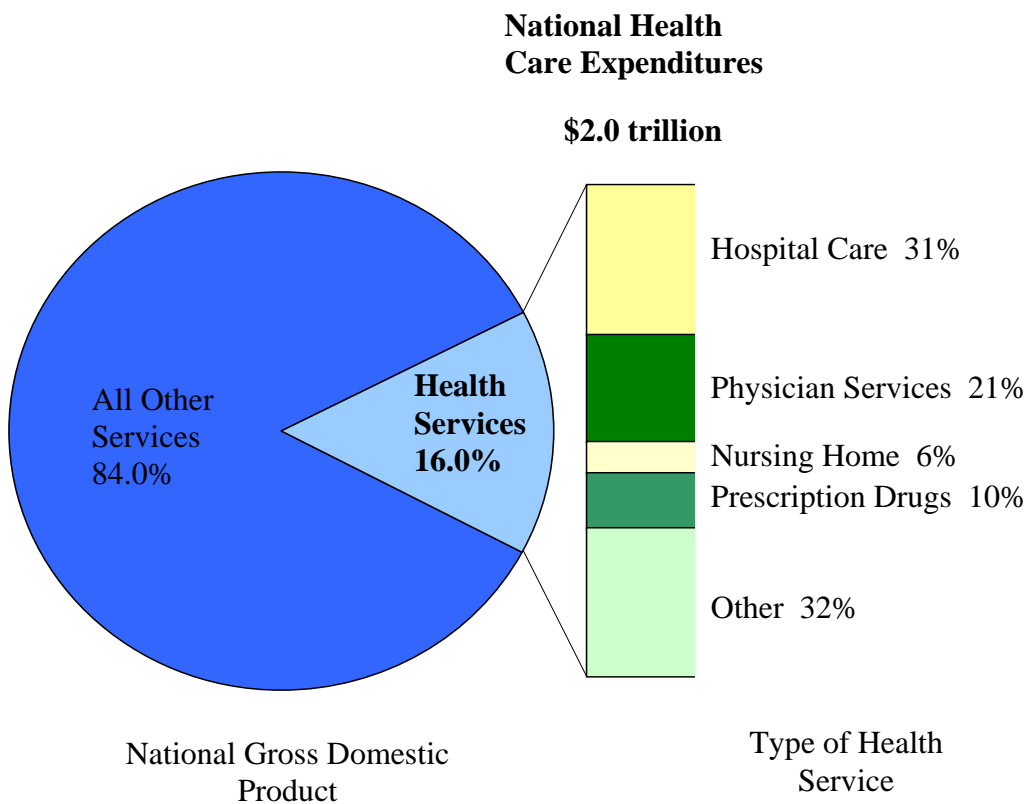
<sup>1</sup> Based on Standard Industrial Classification (SIC) codes for health sector employment.

<sup>2</sup> Based on North American Industrial Classification System (NAICS) for health sector employment.

- Expenditures are projected to double from \$2 trillion in 2005 to \$4.1 trillion in 2016;
- Health care services as a share of the national GDP are projected to increase from 16.0 percent in 2005 to 19.6% in 2016; and
- Per capital health expenditures will increase from \$6,697 in 2005 to \$12,320 in 2016.

**Figure 1** illustrates 2005 health expenditures by percent of gross domestic product and by type of health service. The largest health service type was hospitals, representing 31.0 percent of the total. The next largest type of health services was physician services with 21.0 percent of the total.

**Figure 1.  
National Health Expenditures  
as a Percent of Gross Domestic Product and by Health Service Type, 2005**



**County Demographic and Economic Data**

The population for Linn County, cities and towns in Linn County, and the State of Missouri will be illustrated in **Table 2**. The study is based on the medical service area that

includes all of Linn County, Missouri. Linn County is located in the north central part of Missouri. Linneus is the county seat of Linn County, with Brookfield being the largest population center in the county, followed by the City of Marceline. Linneus had a population of 364 in 1990 and increased to 369 in the 2000 census, representing an increase of 1.4%. The 2005 estimated population for Linneus is 358, representing a decrease of 3.0% from the 2000 census. Brookfield had a population of 4,888 in 1990 and decreased 2.4% to 4,769 in the 2000 census. The 2005 estimated population of Brookfield was 4,506, a decrease of 5.5 percent from the 2000 census. The City of Marceline had a population of 2,645 in 1990, and the population decreased to 2,558 in 2000, representing a 3.3 percent decrease. From 2000 to 2005 the population of Marceline is estimated to decrease by 6.0 percent to 2,405.

**Table 2**  
**Population of Linn County and State of Missouri, 1990, 2000, 2005 Estimates**

Area	1990 Census	2000 Census	2005 Estimates	1990-2000 % change	2000-2005 % change
Brookfield city	4,888	4,769	4,506	-2.4%	-5.5%
Browning city	331	317	307	-4.2%	-3.2%
Bucklin city	616	524	496	-14.9%	-5.3%
Laclede city	410	415	406	1.2%	-2.2%
Linneus city	364	369	358	1.4%	-3.0%
Marceline city	2,645	2,558	2,405	-3.3%	-6.0%
Meadville city	360	457	443	26.9%	-3.1%
Purdin city	217	223	215	2.8%	-3.6%
Balance of Linn County	<u>4,414</u>	<u>4,122</u>	<u>3,997</u>	<u>1.7%</u>	<u>-3.0%</u>
 Linn County Total	 <u>13,885</u>	 <u>13,754</u>	 <u>13,133</u>	 <u>-0.9%</u>	 <u>-4.5%</u>
 State of Missouri	 <u>5,117,073</u>	 <u>5,595,211</u>	 <u>5,800,310</u>	 <u>9.3%</u>	 <u>3.7%</u>

Source: U. S. Census Bureau, 1990 and 2000 census populations and 2005 estimated population.

The population of Linn County was 13,885 according to the 1990 census and decreased to 13,754 in the 2000 census, a decrease of 0.9 percent. The U. S. Census Bureau has estimated that the population will continue to decrease to 13,133 in 2005, a decrease of 4.5 percent from 2000 to 2005. The State of Missouri population increased from 1990 to 2000 and is estimated to continue to increase from 2000 to 2005.

**Table 3** shows the breakdown by age group for the Linn County population for census years 1990 and 2000 and for the 2005 census estimates. In general, there have been no significant population changes in age grouping.

**Table 3**  
**Population by Age Groups for Linn County, Missouri**  
**1990 and 2000 Census and 2005 Census Estimates**

Age Groups	1990 Census	% of Total	2000 Census	% of Total	2005 Estimated	% of Total
<14 years	2,903	20.9%	2,778	20.2%	2,508	19.1%
15-34 years	3,270	23.6%	3,126	22.7%	3,014	22.9%
35-54 years	3,021	21.8%	3,624	26.3%	3,553	27.1%
55-74 years	3,050	22.0%	2,664	19.4%	2,629	20.0%
75+ years	<u>1,641</u>	<u>11.8%</u>	<u>1,562</u>	<u>11.4%</u>	<u>1,429</u>	<u>10.9%</u>
Totals	<u>13,885</u>	<u>100.0%</u>	<u>13,754</u>	<u>100.0%</u>	<u>13,133</u>	<u>100.0%</u>

Source: U. S. Census Bureau, 1990 and 2000 census populations and 2005 estimated population.

Data in **Tables 4** and **5** are from the U.S. Department of Commerce, Regional Economic Information System, Bureau of Economic Analysis, for the year 2004 and are based on the North American Industry Classification System (NAICS). The purpose of these tables is to demonstrate the importance of the health sector as compared to the entire economy. In 2004, the

**Table 4**  
**Full-Time and Part-Time Employment by Type of Employment**  
**and by Major Industry 1/ for Linn County and the State of Missouri, 2004**

Employment Categories	Linn County			State of Missouri		
	No. of Jobs	% of Total	% of Private	No. of Jobs	% of Total	% of Private
<b>Total FT &amp; PT</b>	<u>7,654</u>	<u>100.0%</u>		<u>3,512,134</u>	<u>100.0%</u>	
Wage & salary	5,292	69.1%		2,832,839	80.7%	
Proprietors'	<u>2,362</u>	<u>30.9%</u>		<u>679,295</u>	<u>19.3%</u>	
Farm proprietors'	1,021	43.2%		107,781	15.9%	
Nonfarm proprietors' 2/	1,341	56.8%		571,514	84.1%	
<b>By Industry:</b>						
Farm	1,094	14.3%		116,655	3.3%	
Nonfarm	<u>6,560</u>	<u>85.7%</u>		<u>3,395,479</u>	<u>96.7%</u>	
Private	5,638	85.9%	<u>100.0%</u>	2,921,715	86.0%	<u>100.0%</u>
For, fshng, rel 3/	64		1.1%	12,764		0.4%
Mining	10		0.2%	7,031		0.2%
Utilities	(D)		**	12,171		0.4%
Construction	251		4.5%	213,141		7.3%
Manufacturing	1,158		20.5%	323,075		11.1%
Wholesale trade	(D)		**	129,116		4.4%
Retail trade	751		13.3%	397,074		13.6%
Transp & wrhsng	(D)		**	121,409		4.2%
Information	523		9.3%	72,056		2.5%
Finance & ins	244		4.3%	159,585		5.5%
RE rental & leasing	119		2.1%	120,888		4.1%
Prof & techn svcs	226		4.0%	176,344		6.0%
Mgmt of cos & enterp	(D)		**	65,223		2.2%
Admin & waste svcs	(D)		**	174,021		6.0%
Educational svcs	36		0.6%	74,431		2.5%
<b>Hlth care &amp; soc assist</b>	<b>610</b>		<b>10.8%</b>	<b>350,394</b>		<b>12.0%</b>
Arts, entert, & rec	(D)		**	70,277		2.4%
Accomm & food svcs	428		7.6%	239,838		8.2%
Other svcs, not pub	425		7.5%	202,877		6.9%
Govt & govt enterprises	922	14.1%		473,764	14.0%	

SOURCE: 2007 Regional Economic Information System, Bureau of Economic Analysis, 2004 data.

1/ The estimates are based on the North American Industry Classification System (NAICS).

2/ Excludes limited partners.

3/ "Other" consists of the number of jobs held by U.S. residents employed by international organizations and foreign embassies and consulates in the U.S.

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

\*\* Due to nondisclosure of confidential data, no percentages are available.

**Table 5**  
**Personal Income\* by Major Source and Industry 1/**  
**for Linn County and the State of Missouri, 2004**

	Linn County			State of Missouri		
	Income \$1,000s	% of Total	% of Private	Income \$1,000s	% of Total	% of Private
<b>Total Personal Income</b>	313,432			175,524,474		
<b>Earnings by place of work</b>						
Total earnings by place of work	<u>197,999</u>	<u>100.0%</u>		<u>135,403,221</u>	<u>100.0%</u>	
Wage and salary disbursements	134,911	68.1%		97,324,060	14.2%	
Proprietors' income	26,883	13.6%		13,823,520	24.9%	
Other	36,205	18.3%		24,255,641	0.0%	
<b>Earnings by industry</b>						
Total earnings by industry	<u>197,999</u>	<u>100.0%</u>		<u>135,403,221</u>	<u>100.0%</u>	
Farm earnings	12,778	6.5%		1,514,406	1.1%	
Nonfarm earnings	185,221	93.5%		133,888,815	98.9%	
Private earnings	<u>153,307</u>		<u>100.0%</u>	<u>112,157,485</u>		<u>100.0%</u>
For, fshng, related, and other 2/	1,049		0.7%	339,569		0.3%
Mining	(L)		**	321,025		0.3%
Utilities	(D)		**	1,116,339		1.0%
Construction	5,296		3.5%	8,982,976		8.0%
Manufacturing	42,697		27.9%	19,088,192		17.0%
Wholesale trade	(D)		**	7,496,122		6.7%
Retail trade	12,572		8.2%	9,393,959		8.4%
Transp and warehousing	(D)		**	5,174,695		4.6%
Information	14,837		9.7%	4,739,407		4.2%
Finance and insurance	5,350		3.5%	7,950,123		7.1%
Real estate & rental & leasing	1,776		1.2%	2,510,874		2.2%
Prof and technical services	6,457		4.2%	9,805,501		8.7%
Mgmt of cos and enterprises	(D)		**	5,463,035		4.9%
Administrative & waste services	(D)		**	4,396,324		3.9%
Educ services	581		0.4%	2,265,513		2.0%
<b>Health care &amp; social asst</b>	<b>12,72</b>		<b>8.3%</b>	<b>13,316,38</b>		<b>11.9%</b>
Arts, entertainment, & rec	(D)		**	1,834,629		1.6%
Accommodation & food svcs	3,565		2.3%	3,661,261		3.3%
Other services, except pub admin	7,281		4.7%	4,301,557		3.8%
Govt & govt enterp	31,914	20.8%	20.8%	21,731,330	19.4%	19.4%

SOURCE: 2007 Bureau of Economic Analysis, Regional Economic Information System

1/ The estimates of earnings for 2001-2004 are based on the 2002 North American Industry Classification System (NAICS)..

2/ "Other" consists of wage and salary disbursements to U.S. residents employed by international organizations and foreign embassies and consulates in the United States.

\* All state and local area dollar estimates are in current dollars (not adjusted for inflation).

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

(L) Less than \$50,000, but the estimates for this item are included in the totals.

health care and social assistance sector (which includes hospitals) accounted for 610 full-time and part-time employees or 10.8 percent of the private employment in Linn County (**Table 4**). This compared to 12.0 percent for the State of Missouri. For Linn County, the health care and social assistance sector was the third largest sector of private employment, behind manufacturing with 20.5% and retail trade with 13.3%. Health care and social assistance employment was the 2nd largest sector in the State of Missouri. Personal income data are presented in **Table 5**. The health care sector accounted for 8.3 percent of the private earnings in Linn County and was the 3rd largest private sector. This compared to 11.9 percent of private earnings from the health care sector for the State of Missouri and was the 2nd largest private sector.

### **The Direct Economic Activities**

Employment and payroll are the important direct economic activities created in Linn County from the health sector. The health sector is divided into the following five components:

- Hospitals
- Offices of Physicians, Dentists, and Other Health Practitioners
- Nursing and Protective Care
- Pharmacies
- Other Medical and Health Services

The total health sector in Linn County employs 500 full-time and part-time employees and has an estimated payroll including benefits of \$16,440,062 (**Table 6**). The hospital component employs 152 people with an annual payroll of \$5,885,512. The hospital sector includes Pershing Health System with Pershing Memorial Hospital, a 25-bed critical access hospital, providing inpatient and outpatient care, a 24/7 emergency room staffed with emergency physicians, a specialty physicians' outpatient clinic, and Community Medical Associates, a rural health clinic. The offices of physicians, dentists, and other health practitioners' component employs 58 full-time and part-time employees, with an annual payroll of \$3,255,924. This

**Table 6**  
**Direct Impact of Health Services**  
**in Linn County, Missouri, 2007**

Health Care Entity	Number of Employees	Income (Wages, Salaries, and Proprietors' Income, plus Benefits)
<b>Hospital</b> (Includes Pershing Health System with Pershing Memorial Hospital, a 25-bed critical access hospital, providing inpatient and outpatient care, 24/7 Emergency Room staffed with emergency physicians, and a specialty physicians' outpatient clinic; and Community Medical Associates, a rural health clinic)	152	\$5,885,512
<b>Offices of Physicians, Dentists, and Other Health Practitioners</b> (Includes Marceline Health Center and five independent primary care physician practices; one radiologist; three dental offices; two physical therapy/rehabilitation facilities; three dental offices; two mental health facilities; and one optometrist)	58	\$3,255,924
<b>Nursing and Protective Services</b> (Includes three nursing homes and two assisted living facilities)	228	\$5,433,888
<b>All Other Health Services</b> (Includes health department; emergency medical services; two pharmacies, school nurses in five school districts; and YMCA wellness and exercise programs)	<u>62</u>	<u>\$1,864,739</u>
<b>TOTALS</b>	<b>500</b>	<b>\$16,440,062</b>

SOURCE: Local data for hospital; local employment data for all other health services; income data for all services but the hospital were estimated utilizing average incomes from the U. S. Bureau of Labor Statistics online (www.bls.gov [3/22/07]).

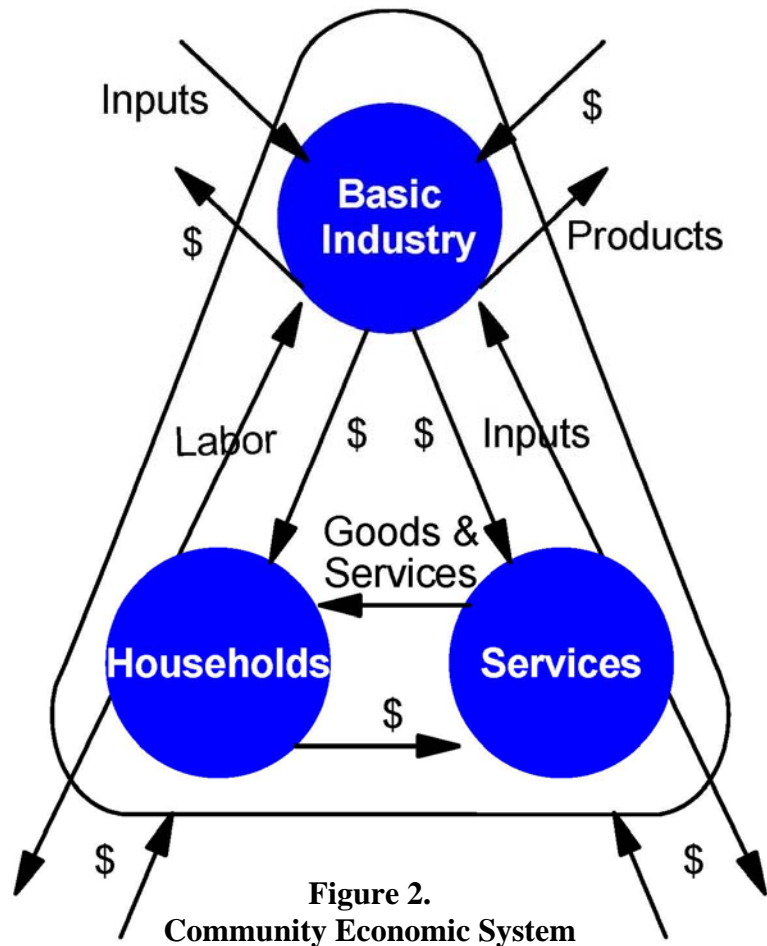
component includes Marceline Health Center and five independent primary care physician practices; a radiologist; three dental offices; two physical therapy/rehabilitation facilities; two mental health facilities; and one optometrist. The nursing and protective care component employs 228 people with an annual payroll of \$5,433,888. The nursing and protective care component includes three nursing homes and two assisted living facilities. The pharmacies component has been combined with the other medical and health services component to protect the privacy of the individual employers. The other medical and health services component employs 62 employees with an annual payroll of \$1,864,739. The other medical and health services component includes the health department, emergency medical services, school nurses, YMCA wellness and exercise programs, and two pharmacies. It should be noted that many rural communities have a large number of elderly, and the ranchers and farmers often retire in the towns. Thus, nursing and protective care facilities are an important component of the health sector.

In summary, the health sector is vitally important as a community employer and important to the community's economy. The health sector definitely employs a large number of residents. The health sector and the employees in the health sector purchase a large amount of goods and services from businesses in Linn County. These impacts are referred to as secondary impacts or benefits to the economy. Before the secondary impacts of the health sector are discussed, basic concepts of community economics will be discussed.

### **Some Basic Concepts of Community Economics and Income and Employment Multipliers**

**Figure 2** illustrates the major flows of goods, services, and dollars of any economy. The foundation of a community's economy are those businesses which sell some or all of their goods and services to buyers outside of the community. Such a business is a basic industry. The flow

of products out of, and dollars into, a community are represented by the two arrows in the upper right portion of **Figure 2**. To produce these goods and services for "export" outside the community, the basic industry purchases inputs from outside of the community (upper left portion of **Figure 2**), labor from the residents or "households" of the community (left side of **Figure 2**), and inputs from service industries located within the community (right side of **Figure 2**). The flow of labor, goods, and services in the community is completed by households using their earnings to purchase goods and services from the community's service industries (bottom of **Figure 2**). It is evident from the interrelationships illustrated in **Figure 2** that a change in any one segment of a community's economy will have reverberations throughout the entire economic system of the community.



Consider, for instance, the closing of a hospital. The services section will no longer pay employees and dollars going to households will stop. Likewise, the hospital will not purchase goods from other businesses and dollar flow to other businesses will stop. This decreases

income in the "households" segment of the economy. Since earnings would decrease, households decrease their purchases of goods and services from businesses within the "services" segment of the economy. This, in turn, decreases these businesses' purchases of labor and inputs. Thus, the change in the economic base works its way throughout the entire local economy.

The total impact of a change in the economy consists of direct, indirect, and induced impacts. Direct impacts are the changes in the activities of the impacting industry, such as the closing of a hospital. The impacting business, such as the hospital, changes its purchases of inputs as a result of the direct impact. This produces an indirect impact in the business sectors. Both the direct and indirect impacts change the flow of dollars to the community's households. The households alter their consumption accordingly. The effect of this change in household consumption upon businesses in a community is referred to as an induced impact.

A measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect. Multipliers are used in this report. An employment multiplier is defined as:

*the ratio between direct employment, or that employment used by the industry initially experiencing a change in final demand and the direct, indirect, and induced employment.*

An employment multiplier of 3.0 indicates that if one job is created by a new industry, 2.0 jobs are created in other sectors due to business (indirect) and household (induced) spending.

### **Secondary Impacts of Health Sector on the Economy of Linn County, Missouri**

Employment and income multipliers for the area have been calculated by use of the IMPLAN model. It was developed by the U.S. Forest Service and is a model which allows for

development of county multipliers. Additional information on IMPLAN is included in **Appendix A.**

The employment multipliers for the components of the health sector are shown in **Table 7.** The employment multiplier for the hospital component is 1.39. This indicates that for each job created in that sector, a 0.39 job is created throughout the area due to business (indirect) and household (induced) spending. The employment multipliers for the other health sector components are also shown in **Table 7.**

**Table 7**  
**Employment Impact of Health Services**  
**in Linn County, Missouri, 2007**

Health Care Entity	Number of Employees	Employment Multiplier	Secondary Impact	Total Impact
Hospital	152	1.39	59	211
Offices of Physicians, Dentists, and Other Health Practitioners	58	1.36	21	79
Nursing and Protective Services	228	1.24	55	283
Other Health and Medical Services*	<u>62</u>	1.23	<u>14</u>	<u>76</u>
Totals	<b><u>500</u></b>		<b><u>149</u></b>	<b><u>649</u></b>

SOURCE: Health care employment data provided from local sources; multipliers from Minnesota IMPLAN Group, Inc., 2004 IMPLAN Data.

\* Multiplier for "Other Health and Medical Services" is a weighted average of four sub-sectors of IMPLAN model; data consolidated to protect privacy of individual employers.

Applying the employment multipliers to the employment for each of the health sector components yields an estimate of each component's employment impact on Linn County (**Table 7**). For example, the hospital has employment of 152 employees; applying the employment multiplier of 1.39 to the employment number of 152 brings the total employment impact of the hospitals to 211 employees ( $152 \times 1.39 = 211$ ). The secondary impact of the hospital is 59 employees ( $152 \times 0.39 = 59$ ); these are the jobs created in other industry sectors in the Linn County economy as a result of the spending of the hospital and the spending of the 152 hospital employees. The offices of physicians, dentists and other health practitioners' component has a direct impact of 58 employees and after the application of the multiplier of 1.36, the secondary impact is 21 employees and the total impact comes to 79 employees. The nursing and protective care component has a direct effect of 228 employees and an employment multiplier of 1.24, to bring the secondary impact to 55 and the total impact to 283 employees. The other medical and health services component has a total employment impact of 76 employees, based on direct employment of 62 employees and an employment multiplier of 1.23; the secondary impact is 14 employees. The total employment impact of the health sector in Linn County is estimated at 649 employees (**Table 7**).

The income multiplier for the hospital sector is 1.32 (**Table 8**). This indicates that for each dollar created in that sector, 0.32 dollars are created throughout the area due to business (indirect) and household (induced) spending. The income multipliers for the other health sector components are also given in **Table 8**.

Applying the income multipliers to the income (wages, salaries, and proprietor income plus benefits) for each of the health sector components yields an estimate of each component's income impact on Linn County (**Table 8**). The hospital component has a total payroll of

\$5,885,512; applying the income multiplier of 1.32 brings the total hospital income impact to \$7,768,876 ( $\$5,885,512 \times 1.32 = \$7,768,876$ ). The secondary income impact from the hospital component is \$1,883,364, which is the income generated in the other industry sectors in the Linn County economy due to the hospital spending and the hospital employees' spending. The offices of physicians, dentists and other health practitioners have a total income impact of \$3,907,109 based on the application of the income multiplier of 1.20 to the payroll for this component of

**Table 8**  
**Income Impact of Health Services**  
**in Linn County, Missouri, 2007**

Health Care Component	Income (\$\$)	Income Multiplier	Secondary Impact	Total Impact	Retail Sales	1¢ Sales Tax
Hospital	\$5,885,512	1.32	\$1,883,364	\$7,768,876	\$2,276,281	\$22,763
Offices of Physicians, Dentists, & Other	\$3,255,924	1.20	\$651,185	\$3,907,109	\$1,144,783	\$11,448
Nursing and Protective Services	\$5,433,888	1.23	\$1,249,794	\$6,683,682	\$1,958,319	\$19,583
Other Medical & Health Services*	<u>\$1,864,739</u>	1.18	<u>\$335,653</u>	<u>\$2,200,392</u>	<u>\$644,715</u>	<u>\$6,447</u>
Totals	<b><u>\$16,440,062</u></b>		<b><u>\$4,119,996</u></b>	<b><u>\$20,560,059</u></b>	<b><u>\$6,024,098</u></b>	<b><u>\$60,241</u></b>

SOURCE: Hospital income provided by local sources; income data for all services (except hospital) were estimated utilizing average incomes from the U. S. Bureau of Labor Statistics online (www.bls.gov [3/22/07]); multipliers from Minnesota IMPLAN Group, Inc., 2004 IMPLAN Data.

\* Multiplier for "Other Medical & Health Services" is a weighted average; data consolidated to protect privacy of individual employers.

\$3,255,924. The secondary income impact from this component is \$651,185. The nursing and protective care component has a payroll of \$5,433,888, a multiplier of 1.23, resulting in a secondary impact of \$1,249,794 and a total income impact of \$6,683,682. The other medical and

health services component has an income impact of \$2,200,392, based on the direct payroll of \$1,864,739 and the income multiplier of 1.18. The total income impact of the health sector in Linn County is projected to be \$20,560,059 (**Table 8**).

Income also has an impact on retail sales. If the county ratio between retail sales and income continues as in the past several years, then direct and secondary retail sales generated by the health sector and its employees equals \$6,024,098 (**Table 8**). Each of the health sector components' income impacts is utilized to determine the retail sales and a 1¢ sales tax collection for each component. Then the health sector components are totaled to determine the direct and secondary retail sales generated by the health sector. A 1¢ sales tax collection is estimated to generate \$60,241 in Linn County as a result of the total health sector impact (**Table 8**). This estimate is probably low, as many health care employees will spend a larger proportion of their income in local establishments that collect sales tax. The bottom line is that the health sector not only contributes greatly to the medical health of the community, but also to the economic health of the community.

### **The Impact from Pershing Health System's Capital Improvement Project**

Pershing Health System is in the midst of a major capital improvement project. The construction activities of a large capital improvement project have a significant impact on the local economy. The capital project will be completed later in 2007. The impact of construction activities is often overlooked. Data were collected for the capital improvement project over a two year period, 2006 and 2007. Pershing Health System had capital expenditures of \$1.6 million in 2006 and expects total capital expenditures of \$8.6 million in 2007. Data in **Table 9** show the capital investment for the proposed capital improvement projects during the two year

construction period, as well as the construction employment and income (wages, salaries, proprietor income, and benefits) estimated from county data.

Data from the IMPLAN model were utilized to estimate employment and income. The data were checked against industry standard and appear to be very accurate estimates. The construction or capital impacts only occur during the year the expenditures are incurred, but they are very large. The \$1.6 million capital investment in 2006 is expected to create 19 full-time and part-time jobs and generate \$538,138 in wages and salaries (**Table 9**). In 2007, the \$8.6 million capital investment is estimated to generate 101 full-time and part-time construction jobs with income of \$2,860,631. This is the direct employment and income from the construction activities and not the total construction impact which is again estimated with multipliers.

**Table 9**  
**Employment and Income Generated from**  
**Pershing Health System's Capital Improvement Plans**

Year	Capital Investment (millions)	Employees (Full and Part Time)	Wages, Salaries & Benefits
2006	\$1.60	19	\$538,138
2007	\$8.60	101	\$2,860,631

Source: Capital investment amounts from local sources; employment and income estimated utilizing Minnesota IMPLAN Group, Inc., 2004 IMPLAN data.

The total impact on employment from Pershing Health System’s capital improvements is presented in **Table 10**. The construction employment multiplier of 1.29 indicates that a 0.29 job is created in other businesses in the local economy due to each job associated with the construction activities. These jobs in other businesses are referred to as secondary jobs. The

estimated secondary employment impact is 6 jobs for 2006, making a total employment impact in 2006 of 25 jobs. During year 2007, it is estimated that the secondary employment impact will be 29 jobs, bringing the total estimated employment impact in 2007 of 130 jobs.

**Table 10**  
**Employment Impact from Pershing Health System's**  
**Construction Activities on Linn County, Missouri**

Year	Number of Construction Jobs	Construction Multiplier	Secondary Jobs	Total Jobs
2006	19	1.29	6	25
2007	101	1.29	29	130

Source: Multiplier from Minnesota IMPLAN Group, Inc., 2004 IMPLAN data.

The impact on income is presented in **Table 11**. The income multiplier is 1.23, which means that for each dollar of wages and salaries paid to construction works, another \$0.23 of wages and salaries are generated in other businesses in the local economy. The secondary income impact for 2006 is estimated at \$123,772 for a total income impact on the local economy

**Table 11**  
**Income Impact from Pershing Health System's**  
**Construction Activities on Linn County, Missouri**

Year	Income	Income Multiplier	Secondary Impact	Total Impact	Retail Sales	1¢ Sales Tax
2006	\$538,138	1.23	\$123,772	\$661,910	\$193,958	\$1,940
2007	\$2,860,631	1.23	\$657,945	\$3,518,576	\$1,031,039	\$10,310

Source: Multiplier from Minnesota IMPLAN Group, Inc., 2004 IMPLAN data.

of \$661,910. During year 2007, it is estimated that the secondary income impact will be \$657,945, bringing the total estimated income impact in 2007 to \$3,518,576.

The retail sales resulting from the spending of the construction employment has also been calculated. For 2006, total retail sales generated from the spending of the construction employment is estimated to be \$193,958, resulting in \$1,940 for each 1¢ sales tax. During 2007, the retail sales are estimated to be \$1,031,039, with \$10,130 for each 1¢ sales tax.

### **Summary**

The economic impact of the health sector upon the economy of Linn County is tremendous. The health sector employs a large number of residents, similar to a large industrial firm. The secondary impact occurring in the community is extremely large and measures the total impact of the health sector. If the health sector increases or decreases in size, the medical health of the community as well as the economic health of the community are greatly affected. For the attraction of industrial firms, businesses, and retirees, it is crucial that the area have a quality health sector. The construction impact is also significant to the local economy; however, the construction impact only occurs during the construction years, while the operations' impacts of the hospital and the other health components continue every year. Often overlooked is the fact that a prosperous health sector contributes to the economic health of the community.

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## APPENDIX A

### **Model and Data Used to Estimate Employment and Income Multipliers**

## **Appendix A Model and Data Used to Estimate Employment and Income Multipliers**

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

### **A Review of Input-Output Analysis**

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

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

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

### **MicroIMPLAN**

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

Five different sets of multipliers are estimated by IMPLAN, corresponding to five measures of regional economic activity. These are: total industry output, personal income, total income, value added, and employment. Two types of multipliers are generated. Type I multipliers measure the impact in terms of direct and indirect effects. Direct impacts are the changes in the activities of the focus industry or firm, such as the closing of a hospital. The focus business changes its purchases of inputs as a result of the direct impacts. This produces indirect impacts in other business sectors. However, the total impact of a change in the economy consists of direct, indirect, and induced changes. Both the direct and indirect impacts change the flow of dollars to the state, region, or county's households. Subsequently, the households alter their consumption accordingly. The effect of the changes in household consumption on

businesses in a community is referred to as an induced effect. To measure the total impact, a Type II multiplier is used. The Type II multiplier compares direct, indirect, and induced effects with the direct effects generated by a change in final demand (the sum of direct, indirect, and induced divided by direct). IMPLAN also estimates a modified Type II multiplier, called a Type III multiplier that also includes the direct, indirect, and induced effects. The Type III multiplier further modifies the induced effect to include spending patterns of households based on a breakdown of households by nine difference income groups.

### **Minnesota IMPLAN Group, Inc. (MIG)**

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

As an outgrowth of their work with the University of Minnesota, Lindall and Olson entered into a technology transfer agreement with the University of Minnesota that allowed them to form MIG. At first, MIG focused on database development and provided data that could be used in the Forest Service version of the software. In 1995, MIG took on the task of writing a new version of the IMPLAN software from scratch. This new version extended the previous Forest Service version by creating an entirely new modeling system that included creating Social Accounting Matrices (SAMs) – an extension of input-output accounts, and resulting SAM multipliers. Version 2 of the new IMPLAN software became available in May of 1999. For more information about Minnesota IMPLAN Group, Inc., please contact Scott Lindall or Doug Olson by phone at 651-439-4421 or by email at [info@implan.com](mailto:info@implan.com) or review their website at [www.implan.com](http://www.implan.com).