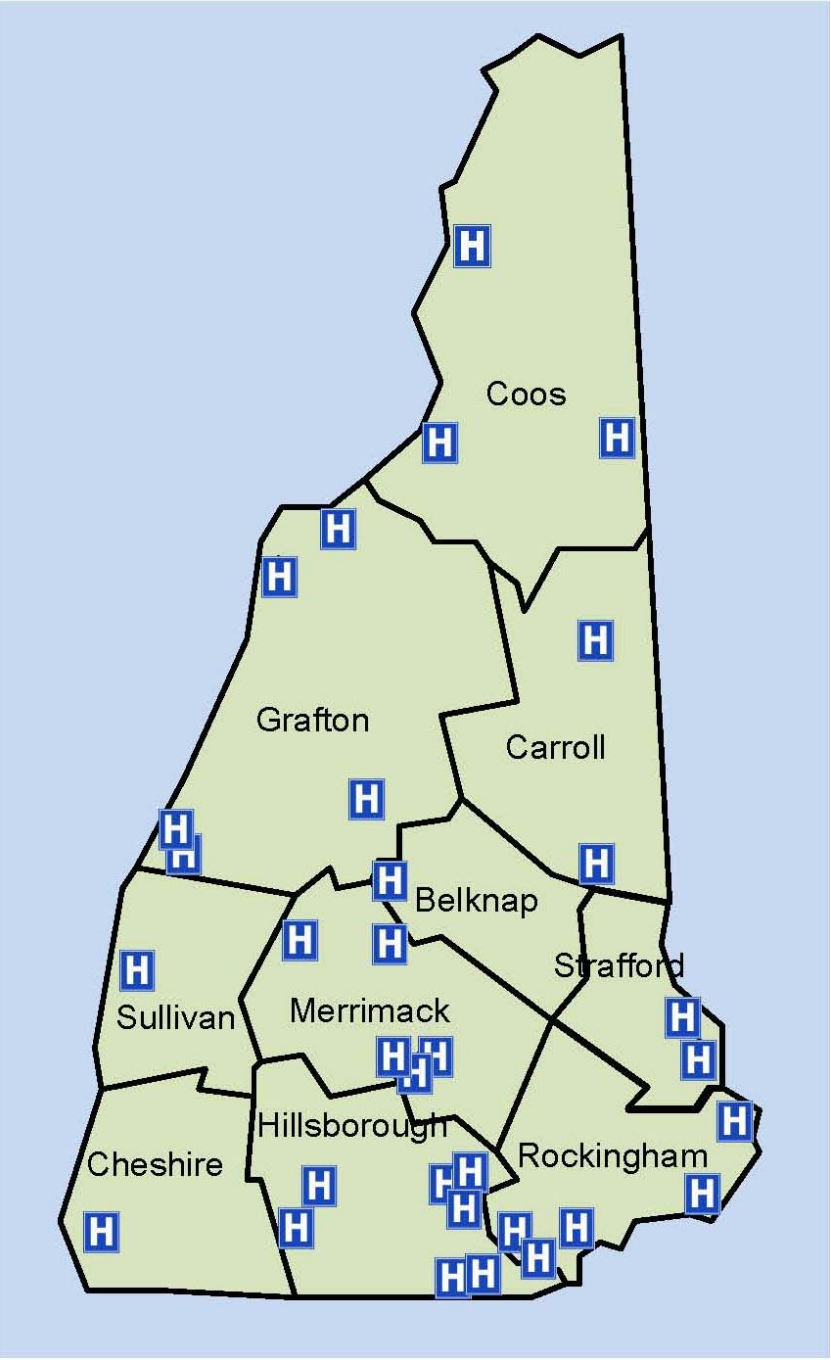
The Economic Impact of Hospital Systems in New Hampshire



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In 2008, New Hampshire hospitals treated 596,000 people in their emergency departments, performed 124,000 inpatient and outpatient surgeries, and delivered over 13,000 babies. Every year acute care hospitals provide vital health services to thousands of people across New Hampshire. Traditionally, acute care hospitals have been thought of as places with only hospital beds and emergency rooms. In response to diverse health care needs, hospitals have adapted and emerged as hospital systems with a variety of health care services available under the same system. ***Hospital systems provide much more than health care services; hospital systems are vital to the economy.***

The Economic Impact of Hospital Systems in New Hampshire documents the economic impact of hospital systems to the economy. This report provides estimates of the direct and secondary impacts of employment and income (payroll including wages, salaries and benefits) of the hospital systems in New Hampshire. Impacts are estimated at the state and county levels utilizing hospital system data for the year 2008. This report focuses exclusively on acute care hospital systems. Although the six specialty care hospitals are not illustrated in this study, these hospitals are extremely critical to providing specialty care to New Hampshire residents and their importance should not be overlooked.

Specifically, this report will illustrate the importance of health care to economic development, as well as show trends in health care at the national, regional, and state levels. A discussion of New Hampshire acute care hospital systems will be presented, as well as the estimates of the economic impacts of the acute care hospital systems on the county and state economies.

The Importance of Health Care to Economic Development

The importance of health care to rural development is often overlooked. A strong health care system can help attract and maintain business and industry growth and attract and retain retirees. A strong health care system can also create jobs in the local area.

To attract and maintain business and industry, health services and education are the two most important services needed. Studies have found that quality-of-life (QOL) factors are playing a dramatic role in business and industry location decisions. Among the most significant of these QOL variables are health care services. First, good health and education services are imperative to industry and business leaders in site location; employees and management will not locate in a community with substandard or inconveniently-located health services. Second, business and industry want to ensure that the local labor force will be productive and a key factor in productivity is good health; investments in health care services are expected to yield dividends in the form of increased labor productivity. The third business and industry consideration is cost of health care services; corporations are taking a serious look at health care costs, giving location priority to sites with lower health care costs.

Retirees are a special group of residents whose spending and purchasing can be a significant source of income for the local economy. The amount of spending embodied in the retirement population is substantial, including the purchasing power associated with Social Security,

Medicare, and other transfer payments. Additionally, middle and upper income retirees often have substantial net worth. To attract and retain retirees, a strong and convenient health care system is important.

Many rural areas have environments (e.g., moderate climate and outdoor activities) that attract and retain retirees. Although the data are limited, studies suggest availability of health services greatly influences retirement location. One study found the best predictors of retirement locations were safety, recreational facilities, dwelling units, and health care. Another study found that health services were in the "must have" category when considering a retirement community. Only protective services were mentioned more often than health services as a "must have" service.

Health Care Trends

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

- In 1970, health care services as a share of the national gross domestic product (GDP) were 7.2 percent and increased to 16.2 percent in 2007;
- Per capita health expenditures increased from $356 in 1970 to $7,421 in 2007;
- Employment in the health sector increased over 324.0 percent from 1970 to 2007; and
- Annual increases in employment from 2003 to 2007 ranged from 2.0 percent to 2.7 percent.

In addition, the Bureau of Labor Statistics projects substantial increases in health care expenditures from 2008 through 2018. In fact, the U. S. Department of Health and Human Services, Centers for Medicare and Medicaid Services, predicts that health care expenditures will account for 18.9 percent of GDP by 2015 and increase to 20.3 percent of GDP in 2018. Per capita health care expenditures are projected to increase to $10,929 in 2015 and to $13,100 in 2018. Total health expenditures are projected to increase to almost $4.4 trillion in 2018.

Figure 1 illustrates 2007 health expenditures by percent of gross domestic product and by type of health service. The largest health service type was hospital care, representing 31.0 percent of the total. The next largest category was physician services with 21.0 percent of the total.

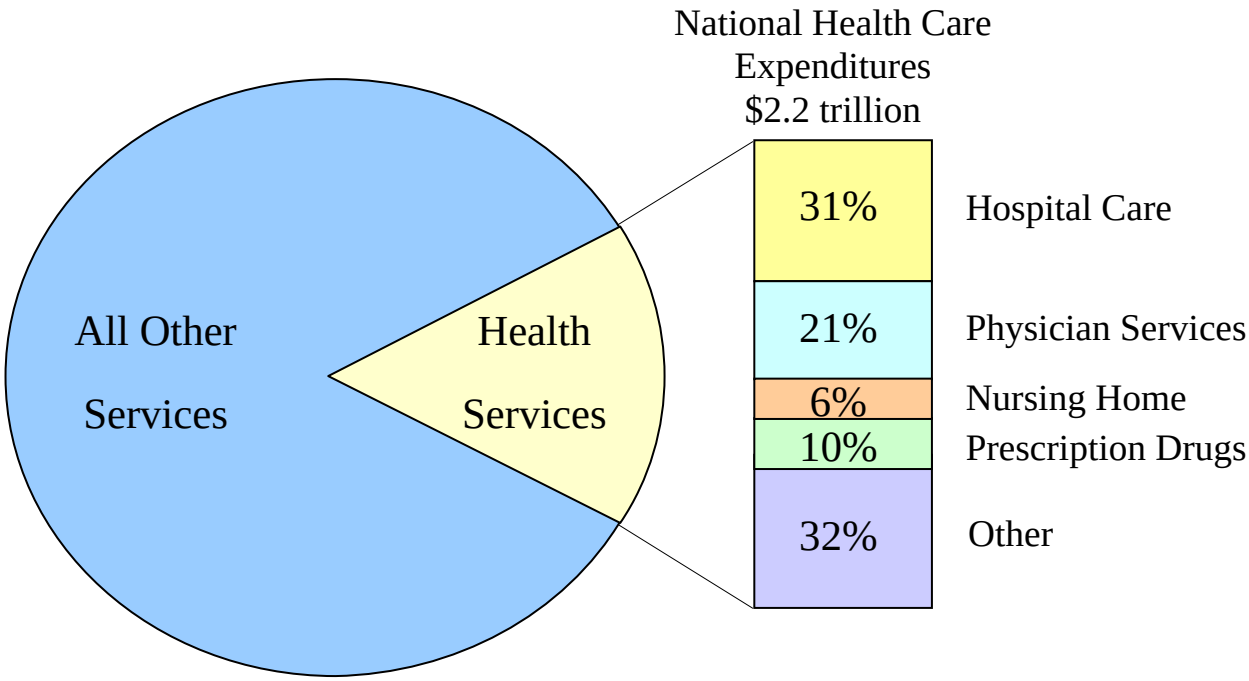
Table 1 and **Figure 1** are comprehensive and are based on the total national health care expenditures which include all categories of personal health care expenditures as well as amounts invested in medical sector structures and equipment and in non-commercial research in the U.S. **Table 2** is provided to compare national, regional, and state per capita health expenditures and percent of gross product. These data are based on a narrower definition of health care expenditures which includes only the personal health care expenditures.

Table 1
United States Health Expenditures and Employment Data
1970-2007; Projected for 2009, 2012, 2015 & 2018

Year	Total Health Expenditures ($Billions)	Per Capita Health Expenditures ($)	Health as % of GDP (%)	Health Sector Employment (000)		Ave. Annual Increase in Employment (%)
1970	$74.9	$356	7.2%	3,052	[a]	
1980	253.4	1,100	9.1%	5,278	[a]	7.3%
1990	714.1	2,814	12.3%	7,814	[a]	4.8%
2000	1,353.2	4,789	13.8%	10,858	[a]	3.9%
2001	1,469.4	5,149	14.5%	11,188	[a]	3.0%
2002	1,602.3	5,560	15.3%	11,536	[a]	3.1%
2003	1,734.9	5,967	15.8%	11,817	[b]	N/A
2004	1,854.8	6,319	15.9%	12,055	[b]	2.0%
2005	1,980.6	6,687	15.9%	12,314	[b]	2.1%
2006	2,112.7	7,062	16.0%	12,602	[b]	2.3%
2007	2,241.2	7,421	16.2%	12,946	[b]	2.7%
Projections						
2009	2,509.5	8,160	17.6%			
2012	2,930.7	9,282	18.0%			
2015	3,541.3	10,929	18.9%			
2018	4,353.2	13,100	20.3%			

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics (www.bls.gov [January 2009]); U. S. Department of Commerce, Bureau of Economic Analysis (www.bea.gov [January 2009]); U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, National Health Expenditures Historical 1970-2007 and National Health Expenditure Projections 2008-2018 (www.cms.hhs.gov [September 2009]).
N/A – Not Available
[a] Based on Standard Industrial Classification (SIC) codes for health sector employment.
[b] Based on North American Industry Classification System (NAICS) for health sector employment.

Figure 1
National Health Expenditures
as a Percent of Gross Domestic Product
and by Health Service Type, 2007



Based on this definition, **Table 2** shows the U.S. data and the data for the New England Region, and the states in the region. Data are only available through 2004. These data generally illustrate the same trend as **Table 1**, that per capital health expenditures are increasing and that health expenditures are increasing as a percent of gross state product or gross domestic product.

For New Hampshire, the percent of gross state product was 11.2 percent in 1992 and had increased to 13.7 percent in 2004. The per capital health expenditures for New Hampshire increased from $2,672 in 1992 to $5,431 in 2004; the per capita health expenditures more than doubled during this 12-year period. When comparing New Hampshire data to the U.S., New Hampshire per capita expenditures were lower than the U.S. in 1992 and 1996 but higher than the U.S. in 2000 and 2004. The New Hampshire percent of gross state product was also lower in 1992 and 1996, the same in 2000, and higher in 2004.

When comparing New Hampshire to the New England Region, New Hampshire had lower per capita and lower percent of GSP for all four years. When comparing New Hampshire to the other

Table 2

Comparison of the United States, New England Region, and New England Region States -

Personal Health Care Expenditures in Total, Per Capita, and Percent of Gross Product - 1992, 1996, 2000, and 2004

	1992			1996			2000			2004		
Geography	Personal Health Care Exp ($millions)	Per Capita Health Exp ($)	% of GSP/ GDP[1]	Personal Health Care Exp ($millions)	Per Capita Health Exp ($)	% of GSP/ GDP[1]	Personal Health Care Exp ($millions)	Per Capita Health Exp ($)	% of GSP/ GDP[1]	Personal Health Care Exp ($millions)	Per Capita Health Exp ($)	% of GSP/ GDP[1]
United States	$725,920	$2,830	11.8%	$910,273	$3,379	11.9%	$1,139,855	$4,039	11.7%	$1,551,255	$5,283	13.4%
New England Region	$43,286	$3,261	12.1%	$53,786	$3,968	12.2%	$67,172	$4,813	11.9%	$91,269	$6,408	14.1%
Connecticut	$11,486	$3,480	11.0%	$13,807	$4,138	10.9%	$16,890	$4,949	10.5%	$22,167	$6,344	12.2%
Maine	$3,283	$2,650	13.5%	$4,311	$3,452	15.1%	$5,798	$4,540	16.3%	$8,593	$6,540	19.9%
Massachusetts	$20,944	$3,474	12.6%	$26,046	$4,215	12.5%	$31,947	$5,021	11.6%	$43,009	$6,683	14.0%
New Hampshire	**$2,987**	**$2,672**	11.2%	**$3,900**	**$3,319**	11.2%	**$5,094**	**$4,105**	11.7%	**$7,050**	**$5,431**	13.7%
Rhode Island	$3,166	$3,125	14.0%	$3,855	$3,776	14.5%	$4,844	$4,609	14.4%	$6,682	$6,193	15.9%
Vermont	$1,420	$2,478	11.3%	$1,867	$3,143	12.8%	$2,599	$4,261	14.6%	$3,768	$6,068	17.3%

SOURCES: U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, National Health Expenditures Historical selected years 1992-2004 and National Health Expenditure Projections selected years 1992-2004 (www.cms.hhs.gov [November 2009]).

[1] GSP/GDP - Gross State Product or Gross Domestic Product (whichever is applicable to the data).

states in the New England Region, New Hampshire was third to the lowest per capita in 1992 and second to the lowest per capita in 1996; Vermont had the lowest per capita health expenditures in the region these two years. When comparing to the other states in the New England Region, New Hampshire had the lowest per capita health expenditures in 2000 and 2004. New Hampshire had the second lowest percent of GSP of all the states in the New England Region in 2004.

The next three tables include data from the New Hampshire Employment Security and demonstrate the importance of the health sector as compared to the entire economy. These data are for comparative and growth purposes only. Data from different sources utilize different definitions and industry sectors determine their reporting industry category; therefore, comparisons between data sources are not definitive.

Table 3 shows an increase of 14,999 employees or 27.7 percent in the average employment in health services in New Hampshire over the eight year period from 2000 and 2008. For average wages in health services, the eight year increase was 82.1 percent or an increase of $1.5 billion. The data show health care broken into three segments, ambulatory health care services (e.g., physician practices, health centers, home health care, hospice programs, all health services that are not in the other two categories, etc.), hospitals, and nursing and residential care. The ambulatory health care services accounted for the largest increase in both employment and wages. Hospitals were the second largest category. Hospitals represented 37.5 percent of total average annual health care employment in 2000 and increased to 39.2 percent in 2008. For annual average wages, hospitals represented 36.3 percent of the total in 2000 and increased to 38.4 percent in 2008. Hospitals have evolved into hospital systems and this is changing the categories of health services.

Table 3
Employment and Payroll for Health Services in New Hampshire, 2000 and 2008

	Avg Annual Employment	% of Total	Avg Annual Wages	% of Total
2000 Data				
Ambulatory Health Care Services	22,881	42.2%	$947,411,601	50.8%
Hospitals	**20,326**	**37.5%**	**$676,480,989**	**36.3%**
Nursing & Residential Care Facilities	10,993	20.3%	$242,242,188	13.0%
Total Health Care	54,200	100.0%	$1,866,134,778	100.1%
2008 Data				
Ambulatory Health Care Services	27,715	40.1%	$1,664,995,254	49.0%
Hospitals	**27,131**	**39.2%**	**$1,305,805,263**	**38.4%**
Nursing & Residential Care Facilities	14,353	20.7%	$426,714,116	12.6%
Total Health Care	69,199	100.0%	$3,397,514,633	100.0%
Increase from 2000 to 2008	**14,999**	**27.7%**	**$1,531,379,855**	**82.1%**

Source: New Hampshire Employment Security, Economic and Labor Market Information Bureau – NH Covered Employment and Wages for 2000 and 2008.

Table 4 illustrates that health care ranked third in average annual employment and second in average annual wages among private sector industries in New Hampshire in 2008. Retail trade had the largest number of employees with 96,785, representing 17.9 percent of total private industry employment in the state. Second, manufacturing has 75,912 or 14.0 percent. Health care had 69,199 employees which represented 12.8 percent of the total, for the third largest private industry sector. Manufacturing had the largest amount of average annual wages with $4.4 billion, representing 18.1 percent of the total private industry average annual wages. Health care had the second largest amount of average annual wages with $3.4 billion which was 13.8 percent of the total.

Table 4
Average Annual Employment and Wages and Salaries (Income)
by Top Five Private Industries for New Hampshire, 2008

Industry Category	Avg Annual Employment	% of Total Private
Total Private	541,767	100.0%
Retail Trade	96,785	17.9%
Manufacturing	75,912	14.0%
Health Care	**69,199**	**12.8%**
Accommodation & Food Services	52,774	9.7%
Professional & Technical Services	30,970	5.7%

Industry Category	Avg Annual Wages ($1,000s)	% of Total Private
Total Private	$24,668,864	100.0%
Manufacturing	$4,474,177	18.1%
Health Care	**$3,397,515**	**13.8%**
Retail Trade	$2,574,675	10.4%
Professional and Technical Services	$2,288,002	9.3%
Finance and Insurance	$2,097,241	8.5%

Source: Economic and Labor Market Information Bureau, New Hampshire Employment Security, 2008.

Data are also available to illustrate the private industries with highest percent growth from 2000 to 2008. In **Table 5**, health care ranks second in growth over the eight year period for both average annual employment and average annual wages. For average annual employment, only mining had a larger growth rate. Health care increased employment by 27.7 percent, compared to mining with an increase of 30.7 percent. For average annual wages, educational services grew the most with an 83.0 percent increase from 2000 to 2008. Health care was the second largest category in terms of growth in private industry, with an 82.1 percent increase from 2000 to 2008. This is an average of over 10.0 percent per year.

Table 5
Top Five Private Industries based on Percent Growth in New Hampshire from 2000 – 2008

Industry Category	2000 Avg Annual Employment	2008 Avg Annual Employment	2000 – 2008 Percent Change
Total Private	529,504	541,769	2.3%
Mining	462	604	30.7%
Health Care	**54,200**	**69,199**	**27.7%**
Educational Services	14,633	17,573	20.1%
Professional & Technical Services	26,358	30,970	17.5%
Management of Cos/Enterprises	7,261	8,111	11.7%

Industry Category	2000 Avg Annual Wages ($1,000s)	2008 Avg Annual Wages ($1,000s)	2000 -2008 Percent Change
Total Private	$18,664,639	$24,527,578	31.4%
Educational Services	$430,169	$787,052	83.0%
Health Care	**$1,866,135**	**$3,397,515**	**82.1%**
Administrative & Waste Services	$638,851	$1,060,326	66.0%
Mining	$18,789	$30,714	63.5%
Finance & Insurance	$1,345,259	$2,085,200	55.0%

Source: Economic and Labor Market Information Bureau, New Hampshire Employment Security, 2000 and 2008.

The population of New Hampshire for 2000 and 2008 is presented in **Table 6** with age group breakdowns. The age group 45 to 64 years of age had the largest increase, 25.0 percent, from 2000 to 2008. The next largest group was age 65 and older with 12.8 percent. The age distribution of the population greatly impacts the type of health care services needed.

Table 6
Population by Age Group for New Hampshire, 2000 and 2008

Population by Age Groups	Census 2000	Census Estimate 2008	Percent Change
Age 19 and under	344,165	340,293	-1.1%
Age 20 thru 44	450,006	455,797	1.3%
Age 45 to 64	293,645	391,408	25.0%
Age 65 and older	147,970	169,718	12.8%
Totals	1,235,786	1,357,216	8.9%

SOURCE: U.S. Census Bureau; 2000 Census and 2008 population estimates (www.census.gov [November 2009]).

Data in **Table 7** present comparisons of New Hampshire with the U.S. and other states in the New England Region. Per capita income (PCI) for New Hampshire is third highest in the New England Region and higher than the PCI for the U.S. The poverty rate for all ages for New Hampshire is the lowest in the region and significantly lower than the U.S. The poverty rate for the 18 and under ages is lowest in the region and significantly lower than the U.S. The 2008 annual unemployment rate for New Hampshire was the lowest in the region and lower than the U.S. The September 2009 unemployment rate was the second lowest in the region and lower than the U.S. These data are illustrative of the overall health of the economy in New Hampshire.

Data in **Table 8** illustrate total personal income and total transfer receipts for 2007 for New Hampshire and the U.S. from the U. S. Department of Commerce, Bureau of Economic Analysis.

Table 7
Economic Data – New Hampshire, States in New England Region, and U.S.

Region	2007 Per Capita Income	2007 % of Poverty - All Ages	2007 % of Poverty - <18	2008 Annual Unemployment Rate	September 2009 Unemployment Rate
United States	$38,615	13.0%	18.0%	5.8%	9.8%
Connecticut	$54,981	7.9%	10.8%	5.7%	8.2%
Maine	$33,991	12.2%	15.7%	5.4%	7.8%
Massachusetts	$48,995	10.0%	13.0%	5.3%	9.3%
New Hampshire	**$41,639**	**7.3%**	**9.2%**	**3.8%**	**7.2%**
Rhode Island	$39,829	11.9%	16.9%	7.8%	12.3%
Vermont	$37,483	10.1%	12.4%	4.8%	6.4%

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics (www.bls.gov [November 2009]); U. S. Department of Commerce, Bureau of Economic Analysis (www.bea.gov [November 2009]); U.S. Census Bureau (www.census.gov [November 2009]).

Table 8
Economic Indicators for New Hampshire and the United States, 2007

Indicator	New Hampshire	Percent	United States	Percent
Total Personal Income (2007)	$54,640,414,000		$11,634,322,000,000	
Total Transfer Receipts (2007)	$6,445,999,000	100.0%	$1,712,794,000,000	100.0%
Retirement & Disability Ins Benefits	$2,881,064,000	44.7%	$609,445,000,000	35.6%
Medical Benefits	$2,514,126,000	39.0%	$767,270,000,000	44.8%
Income Maintenance Benefits	$383,875,000	6.0%	$169,513,000,000	9.9%
Unemployment Ins Compensation	$100,677,000	1.6%	$33,299,000,000	1.9%
Veterans Benefits	$201,930,000	3.1%	$41,508,000,000	2.4%
All other transfer receipts	$364,327,000	5.7%	$91,759,000,000	5.4%
Transfer Receipts as a Percentage of Total Personal Income (2007)	11.80%		14.70%	

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis (www.bea.gov [November 2009]).

Of the total transfer receipts, retirement and disability insurance benefits are 44.7 percent and medical benefits 39.0 percent for New Hampshire, compared to the U.S. with 35.6 percent and 44.8 percent, respectively. Transfer receipts as a percent of total personal income was 11.8 percent for New Hampshire compared to 14.7 percent for the U.S. The higher this percent, the more dependent an economy is on federal and state government funds; New Hampshire has a very low percent of transfer receipts to total personal income.

Data in **Table 9** are the ten leading causes of death presented in rank order for New Hampshire residents, with the age-adjusted rates per 100,000 population. New Hampshire rates exceed the U.S. rates for invasive cancer, chronic lower respiratory, Alzheimer's, and suicide. The causes of death are an indicator of the type of health services needed in New Hampshire.

Table 9
Leading Causes of Death for
New Hampshire Residents, 1999-2001

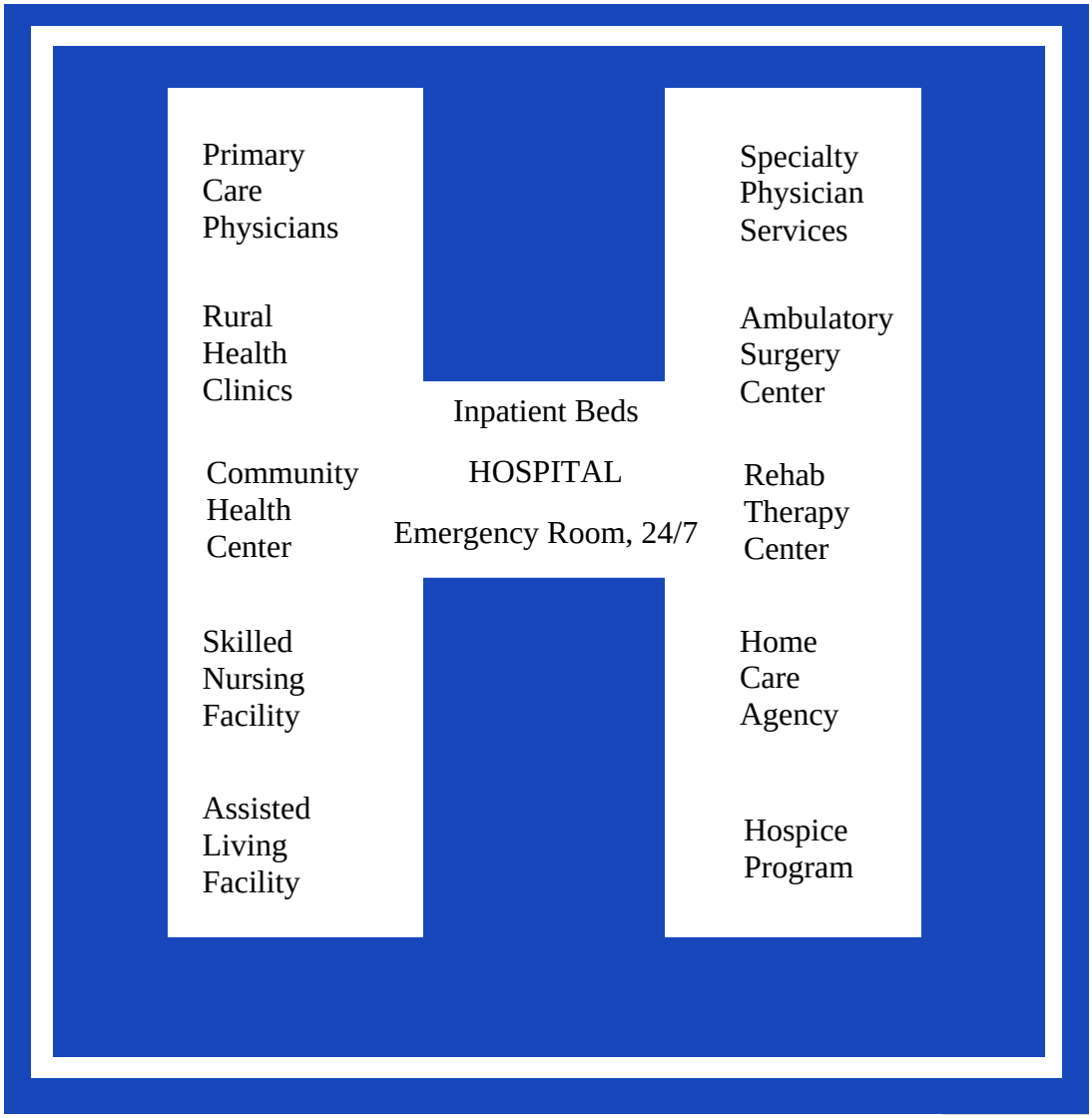
Leading Causes	NH Age Adjusted Rate / 100,000	US Rate / 100,000
Diseases of heart	236.1	258.3
Invasive cancer	202.0	198.6
Cerebrovascular disease	55.7	60.0
Chronic lower respiratory	50.7	44.4
Unintentional injuries	28.4	33.9
Diabetes	24.8	25.1
Alzheimer's	24.1	17.8
Flu & pneumonia	16.7	23.0
Suicide	12.1	10.5
Nephritis	9.5	13.5

SOURCE: New Hampshire Department of Health and Human Services, Division of Public Health Services - Health Statistics and Data Management Leading Causes of Death of New Hampshire Residents, 1999-2001.

Acute Care Hospital Systems in Hew Hampshire

Traditionally, acute care hospitals have included inpatient care and emergency room services, 24/7. However, it is important to understand that acute care hospitals have changed. In response to diverse health care needs and to adapt to a changing, complex environment, acute care hospitals in New Hampshire are now systems of local health services that may include: primary care and specialty care physician practices; ambulatory surgery centers; health centers or clinics; assisted living or skilled nursing care facilities; home care or hospice services; rehabilitation therapy centers, etc. For example, primary care physician practices are more often becoming part of a "hospital system" because independent practices are not as financially viable. Assisted living facilities within a hospital system are often in response to an aging population. **Figure 2** illustrates the concept of the hospital systems; however, each "hospital system" may vary based

Figure 2. Concept of a Hospital System



on the needs and resources of the medical service area or community. Hospital systems have resulted in the hospital sector having higher employment and income and including services that have not traditionally been included in the hospital sector. The importance of hospital systems, however, extends beyond health care.

The hospital systems in New Hampshire are presented in **Figure 3**. All hospital systems are shown including the specialty hospitals. A legend is provided in **Table 10** with the names of the hospital systems that relate to the numbers in the circles on the figure; the type of hospital system and the location of the hospital system (city/town) are also shown.

Data for the acute care hospital systems were from the 2008 audited financial statements submitted to the New Hampshire Hospital Association by each of the acute care hospital

Figure 3.
Hospital Systems in New Hampshire

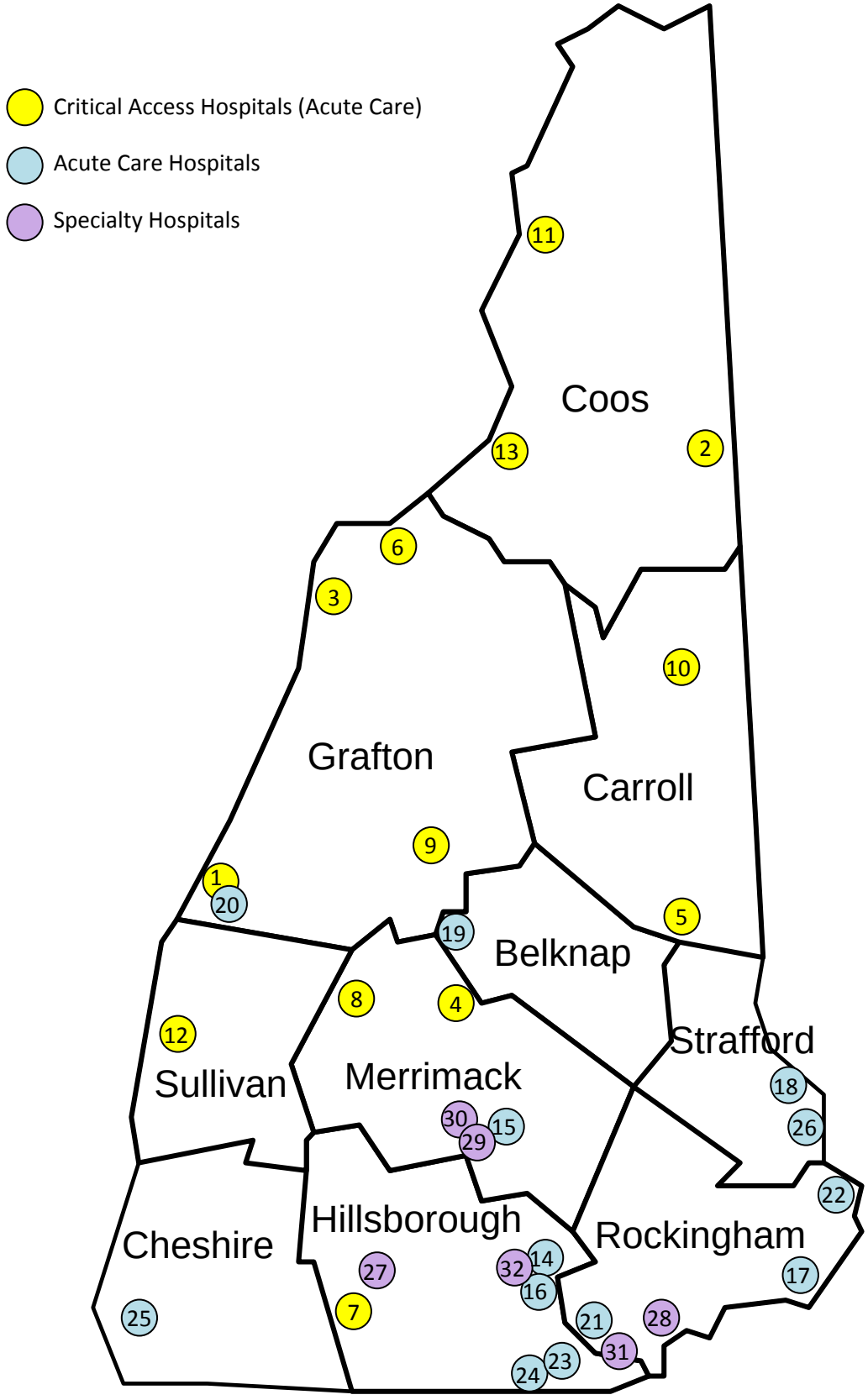


Table 10
All New Hampshire Hospital Systems by Type

	Hospital Systems	City/Town	Type
1	Alice Peck Day Memorial Hospital	Lebanon	CAH*
2	Androscoggin Valley Hospital	Berlin	CAH*
3	Cottage Hospital	Woodsville	CAH*
4	Franklin Regional Hospital	Franklin	CAH*
5	Huggins Hospital	Wolfeboro	CAH*
6	Littleton Regional Hospital	Littleton	CAH*
7	Monadnock Community Hospital	Peterborough	CAH*
8	New London Hospital Assn Inc	New London	CAH*
9	Speare Memorial Hospital	Plymouth	CAH*
10	The Memorial Hospital	North Conway	CAH*
11	Upper Connecticut Valley Hospital	Colebrook	CAH*
12	Valley Regional Hospital	Claremont	CAH*
13	Weeks Medical Center	Lancaster	CAH*
14	Catholic Medical Center	Manchester	Acute Care
15	Concord Hospital	Concord	Acute Care
16	Elliot Hospital	Manchester	Acute Care
17	Exeter Hospital	Exeter	Acute Care
18	Frisbie Memorial Hospital	Rochester	Acute Care
19	Lakes Region General Hospital	Laconia	Acute Care
20	Mary Hitchcock Memorial Hospital	Lebanon	Acute Care
21	Parkland Medical Center	Derry	Acute Care
22	Portsmouth Regional Hospital	Portsmouth	Acute Care
23	Southern NH Medical Center	Nashua	Acute Care
24	St. Joseph Hospital	Nashua	Acute Care
25	The Cheshire Medical Center	Keene	Acute Care
26	Wentworth-Douglass Hospital	Dover	Acute Care
27	Crotched Mountain Rehab Center	Greenfield	Specialty
28	Hampstead Hospital	Hampstead	Specialty
29	Healthsouth Rehab Hospital	Concord	Specialty
30	New Hampshire Hospital	Concord	Specialty
31	Northeast Rehab Hospital	Salem	Specialty
32	Veterans Affairs Medical Center	Manchester	Specialty

* CAH - Critical Access Hospital (rural acute care hospital)

Table 11
Selected Statistics for New Hampshire Acute Care Hospital Systems
by Hospital Bed Size – 2008

	25 or Less Beds*	85 - 200 Beds	200+ Beds	All Hospitals
No. of Hospital Systems	13	7	6	26
Employment	5,881	10,450	21,184	37,515
Average Employment	452	1,493	3,531	1,443
Payroll & Benefits	$304,542,805	$653,696,116	$1,463,959,294	$2,422,198,215
Average Payroll	$23,426,370	$93,385,159	$243,993,216	$93,161,470
Average Salary	$51,784	$62,555	$69,107	$64,566

* Critical Access Hospitals
Source: 2008 Audited Financial Statements; data compiled by New Hampshire Hospital Association.

systems. The hospitals in New Hampshire have developed into hospital systems and these data are reflective of these total hospital systems and not just traditional hospitals with inpatient beds and emergency rooms. **Table 11** presents the data by hospital bed size to provide a framework to illustrate employment and payroll for the hospital systems. For the critical access hospital (CAH) systems with 25 beds or less, the table shows 13 CAH hospital systems, with total employment of 5,881 and average employment per hospital system of 452. For CAH systems, total payroll (wages, salaries, and benefits) was $304.5 million with an average payroll per hospital system of $23.4 million and an average salary per employee of $51,784. The data are also available for hospital systems with 85 to 200 beds and for hospital systems with 200 or more beds.

The total for all 26 acute care hospital systems was 37,515 employees and $2.4 billion in payroll plus benefits. The average employment per hospital system was 1,443 and the average payroll with benefits was $93.2 million. The average salary per employee for all acute care hospital systems was $64,566.

Table 12 illustrates the acute care hospital systems by counties with licensed beds, admissions including newborns, total employment and total annual payroll with benefits for 2008. These data are from the 2008 audited financial statements for each hospital system, received by the New Hampshire Hospital Association.

Population for each county is given based on U.S. Census Bureau population estimates for 2008. In summary, New Hampshire has 26 acute care hospital systems with 3,020 licensed beds and 132,498 total admissions including newborns. The acute care hospital systems had total employment of 37,515 and total annual payroll with benefits of $2.4 billion. The total annual payroll without benefits was $1.9 billion.

Table 12
Acute Care Hospital Systems by Counties in New Hampshire, 2008

	Hospital Systems	Licensed Beds	Admissions (incl newborns)	Total Employees[1]	Annual Payroll with Benefits[1]
BELKNAP COUNTY – Population 61,057					
19	Lakes Region General Hosp – Laconia	137	5,525	1,277	$71,769,940
CARROLL COUNTY – Population 47,395					
5	Huggins Hosp - Wolfeboro*	25	1,661	565	$28,466,843
10	The Memorial Hosp - North Conway*	25	1,644	592	$33,040,239
CHESHIRE COUNTY – Population 76,789					
25	The Cheshire Medical Center – Keene	169	5,515	1,320	$73,228,794
COOS COUNTY – Population 33,860					
2	Androscoggin Valley Hosp – Berlin*	25	1,559	438	$25,483,102
11	Upper CT Valley Hosp – Colebrook*	16	406	159	$9,204,541
13	Weeks Medical Center – Lancaster*	25	893	434	$23,440,239
GRAFTON COUNTY – Population 87,818					
1	Alice Peck Day Memorial Hosp - Lebanon*	25	1,359	495	$22,034,270
20	Mary Hitchcock Memorial Hosp - Lebanon	396	20,442	9,164	$700,030,000
6	Littleton Regional Hosp - Littleton*	25	1,764	396	$22,375,405
9	Speare Memorial Hosp - Plymouth*	25	1,381	356	$22,081,071
3	Cottage Hosp - Woodsville*	25	1,015	249	$12,989,588
HILLSBOROUGH COUNTY – Population 400,940					
14	Catholic Medical Center – Manchester	330	9,934	2,081	$137,195,834
16	Elliot Hosp – Manchester	296	14,496	3359	$189,559,786
7	Monadnock Community Hosp - Peterborough*	25	2,069	782	$31,739,907
23	Southern NH Medical Center – Nashua	188	10,893	2,253	$144,108,840
24	St Joseph Hosp – Nashua	208	5,931	1,945	$120,212,000
MERRIMACK COUNTY – Population 146,695					
15	Concord Hosp - Concord	295	13,316	3,600	$231,791,000
4	Franklin Regional Hosp - Franklin*	25	980	352	$18,470,157
8	New London Hosp Assn Inc - New London*	25	742	492	$30,438,320
ROCKINGHAM COUNTY – Population 295,525					
17	Exeter Hosp – Exeter	100	6,294	2,197	$136,821,584
21	Parkland Medical Center – Derry	86	3,656	525	$40,799,816
22	Portsmouth Regional Hosp – Portsmouth	209	7,517	1,035	$85,170,674
STRAFFORD COUNTY – Population 122,828					
18	Frisbie Memorial Hosp – Rochester	112	4,328	803	$61,491,000
26	Wentworth-Douglass Hosp – Dover	178	7,713	2,075	$125,476,142
SULLIVAN COUNTY – Population 42,093					
12	Valley Regional Hosp – Claremont*	25	1,465	571	$24,779,123
STATE OF NEW HAMPSHIRE Totals		**3,020**	**132,498**	**37,515**	**$2,422,198,215**
	Total annual payroll excluding benefits				$1,888,758,796

SOURCES: Estimated county population data for 2008, New Hampshire Office of Energy and Planning; hospital systems data from 2008 audited financial reports, New Hampshire Hospital Association.

* CAH - Critical Access Hospital (rural acute care hospital) systems.

[1] Employment and payroll data include the hospital systems. Hospital systems vary by community but may include physicians and staff in primary care and/or specialty care, long-term care facilities, home health care, etc.

Impact of Acute Care Hospital Systems in New Hampshire

Hospital systems are not only a major employer and source of income (wages, salaries, and benefits), hospital systems play a critical role in local, regional, and state economic development by generating employment and income in a wide range of other businesses and industries. The impact of the acute care hospital systems in New Hampshire will be presented in this section. The employment and income (wages, salaries, and benefits) of the acute care hospital systems in New Hampshire were derived from the 2008 audited financial statements collected by the New Hampshire Association.

The economic impact of New Hampshire acute care hospital systems, measured by employment of 37,515 and payroll of $2.4 billion, is significant. However, this does not tell the complete story because secondary economic impacts are created when hospital systems and their employees spend money. These secondary benefits are measured by multipliers using an input-output model and data from IMPLAN (the model and data are further discussed in **Appendix A**). This model is widely used and nationally-recognized by economists and other policy analysts across the U.S.

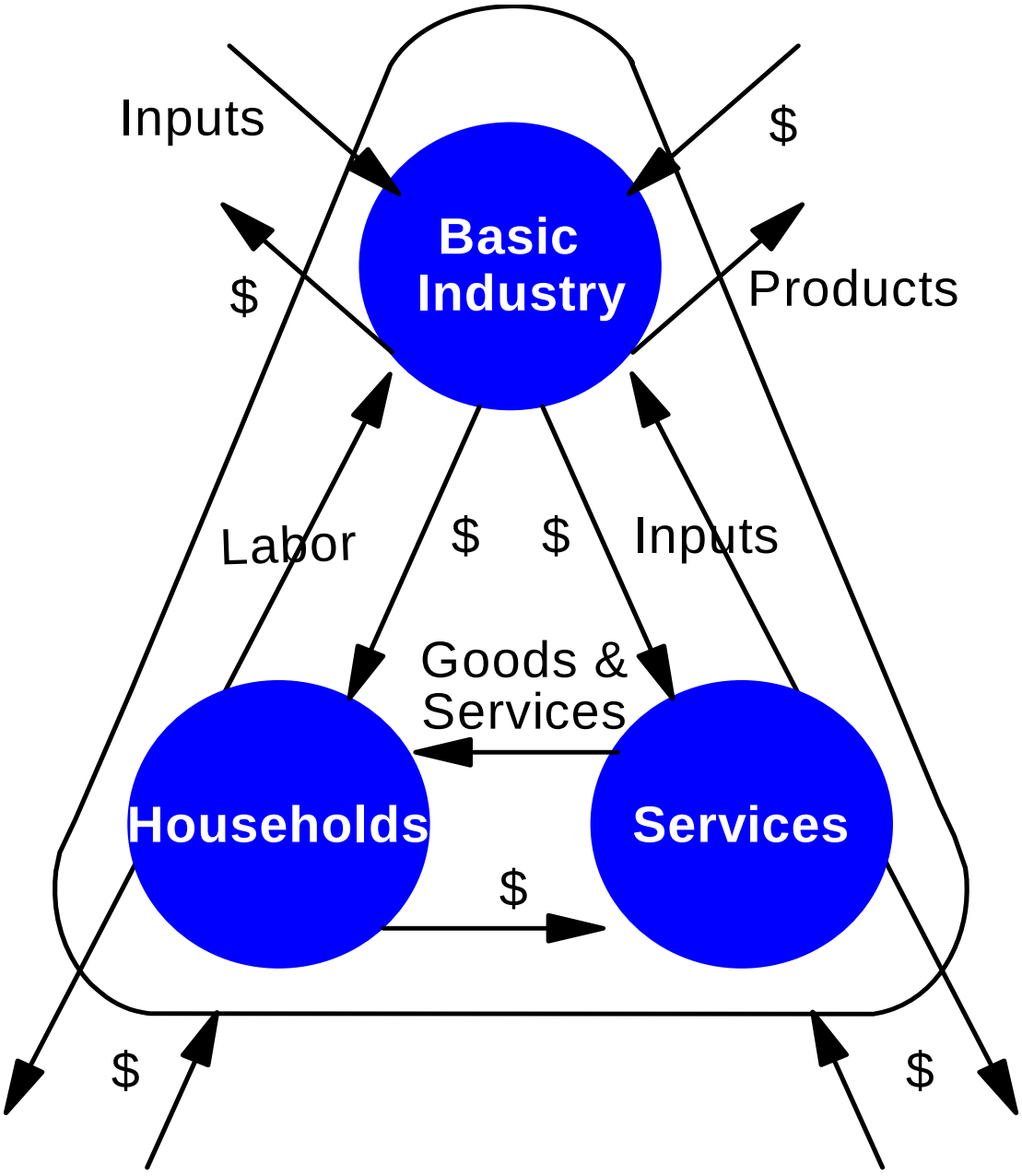
Utilizing the model and data, the direct and secondary economic impacts of hospital systems are estimated at the county and state level. Secondary impacts include the purchases that the hospital system makes to support hospital activities and those purchases made by their employees. The estimated impacts utilize employment and income multipliers specifically derived for New Hampshire. The next section will explain the concept of multipliers in a community economic system.

Some Basic Concepts of Community Economics

Figure 4 illustrates the major flows of goods, services, and dollars of any economy. The foundation of a community's economy is 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 4**. 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 4**), labor from the residents or "households" of the community (left side of **Figure 4**), and inputs from service industries located within the community (right side of **Figure 4**). 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 4**). The figure illustrates the interrelationship between a change in any one segment of a community's economy, resulting in reverberations throughout the entire economic system of the community.

Consider, for instance, the closing of a retail store. The services sector will no longer pay employees and dollars going to households will stop. Likewise, the retail store 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

Figure 4.
Community Economic System



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.

An industry sector purchases goods from other businesses and then the dollars flow to other businesses and this multiplier effect is reflected in the indirect impacts of an industry sector. Some examples of the hospital sector purchasing goods from other business and industries in New Hampshire are illustrated below:

- The Androscoggin Valley Hospital in Berlin works with the Northway Bank in their community for its financial transactions. In addition, AVH purchased over $400,000 last year in fuel from Munce's Superior Oil in Berlin.

- The Cheshire Medical Center in Keene recorded purchases totaling $2.9 million this year within New Hampshire on general materials and services.

- LRGHealthcare, with hospital systems in Laconia and Franklin, purchased goods and services annually from many local businesses. These include: Giguere Electric ($100,000); Belknap Landscaping ($15,000); Boulia-Gourel Lumber ($2,500); Joyce Janitorial Services ($183,000) and NAPA Auto ($4,500).

- The New London Hospital uses a local printer and spends about $55,000 annually. In addition, it purchases another $2,000 per year for small printing jobs and photo needs. Clarkes is a local retailer near the hospital system where they purchase about $18,000 annually for general supplies and special orders. The Dead River Company will provide maintenance services and fuel oil for over $250,000 in 2009.

- The Valley Regional Hospital in Claremont purchased a wide range of goods and services in their region. Examples include: $49,000 worth of snow plowing services from Charlestown Cornerstone LLC, $80,000 for carpentry and building repairs from Clean Cutz Carpentry in Claremont, more than $10,000 in computer supplies and services from Competitive Computers in Claremont, $7,200 from Lambert Supply Co., $9,500 from Brayshaw Printing in Warner and $2,700 for the Greater Claremont Chamber of Commerce membership and events.

The purchases of the hospital sector from all the other businesses and industries listed in the examples above will generate employment and income (wages, salaries, and benefits and proprietor income) in these other businesses and industries. The additional employment and income generated are part of the secondary employment and income impacts of the hospital sector.

Hospital employees purchase housing, food, clothing, cars, appliances, and services that spur local and regional economic development in numerous ways. Taxes paid by direct and secondary employment in the hospital sector support schools, community colleges, local police and fire departments, and other public services.

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 retail store. The impacting business, such as the retail store, 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. The indirect and induced impacts are also referred to as secondary impacts.

State Economic Impact of Acute Care Hospital Systems

In 2008, 37,515 people were employed by the 26 acute care hospital systems in New Hampshire (**Table 13**). The model derived the state employment multiplier of 1.75. This means that for every job in the hospital sector, another 0.75 jobs are created in other businesses and industries in the state. Applying the multiplier, these hospital systems generated an additional 28,136 jobs in secondary employment impact in other New Hampshire businesses and industries. The total employment impact from New Hampshire acute care hospital systems was 65,651.

Table 13
State Economic Impact of All Acute Care Hospital Systems on Employment and Income in New Hampshire, 2008

Employment Impact			
Direct Impact	Employment Multiplier	Secondary Impact	Total Impact
37,515	1.75	28,136	65,651
Income Impact			
Direct Impact	Income Multiplier	Secondary Impact	Total Impact
$2,422,198,215	1.54	$1,307,987,036	$3,730,185,250

SOURCES: 2008 Audited Financial Statements, New Hampshire Hospital Association; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

Data on the impact of income from the acute care hospital systems in New Hampshire are

presented in the second part of **Table 13**. Direct income from the 26 acute care hospital systems was estimated at $2.4 billion. The income multiplier is 1.54, which indicates that for every $1 in income from the hospital systems, an additional $0.54 in income is generated in other businesses and industries throughout the state. The secondary income impact was estimated at $1.3 billion. The total income impact of acute care hospital systems in New Hampshire was $3.7 billion.

Thirteen of the 26 acute care hospital systems in New Hampshire are designated as Critical Access Hospitals (CAHs). CAH is a federal designation for hospital systems located in rural areas that meet specific service and size criteria (e.g.; number of licensed beds, average length of stay of 96 hours or less). A listing of the CAHs is available in **Table 10**, hospital systems #1 - #13. As indicated in **Table 11**, the CAHs have employment of 5,881 and income of $304.5 million. Utilizing the state hospital employment and income multipliers will yield the estimated impact of CAHs on New Hampshire.

The secondary employment impact of CAHs, based on the state hospital employment multiplier of 1.75, was 4,411, for a total employment impact of 10,292. The income impact is based on the state hospital income multiplier of 1.54, resulting in secondary income impact of $164.5 million and total income impact of $469.0 million. These are the impacts of the 13 critical access hospital systems in New Hampshire: employment impact of 10,292 and income impact of $469.0 million (**Table 14**).

Table 14
State Economic Impact
of Critical Access Hospital (CAH) Acute Care Hospital Systems
on Employment and Income in New Hampshire, 2008

Employment Impact			
Direct Impact	Employment Multiplier	Secondary Impact	Total Impact
5,881	1.75	4,411	10,292
Income Impact			
Direct Impact	Income Multiplier	Secondary Impact	Total Impact
$304,542,805	1.54	$164,453,115	$468,995,920

SOURCES: 2008 Audited Financial Statements, New Hampshire Hospital Association; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

The remaining 13 acute care hospital systems in New Hampshire are the non-rural acute care hospital systems. A listing of these hospital systems is available in **Table 10**, hospital systems #14 - #26. These are the acute care hospital systems with over 25 beds (**Table 11**) with total direct employment of 31,634 and total direct income of $2.1 billion. Applying the state hospital employment and income multipliers resulted in total employment impact of 55,360 and total income impact of $3.3 billion (**Table 15**).

Table 15
State Economic Impact of Non-Rural Acute Care Hospital Systems on Employment and Income in New Hampshire, 2008

Employment Impact			
Direct Impact	Employment Multiplier	Secondary Impact	Total Impact
31,634	1.75	23,726	55,360
Income Impact			
Direct Impact	Income Multiplier	Secondary Impact	Total Impact
$2,117,655,410	1.54	$1,143,533,921	$3,261,189,331

SOURCES: 2008 Audited Financial Statements, New Hampshire Hospital Association; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

County Impact of Acute Care Hospital Systems

The impacts of the hospital systems in each county are illustrated in **Tables 16** and **17**. Each county has a multiplier based on the economic activity in the county. The hospital systems located in each county are shown in **Table 12**.

Grafton County has the largest hospital employment with 10,660 (**Table 16**). Applying the Grafton County hospital employment multiplier of 1.64, results in secondary hospital

Table 16
County Employment Impact of New Hampshire Hospital Systems on County Economies

County	Direct Impact	Multiplier	Secondary Impact	Total Impact
Belknap County	1,277	1.65	830	2,107
Carroll County	1,157	1.60	694	1,851
Cheshire County	1,320	1.73	964	2,284
Coos County	1,031	1.51	526	1,557
Grafton County	10,660	1.64	6,822	17,482
Hillsborough County	10,420	1.67	6,981	17,401
Merrimack County	4,444	1.67	2,977	7,421
Rockingham County	3,757	1.67	2,517	6,274
Strafford County	2,878	1.63	1,813	4,691
Sullivan County	571	1.55	314	885

SOURCES: 2008 Audited Financial Statements, New Hampshire Hospital Association; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

employment impact of 6,822 and total hospital employment impact of 17,482. Coos County has direct hospital employment of 1,031 and a Coos County hospital employment multiplier of 1.51, resulting in secondary hospital employment impact of 526 and total hospital employment impact of 1,557.

Table 17
County Income Impact of New Hampshire Hospital Systems on County Economies

County	Direct Impact ($ millions)	Income Multiplier	Secondary Impact ($ millions)	Total Impact ($ millions)
Belknap County	$71,769,940	1.45	$32,296,473	$104,066,413
Carroll County	$61,507,082	1.37	$22,757,620	$84,264,702
Cheshire County	$73,228,794	1.37	$27,094,654	$100,323,448
Coos County	$58,127,882	1.30	$17,438,365	$75,566,247
Grafton County	$779,510,334	1.40	$311,804,134	$1,091,314,468
Hillsborough County	$622,816,367	1.51	$317,636,347	$940,452,714
Merrimack County	$280,699,477	1.47	$131,928,754	$412,628,231
Rockingham County	$262,792,074	1.50	$131,396,037	$394,188,111
Strafford County	$186,967,142	1.40	$74,786,857	$261,753,999
Sullivan County	$24,779,123	1.32	$7,929,319	$32,708,442

SOURCES: 2008 Audited Financial Statements, New Hampshire Hospital Association; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

Table 17 shows the income impact of the hospital systems in each county in New Hampshire for 2008. Again, each county has a multiplier derived specifically for the county based on the economic activity of the county. Hillsborough County has direct hospital income of $622.8 million. With the Hillsborough County hospital income multiplier of 1.51, the secondary hospital income impact was $317.6 million and the total hospital income impact was $940.5 million. Coos County again had the smallest multiplier. Coos County had direct hospital income of $58.1 million with a Coos County hospital income multiplier of 1.30. Coos County had secondary hospital income impact of $17.4 million and total hospital income impact of $75.6 million.

The impact of the hospital systems in each county in New Hampshire are also shown in **Tables 16** and **17**. The county multipliers are less than the state multipliers because the amount of economic activity in the county is less than the state.

Summary

Every year acute care hospitals provide vital health services to thousands of people across New Hampshire. Traditionally, acute care hospitals have been thought of as places with only hospital beds and emergency rooms. In response to diverse health care needs, hospitals have adapted and emerged as hospital systems with a variety of health care services available under the same system. Hospital systems provide much more than health care services; hospital systems are vital to the economy. The study documents the economic impact of acute care hospital systems to the economy.

Health care and Economic Development. Hospital systems play a role in local economic development. The ability of a community to attract new industry or retain private businesses is influenced by the availability of health care services and other variables. Businesses and industries must compete for skilled workers and these workers need health care services nearby for them and their family. Retirees are another key component to successful economic development. New Hampshire is attractive to many people as a place to retire for its quality of life and many natural resources. The availability of health care services is an important factor for older adults seeking suitable retirement locations.

Trends in Health Care. The national health care sector is fast-growing in the U.S. Based on historical and projected data, the trend is expected to continue. Per capita health expenditures increased from $356 in 1970 to $7,421 in 2007 and are projected to continue to $9,282 in 2012. For New Hampshire, the personal per capital health expenditures increased from $2,672 in 1992 to $5,431 in 2004, more than doubling during this 12-year period.

Utilizing New Hampshire Employment Security data, average annual health care employment increased 14,999 or 27.7 percent and average annual health care wages increased $1.5 billion or 82.1 percent from 2000 to 2008. Based on size of private industries, health care ranked third in average annual employment with 12.8% of the total and ranked second in average annual wages with 13.8 percent. Based on percent growth in private industries from 2000 to 2008, health care ranked second in average annual employment growth with 27.7 percent and ranked second in average annual wages growth with 82.1 percent.

New Hampshire Demographic Data. In New Hampshire, population increased by 8.9 percent from 2000 to 2009; the age group 45 to 64 increased 25.0 percent and the age group age 65 and older increased 12.8 percent during the same time. Economic indicators for New Hampshire showed per capita income of $41,639 in 2007, which was higher than the U.S. and third highest of the New England states. Poverty rates for 2007 were considerably lower than national and the lowest in the New England region. The unemployment rate for September 2009 was lower than the U.S. and second lowest in the New England region. Transfer receipts as a percent of total personal income were 11.8 percent, which is lower than the U.S. Transfer receipts are the federal and state government monies paid to recipients in New Hampshire. A high percent of transfer receipts to personal income is an indicator of high utilization of government programs.

New Hampshire Leading Causes of Death. Leading causes of death showed New Hampshire with higher rates of cancer, chronic lower respiratory disease, Alzheimer's, and suicide than the U.S. The causes of death are an indicator of the type of health services needed in New Hampshire.

Acute Care Hospital Systems in New Hampshire. Acute care hospital systems are more than just inpatient and emergency room services. They have evolved into hospital systems that may include primary care and specialty care physician services, ambulatory surgery centers, health centers or clinics, assisted living or skilled nursing care facilities, home care or hospice services, rehabilitation therapy centers, etc. Hospital systems have resulted in the hospital sector having higher employment and income and including services that have not traditionally been included in the hospital sector. The importance of hospital systems extends beyond health services.

New Hampshire has 26 acute care hospital systems; 13 of these are designated as critical access hospital systems which have 25 beds or less and are the smaller, rural hospital systems. The other 13 are the non-rural acute care hospital systems. The New Hampshire Hospital Association utilized the 2008 audited financial statements for each hospital system for the study data. The 13 CAH hospital systems have total employment of 5,881 and total payroll (wages, salaries, and benefits) of $304.5 million. The other 13 non-rural acute care hospital systems have employment of 31,634 and total payroll of $2.1 billion. The total for all 26 acute care hospital systems was 37,515 employees and $2.4 billion in payroll plus benefits. The average employment per hospital system was 1,443 and the average payroll with benefits was $93.2 million. The average salary per employee for all acute care hospital systems was $64,566. These hospital systems had 3,020 licensed beds and 132,498 total admissions including newborns.

Economic Impact of Acute Care Hospital Systems. The economic impact of New Hampshire acute care hospital systems, measured by employment of 37,515 and payroll of $2.4 billion, is significant. The hospitals in New Hampshire have developed into hospital systems and these data are reflective of these total hospital systems and not just traditional hospitals with inpatient beds and emergency rooms. However, this does not tell the complete story of the impact of hospital systems because secondary economic impacts are created when hospital systems and their employees spend money. These secondary benefits are measured by multipliers using an input-output model and data from IMPLAN. This model is widely used and nationally-recognized by economists and other policy analysts across the U.S.

State Impact of Acute Care Hospital Systems. For all acute care hospital systems in New Hampshire, the total employment impact was 65,651 and the total income (payroll plus benefits) impact was $3.7 billion. This is based on the state hospital employment multiplier of 1.75 and the state hospital income multiplier of 1.54. The state hospital employment multiplier of 1.75 indicates that for each employee in the hospital sector, 0.75 employees are generated in other businesses and industries in the state. The employees in the other businesses and industries are referred to as secondary employment. The secondary employment was 28,136. The same concept applies to the income. The secondary income was $1.3 billion.

State Impact of Critical Access Hospital Acute Care Hospital Systems. Based on direct employment of 5,881 and direct income of $304.5 million, the state multipliers were applied to result in the secondary and total impacts. The secondary employment impact was 4,411, for a total employment impact of 10,292. The secondary income impact was $164.5 million, for a total income impact of $469.0 million.

State Impact of Non-Rural Acute Care Hospital Systems. Based on direct employment of 31,634 and direct income of $2.1 billion, the state multipliers were applied to result in the secondary and total impacts. The secondary employment impact was 23,726, for a total employment impact of 55,360. The secondary income impact was $1.1 billion, for a total income impact of $3.3 billion.

County Impact of Acute Care Hospital Systems. The hospital systems in each county have an impact on the economy of the county. The employment and income data for acute care hospital

systems by county are available. Each county has a multiplier derived specifically for the county. To illustrate employment impact for a county, Grafton County, with the largest county hospital system employment of 10,660, generates secondary employment impact of 6,822 and total employment impact of 17,482. To illustrate income impact for a county, Coos County, with the smallest county multiplier, had direct income of $58.1 million resulting in secondary income impact of $17.4 million and total income impact of $75.6 million.

Summary. The analysis presented in this report reveals that the acute care hospital systems in New Hampshire have a substantial impact on the state economy and the county economies. This contribution is sometimes overlooked in public policy discussions of access to care, community benefits, and health care cost containment.

Appendix A

Model and Data Used to Estimate Employment and Income Multipliers

A computer spreadsheet that uses 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).

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 or review their website at www.implan.com.

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