
Economic Contributions of Oregon's Community Hospitals

Main Report

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ECONorthwest
ECONOMICS • FINANCE • PLANNING

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The Oregon Association of Hospitals and Health Systems (OAHHS) is a nonprofit trade association that promotes community health and seeks to improve Oregon's health care industry. OAHHS works on behalf of the 60 hospitals in Oregon that provide inpatient and outpatient medical care 24 hours a day, 365 days a year.

A map of Oregon showing its 37 counties. Blue 'H' icons indicate the locations of hospitals. The counties and their corresponding hospital counts are: Clatsop (1), Washington (1), Hood River (1), Multnomah (1), Umatilla (1), Wallowa (1), Tillamook (1), Yamhill (1), Clackamas (1), Wasco (1), Morrow (1), Union (1), Polk (1), Marion (1), Lincoln (1), Benton (1), Linn (1), Jefferson (1), Grant (1), Baker (1), Lane (1), Deschutes (1), Crook (1), Harney (1), Malheur (1), Coos (1), Douglas (1), Lake (1), Curry (1), Jackson (1), Klamath (1), and Josephine (1). The map also shows the Pacific Ocean to the west and the California border to the south.

OAHHS commissioned ECONorthwest (ECO) to conduct a study measuring the economic contributions of Oregon’s acute care to the state’s economy.¹ Economic contributions describe the economic linkages between a project, program, or activity—in this case, hospitals—and other sectors of the economy. These economic linkages are determined by the indirect (supply-chain) and induced (consumption-driven) contributions that can be traced back to hospitals.

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ECO measured the aggregate economic activity associated with all hospitals in Oregon. Additionally, ECO calculated the economic activity supported by acute care hospitals for each county in Oregon. For this analysis, we will refer to OAHHS hospitals as the “hospital sector.” Exhibit 2² summarizes the economic contributions of the hospital sector in Oregon for 2015. We provided detailed information about individual hospitals are provided in Appendix A.

Exhibit 2. Economic Contributions of the Hospital Sector in Oregon, 2015 (\$M)

Type of Impact	Direct	Secondary	Total
Jobs	62,278	55,254	117,532
Output	\$9,592	\$6,854	\$16,446
Gross State Product	\$5,720	\$3,884	\$9,604
State and local taxes	\$258	\$295	\$553

Sources: ECONorthwest using direct employment data from the American Hospital Association 2015 Annual Survey and the 2014 IMPLAN economic impact model.

The key findings from this analysis include:

Employment. According to the 2015 American Hospital Association, hospitals in Oregon contributed 62,278 jobs in the state. Through supply-chain and consumption-driven effects, direct employment is linked to another 55,254 jobs in other sectors of the Oregon economy. In total, hospitals in Oregon are associated with 117,532 jobs in Oregon in 2015. This represents 4.9 percent of the total employment in Oregon in 2015.³

Output. Direct output from hospitals in Oregon total \$9.6 billion. After including secondary impacts from hospital operations, the total economic output is \$16.4 billion.

Gross State Product. The direct and secondary economic activity linked to hospitals contributed approximately \$9.6 billion to Oregon’s total Gross State Product (GSP) in 2015.

State and Local Taxes. Hospitals directly generated approximately \$258 million in tax and fee revenue for state and local tax jurisdictions in 2015. The state and local governments collected another \$295 million in taxes from businesses that supply goods and services to hospitals. This results in total tax revenue of about \$553 million in 2015.

Output represents the value of goods and services produced. This is the broadest measure of economic activity and includes contribution to gross state product and value of intermediate goods and services purchases.

Gross State Product is a measure of the value-added in production and, in the economic impact model, represents the sum of personal income, other income, and indirect business taxes.

State and Local Taxes
Taxes included are social insurance tax, property tax, motor vehicle tax, income tax, and other taxes and fees. It is important to consider that in IMPLAN, tax impacts are not based on rates or levies, but on the actual tax collected by the

² This analysis relies on full-time and part-time employment data from the American Hospital Association’s Annual Survey Database for fiscal year 2015. Accordingly, all references to 2015 are for the 2015 hospital fiscal year.

³ IMPLAN 2014 base data for Oregon. This includes covered and uncovered employment. Covered employment refers to jobs that are “covered” by state unemployment insurance. There are number of reasons workers would be classified as uncovered employees. In this analysis, uncovered employment generally refers to workers who are self-employed.

Another way to describe the economic activity supported by Oregon hospitals is to look at their economic multipliers. Economists use economic multipliers as a shorthand way to better understand the linkages between an activity and other sectors of the economy. Larger economic multipliers mean greater linkages and larger contributions to the economy. The economic multipliers associated with the hospital sector in Oregon for 2015 are shown in the exhibit below.

Exhibit 3. Economic Multipliers for the Hospital Sector in Oregon, 2015

Type of Impact	Multiplier
Jobs	1.9
Output	1.7
Gross State Product	1.7
State and Local Taxes	2.1

Sources: ECONorthwest using direct employment data from the American Hospital Association 2015 Annual Survey and the IMPLAN economic impact model.

The economic multipliers for the hospital sector in Oregon can be interpreted as follows:

- **Job multiplier of 1.9** suggests that every ten jobs in the hospital sector are linked, on average, to another 9 jobs in other sectors in Oregon.
- **Output multiplier of 1.7** means that every million dollars in goods and services produced in the hospital sector, another \$700,000 is produced in other sectors of the economy.
- **Gross State Product multiplier of 1.7** means that every million dollars in value that is directly generated by the hospital sector (incomes, profits, and business taxes) is associated with another \$700,000 in value added in other sectors of the Oregon economy.
- **State and local tax multiplier of 2.1** means that every million dollars in state and local taxes and fees directly generated by the hospital sector is linked to another \$1.1 million in state and local taxes and fees generated by other sectors.⁴

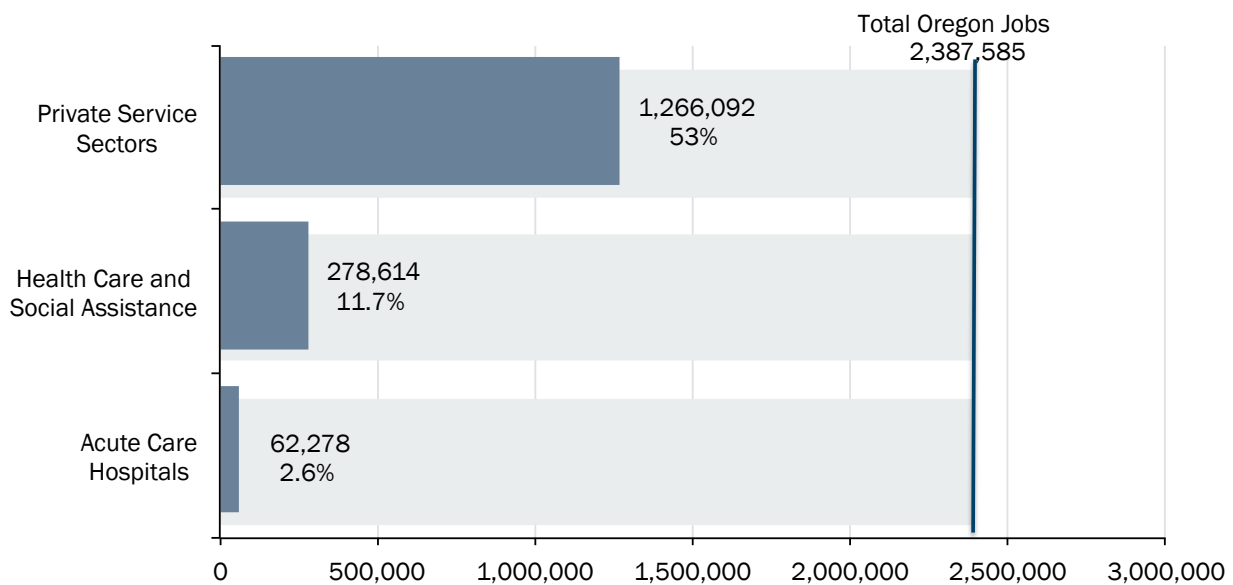
⁴ This does not include hospital provider taxes or federal matching Medicaid funds.

Hospital Sector and the Oregon Economy

Most of this report focuses on the economic effects supported by hospital operations in Oregon. Although these economic contributions measure describe the magnitude and distribution of economic activity supported in the state, it is also helpful to understand the broader role that the industry plays in Oregon's economy.

The exhibit below compares total hospital employment as a share of total Oregon employment, to the healthcare and social assistance sector, to all private service sectors⁵ in 2015. ECO used 2015 Bureau of Economic Analysis data for the private service sector, and the health care and social assistance sector. Private hospital employment is from the 2015 AHA survey. The private service sector includes all industries from two digit NAICS code 52 through 81. Health care and social assistance below is two-digit NAICS code 62. Hospitals are classified as three-digit NAICS code 622. According to the Bureau of Economic Analysis (BEA), Oregon's total employment⁶ was 2.3 million in 2015.

Exhibit 4. Employment in Service, Health Care, and Hospital sectors, Oregon, 2015



Source: BEA and the 2015 AHA Survey

Private service sectors employed 1.2 million people or 53 percent of the states total employment, in 2015. A subset of that, the healthcare and social assistance sector employment 278,614 people

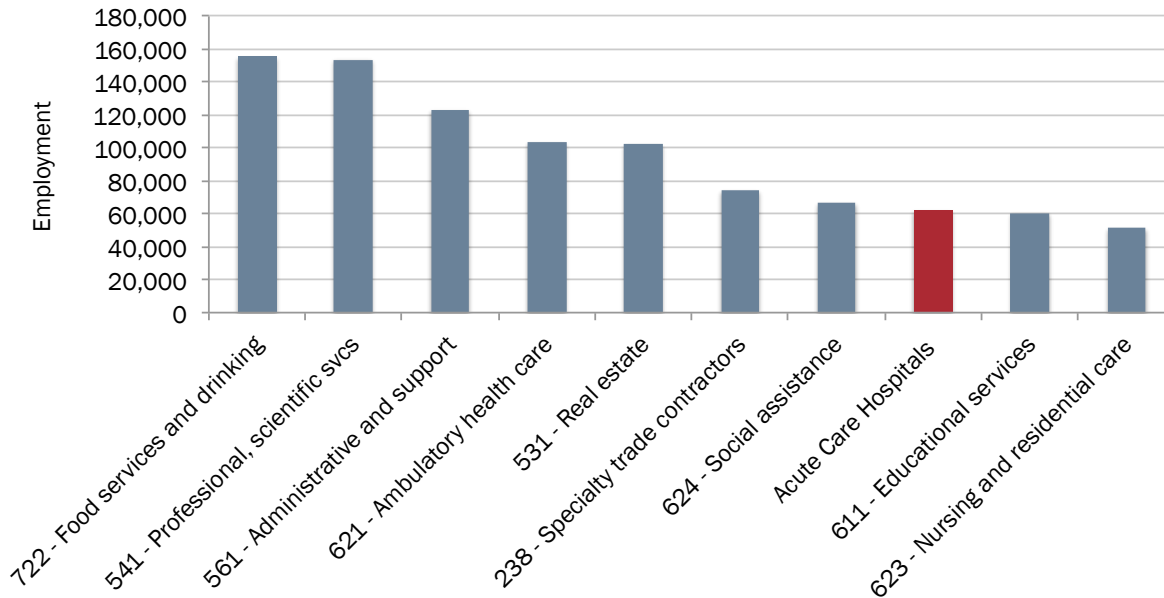
⁵ Private services sectors include all services from two digit NAICS code 52 through 81. (i.e. Information, Finance and insurance, Real estate, professional services, management of companies, administrative and support services, Educational services, Health care and social assistance, arts and entertainment, accommodations and food, and Other services (except public administration))

⁶ Employment here is farm and non-farm, public and private. See BEA's regional definitions of employment. <https://www.bea.gov/regional/definitions/>

or 11.7 percent of the states total employment, in 2015. Hospitals employed 62,278 people or 2.6 percent of the states total employment in the same year.

ECO used 2015 BEA data to compare hospital employment to 86 other industries at the 3-digit NAIC code level. Hospitals were in the top ten private industries for employment. Other top industries for employment shown in Exhibit 5 are food services and drinking places, professional, scientific and technical services, and administrative and support services.

Exhibit 5. Full-Time and Part-Time Employment by Major Private Industry Sector, 2015

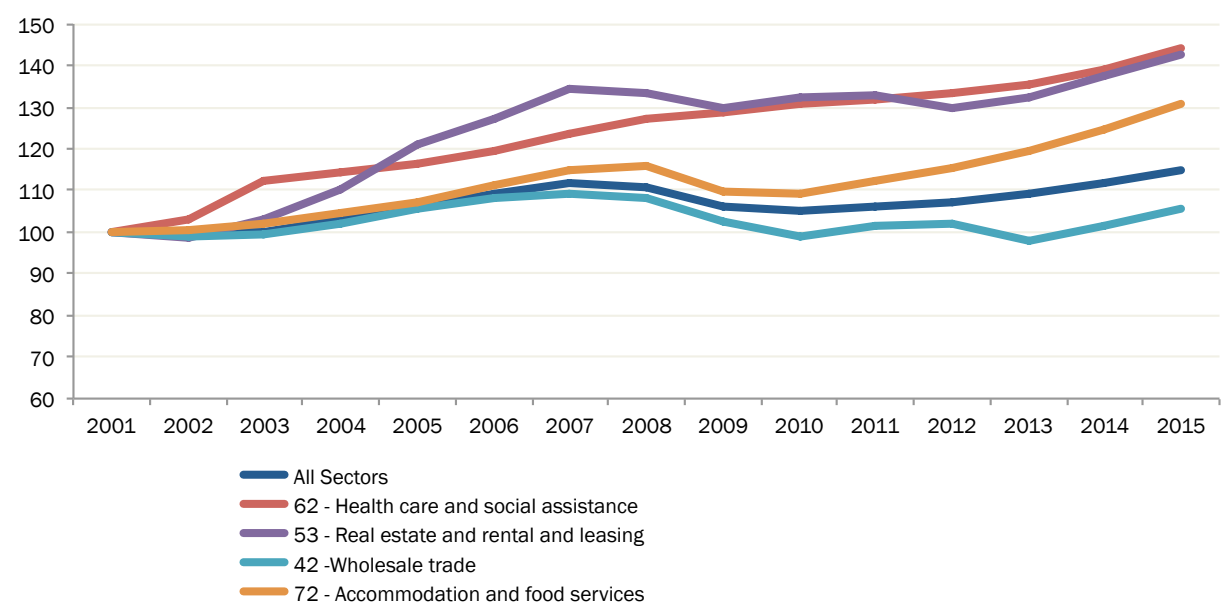


Source: Bureau of Economic Analysis, 2015

Hospitals were the 8th largest employer out of all private industries in Oregon in 2015, by employing 62,278 people. Food services and drinking places employed 155,700 people, professional, technical, and scientific services employed 153,830 people, and administrative and support services employed 123,137 people in 2015, respectively.

The health care sector as a whole has higher job growth than average private sector employment in Oregon. It also is growing at a faster rate than the other top employing private industries. Exhibit 6 shows the growth of the different industries, with 2001 as the baseline year. This graph, on the next page, displays employment growth between industries.

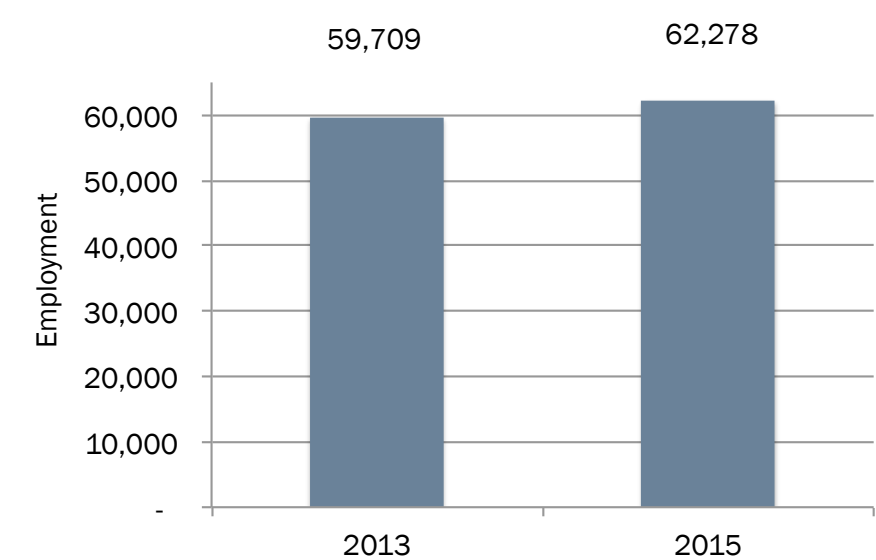
Exhibit 6. Percent Employment Growth, Health Care Industry and All Industries, 2001-2015, Oregon, (2001 = 100)



Source: Bureau of Economic Analysis

Exhibit 7 compares hospital employment using the 2013 and 2015 AHA survey. This shows the direct hospital employment growth between the two surveys. According the AHA survey total hospital employment increased by 2,569 jobs or by 4.3 percent from 2013 to 2015.

Exhibit 7. Acute Care Hospital Employment, 2013 and 2015

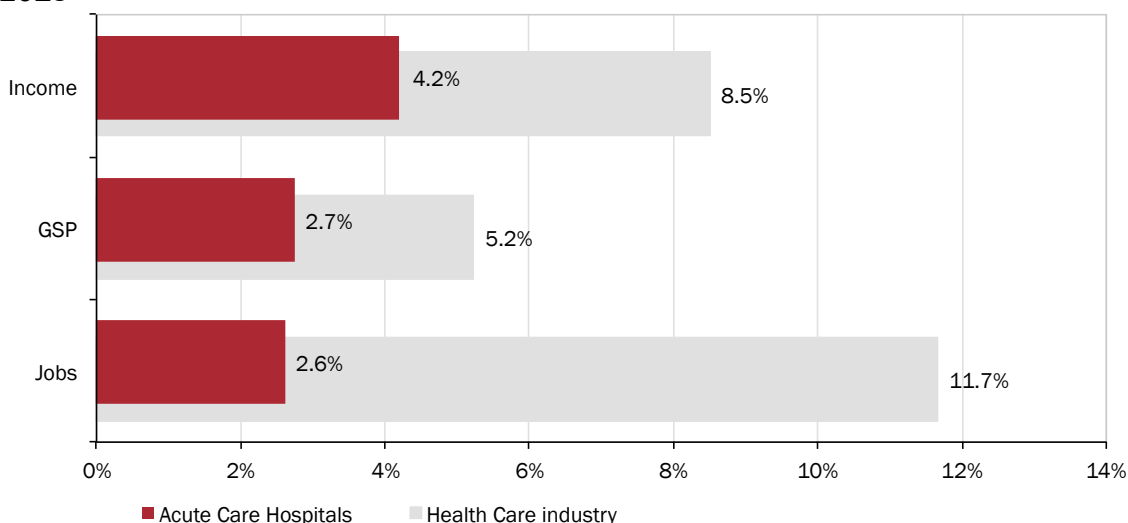


Source: American Hospital Association Survey, 2013 and 2015

Exhibit 8 shows direct GSP, income, and employment as a share of Oregon’s total. The direct economic activity of hospitals is approximately \$5.7 billion to Oregon’s GSP in 2015. This

represents 2.7 percent of Oregon’s GSP. The job contribution represents approximately 2.6 percent of total employment (farm and nonfarm) in Oregon for 2015. The red bar represents Hospital Sector as a percent of the Oregon total, and the gray bars represent the rest of the Health Care Sector’s share relative to the state.

Exhibit 8. Hospital and Health Care Direct Income, GSP and Jobs as a percent of Oregon Total, 2015



Sources:

ECONorthwest using direct employment data from the American Hospital Association 2015 Annual Survey and the IMPLAN economic impact model.

Note: Hospital jobs in this exhibit use the total (public and private) jobs number from the 2015 AHA survey

Economic Impacts

Impacts by Type

Economic impact analysis employs specific terminology to identify the different types of economic impacts. The four terms of interest are as follows.

1. *Direct Impacts* are those associated with the payroll and employment. They also include the direct output of the activities associated with the organization, which is estimated using an expenditure approach that sums labor and non-labor operating expenses.
2. *Indirect Impacts* are the goods and services purchased for operations. This spending generates the first round of indirect impacts. Suppliers will also purchase additional goods and services; this spending leads to additional rounds of indirect impacts. Because they represent interactions among businesses, these indirect effects are often referred to as supply-chain impacts.
3. *Induced Impacts* are the purchases of goods and services from household incomes. The direct and indirect increases in employment and income enhance the overall purchasing power in the economy, thereby inducing further consumption- and investment-driven stimulus. Employees at the organization, for example, will use their income to purchase

groceries or take their children to the doctor. These induced effects are often referred to as consumption-driven impacts.

4. *Secondary Impacts* are the sum of indirect and induced impacts or, simply, the economic effects on sectors outside of direct work on the project

Detailed Economic Contributions and Tax Revenue Results

This section presents the detailed economic contributions of hospitals. ECO measured contributions collectively for the hospital sector in Oregon and each county. ECO reported the economic contributions of the hospital sector for individual counties and the State of Oregon, including spillover effects⁷, in exhibit 9. Spillover effects arise from goods and services purchased outside the given study area. For example, a Hospital in Lane County may buy goods and services from Multnomah County, or vice versa. The spillover effects are reported for the state rather than allocated to individual counties. As such, the contributions reported below likely underestimate the economic contributions to each county.

Exhibit 9. Economic Contributions of the Hospital Sector, by County, 2015 (\$M)

County	Jobs			Gross State Product			State & Local Taxes		
	Direct	Secondary	Total	Direct	Secondary	Total	Direct	Secondary	Total
Baker	204	102	306	\$15.9	\$4.8	\$20.7	\$0.8	\$0.5	\$1.2
Benton	2,010	1,327	3,337	\$213.5	\$86.2	\$299.8	\$9.9	\$7.7	\$17.6
Clackamas	3,765	3,276	7,041	\$363.4	\$213.6	\$577.0	\$17.6	\$18.5	\$36.1
Clatsop	948	711	1,659	\$95.4	\$38.3	\$133.7	\$4.4	\$3.1	\$7.5
Coos	1,414	1,089	2,503	\$156.9	\$59.8	\$216.7	\$7.3	\$5.3	\$12.6
Crook	200	118	318	\$20.8	\$6.4	\$27.2	\$0.9	\$0.7	\$1.6
Curry	318	216	534	\$35.1	\$10.4	\$45.5	\$1.5	\$1.1	\$2.5
Deschutes	3,112	3,299	6,411	\$304.8	\$204.2	\$509.0	\$13.8	\$16.8	\$30.6
Douglas	1,033	723	1,756	\$97.5	\$40.6	\$138.1	\$4.6	\$3.6	\$8.2
Grant	206	111	317	\$20.9	\$4.8	\$25.6	\$0.9	\$0.5	\$1.5
Harney	168	104	272	\$17.9	\$4.3	\$22.2	\$0.8	\$0.5	\$1.3
Hood River	525	368	893	\$45.9	\$20.2	\$66.1	\$2.2	\$1.9	\$4.1
Jackson	3,879	3,646	7,525	\$315.9	\$203.5	\$519.4	\$15.1	\$19.3	\$34.4
Jefferson	191	78	269	\$16.1	\$4.3	\$20.4	\$0.8	\$0.4	\$1.2
Josephine	1,030	762	1,792	\$89.6	\$39.4	\$129.0	\$4.1	\$3.9	\$8.0
Klamath	1,299	974	2,273	\$114.9	\$51.5	\$166.4	\$5.4	\$5.2	\$10.6
Lake	244	115	359	\$25.7	\$5.5	\$31.2	\$1.3	\$0.7	\$2.0
Lane	4,906	4,415	9,321	\$437.0	\$282.6	\$719.7	\$20.6	\$22.2	\$42.8
Lincoln	818	581	1,399	\$79.4	\$31.6	\$111.0	\$3.6	\$2.6	\$6.2
Linn	1,655	976	2,631	\$150.7	\$58.3	\$208.9	\$7.0	\$5.3	\$12.4
Malheur	423	207	630	\$27.9	\$10.7	\$38.7	\$1.3	\$1.1	\$2.3
Marion	5,004	4,353	9,357	\$466.1	\$284.0	\$750.0	\$23.7	\$23.2	\$46.9
Morrow	74	21	95	\$7.0	\$1.4	\$8.4	\$0.4	\$0.1	\$0.5
Multnomah	18,500	14,430	32,930	\$1,666.0	\$1,190.6	\$2,856.5	\$65.0	\$73.7	\$138.7
Polk	140	66	206	\$15.7	\$3.7	\$19.4	\$0.7	\$0.4	\$1.0
Tillamook	443	284	727	\$44.0	\$14.3	\$58.3	\$2.1	\$1.3	\$3.4
Umatilla	912	529	1,441	\$80.8	\$30.7	\$111.5	\$4.0	\$2.8	\$6.8
Union	617	352	969	\$55.1	\$17.1	\$72.3	\$2.6	\$1.8	\$4.4
Wallowa	158	98	256	\$16.5	\$5.5	\$21.9	\$0.7	\$0.6	\$1.3
Wasco	567	340	907	\$43.9	\$20.0	\$63.8	\$2.2	\$1.7	\$3.9
Washington	6,412	4,488	10,900	\$583.5	\$385.4	\$968.9	\$28.1	\$27.9	\$56.0
Yamhill	1,103	640	1,743	\$96.0	\$37.2	\$133.1	\$4.6	\$3.5	\$8.1
Spillover	0	6,455	6,455	\$0.0	\$513.3	\$513.3	\$0.0	\$37.3	\$37.3
Grand Total	62,278	55,254	117,532	\$5,719.7	\$3,883.9	\$9,603.6	\$257.9	\$295.2	\$553.1

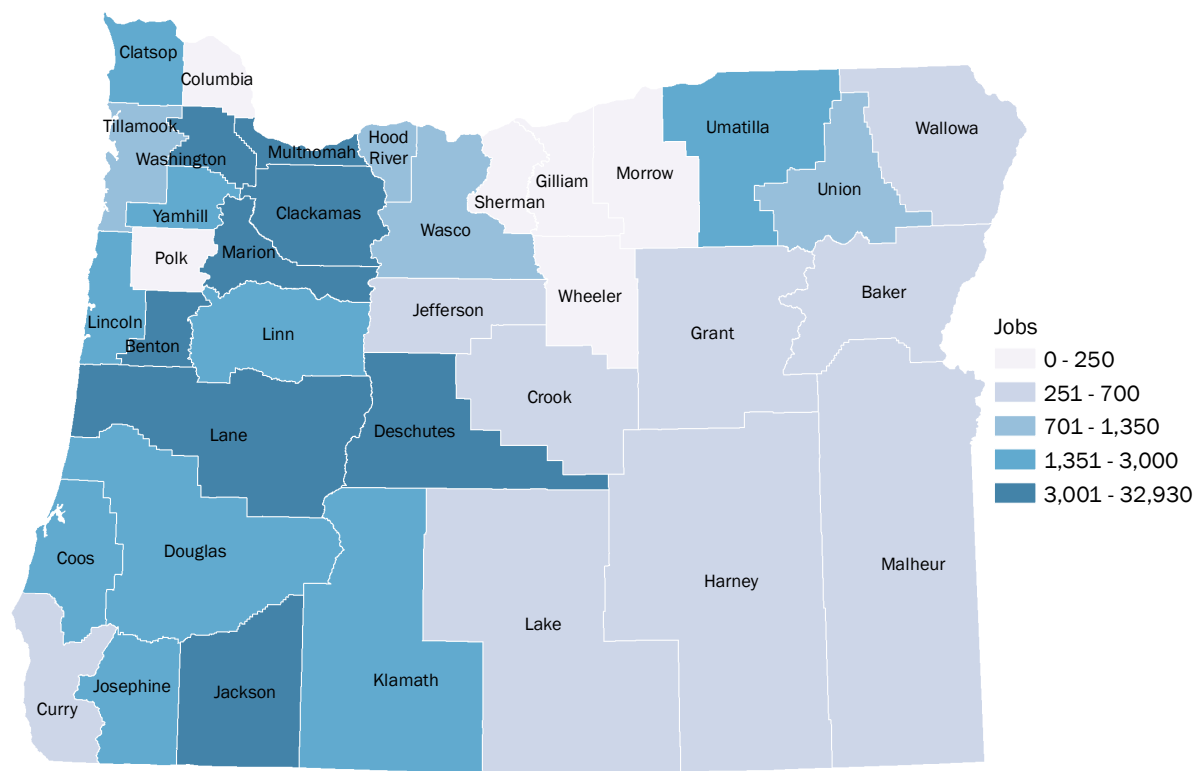
Sources: ECONorthwest using direct employment data from the American Hospital Association 2015 Annual Survey and the IMPLAN economic impact model.

The hospital sector directly employed 62,278 people in fiscal year 2015. Through supply-chain and consumption-driven effects, the hospital sector is associated with another 55,254

⁷ Spillover effects in this context are economic activities that occur in one region because of economic activities that occur in a different region

secondary jobs in other sectors of the Oregon economy. In total, 117,532 jobs are linked to economic activity generated by the hospital sector in 2015.

Exhibit 10. Direct and Secondary Job Contribution, by County



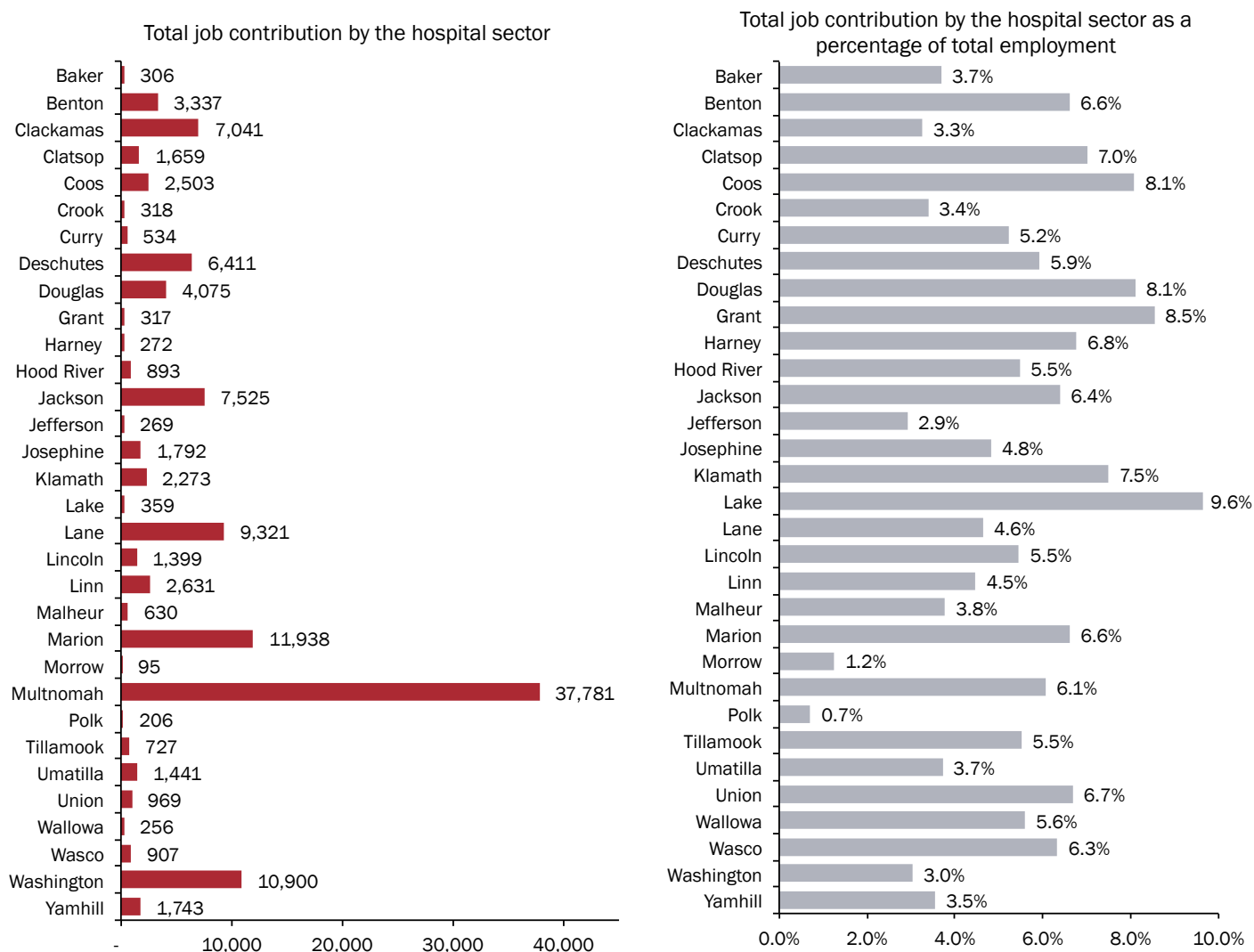
Source: 2015 AHA survey

In addition, the hospital sector directly supported \$257.9 million in revenue for state and local tax jurisdictions. Secondary spending and activities that are linked to the hospital sector generated another \$295.2 million in state and local tax and fee revenue. In total, the economic activity directly and indirectly linked to the hospital sector supported a total of \$553.1 million in tax and fee revenue for state and local tax jurisdictions in 2015.

IMPLAN estimates taxes incurred directly, indirectly, and through induced spending and employment. IMPLAN has only limited accuracy for tax rates by industrial classification, asset classes and geography for the secondary effects, and the results should be read as illustrative and not construed to be the detailed analysis. See technical appendix for further explanation of how tax revenues are calculated.

Exhibit 11 shows the total job contribution by hospitals and the total job contribution as a percentage of total employment in the county. These percentages show the relative importance of hospitals in each county.

Exhibit 11. Total Employment Contributions, 2015



Sources: ECONorthwest using direct employment data from the American Hospital Association 2015 Annual Survey and the IMPLAN economic impact model.

IMPLAN calculates multipliers for each economic effect calculated for this analysis: output, labor income, gross state product, and employment. The size of the multiplier is not a measure of the amount of activity or the importance of a given industry for the economy. It is an estimation of what would happen if that industry's sales to final demand ratio increased or decreased.

In other words, multipliers can be used to gauge the interdependence of sectors: the larger the output multiplier, the greater the interdependence of the sector on the rest of the regional economy. For example, the hospital sector has a greater interdependence with other sectors in Deschutes County (multipliers range from 1.67 to 2.06) relative to Wallowa County (1.33 to 1.62). The more hospital suppliers in a local area, the larger the multipliers will be.

Multipliers are calculated by dividing the total contribution by the direct contribution of the hospitals in that county. In employment terms, if the multiplier is 2.0, it means that for every job at the hospital, one additional job is supported in other sectors in the study area. Similarly, for GSP, if the multiplier is 1.5, for every \$1 million in hospital's contribution to GSP, an additional \$500,000 in production by other firms reacting to purchases by hospitals and their employees.

The hospital sector job multiplier of 1.89 exceeds the weighted average job multiplier for all industries in Oregon of 1.81. Statewide multipliers are higher than the county multipliers. This is due to indirect and induced spillover effects, which are not captured in the individual county models. The economic multipliers are shown for each county and the state of Oregon in Exhibit 12.

Exhibit 12. Economic Multipliers of the Hospital Sector, 2015

County	Employment	Gross State		State & Local
		Product	Output	
Baker	1.50	1.30	1.33	1.65
Benton	1.66	1.40	1.47	1.78
Clackamas	1.87	1.59	1.63	2.05
Clatsop	1.75	1.40	1.47	1.72
Coos	1.77	1.38	1.45	1.73
Crook	1.59	1.31	1.35	1.71
Curry	1.68	1.30	1.38	1.72
Deschutes	2.06	1.67	1.75	2.21
Douglas	1.70	1.42	1.46	1.80
Grant	1.54	1.23	1.29	1.59
Harney	1.62	1.24	1.35	1.57
Hood River	1.70	1.44	1.49	1.86
Jackson	1.94	1.64	1.70	2.27
Jefferson	1.41	1.27	1.31	1.51
Josephine	1.74	1.44	1.51	1.96
Klamath	1.75	1.45	1.51	1.97
Lake	1.47	1.21	1.27	1.54
Lane	1.90	1.65	1.67	2.08
Lincoln	1.71	1.40	1.45	1.73
Linn	1.59	1.39	1.40	1.76
Malheur	1.49	1.38	1.38	1.84
Marion	1.87	1.61	1.64	1.98
Morrow	1.28	1.20	1.23	1.35
Multnomah	1.78	1.71	1.70	2.14
Polk	1.47	1.23	1.30	1.50
Tillamook	1.64	1.33	1.40	1.65
Umatilla	1.58	1.38	1.40	1.69
Union	1.57	1.31	1.36	1.67
Wallowa	1.62	1.33	1.40	1.76
Wasco	1.60	1.45	1.47	1.76
Washington	1.70	1.66	1.64	1.99
Yamhill	1.58	1.39	1.43	1.76
Statewide	1.89	1.68	1.71	2.14

Sources: ECONorthwest using direct employment data from the American Hospital Association 2015 Annual Survey and the IMPLAN economic impact model.

ECO compared Exhibit 12 to the economic multiplier table in the 2015 impact report of acute care facilities. We found that multipliers are slightly lower than what they were in the 2015 report. This is because Output and Gross State Product can fluctuate from year to year. This results in slightly lower secondary in some Exhibits when compared to the 2015 report.

Exhibit 13 reports the economic contributions of the hospital sector across Oregon's five Congressional Districts. Congressional District IMPLAN models were used to measure the contributions to each Oregon district. These models were used because counties do not exactly align with Congressional District boundaries, and because the Congressional Districts are larger in area than counties, thus having different interconnectedness between industries and therefore, different multipliers.⁸

Exhibit 13. Economic Contributions of Hospitals, by Congressional District, 2015 (\$M)

Congressional Districts	Jobs			Gross State Product		
	Direct	Secondary	Total	Direct	Secondary	Total
First	8,995	6,836	15,831	\$879	\$529	\$1,408
Second	18,942	16,480	35,422	\$1,753	\$942	\$2,694
Third	10,701	8,347	19,048	\$963	\$649	\$1,612
Fourth	15,938	13,388	29,326	\$1,420	\$809	\$2,229
Fifth	7,702	6,624	14,326	\$705	\$438	\$1,143
Spillover	-	6,455	6,455	\$0	\$513	\$513
TOTAL	62,278	60,110	127,857	\$5,720	\$3,879	\$9,599

Source: 2015 AHA survey and IMPLAN model

Direct effects remain the same at 62,278 jobs and \$5.7 billion in gross state product. Economic activity at hospitals is not changing. The secondary effects do differ from the county multipliers slightly when using the larger congressional district geography. Hospitals support 60,110 secondary jobs in the congressional district model, compared to 55,254 secondary jobs in the county model. Hospitals support another \$3.879 billion in gross state product in the congressional district model, compared to \$3.884 billion in the county model.

Additionally, 4,856 more secondary jobs are supported by hospitals using congressional districts, but \$4.5 million less gross state product is supported by hospitals. This is because of the relative share of demand to production in the study region. The second congressional district is the largest in Oregon, covering roughly two-thirds of the state. This larger, more rural, geography compared to a county will have a less relative increase in demand, than it will in production. This drops the multiplier and explains the lower secondary gross state product compared to the aggregate county GSP.

In addition to calculating the economic activity supported from hospital operations in Oregon, ECO calculated the economic contributions from hospital community benefit expenditures. Examples of community benefits include providing free or discounted care to low income individuals, conducting education or research to promote community health, or donating funds and/or services to community groups. ECO used the Oregon Health Authority (OHA)'s data on community benefit expenditures to calculate the impacts shown in exhibit 14.

⁸ Because the county totals are not simply summed to the Congressional Districts, the totals for all Congressional Districts do not match the total for the state of Oregon in Exhibit 9. Similar to the county contributions, spillover effects are only reported for the state as a whole rather than allocated to individual districts.

Exhibit 14. Impacts of Community Benefit Expenditures by Hospitals, Oregon, 2015 (\$M)

Type of Impact	Direct	Secondary	Total
Output	\$1,906	\$1,546	\$3,452
Gross State Product	\$1,129	\$881	\$2,011
Labor Income	\$949	\$524	\$1,473
Jobs	14,080	12,120	26,200

Source: Oregon Health Authority's 2015 Community Benefit Data and IMPLAN the economic impact model

Hospitals in Oregon spent \$1.906 billion on hospitals services, clinics and hotlines, community health research, health profession education, and other community programs in 2015. From this spending, \$949 million in wages and benefits were paid across all places where community spending took place. This spending supported 14,080 jobs across all places where community spending took place. Community benefit places bought goods and services in Oregon, which supported an additional \$1.546 billion in output and 12,120 jobs. This totals to \$3.5 billion in economic output and 26,200 total jobs.

Appendix A. Technical Appendix

Measuring Economic and Fiscal Contributions

Economists have developed several approaches to measure the contributions of organizations on the communities in which they operate. The most common method estimates the contribution associated with the company's spending on payroll, goods and services, and capital projects.

Input-Output Modeling Framework

The expenditure approach is typically conducted within an input-output modeling framework. Input-output models are mathematical representations of the economy that show how different parts (or sectors) are linked to one another. The strengths of the input-output modeling framework include:

- a double-entry accounting framework that results in a model structure that is well ordered, symmetric, and where, by definition, inputs must be equal to outputs;
- a reasonably comprehensive picture of the economic activities within a region, with mathematical equations that describe the flow of commodities between producing and consuming sectors, the flow of income between businesses and institutions, and the trade in commodities between regions;
- model construction using secondary source data that are gathered and vetted by government agencies; and
- the ability to cost-effectively create input-output or economic impact models for any region.

Input-output models that rely on survey or primary source data are expensive to construct. As a result, special modeling techniques have been developed to estimate the necessary empirical relationships. These techniques use a combination of national technological relationships and state- and county-level measures of economic activity, and have been packaged into IMPLAN.

The IMPLAN Economic Impact Model

IMPLAN has been developed and distributed by the Minnesota IMPLAN Group, Inc., since 1993. The IMPLAN modeling system is widely used and well respected.

In general terms, the IMPLAN model works by tracing how spending associated with an industry circulates through an economy or study area. That is, changes in one sector or multiple sectors trigger changes in demand and supply throughout the economy. Initial changes in the model propagate through the economy via supply- and demand-chain linkages, altering the equilibrium quantities of inputs and outputs and associated jobs, income, and value-added. These *multiplier effects* continue until the initial change in final demand leaks out of the economy in the form of savings, taxes, and imports.

Classifying Economic Contributions

Depending on the activity being analyzed, economic contributions (or impacts) can be classified by phases, types, and measures.

Impacts by Type

Economic impact analysis employs specific terminology to identify the different types of economic impacts. The four terms of interest are as follows.

5. *Direct Impacts* are those associated with the payroll and employment. They also include the direct output of the activities associated with the organization, which is estimated using an expenditure approach that sums labor and non-labor operating expenses.
6. *Indirect Impacts* are the goods and services purchased for operations. This spending generates the first round of indirect impacts. Suppliers will also purchase additional goods and services; this spending leads to additional rounds of indirect impacts. Because they represent interactions among businesses, these indirect effects are often referred to as supply-chain impacts.
7. *Induced Impacts* are the purchases of goods and services from household incomes. The direct and indirect increases in employment and income enhance the overall purchasing power in the economy, thereby inducing further consumption- and investment-driven stimulus. Employees at the organization, for example, will use their income to purchase groceries or take their children to the doctor. These induced effects are often referred to as consumption-driven impacts.
8. *Secondary Impacts* are the sum of indirect and induced impacts or, simply, the economic effects on sectors outside of direct work on the project.

Impact Measures

The IMPLAN model reports the following measures of economic impacts:

1. *Jobs*, according to IMPLAN's methodology, are measured in terms of full-year-equivalents (FYE). One FYE job equals work over twelve months in a given industry (this is the same definition used by the Bureau of Labor Statistics (BLS)). For example, two jobs that last six months each in 2015 count as one FYE job in 2015. A job can be full-time or part-time, seasonal or permanent; IMPLAN counts jobs based on the duration of employment, not the number of hours per week worked. Job impacts from operations are for one year of normal operations.
2. *Output* represents the value of goods and services produced, and is the broadest measure of economic activity
3. *Gross State Product* ("GSP") measures the value added in production. It includes personal income, other income, and indirect business taxes.

4. *State and local taxes and fees* include production business taxes; personal income taxes; social insurance (employer and employee contributions) taxes; and various other taxes, fines, licenses, and fees paid by businesses and households.

For this analysis, ECO used IMPLAN's multi-regional, input-output ("MRIO") functionality to link counties to the rest of the state. This approach facilitated the measurement of "spillover effects" (also called leakages or, more precisely, domestic imports) that spill out of one county and are captured elsewhere in Oregon. For example, purchases of medical equipment or pharmaceuticals by hospitals in Lane County may accrue to businesses in Multnomah County, or *vice versa*. Although the IMPLAN model can measure spillover effect between specific counties, the sheer number of counties in Oregon would make that effort quite costly. Consequently, spillover effects were not allocated to specific counties, but rather to the rest of Oregon as a whole, and, as a result, specific county level impacts will be understated.

The primary inputs into these models were full- and part-time employment data⁹ for hospitals in Oregon, as reported in the American Hospital Association Annual Survey Database for the 2015 fiscal year¹⁰. The American Hospital Association Survey Database is compiled from surveys of 6,500 hospitals throughout the United States and, with more than 800 data fields, provides comprehensive information for hospitals and the communities in which they operate.

Tax Impacts Reported by IMPLAN

IMPLAN generates estimates of fiscal impacts for each spending activity. The impacts on taxing districts must be carefully interpreted, and understood the difference from a more detailed and accurate fiscal impact analysis.

IMPLAN allocates taxes paid by sector based on the relationship of labor income in each of the 536 sectors. Furthermore, the taxes are distributed among counties based on the amount of labor income in each sector. Lastly, the taxes are distributed among types of tax according to the Annual Census of Government Finances distribution. Marginal impacts, or activities run in an IMPLAN model, will use the same distribution of taxes as the base dataset in that year to estimate the impact to state and local taxes. In summary, the tax impacts are not based on rates or levies, but on the actual tax collected by the government for the year of the data set.

Income Tax

The income taxes paid to state and local governments are estimated by taking the percentage of total employee compensation that goes towards state and local government in a specific geography. It does not take into account actual income tax rates and brackets. It also does not incorporate actual wages for individuals, but rather, the total employee compensation as a whole. A similar process exists for proprietor income.

⁹ The hospitals are classified under the three-digit North American Industry Classification System ("NAICS") code #622:Hospitals. This sector maps directly to IMPLAN sector #482.

¹⁰ For more information, see <http://www.ahadata.com/ahadata/html/AHASurvey.html>.

Other Taxes

The indirect, or supply-chain, tax impacts are also estimates based on amount of actual taxes received by governments. The distribution of taxes is the same in IMPLAN whether the impacted industry was computers, tourism, tobacco, or forest products. Logically, forest products or mining would have a higher proportion of severance taxes compared to computers or tobacco, but that would not show up in the tax impact report.

While the total amounts paid to government are industry and institution-specific, the detailed distribution of those payments amongst the various types of taxes is the same for all industries and institutions. For example, while tourism has a greater effect on sales and lodging taxes, mining is heavily weighted towards severance taxes, and liquor or tobacco sales are heavily weighted towards excise taxes. This level of specificity is not captured in the tax impact report.