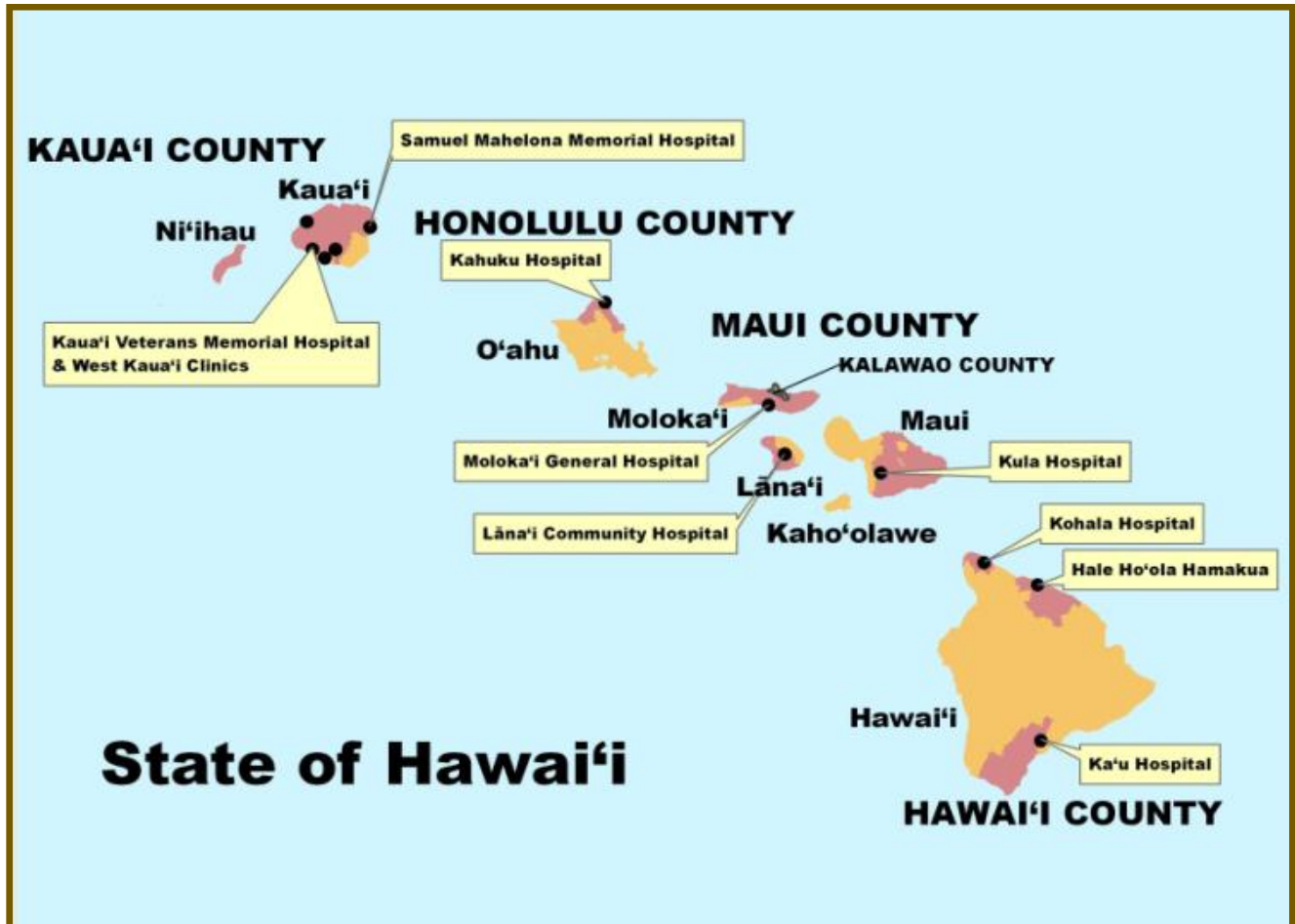


# The Economic Impact of Hawai'i Critical Access Hospitals on a Community, County, and State



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on a Community, County, and State**

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## **The Economic Impact of Hawai'i Critical Access Hospitals on a Community, County, and State**

Critical access hospitals (CAHs) have a huge medical and economic impact on the community, county and state in which they are located. CAHs are often the cornerstone for health care services in rural and remote communities. Without them, many communities would not retain access to medical services. Medical contributions of CAHs are known to everyone; however, CAHs are also extremely important to the economy of rural and remote communities. CAHs are often the second largest community employer. Without CAHs, rural development and economic growth would not occur. The overall objective of this study is to demonstrate how important a CAH is to the community, county and the State of Hawai'i. This will be accomplished by:

1. Discussing the importance of CAHs to rural development;
2. Presenting the economic impact of a CAH on the community;
3. Presenting the economic impact of three CAHs on the county; and
4. Presenting the economic impact of all CAHs on the State of Hawai'i.

Before presenting the economic impacts of a CAH, a review of the importance of health care to rural development will be discussed. The hospital is the cornerstone of health services. Without a hospital, research proves that other medical services cannot survive in a rural community. Generally, when a hospital goes out of business, the physician offices close shortly thereafter. This starts a downward spiral with the community losing pharmacies next and eventually the nursing homes and other medical providers.

### **Health Services and Rural Development**

The nexus between health care services and rural development is often overlooked. At least three primary areas of commonality exist. 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.

### **Services that Impact Rural Development**

Type of Growth	Services Important to Attract Growth
Business and Industry	Health and Education
Retirees	Health and Safety

Studies have found that quality-of-life (QOL) factors play a dramatic role in business and industry location decisions. Among the most significant of the QOL variables is health care services, which are important for at least three reasons.

#### **Business and Industry Growth**

First, as noted by a member of the Board of Directors of a community economic development corporation, the presence of good health and education services is imperative to business and industrial leaders as community location decisions are made. Employees and participating management may offer strong resistance if asked to move into a community with substandard or inconveniently located health services.

Secondly, once the business or industry makes a location decision, the next priority is to ensure that the local labor force will be productive. A key factor in labor force productivity is good health; thus, investments in local health care services can be expected to yield dividends in the form of increased labor force productivity.

The cost of health care services is the third factor that is considered by business and industry in development decisions. Research shows that corporations take a serious look at health care costs in determining site locations. Sites that provide health care services at a lower

cost are given higher consideration for new industry than sites with much higher health care costs.

### **Health Services and Attracting Retirees**

A strong and convenient health care system is important to retirees, a special group of residents whose spending and purchasing can be a significant source of income for the local economy. Many rural areas have environments that attract and retain retirees (e.g., moderate climate and outdoor activities). The amount of spending embodied in this population, including the purchasing power associated with Social Security, Medicare, and other transfer payments, is substantial. Additionally, middle and upper income retirees often have substantial net worth. Although the data are limited, several studies suggest health services may be a critical variable that influences the location decision of retirees. For example, one study found that four items were the best predictors of retirement locations: health care, safety, recreational facilities, and dwelling units. Another study found that nearly 60 percent of potential retirees said 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.

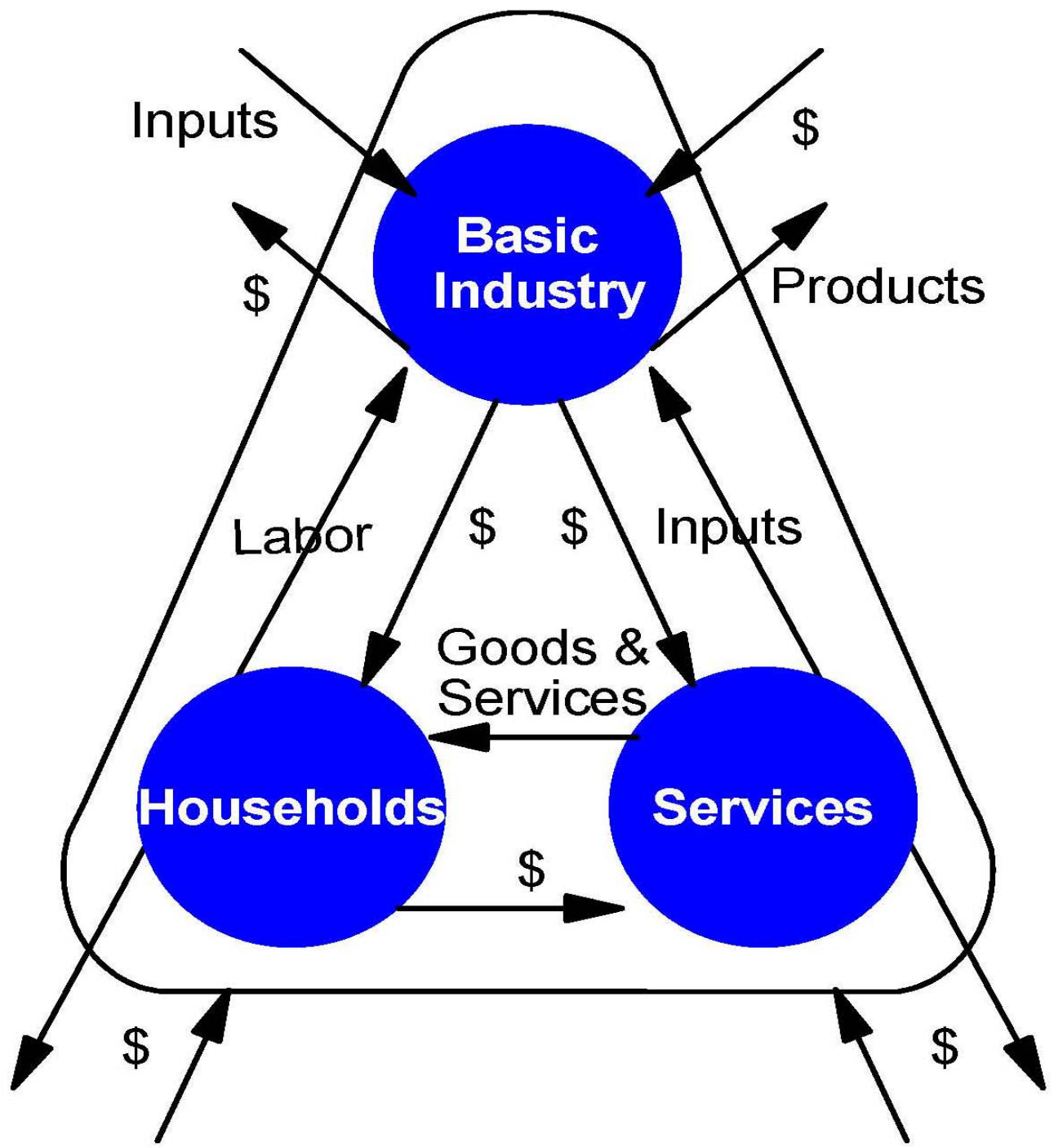
In summary, CAHs are vitally important as a community employer and important to the community’s economy. The hospital and its employees purchase a large amount of goods and services in the local community. These impacts are referred to as secondary impacts or benefits to the economy. Before the economic impact of the CAHs are presented, basic concepts of community economics will be presented.

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

**Figure 1** illustrates the major flow 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 1**. 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 1**), labor from the residents or "households" of the community (left side of **Figure 1**), and inputs from service industries located within the community (right side of **Figure 1**). 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 1**). The interrelationships shown in **Figure 1** illustrate that a change in any one segment of a community's economy will have reverberations throughout the entire economic system of the community.

Consider, for instance, the closing of a hospital. The services section will no longer pay employees and dollars going to households will stop. Likewise, the hospital will not purchase goods from other businesses and dollar flow to other businesses will stop. This decreases income in the "households" segment of the economy. Since earnings would decrease, households decrease their purchases of goods and services from businesses within the "services" segment of the economy. This, in turn, decreases these businesses' purchases of labor and inputs. Thus, the change in the economic base works its way throughout the entire local economy.





**Figure 1.**  
**Community Economic System**

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

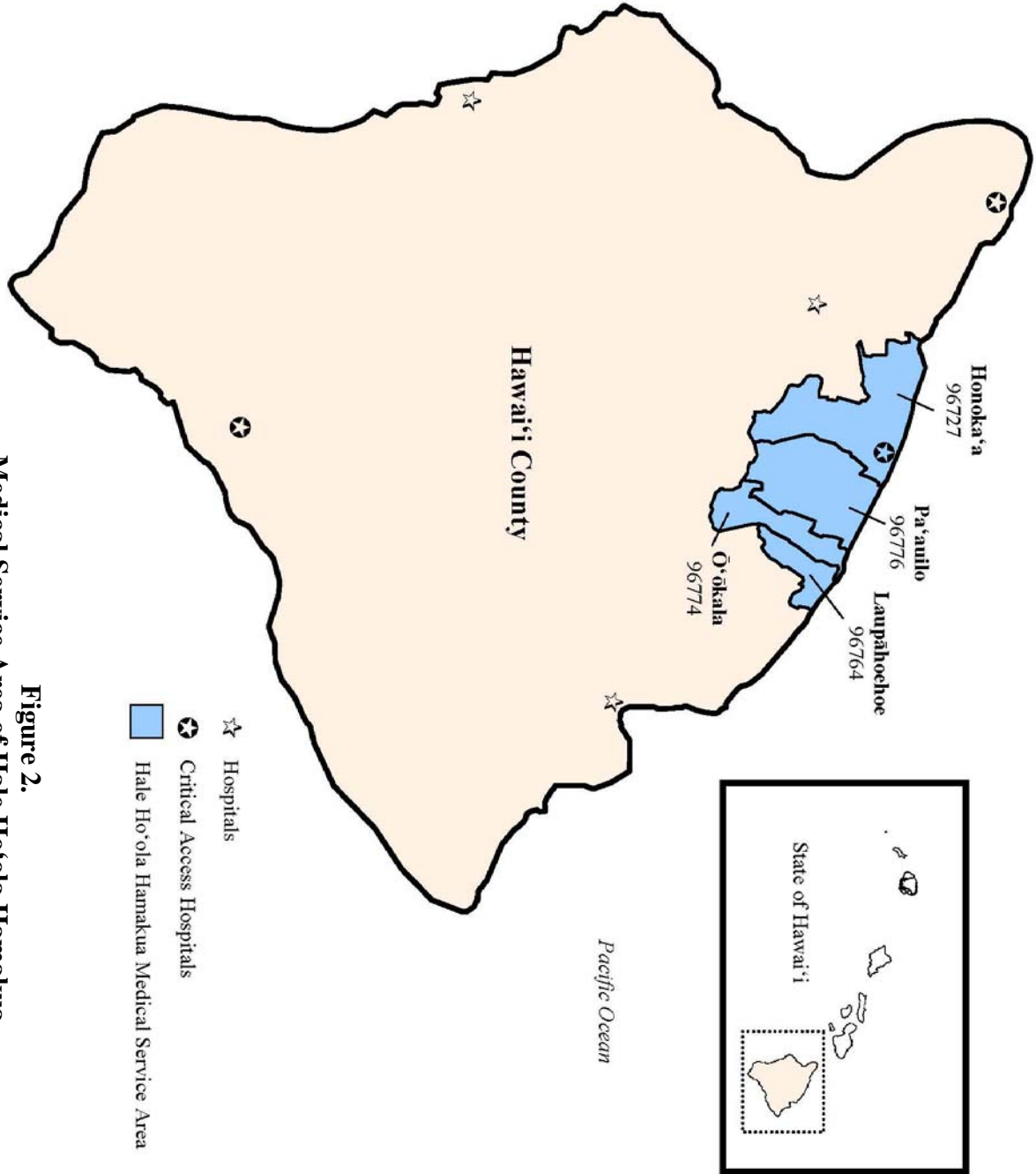
A measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect. Multipliers are used in this report. An employment multiplier is defined as:

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

An employment multiplier of 2.0 indicates that if one job is created by a new industry, 1.0 jobs are created in other sectors due to business (indirect) and household (induced) spending. The combination of indirect and induced impacts are commonly referred to as secondary impacts.

### **The Economic Impact of a CAH on a Community**

To illustrate the economic impact of a CAH on a community, the Hale Ho‘ola Hamakua CAH in Hawai‘i County was selected. The community medical service area (MSA) as identified by local leaders includes the four zip code areas outlined in **Figure 2**. Zip code data from IMPLAN were utilized to generate the multipliers in the economic model. The community MSA population for the four zip code areas was 6,813, according to the 2000 U. S. Census Bureau (**Table 1**). Since the U. S. Census Bureau only has zip code population for the 2000 census



- ☆ Hospitals
- ☆ Critical Access Hospitals
- Hale Ho'ola Hamakua Medical Service Area

**Figure 2.**  
**Medical Service Area of Hale Ho'ola Hamakua**

**Table 1**  
**Population by Zip Code**  
**for the Medical Service Area of the Hale Ho‘ola Hamakua Critical Access Hospital**

Zip Code Area	2000 Census	Populations		
		2000 ESRI	2006 ESRI	2011 ESRI
96727 Honoka‘a	4,435	5021	5,707	6,391
96776 Pa‘auilo	1,396	1,087	1,247	1,405
96764 Laupāhoehoe	795	1,029	1,166	1,306
96774 Ō‘ōkala	<u>187</u>	<u>413</u>	<u>488</u>	<u>555</u>
Total Medical Service Area	<b><u>6,813</u></b>	<b><u>7,550</u></b>	<b><u>8,608</u></b>	<b><u>9,657</u></b>
% Increase from 2000			<b>14.0%</b>	<b>27.9%</b>
Hawai‘i County	148,677			
State of Hawai‘i	1,211,537			

SOURCE: U. S. Census Bureau, 2000 population (www.census.gov [November 2007]); Community Sourcebook of Zip Code Demographics, 20th Edition, 2006, ESRI, ESRI 2000 population and 2006 and 2011 projected populations.

NOTE: Zip code boundaries vary by source and methods for breaking down population by zip code boundaries vary by source; thus, causing some minor discrepancies in the data.

year, another source for more current populations by zip code was researched. ESRI, a company specializing in geographic information systems software, has illustrated zip code populations for the 2000 census year and projected zip code populations for 2006 and 2011. The zip code populations do not match due to a variance in zip code boundaries and based on the methodology for determining population by zip code. The ESRI data shows the 2000 population to be 7,550 and shows projections with growth of 14.0 percent from 2000 to 2006 and of 27.9 percent from 2000 to 2011 (**Table 1**).

### **The Direct Economic Activities**

Employment and payroll are the important direct economic activities created from the hospital in the community MSA of Hale Ho‘ola Hamakua. The hospital component includes Hale Ho‘ola Hamakua, a CAH located in Honoka‘a on the northeast coast of Hawai‘i County.

Hale Ho‘ola Hamakua includes four acute/skilled nursing beds (swing beds) and 46 long-term care beds and provides emergency room services 24 hours/day, seven days/week with a physician, registered nurse, laboratory and X-ray services. Other services include rehabilitative services (physical therapy, occupational therapy, and speech therapy), pharmacy services, and social services. Hale Ho‘ola Hamakua directly employs 100 full- and part-time employees with an annual payroll of \$6.4 million (**Table 2**).

**Table 2**  
**Direct Economic Activities**  
**of Hale Ho‘ola Hamakua Critical Access Hospital in Hawai‘i County, Hawai‘i**

CAH Hospital	Number of Full- & Part-Time Employees	Income (Wages, Salaries, & Benefits)
Hale Ho‘ola Hamakua	100	\$6,407,893

SOURCE: Direct employment and income provided by Hale Ho‘ola Hamakua CAH.

### **Secondary Economic Impacts of a CAH on a Local Community**

Employment and income multipliers have been calculated using the IMPLAN model. The model was developed by the U.S. Forest Service and allows for development of community, county, and state multipliers. **Appendix A** includes additional information on the model and the IMPLAN data.

The employment multiplier for the hospital is 1.29 (**Table 3**). This indicates that for each job created in Hale Ho‘ola Hamakua CAH, 0.29 jobs are created in other businesses and industries throughout the community MSA. The income multiplier is 1.16 and indicates that for every dollar of income (wages, salaries, and benefits) from Hale Ho‘ola Hamakua CAH, another \$0.16 of income is generated in other businesses and industries in the community MSA.

**Table 3**  
**Economic Impacts of Employment and Income**  
**of Hale Ho‘ola Hamakua Critical Access Hospital on the Local Community**

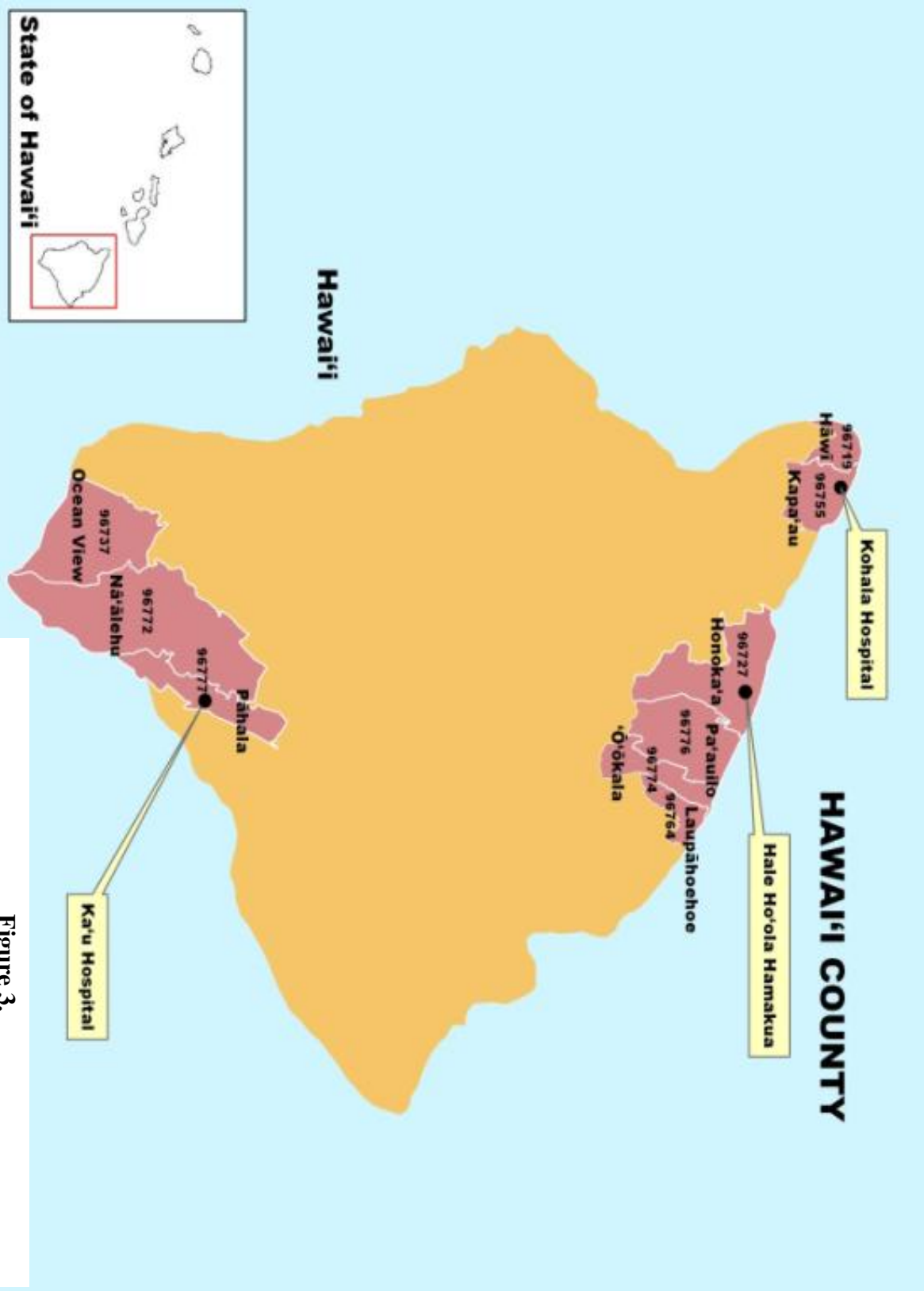
<b>Employment</b>		
Direct Employment Impact of Hale Ho‘ola Hamakua		100
Community Hospital Employment Multiplier	1.29	
Secondary Employment Impact of Hale Ho‘ola Hamakua		<u>29</u>
Total Employment Impact of Hale Ho‘ola Hamakua		<u><b>129</b></u>
<b>Income</b>		
Direct Income Impact of Hale Ho‘ola Hamakua		\$6,407,893
Community Hospital Income Multiplier	1.16	
Secondary Income Impact of Hale Ho‘ola Hamakua		<u>\$1,025,263</u>
Total Income Impact of Hale Ho‘ola Hamakua		<u><b>\$7,433,156</b></u>

SOURCE: Direct employment and income provided by Hale Ho‘ola Hamakua CAH; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

Hale Ho‘ola Hamakua has direct employment of 100 employees; the secondary employment impact is 29 employees ( $100 \times 0.29 = 29$ ), resulting in total employment impact of 129 employees on the local community MSA ( $100 \times 1.29 = 129$ ). Hale Ho‘ola Hamakua has direct income of \$6.4 million; the secondary income impact is \$1.0 million ( $\$6.4 \text{ million} \times 0.16 = \$1.0 \text{ million}$ ) and the total income impact is \$7.4 million on the local community MSA ( $\$6.4 \text{ million} \times 1.16 = \$7.4 \text{ million}$ ).

### **The Economic Impact of Three CAHs on Hawai‘i County**

Hawai‘i County was selected to illustrate how several CAHs impact a county’s economy, given that Hawai‘i County has three CAHs: Hale Ho‘ola Hamakua; Ka‘u Hospital; and Kohala Hospital (**Figure 3**). The employment and income (wages, salaries, and benefits) are presented



**Figure 3.**  
**Medical Service Areas**  
**of the Three Critical Access Hospitals in Hawaii'i County**

in **Table 4**. In total, the three CAHs in Hawai‘i County directly employ 220 full- and part-time employees and have a payroll of \$16.3 million.

**Table 4**  
**Direct Economic Activities of Three Critical Access Hospitals**  
**in Hawai‘i County, Hawai‘i**

Critical Access Hospitals	Number of Full- & Part-Time Employees	Income (Wages, Salaries, & Benefits)
Hale Ho‘ola Hamakua	100	\$6,407,893
Ka‘u Hospital	60	\$4,029,874
Kohala Hospital	<u>60</u>	<u>\$5,894,948</u>
Totals	<b><u>220</u></b>	<b><u>\$16,332,715</u></b>

SOURCE: Direct employment and income from the critical access hospitals.

The employment and income impacts are presented in **Table 5**. The county hospital employment multiplier is 1.70. This indicates that for each CAH employee, another 0.7 jobs are

**Table 5**  
**Employment and Income Impacts of Three Critical Access Hospitals (CAHs)**  
**in Hawai‘i County, Hawai‘i**

<b>Employment</b>		
Direct Employment Impact of Three CAHs		220
County Hospital Employment Multiplier	1.70	
Secondary Employment Impact of Three CAHs		<u>154</u>
Total Employment Impact of Three CAHs		<b><u>374</u></b>
<b>Income</b>		
Direct Income Impact of Three CAHs		\$16,332,715
County Hospital Income Multiplier	1.42	
Secondary Income Impact of Three CAHs		<u>\$6,859,740</u>
Total Income Impact of Three CAHs		<b><u>\$23,192,455</u></b>

SOURCE: Direct employment and income from the critical access hospitals; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.



created in other businesses and industries in Hawai‘i County. The county hospital income multiplier is 1.42, which indicates that for each dollar of income (wages, salaries, and benefits) in the CAHs, an additional \$0.42 are generated in other businesses and industries in Hawai‘i County.

The CAHs in Hawai‘i County create 154 secondary jobs, resulting in total employment impact of 374 jobs. The CAHs generate secondary income impact of \$6.9 million with total income impact of \$23.2 million in Hawai‘i County.

### **The Economic Impact of All CAHs on the State of Hawai‘i**

The direct economic activities of the nine CAHs in the State of Hawai‘i are presented in **Table 6**. The nine CAHs directly employ 1,032 full- and part-time employees with an annual payroll of \$63.7 million. The locations of the nine CAHs in the State of Hawai‘i are in **Figure 4**.

**Table 6**  
**Direct Economic Activities of All Nine Critical Access Hospitals**  
**in the State of Hawai‘i**

Critical Access Hospital	County Location	Number of Full- & Part-Time Employees	Income (Wages, Salaries, & Benefits)
Hale Ho‘ola Hamakua	Hawai‘i	100	\$6,407,893
Ka‘u Hospital	Hawai‘i	60	\$4,029,874
Kahuku Medical Center	Honolulu	112	\$4,481,990
Kaua‘i Veterans Memorial Hospital	Kaua‘i	225	\$14,778,168
Kohala Hospital	Hawai‘i	60	\$5,894,948
Kula Hospital	Maui	206	\$12,095,236
Lāna‘i Community Hospital	Maui	45	\$2,473,773
Moloka‘i General Hospital	Moloka‘i	88	\$4,830,000
Samuel Mahelona Memorial Hospital	Kaua‘i	<u>136</u>	<u>\$8,681,205</u>
Totals		<b><u>1,032</u></b>	<b><u>\$63,673,087</u></b>

SOURCE: Direct employment and income data provided by the critical access hospitals.

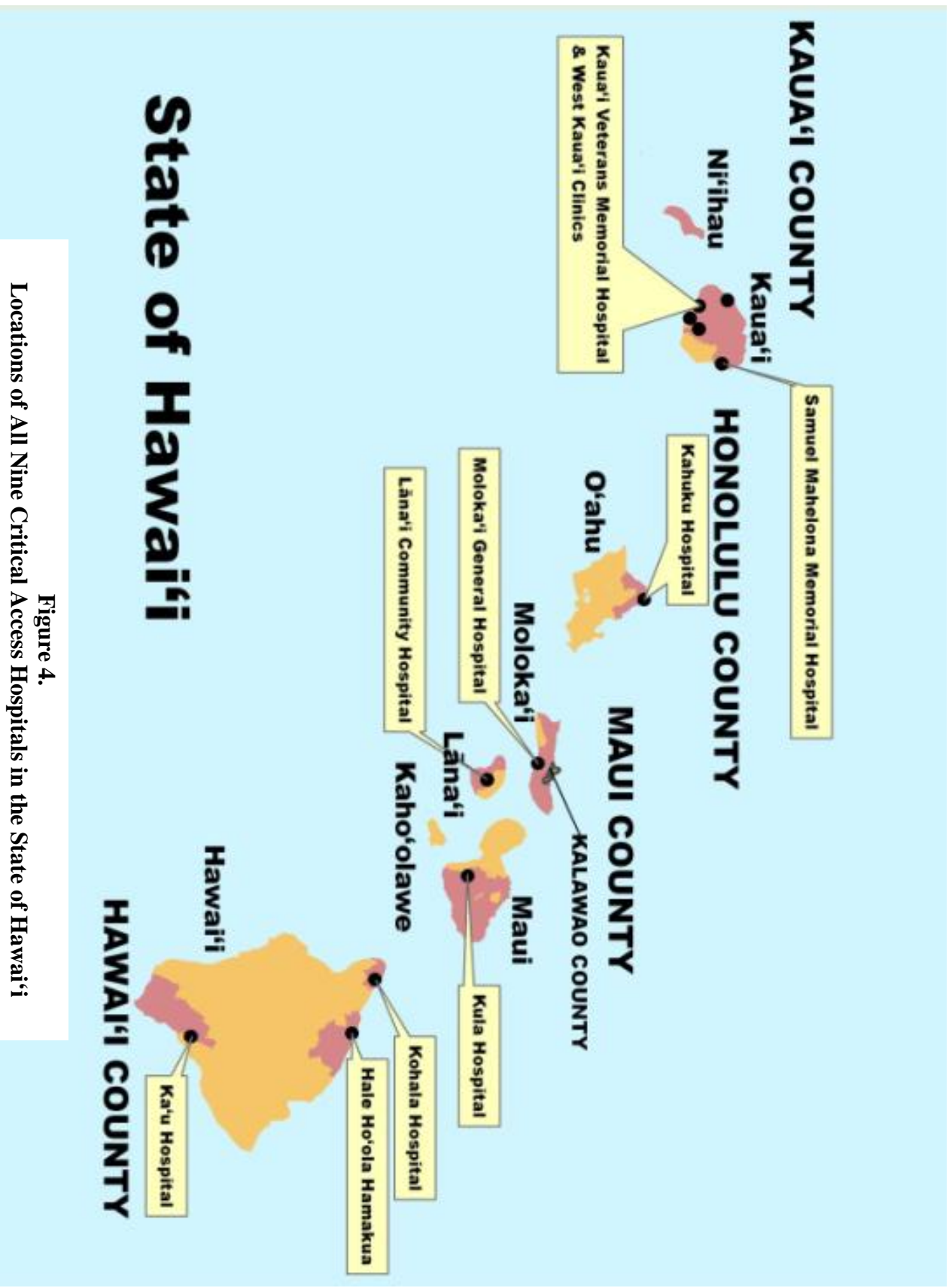


Figure 4. Locations of All Nine Critical Access Hospitals in the State of Hawai'i

The economic impacts of all CAHs on the State of Hawai‘i are presented in **Table 7**. The state hospital employment multiplier is 1.88. This indicates that for each job in a CAH in the State of Hawai‘i, another 0.88 jobs are created in other businesses in the State of Hawai‘i. From all CAHs in the State of Hawai‘i, the secondary employment impact is 908 jobs and the total employment impact is 1,940 jobs. The secondary income impact is \$32.5 million and the total income impact is \$96.1 million from all CAHs in the State of Hawai‘i.

**Table 7**  
**Employment and Income Impacts of All Critical Access Hospitals (CAHs)**  
**on the State of Hawai‘i**

<b>Employment</b>		
Direct Employment Impact of All CAHs		1,032
State Hospital Employment Multiplier	1.88	
Secondary Employment Impact of All CAHs		<u>908</u>
Total Employment Impact of All CAHs		<u><b>1,940</b></u>
<b>Income</b>		
Direct Income Impact of All CAHs		\$63,673,087
State Hospital Income Multiplier	1.51	
Secondary Income Impact of All CAHs		<u>\$32,473,274</u>
Total Income Impact of All CAHs		<u><b>\$96,146,361</b></u>

SOURCE: Direct employment and income from the critical access hospitals; multipliers from IMPLAN, Minnesota IMPLAN Group, Inc.

### **Discussion of Economic Impacts at Community, County, and State Levels**

In this illustration, the impacts are shown at the community, county, and state geographic levels. The multipliers for each level are based on the amount of economic activity at each level. Economic activity is the employment, wages, salaries and benefits, proprietors’ income, and total revenues and expenditures resulting from all businesses and industries in the defined area. The model analyzes the transactions among the businesses and industries in the economy and

captures the interrelated circular behavior of the economy. By accounting for structural interaction between sectors and industries, the analysis gives expression to the general economic equilibrium system. The analysis executes and interprets, based on defining the structure of an area, the interdependencies among businesses and industries and forecasting economic outcomes. 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.

For instance, the community multipliers are based on the economic activity in the four zip code areas defined as the community MSA of the Hale Ho‘ola Hamakua CAH. This is a small community MSA representing a small portion of the county. The amount of economic activity in the community MSA is considerably less than the entire county or the entire state. Therefore, the community multiplier is much lower than either the county or state multipliers.

The multipliers for each level, community, county, and state, are included in **Table 8**. The county hospital employment multiplier of 1.70 is larger than the community hospital

**Table 8**  
**Comparison of Multipliers at Community, County, and State Levels**

	Employment Multipliers	Income Multipliers
Community Level (for Hale Ho‘ola Hamakua critical access hospital in community medical service area of four zip code areas in Hawai‘i County)	1.29	1.16
County Level (for the three critical access hospitals in Hawai‘i County)	1.70	1.42
State Level (for all nine critical access hospitals in the State of Hawai‘i)	1.88	1.51

SOURCE: Multipliers derived from IMPLAN data, Minnesota IMPLAN Group, Inc.

employment multiplier of 1.29. The larger county hospital employment multiplier measures the impact on Hawai'i County in total, whereas the community hospital multiplier only measures the impact on the local community MSA. This relationship also applies to the hospital income multipliers; the community hospital income multiplier is 1.16 and the county hospital income multiplier is 1.42.

The state hospital employment multiplier is larger than the community and the county. Again, if the economy activity of the defined area increases, then the multipliers would also increase. This is not based on geographic size of the defined area, but rather on the amount of economy activity. The state hospital employment multiplier is 1.88, as compared to the county hospital employment multiplier of 1.70 and the community hospital employment multiplier of 1.29. The state income multiplier is 1.51, as compared to the county hospital income multiplier of 1.42 and the community hospital income multiplier of 1.16.

This study illustrates the impacts at different levels of economic activity; community, county, and state. In this instance, the economic activity increases with the size of the defined areas. The state level multiplier is larger than the county and the county level multiplier is larger than the community multiplier.

### **Conclusions**

The medical contributions of critical access hospitals are well recognized in rural and remote communities and counties. Their economic contributions are often not acknowledged. The object of this report is to document the economic contribution of a critical access hospital on a community economy, three critical access hospitals on a county economy, and all critical access hospitals on a state economy. Three important conclusions result from this study: (1) these impacts illustrate the economic contributions that critical access hospitals make to the

community, county, or state; (2) economic impacts differ as the economic activity of a defined area changes; and (3) hospital leadership can utilize these reported economic contributions in advocating health care policy at the community, county, and state levels.

### **Economic Contributions of Critical Access Hospitals on Community, County, and State**

After applying the community hospital employment multiplier of 1.29, Hale Ho‘ola Hamakua critical access hospital’s direct employment of 100 employees results in secondary employment impact of 29 employees and total employment impact of 129 employees on the local community MSA. With a community hospital income multiplier of 1.16, Hale Ho‘ola Hamakua critical access hospital’s direct income of \$6.4 million results in secondary income impact of \$1.0 million and total income impact of \$7.4 million on the local community MSA.

With the county hospital employment multiplier of 1.70 and direct employment for the three critical access hospitals in Hawai‘i County of 220, the secondary employment impact is 154 jobs and the total employment impact is 374 jobs for the three critical access hospitals in Hawai‘i County. With a payroll of \$16.3 million for the three critical access hospitals in Hawai‘i County, the secondary income impact is \$6.9 million and the total income impact is \$23.2 million, after applying the county hospital income multiplier of 1.42.

The nine critical access hospitals in the State of Hawai‘i directly employ 1,032 full- and part-time employees with an annual payroll of \$63.7 million. Applying the state hospital employment multiplier of 1.88 to the direct employment of the nine critical access hospitals of 1,032 results in secondary employment impact of 908 and total employment impact of 1,940 from the nine critical access hospitals in the State of Hawai‘i. Applying the state hospital income multiplier of 1.51 to the direct income of the nine critical access hospitals of \$63.7

million results in secondary income impact of \$32.5 million and total income impact of \$96.1 million from the nine critical access hospitals in the State of Hawai'i.

### **Impacts Change as Area of Analysis Changes**

This study illustrates the impacts at different levels of economic activity; community, county, and state. If the economy activity of the defined area increases, then the multipliers would also increase. This report clearly demonstrates how the economic impacts differ with the level of economic activity in a defined area.

### **Policy Implications – Hospital Advocacy at Community, County, and State Level**

The economic contributions of critical access hospitals are not obvious to community leaders. Armed with the hard facts and figures from the economic impact of a community critical access hospital, local hospital leadership are in a position to share this information with local leaders to advocate for support of the community hospital. For instance, if a critical access hospital needs to update the current structure or build a replacement facility, hospital leadership can develop local support for these activities by showing the contributions of the community hospital to the local economy. Local hospital leaders can also use the reported economic impacts to obtain foundation or private donations (such as free land or special funds for a project). Examples of community level support include donation of land, provision of utilities, local fundraisers, or provision of city sales tax earmarked for hospital projects.

At the next level, the county economic impact results can be taken to county officials for support. One example of county level support is to vote a county sales tax or obtain capital through county bonds to support hospital operations or facility upgrades.

The state level impacts can be shared with state legislative leaders to advocate for support of critical access hospitals. The economic impacts of critical access hospitals provide hospital

leaders a tool to seek additional support and advocacy for critical access hospitals. One example would be to obtain cost-based reimbursement for Medicaid participants.

### **Summary**

In summary, the various levels of economic impact of critical access hospitals provide hospital leaders at the community, county and state level with tools to seek necessary support and advocacy at the appropriate political level. These tools assist the hospital leaders in presenting the need for support of critical access hospitals. The medical contributions of critical access hospitals are essential to the health and welfare of the rural residents. However, the economic contributions of critical access hospitals are crucial in sustaining the economies of America's rural communities.



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## APPENDIX A

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



## **Appendix A**

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

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

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

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

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

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

### **MicroIMPLAN**

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

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

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

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

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

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