

# ECONOMIC AND REVENUE IMPACT OF \$1 MILLION IN SUSTAINED CANCER RESEARCH FUNDS



By: Alberta H. Charney, Ph.D.  
Marshall Vest, Director

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*Economic and Business Research Center  
Eller College of Management  
The University of Arizona  
Tucson, Arizona*

February 2008

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## EXECUTIVE SUMMARY

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**T**he Economic and Business Research Center at the University of Arizona's Eller School of Management was asked to determine the impact of a sustained \$1 million in cancer research would have on the Arizona economy and on Arizona state tax revenues.

Combining the economic and revenue effects of the research expenditure with the effects of the cancer research-related spin-off companies located within Arizona, the study found the following impacts associated with each sustained \$1 million of research funds,

- 74 jobs
- \$3.39 million in wages
- \$11.35 million in gross sales
- \$100,000 in city/county revenues
- \$150,000 in state revenues

Each \$1 million in cancer research returns approximately \$150,000 to the state in the form of state revenues, including the both impacts of the research expenditures and cancer research-related spin-off companies.

## INTRODUCTION

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This year marks the 30th anniversary of the Arizona Cancer Center (ACC). Designated a National Cancer Institute (NCI) center with a support grant in 1978, it was the first cancer center to receive "Comprehensive Status" under NCI's new criteria in 1990. As one of only 39 NCI-designated Comprehensive Cancer Centers in the U.S., it ranks in the top 25 in terms of NCI research dollars.



Cancer research represents an important component of research dollars streaming into the State of Arizona. Cancer research impacts the state in numerous ways, including the impacts of the research dollars on jobs, wages and output, the creation of spin-off firms in related industries, the identification of the state as a research-oriented hub, and most-importantly, the restored wellness of individuals who have benefited from cancer research.

This report quantifies the economic and revenue benefits of only two aspects of cancer research, specifically, the impacts of the research dollars spent and the impacts of spin-off firms that exist in Arizona as a result of the long-term sustained research effort at the ACC.

### Methodology and Data

This report relies heavily on previous research; in particular, the impact of \$1 million in research is computed from an earlier report conducted for the University of Arizona in 2002.

In addition, data on companies that have started as a result of the research conducted at the ACC

have been collected. Limited data on 14 "spin-off" firms has been obtained from the ACC. The data consists of company names, the approximate level of employment, their location and a description of their activities.

In total, the 14 identified "spin-off" firms represent approximately 1,290 jobs. The bulk of these jobs (1,060) reside close to the source of the research in Pima County. However, there are approximately 150 jobs elsewhere in the United States in firms that have been spun-off from ACC's research, including jobs in New Jersey, Utah and California. A "spin-off" firm also exists in Australia, employing approximately 75.

It is not surprising that most of the spin-off firms are within Arizona and, in particular, within Pima County. Location and proximity to the research program tends to drive the location of research-related firms. The firms identified by ACC as spin-off firms from cancer research activities are involved with biotechnology research, pharmaceutical products (mostly related to cancer treatment), improved diagnostic products and equipment, including advanced digitalized imaging equipment.

Data on spin-off firms were combined with an on-line search (and in some instances, calls to the firms) to collect additional information on what the companies do, in order to categorize each of the firms into NAICS (North American Industrial Classification System) codes. Once categorized, the employment figures were entered into an IMPLAN Input-Output Model for Arizona to generate direct, indirect and induced economic impacts. Revenue impacts were computed using output from the input-output model.

## Economic and Revenue Impacts of \$1 Million in Research Dollars

Table 1 summarizes the job, wage, sales and revenue impacts per \$1 million in cancer research funds. These figures were derived from a previous study and adjusted for inflation where appropriate. Each \$1 million in research funds create 29 jobs in the state, \$860,000 in wages, \$1.35 million in gross sales, \$50,000 in state revenues, and \$30,000 in county/city revenues. Revenue estimates include revenues that accrue to the state and local governments from sales taxes, individual income taxes, and highway-related taxes. Local revenues also include state-shared revenues (shared sales taxes, shared income taxes, and shared highway taxes) and local property taxes (excluding school taxes). See the brief Appendix for definitions and additional information on revenue sources.

In Table 1, impacts must not be added because the sales (output) impact is inclusive of the wage and revenue impacts.

**Table 1. Estimated Arizona Impact Per \$1 Million Cancer Research Funds (2007)**

*(\$ figures are in millions)*

Jobs*	29.1
Wages	\$0.86
Gross Sales	\$1.35
State Revenues	\$0.05
City/County Revenues	\$0.03

\*Includes student jobs, which are listed as full-time-equivalent positions.

Source: University of Arizona Research Expenditures: Generating Jobs, Wages and Tax Revenues in the Local Economy – An Economic and Tax Revenue Analysis for FY2002, February 18, 2003, Drs. Alberta H. Charney and Vera Pavlakovich-Kochi. Some impact figures have been adjusted from 2002 to 2007.

## Economic and Revenue Impacts of Cancer Research-Related "Spin-Off" Firms

The 1,060 direct Pima County jobs represent an estimated \$414 million in total output and \$86 million in wages. These firms make purchases from other local producers; in addition, the employees in both the research-related firms and in the firms that supply them spend most of their money locally. Local firm purchases and employee spending create an additional 2,120 jobs (indirect and induced effects). Therefore, these cancer research-related spin-off firms create an estimated 3,180 jobs in Arizona. Note that, although the direct jobs are in Pima County, a portion of purchases are made elsewhere in Arizona, so these are statewide impacts. The total sales (output) impact is \$700 million and the total wage impact is \$177 million.

**Table 2. Estimated Arizona Impact of Cancer Research-Related Spin-Off Firms (2007)**

*(\$ figures are in millions)*

	Direct	Indirect/Induced	Total
Jobs	1,060	2,120	3,180
Wages	\$86	\$91	\$177
Sales	\$414	\$286	\$700

Source: Economic and Business Research Center, IMPLAN Input-Output Model

Two types of revenues are calculated – direct and induced. Direct state and local revenues are taxes paid by the spin-off firms in the course of doing their daily business, such as sales taxes paid on utilities and purchases. Data used to compute estimates of direct revenues uses firm expenditure estimates, by category, from the input-output model.

Induced state and local revenues are taxes paid by workers in the spin-off firms or firms that are economically linked to the spin-off firms. It is estimated that the state collects \$7.1 million in revenue from the 1,060 spin-off firms and the

estimated 3,180 workers in the spin-off and related firms. Local governments also collect approximately \$5.4 million. It should be noted that the state revenue estimates do not include any corporate income taxes collected from the spin-off firms. Such estimates are extremely difficult to make without having access to firm-specific financial records. In addition, estimated city/county tax revenues exclude any property taxes paid by spin-off firms to local governments.

**Table 3. Estimated Revenues Associated with Cancer Research-Related Spin-Off Firms (2007)**

*(\$ figures are in millions)*

	Direct	Induced	Total
State Revenues	\$1.1	\$6.0	\$7.1
City/County Revenues	\$0.8	\$4.6	\$5.4

Source: Economic and Business Research Center, Revenue Impact Model

### Combining the Economic and Revenue Impacts of Cancer Research Funds and Spin-Off Firms

It is conceptually difficult to combine the economic and revenue impact of \$1 million in research funds with the economic impact of spin-off companies, which have developed over the years due to the long-standing and exceptional research effort conducted at the ACC. The results of the two types of impacts are combined under the assumption that the spin-off companies exist because of the long-term *sustained* research effort of ACC, which in recent years has been between \$65 and \$70 million per year.

The following table utilizes the figures in Tables 2 and 3 and "normalizes" them by dividing the results by 70 (representing the annual \$70 million in research at ACC), so it represents the spin-off firm impact per \$1 million in *sustained* research effort at the ACC.

**Table 4. Estimated Economic and Revenue Impact of Cancer Research-Related Spin-Off Firms Per \$1 Million Sustained ACC Research Funds (2007)**

*(\$ figures are in millions)*

Jobs	45
Wages	\$2.53
Gross Sales	\$10.00
State Revenues	\$0.10
City/County Revenues	\$0.08

Source: Economic and Business Research Center

Table 4 indicates that a *sustained* cancer research effort of \$1 million result in 45.4 additional jobs in the community, either directly or indirectly, due to spin-off firms and the multiplier effect of those jobs. Each \$1 million in *sustained* cancer research effort is associated with \$2.53 million in wages created elsewhere in the community due to the spin-off jobs and \$10 million in gross sales elsewhere in the community. These wages and sales generate an additional \$100,000 in revenues for the state and approximately \$80,000 for city and county governments in the state of Arizona.

Table 4 presents the spin-off firm impact normalized to reflect the level of research in recent years at the ACC. Table 5 combines the economic and revenue impacts of the research dollars and the spin-off firms by adding the figures in Tables 1 and 4.

Each \$1 million in cancer research creates an estimated 74 jobs, either because of the research itself or because of spin-off firms that have been created over the years due to this level of sustained research. In addition, each million in cancer research generates almost \$3.4 million in wages in the state and \$11.35 million in total sales in large part because those spin-off firms that have been created in the state. Each \$1 million in cancer research generates approximately \$150,000 in state revenues, which is approximately 15 percent of the initial \$1 million in research dollars. Again, this sizeable impact is largely

due to the private-sector jobs that have been created over time as a result of the long-standing research effort of the ACC.

**Table 5. Combined Estimated Economic and Revenue Impact of Cancer Research and Related Spin-Off Firms Per \$1 Million Sustained ACC Research Funds (2007)**

*(\$ figures are in millions)*

Jobs	74
Wages	\$3.39
Gross Sales	\$11.35
State Revenues	\$0.15
City/County Revenues	\$0.10

*Source: Economic and Business Research Center*

*Figures are derived by adding results in Tables 1 and 4.*

*Figures may not add because of rounding to 2-digits.*

## Limitations of this Study

Several limitations of this study should be mentioned. First, and most importantly, no attempt has been made to estimate the societal benefits derived from cures and treatments that have resulted from cancer research at the ACC. Nor was any attempt made to estimate the economic benefits associated with the increased lifetime earning potentials of cancer survivors. Secondly, the data obtained on the spin-off firms was very limited; no financial records were obtained from individual firms. Thus, the economic impacts were estimated using the employment figures provided by the ACC. Similarly, direct revenue estimates were derived using the expenditure patterns of firms in industry classifications similar to the spin-off firms. Finally, it is difficult to conceptually combine the impacts of ongoing annual research funds with the impacts of a group of spin-off firms that have been created and grown over time.

## CONCLUSIONS

The ACC has a strong ongoing cancer research program. Each \$1 million in research funds creates jobs, wages and sales throughout the state's economy. In addition, cancer research-related firms have been "spun-off" in Arizona. Those firms, most involved in research and development, also create jobs, wages and sales.

Combined, the cancer research funds and the related spin-off companies create approximately

74 jobs per \$1 million sustained cancer research funds. These jobs create \$3.39 million in wages and \$11.35 million in gross sales. In turn, these wages and sales generate approximately \$150,000 in state revenues and \$100,000 in city and county revenues. Each \$1 million of cancer research funds, over time, including spin-off firms and their impacts, returns approximately 15 percent to the state in the form of state revenues.

## APPENDIX - DEFINITIONS

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**Sales** correspond to "output" defined as the value of production, except for wholesale and retail trade. For the wholesale and retail sectors, output is the "margin" added to the goods being sold. Thus "sales" for these sectors equals output (margin) plus cost of goods sold. For construction sectors, output is equal to sales of construction companies, but the value of a construction project equals the construction output (sales) plus the cost of materials and outside subcontractors required for the project.

An **input-output (I-O)** model represents a regional economy in terms of transaction flows among economic sectors. For example, to produce \$1 worth of staplers, 20 cents worth of input is needed from fabricated metal products, 20 cents worth from business services, 30 cents worth of labor and 30 cents worth of other value added (e.g., rent, interest and profit). An increase in the production of staplers will cause an increase in the production of other related sectors in proportion to their inputs per \$1 of output in staplers. Because these related sectors also use inputs from other sectors, an increase in the production of staplers will indirectly affect many other sectors.

**Direct economic impacts** are represented by jobs, wages and sales of the firms/entities being analyzed (staplers in the above example).

**Indirect economic impacts** are represented by the jobs, wages and sales of other firms/entities that sell to either the firms/entities being analyzed (staplers in the above example) or to other related firms (fabricated metal products and business services in the above example). The magnitude of indirect (inter-industry) impacts depends upon the percentage of locally produced goods and services represented in

the model as the regional purchase coefficient. The more locally produced goods and services used, the higher the indirect impacts. Conversely, the higher the percent of goods and services purchased from outside the region, the higher the leakage and the lower the indirect impacts to the county.

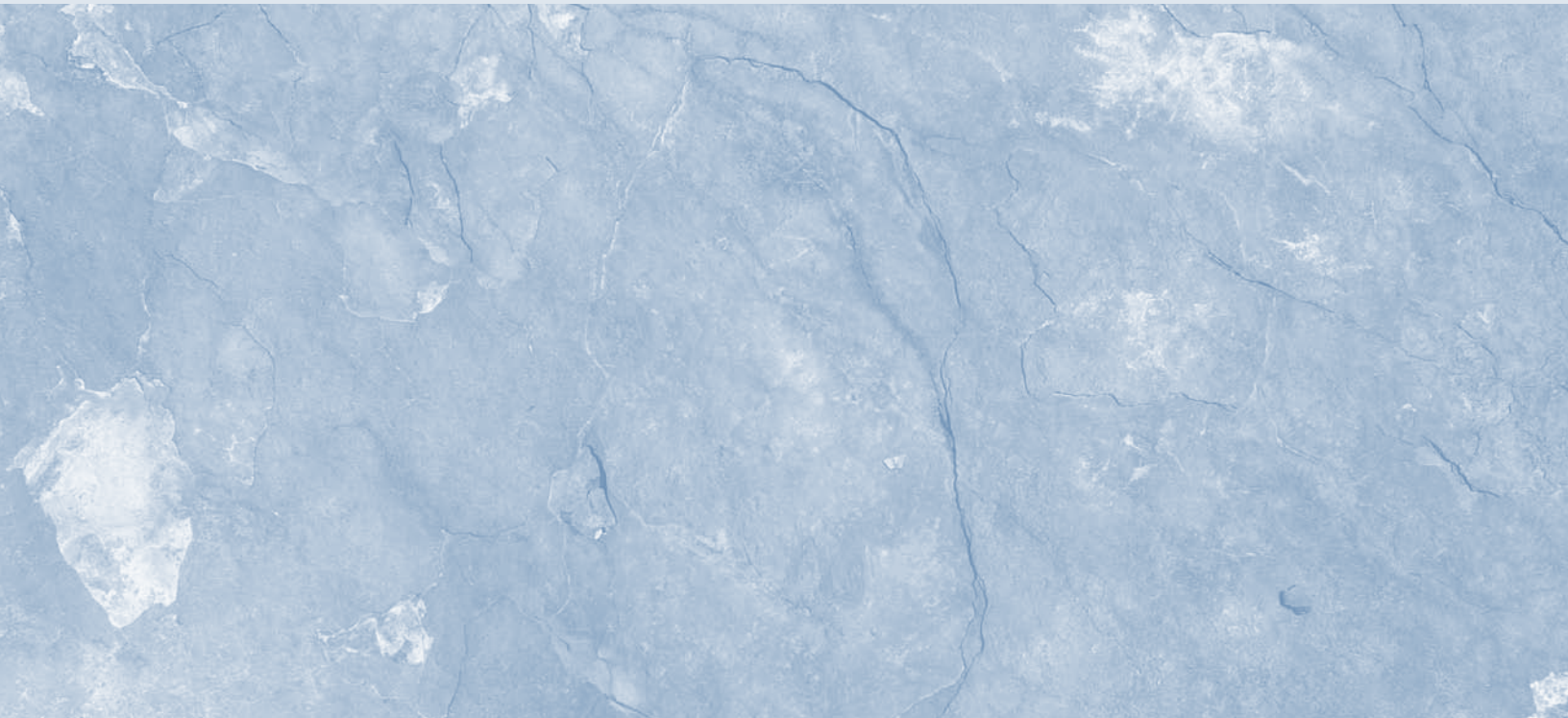
**Induced economic impacts** are the impacts that result from an increase in employees' spending, due to jobs in both the direct and indirect sectors.

The **revenue impact model** computes state, county and city revenues associated with changes in business activity. The model is designed to be used in conjunction with the results of the input-output model. The model is essentially a large spreadsheet that contains state and local tax rates, revenue sharing formulas, state and county income and population data.

**Direct revenues** are those paid by the firms/entities directly to state and local governments in the course of doing business in the state. Those estimated by the revenue impact model include state sales taxes, county excise (sales) taxes, state-shared sales taxes (taxes paid to the state but shared back to cities and counties), and city sales taxes.

**Induced revenues** are those paid by the estimated numbers of workers in the direct, indirect and induced economic sectors. Induced revenues estimated for the state government include the individual income tax, sales taxes, fuel taxes and other highway-related taxes and fees. Induced revenues estimated for cities and counties include county excise (sales) state-shared sales taxes, state-shared fuel and other highway taxes and fees, local government property taxes (excluding school districts), and city sales taxes.





**Eller** COLLEGE OF  
MANAGEMENT

THE UNIVERSITY OF ARIZONA.

*Economic and Business Research Center  
PO Box 210108  
Tucson, Arizona 85721-0108*