University Center for Social and Urban Research

THE IMPACT OF THE UNIVERSITY OF PITTSBURGH CANCER INSTITUTE AND UPMC CANCER CENTERS ON THE PITTSBURGH REGIONAL ECONOMY

PREPARED FOR THE
UNIVERSITY OF PITTSBURGH
CANCER INSTITUTE AND UPMC CANCER CENTERS

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The Impact of the University of Pittsburgh Cancer Institute and UPMC Cancer Centers on the Pittsburgh Regional Economy

Executive Summary: The University of Pittsburgh Cancer Institute (UPCI) and UPMC Cancer Centers generate substantial economic impacts to the Southwestern Pennsylvania regional economy. The role of medical facilities in regional economic development continues to grow in importance. Overall, medical facilities like UPCI and UPMC Cancer Centers contribute to a region's economy through employment, purchases, housing, neighborhood development, quality of life issues, and, in particular for this study, research activities. UPCI and UPMC Cancer Centers effect on regional economic development in Southwestern Pennsylvania is derived from its activities including cancer care delivery, research, education, and business operations.

The University of Pittsburgh Cancer Institute, the region's only National Cancer Institute (NCI) designated Comprehensive Cancer Center, is the academic and research center for cancer at the University of Pittsburgh and University of Pittsburgh Medical Center (UPMC). UPCI works in tandem with UPMC Cancer Centers, which is UPMC's clinical network for cancer care. With over 40 locations, including the main research and treatment facility at the Hillman Cancer Center in the Shadyside/Oakland neighborhoods of Pittsburgh, UPCI and UPMC Cancer Centers are major contributors to the region's economy and represent an important economic growth engine for the region, in addition to serving their main scientific and health mission.

This study estimates the direct and indirect impacts of UPCI and UPMC Cancer Centers on the Pittsburgh regional economy using the Regional Economic Modeling, Inc. (REMI) model. The Pittsburgh REMI Model calculates the total economic impact of UPCI and UPMC Cancer Centers on the Pittsburgh region and projects those impacts through 2020. The region includes Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland counties.

UPCI and UPMC Cancer Centers represent an important source of economic activity for the region. UPCI and UPMC Cancer Centers exceed the typical impact of a large service hospital due to their research activity. UPCI and UPMC Cancer Centers' research means that as focused specialty healthcare institutions, they produce a large amount of expenditures per individual health care worker and thus have a larger economic impact in the region. Specifically, the current economic impacts of the UPCI and UPMC Cancer Centers include:

- The direct and secondary impacts of the University of Pittsburgh Cancer Institute and UPMC Cancer Centers' total economic activity contributed *$451 million* to Gross Regional Product (GRP) in the Southwestern Pennsylvania region in 2006.
- The total direct and secondary employment impacts from clinical and research activities at the University of Pittsburgh Cancer Institute and UPMC Cancer Centers resulted in an increase of *6,532 workers* in 2006 to the regional economy.
- UPCI and UPMC Cancer Centers added *$720 million* to Total Regional Output in 2006 through total direct and indirect effects. Total regional output is a broader measure of the regional economy than GRP and is the equivalent to total sales.

The report develops a baseline forecast and three different growth scenarios for UPCI and UPMC Cancer Centers through 2020. All three growth scenarios incorporate a baseline population forecast for the region, which is the same for each growth scenario. Projected local

demand is limited by slow population growth in the region. The three growth scenarios reflect different projections for future revenue growth tied to research and export clinical care activities, where "export" clinical care activities are those drawn from outside the Pittsburgh region. The projected growth percentages for research exports were based on conservative estimates to account for the variability inherent to research programs. Further, the growth scenarios do not directly factor in planned future development, international care sites or spin-off business ventures, all of which are current focuses of UPCI and UPMC Cancer Centers. Each activity would only serve to add impact growth to already substantial projections. As one of the largest cancer centers in the country, UPCI and UPMC Cancer Centers' long term growth trend will be largely tied to national research funding. The three growth scenarios reflect recent and long term trends in National Cancer Institute funding. The following impacts (in 2006 dollars) are projected:

- UPCI and UPMC Cancer Centers are projected to contribute between *5,999 jobs and 6,589 jobs* to net job creation in the Pittsburgh region by 2020.
- The combined effects of UPCI and UPMC Cancer Centers are projected to add between *$557 million and $609 million* to Total Gross Regional Product by 2020.
- Total Regional Output added by UPCI and UPMC Cancer Centers is projected to reach *$926 million* in 2020 under the high growth scenario.

The presence of UPCI and UPMC Cancer Centers stimulates expansion in the overall economy, as these institutions expand. Growth in UPCI and UPMC Cancer Centers through 2020 is projected to increase population in the region between 8,091 and 8,594 persons, with additions to the regional labor force topping 5,000 workers. These employment impacts are not limited to additions in the health care sector. UPCI and UPMC Cancer Centers are projected to add jobs in other industries, especially in services, trade, and construction. In addition, their activities will have important fiscal impacts on state and local governments. The REMI model projects additions between $67 million and $72 million in state government revenues by 2020. Additions to local revenues are projected to add $56 million to $59 million by 2020.

Forecast of Total Economic Impact of UPCI and UPMC Cancer Centers on Pittsburgh Region, 2006-2020 (values correspond to impact activity in the year indicated only)

Summary Variables – 2% growth scenario	**2006**	**2010**	**2015**	**2020**
Total Employment	6,532	6,324	5,925	5,999
Total Gross Regional Product (millions of 2006 $)	$451	$473	$499	$557
Total Regional Output (millions of 2006 $)	$720	$734	$759	$845
Labor Force	2,344	4,384	4,873	5,012
Population	2,435	5,581	7,262	8,091
Summary Variables – 2.8% growth scenario				
Total Employment	6,532	6,383	6,061	6,217
Total Gross Regional Product (millions of 2006 $)	$451	$477	$509	$576
Total Regional Output (millions of 2006 $)	$720	$741	$776	$875
Labor Force	2,344	4,408	4,951	5,153
Population	2,435	5,607	7,357	8,280

Summary Variables – 4% growth scenario	2006	2010	2015	2020
Total Employment	6,532	6,475	6,280	6,589
Total Gross Regional Product (millions of 2006 $)	$451	$484	$527	$609
Total Regional Output (millions of 2006 $)	$720	$751	$804	$926
Labor Force	2,344	4,447	5,077	5,389
Population	2,435	5,649	7,511	8,594

The economic impact reflected in the scenarios above is quite substantial and at the same time conservatively modeled off of existing facilities and conservative trends. UPCI and UPMC currently are in the early stages of development for an additional biomedical research facility. The new tower, as planned, could generate economic growth effects similar to those experienced by the opening of the Hillman Cancer Center. On the clinical side, UPMC Cancer Centers continues to foster growth in the form of start-up and international ventures while maintaining its headquarters in Pittsburgh. This type of national and international exposure is likely to pay dividends to the region not only in the form of increased discretionary finances but also by attracting professionals and continuing Pittsburgh's revitalization as a location for novel enterprise. For this economic impact model, however, growth in these areas was excluded due to difficulty in accurately predicting future impacts in these sectors.

I. Introduction

This report estimates the economic impacts of the University of Pittsburgh Cancer Institute (UPCI) and UPMC Cancer Centers on the Southwestern Pennsylvania region. UPCI and UPMC Cancer Centers together make up a leading cancer center whose impacts extend beyond its main scientific research and health mission to generating economic benefits for the region. UPCI, UPMC Cancer Centers, and other parts of the region's medical and health care facilities comprise an important contribution to the Pittsburgh regional economy. UPCI and UPMC Cancer Centers deliver cancer care, research and education, along with business transactions and services that have a significant effect on regional economic development in Southwestern Pennsylvania.

UPCI and UPMC Cancer Centers have expanded rapidly in the past twenty years. In 1990, UPCI was designated as a Comprehensive Cancer Center by the National Cancer Institute. UPMC acquired the Hematology Oncology Associates (HOA) and Oncology Hematology Associates (OHA) practices in 1996 and 2000, respectively, among other practices. The Hillman Cancer Center, which opened in 2002, marked yet another milestone in the Institute's growth. Each of these events is highlighted as part of the analysis of UPCI and UPMC Cancer Centers' impact on the regional economy.

This report divides regional impacts into two parts. The first regional impacts are derived from the "export activities" of UPCI and UPMC Cancer Centers. Export industries bring dollars into a region from the outside. At UPCI, these export industries include research functions and activities related to research, including, most predominately, research personnel. Also included in these export activities is a small subset of cancer care at UPMC Cancer Centers that involves patients from outside the region.

The second impacts are the "local" impacts - the care and treatment of local and regional patients in UPMC Cancer Centers' facilities. UPMC Cancer Centers operates an integrated network of cancer care for patients in over 40 locations. These activities represent a substitution of cancer care around the region. Thus, we assume no new dollars are spent – these dollars would be spent elsewhere in the region on cancer care. They comprise the "local" impact of UPCI and UPMC Cancer Centers.

Some growth factors were intentionally excluded from the REMI model predictions to ensure a conservative projection. The model excluded planned but not developed projects like the addition of a biomedical research tower. Due to the novelty of the international developments as well as UPMC Cancer Centers' spin-off companies, the model was not able to reliably predict for future impacts generated in these areas, and they, therefore, were excluded.

Purpose and Design for the Report

Regional economic impact studies increasingly focus on service sectors, such as health and education (Carstensen et al, 2000; Doeksen, 1997; Iannone, 1996; Lichty et al, 1986; Saripalle et al, 2002; University of South Florida, 1999; Van den Berg, 1996). Medical facilities, along with

educational institutions, are now recognized as major contributors to regional economies. "Meds and Eds," as they are often called, may be among the city or region's largest employers (Adams, 2003; Harkavy and Zuckerman, 1999), oftentimes with the health sector as the largest private employer in the area.

Medical facilities contribute to a regional economy in many ways. They represent substantial interregional exports that generate employment and income for the regional economy. They purchase significant amounts of goods and services from the local economy, as well as from outside the region. Additionally, as physical entities, medical facilities and educational institutions represent significant assets to neighborhoods, cities, and regions that may be used to stimulate additional development.

In Pennsylvania, the hospital sector is one of the state's largest employers, with 265,400 employees in 2006, or nearly 5% of the state's total jobs (PA L&I, 2007). The health care industry in total employed 12% of Pennsylvania workers in 2006.

The hospital sector is part of the overall health care and social assistance industry, generating over $48 billion, or 9.4%, of total Gross State Product (GSP) (U.S. Department of Commerce, 2007). Though data for 2006 were not available in detailed form, generally, social assistance is less than 1% of GSP, so health care alone is estimated to be just under 9% of GSP in 2006.

In Pittsburgh, 57,500 people worked in hospitals in the region, or 5.1% of the regional employment. The total health care sector is estimated to account for over $8 billion of the region's Gross Regional Product (GRP), or roughly 8% of the region's nearly $100 billion economy. In 2006, health care employed 147,700 people in the region, while the educational sector employed 49,500 people in the same year. Together health care and educational services employed nearly 20% of the region's workers in 2006. Thus, institutions such as UPCI and UPMC Cancer Centers play a significant role in the Pittsburgh regional economy.

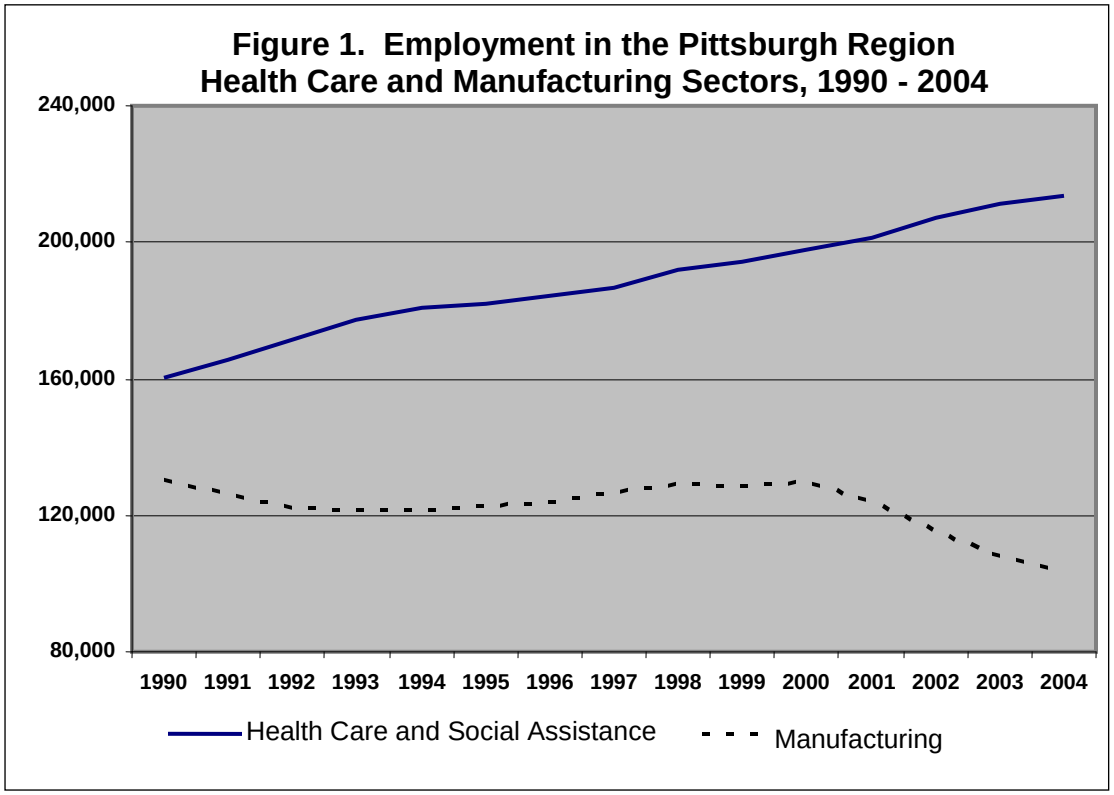
UPCI and UPMC Cancer Centers contribute to regional economic development of the Pittsburgh region in a number of ways. They are a direct purchaser of goods and services, many of them acquired locally. They generate substantial export earnings through research dollars that flow to the institution. They are a significant employer of local residents and attract new residents for research and clinical work. This flow of funds generates a "multiplier" effect, meaning that the total impact on the region goes beyond the effect of direct spending, such as purchases and payroll. Secondary impacts, called indirect and induced effects, are the result of subsequent rounds of spending by businesses and individuals. The total effect of direct, indirect, and induced effects of UPCI and UPMC Cancer Centers' spending is captured in this impact analysis.

Finally, primary health care provided by UPMC Cancer Centers clearly has an impact on the region's quality of life. Factors that affect the quality of life change the amenity value of the Pittsburgh region. The health sector and its components are an important part of the region's quality of life, as well as its economy.

Brief summary of Pittsburgh regional economy

The Pittsburgh region underwent a major restructuring of its regional economy from the late 1970s through the 1980s, as it shed its traditional manufacturing base, the metals industries. Such a radical transformation meant the loss of over 150,000 manufacturing jobs in just over a decade. Emerging as some of the region's largest industries -- at least in terms of employment -- were the health care and educational sectors. The region's famous public-private partnerships, forged during the city's redevelopment after World War II, added new nonprofit health and educational institutions to the development agenda (Sbragia, 1990; Mitchell-Weaver, 1992).

Today, employment in health care and education well exceeds total manufacturing employment in the region, and recent trends show an increasing gap between the local impacts of the two sectors (see Figure 1). Between 1990 and 2004, employment in health care and educational services in the Pittsburgh region increased by over 33% while manufacturing employment declined by 21%.



Source: Pittsburgh REMI Model, University Center for Social and Urban Research.

New industries related to health and education gained prominence in the region's economic development agenda, most notably the biotechnology industry. In 1988, the Pittsburgh Biomedical Development Corporation was formed from the Pittsburgh High Technology Council and the CEO Venture Fund. Pittsburgh and Southwestern Pennsylvania, along with the state of Pennsylvania, began focused efforts to build a commercial biotechnology cluster within the

region and state. Those efforts continued in the 1990s, with the establishment of "biotechnology greenhouses," state projects funded by the tobacco settlement funds for furthering the state's biotechnology industry. In the Pittsburgh region, the Pittsburgh Life Sciences Greenhouse was established as a partnership among the universities, health system, and state to promote technology transfer and new firm development in the industry. At UPCI, the Limbach Entrepreneurial Center in the Office for Enterprise Development serves to promote academic-industry connections from UPCI and the McGowan Institute for Regenerative Medicine.

Research into the development of the national biotech industry strongly supports the hypothesis that the best "star" scientists are crucial in both the development of the science and its commercialization (Zucker et al, 1998). The concentration of specific scientific knowledge is what makes a relatively small number of principal scientists one of the main predictors of regional growth in advanced technology industries, such as biotech. These key individuals form the core of academic research but are also agents for the knowledge spillover and commercialization of newly developed technology. Unlike more mature industries, the knowledge cannot be easily replicated.

As a relatively new industry, the future impacts are hard to measure at this stage. Emergent industries are, by their very nature, highly volatile in their growth path. As is typical of emerging industries, many firms do not survive an early developmental stage to become commercial successes. The rapid creation and destruction of firms and the novel nature of their products makes even the current status of the biotechnology industry hard to quantify, let alone forecast.

II. UPCI and UPMC Cancer Centers Overview and Milestones

UPCI and UPMC Cancer Centers have expanded mightily in the past two decades, with major milestones marked during this brief history. The University of Pittsburgh Cancer Institute was founded in 1984 as the Pittsburgh Cancer Institute. A planning task force recommended that the University of Pittsburgh, Carnegie Mellon University, and six university-affiliated hospitals form a consortium for cancer care and research among the region's leading cancer institutions (University of Pittsburgh Cancer Institute, 2005).

UPCI became a National Cancer Institute-designated Comprehensive Cancer Center in 1990, one of only three in Pennsylvania and 39 in the country. National Cancer Institute (NCI) Comprehensive Cancer Centers are marked by scientific excellence and are engaged in interdisciplinary efforts in basic, clinical, and population-based cancer research (NCI 2003). NCI funding to Comprehensive Cancer Centers is highly concentrated in a small set of institutions. Of $2.5 billion in total NCI support in 2005, $1.4 billion went to the top 20 institutions (see Table 1). In 2005, UPCI ranked as the 13th largest recipient of NCI funding, an improvement from a ranking of 30th in 1998 and 15th in 2003.

Table 1. Institutions Receiving National Cancer Institute Support – 2005
Ranked by Total Support (thousands of dollars)

	Institution	Grants	Contracts	Total
1)	University of California System	$180,697	$4,234	$184,931
2)	University of Texas MD Anderson Cancer Center	113,726	4,656	118,382
3)	Fred Hutchinson Cancer Research Center	91,066	6,204	97,270
4)	Science Applications International Corporation		94,072	94,072
5)	Johns Hopkins University Westat Inc.	84,585	717	85,302
6)	University of Pennsylvania	73,397	688	74,085
7)	Dana-Farber Cancer Institute	68,474		68,474
8)	University of Michigan at Ann Arbor Wayne State University	63,732	3,515	67,247
9)	Sloan-Kettering Institute for Cancer Research	65,715	1,509	67,223
10)	Duke University	61,393	658	62,051
11)	Vanderbilt University	55,988	0	55,988
12)	Mayo Clinic Rochester	52,312	3,413	55,725
13)	University of Pittsburgh at Pittsburgh	53,107	2,019	55,126
14)	Department of Interior		53,212	53,212
15)	Washington University	44,380	6,390	50,770
16)	University of Southern California	46,703	3,486	50,189
17)	University of North Carolina Chapel Hill	49,615		49,615
18)	Ohio State University	40,321	1,807	42,127
19)	University of Arizona	37,818	1,747	39,565
20)	National Childhood Cancer Foundation	39,438		39,438
	Top 20 Subtotal	1,222,467	188,327	1,410,792
	National Total	*$2,233811*	*$235,143*	*$2,499,024*

Source: National Cancer Institute, 2005

UPCI extended its footprint in the community when Hematology Oncology Associates (HOA) joined UPMC in 1996. In 2000, UPCI's presence in the community was further bolstered when the Oncology Hematology Associates (OHA) practice of western Pennsylvania joined UPMC. OHA, which was formed in 1978, employed 30 oncologists and 260 staff members in 21 locations at that time. Adding OHA enabled UPCI and UPMC Cancer Centers to enhance their research-clinical practice links in cancer research.

Finally, in 1999, construction began on the Hillman Cancer Center at the UPMC Shadyside Hospital campus. The Hillman Cancer Center opened in 2002 as the main facility for clinical services of the UPMC Cancer Centers and research functions of UPCI. The Hillman Cancer Center is located on what is now a two acre campus including UPMC Shadyside Hospital and the UPMC Cancer Pavilion. The Hillman Cancer Center employs a total staff of 600, with 400 full-time researchers and clinicians alone, serving an estimated 100,000 patient visits. UPCI's basic cancer scientists work in the Research Pavilion, a 178,000 square foot research laboratory and office facility. Senior UPCI and UPMC Cancer Centers staff, along with other cancer specialties and departments, is housed in the 100,000 square feet UPMC Cancer Pavilion, a facility connected to Hillman Cancer Center via a walking bridge over Centre Avenue.

Important interactions occur between the UPCI and UPMC Cancer Centers complex and the multiple offices and facilities at the University of Pittsburgh's main campus in nearby Oakland. UPCI personnel work and teach at the University's medical school and UPMC facilities in Oakland. Further expansion of UPCI activities is expected with the completion of the University of Pittsburgh's Biomedical Science Tower III, which includes UPCI's Molecular Therapeutics and Drug Discovery Program, along with other basic research in genetics. Biomedical Science Tower III is a 331,000 square foot building, which opened in 2005.

Besides its important contribution to the regional economy and quality of life, the Hillman Cancer Center also offers benefits to the North Oakland and Shadyside neighborhoods, where it is located, and, by extension, to the city of Pittsburgh, for its developing role as a neighborhood anchor. Health and educational institutions, despite sometimes uneasy relations with nearby neighbors, can provide strength to neighborhood improvement through attracting new investments, creating spin-off development, improving property values and thus, raising tax revenues to cities (Adams, 2003). The Hillman Cancer Center in North Oakland lies in the middle of the Baum-Centre Corridor Development District, an area receiving significant planning and investment for revitalization (Pittsburgh, City of, 2004). The Hillman Cancer Center is one of the major contributing factors to new attention and focus for this district (Fitzpatrick, 2002; Pittsburgh).

UPMC Cancer Centers

In addition to its location at the Hillman Cancer Center, UPMC Cancer Centers operates a decentralized network of cancer care facilities throughout the region. UPMC Cancer Centers offers patients care in cancer prevention, detection, diagnosis, and treatment in an integrated network of cancer care facilities in 43 locations across Southwestern Pennsylvania and into West Virginia and Ohio (see Figure 2). More than 30,000 patients are treated each year at these

facilities. UPMC Cancer Centers' cancer care network employs more then 2,300 physicians, researchers, and other administrative and professional staff.

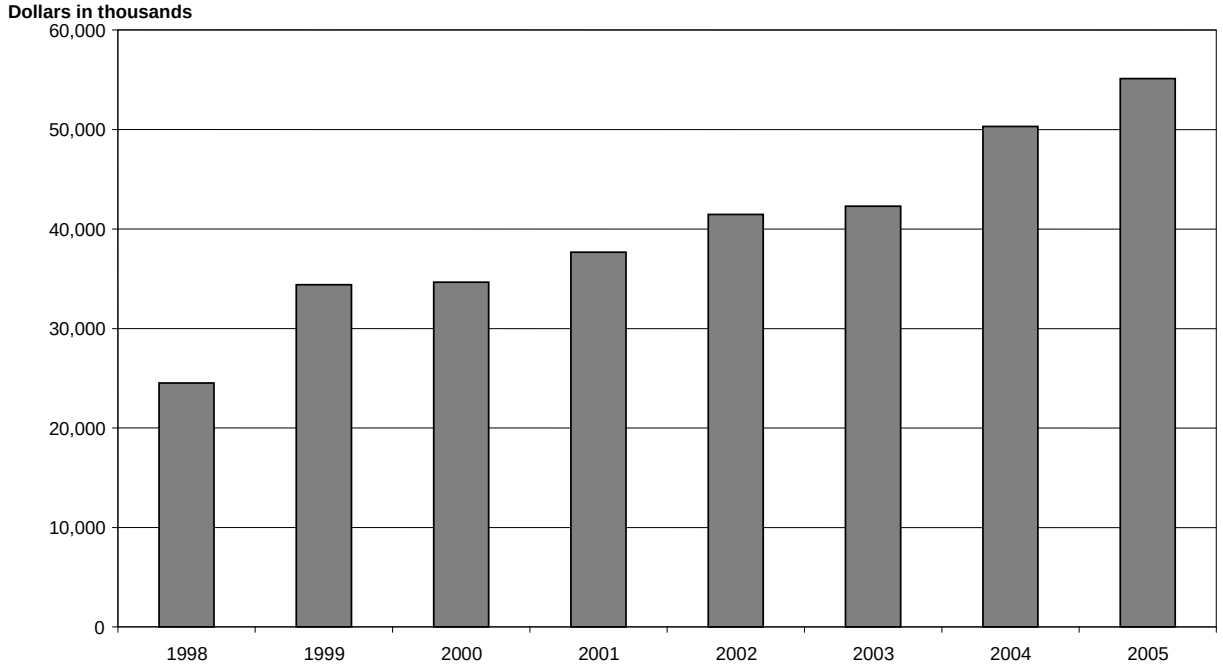
Figure 2. Locations of UPMC Cancer Facilities

In our impact model, we analyze the impact of UPMC Cancer Centers clinical care on the regional economy separately from UPCI research activities. UPMC Cancer Centers' activity -- revenues and expenditures – are primarily locally serving and are modeled separately from export-oriented research activities. Only a small proportion of clinical cancer care, 10%, involves patients from outside the region. This portion of UPMC Cancer Centers' activities is modeled as "exports" in the regional economy with research activity.

National Cancer Institute Funding

National Cancer Institute (NCI) funding is an important measure of UPCI's growth over the past years. The University of Pittsburgh's NCI funding increased by 125% in current dollars between 1998 and 2005, reaching $55 million (see Figure 3). Since 1998, the average annual increase in total NCI support to the University of Pittsburgh in constant, inflation-adjusted dollars, has been 8.2%.

Figure 3. University of Pittsburgh Cancer Institute
National Cancer Institute Funding, 1998 - 2005



Within the Pittsburgh region, the University of Pittsburgh is by far the largest recipient of federal funding for cancer programs. In 2003 it accounted for two-thirds of the Pittsburgh region's funding (see Table 2).

Table 2. Federal Funding for Cancer Programs by Institution, Pittsburgh MSA, 2003

University of Pittsburgh	$43,217,197
NSABP Foundation, Inc.	$19,171,058
UPMC McKeesport*	$1,229,830
Duquesne University	$746,134
ProlX Pharmaceuticals Corp.	$649,618
Carnegie Mellon University	$577,221
Childrens Hosp. of Pittsburgh of UPMC*	$492,966
Oncology Nursing Society	$492,146
ChromoDynamics, Inc	$100,000
Magee-Womens Health Corporation*	$9,625
Total	$66,685,795

*Part of UPMC
Source: FAADS 2003

We can compare NCI rankings along a number of dimensions. First, when analyzing NCI funding by state, Pennsylvania is one of the major recipients. The state ranked fourth among all states in per capita federal cancer research funds in 2005 (see Table 2). Pennsylvania was also twice as specialized in NCI funding as the U.S. average, with a location quotient of 200.6 against a U.S. average of 100.0. This means that Pennsylvania receives twice the U.S. average for NCI funding by state (see Table 3).

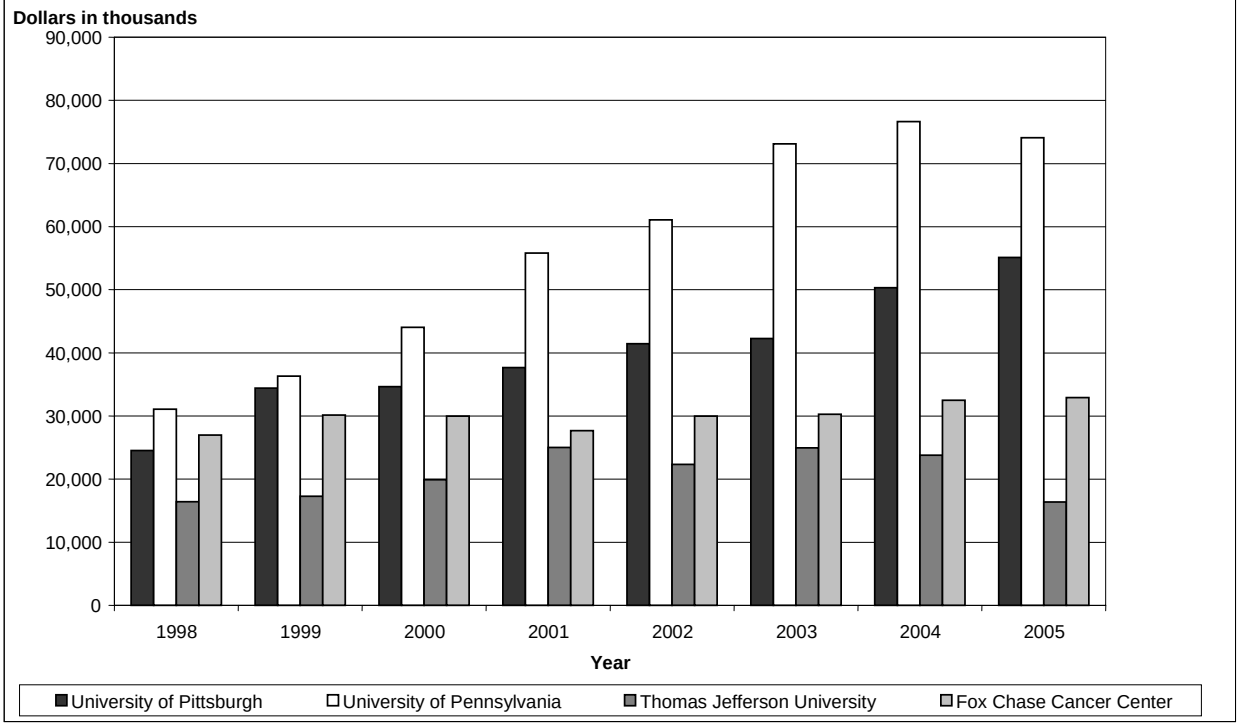
Table 3. Federal Cancer Research Funds, Ranked by Top Ten States, Location Quotients and Per Capita Expenditures, 2005

State	Location Quotient (100=U.S. average)	Per capita expenditures
1. District of Columbia	600.2	72,982
2. Massachusetts	405.8	49,340
3. Maryland	347.3	42,232
4. Pennsylvania	200.6	24,395
5. Washington	199.4	24,250
6. New Hampshire	156.2	18,988
7. Minnesota	150.6	18,315
8. California	138.2	16,809
9. North Carolina	128.6	15,642
10. Tennessee	127.0	15,438

Overall, NCI funds for all institutions in Pennsylvania increased by 145% between 1998 and 2005 (in current dollars). Cutting across Pennsylvania, NCI funding differs by region, with most

funds going to Pittsburgh and Philadelphia. The major cancer centers in the Philadelphia region are the University of Pennsylvania, Thomas Jefferson University, and Fox Chase Cancer Center. Figure 4 compares NCI funding between 1998 and 2005 for these top four Pennsylvania institutions. The University of Pittsburgh and the University of Pennsylvania remain the largest recipients of NCI funding in the state.

Figure 4. Select Pennsylvania Institutions Receiving National Cancer Institute Funding, 1998-2005



Source: National Cancer Institute, annual.

Finally, we compare the Pittsburgh region's cancer research to other metropolitan areas across the country. Using data from the Federal Assistance Award Data System (FAADS), it is possible to quantify the rank of metropolitan areas in the U.S. according to the level of federal funding for cancer specific programs. Every quarter, the FAADS produces a file of standardized data records with all types of financial assistance awards made by federal agencies to all types of recipients. We have identified nine programs that are specific to cancer, including cancer research. These are used to determine funding by metropolitan region (see Table 5).

Table 4. Federal Domestic Assistance Programs Relating to Cancer.

CFDA Code - Description
93.396 - Cancer Biology Research
93.393 - Cancer Cause and Prevention Research
93.397 - Cancer Centers Support Grants
93.392 - Cancer Construction
93.399 - Cancer Control
93.394 - Cancer Detection and Diagnosis Research
93.398 - Cancer Research Manpower
93.395 - Cancer Treatment Research
Source: CFDA (2004)

Federal cancer support is highly concentrated to a small number of metropolitan areas reflecting the concentration of research capacity at a set of institutions. Approximately 79% of all federal support for cancer programs is awarded in 25 metropolitan areas across the country (see Appendix A). Among large metropolitan regions, the Pittsburgh region stands out in the level of federal support for cancer programs on a per capita basis (see Table 5). In 2003, the Pittsburgh MSA received approximately $66.7 million in federal cancer funding. In per capita spending, the Pittsburgh MSA ranked ninth in the nation, with $28 per capita in federal cancer funding.

Table 5. Per Capita Federal Cancer Funding, 25 Largest Metropolitan Statistical Areas - 2003

	Metropolitan Region	Population	Funding	Per Capita
1)	Boston-Cambridge-Quincy, MA-NH	4,430,430	$305,393,930	$68.93
2)	Washington-Arlington-Alexandria, DC-VA-MD-WV	5,070,685	$326,580,982	$64.41
3)	Seattle-Tacoma-Bellevue, WA	3,142,153	$140,306,276	$44.65
4)	Baltimore-Towson, MD	2,627,122	$112,204,175	$42.71
5)	San Diego-Carlsbad-San Marcos, CA	2,918,829	$115,526,044	$39.58
6)	Houston-Baytown-Sugar Land, TX	5,073,419	$158,349,000	$31.21
7)	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	5,772,285	$174,651,731	$30.26
8)	San Francisco-Oakland-Fremont, CA	4,156,316	$119,928,003	$28.85
9)	Pittsburgh, PA	2,409,617	$66,685,795	$27.67
10)	Cleveland-Elyria-Mentor, OH	2,140,376	$48,093,473	$22.47
11)	St. Louis, MO-IL	2,777,272	$49,351,898	$17.77
12)	Los Angeles-Long Beach-Santa Ana, CA	12,820,531	$199,854,994	$15.59
13)	New York-No. New Jersey-Long Island, NY-NJ-PA	18,669,826	$285,158,851	$15.27
14)	Denver-Aurora, CO	2,301,861	$32,935,744	$14.31
15)	Minneapolis-St. Paul-Bloomington, MN-WI	3,084,874	$37,272,321	$12.08
16)	Chicago-Naperville-Joliet, IL-IN-WI	9,329,621	$96,681,585	$10.36
17)	Tampa-St. Petersburg-Clearwater, FL	2,531,185	$21,278,127	$8.41
18)	Portland-Vancouver-Beaverton, OR-WA	2,041,219	$15,157,931	$7.43
19)	Detroit-Warren-Livonia, MI	4,487,435	$32,776,675	$7.30
20)	Cincinnati-Middletown, OH-KY-IN	2,046,990	$14,064,551	$6.87

21)	Atlanta-Sandy Springs-Marietta, GA	4,604,817	$21,545,477	$4.68
22)	Dallas-Fort Worth-Arlington, TX	5,585,889	$19,719,588	$3.53
23)	Miami-Fort Lauderdale-Miami Beach, FL	5,277,451	$12,556,137	$2.38
24)	Riverside-San Bernardino-Ontario, CA	3,645,017	$5,913,678	$1.62
25)	Phoenix-Mesa-Scottsdale, AZ	3,593,297	$4,208,757	$1.17

Source: Compiled from Federal Assistance Award Data System (FAADS)

These federal funds comprise the major share of UPCI's export earnings. In the next section, we will discuss the methodology of the study and the impact analysis.

III. Methodology

UPCI and UPMC Cancer Centers affect the economy directly through their employment, purchases, tourism, and general public service, which includes community outreach, service provision, and basic research. Each of these areas is quantified with available data from UPCI, UPMC Cancer Centers, federal and state government, and local business.

This study employs the Pittsburgh REMI model to estimate the impact of UPCI and UPMC Cancer Centers' spending on the regional economy by analyzing direct and secondary effects of spending:

- *Direct effects.* Direct expenditures by UPCI and UPMC Cancer Centers for payroll and the purchase of goods and services. These generate direct job and income creation.

- *Indirect effects.* Second round spending by supplier businesses for other goods and services in the region. For instance, if UPCI purchases supplies from a company, that company's spending on payroll, other inputs, and services initiates the next round of the indirect effects spending on the regional economy.

- *Induced effects.* Consumer expenditures from both direct payroll impacts and indirect payroll impacts. This includes consumer spending on local goods and services, from haircuts and restaurant meals to durable goods and property.

The secondary effects -- indirect and induced effects -- have significant leakages out of the regional economy. The secondary effects are calculated round by round in the regional model, until a multiplier effect of UPCI and UPMC Cancer Centers' spending on jobs and income is determined.

The impacts of UPCI and UPMC Cancer Centers are broken down between those that are locally serving and those that are export-based.[1] Most clinical activities are locally serving and do not generate export earnings. Export-based activities have higher multiplier effects, since they bring money from outside the region into the region and generate greater indirect and induced effects.

Research activities are export-based. These 'export' revenues are a major driver within the regional economy and are significant parts of UPCI production. For example, research revenues generated from Federal and State governments represent a major source of export-based revenue. In addition to research, a portion of clinical care is export-related -- the treatment of patients who travel to UPCI or UPMC Cancer Centers from outside the region.

This report will focus on the cumulative effect of UPCI and UPMC Cancer Centers on the entire Southwestern Pennsylvania region covered by the Pittsburgh REMI model. This includes the seven counties of the Pittsburgh Metropolitan Statistical Area (MSA): Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland. Also included are three counties that

[1] "Exports" in this context are sales of goods and services that generate dollar flows from outside of the Pittsburgh region. As such they are not limited to international exports, which are a relatively small share of total exports for

border the MSA: Indiana, Greene, and Lawrence. Across a wide range of economic variables, it is not possible to specify the economic impact on any one sub-region in an integrated regional economy. While UPCI and UPMC Cancer Centers activities are concentrated in Allegheny County, the impacts are not limited to any one county. Impacts in the region's core have an impact across the region because of the interaction of business-to-business supplier networks and, most importantly, commuting of local workers between counties.

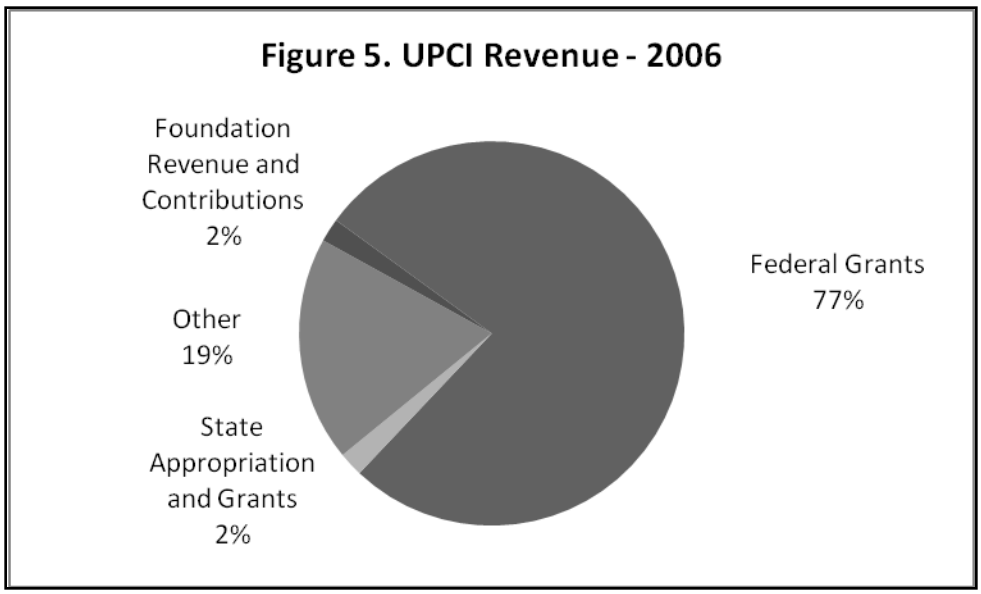
UPCI and UPMC Cancer Centers Revenue

The impact and forecasting model uses revenues and expenses provided by UPCI and UPMC Cancer Centers. Clinical care generates revenue from mainly local patients, with a small portion generated from patients who come from outside the region. Patients who come from outside the region generate 'export' dollars into the region, unlike local patients. On the other hand, research activity is primarily funded by revenue sources outside the region and is considered to be almost entirely an export-based portion of revenue.

Hospitals generate revenue in several ways. For most hospitals, clinical revenues make up the bulk of a hospital's total revenues. These "patient revenues" generate 80-90% of total revenue for a typical hospital (Erickson, 1986). Of these clinical revenues, most come from local or regional patients, and thus are part of our locally serving industry in our impact analysis.

Clinical care provides a significant part of total cancer revenue. For instance, in 2006, total revenues for clinical care amounted to over $530 million with $408 million coming from net patient revenues. Though the bulk of clinical care is provided to local patients, a small portion, 10% of UPMC Cancer Centers patient revenues, is treated as "export-based." This covers patients who come from out of the region for cancer care at UPMC Cancer Centers, such as patients who travel to UPMC Cancer Centers to be part of clinical trials or for very specialized care not available in their own state or region. This "export-based" clinical care is treated similarly to research based revenue in terms of its impact on the local economy.

UPCI represents a more complicated hospital case, with different revenue streams, because it is a major research center. Research revenues are calculated separately from the clinical operations in the impact model. Federal and state research grants make up, by far, the largest source of UPCI revenue. In 2006, federal and state direct grants plus indirect expenses on those grants accounted for 80% of UPCI's revenue (see Figure 5).



On the clinical side, demand for local health care services is highly dependent on the current and future demographic composition of the Pittsburgh region's population. Especially for cancer care, the incidence of disease, and consequently, the demand for medical services, is highly age-selective. The Pittsburgh region has an unusual age distribution, skewed to older age cohorts, compared to the nation or most other U.S. regions. With its relatively older population, Pittsburgh has a demand for medical services greater than expected for its population size. Therefore, the current and future trends in the local population will not reflect the same pattern occurring elsewhere in the nation.

Clinical care that is provided to patients from outside the region can experience a different demographic trend. These are based more on national population projections and on changes in the proportion of "export-based" cancer care captured by UPMC Cancer Centers. For the model, we assume a continued trend of 10% export-related clinical revenues through three distinct growth scenarios through 2020.

A final note on revenue: The impacts here are the direct and secondary impacts of UPCI and UPMC Cancer Centers spending. This report does not measure impacts of technology spin-off or new commercial activity generated by UPCI and UPMC Cancer Centers beyond the normal business-to-business activity captured in the REMI model. While UPCI has generated important technological spin-offs and new firm development, to date the firms are relatively new and small. Emergent industries are almost by definition difficult, if not impossible, to forecast. The most difficult of high technology-based economic development has always been the commercialization of research activity, as described in Section 1. That challenge will continue.

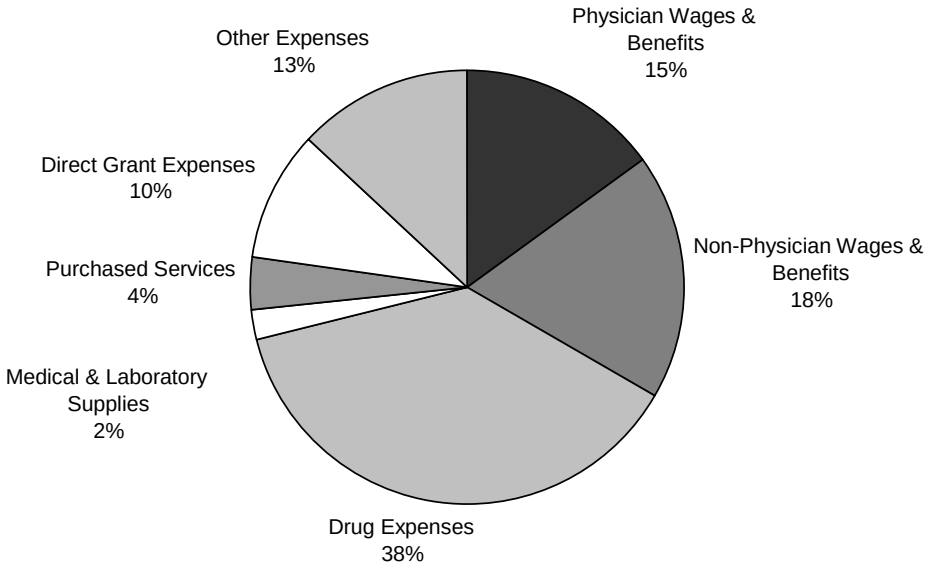
Furthermore, UPMC Cancer Centers are developing new projects. These are either in their early or planning stages and are not included in the impact estimate here or projections to 2020. Examples include UPMC Cancer Centers' radiation oncology services in Waterford and Dublin,

Ireland, where news clinic opened in 2006 (Mamula 2005). Though important for UPCI and UPMC Cancer Centers' economic impact, new business activities are more difficult to model.

UPCI and UPMC Cancer Centers Expenditures

In 2006, UPMC Cancer Centers' expenditures exceeded $438 million, with drug expenses and salaries as the two largest expense categories (see Figure 6). The impact of direct pharmaceutical expenses is significant as to how UPCI and UPMC Cancer Centers impact the local economy. For instance, within clinical care accounting, drug expenses in 2006 amounted to $165 million, which exceeded total expenses of $146 million for clinical staff salaries and accounted for 46% of clinical expenditures (see Figure 6.).

Figure 6. UPMC Cancer Centers Clinical Expenditures by Type, 2006



The impacts of drug expenses on the regional economy are different from other direct expenses, such as salaries. Most salaries go to people living and working in the region and generate regional multiplier effects. However, most of the costs of pharmaceuticals are not retained in the region and flow to where the firms are located. The local impact is largely in wholesale distribution. Therefore, the multiplier effect is lower. The regional impact of drug expenditures was derived from local distribution and wholesaling activities. This produces a different employment and income impact than if the total drug sales were included as a general expense.

On the UPCI side, total expenses in 2006 were nearly 75 million dollars. Salaries represent the largest expense category at 41.8 percent of total research salaries in 2006.

The Pittsburgh REMI Model

The Pittsburgh REMI model was used to estimate the impacts of UPCI and UPMC Cancer Centers on the regional economy. The REMI model is a dynamic, multi-sector, regional-econometric model developed specifically for the Pittsburgh region by Regional Economic Models, Inc. of Amherst, Massachusetts. The University of Pittsburgh Center for Social and Urban Research (UCSUR) is a partner with the Southwestern Pennsylvania Commission (SPC) in using the Pittsburgh REMI model for long-term forecasting and economic impact analysis. This model provides detail on a ten county region of Southwestern Pennsylvania. The REMI model includes all major inter-industry linkages among 169 private industries, which are aggregated into 70 major industrial sectors.

REMI is a comprehensive forecasting and policy analysis system that includes key econometric estimates and integrates inter-industry transactions, long run equilibrium features, and the new economic geography. The model includes substitution among factors of production in response to changes in relative factor costs; migration responses to changes in expected income; labor participation rate responses to changes in real wage and employment conditions; wages create responses to labor market changes, consumer consumption responses to changes in real disposable income and commodity prices; and local, regional, and market shares' responses to changes in regional production costs and agglomeration economies.

The REMI model is based on the national input-output (I/O) model known as the Regional Input-Output Modeling System (RIMS II) that the U.S. Department of Commerce (DOC) developed and continues to develop. An "input-output" model uses empirically established relationships between economic sectors and regions to determine the response of the regional economy to changes in demand in local industrial sectors or the national economy. As one industry expands or contracts, it produces secondary or induced changes in the economic output of other industries in the region. Other factors, such as population, are directly affected as the regional labor force adjusts to changes in regional industries (see Appendix B for more on the REMI model).

Because the variables in REMI are interrelated, a change in any one variable affects many others. For example, if wages in a particular sector rise, the relative prices of inputs change and may induce the employer to substitute capital for this labor. This changes the demand for other inputs, which affects employment and wage levels, as well as other variables in those industries. Changes in employment and wages likewise affect migration and population levels, as well, which in turn affect other employment variables. Any one change resonates throughout the economy and is reflected in the REMI model. This also is informative. Understanding the linkages among sectors and how each affects others can help policymakers. (For a glossary of economic terms used in the model, see Appendix C.)

Demographic Projections

Potential growth of medical care provided by UPMC Cancer Centers to residents of the Pittsburgh region is modeled separately from projections for research-generated revenues and export activity. Trends in the size and characteristics of the local population are one of the

primary determinants of clinical care revenues that will be generated by UPCI going into the future.

To model clinical care, two data sets are used:

1. *Population projections by age-race-sex*. The population projection is generated by the REMI model through the year 2030 for the Pittsburgh region. The population projection, or demographic module, is part of the model's overall economic forecast for the region. What the demographic module provides is a detailed breakdown of projected population in the Pittsburgh region by single year of age, race, and sex. The REMI model uses a "cohort-component" method to forecast the population. Components of change, including births, deaths, and domestic and international migration, are estimated and applied to a base population each year to form the next year's population estimate (For more details, see Appendix D).

2. *Cancer incidence rates.* To estimate the projected national trend in cancer treatment, a National Cancer Institute projection for all-site cancer incidence is used (Table 6). This projection matches census population projections by age-race-sex to recent data on observed cancer incidence rates.

Table 6. Projected National Cancer Incidence, by Age and Year, 2000-2050

	Ages					
Year	<50	50-64	65-74	75-84	85+	Total
2000	188,492	361,345	365,135	295,346	93,214	1,303,532
2010	187,277	508,404	416,897	309,509	129,970	1,552,057
2020	180,988	575,402	623,250	376,789	153,098	1,909,527
2030	196,868	521,791	754,157	577,298	203,943	2,254,056
2040	208,782	551,775	679,611	710,853	328,485	2,479,505
2050	219,618	605,922	719,302	654,560	447,394	2,646,796

Source: National Cancer Institute: http://seer.cancer.gov/report_to_nation/1973_1999/datapoints/figure5.pdf

Matching cancer incidence rates to the region's population projection produces an estimate of the demand for regional cancer care through 2035. This trend is reflected in Figure 7 and shows increasing growth in cancer incidence through 2020 and slower growth thereafter. The primary reason is the unusual demographic structure of the Pittsburgh region. The elderly population in the Pittsburgh region peaked in the mid-1990's and has been declining for the past decade. Projections are that this decline will continue for several more years followed by relatively flat growth in the elderly cohort (see Appendix B).

The national elderly population will grow more rapidly than the Pittsburgh region in the coming decades. For this reason, cancer incidence will grow more rapidly in the U.S. (see Figure 8). For Pennsylvania as a whole, the population over age 65 is projected to increase by 50% between 2000 and 2030, the slowest growth in the elderly population among all 50 states over this time period. By 2030 the national elderly population will increase by over 100% with several states expected to have growth of over 200% in their local elderly population. This disparity between

local and national growth trends in the elderly population is even more pronounced in the Pittsburgh region because of today's relatively high concentration of elderly.

Figure 7. Pittsburgh Region Projected Change in Annual Cancer Incidence Over 5 Year Intervals, 2000-2035

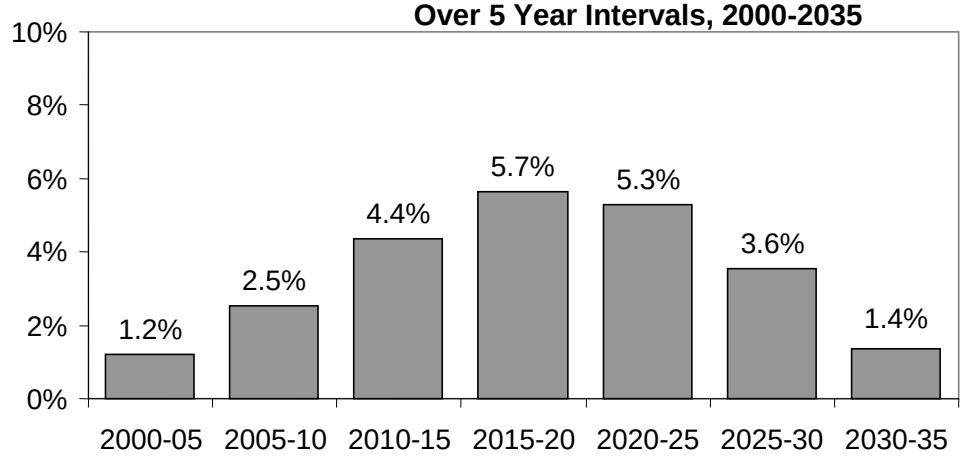
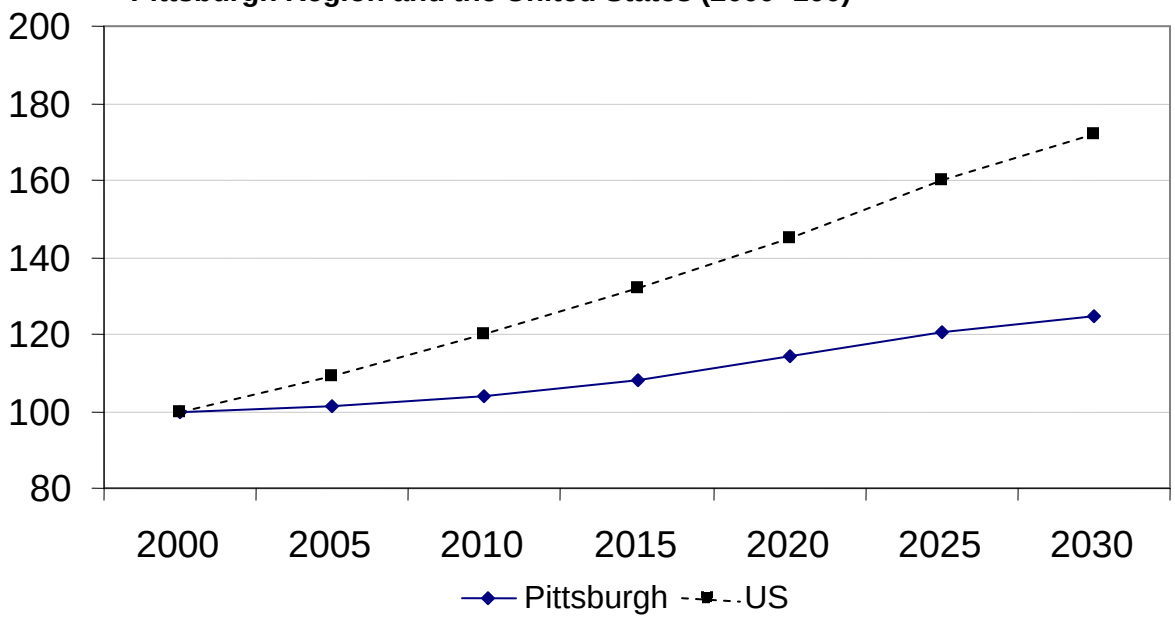


Figure 8. Index of Projected Trend in Cancer Incidence 2000-2030 Pittsburgh Region and the United States (2000=100)



IV. Growth Scenarios and Assumptions

UPCI and UPMC Cancer Centers have undergone rapid expansions in recent years. However, we expect the pace of new cancer center development from a clinical perspective to moderate over the next several years. For that reason, UPCI and UPMC Cancer Centers' impacts into the future are modeled under different growth scenarios for UPCI research activities, largely representing different growth rates in future NCI research funding. The primary difference among these scenarios is the assumed rate of growth in research specific expenditures generated by UPCI in the Pittsburgh region. UPMC Cancer Centers' clinical projections use REMI-generated population forecasts for the Pittsburgh region, combined with cancer incidence rates to estimate the "demand" for future cancer care in the region.

Scenario 1 -- Baseline Impact through 2006 (No Growth Model).

First, the REMI model is set up to measure the impacts of UPCI and UPMC Cancer Centers as they currently exist. A baseline is begun by "removing" UPCI and UPMC Cancer Centers from the Pittsburgh economy. Since both UPCI and UPMC Cancer Centers already exist, they first must be removed to establish what the regional economy would look like without them. This is then used to determine the impact of UPCI and UPMC Cancer Centers as they are "brought back into" the economy. We measure impacts *as the difference between the existing regional economy, which includes UPCI and UPMC Cancer Centers, and the counterfactual regional economy, which excludes both.* This is a modeling methodology that allows the results to be interpreted as the positive impact of the UPCI and UPMC Cancer Centers' continuing operations by reversing the signs of the economic variables. Data elements were provided by UPCI and UPMC Cancer Centers.

Scenario 1 estimates the impact of UPCI and UPMC Cancer Centers in the Southwestern Pennsylvania regional economy. It captures only the current impact on the regional economy. Scenarios 2, 3, and 4 will model the economic impact of both the research and clinical sides with various assumptions for expected growth into the future.

Scenario 2 -- Low Growth Model

Scenario 2 includes the same historical data as Scenario 1 above, the Baseline Impact. It takes into account the observed activity at UPCI and UPMC Cancer Centers through 2006, but also assumes a continued growth rate in both thereafter. The Low Growth Model, Scenario 2, assumes 2% annual growth in UPCI research activities through 2020. In actuality, the recent growth path is in excess of this rate. This represents a conservative -- or low -- estimate of what UPCI's growth might be into the future.

On the clinical side, future year expenditures are adjusted according to anticipated changes in the local demand for clinical cancer care, using the population projections and cancer incidence rates for the region. For the Low Growth model, the same projected growth rate in expenditures is applied to local demand for clinical cancer care. Export clinical cancer care, expenditures generated from patients outside the region, grows at the assumed rate for each scenario.

Scenario 3 -- Moderate Growth or Trend Model

Scenario 3 also takes into account the observed activity at UPCI and UPMC Cancer Centers for both research and clinical care through 2006, but assumes a continued annual growth rate of 2.8% in research activities thereafter to 2020, the long term rate of change, and 2.8% growth in the export portion of clinical care. This is called the moderate -- or trend -- rate of growth.

A larger rate of growth in the export share of cancer center expenditures is justified for a number of reasons. National demographic changes over the coming decades will include increases in the elderly population, resulting in increased demand for cancer care. If UPMC Cancer Centers were to capture the same national share of that total demand, larger local expenditures will be generated as a result.

Scenario 4 -- High Growth Model

Scenario 4 assumes a higher rate of growth into the future, 4% per year for UPCI research activities and UPMC Cancer Centers' export-oriented clinical care from 2006-2020. Whether 4% is a sustainable number is debatable, but it is within a reasonable range. Nonetheless, the difference when compounded does make for a larger impact into the future. On the clinical side, once again, as in Scenario 3, we assume an increasing proportion of export-related clinical care over this period. This includes a greater portion of patients at UPMC Cancer Centers coming from outside the region.

V. Results of Impact and Forecasting Models

What is the economic impact of the University of Pittsburgh Cancer Institute and UPMC Cancer Centers on the Pittsburgh regional economy? What will be the future impacts on the regional economy as UPCI and UPMC Cancer Centers continue to grow? These impacts are modeled along the four scenarios established and summarized in Table 7. All scenarios break down the economic impact across a range of important economic and demographic variables. The current impact includes local wage and salaries paid out by UPCI and UPMC Cancer Centers and the wages and salaries generated via indirect economic impacts.

Table 7. Summary of Projection Assumptions for 2006-2020

	Research	Clinical Medical
Scenario #1 -- Baseline	No growth in research activities above 2006 levels	No growth above 2006 levels
Scenario #2 -- Low Growth Model	2.0% annual growth in research funds	Adjusted for REMI generated Pittsburgh Population Projection and additional growth in export share.
Scenario #3 -- Moderate or Trend Growth	2.8% annual growth in research funds	
Scenario #4 -- High Growth Projection	4% annual growth in research funds	

Current Impact of UPCI and UPMC Cancer Centers -- Baseline Model, Scenario 1

UPCI and UPMC Cancer Centers have a strong impact on the Southwestern Pennsylvania regional economy. Their spending resulted in direct and secondary creation of 6,532 jobs in 2006, with the clinical side generating 5,251 jobs, while research added 1,281 positions (see Table 8). Thus, *6,532 additional jobs in the region in 2006 depended on UPCI and UPMC Cancer Centers* in the 10-county Southwestern Pennsylvania region.

Table 8. Impact of UPCI and UPMC Cancer Centers on the Pittsburgh Regional Economy, by Clinical and Research Activities, 2006

	Clinical	Research	Total
Total Employment	5,251	1,281	6,532
Total Gross Regional Product (millions)	$365	$86	$451
Total Regional Output (millions)	$583	$137	$720
Labor Force	1,901	443	2,344
Population	1,973	462	2,435

The total impact of UPCI and UPMC Cancer Centers on Gross Regional Product (GRP) was nearly $451 million in 2006. GRP is a measure of local value-added economic production and is considered the best and most comprehensive measure of the economic activity. GRP is the same as national estimates of gross domestic product (GDP) that are commonly cited. GRP is also comparable to estimates of gross state product (GSP) that are produced by the Department of Commerce's Bureau of Economic Analysis.

In 2006, clinical and research operations combined for a total impact of $720 million in Total Regional Output. Total regional output is a broader measure of economic activity than GRP. It is more akin to a total sales figure. Total regional output includes GRP, but does not adjust for the value of intermediate inputs that are purchased from suppliers outside of the region. Thus estimates of total regional output are typically higher than estimates of GRP, especially for industries that purchase a significant proportion of inputs from outside of the region. A typical locally-serving health care industry would have estimates of output much closer to GRP than the results of these simulations. Here, we see a sizable difference between GRP and total regional output. This is mostly the result of the disproportionate cost of pharmaceuticals in cancer care. The dispensing of these drugs locally pushes up the value of local output because these drugs are, for the most part, manufactured outside the Pittsburgh region. Their value added, or GRP, is not generated in the Pittsburgh region.

How large are these impacts? The total impact for UPCI and UPMC Cancer Centers is well above the typical impact for a large service hospital. The nature of UPCI and UPMC Cancer Centers in research means that as a focused specialty hospital, they produce a large amount of expenditures per individual health care worker and thus a larger economic impact within the region.

Furthermore, UPCI and UPMC Cancer Centers' impact can be analyzed by the industrial sector. Obviously, its major impact is on health care employment and educational services, both contained in the sector "services" (see Table 9). The impact of UPCI, however, includes employment and output across a broad range of other industries.

Table 9. Impact of UPCI and UPMC Cancer Centers on Employment by Industry, Research and Clinical Activities, 2006

Industry	Research	Clinical	Total
Natural Resources, Mining, Utilities & Construction Industries	71	355	426
Manufacturing	14	67	81
Trade	120	725	845
Transportation, Information	71	353	424
Services	983	3,656	4,639
Public Administration	22	94	117

Most notably, UPCI and UPMC Cancer Centers created the largest secondary impact on the trade sector. This results from the purchase of goods and services by UPCI and UPMC Cancer Centers, which in turn creates further rounds of spending in the trade sector. While we have not broken down the differential impacts regionally, we can presume that many of these jobs are

related to local and regional purchases of goods and services by UPCI and UPMC Cancer Centers.

Additional economic activity induced by UPCI and UPMC Cancer Centers includes employment in transportation and information industries and lesser increases in manufacturing, utilities, and construction. Construction and manufacturing activity is a result of continuing investment within the region generated both by growth of existing establishments and also the replacement of capital during its normal schedule of depreciation.

Economic activity generated by UPCI and UPMC Cancer Centers also yields tax revenues for state and local governments. The REMI model estimates additional revenues and expenditures for both local and state government that are generated by UPCI and UPMC Cancer Centers directly and indirectly. Additional tax revenue is generated from a broad range of taxes and is not limited to direct payment by UPCI and UPMC Cancer Centers themselves. Additional personal income in the region has a direct impact on state and local income taxes. Local spending on final products will produce additional sales taxes and multiple other product specific sales taxes have revenues that correlate with overall economic activity.[2]

In 2006, the direct and indirect impacts of UPCI and UPMC Cancer Centers generated $46.0 million in state government revenues and $23.6 million for all local governments (see Table 10).

Table 10. Impact of UPCI and UPMC Cancer Centers on State and Local Government Revenues and Expenditures, by Research and Clinical Activities, 2006 (millions of dollars)

	Research	Clinical.	Total.
State Government Revenues	$6.6	$39.4	$46.0
Local Government Revenues	$3.5	$20.1	$23.6
State Government Expenditures	$1.3	$5.4	$6.8
Local Government Expenditures	$1.9	$7.4	$9.2

Scenario2: Low Growth Projection

The second scenario or the low growth projection assumes a relatively slow rate of growth in UPCI's research activities at 2% annually. This rate falls below current averages and represents a floor of anticipated impacts of UPCI to 2020. In this model, research and export-oriented clinical care are assumed to grow by 2% each year through 2020.

Under the low growth projection, UPCI and UPMC Cancer Centers' impact on total regional output is estimated at $720 million in 2006 and to grow to $845 million in 2020 (in constant 2006 dollars; see Table 11). Moreover, UPCI and UPMC Cancer Centers' contribution to Gross Regional Product is projected to reach $557 million by 2020.

[2] Projections from the Baseline, Scenario 1 model are shown in the appendix and not here in the text. The projections are "no growth."

Direct, indirect, and induced effects of UPCI and UPMC Cancer Centers are expected to increase total employment by 5,999 jobs by 2020. Overall, those contributions will expand the region's labor force by 5,012 people by 2020.

Table 11. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 2.0% Annual Research and Export Growth

(values correspond to impact activity in the year indicated only)

Summary Variables–Clinical	**2006**	**2010**	**2015**	**2020**
Total Employment	5,251	5,004	4,601	4,599
Total Gross Regional Product (millions of 2006 $)	$365	$378	$392	$434
Total Regional Output (millions of 2006 $)	$583	$586	$597	$658
Labor Force	1,901	3,521	3,858	3,918
Population	1,973	4,480	5,758	6,340
Summary Variables—Research				
Total Employment	1,281	1,320	1,324	1,400
Total Gross Regional Product (millions of 2006 $)	$86	$95	$106	$123
Total Regional Output (millions of 2006 $)	$137	$148	$162	$188
Labor Force	443	863	1,015	1,094
Population	462	1,101	1,504	1,751
Summary Variables—Combined Activities				
Total Employment	6,532	6,324	5,925	5,999
Total Gross Regional Product (millions of 2006 $)	$451	$473	$499	$557
Total Regional Output (millions of 2006 $)	$720	$734	$759	$845
Labor Force	2,344	4,384	4,873	5,012
Population	2,435	5,581	7,262	8,091

Further impacts can be measured by examining sectors of the economy (see Table 12). As in the current impact estimation above, the largest impacts of UPCI and UPMC Cancer Centers growth will be in the services industries, where the health care sector lies. Nonetheless, UPCI and UPMC Cancer Centers expansion leads to job growth in related sectors. Clinical and research activities have strong impacts on job growth in the public administration area and services.

Finally, the low growth scenario is projected to generate $67 million in additional state government revenues and $56 million in additional local government revenues (see Table 13). Likewise, state and local government expenditures increase under this growth scenario.

Table 12. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 2.0% Annual Research and Export Growth
Employment by Industry (values correspond to impact activity in the year indicated only)

Employment by Industry—Clinical	**2006**	**2010**	**2015**	**2020**
Natural Resources, Mining, Utilities & Construction Industries	355	393	278	231
Manufacturing	67	33	20	27
Trade	725	682	602	572
Transportation, Information	353	270	222	231
Services	3,656	3,415	3,205	3,239
Public Administration	94	211	274	299
Employment by Industry—Research				
Natural Resources, Mining, Utilities & Construction Industries	71	86	70	64
Manufacturing	14	8	6	8
Trade	120	122	116	116
Transportation, Information	71	58	52	58
Services	983	993	1,008	1,071
Public Administration	22	53	72	84
Employment by Industry—Combined Activities				
Natural Resources, Mining, Utilities & Construction Industries	426	479	348	296
Manufacturing	81	41	26	35
Trade	845	804	717	688
Transportation, Information	424	328	275	289
Services	4,639	4,408	4,213	4,310
Public Administration	117	264	346	383

Table 13. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 2.0% Annual Research and Export Growth
Fiscal Impacts (millions of 2006 dollars; values correspond to impact activity in the year indicated only)

Fiscal Impacts—Clinical	**2006**	**2010**	**2015**	**2020**
State Government Revenues	$39	$46	$50	$54
Local Government Revenues	$20	$30	$38	$45
State Government Expenditures	$5	$16	$22	$26
Local Government Expenditures	$7	$18	$25	$29
Fiscal Impacts—Research				
State Government Revenues	$7	$9	$11	$12
Local Government Revenues	$4	$6	$9	$11
State Government Expenditures	$1	$4	$6	$8
Local Government Expenditures	$2	$5	$7	$9
Fiscal Impacts—Combined				
State Government Revenues	$46	$46	$61	$67
Local Government Revenues	$24	$36	$47	$56
State Government Expenditures	$7	$20	$29	$34
Local Government Expenditures	$9	$23	$32	$38

Scenario 3: Moderate Growth, or Trend Model

Scenario 3 is the moderate growth model, or what we call the trend model. Here recent trends are expected to continue over the near to medium term, to 2020. This is a 2.8% annual increase in export-based activities of UPCI and UPMC Cancer Centers.

Economic activity will draw new people into the workforce from the region and attract new workers from outside the region. The moderate growth scenario shows growth in the region's labor force that includes new workers from both inside and outside the region. This, in turn, results in an increase in population from in-migrants to the region and their dependents. By 2020, the moderate growth scenario projects a net addition of 8,280 people to the region (see Table 14). Total employment from clinical and research activities will increase by 6,217, while over a half billion dollars will be added to Gross Regional Product. (Additions to employment by industry and fiscal impacts are shown in Tables 15 and 16.)

Table 14. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 2.8% Annual Research and Export Growth
Summary Variables (values correspond to impact activity in the year indicated only)

Summary Variables—Clinical	**2006**	**2010**	**2015**	**2020**
Total Employment	5,251	5,021	4,640	4,660
Total Gross Regional Product (millions of 2006 $)	$365	$379	$396	$439
Total Regional Output (millions of 2006 $)	$583	$588	$602	$667
Labor Force	1,901	3,528	3,882	3,960
Population	1,973	4,488	5,786	6,396
Summary Variables—Research				
Total Employment	1,281	1,320	1,324	1,400
Total Gross Regional Product (millions of 2006 $)	$86	$95	$106	$123
Total Regional Output (millions of 2006 $)	$137	$148	$162	$188
Labor Force	443	863	1,015	1,094
Population	462	1,101	1,504	1,751
Summary Variables—Combined Activities				
Total Employment	6,532	6,383	6,061	6,217
Total Gross Regional Product (millions of 2006 $)	$451	$477	$509	$576
Total Regional Output (millions of 2006 $)	$720	$741	$776	$875
Labor Force	2,344	4,408	4,951	5,153
Population	2,435	5,607	7,357	8,280

Table 15. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 2.8% Research and Export Growth
Employment by Industry (values correspond to impact activity in the year indicated only)

Employment by Industry—Clinical	**2006**	**2010**	**2015**	**2020**
Natural Resources, Mining, Utilities & Construction Industries	355	394	281	236
Manufacturing	67	33	21	28
Trade	725	684	607	580
Transportation, Information	353	271	224	234
Services	3,656	3,426	3,232	3,282
Public Administration	94	212	275	302
Employment by Industry—Research				
Natural Resources, Mining, Utilities & Construction Industries	71	89	76	74
Manufacturing	14	8	6	9
Trade	120	126	124	129
Transportation, Information	71	60	57	64
Services	983	1,025	1,082	1,192
Public Administration	22	53	75	90
Employment by Industry—Combined Activities				
Natural Resources, Mining, Utilities & Construction Industries	426	483	357	309
Manufacturing	81	42	27	36
Trade	845	810	731	709
Transportation, Information	424	332	281	298
Services	4,639	4,451	4,314	4,474
Public Administration	117	265	350	392

Table 16. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 2.8% Annual Research and Export Growth
Fiscal Impacts (millions of 2006 dollars) (values correspond to impact activity in the year indicated only)

Fiscal Impacts—Clinical	**2006**	**2010**	**2015**	**2020**
State Government Revenues	$39	$46	$51	$55
Local Government Revenues	$20	$30	$39	$45
State Government Expenditures	$5	$16	$22	$27
Local Government Expenditures	$7	$18	$25	$29
Fiscal Impacts—Research				
State Government Revenues	$7	$9	$11	$14
Local Government Revenues	$3	$6	$9	$12
State Government Expenditures	$1	$4	$6	$8
Local Government Expenditures	$2	$5	$7	$9
Fiscal Impacts—Combined Activities				
State Government Revenues	$46	$55	$62	$69
Local Government Revenues	$24	$37	$48	$57
State Government Expenditures	$7	$20	$29	$35
Local Government Expenditures	$9	$23	$32	$38

Scenario 4: High Growth Model

Scenario 4 assumes a 4% per year growth rate in research funds to UPCI. This is within the bounds of previous years growth rates and represents the High Growth Model of the study.

The higher growth model projects research activities to increase in share over the 2006-2020 period on the range of economic indicators. Gross regional product stemming from research activities increases by 86 % over this period. The research share of total additions to GRP increases from 19.1% of the total in 2006 to 26.3% of total GRP growth in 2020. The impact on GRP, including both clinical and research sides, increases to $609 million in 2020 (see Table 17). In addition to increases in GRP, the high growth model forecasts total employment to increase to 6,589 workers. Total output reaches $926 billion by 2020 under the high growth scenario.

As in the previous scenarios, the indirect and induced impacts of UPCI and UPMC Cancer Centers extend across sectors of the regional economy. The greatest impact is in the service sector, which includes direct job creation in health care, along with secondary effects in other service areas. The high growth model creates 4,754 additional jobs in services by 2020 (see Table 18). Fiscal impacts include an additional $72 million in state government revenues and $59 million in local government revenues by 2020 (see Table 19).

Table 17. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 4.0% Annual Research and Export Growth
Summary Variables (values correspond to impact activity in the year indicated only)

Summary Variables—Clinical	**2006**	**2010**	**2015**	**2020**
Total Employment	5,251	5,047	4,702	4,764
Total Gross Regional Product (millions of 2006 $)	$365	$381	$401	$449
Total Regional Output (millions of 2006 $)	$583	$591	$610	$682
Labor Force	1,901	3,540	3,919	4,029
Population	1,973	4,500	5,831	6,487
Summary Variables—Research				
Total Employment	1,281	1,428	1,578	1,825
Total Gross Regional Product (millions of 2006 $)	$86	$103	$126	$160
Total Regional Output (millions of 2006 $)	$137	$160	$194	$245
Labor Force	443	907	1,158	1,360
Population	462	1,149	1,680	2,107
Summary Variables—Combined Activities				
Total Employment	6,532	6,475	6,280	6,589
Total Gross Regional Product (millions of 2006 $)	$451	$484	$527	$609
Total Regional Output (millions of 2006 $)	$720	$751	$804	$926
Labor Force	2,344	4,447	5,077	5,389
Population	2,435	5,649	7,511	8,594

Table 18. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 4.0% Annual Research and Export Growth
Employment by Industry (values correspond to impact activity in the year indicated only)

Employment by Industry—Clinical	**2006**	**2010**	**2015**	**2020**
Natural Resources, Mining, Utilities & Construction Industries	355	396	285	243
Manufacturing	67	34	21	28
Trade	725	688	615	593
Transportation, Information	353	273	228	239
Services	3,656	3,445	3,275	3,355
Public Administration	94	212	277	306
Employment by Industry—Research				
Natural Resources, Mining, Utilities & Construction Industries	71	93	86	89
Manufacturing	14	9	7	10
Trade	120	132	138	151
Transportation, Information	71	64	64	75
Services	983	1,076	1,203	1,399
Public Administration	22	55	81	101
Employment by Industry—Combined Activities				
Natural Resources, Mining, Utilities & Construction Industries	426	489	371	333
Manufacturing	81	42	28	38
Trade	845	820	753	744
Transportation, Information	424	337	291	314
Services	4,639	4,521	4,478	4,754
Public Administration	117	267	358	407

Table 19. Summary Economic Impact on Pittsburgh Region
Demographic Projection and 4% Annual Research and Export Growth
Fiscal Impacts (millions of 2006 dollars) (values correspond to impact activity in the year indicated only)

Fiscal Impacts—Clinical	**2006**	**2010**	**2015**	**2020**
State Government Revenues	$39	$47	$51	$56
Local Government Revenues	$20	$30	$39	$46
State Government Expenditures	$7	$18	$25	$30
Local Government Expenditures	$5	$16	$23	$27
Fiscal Impacts—Research				
State Government Revenues	$7	$9	$12	$16
Local Government Revenues	$3	$6	$10	$13
State Government Expenditures	$1	$4	$7	$9
Local Government Expenditures	$2	$5	$8	$11
Fiscal Impacts—Combined Activities				
State Government Revenues	$46	$56	$63	$72
Local Government Revenues	$24	$37	$49	$59
State Government Expenditures	$9	$22	$32	$39
Local Government Expenditures	$7	$21	$30	$37

Comparison and Discussion of Projections

We compare impacts across a range of variables. Key indicators of economic impact include projected changes in the region's gross regional product (GRP), economic output, total employment, and population. The changes in these variables for each scenario over the period 2006 through 2020 are summarized in Figures 9 through 13.

The three scenarios differ over the long term primarily because of projected growth in the scale of research activity. Growth is also projected in the number of patients that reside outside of the region but seek treatment within the region. It is important to note that in the three scenarios, not all inputs are projected to grow at the same rate. Specifically, the locally generated demand for medical care is derived from the baseline demographic forecast for the region. This baseline projection is used in all three scenarios and is generally less than the projected growth in research activity. The result is that the long term impacts for the three scenarios are smaller than a compounded annual growth rate of 2%, 2.8%, or 4% would imply. Over the long run, the three scenarios do not differ amongst themselves as much as might be expected for the same reason.

Figure 9 compares GRP impacts in the three scenarios. In these scenarios, by 2020, GRP increases to $557 million under the low growth model (almost 25% above the 2006 impact) and nearly $609 million under the high growth model (or 35% above the 2006 impact). The Pittsburgh regional economy is estimated to have a total GRP of $98 billion dollars currently and is projected by the REMI model to grow to $146 billion by 2020. In all scenarios, total GRP growth induced by the simulation exceeds the projected growth for the Pittsburgh region by a large margin.

The alternate measure of the regional economy, Total Regional Output, also increases steadily under the three scenarios (see Figure 10). Here we see successive growth in each scenario's contribution to total economic output over the 2006-2020 period. The high growth scenario shows UPCI and UPMC Cancer Centers' contribution to economic output reaching $926 million by 2020.

Figure 9. Projected Impact of University of Pittsburgh Cancer Institute and UPMC Cancer Centers on Gross Regional Product, Pittsburgh Region, 2006-2020

(values correspond to impact activity in the year indicated only)

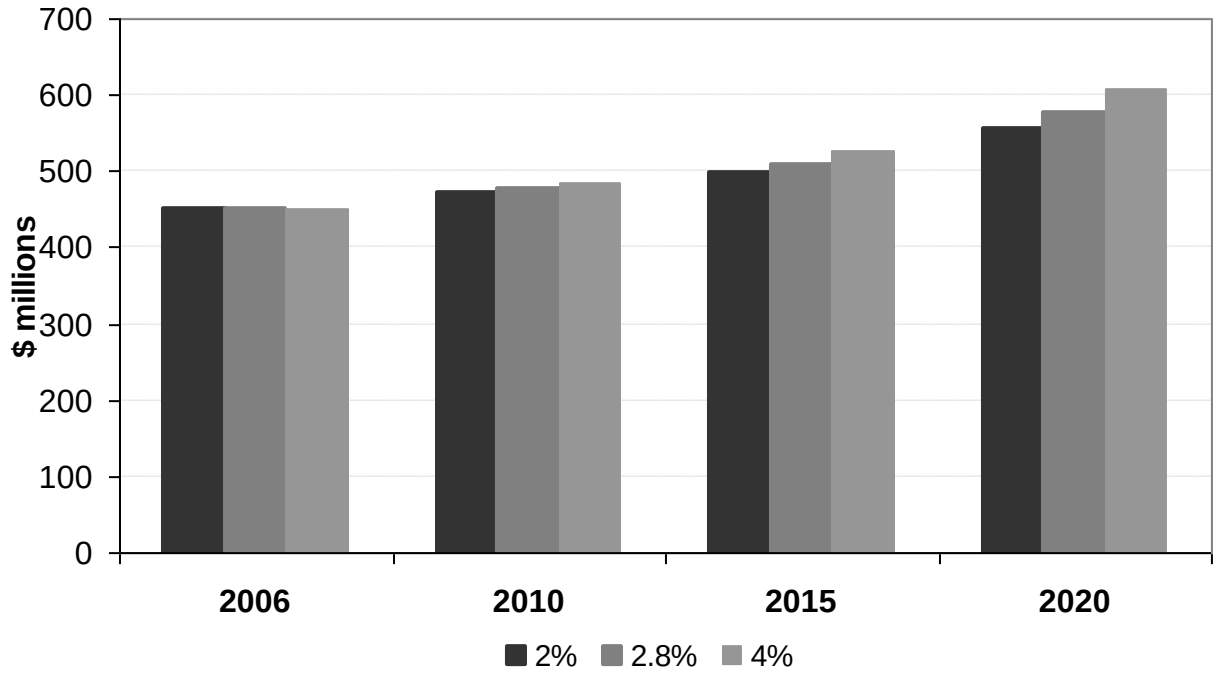
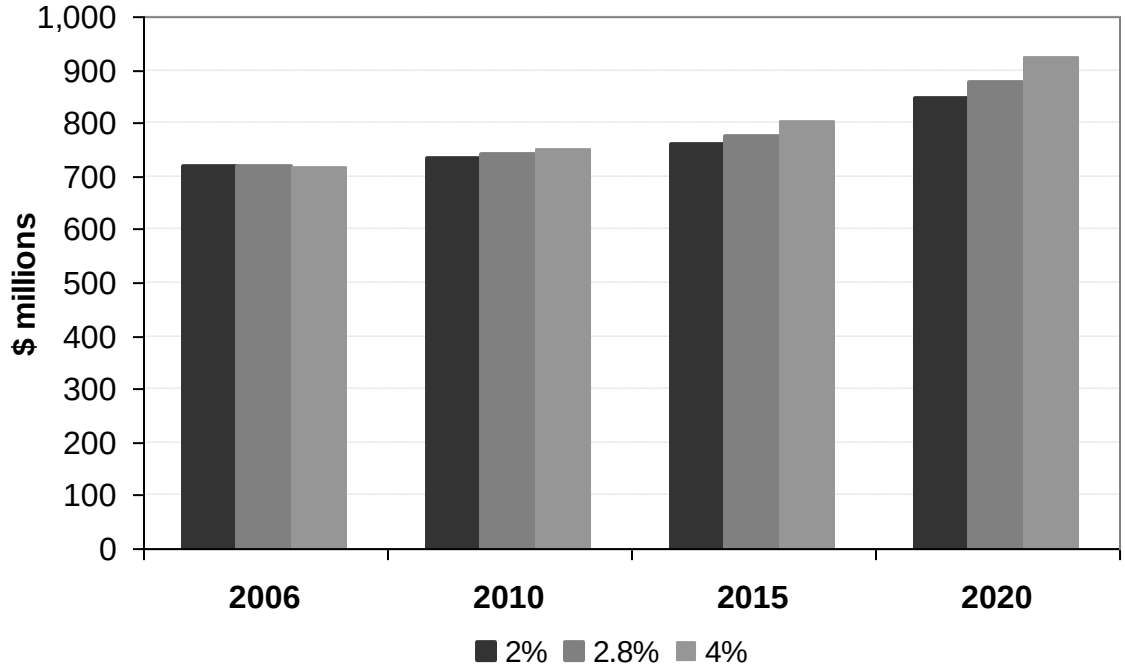


Figure 10. Projected Impact of University of Pittsburgh Cancer Institute and UPMC Cancer Centers on Total Economic Output, Pittsburgh Region, 2006-2020

(values correspond to impact activity in the year indicated only)



Employment and net population impacts are shown in Figures 11-12. Total net employment impact grows from 6,532 additional jobs per year in 2006 to between 5,999 and 6,589 additional jobs in 2020. Employment growth includes both direct job creation at UPCI and UPMC Cancer Centers, but also the induced and indirect jobs created in the local economy. Net job creation has a positive effect both on the local unemployment rate as workers seeking employment find jobs. Job creation will also induce some workers not seeking jobs to enter the local workforce and push up local labor force participation rates.

An indirect impact of employment growth is population growth. While some job creation directly affects local workers, additional workers are induced to move into the region by significant job creating economic activity. These workers themselves bring with them families and dependents. Net population growth is generated by this flow of workers and families into the region. Over the long run, the projected growth scenarios cause the regional population to grow by between 8,091 and 8,594 people by 2020.

Compared to the growth in regional output or employment, regional population changes appear to be much bigger in the long run compared to the short term. This is because migration decisions for workers often lag changes in the regional economies. In the short term, the immediate impact of significant job creation will not allow for an instantaneous change in migration flows. Sustained job creation over many years provides a better incentive to induce movement of workers into the region, and the long term population changes in the scenario results reflect that.

Figure 11. Projected Impact of University of Pittsburgh Cancer Institute and UPMC Cancer Centers on Net Employment Change, Pittsburgh Region, 2006-2020

(values correspond to impact activity in the year indicated only)

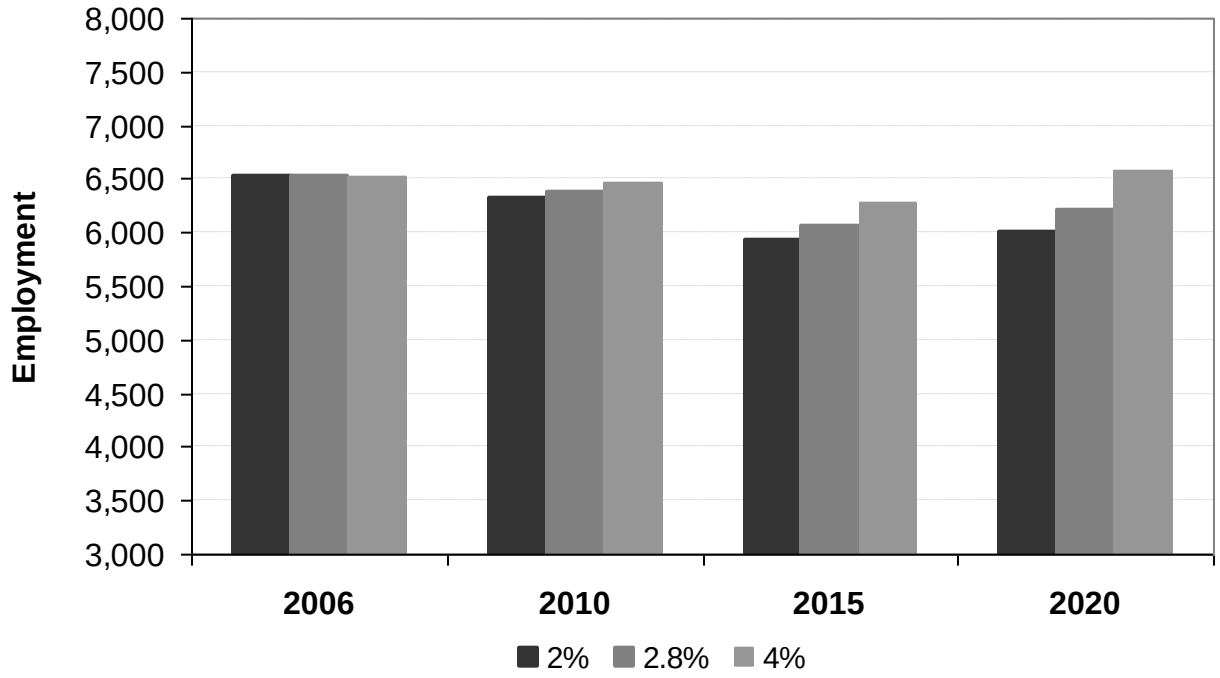
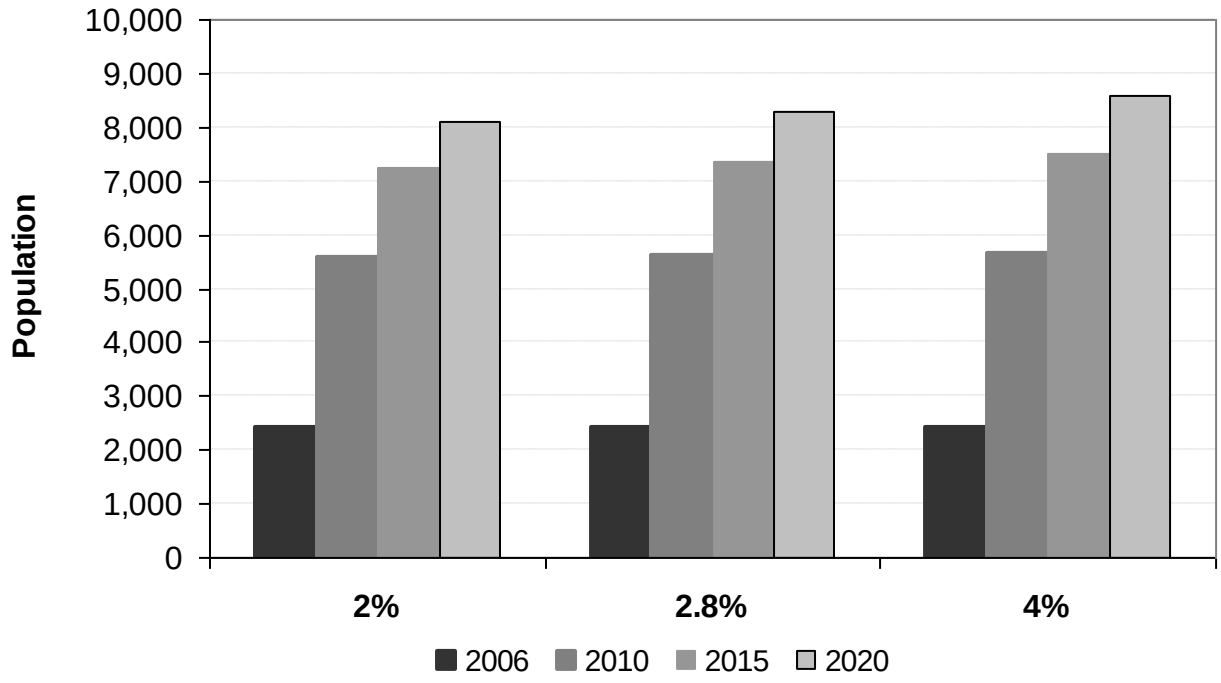


Figure 12. Projected Impact of University of Pittsburgh Cancer Institute and UPMC Cancer Centers on Net Population Change, Pittsburgh Region, 2006-2020
(values correspond to impact activity in the year indicated only)



One other measure that can be derived from this analysis is the quality of jobs being created in these scenarios. In the high growth scenarios, by the year 2020, employment growth reaches 6,589 jobs. The nature of work at UPCI and UPMC Cancer Centers means that net job creation is more concentrated in highly skilled occupations. The jobs generated by future and successive UPCI and UPMC Cancer Centers growth in the region tend to be, on average, higher skilled and higher pay than job generation in general.

VI. Conclusions

This report analyzed the economic impacts of the University of Pittsburgh Cancer Institute (UPCI) and UPMC Cancer Centers on the Pittsburgh regional economy. UPCI and UPMC have expanded greatly in recent years. UPCI was founded in 1984 and became a National Cancer Institute Comprehensive Cancer Center in 1990. In 2005, UPCI ranked 13th in the nation in NCI support, up from 30th in 1998.

UPCI and UPMC Cancer Centers' geographic impacts are extensive, stretching across the Southwestern Pennsylvania region into Ohio and West Virginia. The Pittsburgh REMI model was used to estimate direct and indirect spending impacts of UPCI and UPMC Cancer Centers on the ten county Southwestern Pennsylvania region. Through its research and clinical activities, UPCI and UPMC Cancer Centers generated additions of $451 million in Gross Regional Product to the Southwestern Pennsylvania regional economy in 2006. This generated over 6,532 jobs in the region attributable to the direct and indirect impacts of UPCI and UPMC Cancer Centers' economic activities.

The REMI model was used to project the impacts of UPCI and UPMC Cancer Centers under three growth scenarios: low growth, moderate or trend growth, and high growth. Growth was estimated to occur in the research activities of the institutions. Future impacts were estimated within a demographic model of local cancer-related medical care, using baseline population forecasts for the Pittsburgh region to 2020 and cancer incidence rates from the National Cancer Institute.

The projected impacts of UPCI and UPMC Cancer Centers on the Pittsburgh regional economy were then estimated for a range of economic variables. The REMI model captures direct effects and indirect and induced impacts. The indirect and induced effects are from secondary rounds of spending by businesses and consumers.

Under all three scenarios, the effects of UPCI and UPMC Cancer Centers are extensive across a range of sectors of the regional economy. Under the high growth model, total regional output is projected to increase by $926 million and total employment in the region increases by 6,589 jobs by 2020 by the effects of UPCI and UPMC Cancer Centers. Additions to GRP by the impacts of UPCI and UPMC Cancer Centers are projected to grow to between $589 million and $649 million under the scenarios.

UPCI and UPMC Cancer Centers have expanded rapidly and will continue to expand in the future. Their impact on the regional economy will likewise continue to grow. The results here show the important and substantial impacts that UPCI and UPMC Cancer Centers have on the Southwestern Pennsylvania region and will continue to have into the future.

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Appendix A: Federal Assistance Award Data System (FAADS)

Table A1.
Federal Cancer Funding by Metropolitan Statistical Area - 2003

	Metropolitan Region	Total	Percentage of Total
1)	Washington-Arlington-Alexandria, DC-VA-MD-WV	$326,580,982	9.3%
2)	Boston-Cambridge-Quincy, MA-NH	$305,393,930	8.7%
3)	New York-Northern New Jersey-Long Island, NY-NJ-PA	$285,158,851	8.1%
4)	Los Angeles-Long Beach-Santa Ana, CA	$199,854,994	5.7%
5)	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$174,651,731	5.0%
6)	Houston-Baytown-Sugar Land, TX	$158,349,000	4.5%
7)	Seattle-Tacoma-Bellevue, WA	$140,306,276	4.0%
8)	San Francisco-Oakland-Fremont, CA	$119,928,003	3.4%
9)	San Diego-Carlsbad-San Marcos, CA	$115,526,044	3.3%
10)	Baltimore-Towson, MD	$112,204,175	3.2%
11)	Durham, NC	$110,929,666	3.1%
12)	Chicago-Naperville-Joliet, IL-IN-WI	$96,681,585	2.7%
13)	Pittsburgh, PA	$66,685,795	1.9%
14)	Ann Arbor, MI	$61,597,134	1.7%
15)	Birmingham-Hoover, AL	$55,937,395	1.6%
16)	Rochester, MN	$53,382,657	1.5%
17)	Nashville-Davidson--Murfreesboro, TN	$50,039,051	1.4%
18)	St. Louis, MO-IL	$49,351,898	1.4%
19)	Cleveland-Elyria-Mentor, OH	$48,093,473	1.4%
20)	Madison, WI	$45,852,310	1.3%
21)	San Antonio, TX	$44,301,398	1.3%
22)	San Jose-Sunnyvale-Santa Clara, CA	$43,789,010	1.2%
23)	Columbus, OH	$38,760,425	1.1%
24)	Minneapolis-St. Paul-Bloomington, MN-WI	$37,272,321	1.1%
25)	Buffalo-Niagara Falls, NY	$37,074,516	1.1%
	Subtotal for 25 MSA's	$2,777,702,620	78.8%
	Total for United States	$3,526,180,000	

Source: Compiled from Federal Assistance Award Data System (FAADS) and Census Bureau County Population Estimates.

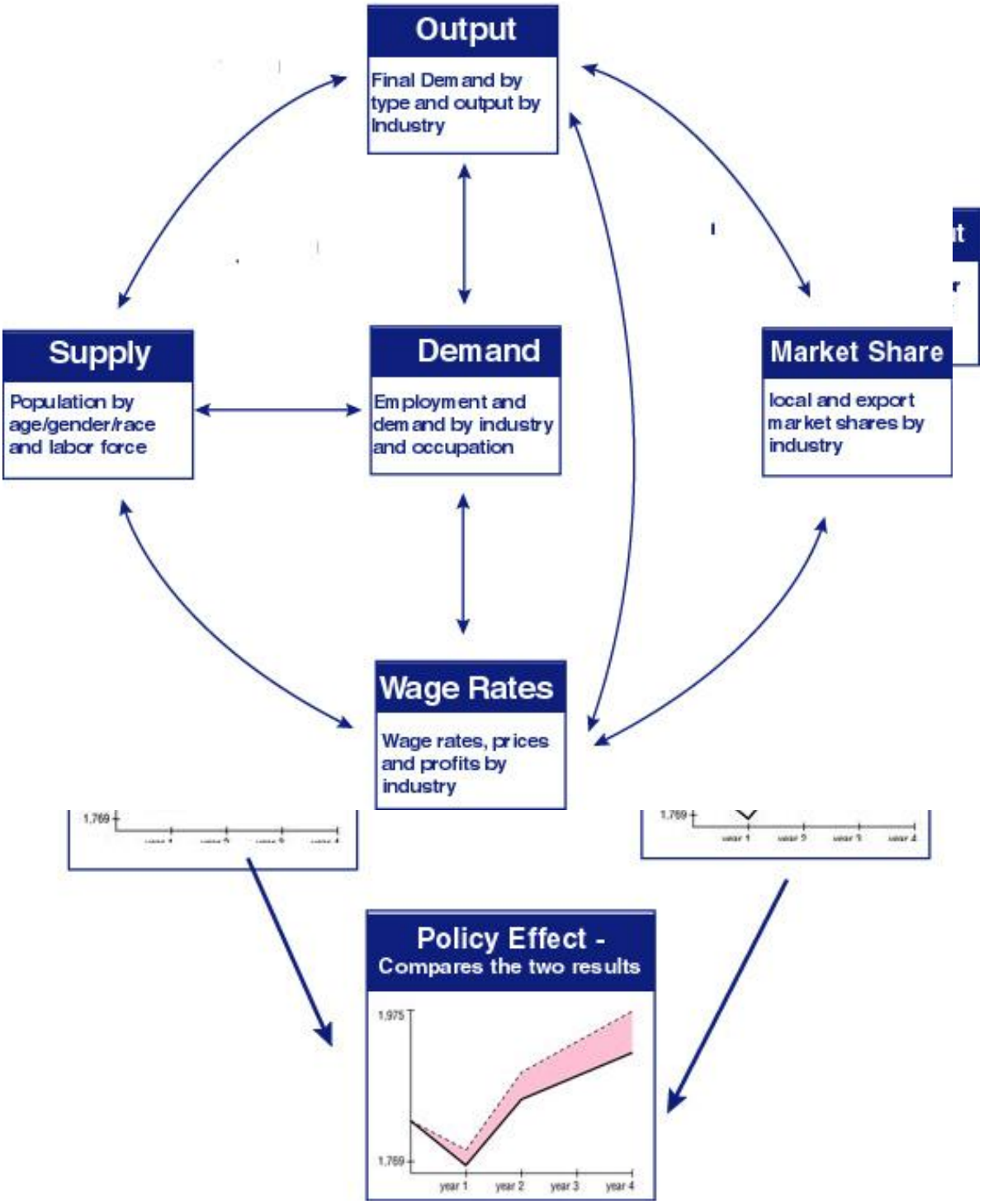
Appendix B: The Pittsburgh REMI Model

The REMI Model differs from other Input/Output models in that it also has a dynamic time-series aspect to it. This allows the REMI Model not only to give the response of the regional economy to any shocks, but also to show how these impacts are distributed over time. The Pittsburgh REMI model combines inter-industry relationships at the national level with unique aspects of the Pittsburgh regional economy and population. Some important structural characteristics of the Pittsburgh REMI Model include:

- *Consumption* is determined on an industry-by-industry basis, and is based on real disposable income in Keynesian fashion, e.g., with prices fixed in the short run and GDP determined solely by aggregate demand.
- *The demand for labor, capital, fuel, and intermediate inputs* per unit of output demands on relative prices of inputs. Changes in relative prices cause producers to substitute cheaper inputs for relatively more expensive inputs.
- *Wages* are determined by the supply and demand for labor in a sector, and are factored by regional differences. Supply of labor depends on the size of the population and workforce.
- *Prices and productivity* determine the cost of doing business. Changes in the cost of doing business will affect profits and/or prices in a given industry. When the change in cost of doing business is specific to a region, the share of local and U.S. market supplied by local firms will also be affected. Market share and demand determine local output.
- *"Imports" and "exports"* between states are related to relative prices and relative production costs.
- *Property income* depends only on population and its distribution adjusted for traditional regional differences, not on market conditions or building rates relative to business activity.
- *Estimates of transfer payments* depend on unemployment details of the previous period, and total government expenditures are proportional to population size.
- *Federal military and civilian employment* is exogenous and maintained at a fixed share of the corresponding total U.S. values, unless specifically altered in the analysis.

How the REMI Model Works

Linkages Among Major Parts of the REMI Model



Appendix C: Glossary of Economic Impact Terms

Demand. Demand is the amount of goods and services demanded, or consumed, by the local region. Some demand is satisfied locally, some by imports. Demand differs from output in that only the proportion of demand that is usually supplied locally is added to local output. Demand is apportioned to local production by using the regional purchase coefficient.

Direct Employment. Direct employment means the jobs that are an integral part of a project or other economic activity that is being considered by an economic impact analysis. In the REMI Model, changes to direct employment are caused by the policy variables that are entered when running a simulation. Direct changes are also called exogenous changes, meaning that the values are determined outside the economic impact model.

Employment. Employment is a Bureau of Economic Analysis (BEA) concept that measures full-time and part-time jobs on a place-of-work basis, that is, in the economic region where the employer is located. Individuals may hold more than one job and, therefore, may be counted twice.

Gross Regional Product. Gross Regional Product (GRP) is analogous to the national concept of Gross Domestic Product, or value-added. GRP equals the residual that is left over for compensation and profits after subtracting the value of all intermediate inputs from the gross sales value of an entities production, or output.

Indirect Employment. Indirect employment means jobs that are created by the supply requirements and linkages of the project or other economic activity analyzed. Indirect employment is sometimes called intermediate employment.

Induced Employment. Induced employment means jobs that are created by the re-spending of wages by employees of the project being analyzed and employees of any secondary economic activity simulated by the project.

Investment Spending. Investment Spending converts a single amount into changes in demand by industry using a detailed table of supply linkages. Changes in demand by industry are then apportioned to local industry production, or output, using the regional purchase coefficient.

Output. Output represents the amount of production in dollars recorded by economic entities within a region. Output includes purchases of intermediate goods, plus value-added, or compensation and profit. Output can also be thought of as gross sales.

Population. Mid-year estimates of population include survivors from the previous year, births, special populations (e.g., military personnel, college students, and prisoners), and economic, international, and retired migrants.

Regional Purchase Coefficient (RPC). The Regional Purchase Coefficient is a measure of the percentage of local demand supplied from within the local region. It is the proportion of the regional demand for a good or service that is fulfilled by regional production as opposed to imports from other regions.

Appendix D: Demographic Model of Projected Local Cancer-Related Medical Care

Future demand for cancer-specific medical care in the Pittsburgh Region was derived from multiple factors. We assume that most (90%) locally treated cancer patients, now and in the future, are residents of the greater Southwestern Pennsylvania region. For that segment of medical service demand, the projection of the local population is a primary determinant of future medical service needs. Other factors include the rate of inflation in medical care and any changes in the flow of patients

Because the pattern of cancer incidence is highly age selective, the Pittsburgh region's relatively older population means that cancer incidence differs significantly from national or even state trends. This appendix generates projections based on current (1992-2001) age-race and gender specific incidence rates applied to projected populations for the Pittsburgh region derived from the REMI model for the years 2000 to 2035.

All-site cancer incidence rates produced by the National Cancer Institute are used here. Table D1 shows the breakdown of this data by age group, race and gender. Tables D2 though D12 present the baseline population forecasts for the Pittsburgh Region 2000 though 2030. These are generated by the Pittsburgh REMI model and breakdown population forecasts by age, gender and race for each year.

Table D1: All Cancer Incidence by Age, Race, and Gender per 100,000 Population, 1992-2001

	White		Black			Asian or Pacific Islander		Hispanic	
Age	**Male**	**Female**	**Male**	**Female**		**Male**	**Female**	**Male**	**Female**
0-4	23.1	20.0	15.0	14.7		19.5	17.5	21.6	18.3
5-9	12.7	10.6	8.6	7.1		10.4	8.7	12.6	10.5
10-14	13.0	13.0	10.9	9.5		11.4	9.5	11.6	12.8
15-19	22.5	20.4	14.2	14.0		16.3	16.1	18.5	15.5
20-24	34.2	35.9	22.3	26.8		19.8	22.5	25.3	25.1
25-29	52.9	61.0	39.0	43.3		27.1	40.0	36.8	43.5
30-34	76.6	95.1	67.5	82.9		43.0	71.9	54.7	73.5
35-39	103.9	158.3	102.0	143.3		65.6	131.1	71.5	127.9
40-44	153.1	263.5	193.1	253.8		104.5	220.8	102.2	215.8
45-49	258.7	414.3	377.2	409.6		177.5	350.2	168.4	323.4
50-54	497.4	595.6	773.7	581.4		303.4	450.6	329.4	423.6
55-59	914.5	833.0	1381.4	819.9		555.2	589.8	600.9	565.7
60-64	1548.3	1114.1	2210.0	1075.9		909.0	700.5	1073.2	757.6
65-69	2360.5	1422.9	3032.8	1346.1		1505.4	876.7	1775.0	975.0
70-74	3007.3	1725.9	3840.8	1624.9		2114.5	1062.8	2308.7	1191.7
75-79	3344.1	1929.1	3875.1	1765.4		2475.9	1300.8	2695.6	1367.2
80-84	3495.9	2036.8	3806.8	1880.4		2680.2	1472.8	2822.3	1552.6
85+	3423.0	1949.9	3594.3	1895.9		2854.9	1545.3	2823.6	1613.5

Source: National Cancer Institute

Tables D13 though D23 are projected number of cancer cases in the Pittsburgh Region for 2000 through 2030 based on REMI population projections and age-specific cancer incidence rates. These tables are the result of matching the cancer incidence rates of Table 1 with the population forecast for the Pittsburgh Region. This produces a baseline projection of cancer incidence by age, gender and race for each year through 2030.

The results here are not meant to be a complete forecast of anticipated change in either the number of cancer cases nor the total expenditures of cancer related medical care in the region. The projections make no adjustment for changes in the incidence rates of specific cancers, differences in medical care inflation nor the per patient costs of treatment. These projections are intended to provide a broad benchmark of demographic induced changes that can be anticipated to affect the demand for medical care in the Pittsburgh region.

The results show a qualitative difference to be expected at different periods in upcoming decades. Near term increases in the annual level of cancer incidence are moderate: +1.3% between 2000 and 2005 and +2.6% between 2005-2010. This pattern reflects changes in the age structure of the region. Certain older age groups will be increasing over this time period while some will be decreasing (ages 65-75 in particular). When matched to the high proportion of cancer incidence that is generated by these age groups, the result is a relatively low rate of growth in Pittsburgh region generated demand for cancer care compared to national projections.

Table D2: Baseline Population Forecast: 2000-2030: White Non-Hispanic Male

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	62,603	55,611	54,215	57,851	63,878	67,824	67,699
Ages 5-9	71,587	62,690	55,727	54,689	59,561	66,432	70,417
Ages 10-14	76,728	71,765	63,044	56,344	56,293	61,856	68,771
Ages 15-19	77,075	87,398	84,590	76,127	70,233	70,728	76,311
Ages 20-24	67,314	78,875	93,081	90,842	83,965	79,096	79,584
Ages 25-29	64,262	58,107	65,407	80,156	80,083	74,729	69,967
Ages 30-34	75,401	61,404	55,645	63,371	79,811	81,000	75,785
Ages 35-39	87,517	72,844	60,152	54,771	63,691	80,900	82,169
Ages 40-44	99,768	87,224	72,211	59,957	55,653	65,210	82,333
Ages 45-49	94,019	98,343	85,984	71,459	60,232	56,590	66,114
Ages 50-54	80,718	91,423	95,709	83,858	70,293	59,753	56,256
Ages 55-59	60,457	76,042	88,061	92,439	81,488	68,743	58,629
Ages 60-64	50,182	57,817	71,844	83,499	88,163	78,180	66,246
Ages 65-69	46,332	44,769	52,378	65,386	76,334	80,915	72,035
Ages 70-74	48,901	39,090	38,062	44,888	56,469	66,294	70,606
Ages 75-79	40,184	38,108	30,796	30,385	36,223	46,035	54,468
Ages 80-84	24,983	27,233	26,253	21,570	21,695	26,279	33,912
Ages 85 and Over	15,377	19,944	23,434	24,801	23,086	22,894	26,419
Total Population	1,143,408	1,128,687	1,116,593	1,112,393	1,127,151	1,153,458	1,177,721

Table D3: Baseline Population Forecast: 2000-2030: White Non-Hispanic Female

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	59,096	52,201	50,766	54,292	60,160	63,996	63,869
Ages 5-9	67,538	59,306	52,317	51,176	55,802	62,437	66,324
Ages 10-14	72,654	67,955	59,658	52,933	52,705	57,956	64,618
Ages 15-19	73,891	84,787	82,404	74,370	68,466	68,790	74,057
Ages 20-24	66,518	76,853	91,971	90,248	84,105	79,423	79,730
Ages 25-29	64,159	56,989	62,607	78,278	78,723	74,105	69,531
Ages 30-34	77,481	60,584	54,093	60,118	77,329	78,882	74,356
Ages 35-39	91,033	75,438	60,336	54,203	61,413	79,411	81,017
Ages 40-44	101,974	91,229	75,008	60,281	55,192	63,078	81,053
Ages 45-49	95,758	100,970	90,030	74,182	60,359	55,861	63,759
Ages 50-54	84,626	93,144	98,538	87,951	72,927	59,699	55,301
Ages 55-59	66,328	81,081	90,679	96,186	86,355	72,013	59,099
Ages 60-64	58,039	64,550	78,226	87,774	93,651	84,504	70,703
Ages 65-69	56,947	53,842	60,593	73,733	83,060	88,890	80,373
Ages 70-74	64,584	50,918	48,417	54,800	67,121	75,881	81,432
Ages 75-79	60,406	54,963	43,840	42,116	48,038	59,255	67,273
Ages 80-84	44,865	46,869	43,392	35,025	34,164	39,358	49,016
Ages 85 and Over	38,947	47,499	54,321	56,230	52,060	49,856	53,649
Total Population	1,244,844	1,219,178	1,197,196	1,183,896	1,191,630	1,213,395	1,235,160

Table D4: Baseline Population Forecast: 2000-2030: Black Non-Hispanic Male

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	8,306	7,856	8,575	9,437	9,920	10,132	10,412
Ages 5-9	9,659	8,317	7,822	8,574	9,546	10,123	10,368
Ages 10-14	9,121	9,713	8,376	7,909	8,748	9,795	10,397
Ages 15-19	8,266	9,646	10,326	9,022	8,629	9,528	10,592
Ages 20-24	6,657	8,033	9,862	10,594	9,446	9,172	10,099
Ages 25-29	5,903	6,024	7,422	9,296	10,216	9,247	9,032
Ages 30-34	5,982	5,952	5,892	7,324	9,335	10,386	9,480
Ages 35-39	6,391	5,712	5,842	5,823	7,346	9,429	10,506
Ages 40-44	6,645	6,238	5,664	5,825	5,902	7,479	9,560
Ages 45-49	5,999	6,389	6,053	5,529	5,767	5,917	7,488
Ages 50-54	4,993	5,581	6,063	5,776	5,341	5,628	5,803
Ages 55-59	3,317	4,512	5,209	5,697	5,482	5,119	5,419
Ages 60-64	2,809	2,959	4,102	4,776	5,284	5,135	4,829
Ages 65-69	2,588	2,330	2,554	3,576	4,198	4,683	4,583
Ages 70-74	2,305	2,094	1,875	2,078	2,945	3,485	3,922
Ages 75-79	1,808	1,671	1,544	1,404	1,582	2,281	2,732
Ages 80-84	1,006	1,170	1,106	1,043	969	1,112	1,635
Ages 85 and Over	681	857	1,080	1,174	1,201	1,189	1,299
Total Population	92,436	95,054	99,367	104,857	111,857	119,840	128,156

Table D5: Baseline Population Forecast: 2000-2030: Black Non-Hispanic Female

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	8,095	7,428	8,046	8,878	9,348	9,556	9,825
Ages 5-9	9,274	8,121	7,402	8,048	8,977	9,533	9,770
Ages 10-14	8,942	9,293	8,173	7,481	8,207	9,205	9,782
Ages 15-19	7,930	9,466	9,953	8,862	8,245	9,032	10,048
Ages 20-24	7,226	7,830	9,683	10,233	9,315	8,835	9,660
Ages 25-29	6,674	6,573	7,227	9,133	9,874	9,124	8,701
Ages 30-34	6,838	6,700	6,460	7,156	9,194	10,053	9,349
Ages 35-39	7,725	6,693	6,687	6,487	7,287	9,405	10,293
Ages 40-44	7,911	7,686	6,681	6,710	6,607	7,480	9,609
Ages 45-49	7,100	7,612	7,566	6,608	6,712	6,678	7,564
Ages 50-54	5,816	6,887	7,387	7,372	6,500	6,655	6,646
Ages 55-59	4,362	5,466	6,612	7,125	7,170	6,375	6,548
Ages 60-64	3,855	4,104	5,162	6,280	6,824	6,917	6,186
Ages 65-69	3,679	3,465	3,715	4,710	5,765	6,301	6,417
Ages 70-74	3,610	3,160	2,979	3,222	4,127	5,083	5,585
Ages 75-79	2,919	2,982	2,610	2,494	2,725	3,529	4,373
Ages 80-84	1,915	2,180	2,274	2,021	1,963	2,171	2,848
Ages 85 and Over	1,758	2,176	2,650	3,027	3,106	3,134	3,339
Total Population	105,629	107,822	111,267	115,847	121,946	129,066	136,543

Table D6: Baseline Population Forecast: 2000-2030: Other Race Male

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	2,705	1,760	1,797	2,176	2,910	3,649	4,055
Ages 5-9	2,319	2,705	1,849	1,901	2,316	3,086	3,842
Ages 10-14	1,976	2,610	2,839	1,998	2,077	2,524	3,308
Ages 15-19	2,251	3,569	4,448	4,694	3,875	3,981	4,441
Ages 20-24	2,583	3,063	4,658	5,565	5,856	5,087	5,214
Ages 25-29	2,441	1,419	1,409	3,018	3,985	4,343	3,606
Ages 30-34	2,144	1,752	1,317	1,337	2,987	4,008	4,394
Ages 35-39	1,719	2,609	1,778	1,366	1,420	3,101	4,138
Ages 40-44	1,409	1,947	2,634	1,828	1,447	1,533	3,218
Ages 45-49	1,154	1,429	1,984	2,677	1,905	1,553	1,653
Ages 50-54	1,046	1,155	1,417	1,976	2,672	1,940	1,599
Ages 55-59	801	1,005	1,163	1,428	1,986	2,677	1,977
Ages 60-64	610	874	1,037	1,198	1,465	2,016	2,688
Ages 65-69	403	638	881	1,041	1,195	1,451	1,974
Ages 70-74	288	370	579	803	948	1,089	1,324
Ages 75-79	198	261	342	527	722	853	981
Ages 80-84	116	154	217	283	433	593	705
Ages 85 and Over	83	133	188	264	354	518	739
Total Population	24,246	27,453	30,537	34,080	38,553	44,002	49,856

Table D7: Baseline Population Forecast: 2000-2030: Other Race Female

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	2,770	1,753	1,752	2,122	2,828	3,542	3,935
Ages 5-9	2,234	2,688	1,799	1,810	2,212	2,951	3,679
Ages 10-14	1,900	2,553	2,774	1,897	1,934	2,364	3,116
Ages 15-19	2,068	3,399	4,336	4,571	3,718	3,781	4,223
Ages 20-24	2,323	2,789	4,452	5,419	5,709	4,914	5,001
Ages 25-29	2,379	1,455	1,386	3,078	4,104	4,463	3,702
Ages 30-34	406	1,681	1,350	1,313	3,042	4,117	4,501
Ages 35-39	1,793	125	1,813	1,505	1,501	3,264	4,355
Ages 40-44	1,553	2,242	205	1,904	1,624	1,653	3,425
Ages 45-49	1,386	1,579	2,261	253	1,963	1,709	1,750
Ages 50-54	1,279	1,333	1,505	2,194	221	1,934	1,689
Ages 55-59	903	1,234	1,326	1,505	2,196	267	1,967
Ages 60-64	617	960	1,261	1,360	1,545	2,236	354
Ages 65-69	443	637	973	1,269	1,366	1,551	2,220
Ages 70-74	400	437	590	909	1,189	1,282	1,457
Ages 75-79	280	371	418	562	855	1,118	1,208
Ages 80-84	183	225	329	371	499	757	995
Ages 85 and Over	156	258	349	487	608	788	1,121
Total Population	23,073	25,719	28,879	32,529	37,114	42,691	48,698

Table D8: Baseline Population Forecast: 2000-2030: Hispanic Male

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	877	1,083	1,522	1,859	2,137	2,423	2,740
Ages 5-9	851	952	1,228	1,658	2,012	2,302	2,587
Ages 10-14	861	1,077	1,185	1,445	1,885	2,240	2,522
Ages 15-19	933	1,475	1,749	1,826	2,088	2,511	2,840
Ages 20-24	1,013	1,398	2,074	2,316	2,409	2,668	3,069
Ages 25-29	849	1,100	1,477	2,127	2,396	2,505	2,757
Ages 30-34	834	1,001	1,248	1,609	2,279	2,566	2,675
Ages 35-39	712	840	1,070	1,308	1,685	2,365	2,653
Ages 40-44	612	772	869	1,094	1,346	1,733	2,412
Ages 45-49	505	602	786	881	1,116	1,377	1,766
Ages 50-54	377	505	602	782	885	1,125	1,386
Ages 55-59	286	379	506	599	781	887	1,125
Ages 60-64	228	290	379	501	597	777	882
Ages 65-69	180	220	285	368	483	574	745
Ages 70-74	153	188	208	267	341	445	528
Ages 75-79	131	133	170	188	240	308	402
Ages 80-84	71	98	110	140	155	199	257
Ages 85 and Over	59	81	111	136	171	203	254
Total Population	9,532	12,194	15,579	19,104	23,006	27,208	31,600

Table D9: Baseline Population Forecast: 2000-2030: Hispanic Female

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	842	1,081	1,497	1,820	2,088	2,362	2,665
Ages 5-9	760	923	1,211	1,619	1,957	2,235	2,509
Ages 10-14	778	938	1,110	1,386	1,804	2,144	2,417
Ages 15-19	826	1,254	1,462	1,613	1,895	2,306	2,632
Ages 20-24	821	1,178	1,731	1,917	2,091	2,382	2,781
Ages 25-29	778	928	1,269	1,801	2,014	2,205	2,491
Ages 30-34	739	894	1,135	1,457	2,008	2,232	2,418
Ages 35-39	729	899	1,051	1,280	1,617	2,177	2,399
Ages 40-44	671	807	992	1,137	1,379	1,726	2,285
Ages 45-49	503	727	863	1,043	1,198	1,448	1,795
Ages 50-54	407	528	758	890	1,077	1,237	1,486
Ages 55-59	348	454	566	790	926	1,115	1,274
Ages 60-64	256	364	489	596	820	958	1,143
Ages 65-69	215	278	385	502	605	821	953
Ages 70-74	179	210	276	374	483	579	780
Ages 75-79	194	192	209	269	360	464	556
Ages 80-84	98	151	172	188	242	322	416
Ages 85 and Over	116	153	210	261	305	375	488
Total Population	9,260	11,959	15,386	18,943	22,869	27,088	31,488

Table D10: Baseline Population Forecast: 2000-2030: Total Male Population

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	74,491	66,786	66,722	71,781	79,094	84,138	84,987
Ages 5-9	84,416	75,004	67,229	67,355	73,798	82,111	87,260
Ages 10-14	88,686	85,453	75,886	68,234	69,458	76,710	85,113
Ages 15-19	88,525	102,346	101,486	92,051	85,293	87,143	94,433
Ages 20-24	77,567	92,015	110,101	109,555	101,905	96,358	98,258
Ages 25-29	73,455	67,329	76,616	94,878	96,740	90,896	85,574
Ages 30-34	84,361	70,594	64,966	74,432	94,560	97,904	92,316
Ages 35-39	96,339	82,378	69,464	64,046	74,830	95,856	99,343
Ages 40-44	108,434	96,497	81,863	69,253	65,038	76,567	97,527
Ages 45-49	101,677	107,001	95,212	80,977	69,501	66,068	77,586
Ages 50-54	87,134	98,846	104,094	92,754	79,570	68,881	65,636
Ages 55-59	64,861	82,080	95,171	100,430	90,055	77,765	67,552
Ages 60-64	53,829	62,062	77,544	90,173	95,736	86,390	74,953
Ages 65-69	49,503	47,989	56,235	70,535	82,386	87,829	79,597
Ages 70-74	51,647	41,742	40,752	48,161	60,851	71,475	76,569
Ages 75-79	42,321	40,173	32,852	32,529	38,875	49,608	58,726
Ages 80-84	26,176	28,655	27,686	23,036	23,273	28,272	36,617
Ages 85 and Over	16,200	21,014	24,813	26,374	24,812	24,819	28,787
Total Population	1,269,622	1,267,964	1,268,692	1,276,554	1,305,775	1,348,790	1,390,834

Table D11: Baseline Population Forecast: 2000-2030: Total Female Population

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	70,803	61,987	61,448	66,654	74,175	79,346	80,213
Ages 5-9	79,806	70,698	62,126	62,120	68,585	76,988	82,236
Ages 10-14	84,274	80,451	71,273	63,159	64,195	71,374	79,818
Ages 15-19	84,715	98,648	97,782	89,034	81,856	83,514	90,711
Ages 20-24	76,888	88,004	107,411	107,579	100,991	95,219	96,880
Ages 25-29	73,990	65,266	71,588	92,009	94,655	89,825	84,213
Ages 30-34	85,464	69,374	62,174	69,253	91,425	95,340	90,642
Ages 35-39	101,280	82,782	69,265	62,697	71,130	94,196	98,187
Ages 40-44	112,109	101,648	82,401	69,483	64,112	73,325	96,368
Ages 45-49	104,747	110,650	100,315	81,655	69,751	65,065	74,303
Ages 50-54	92,128	101,710	107,885	98,045	80,346	69,090	64,530
Ages 55-59	71,941	88,093	98,951	105,339	96,329	79,431	68,486
Ages 60-64	62,767	69,856	84,956	95,811	102,613	94,333	78,078
Ages 65-69	61,284	58,190	65,529	80,050	90,620	97,357	89,703
Ages 70-74	68,773	54,725	52,234	59,180	72,772	82,663	89,065
Ages 75-79	63,799	58,508	47,077	45,416	51,870	64,235	73,267
Ages 80-84	47,061	49,425	46,167	37,605	36,847	42,519	53,167
Ages 85 and Over	40,977	50,087	57,530	60,006	56,079	54,138	58,521
Total Population	1,382,806	1,360,102	1,346,112	1,345,095	1,368,351	1,407,958	1,448,388

Table D12: Baseline Population Forecast: 2000-2030: Total Population

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	145,294	128,773	128,170	138,435	153,269	163,484	165,200
Ages 5-9	164,222	145,702	129,355	129,475	142,383	159,099	169,496
Ages 10-14	172,960	165,904	147,159	131,393	133,653	148,084	164,931
Ages 15-19	173,240	200,994	199,268	181,085	167,149	170,657	185,144
Ages 20-24	154,455	180,019	217,512	217,134	202,896	191,577	195,138
Ages 25-29	147,445	132,595	148,204	186,887	191,395	180,721	169,787
Ages 30-34	169,825	139,968	127,140	143,685	185,985	193,244	182,958
Ages 35-39	197,619	165,160	138,729	126,743	145,960	190,052	197,530
Ages 40-44	220,543	198,145	164,264	138,736	129,150	149,892	193,895
Ages 45-49	206,424	217,651	195,527	162,632	139,252	131,133	151,889
Ages 50-54	179,262	200,556	211,979	190,799	159,916	137,971	130,166
Ages 55-59	136,802	170,173	194,122	205,769	186,384	157,196	136,038
Ages 60-64	116,596	131,918	162,500	185,984	198,349	180,723	153,031
Ages 65-69	110,787	106,179	121,764	150,585	173,006	185,186	169,300
Ages 70-74	120,420	96,467	92,986	107,341	133,623	154,138	165,634
Ages 75-79	106,120	98,681	79,929	77,945	90,745	113,843	131,993
Ages 80-84	73,237	78,080	73,853	60,641	60,120	70,791	89,784
Ages 85 and Over	57,177	71,101	82,343	86,380	80,891	78,957	87,308
Total Population:	2,652,428	2,628,066	2,614,804	2,621,649	2,674,126	2,756,748	2,839,222

Table D13: Projected Cancer Incidence - All Sites: White Male Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	14	13	13	13	15	16	16
Ages 5-9	9	8	7	7	8	8	9
Ages 10-14	10	9	8	7	7	8	9
Ages 15-19	17	20	19	17	16	16	17
Ages 20-24	23	27	32	31	29	27	27
Ages 25-29	34	31	35	42	42	40	37
Ages 30-34	58	47	43	49	61	62	58
Ages 35-39	91	76	62	57	66	84	85
Ages 40-44	153	134	111	92	85	100	126
Ages 45-49	243	254	222	185	156	146	171
Ages 50-54	402	455	476	417	350	297	280
Ages 55-59	553	695	805	845	745	629	536
Ages 60-64	777	895	1,112	1,293	1,365	1,210	1,026
Ages 65-69	1,094	1,057	1,236	1,543	1,802	1,910	1,700
Ages 70-74	1,471	1,176	1,145	1,350	1,698	1,994	2,123
Ages 75-79	1,344	1,274	1,030	1,016	1,211	1,539	1,821
Ages 80-84	873	952	918	754	758	919	1,186
Ages 85 and Over	526	683	802	849	790	784	904
Total Population:	7,692	7,805	8,076	8,568	9,205	9,789	10,132

Table D14: Projected Cancer Incidence - All Sites: White Female Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	12	10	10	11	12	13	13
Ages 5-9	7	6	6	5	6	7	7
Ages 10-14	9	9	8	7	7	8	8
Ages 15-19	15	17	17	15	14	14	15
Ages 20-24	24	28	33	32	30	29	29
Ages 25-29	39	35	38	48	48	45	42
Ages 30-34	74	58	51	57	74	75	71
Ages 35-39	144	119	95	86	97	126	128
Ages 40-44	269	240	198	159	145	166	214
Ages 45-49	397	418	373	307	250	231	264
Ages 50-54	504	555	587	524	434	356	329
Ages 55-59	552	675	755	801	719	600	492
Ages 60-64	647	719	871	978	1,043	941	788
Ages 65-69	810	766	862	1,049	1,182	1,265	1,144
Ages 70-74	1,115	879	836	946	1,158	1,310	1,405
Ages 75-79	1,165	1,060	846	812	927	1,143	1,298
Ages 80-84	914	955	884	713	696	802	998
Ages 85 and Over	759	926	1,059	1,096	1,015	972	1,046
Total	7,456	7,476	7,529	7,648	7,858	8,101	8,292

Table D15: Projected Cancer Incidence - All Sites: Black Male Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	1	1	1	1	1	2	2
Ages 5-9	1	1	1	1	1	1	1
Ages 10-14	1	1	1	1	1	1	1
Ages 15-19	1	1	1	1	1	1	2
Ages 20-24	1	2	2	2	2	2	2
Ages 25-29	2	2	3	4	4	4	4
Ages 30-34	4	4	4	5	6	7	6
Ages 35-39	7	6	6	6	7	10	11
Ages 40-44	13	12	11	11	11	14	18
Ages 45-49	23	24	23	21	22	22	28
Ages 50-54	39	43	47	45	41	44	45
Ages 55-59	46	62	72	79	76	71	75
Ages 60-64	62	65	91	106	117	113	107
Ages 65-69	78	71	77	108	127	142	139
Ages 70-74	89	80	72	80	113	134	151
Ages 75-79	70	65	60	54	61	88	106
Ages 80-84	38	45	42	40	37	42	62
Ages 85 and Over	24	31	39	42	43	43	47
Total	500	517	553	607	673	741	806

Table D16: Projected Cancer Incidence - All Sites: Black Female Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	1	1	1	1	1	1	1
Ages 5-9	1	1	1	1	1	1	1
Ages 10-14	1	1	1	1	1	1	1
Ages 15-19	1	1	1	1	1	1	1
Ages 20-24	2	2	3	3	2	2	3
Ages 25-29	3	3	3	4	4	4	4
Ages 30-34	6	6	5	6	8	8	8
Ages 35-39	11	10	10	9	10	13	15
Ages 40-44	20	20	17	17	17	19	24
Ages 45-49	29	31	31	27	27	27	31
Ages 50-54	34	40	43	43	38	39	39
Ages 55-59	36	45	54	58	59	52	54
Ages 60-64	41	44	56	68	73	74	67
Ages 65-69	50	47	50	63	78	85	86
Ages 70-74	59	51	48	52	67	83	91
Ages 75-79	52	53	46	44	48	62	77
Ages 80-84	36	41	43	38	37	41	54
Ages 85 and Over	33	41	50	57	59	59	63
Total	415	437	463	494	532	574	619

Table D17: Projected Cancer Incidence - All Sites: Other Race Male Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	1	0	0	0	1	1	1
Ages 5-9	0	0	0	0	0	0	0
Ages 10-14	0	0	0	0	0	0	0
Ages 15-19	0	1	1	1	1	1	1
Ages 20-24	1	1	1	1	1	1	1
Ages 25-29	1	0	0	1	1	1	1
Ages 30-34	1	1	1	1	1	2	2
Ages 35-39	1	2	1	1	1	2	3
Ages 40-44	1	2	3	2	2	2	3
Ages 45-49	2	3	4	5	3	3	3
Ages 50-54	3	4	4	6	8	6	5
Ages 55-59	4	6	6	8	11	15	11
Ages 60-64	6	8	9	11	13	18	24
Ages 65-69	6	10	13	16	18	22	30
Ages 70-74	6	8	12	17	20	23	28
Ages 75-79	5	6	8	13	18	21	24
Ages 80-84	3	4	6	8	12	16	19
Ages 85 and Over	2	4	5	8	10	15	21
Total	44	58	76	97	121	148	177

Table D18: Projected Cancer Incidence - All Sites: Other Race Female Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	0	0	0	0	0	1	1
Ages 5-9	0	0	0	0	0	0	0
Ages 10-14	0	0	0	0	0	0	0
Ages 15-19	0	1	1	1	1	1	1
Ages 20-24	1	1	1	1	1	1	1
Ages 25-29	1	1	1	1	2	2	1
Ages 30-34	0	1	1	1	2	3	3
Ages 35-39	2	0	2	2	2	4	6
Ages 40-44	3	5	0	4	4	4	8
Ages 45-49	5	6	8	1	7	6	6
Ages 50-54	6	6	7	10	1	9	8
Ages 55-59	5	7	8	9	13	2	12
Ages 60-64	4	7	9	10	11	16	2
Ages 65-69	4	6	9	11	12	14	19
Ages 70-74	4	5	6	10	13	14	15
Ages 75-79	4	5	5	7	11	15	16
Ages 80-84	3	3	5	5	7	11	15
Ages 85 and Over	2	4	5	8	9	12	17
Total	46	57	69	81	96	113	132

Table D19: Projected Cancer Incidence - All Sites: Hispanic Male Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	0	0	0	0	0	0	0
Ages 5-9	0	0	0	0	0	0	0
Ages 10-14	0	0	0	0	0	0	0
Ages 15-19	0	0	0	0	0	0	0
Ages 20-24	0	0	0	0	1	1	1
Ages 25-29	0	0	1	1	1	1	1
Ages 30-34	1	1	1	1	1	2	2
Ages 35-39	1	1	1	2	2	3	3
Ages 40-44	1	2	2	2	3	4	5
Ages 45-49	2	2	3	3	4	5	6
Ages 50-54	2	2	3	4	5	5	6
Ages 55-59	2	3	3	4	5	6	7
Ages 60-64	2	3	4	5	6	7	9
Ages 65-69	2	3	4	5	6	8	9
Ages 70-74	2	3	3	4	6	7	9
Ages 75-79	3	3	3	4	5	6	8
Ages 80-84	2	2	3	3	4	5	6
Ages 85 and Over	2	2	3	4	5	6	8
Total	21	27	35	44	54	67	81

Table D20: Projected Cancer Incidence - All Sites: Hispanic Female Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	0	0	0	0	0	1	1
Ages 5-9	0	0	0	0	0	0	0
Ages 10-14	0	0	0	0	0	0	0
Ages 15-19	0	0	0	0	0	0	1
Ages 20-24	0	0	1	1	1	1	1
Ages 25-29	0	0	1	1	1	1	1
Ages 30-34	0	1	1	1	1	1	1
Ages 35-39	1	1	1	1	1	2	2
Ages 40-44	1	1	1	1	1	2	2
Ages 45-49	1	1	1	1	2	2	3
Ages 50-54	1	2	2	3	3	4	5
Ages 55-59	2	2	3	4	5	5	7
Ages 60-64	2	3	4	5	6	8	9
Ages 65-69	3	4	5	7	9	10	13
Ages 70-74	4	4	5	6	8	10	12
Ages 75-79	4	4	5	5	6	8	11
Ages 80-84	2	3	3	4	4	6	7
Ages 85 and Over	2	2	3	4	5	6	7
Total	23	28	35	44	55	68	84

Table D21: Projected Cancer Incidence - All Sites: Total Male Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	16	14	14	14	17	19	19
Ages 5-9	10	9	8	8	9	9	10
Ages 10-14	11	10	9	8	8	9	10
Ages 15-19	18	22	21	19	18	18	20
Ages 20-24	25	30	35	34	33	31	31
Ages 25-29	37	33	39	48	48	46	43
Ages 30-34	64	53	49	56	69	73	68
Ages 35-39	100	85	70	66	76	99	102
Ages 40-44	168	150	127	107	101	120	152
Ages 45-49	270	283	252	214	185	176	208
Ages 50-54	446	504	530	472	404	352	336
Ages 55-59	605	766	886	936	837	721	629
Ages 60-64	847	971	1,216	1,415	1,501	1,348	1,166
Ages 65-69	1,180	1,141	1,330	1,672	1,953	2,082	1,878
Ages 70-74	1,568	1,267	1,232	1,451	1,837	2,158	2,311
Ages 75-79	1,422	1,348	1,101	1,087	1,295	1,654	1,959
Ages 80-84	916	1,003	969	805	811	982	1,273
Ages 85 and Over	554	720	849	903	848	848	980
Total	8,257	8,409	8,738	9,317	10,050	10,746	11,196

Table D22: Projected Cancer Incidence - All Sites: Total Female Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	13	11	11	12	13	16	16
Ages 5-9	8	7	7	6	7	8	8
Ages 10-14	10	10	9	8	8	9	9
Ages 15-19	16	19	19	17	16	16	18
Ages 20-24	27	31	38	37	34	33	34
Ages 25-29	43	39	43	54	55	52	48
Ages 30-34	80	66	58	65	85	87	83
Ages 35-39	158	130	108	98	110	145	151
Ages 40-44	293	266	216	181	167	191	248
Ages 45-49	432	456	413	336	286	266	304
Ages 50-54	545	603	639	580	476	408	381
Ages 55-59	595	729	820	872	796	659	565
Ages 60-64	694	773	940	1,061	1,133	1,039	866
Ages 65-69	867	823	926	1,130	1,281	1,374	1,262
Ages 70-74	1,182	939	895	1,014	1,246	1,417	1,523
Ages 75-79	1,225	1,122	902	868	992	1,228	1,402
Ages 80-84	955	1,002	935	760	744	860	1,074
Ages 85 and Over	796	973	1,117	1,165	1,088	1,049	1,133
Total	7,939	7,999	8,095	8,264	8,539	8,858	9,126

Table D23: Projected Cancer Incidence - All Sites: Total Population by Age

	2000	2005	2010	2015	2020	2025	2030
Ages 0-4	29	25	26	27	31	36	36
Ages 5-9	18	16	15	14	16	18	19
Ages 10-14	21	20	18	16	16	19	20
Ages 15-19	34	41	41	37	35	35	39
Ages 20-24	52	62	74	72	67	64	65
Ages 25-29	80	73	82	103	104	99	92
Ages 30-34	144	119	108	122	156	161	152
Ages 35-39	259	216	179	165	187	245	255
Ages 40-44	462	417	344	290	269	312	402
Ages 45-49	703	740	666	552	473	444	515
Ages 50-54	992	1,109	1,171	1,054	882	764	722
Ages 55-59	1,202	1,497	1,709	1,812	1,638	1,386	1,201
Ages 60-64	1,543	1,747	2,160	2,481	2,641	2,396	2,041
Ages 65-69	2,050	1,968	2,261	2,808	3,242	3,466	3,153
Ages 70-74	2,754	2,210	2,132	2,472	3,091	3,585	3,846
Ages 75-79	2,651	2,473	2,007	1,960	2,293	2,891	3,371
Ages 80-84	1,873	2,008	1,907	1,569	1,559	1,848	2,355
Ages 85 and Over	1,352	1,696	1,970	2,072	1,941	1,903	2,120
Total	16,219	16,437	16,869	17,624	18,642	19,670	20,405