NATIONAL CANCER INSTITUTE

1998-2018

NATIONAL ECONOMIC IMPACTS

from the National Cancer Institute SBIR/STTR Program

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES | NATIONAL INSTITUTES OF HEALTH

EXECUTIVE SUMMARY

The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are the U.S. government's primary mechanisms for engaging small businesses in research and development (R&D) to benefit the nation. The National Cancer Institute (NCI) has one of the largest SBIR/STTR programs, with an annual expenditure of $158 million in fiscal year (FY) 2017.

The NCI SBIR Development Center hired an external organization to conduct an economic impact study to quantify the NCI SBIR/STTR program's overall contribution to the national economy. This pilot study examined the economic outcomes and impacts leading up to 2018 from all NCI SBIR/STTR Phase II grants awarded during FYs 1998–2010, providing definitive answers to the question: What resulted from NCI's investment of $787 million in small business R&D provided to companies nationwide through 690 separate SBIR/STTR Phase II awards? In addition, the study tested a series of key patient and societal impact questions to better understand what technologies were reaching cancer patients and caregivers, or cancer researchers.

The study found that more than half of the NCI Phase II awards—53 percent—resulted in sales of new products and services based on the innovations developed under the awards that were included in the study. Major study findings include:

$9.1 BILLION
in total sales to date of products and services resulting from the NCI SBIR/STTR Phase II awards

$2.9 BILLION
in new tax revenues (federal, state, and local)

$8.1 BILLION
in labor income

$26.1 BILLION
in total economic output nationwide

$13.4 BILLION
in value added, representing new wealth creation in the economy

107,918
new jobs created with an average compensation of **$75,385**

The study was conducted by TechLink, a center at Montana State University–Bozeman that specializes in economic-impact studies of federal SBIR and technology transfer programs, in collaboration with the Bureau Research Division (BRD) of the Leeds School of Business at the University of Colorado Boulder. IMPLAN economic-impact modeling software was used to estimate the overall effects on the economy resulting from both the R&D expenditures and sales of SBIR/STTR-developed products and services.

The TechLink research team contacted all 444 companies with NCI SBIR/STTR Phase II awards during the study period. Companies were asked to provide the total sales of new products and services directly related to their NCI SBIR/STTR Phase II awards. In addition, they were asked about related economic outcomes, including follow-on R&D awards, licensing revenue, and sales by licensees and spin-out companies. The research team also asked a series of questions to quantify patient and societal impacts resulting from the NCI SBIR/STTR program. Respondents provided comprehensive information on the economic outcomes of 91 percent of the awards.

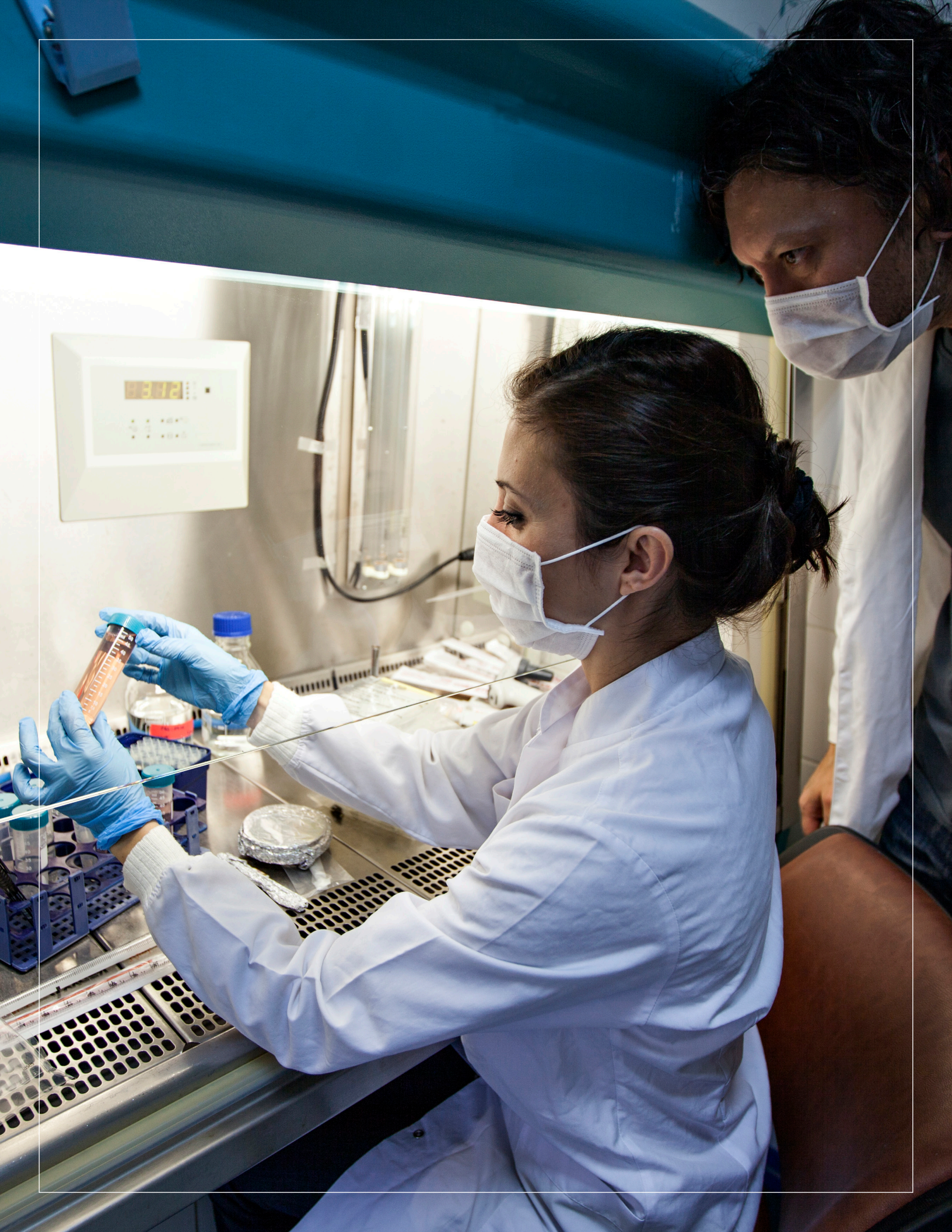
** This Executive Summary was prepared by NCI SBIR Development Center. The full report was prepared by TechLink.*

PURPOSE OF STUDY

This pilot study was undertaken to quantify the NCI SBIR/STTR program's overall contribution to the national economy.[1] The study examined the economic outcomes and impacts leading up to 2018 from all NCI SBIR/STTR Phase II awards initiated during the FY 1998–2010 period.[2] It was intended to answer the following basic question: *What resulted from the NCI SBIR/STTR investment of approximately $787 million, provided to 444 companies in 690 separate SBIR/STTR awards?*[3]

The study's primary objectives were (1) to determine the extent that the NCI SBIR/STTR program has contributed to new economic activity and job creation in the United States, and (2) to test a series of questions with the goal of determining key patient and societal impacts resulting from this program. The NCI SBIR/STTR program commissioned the study.

[1] The federal SBIR and STTR programs are similar. However, STTR programs are much smaller and require small businesses to formally collaborate with not-for-profit research institutions, such as universities. See www.sbir.gov.
[2] The study did not cover SBIR/STTR awards initiated after 2010 because biomedical technologies tend to commercialize very slowly and NCI SBIR/STTR program managers believed that later awards would not have had time to generate any significant economic results.
[3] The exact amount of NCI's SBIR/STTR Phase II investment was $786,976,182.



NCI SBIR/STTR PROGRAM IN CONTEXT

SBIR programs originated with federal legislation in 1982 and were created expressly to harness the innovativeness of U.S. small business—both to help the federal government meet high-priority technology needs and to benefit the national economy. Establishment of these programs was part of a larger effort in the United States during the early 1980s to make strategic R&D investments to counter the loss of national economic competitiveness.

The enabling legislation for these programs, the Small Business Innovation Development Act of 1982,[4] was based on the conviction that technological innovation creates jobs and increases productivity, competitiveness, and economic growth. It also was predicated on the belief that small businesses are the principal source of innovation in the United States. The 1982 Small Business Innovation Act was designed to achieve four major economic objectives:

- Spur technological innovation in the United States.
- Help meet federal government R&D needs.

[4] Text available at http://history.nih.gov/research/downloads/PL97-219.pdf.

- Increase private sector commercialization of innovations resulting from federally funded investments.
- Encourage participation by minority and disadvantaged persons in technological innovation.

All federal agencies with extramural R&D budgets that exceed $100 million (currently 11 agencies) are required to allocate a small portion of their R&D budgets to fund R&D at small businesses through the SBIR program. The designated percentage in FY 2017 was 3.2 percent. In addition, the five federal agencies with extramural R&D budgets exceeding $1 billion—the Department of Defense (DoD), Department of Energy, Department of Health and Human Services (HHS), National Aeronautics and Space Administration (NASA), and National Science Foundation—are required to expend a very small portion of their R&D budgets on STTR, a program that requires a partnership between the small business and a not-for-profit research partner, often a university. In FY 2017, 0.45 percent of the extramural budget of the five federal agencies was used for the STTR program.

Each agency determines its own R&D topics, issues solicitations, accepts proposals from small businesses (defined as for-profit entities with not more than 500 employees), establishes evaluation processes for these proposals, and makes awards on a competitive basis. The Small Business Administration functions as the overall coordinating agency for both SBIR and STTR.

There are three phases to SBIR/STTR programs. *Phase I* funds short-term (typically 6-month) feasibility studies of proposed innovations. These awards normally do not exceed $300,000 at NCI. Assuming that a company establishes the scientific and technical merit as well as the commercial potential of its proposed innovation, it can compete for follow-on Phase II funding. *Phase II* funds the further development, testing and/or evaluation, such as creation of a prototype, of the proposed innovation. Phase II awards normally do not exceed $2 million at NCI, and are typically for a 2-year R&D effort. *Phase III* involves the commercialization of technologies developed during the previous phases, or their transition to government acquisition programs. However, HHS does not participate in the transition of SBIR/STTR-supported technologies to government acquisition programs, and therefore no additional federal funding is available for this phase at HHS.

Approximately $2.5 billion is awarded annually through the federal SBIR/STTR programs. HHS is one of the largest participants (second only to DoD), currently providing nearly $1 billion in SBIR/STTR awards annually.[5] Within HHS, the National Institutes of Health (NIH) account for approximately 98 percent of the total SBIR funding.[6] NCI has NIH's largest SBIR/STTR program, accounting for approximately 19 percent of the total NIH SBIR/STTR funding, or approximately $159 million in FY 2017.

[5] $982.5 million in FY 2017.
[6] The Centers for Disease Control and Prevention, Administration for Community Living, and Food and Drug Administration account for the other 2 percent.

Due to the substantially greater time and expense needed to develop most biomedical technologies, NIH SBIR/STTR programs have higher budget limits than most other agencies, and also have specialized funding options. These include a "Fast-track" option in which Phase I and Phase II proposals are submitted and reviewed simultaneously, reducing or eliminating the funding gap between Phase I and Phase II; a "Direct-to-Phase II" option, in which NIH programs accept Phase II submissions from applicants that have already completed Phase I-type proof-of-concept research using non-SBIR sources of funding; and "Phase IIB" awards that provide substantial follow-on funding exceeding the Phase II budget limits for promising biomedical projects that require additional time and effort in the R&D phase.

This study is the first comprehensive analysis of the economic outcomes and impacts of an SBIR/STTR program outside of DoD. It uses the well-established national IMPLAN model to estimate two key impacts of the overall NCI SBIR/STTR program: the impacts directly related to the Phase II awards themselves, and the impacts related to the subsequent commercialization of the innovations developed with these awards. The impacts assessed include total economic output, employment, labor income, value added, and tax revenues.

The current study builds on previous recent studies by the same research team. In 2015, TechLink finalized a study of all Air Force SBIR/STTR Phase II contracts completed between 2000 and 2013.[7] Subsequently, in 2016, it finalized a similar study for the Navy covering all Navy SBIR/STTR contracts that ended during the same 2000–2013 period.[8] In 2016, it also launched a study of the entire DoD SBIR/STTR program covering all DoD SBIR/STTR Phase II awards initiated during FYs 1995–2012—a total $14.4 billion in funding provided to 4,420 companies in 16,974 separate SBIR/STTR contracts.

In summary, this study provides comprehensive and definitive answers to the overriding question: *What resulted from NCI's SBIR/STTR investment of approximately $787 million in biomedical R&D awards to U.S. small businesses?* Looked at more broadly, it also addresses the question of how successful NIH and NCI have been in achieving the major economic goals of the federal SBIR/STTR mandate—spurring technological innovation, helping meet federal government R&D needs, and achieving private-sector commercialization of innovations from federal funding investments. Finally, the study provides important data and insights into the patient and societal impacts this NCI SBIR/STTR program has achieved (Appendix 1).

[7] TechLink. 2015. National Economic Impacts from the Air Force SBIR/STTR Program, 2000–2013. Text available at https://www.sbir.gov/node/832335.
[8] TechLink. 2016. National Economic Impacts from the Navy SBIR/STTR Program, 2000–2013. Text available at https://www.sbir.gov/node/832335.

RESEARCH TEAM

This economic-impact study was conducted by TechLink, a federally funded technology transfer center at Montana State University–Bozeman, in collaboration with the Business Research Division (BRD) of the Leeds School of Business at the University of Colorado Boulder.

Since 1999, TechLink has served as DoD's primary national "partnership intermediary," helping to develop technology transfer partnerships between DoD laboratories and U.S. industry nationwide. TechLink's primary focus is helping DoD labs transfer their inventions to U.S. companies through license agreements. TechLink annually brokers or facilitates over 60 percent of all DoD license agreements with industry. In addition, TechLink regularly undertakes economic-impact studies of DoD technology transfer and SBIR programs; conducts "innovation discovery" workshops to help DoD labs identify and protect their inventions, generating more and better patents; and develops articles and videos of DoD technology transfer success stories. (For more information, see https://techlinkcenter.org and http://www.montana.edu/techlink.)

The BRD has been analyzing local, state, and national economies for more than 95 years. It specializes in customized research and economic-impact studies that help companies,

associations, nonprofits, and government agencies make informed business and policy decisions. The BRD has conducted economic-impact studies for a wide range of clients, including the National Renewable Energy Laboratory, Xcel Energy, Western Union, the American Petroleum Institute, and CO-LABS, a consortium of federally funded scientific laboratories, universities, businesses, and local governments in Colorado. (For more information, see https://www.colorado.edu/business/business-research-division.)

This is the 8th national economic-impact study undertaken by TechLink and the 5th it has conducted with the BRD.[9] The principal authors were Will Swearingen, Ph.D., Michael Wallner, Ph.D., and Jeff Peterson of TechLink, and Brian Lewandowski and Richard Wobbekind, Ph.D., of the BRD.

[9] These studies are available at http://techlinkcenter.org/category/publications.

METHODOLOGY

This study was undertaken in three major phases. First, during the *Data Gathering* phase, the research team approached all companies with NCI SBIR/STTR Phase II grants initiated during FYs 1998–2010. Respondents were asked to disclose the total sales of new products and services and other economic results up to the time of the study in 2018 directly related to these SBIR/STTR awards. They were also asked about patient and societal impacts emerging from the NCI funding. This phase lasted approximately 6 months, and ran from mid-January 2018 to mid-July 2018. Second, during the *Data Analysis* phase, the research team analyzed the information gathered and used IMPLAN economic-impact assessment software to estimate the total economic impacts resulting from (1) the initial Phase II funding expended for R&D, and (2) subsequent sales of new products and services derived from the innovations generated by the R&D. This second phase extended from early July through mid-August 2018. The *Final Report Generation* phase occupied most of the August–September 2018 period. Specific activities undertaken during the first two phases are subsequently described.

Data Gathering

To enable TechLink to undertake this study, the NCI SBIR/STTR program provided essential information on all NCI SBIR/STTR Phase II projects initiated during FYs 1998–2010. The study focused exclusively on Phase II grant awards, because Phase I awards are strictly intended to investigate the feasibility of new technology concepts. Unless followed by subsequent Phase II funding, Phase I awards rarely lead to new commercial products and services. SBIR/STTR awards initiated after 2010 were not included because NCI program managers believed that later awards would have produced few significant economic results, given the long period of time it takes to develop, clinically test, and gain regulatory approval for general public use of biomedical technologies. Altogether, the study included a total of 690 Phase II awards awarded to 444 different companies.

Information provided for each Phase II award was entered into a custom database developed for this study, to facilitate data gathering and analysis. Essential Phase II award information included the company name and location, the award number and award amount, the date of the award, and the names and contact information for the principal investigator and company executive at the time of the award. Award titles and abstracts, which provide background information on the technology being developed, helped establish connections to any resulting commercial technologies and were especially useful when analyzing companies with multiple SBIR/STTR awards.

TechLink economic research specialists used the Phase II information and database to survey the companies involved. They attempted to contact, by email and telephone, all 444 Phase II recipients about the outcomes of their 690 NCI Phase II awards. Survey participants were directly involved or familiar with the technology development and the company at the time of the SBIR/STTR Phase II award. Not all respondents were current employees of the surveyed awardee company. The number of awards exceeds the number of companies because a subset of companies included in

the study (120, or nearly 27 percent) had two or more NCI SBIR/STTR Phase II awards. The most active participant in the NCI program had 13 Phase II awards.

Survey questions. Companies were asked a series of questions that focused on the economic outcomes and impacts related to their NCI SBIR/STTR Phase II awards. They were assured that their responses would be treated as confidential information and that, in order to conceal their identity, their responses would be aggregated with the responses of other companies and submitted to the NCI without company names attached. Basic economic questions addressed the following:

- Sales of new products and services embodying technology developed with the NCI SBIR/STTR funding
- Follow-on research and development funding to further develop technology originating with the NCI SBIR/STTR awards
- Sales by sublicensees of technology developed with NCI SBIR/STTR funding, and royalties received from those sublicensees
- Sales by spin-out companies of technology developed with NCI SBIR/STTR funding
- New company creation related to commercialization of technology developed with NCI SBIR/STTR funding
- Investment funding received from venture capital, angel, or other private-sector funds directly related to technology developed with NCI SBIR/STTR funding
- Company acquisitions of the NCI SBIR/STTR Phase II recipients directly related to successful development and commercialization of technology developed with NCI SBIR/STTR funding, and acquisition amounts

In addition to the previous economic questions, Phase II recipients were asked a series of questions intended to quantify patient and societal impacts resulting from the NCI SBIR/STTR program. These questions addressed the following:

- Type of technology developed or under development with the NCI SBIR/STTR funding
- Current development stage of the SBIR/STTR-funded technology
- Cancer type(s) being targeted by the technology
- Whether the FDA approved the technology and, if so, for what type(s) of cancer
- Improvement for patients resulting from the technology developed or under development with the NCI SBIR/STTR funding
- Statistics on the use of product(s) resulting from NCI SBIR/STTR funding
- Additional key benefits from the NCI SBIR/STTR award (access to capital, scientific validation, patents, publications, or other)
- University involvement in developing the technology
- Overall value of the NCI SBIR/STTR program

Response Rate. The response rate was over 94 percent. Respondents provided definitive information on the outcomes of 648 awards of the 690 total. Results from only 42 awards remain unknown.

Only 5 of the 444 NCI Phase II recipient companies either openly refused to participate in the study or were non-responsive, despite multiple efforts to secure the necessary information. An additional 32 companies could not be surveyed because they could not be contacted. These companies had gone out of business, changed their names, or been acquired by other companies and had left no trails that could be followed. In short, the research team was able to obtain comprehensive economic information from 91 percent of the companies in the study, with only 37 companies not participating.

The primary reasons for the study's high response rate are believed to be the following:

- *Clear communication about the purpose and legitimacy of the study.* Companies were informed that the study's purpose was to quantify the extent to which the NCI SBIR/STTR program was having a positive impact on the national economy and that the results would be communicated to NCI policymakers, other government agencies, Congress, and the U.S. public. Companies that questioned the legitimacy of the study were sent a letter from the director of the NCI SBIR/STTR program that explained the purpose, confidential nature, and importance of the study, as well as TechLink's role in undertaking it. They also were referred to the TechLink website, where they could find information about both the study and research team, and also download a copy of the NCI letter.
- *Strong assurance that company-specific information would be kept confidential.* Companies were assured that NCI was only interested in the overall economic impacts from its SBIR/STTR program—not in company-specific results. Most companies consider their sales figures to be confidential, proprietary, or business-sensitive. Without the assurance that all responses would

be treated as confidential information, few companies would have been willing to divulge their sales information.

- *Extensive research to find current contact information.* Because of the long time span covered by the study and the impermanent nature of many small R&D companies, in some cases the contact information for principal investigators and company executives in the NCI SBIR/STTR awards database was no longer valid. Among other things, telephone area codes had changed; companies had gone out of business, relocated, or merged with other firms; and the key people had changed positions, moved to other companies, retired, or even died. The research team expended extensive time and effort to find people knowledgeable about the outcomes of the NCI SBIR/STTR Phase II awards.
- *Persistence by the TechLink economic research team***.** Some companies were contacted more than a dozen times by email, LinkedIn, and telephone in an attempt to get through to the right person and obtain the necessary information. Several different approaches were tried to secure compliance from recalcitrant companies, including approaching different company personnel. In cases of both non-responsive companies and companies that were no longer in business, efforts were made to track down former employees who could provide information on the economic outcomes from the NCI SBIR/STTR Phase II awards. This sometimes required the pursuit of dozens of potential contacts before someone knowledgeable and willing to participate was located.
- *Conciseness of the survey.* The survey questions were few in number and relatively easy to answer. In some cases, the research team was able to secure the necessary information over the telephone on the first contact. More commonly, extensive follow-up by phone and email was required, often involving several different company personnel. This was especially true with companies having numerous NCI SBIR/STTR awards. However, the conciseness of the survey encouraged participation.

NAICS code assignments. TechLink assigned all Phase II awards to the appropriate six-digit North American Industry Classification System (NAICS) code or codes. This was an essential step for accurate analysis of the overall economic impacts. NAICS codes are one of the most important inputs to the IMPLAN economic-impact model (see page 29) and were used to accurately determine the economic multipliers specific to the primary business activities associated with the SBIR/STTR Phase II awards.

NAICS is the U.S. government's standard industry classification system. It is a comprehensive production-oriented system that groups companies and divisions of companies into industries based on the business activities in which they are primarily engaged. NAICS recognizes 1,057

different industrial activities and assigns a unique code to each. NAICS codes can be found at the U.S. Census Bureau's NAICS code website (http://www.census.gov/eos/www/naics).

Many NCI SBIR/STTR Phase II awards had more than one NAICS code. All were assigned the primary medical R&D NAICS code (541715) for analysis of the economic impacts resulting from the Phase II R&D activity itself.[10] In addition, if the R&D led to commercial sales or other economic outcomes from the resulting innovations, the research team assigned NAICS codes specific to those economic activities. For example, if an NCI Phase II recipient is manufacturing an improved needle for bone marrow biopsies resulting from its SBIR research, it would be assigned NAICS code 339112: Surgical and Medical Instrument Manufacturing.

The research team used Phase II award information, data provided by companies during the survey, and the NAICS classification system to identify the appropriate NAICS codes for new sales of products or services. In this process, the team relied heavily on the Census Bureau's NAICS code look-up site, https://www.census.gov/cgi-bin/sssd/naics/naicsrch. Additional resources consulted included the federal System for Award Management (www.sam.gov), D&B Hoovers (www.hoovers.com), and the LexisNexis Academic website (www.lexisnexis.com). The research team discussed NAICS code assignments with respondents to determine the most accurate code for the specific situation.

Next, the TechLink research team entered company sales and other economic data as well as the NAICS code information into the custom database developed for this study. The database greatly facilitated data entry and processing. Once the data were aggregated and carefully validated by the team, the database provided mechanisms for quickly querying and analyzing the data as well as generating a final dataset for economic-impact modeling.

TechLink subsequently submitted the final dataset to the BRD at the University of Colorado Boulder. For each NCI SBIR/STTR award that had achieved sales, the dataset included a code number to identify the agreement and conceal the company's name, the six-digit NAICS code for the corresponding product or service, and the total sales figures.

The sales category includes sales of new products and services directly related to the technologies developed with the NCI SBIR/STTR funding, up to the time of the study (2018). It also includes follow-on R&D awards to further develop these technologies (defined as sales of R&D services); royalties from licensees of the technologies developed with the NCI SBIR/STTR funding; licensee sales of the licensed NCI SBIR/STTR-developed technologies, when this information could be obtained; and sales by spin-out companies of the NCI SBIR/STTR-developed technologies, when this information was available.

[10] 2017 NAICS Code 541715: Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology).

Data Analysis

The BRD employed a widely used economic-impact analysis software program, IMPLAN, to estimate the economic contribution effects of the total sales resulting from the NCI SBIR/STTR Phase II awards. More than 1,500 entities in academia, the private sector, and government use IMPLAN to model economic impacts. It is employed to determine economic impacts on regions ranging in size from ZIP code area to county, state, and national levels (www.implan.com). Previous uses of the IMPLAN model includes the Department of Defense Economic Impact Study,[11] Adverted study on economic impact of medical industry,[12] and BIO state bioscience report.[13]

IMPLAN draws on a mathematical input-output framework originally developed by Wassily Leontief, the 1973 Nobel laureate in economics, to study the flow of money through a regional economy. IMPLAN assumes fixed relationships between producers and their suppliers, based on demand, and that inter-industry relationships within a given region's economy largely determine how that economy responds to change. Increases in demand for a certain product or service (for example, sales of a new NCI SBIR-developed medical device) cause a multiplier effect—a series of ripples through the economy. This increased demand affects the producer of the product, the producer's employees, the producer's suppliers, the supplier's employees, and others, ultimately generating a total impact on the economy that significantly exceeds the initial change in demand.

For example, MedTech Corporation used its NCI SBIR Phase II funding to develop improved endoscopic ultrasound systems. It now manufactures and sells these systems to the medical industry worldwide. This requires it to hire factory workers, who subsequently spend their payroll checks on groceries and other goods. In addition, MedTech has to purchase industrial machines, tools, electronic components, supplies, and packaging materials from other companies, which also employ workers who purchase groceries and other goods, and so on.

In this example, to use common economic-impact study terminology, *direct effects* are the sales of the endoscopic ultrasound systems developed with NCI funding. *Indirect effects* are the inter-industry purchases of machinery, components, and supplies needed to manufacture these systems. *Induced effects* are the household expenditures as workers spend their payroll checks on goods and services across a wide spectrum of the economy. The total *economic impacts* are the sum of direct, indirect, and induced effects.

Multipliers are the ratio of the overall economic impact to the initial change and are typically derived from the following equation: (direct effect + indirect effect + induced effect) / direct effect. Multipliers are very specific to industry sectors and regions. IMPLAN uses NAICS codes to

[11] TechLink. The Air Force Impact to the Economy via SBIR/STTR: 2014 Economic Impact Study. Commissioned by the Air Force SBIR/STTR Program. Available at https://www.sbir.gov/sites/default/files/USAF%20SBIR-STTR%20Economic%20Impact%20Study%20FY2015.pdf.

[12] Simon Tripp, Martin Grueber, and Ryan Helwig. 2012. The Economic Impact of the U.S. Advanced Medical Technology Industry. Prepared by Battelle Technology Partnership Practice for the Advanced Medical Technology Association (AdvaMed). Available at http://www.chi.org/uploadedFiles/Industry_at_a_glance/BattelleFinalAdvaMedEconomicImpactReportMarch2012.pdf.

[13] Battelle, BIO, PMP Public Affairs Consulting, Inc., and Bravo Group. Battelle/BIO State Bioscience Jobs, Investments and Innovation 2014. Available at https://www.bio.org/sites/default/files/files/Battelle-BIO-2014-Industry.pdf.

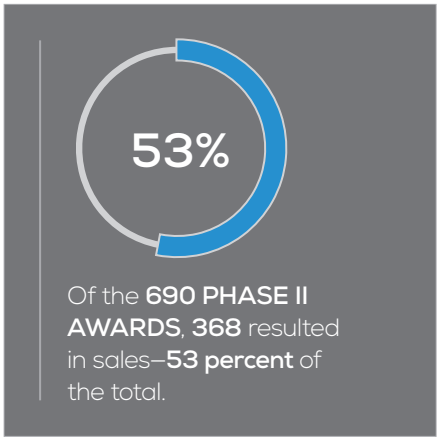
distinguish between 536 industry sectors recognized by the U.S. Department of Commerce. Each sector has a unique output multiplier because it has a different pattern of purchases from firms inside and outside of the regional economy. Each year, IMPLAN is updated using data collected by various federal government agencies.

In this study, BRD converted the NAICS codes provided by TechLink to the 536-sector IMPLAN input-output model, then applied this model to (1) the NCI SBIR/STTR Phase II R&D activity, and (2) the total sales figures *up to the time of the study* (2018) that were directly attributable to the sales of the innovations resulting from the R&D activity. As previously indicated, these sales figures included all sales of products and services related to the NCI SBIR/STTR Phase II projects in the study. Using IMPLAN, BRD was able to estimate the sum of the direct, indirect, and induced effects of these sales. The overall purpose of this modeling exercise was to estimate the total economic contribution of these sales to the nation's economy, including total economic output, value added, employment, labor income, and tax revenues.

Sales were assumed to be in 2017 dollars for IMPLAN modeling. Company sales occurred up to the time that the study was conducted (2018). Some sales date back to the late 1990s. However, companies reported their aggregate sales up to the time that sales information was collected. There was a need to select a reference year for IMPLAN modeling. Use of 2017 as the reference year represents a conservative approach because it does not reflect the relatively higher value of the earlier sales figures due to inflation: A dollar in 2017 was worth 29 percent less than a dollar in 2000.[14]

[14] Per the U.S. Bureau of Labor Statistics, Consumer Price Index (CPI) Inflation Calculator, available at http://www.bls.gov/data/inflation_calculator.htm.

SURVEY RESULTS



Sales from NCI SBIR/STTR Phase II Awards

As revealed in Table 1 (page 24), over half of the NCI SBIR/STTR Phase II awards resulted in commercialization. Of the 690 Phase II awards, 368 resulted in sales—53 percent of the total.[15] Of the remaining 322 awards, 281 did not result in sales and 41 consisted of awards for which the research team could obtain no information. Ultimately, the commercialization level achieved by these NCI SBIR/STTR Phase II awards may be significantly higher. It usually takes 2 to 8 years to convert most new technologies into a product, and this development cycle is substantially longer for most medical technologies. Many of the newer awards have not yet resulted in sales.

[15] This commercialization level is higher than the 49 percent reported for NIH SBIR/STTR Phase II projects in the study, National Academies of Sciences, Engineering, and Medicine, 2015, SBIR at the National Institutes of Health, Washington, DC: National Academies Press. The difference in these commercialization results can be explained by two factors: The NIH study looked at all NIH SBIR/STTR Phase II awards and not just NCI awards. In addition, it obtained information from only 21.5 percent of the total awardee population, as opposed to 94 percent in the current study.

Table 1. Sales Resulting from NCI SBIR/STTR Phase II Awards, 1998–2018

NCI SBIR/STTR Phase II Awards	Total Number of Awards	Percent of Total
Total awards	690	100%
Awards with sales	368	53
Awards without sales	281	41
Awards with unknown results	41	6

Total cumulative sales from the NCI SBIR/STTR Phase II awards were over $9.1 billion ($9,144,404,328). This equates to average sales of approximately $24.8 million for each of the 368 awards that achieved commercialization. The average sales per award, when considering all of the NCI Phase II awards, including those without commercialization success, was just under $13.3 million. This is approximately 12 times the average award amount of $1.1 million, demonstrating that the NCI SBIR/STTR program achieved substantial commercialization success from its funding of small R&D companies nationwide.

$9.1 BILLION

Total cumulative sales from the NCI SBIR/STTR Phase II awards ($9,144,404,328)

$24.8 MILLION

Average sales for each of the **368 AWARDS** that achieved commercialization

As previously noted, the sales category included all of the following sources of revenue from commercialization of the technologies developed with NCI SBIR/STTR Phase II funding:

- Sales of new products and services
- Follow-on R&D funding to further develop NCI SBIR/STTR-developed technologies for specific applications (considered sales of R&D services)
- Royalties accruing to the NCI SBIR/STTR Phase II award recipients from sales by licensees of the technologies developed with the NCI funding[16]
- Sales by licensees of the NCI SBIR/STTR-developed technologies—when this information could be obtained
- Sales by spin-out companies that were commercializing the NCI SBIR/STTR-developed technologies—when this information was available

[16] In situations in which TechLink researchers obtained both royalty figures and licensee sales figures pertaining to the commercialization of a technology, the royalty payments were omitted from the impact model to avoid double counting.

Table 2. Sales from NCI SBIR/STTR Phase II Awards, by Sales Category

Sales Category	Total Sales ($ Millions)	Percent of Total
Commercial product/service sales by the SBIR/STTR recipient	$7,990.6*	87
Follow-on R&D awards	$957.3	10
Royalties from licensees	$29.2	0.3
Sales by licensees	$140.2	2
Sales by spin-out companies	$56.3	1
Total	$9,144.4	100

Note: Totals may not tally due to rounding.
*This total does not include product or service sales by licensees and spin-out companies.

Table 2 shows the total sales from the NCI SBIR/STTR Phase II awards, broken down by sales category. As this table shows, commercial product and service sales by the SBIR/STTR awardees were nearly $8 billion, and accounted for 87 percent of the total sales. This relatively high level of sales indicates that the NCI SBIR/STTR program is achieving the objective of private-sector commercialization of new technology.

$3.5 BILLION
Approximate total combined sales generated by the most productive SBIR/STTR Phase II award

This amount was around **3 TIMES** larger than the second most successful Phase II award, which had approximately **$1.1 BILLION**

Follow-on R&D awards to further develop the technologies generated with NCI SBIR/STTR funding amounted to $957 million and accounted for 10 percent of the total. This R&D funding came from both the private sector and the government (including Phase III contracts and additional SBIR awards).

Royalties resulting from licensee sales of the technologies developed with NCI Phase II funding were approximately $29 million. This category is important because some companies engaged in SBIR/STTR research choose to remain R&D companies and license successfully developed technologies to other companies for subsequent commercialization. Sales by licensees were reported to be $140 million. Sales by spin-out companies totaled $56 million. Creating spin-out companies is another major way that companies engaged in SBIR/STTR research choose to commercialize SBIR-developed technology. Together, the last three categories accounted for around 3 percent of the total sales.

The most productive SBIR/STTR Phase II award generated approximately $3.5 billion in total combined sales. This amount was around three times larger than the second most successful Phase II award, which had approximately $1.1 billion in sales. Both were impressive outliers. However, many awards yielded significant returns. Thirteen awards generated sales in excess of $100 million; 84 had sales of $10 million or more; and 211 had sales larger than $1,143,932, which was the average size of the individual NCI SBIR/STTR Phase II awards.

13 AWARDS generated sales in excess of
$100 MILLION

84 had sales in excess of
$10 MILLION

and **211** had sales larger than
$1.1 MILLION

Sales figures understate the reality.

For several reasons, total sales figures obtained by this survey are probably significantly smaller than the actual total sales resulting from NCI SBIR/STTR Phase II awards initiated during the FY 1998–2010 period. Reasons include:

- *Non-responding companies.* Sales information was not available from a significant number of companies. As previously noted, results from 37 companies were not included in the study because 5 companies declined to participate and another 32 could not be contacted despite extensive research.
- *Licensee sales information generally unavailable.* The total sales figures also underreport the reality because they do not include most of the licensee sales. Companies reported that they had licensed a total of 103 technologies. However, the TechLink team was able to obtain sales information for only 12 of these licensed technologies. Many companies declined to identify their licensees or to divulge what they knew of licensee sales. In cases where the licensees were identified and contact information was provided, the licensees proved to be resistant. For the most part, licensees did not feel obligated to participate in this study and were not responsive to requests for information on their sales.
- *Licensee underreporting of sales and underpayment of royalties.* Another reason that the total reported sales, as well as the royalties from such sales, are believed to be substantially larger than this survey discovered is that underreporting is common in the licensing world. Historic royalty audit data from the Invotex Group, a well-established accounting and intellectual property management company, reveals that over 80 percent of licensees underreport and underpay royalties to their licensors.[17] There are various reasons that royalties are underreported. However, the Invotex Group found that at least half of the licenses it audited had underreported sales.

[17] D.R. Stewart and J.A. Byrd, "The Significance of Underreported Royalties–2007 Update: The Magnitude and Meaning of Royalty Misreporting," Invotex Group, Baltimore, MD, February 2007, www.lawseminars.com/materials/07LICIL/licil%20m%20stewart2.pdf. D.R. Stewart and J.A. Byrd, "89% of Royalty Revenue is Underreported! Top Five Questions You Should Ask Your Licensee to Avoid Becoming a Statistic," Invotex Group, Baltimore, MD, April 2012, www.invotex.com/assets/2012_Royalty_Audit_Article.pdf

- *Sales information for spin-out companies generally unavailable.* The total sales figures do not include most of the sales by companies spun out of the Phase II recipient companies to commercialize the technologies developed with NCI SBIR/STTR funding. Companies reported that they had created 45 spin-out companies. However, the TechLink team was able to obtain sales information for only 13 of these companies (29 percent). As in the case of licensees, most of the spin-out companies did not feel obligated to participate in this study and were not responsive to requests for information on their sales.
- *Inflation.* Finally, inflation contributes to an under-valuation of earlier sales in this study. There were no adjustments for inflation. All sales figures were aggregated and the timing of sales by year is not known. Some sales date back to the late 1990s. Aggregation of company sales does not preserve the relatively higher value of sales that occurred earlier in the study period. For example, $100 in 1998 had the same purchasing power as $150 in 2017.

For all of the above reasons, the total sales figures reported in this survey are conservative and substantially understate the actual total accumulated sales from the NCI SBIR/STTR Phase II funding examined in the study.

Other Economic Outcomes and Impacts

In addition to sales, the companies in the study reported other significant economic outcomes and impacts. Other outcomes were defined as wealth transfer activities that could not be tied to specific activities within a given industry, such as equity investment. These other outcomes were not factored into the economic impact results of this study because IMPLAN uses industry information to estimate the economic impact. The total outside investment funding (including venture capital and angel funding) directly related to the innovations developed with NCI SBIR/STTR Phase II awards was reported to be approximately $4.3 billion. The number of companies acquired primarily because of the technology developed with NCI SBIR/STTR funding was 101, with a total acquisition value reported to be nearly $22 billion. However, this figure grossly understates the actual value. A large majority of acquired companies stated that the terms of acquisition prevented them from disclosing the acquisition amount. Finally, participants in the study reported that, in order to commercialize technologies developed with NCI SBIR/STTR Phase II funding, they had licensed 103 technologies to other companies and created a total of 45 spin-out companies.

Below is a summary of these other economic outcomes and impacts:

Patient and Societal Impacts

As previously noted, NCI Phase II recipients also were asked a series of questions intended to help quantify the patient and societal impacts resulting from the NCI SBIR/STTR program. These questions focused on the type of technology resulting from the NCI SBIR/STTR funding, its current stage of development, the type of cancer being targeted, the FDA approval status, patient outcomes from treatment with the new technology, its frequency of use, other quantifiable benefits from the NCI award, university involvement in developing the technology, and the overall utility of the NCI SBIR/STTR program.

ECONOMIC IMPACT

Upon receiving the company sales and six-digit NAICS code data from TechLink, the BRD at the Leeds School of Business, University of Colorado Boulder, used the national IMPLAN input-output model to determine the economic impacts of the NCI SBIR/STTR Phase II awards examined in the study. The BRD undertook this task in two stages: IMPLAN analysis of the economic impacts resulting from the nearly $787 million in Phase II R&D activity, and IMPLAN analysis of the sales of the innovations resulting from this R&D. The following results are presented for output, employment, labor income, value added, and tax revenues. As previously noted, all dollar figures are reported in 2017 dollars.[18]

Output

Output is the total value of all goods or services (including intermediate goods and services) produced during a given time period, whether used for further production or consumed. The concept of national output is an integral part of macroeconomics. Output is closely associated with economic-impact analysis and is one of the values most frequently cited following the completion of economic-impact studies.

[18] The IMPLAN model used 2017 as the event or base year, and all dollar figures are assumed to have the value of this national currency in 2017.

Table 3 summarizes the nationwide economic impacts to date resulting from both the NCI SBIR/STTR awards included in the study (a total of $787 million) and the sales of technologies that resulted from these awards (a total of $9.14 billion). The patient and societal impacts of the resulting technologies are described in Appendix 1.

Table 3. Nationwide Economic Impacts from NCI SBIR/STTR Phase II Awards, FYs 1998–2018

Impact Type	Employment (Job Years)	Employment (Avg. per Year)	Labor Income ($ Billions)	Labor Income (Per Job)	Value Added ($ Billions)	Output ($ Billions)	Tax Revenue ($ Billions)
Direct effect	26,299	1,315	$2.94	$111,912	$4.67	$9.93	–
Indirect effect	39,181	1,959	$2.93	$74,780	$4.70	$9.20	–
Induced effect	42,440	2,122	$2.26	$53,307	$4.00	$7.01	–
Total effect	107,918	5,396	$8.14	$75,385	$13.37	$26.15	$2.93

Source: Business Research Division, Leeds School of Business, University of Colorado Boulder; 2016 IMPLAN Model, using 2017 as the event year. *Note: Totals may not tally due to rounding.*

NCI SBIR/STTR Phase II R&D activity. According to the national IMPLAN model, the nearly $787 million expended by NCI SBIR/STTR Phase II award recipients generated an estimated $1.98 billion in economic output nationwide. Of this amount, $787 million was generated by direct expenditures, $559 million resulted from indirect expenditures (firms purchasing from each other to meet increased demand) and $634 million resulted from induced expenditures (increased household purchases from increases in employee payroll spending). Table 4 (page 31) displays these estimates of direct, indirect, and induced effects resulting from the R&D activity undertaken by NCI SBIR/STTR award recipients. It shows the effects on employment, labor income, and value added as well as the total economic output resulting from the R&D activity supported by $787 million in NCI SBIR/STTR phase II funding.

Table 4. Economic Impact of NCI SBIR/STTR Phase II R&D Activity of $787 million, FYs 1998-2010 total award, FYs 1998-2018

Impact Type	Employment (Job Years)	Employment (Avg. per Year)	Labor Income ($ Millions)	Labor Income (Per Job)	Value Added ($ Millions)	Output ($ Millions)
Direct effect	2,865	143	$321	$111,982	$437	$787
Indirect effect	3,207	160	$220	$68,449	$351	$559
Induced effect	3,835	192	$206	$53,829	$363	$634
Total effect	9,908	495	$747	$ 75,378	$1,151	$1,980

Note: Totals may not tally due to rounding.

Sales of NCI SBIR/STTR Phase II innovations.

In addition to the economic output from Phase II R&D, this study examined the output from the subsequent sales of innovations resulting from this R&D. This output value does not consider the direct activity that resulted from the $787 million in SBIR/STTR grant funding, but only examines the economic impact that arose from $9.1 billion in technology sales. According to the IMPLAN model, the $9.1 billion in direct sales of new products and services reported by companies generated an additional $15 billion in sales economy-wide (see Table 5, page 32). Of this amount, $8.7 billion was generated indirectly as the result of interindustry purchases, and $6.4 billion was generated from employee household spending on goods and services (the induced effect). As Table 5 shows, the total economy-wide output from sales of the NCI SBIR/STTR Phase II-developed technology was $24.2 billion.

Dividing total economic output ($24.2 billion) by the direct sales ($9.1 billion) of products and services related to companies' NCI SBIR/STTR Phase II awards yields an output multiplier of 2.64. For every dollar in sales of products and services directly attributable to the NCI SBIR/STTR Phase II awards, an *additional* $1.64 in sales was generated economy-wide.

Table 5. Economic Impact of Subsequent Company Sales, FYs 1998–2018

Impact Type	Employment (Job Years)	Employment (Avg. per Year)	Labor Income ($ Billions)	Labor Income (Per Job)	Value Added ($ Billions)	Output ($ Billions)
Direct effect	23,434	1,172	$2.62	$111,903	$4.23	$9.14
Indirect effect	35,974	1,799	$2.71	$75,344	$4.35	$8.65
Induced effect	38,604	1,930	$2.06	$53,255	$3.64	$6.37
Total effect	98,011	4,901	$7.39	$75,386	$12.22	$24.16

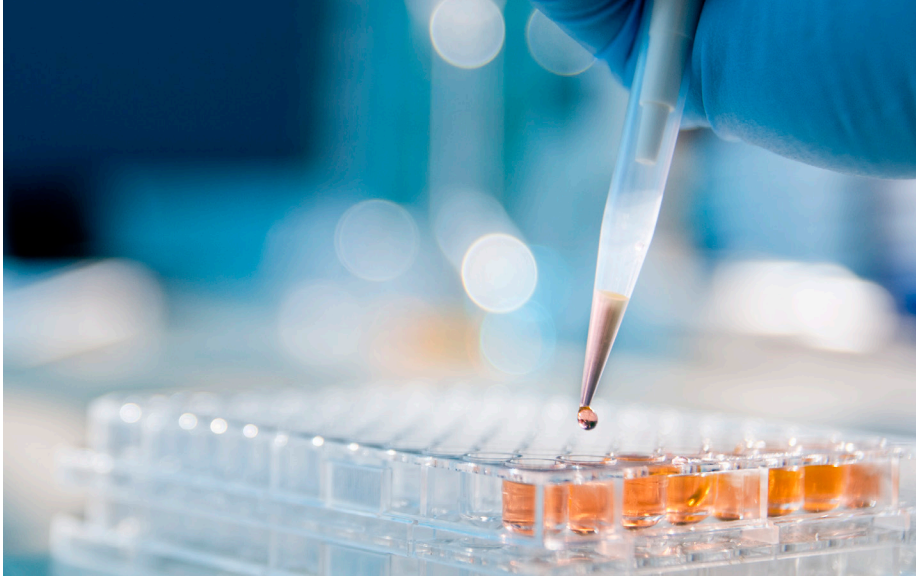
Note: Totals may not tally due to rounding.

Employment

Employment in this analysis refers to the number of jobs created by an economic activity. It is an estimate of the number of jobs supported by the estimated level of output, expressed in "job years" (one job supported for a year). Total job years are divided by 20 to indicate the average number of jobs supported each year during the study period (1998–2018).

NCI SBIR/STTR Phase II R&D activity. Table 4 shows the estimates of employment resulting from the NCI SBIR/STTR Phase II R&D activity. The IMPLAN model estimates that 2,865 job years, an average of 143 jobs per year, were directly supported by the nearly $787 million in Phase II R&D activity. Indirect effects were responsible for an additional 3,207 job years (160 jobs per year), and induced effects for 3,835 job years (192 jobs per year). Altogether, the IMPLAN model estimates that 9,908 job years nationwide (an average of 495 jobs per year) resulted from the direct, indirect, and induced effects of NCI SBIR/STTR Phase II R&D activity.

Sales of NCI SBIR/STTR Phase II innovations. The IMPLAN model estimates that the $9.14 billion in company sales directly supported 23,434 job years economy-wide, or 1,172 average jobs per year (see Table 5). Indirect effects were responsible for an additional 35,974 job years (1,799 jobs per year), and induced effects for 38,604 job years (1,930 jobs per year). Altogether, the IMPLAN model estimates that 98,011 job years nationwide, or 4,901 average jobs per year, resulted from the direct, indirect, and induced effects of the sales of NCI SBIR/STTR Phase II innovations.



Labor Income

Labor income consists of employee compensation (wage and salary payments, including benefits) paid to workers, as well as proprietary income (income received by self-employed individuals).

NCI SBIR/STTR Phase II R&D activity. The national IMPLAN model estimated that labor income directly associated with the $787 million in Phase II R&D activity was $321 million, or approximately $111,982 per job (see Table 4). The indirect labor income was estimated at $220 million, or approximately $68,449 per job. The induced labor income was estimated to be $206 million, or $53,829 per job. The total economy-wide labor income resulting from the NCI SBIR/STTR Phase II R&D activity was $747 million, an average of $75,378 per job.

Sales of NCI SBIR/STTR Phase II innovations. According to the national IMPLAN model, the labor income directly associated with the $9.14 billion in sales reported by companies was $2.62 billion, or $111,903 per job (see Table 5). The indirect labor income was estimated at $2.71 billion, or approximately $75,344 per job. The induced labor income was estimated to be $2.06 billion, or $53,255 per job. The total economy-wide labor income resulting from sales of the NCI SBIR/STTR Phase II innovations was $7.39 billion, representing a per-job average of $75,386.

Value Added

Value added is the difference between a company's output and the cost of intermediate inputs. In other words, it is the difference between a product's sale price and its production cost. This measure recognizes that companies buy goods and services from other companies in order to create products of greater value than the sum of the goods and services used to make these products. This increase in value resulting from the production process is the value added. As determined by IMPLAN, value added is equal to the total sales (plus or minus inventory adjustments) minus the cost of the goods and services purchased to produce the products sold.

The main difference between output and value added is that output includes the value of intermediate goods and services, while value added does not. Many economists prefer value added as an economic measure because, at the macroeconomic scale, output counts the value of inputs multiple times. For example, in the previously cited case of MedTech Corporation, which sells endoscopic ultrasound systems developed with its NCI SBIR funding, the company purchases

transducer probes, processors, displays, special flexible tubing, and other components and supplies to manufacture the ultrasound systems. The value of its sales incorporates the overall cost of these various inputs. Further, each of the companies from which MedTech purchases its inputs incorporates the cost of its respective inputs from other companies. By combining and aggregating the values of intermediate and final products, output overstates the size of the U.S. economy by a factor of roughly 2. For this reason, gross domestic product (GDP), which is a measure of value added, is used to track the size of the U.S. economy. It is a non-duplicative aggregation of production across all industries in the United States. In the current study, value added measures the real contribution that the NCI SBIR/STTR Phase II award recipients made to the national economy as a result of receiving that funding.

NCI SBIR/STTR Phase II R&D activity. Table 4 shows that, according to the national IMPLAN model, the $787 million in NCI Phase II awards generated an estimated $1.15 billion in value added economy-wide. Of this total, $437 million was generated directly, $351 million was generated indirectly, and $363 million was generated from the induced effect.

Sales of NCI SBIR/STTR Phase II innovations*.* Subsequent IMPLAN analysis presented in Table 5 reveals that the $9.14 billion in direct sales reported by companies produced an estimated $12.22 billion in value added economy-wide: $4.23 billion from the direct sales, $4.35 billion indirectly from interindustry purchases, and $3.64 billion from the induced effect of increased household spending.

Tax Revenues

The IMPLAN model provides estimates of tax collections. These include revenues in the form of social insurance taxes such as Social Security and Medicare (paid by employers, employees, and the self-employed), personal income taxes, motor vehicle licenses, property taxes, corporate profits taxes and dividends, and indirect business taxes (comprised mainly of excise and property taxes, fees, licenses, and sales taxes). The $787 million in Phase II award spending and the subsequent $9.14 billion in sales resulted in estimated tax collections of $2.93 billion: $1.96 billion at the federal level and $974 million at state and local levels.

SUMMARY

In summary, this study provides comprehensive and definitive answers to the overriding question: *What resulted from the NCI SBIR/STTR program's investment of approximately $787 million in biomedical R&D awards to U.S. small businesses?* More generally, it addresses the question of how successful NCI has been at achieving the federal SBIR/STTR enterprise's major economic goals—spurring technological innovation, helping meet federal government R&D needs, and achieving private-sector commercialization of federally funded innovations.

The research team examined the cumulative economic contribution to the U.S. economy of NCI SBIR/STTR Phase II awards initiated during FYs 1998–2010. The study's primary purpose was to estimate the extent to which the NCI SBIR/STTR program is contributing to new economic activity and job creation in the United States. A secondary purpose was to determine key qualitative patient and societal impacts resulting from this program.

The research team surveyed 444 companies that initiated SBIR/STTR Phase II awards from the NCI during the FY 1998–2010 period. A total of 690 Phase II awards were included in the study because some companies had multiple awards. Companies were asked to divulge the total sales of new

products and services directly related to their NCI SBIR/STTR Phase II awards. The research team also asked them about follow-on R&D awards, licensing revenue, and sales by licensees and spin-out companies. In addition, the companies were asked about key patient and societal outcomes from the Phase II projects.

Well over half of the NCI Phase II awards—53 percent—resulted in sales of new products and services. Companies reported $9.14 billion in total sales. Other significant economic outcomes included outside investment funding of nearly $4.3 billion, 101 companies acquired by or merged with others for a combined $21.63 billion (the majority of companies were unable to disclose the acquisition terms), 103 technologies licensed to other companies, and a total of 45 new spin-out companies.

IMPLAN economic-impact assessment software was used to estimate the total economic impacts related to both the NCI SBIR/STTR Phase II R&D activity and subsequent sales of new technologies developed with this R&D. Impacts analyzed included economic output, value added, employment, labor income, and tax revenues. Total economy-wide sales, as measured by output, were estimated at nearly $26.2 billion. Value added was estimated at $13.4 billion, representing new wealth creation in the economy. Labor income was estimated at $8.1 billion. Employment impacts included 107,918 total job years, or an average of 5,396 jobs per year, with an average income of $75,385. Total tax revenues (federal, state, and local) were estimated at $2.93 billion.

Appendix 1. Summary of Answers to Questions on Patient and Societal Impacts

The survey of the NCI SBIR/STTR Phase II award recipients included a series of questions on patient and societal outcomes and impacts resulting from these awards. The goal of this part of the study was to test a series of questions to determine key patient and societal impacts resulting from this program. Questions related to product use and patient access are of high interest but are inherently difficult to collect; therefore, the patient and societal impact questions focused on technology type and cancer indication, as well as regulatory milestones that were interpreted as an indicator that the technologies were advancing to clinical use. This appendix summarizes the data from the answers to the major patient/societal impact questions.

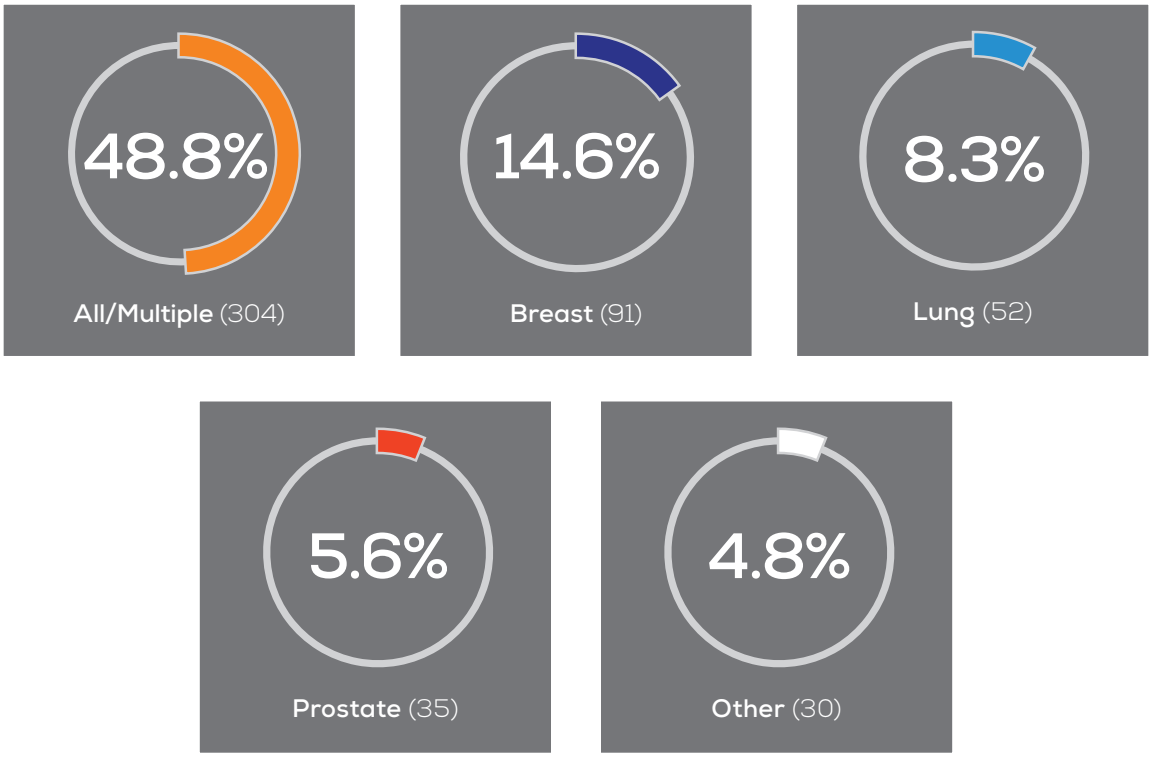
1. What type of technology did the NCI SBIR/STTR award help to develop?[19]

Technology Type	Count
Device	228
Drug	133
Health IT or educational tech	124
Research tool	104
Other	22
In-Vitro diagnostic	12

2. What is the current development state of the SBIR/STTR-funded technology?[20]

Status	Count
Other	270
Commercially available	247
Pre-clinical	53
Clinical trials	49
Full development	4
Prototype	4

[19] Respondents self-reported the technology types and were able to answer more than one option.
[20] Note: Respondents were able to answer more than one option.

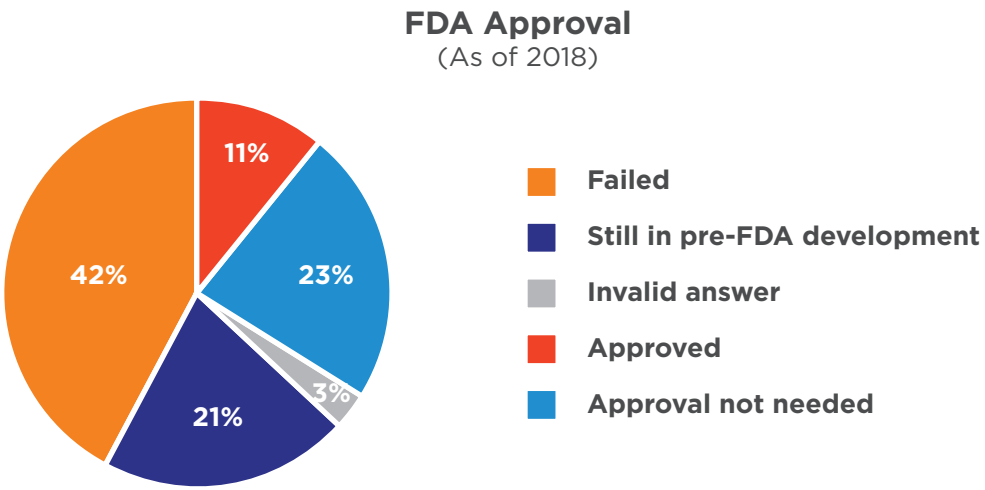


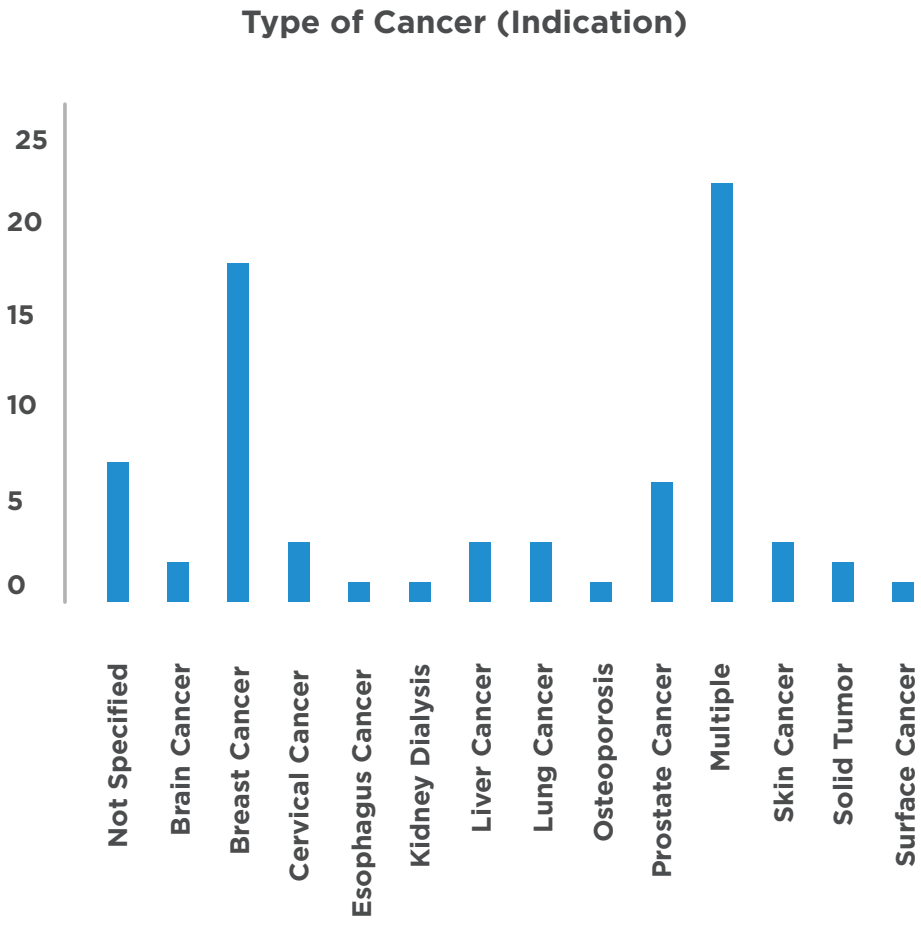
3. What cancer type does your technology target?[21]

Cancer Type	%	Cancer Type	%	Cancer Type	%
All/Multiple	48.8%	Liver	1.6%	Eye	0.3%
Breast	14.6%	Lymphoma	1.4%	Testicular	0.3%
Lung	8.3%	Ovarian	1.3%	Bone	0.3%
Prostate	5.6%	Bladder	1.1%	Malignant glioma	0.2%
Other	4.8%	Leukemia	1.1%	Neuroblastoma	0.2%
Skin	3.4%	Renal	1.0%	Heart	0.2%
Brain	2.9%	Myeloma	0.8%	Peritoneal	0.2%
Colon	2.4%	Esophagus	0.6%	Rectal	0.2%
Pancreatic	2.4%	Gastric	0.6%	Glioblastoma	0.2%
Solid Tumor	2.4%	Head and neck	0.5%	Oral	0.2%
Cervical	1.9%	Gastrointestinal	0.3%	Throat	0.2%
Melanoma	1.9%	Pheochromocytoma	0.3%		

[21] Responses to this question were analyzed by NCI from de-identified original data in order to classify types into a simpler format.

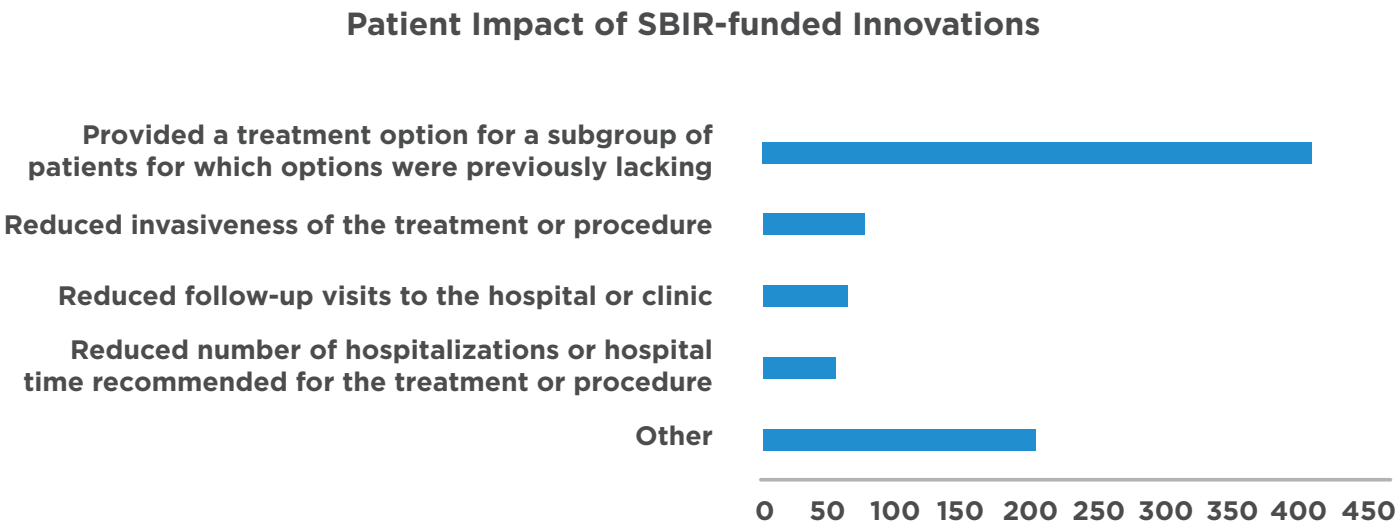
4. What is the FDA-approved status and, if approved, for what type of cancer?[22]





[22] Responses to this question were analyzed by NCI from de-identified original data in order to classify types into a simpler format.

5. What improvements for cancer patients resulted from the NCI SBIR/STTR funding?[23]



6. Did the award provide access to capital at a pivotal or critical moment for the company?[24]

Answer	Count	Percent
Yes	551	89.2%
No	58	9.4%
NA	9	1.5%

[23] Note: Respondents were able to answer more than one option.
[24] Responses to this question were analyzed by NCI from de-identified original data in order to classify types into a simpler format.

NATIONAL
CANCER
INSTITUTE