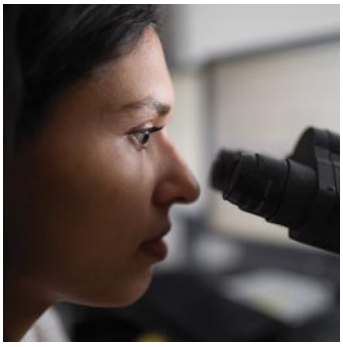
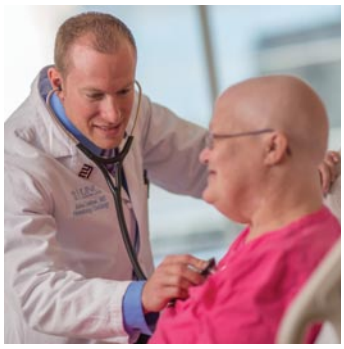
UNIVERSITY CANCER RESEARCH FUND

2015 LEGISLATIVE REPORT





Annual Financial Report to the Joint Legislative Education Oversight Committee and the Office of the State Budget and Management
Submitted November 1, 2015 in accordance with G.S. 116-29.1

UNC LINEBERGER

www.UNCLineberger.org/ucrf

Message from the Chair

Cancer affects nearly 40 percent of North Carolinians during their lifetimes and our State is home to nearly 350,000 cancer survivors. Overall, the annual cost of cancer care to the U.S. economy was nearly $125 billion in 2010, and that figure could grow as much as 66 percent, to nearly $207 billion, by 2020, according to the National Cancer Institute.

While these numbers are staggering, I have good news to share. The University Cancer Research Fund (UCRF) here at Carolina serves as an economic stimulus for our State. It is working to turn the tide towards increasing positive health outcomes for the patients from across North Carolina who are treated at NC Cancer Hospital, the clinical home of UNC Lineberger, with more than 170,000 patient visits each year.

As Chair of the Cancer Research Fund Committee, I am pleased to present our annual legislative report detailing the many positive impacts the UCRF is having on our state. The UCRF's economic impacts are tremendous, including:

- An increased economic benefit for North Carolina: This fiscal year's economic impact was $348.8 million – a return of $7.90 for every dollar invested;
- Continued growth in extramural research funding: UNC received $144.3 million this year in new research funding from outside North Carolina directly attributable to UCRF; and
- An increase in job creation, spinoff commercialization efforts and intellectual property.

People make these economic impacts possible. Since its inception, the UCRF has allowed us to recruit and retain 187 outstanding faculty members who are leaders in their fields. They are caring doctors, skilled researchers, public health specialists and scientists who collaborate across disciplines with the shared goal of eradicating cancer as our state's leading cause of death. People like Gianpettro Dotti and Barbara Savoldo who were recruited from the Baylor College of Medicine in Houston to develop revolutionary clinical trials in immunotherapy, and Stephen Frye of the Eshelman School of Pharmacy, who has helped make UNC a standout in cancer drug discovery. UCRF funds also supported groundbreaking research on DNA repair for which Lineberger member Aziz Sancar won the 2015 Nobel Prize in Chemistry.

Improving treatment and outcomes for cancer patients is critical to the health of our state. The General Assembly's continued support of the University Cancer Research Fund (UCRF) has helped make the University of North Carolina at Chapel Hill a national leader in the fight against cancer and continues to empower our researchers' efforts to prevent, treat and cure our State's leading cause of death.

Thanks to all of these investments, we are making significant progress in the fight against cancer – progress that the National Cancer Institute recognized recently by awarding UNC with one of the highest-ever ratings for cancer research and care. It is with great pride that the University conducts that research and delivers life-saving care for the people of North Carolina. Simply put, this progress would not be possible without the University Cancer Research Fund. Thank you again for your continued support.

Sincerely,

Carol L. Folt, PhD
Chair, Cancer Research Fund Committee



EXECUTIVE SUMMARY

UNIVERSITY CANCER RESEARCH FUND

2015 LEGISLATIVE REPORT

UNC LINEBERGER

EXECUTIVE SUMMARY

In 2007 – the year that cancer overtook heart disease as North Carolina's leading cause of death – the N.C. General Assembly created the University Cancer Research Fund. The UCRF is used solely to support cancer research under UNC Hospitals, the Lineberger Cancer Center, or both in an effort to defeat a disease that affects nearly 40 percent of North Carolinians.

The UCRF supports the recruitment, retention and research of world-class faculty members who are leading our efforts to better understand, prevent, diagnose, and treat a disease that claims the lives of more than 17,000 North Carolinians every year. These faculty members – along with innovative technologies, infrastructure and other core resources – have helped UNC become a national leader in cancer research and earn its highest rating ever from the National Cancer Institute. This simply would not be possible without the UCRF.

Funded by a combination of tobacco settlement funds, taxes on non-cigarette tobacco products such as snuff, and state appropriations, the UCRF received $25 million in 2007, $40 million in 2008 and $50 million in 2009. The legislature consolidated all earmarked tobacco settlement funds into the General Fund in 2013, reducing UCRF funding to $42 million annually, an investment that the legislature has continued each session.

The General Assembly also created the Cancer Research Fund Committee to provide continued oversight and to ensure that UCRF funds are invested responsibly. In 2009, the Committee adopted a Strategic Plan that targets UCRF resources in areas where they can have the most impact. The plan, which was updated in 2014 in an ongoing effort to maintain accountability of UCRF investments, calls for funds to be invested in the following areas:

- Strategic research priorities in genetics, novel therapies, and outcomes;
- Selective opportunities that allow UNC scientists to adapt to a rapidly changing field of research; and
- Clinical excellence and scientific infrastructure such as technology, training, outreach and other core resources.

WHAT IS THE UCRF?

The University Cancer Research Fund is a $42 million nation-leading investment to stimulate cancer research and reduce North Carolina's leading cause of death. The Fund builds upon the exceptional research base at UNC Lineberger Comprehensive Cancer Center, the state's public, NCI-designated comprehensive cancer center.

UCRF FOCUS AREAS

Understanding Cancer Genetics | Developing Novel Therapies | Optimizing Cancer Outcomes

The Cancer Research Fund Committee has published regular reports on the Fund's activities since 2008. In 2011, the General Assembly mandated an annual financial report including UCRF's effects on the state's economy, details on expenditures of UCRF monies and outside funds leveraged by UCRF support, and other performance measures.

This is the fifth financial report submitted under the legislative requirement, demonstrating that the University Cancer Research Fund continues to have a significant economic benefits for the state of North Carolina. From 2008 to 2015, the UCRF has had the following cumulative economic impacts:

- Generated $1.69 billion in economic activity, a 5:1 return on investment
- Supported or sustained more than 10,000 jobs, an average of 1,260 jobs per year
- Yielded directly or indirectly generated state and local government revenues of $48.6 million
- Leveraged UCRF funds to bring in $144 million in extramural funding in FY2015 directly linked to faculty who were recruited or retained by UCRF funds or to the results of innovation grants or technology and infrastructure investments by UCRF. The extramural funding totaled $544.2 million since the inception of UCRF.

In addition to these economic benefits for North Carolina, the human impact of the UCRF will persist through the continuing advancement of cancer research and care. This report details several research highlights according to the priorities adopted in the Strategic Plan.

Genetics in Cancer Causation and Treatment

UNC faculty are at the forefront of global-scale collaborative efforts to catalog thousands of genetic identifiers that can affect the development and growth of cancer. The Cancer Genome Atlas project is transforming the way cancers are classified, diagnosed and treated, and UNC's leadership role in this project is made possible largely because of UCRF investments in sequencing technology and other key research tools. This year UNC hit an important milestone in the project: the sequencing of 10,000 tumor tissues.

NIH THE CANCER GENOME ATLAS
National Cancer Institute
National Human Genome Research Institute

Developing Novel Therapeutics

As scientists better understand how cancer develops and grows, they can work to find better and more effective ways to treat it. UCRF supports research focused on how to improve treatment delivery methods in a way that better targets tumor cells while sparing non-cancerous tissues from toxic side effects. Reprogrammed cells, nanoparticles and other vehicles for more precise drug delivery are continually developed and enhanced. The small molecule cancer drug discovery program initiated with UCRF funding is emerging as one of the strongest in the nation. Enrollment in clinical trials continues to increase, giving more North Carolinians access to cutting-edge therapies as part of the drug testing process.

Optimizing NC Cancer Outcomes

The goal of this research priority is to gain a more holistic understanding of cancer in North Carolina through the use of data; community-based research interventions; and strong partnerships with doctors, hospitals and patients. The UCRF has been an essential resource in building rich population-based data resources and funding community-based projects that test ways to improve prevention and early detection all across our state.

Clinical Excellence and Infrastructure

The UCRF has supported the recruitment and retention of faculty with leadership and expertise and leadership in several key clinical areas. UCRF resources have helped to establish research infrastructure that is widely used not just at UNC, but by provider practices and research institutions across the state. Virtual tumor boards and our telemedicine network connect community doctors and hospitals with oncology experts at UNC.

UCRF's importance in ongoing research, infrastructure and community outreach is complemented by two major capital investments the State of North Carolina made in cancer care: The UNC Cancer Hospital, which opened in 2009 and serves patients from all 100 counties, helping more than 170,000 patients each year; and Marsico Hall, a cutting-edge collaborative research facility that opened in spring 2014 and is home to high-capacity technology and equipment that further accelerates our collaborative research capabilities.

The University Cancer Research Fund is an investment whose positive economic impact, as well as benefits for patients and public health in North Carolina, will keep growing as UNC continues to be a national leader in the fight against cancer. It has been a landmark initiative that is advancing cancer care and research for patients in North Carolina and beyond.

UCRF BY THE NUMBERS

$43.7 million in UCRF funds in FY 2014-15 resulted in an economic impact of $348.8 million

Total economic impact of **$1.69 billion** since UCRF was established

Increased return on investment every year, exceeding an **8 to 1 return** in FY 2014-2015

Recruited and retained over **180 faculty**

Helped launch **33 startup** companies that have created private-sector jobs and raised **$294 million** in venture capital and research investment



ECONOMIC IMPACTS

UNIVERSITY CANCER RESEARCH FUND

2015 LEGISLATIVE REPORT

UNC LINEBERGER

ECONOMIC IMPACTS

To determine whether the UCRF is achieving its goal of stimulating North Carolina's economy, UNC again hired Tripp Umbach, a nationally respected consulting firm, to estimate the UCRF's economic impact for Fiscal Year 2015. Tripp Umbach examined the UCRF's immediate impact on state income growth and employment. The Fund's overall economic impact was estimated as the sum of its direct and indirect and induced impacts (see the full report in the Appendix). Direct impact resulted from two major sources: expenditures from the UCRF itself, and the expenditure of UCRF-attributable research funds awarded to UNC by federal, foundation and other sources. The indirect and induced impact was calculated by applying standard multipliers to direct expenditures.

For Fiscal Year 2015, UCRF's total allocation was $43.7 million. Using standard methodologies, Tripp Umbach estimated that in FY 2015 the UCRF:

- Had an overall economic impact of $348.8 million. This included $188.1 million in direct spending and $160.7 million in indirect and induced impact.
- Generated nearly $8 in economic impact for every UCRF dollar expended.
- Created or sustained 2,288 jobs, including 992 research-related jobs and an additional 1,296 indirect and induced jobs throughout the state of North Carolina
- Resulted in nearly $11.9 million in tax revenues to North Carolina and $25.5 million in federal tax revenue.

The FY 2015 amount brings the total economic impact of the UCRF since its inception to more than $1.69 billion.

Faculty Job Creation and Retention

Faculty drive the UCRF – they lead the teams that conduct the groundbreaking research to push the boundaries of our knowledge and advance cancer treatment, prevention and early detection. Faculty also hire staff, buy equipment, earn research funding from outside North Carolina, and train students and fellows. Since the UCRF was created in 2007, it has had a tremendous positive impact on cancer research faculty:

- Recruitment: The UCRF has supported the recruitment of 152 faculty in the College of Arts and Sciences, the Schools of Nursing, Public Health, Medicine, Pharmacy and Journalism and Mass Communication. These faculty are developing a wide range of research programs in nanomedicine, quantitative biology, cancer genomics, health outcomes, health communications, multiple cancer types, and other areas critical to improving cancer prevention, diagnosis and treatment in our state.
- Retention: UCRF support has led to the retention of 35 faculty who were receiving competitive offers from other universities.

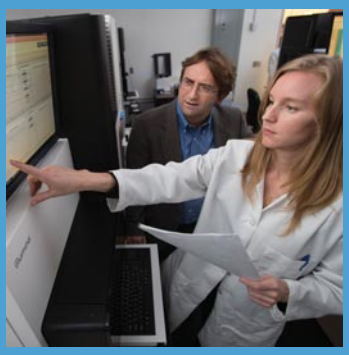
Extramural Funding Growth

Almost all extramural funds come to UNC from outside North Carolina, and they add significantly to the state's economy. The UCRF's Strategic Plan establishes extramural research funding – particularly competitive federal funding – as a key metric for UCRF success. According to this metric, UCRF funds are being invested effectively. UCRF support is leveraging extramural research funds for North Carolina at a time when national funding levels are decreasing and keeping the state at the forefront of research nationally. Key trends include the following:

- FY 2015 funding from outside sources that is directly attributable to the UCRF totaled $144 million in annual total cost dollars.
  - > This amount is based on a snapshot of active attributable extramural funding held by faculty in the first quarter of FY 2015-2016. The dollars represent one year of funding. A complete list of the awards is included in the Appendix.
  - > The positive effects of faculty recruitment and retention, technology enhancement, and developmental projects have accumulated. The UCRF-attributable extramural funding has risen from $5 million in FY 2008. By FY 2011, it was $69 million and in FY 2014 was $137 million. This year, UNC has seen additional grants that push the total to over $144 million. Many of the currently active awards will continue for several more years, and we fully expect new awards to add to the total.
- Between 2007 and 2015, the overall extramural support to the UNC Lineberger Comprehensive Cancer Center increased from $163.6 million to $280 million; support from the National Cancer Institute grew from $48.5 million to $70 million.

Intellectual Property, Innovation, and Entrepreneurship

The UCRF's focus on innovation has promoted entrepreneurship that has created jobs and spinoff companies. The UCRF, in collaboration with UNC's North Carolina Translational and Clinical Sciences Institute, is fostering an entrepreneurial mindset at UNC. The UCRF supports specialized staff to maximize the development and licensing of university intellectual property. In the past eight years, more than 33 startup companies have been launched or expanded their scope with direct UCRF help. These new companies have attracted more than $294 million in external grant support and venture capital investment, as well as creating private-sector jobs.


RESEARCH IMPACTS

UNIVERSITY CANCER RESEARCH FUND

2015 LEGISLATIVE REPORT

UNC LINEBERGER

RESEARCH IMPACTS

The National Cancer Institute (NCI) made a site visit to UNC Lineberger Comprehensive Cancer Center in May of this year as part of its five-year institutional review and consideration of renewal of the center's core grant. The grant award, which runs through 2020, would provide essential support for UNC Lineberger's research program and facilities. UNC Lineberger's grant renewal application received an "exceptional" rating, earning one of the top scores ever awarded to any cancer center since NCI began rigorously rating.

A Comprehensive Cancer Center Designated by the National Cancer Institute

In 2009, when the UCRF reached its fully authorized funding amount of $50 million, the Cancer Research Fund Committee adopted a Strategic Plan to direct the most effective and responsible use of the state's investment. The plan includes three primary tiers: Research Priorities, the Opportunity Fund, and Critical Infrastructure. This section of our report highlights noteworthy successes in each tier.

Research Priorities: Three targeted research priority areas where with focused investment in major scientific programs, disease-based initiatives, or cutting-edge research platforms, UNC could have substantial impact and become a world leader. The priority areas are as follows.

- Understanding the Role of Genetics in Cancer Causation and Treatment – to discover the genes that predispose families to cancer and that predispose cancer patients to poor treatment outcomes – especially by looking for the various genetic mutations in specific cancer subtypes that lead to cancer therapy failure.
- Developing Novel Therapeutics – to devise new therapies that are targeted to the specific vulnerabilities of treatment-resistant cancers, and to develop new ways of delivering treatments that reduce toxic side effects for patients. This research priority relates closely to the genetics initiative, and makes key observations that will be utilized in clinical applications as quickly as possible.

Taneka, breast cancer, Halifax County

George, leukemia, Bladen County

Charles, throat cancer, Scotland County

Physicians at the N.C. Cancer Hospital, the clinical home of UNC Lineberger, treat patients from across North Carolina, with more than 170,000 patients visits each year at all locations.

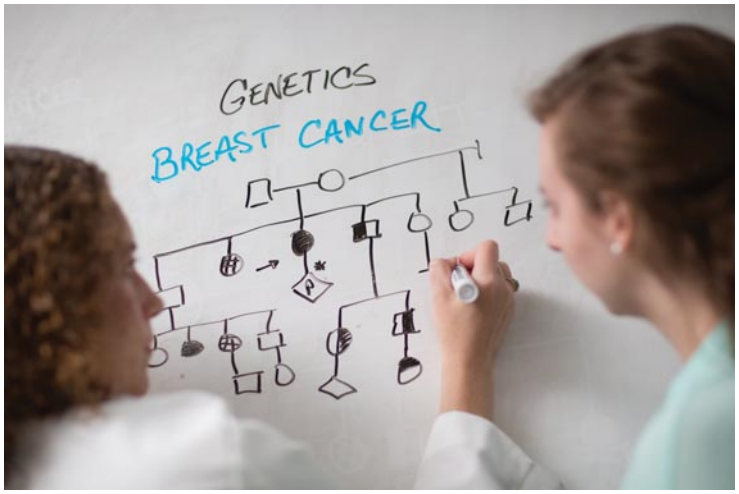
- Optimizing NC Cancer Outcomes – to enhance the quality of oncology and survivor care, and to build population-based datasets that track the occurrence and treatment of cancer across North Carolina to support research designed to improve community prevention and early detection. The ultimate goal is to understand North Carolina's cancer problem at a level unprecedented in the nation and to design research interventions aimed at rectifying these problems at the practice, health system and community levels.

Opportunity Fund: Allows UCRF to remain nimble, seizing research or clinical opportunities as they arise and providing the top minds in the field with the resources they need. Examples include competitive, innovative pilot projects; seed funds to recruit top researchers; support of leading-edge technology and equipment for use by multiple faculty members; and the development of shared research resources.

Critical Infrastructure Fund: Provides critical resources for cancer research that are not readily obtainable by outside funding but upon which future progress relies. Investing in imaging, informatics and fundamental research techniques ultimately provides clinician scientists with the tools to change patient outcomes. This requires enhancement of multidisciplinary excellence in cancer care and the development of a statewide infrastructure to help bring leading-edge clinical research and applications into community practices.

RESEARCH PRIORITY 1 Understanding the Role of Genetics

Cancer genetics – one of the most rapidly changing fields of cancer research – is the study of how an individual's genetic makeup can influence the risk and development of cancer. It also includes the study of how various types of enzymes, proteins and genetic mutations can affect tumor growth. The UCRF has funded investments in high-powered sequencing technologies, massive data resources, and other important tools that have helped UNC become a national leader in cancer genomics.



UNC cancer scientist wins Nobel Prize

School of Medicine Professor and UNC Lineberger member Aziz Sancar, MD, PhD, won the Nobel Prize in Chemistry this year as part of a team that mapped part of the DNA repair system that protects genes against cancer.

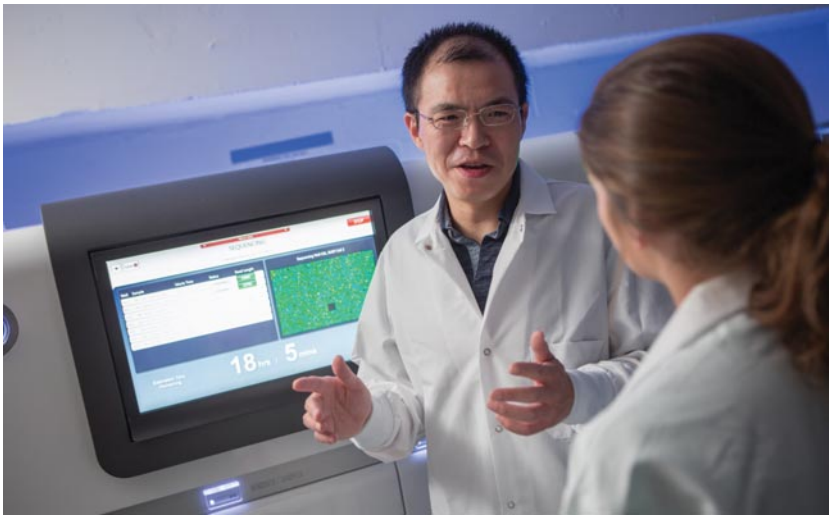
Sancar, who has been a professor at UNC since 1982 and whose recent work has been supported in part with UCRF funds, earned the award for his work on mapping the cellular mechanisms that underlie DNA repair, which occurs every single minute of the day due to outside forces, such as ultraviolet radiation and other environmental factors. In particular, Sancar elucidated one major avenue of repair, nucleotide excision repair, which is vital to UV damage to DNA. When this repair system is defective, people exposed to sunlight develop skin cancer.

Earlier this year, his team used the UCRF-developed genetic sequencing capacity to create a DNA repair map of the entire human genome. "With this map, we can now say to a fellow scientist, 'Tell us the gene you're interested in or any spot on the genome, and we'll tell you how it is repaired,'" Sancar said. "Out of six billion base pairs, pick out a spot and we'll tell you how it is repaired."

Sancar shares this award with Tomas Lindahl of the Francis Crick Institute and Clare Hall Laboratory in Great Britain, and Paul Modrich of Duke University School of Medicine and the Howard Hughes Medical Institute.

UNC hits genetic sequencing milestone in cancer reclassification initiative

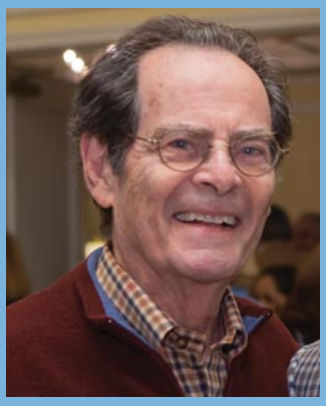
As part of the Cancer Genome Atlas (TCGA) – a $40 million national research project to catalog the genetic characteristics of nearly 30 cancer types – UNC researchers headed the largest, most diverse tumor sequencing project ever. This year, UNC hit a major milestone in this effort: sequencing 10,000 samples of cancer tumor tissue.



Specifically, the major piece of the work that UNC did to support the project was to sequence RNA, which is the genetic code that carries instructions from DNA for making proteins. Sequencing of RNA allows for researchers to get a more detailed look at how genes are expressed in cancer cells. Gene expression analysis helps scientists classify multiple tumor types by their molecular characteristics.

Investments in next-generation sequencing technology from the UCRF were "crucial" in enabling UNC to take on this national leadership role, said Piotr Mieczkowski, director of UNC's High Throughput Sequencing Facility and a research assistant professor of genetics. The University Cancer Research Fund purchased the faster, more efficient sequencers and is keeping UNC abreast of the latest in sequencing technology.

The TCGA project may help doctors more accurately diagnose cancer and help pharmaceutical companies develop more targeted drug therapies, allowing research to focus more on the creation of treatments targeting larger groups of cancers with genomic similarities instead of to a single tissue-based tumor type as drugs are currently developed. While the production side of the project is done, researchers plan to continue to use the data for further analysis. With the 10,000 sequenced samples uploaded to a public database accessible to researchers around the world, that work is expected to continue to fuel new discoveries for at least the next decade.



UNC patient and Raleigh resident Bobby Kadis qualified for a UNCseq clinical trial after learning his lung cancer had returned and progressed to Stage 4. A randomized computer selection would determine if he received one or both therapies for a specific genetic mutation that was driving his cancer. Bobby started his treatment in the clinical trial shortly after his recurrence diagnosis, with a combination therapy of an infusion every 21 days and a daily oral pill. Following the first scan after two months, doctors were pleased to report Bobby had experienced "significant regression." Subsequent scans have indicated that his cancer is no longer observable on the scan.

Genetic sequencing clinical trials reach patients statewide through UNCseq

UNCseq, UNC's genetic sequencing protocol and clinical trial designed to create customized cancer treatment plans based on an individual patient's tumor, has more than 2,000 patients enrolled across the state. This protocol, funded by the UCRF, has been making a difference for patients in situations where standard therapeutic options are not effective or useful.

Under this approach, tumor samples obtained from biopsy or surgery are analyzed using next-generation sequencing to identify the molecular or genetic changes that could influence outcomes or choice of therapy. Once sequencing is complete, researchers hold a molecular tumor board, which is run similarly to a cancer multidisciplinary conference. UNC researchers discuss clinical information about the patients and sample reports from the genomic data, and identify variants that need to be confirmed in the clinical lab. If a molecular alteration is found that can be treated with a drug targeted to that change, UNC oncologists will provide this information to the patient and his or her doctor so that they can discuss this treatment option.

The UNCseq clinical trial is open to patients with all cancer types, and its ultimate aim is to provide every patient with tumor analyses that will allow their doctors to prescribe targeted and efficient therapies on an individualized basis.

"UNCseq uses cutting-edge genetic sequencing to find unsuspected but actionable mutations that may be driving an individual cancer," said Dr. Gus Magrinat, an oncologist at Cone Health Cancer Center in Greensboro who has referred patients to the trial. "This is exactly where we should be heading in terms of customized cancer care."

RESEARCH PRIORITY 2 Developing Novel Therapies

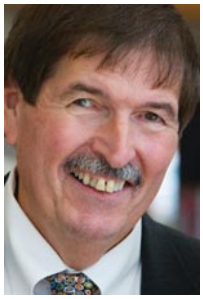
Roughly one third of U.S. cancer patients will die with advanced disease that is resistant to treatment, and it can take more than a decade for a new drug to go through the rigorous testing process required for widespread patient use. The UCRF has been essential in helping UNC researchers further their work to develop and test new therapies and drug delivery methods, aimed at treating cancer more effectively and with less harm to non-cancer cells and fewer toxic side effects for patients.

Small-molecule drug brings big discoveries

UNC scientists are working with the University of Colorado as a team to develop a new treatment for melanoma, the most aggressive type of skin cancer. At the center of the research is a MerTK, a gene discovered at UNC. The team is validating MerTK as a new target in several cancers including melanoma.

The collaborative work is being funded by a $1 million grant received last year from the Melanoma Research Alliance (MRA) and the Saban Family Foundation.

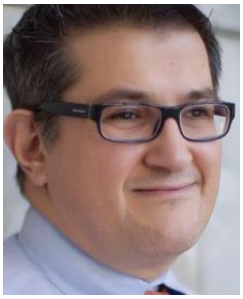
UNC Cancer Care Director Shelton Earp, MD, who discovered MerTK, leads the research team with Stephen Frye, PhD, who, thanks to UCRF funds, was recruited to UNC to lead the Center for Integrative Chemical Biology and Drug Discovery at the Eshelman School of Pharmacy. Five years ago, they began to develop a chemical to inhibit the activity of MerTK, and with over $5 million in grants from NCI, succeeded in developing an oral drug that works well in animal models of melanoma. This work has been performed in the UCRF-developed Mouse Phase 1 Unit.


Dr. Shelley Earp


Dr. Stephen Frye


Dr. David Ollila


Dr. Nancy Thomas


Dr. Stergios Moschos

In recent studies, these researchers with the UNC clinical melanoma team led by David Ollila, MD, Nancy Thomas, MD, PhD, and Stergios Moschos, MD, found that MerTK is elevated in metastatic melanoma and that the team's prototype drug could slow the growth of melanoma cells, both alone and in combination with some of the newly approved melanoma drugs. About half of the MRA grant will be used by the UNC Lineberger/Emory team to develop their small molecule drug, while the other half will be used to understand what activates MerTK in melanoma. The team at Emory is led by former UNC Lineberger MD-PhD student Douglas Graham, who now directs pediatric oncology in Atlanta.

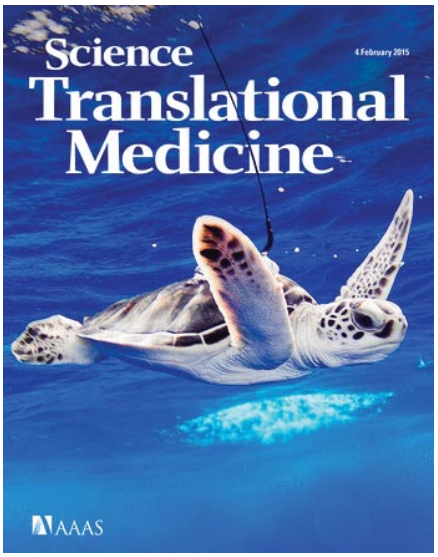
Clinical trial aims for better therapy for melanoma that has spread to the brain

Lineberger member and clinical associate professor Stergios Moschos, MD, is leading North Carolina's Phase II clinical trial studying the effectiveness and safety of a combination treatment for patients with a certain type of melanoma that has metastasized to the brain. Enrollment is open for the trial, in which researchers are working with GlaxoSmithKline.

Moschos, who was recruited to UNC in 2012 thanks to UCRF support, was recognized late last year by the National Cancer Institute with a Cancer Clinical Investigator Team Leadership Award, which recognizes and supports outstanding mid-career clinical investigators at NCI-Designated Cancer Centers who participate extensively in NCI-funded collaborative clinical trials and whose leadership, participation, and activities promote a culture of successful clinical research. He was one of just 11 researchers nationwide to receive this honor.

Pancreatic cancer treatment device to be tested soon in clinical trials

Clinical trials are expected to open in 2016 to test a breakthrough device developed in a UCRF-funded project led by Drs. Joseph DeSimone and Jen Jen Yeh. The device, whose invention was reported in one of the world's top journals, *Science Translational Medicine*, provides a fundamentally new treatment approach that could increase life expectancy for pancreatic cancer patients. The device uses electric fields to drive chemotherapy drugs directly into tumors – preventing their growth and in some cases, shrinking them – and holds the possibility of dramatically increasing the number of people who are eligible for life-saving surgeries.



A groundbreaking pancreatic cancer treatment device created by researchers at UNC Lineberger was featured in the February 2015 issue of one of the world's top science journals, *Science Translational Medicine*.

Pancreatic cancer cells are notoriously difficult to treat because they are protected by walls of surrounding tissue. While surgery provides the best chance for a cure, the diagnosis often comes too late for a patient to be eligible for surgery due to the cancer's tendency to become entangled with major organs and blood vessels. As a result, this type of cancer has a 75 percent mortality rate within a year of diagnosis – a statistic that has not changed in more than 40 years.

"Surgery to remove a tumor currently provides the best chance to cure pancreatic cancer," said Joseph DeSimone, PhD, Chancellor's Eminent Professor of Chemistry in UNC's College of Arts and Sciences and William R. Kenan, Jr. Distinguished Professor of Chemical Engineering at NC State University. "However, often a diagnosis comes too late for a patient to be eligible for surgery due to the tendency of the tumors to become intertwined with major organs and blood vessels."

Depending on the tumor type, the new device can be used internally after a minimally invasive surgery to implant the device's electrodes directly on a tumor (for pancreatic and other less accessible tumors) or externally to deliver drugs through the skin (for inflammatory breast cancers and other accessible tumors such as head and neck cancers). The device can enable higher drug concentrations in tumor tissue while avoiding increased systemic toxicity, which is especially important in treating pancreatic and other solid tumors that are hard to reach using standard treatments that rely on the bloodstream for delivering cancer-fighting drugs.

"Once this goes to clinical trials, it could shift the paradigm for pancreatic cancer

Dr. Joe Desimone

Dr. Jen Jen Yeh

Dr. James Byrne

treatments – or any other solid tumors where standard IV chemotherapy drugs are hard to get to," said Jen Jen Yeh, MD, associate professor of surgery and pharmacology in UNC's School of Medicine.

James Byrne, MD, PhD, a member of DeSimone's lab at UNC-Chapel Hill, led the research by constructing the device and examining its ability to deliver chemotherapeutic drugs effectively to pancreatic cancer tumors, as well as two types of breast cancer tumors. "Progress in the treatment of pancreatic cancer has been persistent but incremental in the past few decades, relying largely on advances in drug therapies. To our knowledge, our study represents the first time iontophoresis has been applied to target pancreatic cancer," said Byrne, who is completing his medical degree at UNC-Chapel Hill after earning his doctorate in 2014 as a member of the DeSimone lab. "We hope our invention can be used in humans in the coming years and result in a notable increase in life expectancy and quality among patients diagnosed with pancreatic and other types of cancer."

RESEARCH PRIORITY 3 Outcomes

The UCRF is an integral part of our work to improve the outcomes for cancer patients in North Carolina. It has enabled us to build unprecedented databases that can give researchers a comprehensive look at cancer incidences in our state, including how patient outcomes can vary by geographic, economic and other differences. UNC has also taken a leadership role in designing national standards that integrate patient-reported feedback into cancer care. Additionally, support from the UCRF is also helping to test different intervention strategies that reduce cancer risk factors and enhance a patient's ability to access screenings, treatments, and other information that could affect their decisions about cancer care.

Patient-reported outcomes critical to improving cancer care

Nausea and other side effects that patients experience in cancer clinical trials are typically reported by doctors, not directly by patients. Previous research led by UNC faculty has shown that doctors under-report these symptoms, and a UNC researcher is leading the way to empower patients to report their own symptoms during cancer drug development.

Dr. Ethan Basch

Ethan Basch, MD, MSc, director of the UNC Lineberger Cancer Outcomes Research Program and associate professor of medicine and public health at the UNC School of Medicine, authored a study this year showing a system developed by him and colleagues for the National Cancer Institute accurately and reliably captures the patient experience with cancer drug side effects.

"This is a landmark study because patient-reported information has not been used for measuring side effects in cancer research," said Basch, the paper's senior author. "This study shows that these patient-reported measures perform well, and are ready for implementation in cancer research."

The study tested the reliability and validity of a group of 124 measures previously developed by Basch and colleagues for the National Cancer Institute to test 78 patient-reported adverse events. Basch as well as other authors were funded by NCI to develop the measures, which are called the Patient Reported Outcomes version of the Common Terminology Criteria for Adverse Events, or PRO-CTCAE. The study involved nearly 1,000 patients who were undergoing outpatient chemotherapy, radiation therapy or both at one of nine U.S. cancer centers or oncology practices

The study found that the PRO-CTCAE measures performed extremely well, demonstrating validity and reliability across items. Basch said that the study is important, as it validates measures developed to obtain reports of adverse events directly from patients.

"Patient reporting improves the quality of information that we have about how patients feel and function, and it provides a fuller picture of the impact of treatments on people's lives," Basch said. "This is important because in risk-benefit balancing for drugs, we need to have comprehensive and valid information about risk."

Basch, a UCRF recruit, was recently appointed to the Board of Scientific Advisors for the National Cancer Institute.

Comprehensive cancer data, analytics capabilities fuel research

The Integrated Cancer Information and Surveillance System (ICISS), a system funded in part by UCRF and comprised of North Carolina data, is a powerful, data-rich research tool that links multiple population, clinical and other data sources. It contains all North Carolina's cancer cases and links to health claims data for 5.5 million people insured by Medicare, Medicaid, State Employees' Health Insurance, and Blue Cross/Blue Shield of North Carolina – covering about 85 percent of North Carolina's population of cancer patient population. No similar integrated population-based cancer informatics system exists at the state or national levels in the nation.

The goal of ICISS is to give researchers an unprecedented view of the cost and quality of cancer care. ICISS is being used to measure outcomes of cancer control activities, especially among vulnerable subgroups and communities that have been traditionally under-represented. Researchers at other academic centers in the state also can access the data to inform their studies.

ICISS allows scientists to consider what kinds of cancer treatments are most effective, which parts of the state need more access to cutting-edge cancer care, what kinds of environmental and economic factors may affect prognosis, and other important questions. Geographic location of all cancer providers in the state has been accomplished with UCRF funding, allowing researchers to understand how distance from cancer care providers alters choice of therapy and cancer outcomes. ICISS-related research will improve scientists' understanding of cancer in North Carolina and provide a pathway to improve cancer outcomes for patients.

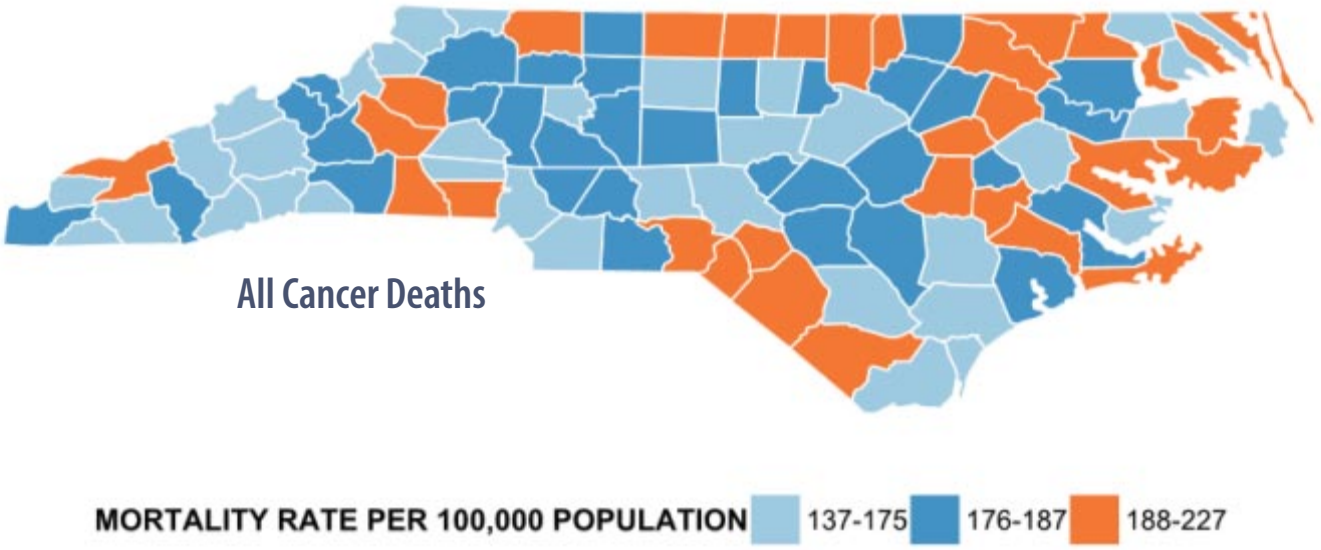
Dr. Andrew Olshan

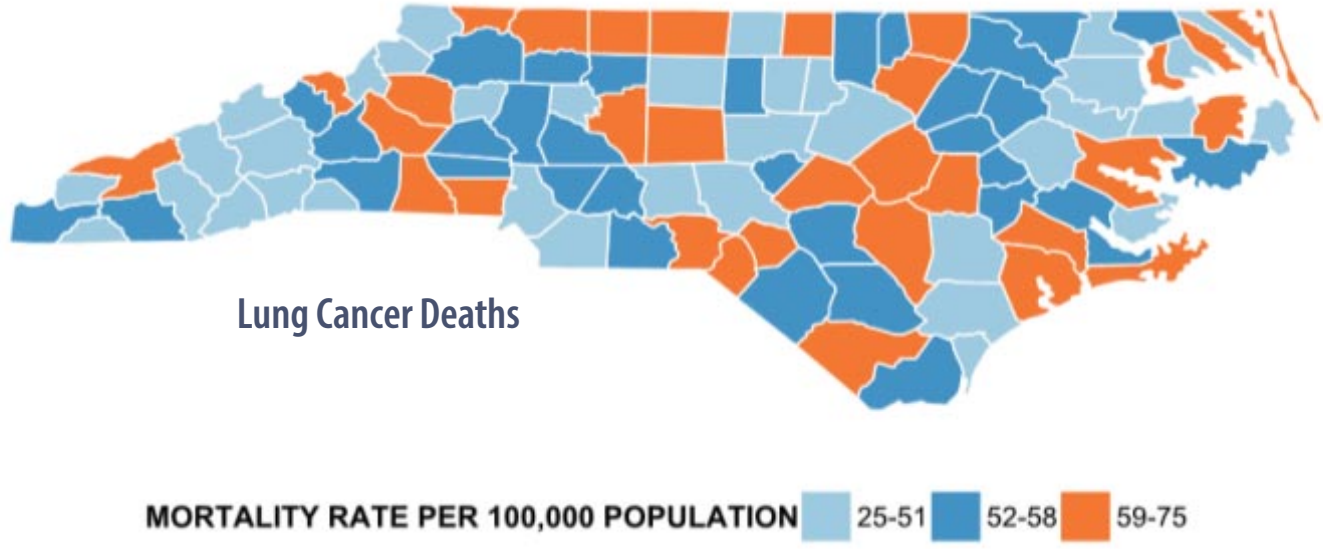
For example, among the studies using ICISS as a research tool this year was a review of state cancer registry cases of various types of gynecological cancer with linked enrollment in Medicare and state Medicaid. The study found that women aged 65 years or older who were dually enrolled in Medicare and Medicaid were found to have an overall 34% increase in mortality after diagnosis with a gynecologic cancer compared with the non-dually enrolled Medicare population. Women with early-stage uterine and vulvar/vaginal cancers appeared to have the most disparate outcomes. Because these malignancies are generally curable, they have the most potential for benefit from targeted interventions. The study was authored by Kemi Doll, MD, UNC School of Medicine Division of Gynecologic Oncology, and Anne-

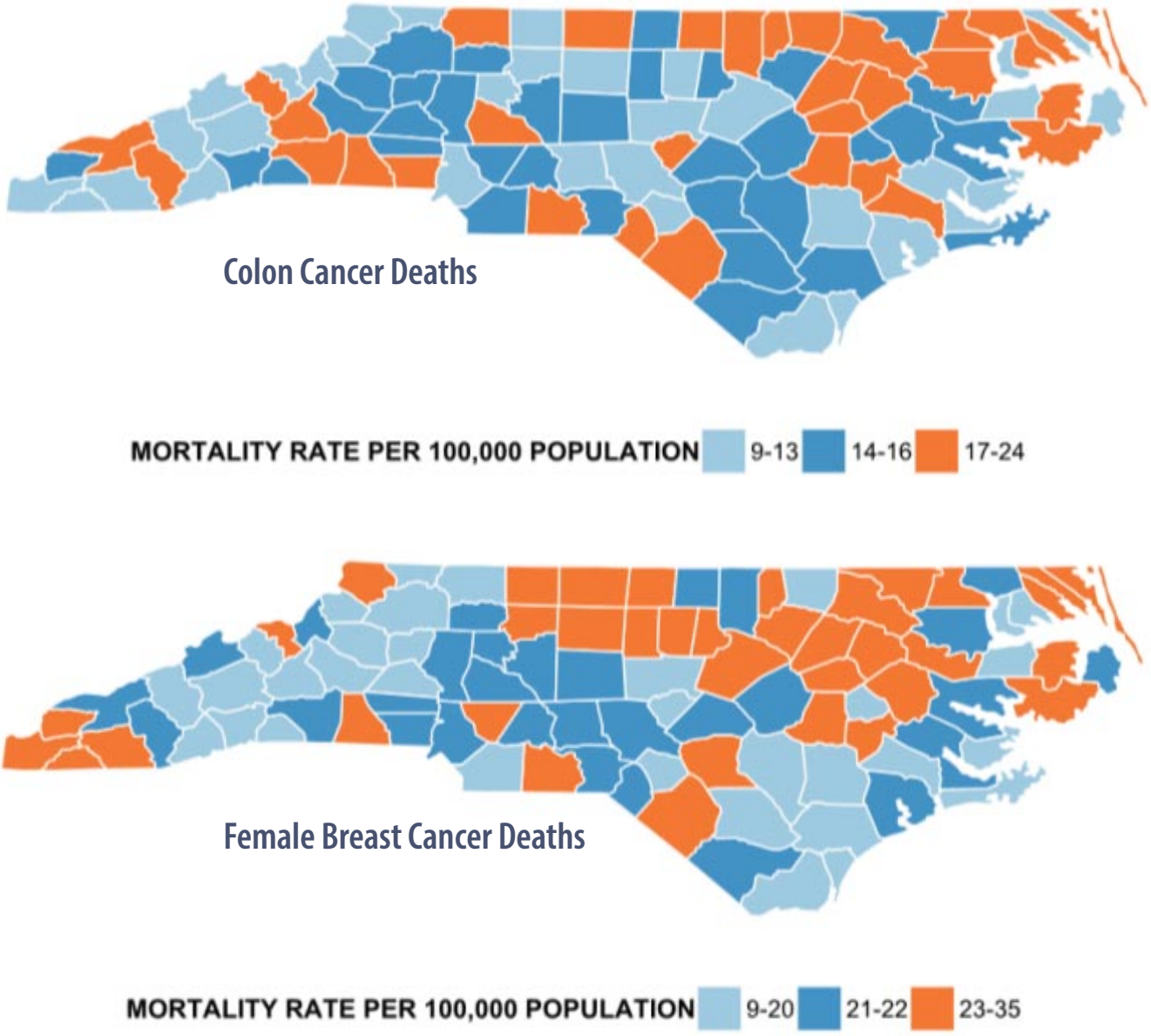
Marie Meyer, PhD, faculty director of the UNC Lineberger Integrated Cancer Information and Surveillance System and a research assistant professor in the UNC Gillings School of Global Public Health Department of Epidemiology.

"North Carolina is very unique in the existence of ICISS, a resource that links Medicare, Medicaid, private insurance claims and the cancer registry," said Dr. Andrew Olshan, UNC Lineberger Associate Director of Population Sciences, who helps to oversee ICISS. "North Carolina is ahead of every other state in terms of the methods that it has employed and the technology that it has developed."

Examples of ICISS data are shown below:







Age-adjusted to the 2000 US Census

UCRF sustains breast cancer study focusing on access to care, other treatment barriers

With significant support from UCRF, the Carolina Breast Cancer Study (CBCS) – the largest population-based study of breast cancer ever in North Carolina and one of the largest in the world – is in Phase III of an effort to improve understanding of breast cancer, especially disparities in the risk of developing cancer and in timely access to health services.

CAROLINA BREAST CANCER STUDY

The CBCS Phases I and II were launched in 1993 and included participants from 44 of North Carolina's 100 counties. Phase III, funded in large part by UCRF, has enrolled 3,000 women and is in the five-year follow-up phase. This phase focuses specifically on how treatment decisions, access to care, and financial or geographic barriers impact breast cancer outcomes, and whether these outcomes are predictable or altered by genetic breast cancer subtypes. The study is also

investigating subtypes of breast cancer that may be associated with different risk factor and prognosis profiles.

"Being a part of the CBCS has helped educate so many women about the importance of collecting this data, and it has empowered them to go back into the community and share their experiences," said Valarie Worthy, founder and president of Sisters Network Triangle NC, a support group for breast cancer survivors and a community adviser for the CBCS. "They know we might not see the results in the next 10 years but they understand that it can really make a difference for their granddaughters. This gives us all a chance to pay it forward."

CBCS has recently received two new grants, one from the Komen Foundation and one as part of an NCI-funded partnership grant between North Carolina Central University and UNC Lineberger to study health disparities.

Opportunity Fund

The objective of the Opportunity Fund is to enable UNC to seize research and clinical opportunities as they arise in the continually evolving field of cancer research. The UCRF funds competitive and innovative pilot projects, supports cutting-edge technology and shared research resources, and provides seed money to recruit and retain the top minds in the field.

Carbon nanotube devices aim to improve cancer imaging

Early detection is the key for increasing the survival rate of lung cancer, which continues to be the leading cause of cancer deaths in the world. UNC researchers are developing a new X-ray imaging system that could improve early detection.

Dr. Otto Zhou

Current digital imaging models require long scanning times that can lead to blurred pictures, patient discomfort and other problems. In clinical trials, Dr. Otto Zhou and his colleagues are now testing a stationary digital chest tomosynthesis (s-DCT) system that relies on a multi-pixel X-ray technology to increase the imaging speed, reduce the size and cost of the equipment, and potentially reduce radiation doses while improving image quality. The s-DCT device is based on a unique carbon nanotube based X-ray source array technology invented by a team of researchers led by Dr. Zhou. UCRF funds have supported his innovative work.

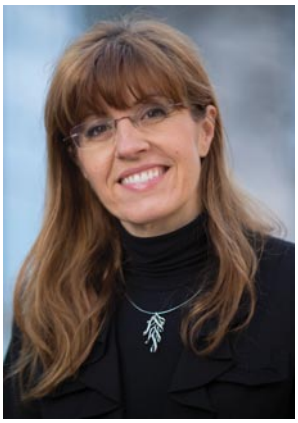
The s-DCT system has increased spatial resolution and enhanced sensitivity and specificity for detection of small lung nodules. The project has the potential of leading to a high-sensitivity, high-specificity, low-dose and low-cost lung cancer screening capability for the general population. Beyond lung cancer screening, the low-dose and highly sensitive 3D DCT lung imaging modality may also be applied in areas such as monitoring pediatric cystic fibrosis patients where reduction of imaging dose is critical. Clinical trials are already under way to test the new device based in Marsico Hall for lung cancer screening. Another prototype based on similar technology has been placed in the N.C. Cancer Hospital and is designed to improve the early detection of breast cancer.

New UNC Lineberger faculty recruited to launch T-cell cancer therapy trials

Two new faculty members have joined the UNC Lineberger Comprehensive Cancer Center to help launch groundbreaking immunotherapy clinical trials that will test an experimental treatment in which patients' own immune cells are genetically engineered to fight their cancer.

Gianpietro Dotti, MD, and Barbara Savoldo, MD, PhD, have joined UNC Lineberger from the Baylor College of Medicine in Houston to help lead the opening of the trials. At Baylor, they worked together for more than 10 years studying this treatment approach. The clinical research program will be the first of its kind at UNC Lineberger and in North Carolina, and is unique to only a handful of academic medical centers around the country.

Dr. Gianpietro Dotti



Dr. Barbara Salvoldo

The type of treatment they will be testing, called Chimeric Antigen Receptor T-cell therapy (CAR-T), involves re-engineering a type of the patient's own disease-fighting white blood T-cells to fight cancer. T-cells are taken from the patient's blood and altered in a specialized lab with "clean rooms" for handling patient materials. The patient's own T-cells are then turned into cancer detectors and fighters that can recognize and kill tumor cells. Once the T-cells are altered and expanded, the cells are given back to the patient. Dotti and Savoldo hope to have clinical trials open by 2016.

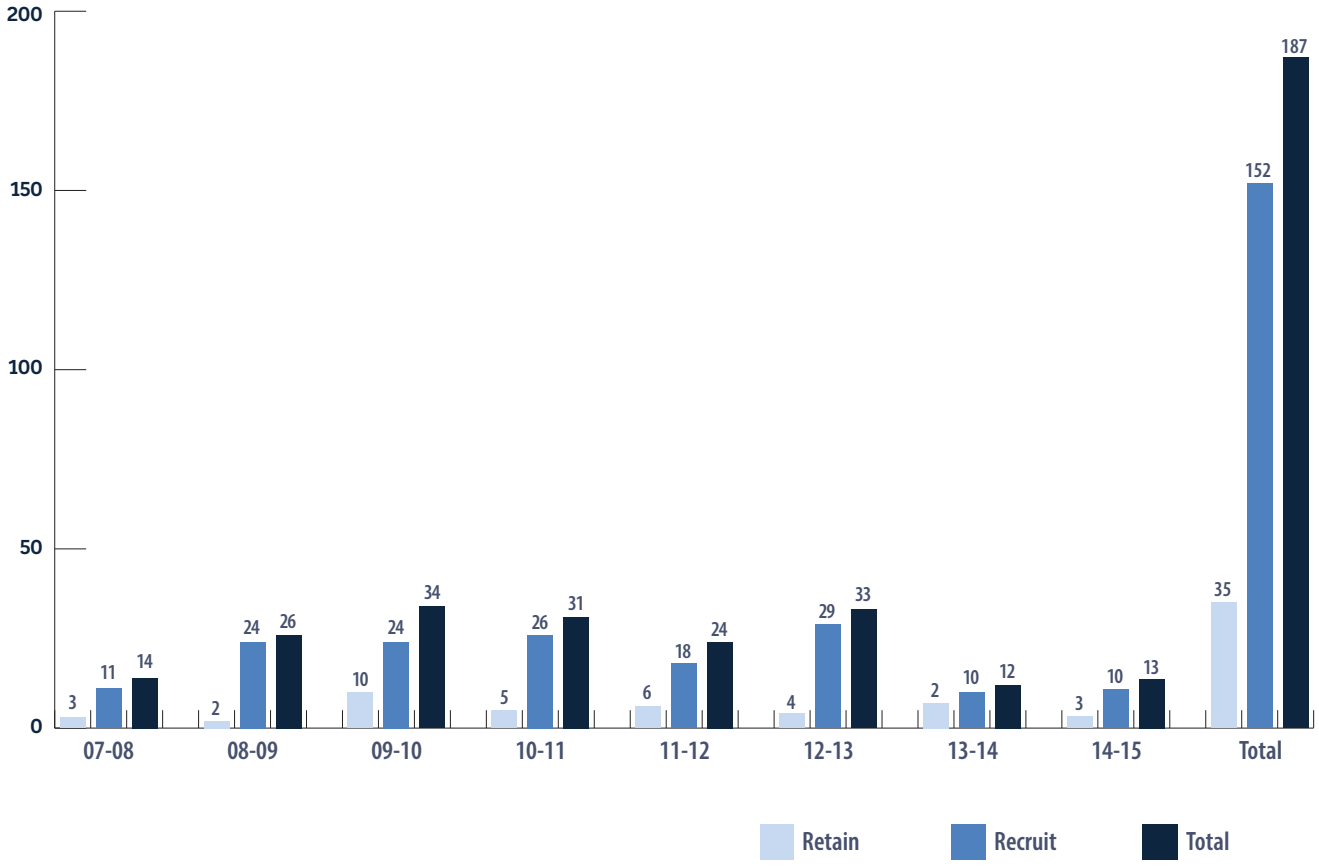
"The launch of these amazing, potentially life-saving clinical trials requires a major, long-term commitment from UNC Lineberger," said UNC Lineberger Director Norman Sharpless, MD. "That would not have been possible without the support of UCRF, which provided funding for the recruitment as well as the construction of the clean room facility."

Drs. Dotti and Salvoldo will perform T-cell testing at the UNC Lineberger Advanced Cellular Therapeutic Facility, which is a specialized lab with "clean rooms" for handling patient materials. These rooms will be GMP-certified, a term referring to the Good Manufacturing Practice Regulations enforced by the US Food and Drug Administration under the authority of the Federal Food, Drug, and Cosmetic Act. GMP certification requires that manufacturers, processors, and packagers of drugs, medical devices and blood products take proactive steps to ensure that their products are safe, pure, and effective.

Building capacity in cancer research

Cancer research is a continually changing field, and new opportunities for strategically important research regularly develop outside the three Tier 1 Research Priorities. Recruiting and retaining outstanding faculty – who are the top experts in their fields and are on the cutting edge of new discoveries – is critical to our efforts to fight cancer, and the Opportunity Fund has successfully helped UNC recruit and retain researchers in order to build capacity in key areas of study. Since the UCRF was established, we have recruited 152 and retained 35 outstanding key researchers.

Recruitment and Retention by Year



Faculty Recruitment

More than 180 top experts have been recruited or retained at UNC with the help of UCRF. During the last year, the following have joined UNC-Chapel Hill and UNC Lineberger.

CRITICAL INFRASTRUCTURE

Yueh (Ray) Lee, MD
Assistant Professor of Radiology
UNC School of Medicine
Department of Radiology

Jason Akulian, MD, MPH
Director, Interventional Pulmonology
Assistant Professor of Medicine
UNC School of Medicine
Department of Medicine – Pulmonary Diseases and Critical Care Medicine

Terence Wong, MD, PhD
Chief, Division of Nuclear Medicine
Director, Molecular Imaging, Biomedical Research Imaging Center (BRIC)
Medical Director of BRIC
UNC School of Medicine
Department of Radiology/BRIC

Jose Zevallos, MD, MPH
Director, Oncologic Research
Assistant Professor, Otolaryngology/Head and Neck Surgery
UNC School of Medicine
Department of Otolaryngology/Head and Neck Surgery

CANCER GENETICS

Bradford Powell, MD, PhD
Assistant Professor
UNC School of Medicine
Department of Genetics

Nirali Patel, MD
Assistant Professor
UNC School of Medicine
Department of Pathology and Laboratory Medicine

Gaorav Gupta, MD, PhD
Assistant Professor
UNC School of Medicine
Division of Radiation Oncology

DEVELOPING NEW TREATMENTS

Yuliya Pylayeva-Gupta, PhD
Assistant Professor
UNC School of Medicine
Division of Immunology

Jeff Aube, PhD
Professor of Chemistry
UNC Eshelman School of Pharmacy
Division of Chemical Biology and Medicinal Chemistry

Barbara Savoldo, MD, PhD
Professor
UNC School of Medicine
Department of Pediatrics
Assistant Director, UNC Lineberger Immunotherapy Program

Gianpietro Dotti, MD
Professor
UNC School of Medicine
Department of Microbiology and Immunology
UNC Lineberger Immunotherapy Program

OPTIMIZING NC OUTCOMES

Pascal Sheeran, PhD
Professor
Department of Psychology
Social Psychology Program at UNC Lineberger

Hazel Nichols, PhD
Assistant Professor of Epidemiology
UNC Gillings School of Global Public Health
Department of Epidemiology

Jennifer Lund, PhD, MSPH
Assistant Professor of Epidemiology
UNC Gillings School of Global Public Health
Department of Epidemiology

Katie Reeder-Hayes, MD, MBA
Assistant Professor
Breast Cancer
UNC School of Medicine
Department of Medicine
Division of Hematology and Oncology

Angela Smith, MD
Assistant Professor of Urology
UNC School of Medicine
Department of Urology

Infrastructure

Marsico Hall fosters collaboration; imaging center among world's best

Marsico Hall, the world-class research facility that opened in April 2014, brings together research teams from across campus under the same roof, further advancing collaboration in cancer research and clinical care. UNC Lineberger members, Eshelman School of Pharmacy faculty members and faculty from UNC School of Medicine are working work side by side in the enhanced laboratory and computational space.

The facility contains UNC's Biomolecular Research Imaging Center (BRIC), the School of Pharmacy's Center for Integrative Chemical Biology and Drug Discovery, the Center of Nanotechnology in Drug Delivery, the Lineberger Comprehensive Cancer Center, Department of Microbiology and Immunology, and the Marsico Lung Institute. Within these spaces are contained laboratories for nanomedicine, pharmacy laboratories, general purpose wet labs and various administrative and support staff spaces.

Lineberger Cancer Center members occupy more than half of Marsico Hall. One of Lineberger's programs that will see significant expansion as a result of Marsico Hall is cancer immunology and immunotherapy, a growing field focused on harnessing the body's own immune system to fight cancer cells. Analysts predict that in 10 years, immunotherapy will be used to treat as many as 60 percent of people with advanced cancer.

Researchers now have access to three floors of imaging technology equipment that will allow us to make significant strides in cancer imaging, drug development and other areas. The 340,000-square-foot building is home to world-class imaging equipment, including a hybrid MRI/PET whole body scanner, a 7 Tesla MRI whole body scanner, and a cyclotron – a machine used to create the isotopes that researchers and clinicians use in their cutting-edge imaging techniques. UNC and Massachusetts General Hospital – in affiliation with Harvard – are the only two academic medical institutions in the country that house all three pieces of technology at one site.

Matt Milowsky, MD, of UNC Lineberger's Urologic Oncology Program, is conducting a clinical trial using the MRI/PET scanner. "We are analyzing how this technology can provide a more accurate image of a patient's cancer," Dr. Milowsky said. "Reviewing blood work and other pathology reports are a great way to monitor our patients' progress during treatment. The scans using this technology — coupled with the pathology — can tell us for sure that a patient is cancer free."

New facility, trials make UNC a unique site for immunotherapy

The successful recruitment of Gianpietro Dotti, MD, and Barbara Savoldo, MD, PhD, will make UNC one of the few places in the nation that can offer immunotherapy as a cure.

“What was once available in only a handful of cancer centers will now be available to patients in North Carolina," said Jon Serody, MD, associate director of translational science at UNC Lineberger and medical oncologist in the UNC Lineberger Leukemia and Lymphoma Program. Serody led the efforts to expand the program and bring Dotti and Savoldo to UNC.

Dotti and Savoldo will initially focus on Hodgkin lymphoma and non-Hodgkin lymphoma, two types of blood cancer marked by the uncontrolled growth of certain white blood cells. They also plan to open a trial for pediatric and adult patients with leukemia, and will work to expand this type of treatment to patients with solid tumors that are currently difficult to treat with standard chemotherapy such as pancreatic, gastric and head and neck cancers.

The research to develop new lines of therapy will be performed in Marsico Hall, but the patient trials will involve the new “clean” facility. This is called a good manufacturing practices (GMP) facility that has been constructed with UCRF funds. This will pave the way for these trials to open in early 2016. The GMP Facility will be led by facility director Paul Eldridge, PhD, who was recruited by UCRF from a similar position at St. Judes. It will be the only facility in the southeast to produce the cells needed to deliver T-cell immunotherapy, allowing UNC oncologists to move this remarkable therapy into new diseases.

For the Sandi family, news of UNC’s immunotherapy program is welcome. Less than two years ago, Carlos and Tina Sandi’s son, Phineas, was diagnosed with acute lymphoblastic leukemia at age 4. He was their second child to be diagnosed with cancer after their daughter, Althea, was diagnosed six years earlier with another form of leukemia. She died from the disease just after her second birthday.

From left: Tina and Carlos Sandi, Phineas, Dr. Roehrs and Fiona Sandi

Within days of his diagnosis, Phineas was undergoing an aggressive chemotherapy treatment at UNC for his disease. Unfortunately, the treatments did not work. For the next stage in his care – a bone marrow transplant – Phineas needed to be cancer-free. With the chemotherapy not working, Phineas’ care team, led by Philip Roehrs, MD, searched for other options and found a clinical trial testing a groundbreaking form of treatment called T-cell immunotherapy at the National Institutes of Health in Maryland.

“We had heard about these experimental trials that used a patient’s immune system to fight the cancer,” said Carlos. “The last thing we wanted to do was leave Chapel Hill and switch care teams, but at that point, it really was his only remaining option.”

Phineas completed the NIH trial and was in full remission within 28 days. Back at UNC following the trial, Phineas successfully underwent his transplant.

The Sandis are "thrilled" that T-cell immunotherapy trials are coming to UNC. "This will give people hope where there used to be no other options," Tina said. "It could mean that their children get to live, that they will get to see their children grow up instead of planning their funerals. That's what this really comes down to."

Telemedicine connects UNC oncologists to communities, patients

The UCRF has significantly improved UNC's ability to connect with oncologists and cancer patients across North Carolina who can tap into expertise from UNC oncologists in many ways. Multiple practices across the state participate in clinical trials without leaving the comforts of their hometown.

With UCRF funds, UNC oncologists and staff developed a telemedicine infrastructure that can connect to physicians and practice sites across the state on a regular basis, allowing access to experts in specific cancers. For example, UNC faculty regularly hold virtual "tumor boards" – an in-depth review of a particular patient's case with a team of doctors – to review pediatric cancer cases at Mission Health in Asheville, NC.

Through the telemedicine program, Dr. Todd Baron is sharing his advanced endoscopy techniques with thousands of physicians and surgeons throughout the state, U.S. and around the globe.

"It is a great benefit to consult and collaborate with a multidisciplinary team of caregivers at UNC on my cases without having to travel to Chapel Hill every other week," said Krystal Bottom, MD, pediatric oncologist at Mission Children's Hospital.

Physician-to-patient telemedicine consultations also are provided in selected specialties that are lacking in rural communities. Clinicians in the Comprehensive Cancer Support Program led by UCRF-recruited expert in psycho-oncology, Don Rosenstein, MD, also use the technology to connect with patients directly, offering virtual counseling sessions for mental health support or genetic counseling in areas of the state where these aspects of care are in short supply.

UCRF has also launched the successful UNC Lineberger Oncology Telehealth Program. Using the infrastructure supported by UCRF funds, the team connects with health care providers across North Carolina in real time to discuss best practices for patient care and cutting-edge research. Since 2012, UNC has hosted more than 120 lectures with over 6,300 live viewings of these broadcast events. Each lecture is also recorded and made available online to the public. Topics range from "Parenting with Cancer" to "Neoadjuvant Approaches to Breast Cancer" with each lecture on average reaching 62 medical professionals – nurses, doctors, physician assistants, nurse practitioners, pharmacists, social workers, nutritionists and clinic managers in over 50 oncology practices across the state. Offering continuing education credits for RNs, MDs, NPs, radiation technologists and others also allows us to support the professional development of North Carolina's health care workforce.

UNC Lineberger supports cancer survivors thanks to Duke Endowment Grant

In January 2015, UNC Lineberger's Comprehensive Cancer Support Program (CCSP) announced the creation of a statewide cancer survivorship network called the N.C. Cancer Survivorship Provider Action Network (NC-CSPAN). Thanks to a new $461,750 grant from The Duke Endowment, NC-CSPAN will substantially improve access to survivorship care for cancer survivors, as well as their family members, friends and caregivers.

Dr. Don Rosenstein, founder of NC-CSPAN

Statistics show that there are approximately 14.5 million cancer survivors nationwide, with nearly 350,000 of them living in North Carolina. And while it's a positive thing that there are growing numbers of individuals surviving long-term and disease-free after a cancer diagnosis, many survivors have emotional and physical needs that are currently not being met.

"Many survivors say they felt as if they had lots of support during their cancer treatment, but once it ended, it was hard to make a transition to a new way of life," explains Donald Rosenstein, MD, CCSP director, UNC Lineberger member and founder of the new network. "The reason for our focus on survivorship care is that many patients in rural North Carolina have very limited access to post-cancer treatment programs that address follow-up care, exercise, nutrition and psychological coping."

In general, the U.S. medical care system primarily focuses on curing the cancer but does less to address how to manage the after-effects of the disease. Patients are often left wondering how frequently they need to be seen after treatment ends and what follow-up tests need to be performed. The cancer may be gone, but patients are often troubled by persistent symptoms and side effects of treatment like pain, fatigue or depression. Finally, cancer survivors may neglect other aspects of their health because they concentrate on monitoring themselves for cancer reoccurrence. The fact is, many adult cancer survivors are at risk for from other health issues like cardiovascular disease, stroke or diabetes complications.

CCSP's response to the challenge of the growing needs of North Carolina cancer survivors was innovative. This summer, a portion of their grant enabled 13 health care providers from all over the state to come to Chapel Hill for a two-day training to learn how to run a Cancer Transitions® group intervention. Attendees learned how to educate cancer survivors on nutrition, exercise, stress management and health maintenance. Two more groups of survivorship providers will be trained in January and June of 2016.

"As the only public comprehensive cancer center in North Carolina, UNC Lineberger has an obligation to address the needs of underserved cancer survivors," says Dr. Rosenstein. "This grant will allow us to train a variety of health care professionals and educators, carefully selected with geographic consideration, to help meet those needs."

James B. Duke

THE DUKE ENDOWMENT



BUDGET AND EXPENDITURES

UNIVERSITY CANCER RESEARCH FUND

2015 LEGISLATIVE REPORT

UNC LINEBERGER

BUDGET AND EXPENDITURES

UCRF Funding Sources

The 2007 law that established the University Cancer Research Fund stated that North Carolina should provide a minimum of $50 million annually for cancer research under UNC Hospitals, the UNC Lineberger Cancer Center, or both. The UCRF initially received $25 million in 2007 and $40 million in 2008 before reaching its fully authorized funding amount of $50 million in 2009.

The UCRF was initially funded by three sources of support: tobacco settlement funds, taxes on other (non-cigarette) tobacco products such as snuff, and state appropriations. Since 2009, total funding has fallen short of the $50 million objective stated in the 2007 law due to lower than expected receipts from the tax on other tobacco products. Under the original law, the Fund received $8 million per year in tobacco settlement funds, and approximately $16 million in state appropriations is allocated annually. In the 2013-2014 budget, the General Assembly eliminated tobacco settlement funds as a source of support, which resulted in a 16 percent reduction to the UCRF, but kept the tax proceeds and state appropriations funding streams intact. State-appropriated funding in 2015 was anticipated to be $43.1 million. The actual proceeds from the tax on other tobacco products (OTP) exceeded projections, leading to total funding of $43,880,863.

FY 14-15 Anticipated and Actual Fund Revenue	Amount *
Anticipated	
State Appropriation	16,020,000
Projected OTP Tax Receipts	27,080,000
Total	43,100,000
Actual	
State Appropriation	16,020,000
Actual OTP Tax Receipts	27,860,863
Total	43,880,863

* Rounded to the nearest dollar

Fund Balance

Though OTP receipts for the year were higher than anticipated, receipts for June 2015 were significantly lower than April and May 2015 and compared with June 2014. This led to a negative balance of $216,390.

FY 14-15 Budget and Expenditures	Amount $
Anticipated Budget	
Revenue	43,100,000
Carryover from FY14	(131)
Total	43,099,869
Actual Budget	
Revenue	43,880,863
Carryover from FY14	(131)
Total	43,880,732
Expenditures	44,097,122
Balance	(216,390)

* Rounded to the nearest dollar

Restrictions on the Use of UCRF Monies

The General Assembly created the University Cancer Research Fund as part of the 2007 budget. G.S. 116 29.1 established the Fund as a special revenue fund in the Office of the President of the University of North Carolina. The law also established the Cancer Research Fund Committee as an oversight measure to provide accountability, and explicitly stated that allocations from the fund "shall be made in the discretion of the Cancer Research Fund Committee and shall be used only for the purpose of cancer research under UNC Hospitals, the Lineberger Comprehensive Cancer Center, or both."

As the Cancer Research Fund Committee, led by its Chairman, then-UNC President Erskine Bowles, developed the UCRF Strategic Plan in 2009, each potential use of UCRF resources was evaluated according to the following questions:

- Will it address North Carolina's needs in terms of the goal of reducing the cancer burden in the state?
- Can we be world class at it? (Does it build on existing strengths, and is there an opportunity to lead?)
- Is there a strong economic model/justification for UCRF investment?

Based on these questions, the Committee developed a clear set of rules to guide how UCRF funds would be best spent. The Committee determined that UCRF funds should focus major resources on a limited set of opportunities to have the greatest impact; fund initiatives where UNC has the opportunity to establish a leadership position; be self-sustaining and provide leverage for additional extramural funding; build

fundamental cancer-related research capabilities that benefit UNC research programs; and enhance North Carolina's economy by creating jobs, intellectual property, and startup companies.

To maximize the effectiveness of the state's cancer investment and to ensure wise and responsible use of the funding, the Strategic Plan imposed additional restrictions on the use of these funds, instructing that UCRF funds should not:

- Invest broadly in an effort to make incremental improvements everywhere;
- Provide funding that would limit future flexibility;
- Undermine faculty innovation and competitiveness by eliminating the need for extramural grant funding;
- Substitute for existing university or health system funding or new philanthropy;
- Make expenditures based upon institutional or other needs outside cancer research; or
- Negatively impact other research on campus, for example by appropriating shared research infrastructure or resources.

Expenditures of State Funds related to UCRF

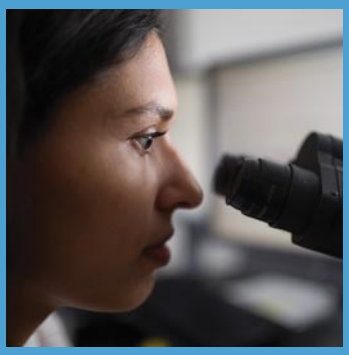
As mandated by G.S. 116-29.1(g), the table below provides an accounting of expenditures of state funding related to the University Cancer Research Fund. Further details regarding these expenditures are included as appendices to this report.

Categories	YTD Actual
Strategic Plan Categories	
Tier 1: Research Priorities	
Understanding Genetics	7,604,787
Developing Novel Therapies	6,813,422
Optimizing Outcomes	6,660,016
Tier 2: Opportunity Fund	8,890,623
Tier 3: Critical Infrastructure	
Clinical Excellence – Research & Outreach	6,489,203
Research & Tech Development and Training	7,639,071
Total	44,097,122

Conclusion

The University Cancer Research Fund continues to fuel innovative research that will improve the prevention and treatment of cancer as well as outcomes for patients. It aligns with UNC's mission of public service and fosters collaborations with other universities, with the private sector, and with communities all across North Carolina. The UCRF is leveraging tremendous amounts of external funding, and creates jobs and commercialization opportunities that will benefit our economy and the health of cancer patients. Its total economic impact shows a 5-to-1 return on investment.

The economic and health impacts of the UCRF have been meaningful for our state, and will continue to be so. We are sincerely grateful for the General Assembly's ongoing support of this landmark initiative, and we continue to utilize these funds responsibly, strategically and effectively. The University Cancer Research Fund is a vital tool in our work to defeat our state's deadliest disease, and this remarkable investment by the state will have a lasting impact both in North Carolina and beyond.



APPENDIX

UNIVERSITY CANCER RESEARCH FUND

2015 LEGISLATIVE REPORT

UNC LINEBERGER

APPENDIX

ESTABLISHING LEGISLATION

§ 116-29.1. University Cancer Research Fund
(as modified by SL 2013-360)

(a) Fund. – The University Cancer Research Fund is established as a special revenue fund in the Office of the President of The University of North Carolina. Allocations from the fund shall be made in the discretion of the Cancer Research Fund Committee and shall be used only for the purpose of cancer research under UNC Hospitals, the Lineberger Comprehensive Cancer Center, or both.

(b) Effective July 1 of each calendar year, the funds remitted to the University Cancer Research Fund by the Secretary of Revenue from the tax on tobacco products other than cigarettes pursuant to G.S. 105-113.40A is appropriated for this purpose are appropriated for this purpose.

(c) Cancer Research Fund Committee. – The Cancer Research Fund Committee shall consist of five ex officio members and two appointed members. The five ex officio members shall consist of the following: (i) one member shall be the Chancellor of the University of North Carolina at Chapel Hill, (ii) one member shall be the Director of the Lineberger Comprehensive Cancer Center, (iii) one member shall be the Dean of the School of Medicine at The University of North Carolina, (iv) one member shall be the Dean of the School of Pharmacy at The University of North Carolina, and (v) one member shall be the Dean of the School of Public Health at The University of North Carolina. The remaining two members shall be appointed by a majority vote of the standing members of the Committee and shall be selected from persons holding a leadership position in a nationally prominent cancer program.

If any of the specified positions cease to exist, then the successor position shall be deemed to be substituted in the place of the former one, and the person holding the successor position shall become an ex officio member of the Committee.

(d) Chair. – The chair shall be the Chancellor of the University of North Carolina at Chapel Hill.

(e) Quorum. – A majority of the members shall constitute a quorum for the transaction of business.

(f) Meetings. – The Committee shall meet at least once in each quarter and may hold special meetings at any time and place at the call of the chair or upon the written request of at least a majority of its members. (2007-323, s. 6.23(b); 2009-451, s. 27A.5(e); 2010-31, s. 9.12.)

(g) Report. – By November 1 of each year, the Cancer Research Fund Committee shall provide to the Joint Legislative Education Oversight Committee and to the Office of State Budget and Management an annual financial report which shall include the following components:

(1) Accounting of expenditures of State funds related to strategic initiatives, development of infrastructure, and ongoing administrative functions.

(2) Accounting of expenditures of extramural funds related to strategic initiatives, development of infrastructure, and ongoing administrative functions.

(3) Measures of impact to the State's economy in the creation of jobs, intellectual property, and start-up companies.

(4) Other performance measures directly related to the investment of State funds.

(5) Accounting of any fund balances retained by the Fund, along with information about any restrictions on the use of these funds.

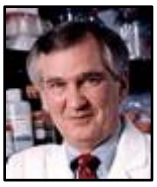
APPENDIX

CANCER RESEARCH FUND COMMITTEE

Cancer Research Fund Committee

The legislatively established Cancer Research Fund Committee, chaired by Carol Folt, Chancellor of the University of North Carolina at Chapel Hill, oversees the University Cancer Research Fund. The seven-member committee includes five ex-officio members designated by the legislation who elect two at-large members. The at-large members are to be leaders at nationally prominent cancer programs. Currently, the two are Drs. Edward Benz (President and CEO, Dana Farber Cancer Institute) and John Mendelsohn (President Emeritus, MD Anderson Cancer Center).

Carol Folt, PhD, Chair
Chancellor
The University of North Carolina at Chapel Hill



Edward J. Benz, MD
President and Chief Executive Officer
Dana Farber Cancer Institute

Robert Blouin, PharmD
Dean
Eshelman School of Pharmacy
The University of North Carolina at Chapel Hill

Ned Sharpless, MD
Director
UNC Lineberger Comprehensive Cancer Center
The University of North Carolina at Chapel Hill

John Mendelsohn, MD
President Emeritus
The University of Texas M. D. Anderson Cancer Center

Barbara K. Rimer, DrPH
Dean
Gillings School of Global Public Health
The University of North Carolina at Chapel Hill

William L. Roper, MD, MPH
Dean, UNC School of Medicine
Vice Chancellor for Medical Affairs
CEO, UNC Health Care

APPENDIX

FY 14-15 EXPENDITURES

UNC LINEBERGER

UCRF Fiscal Year 2015

Strategy	Sum of Annual Budget	Sum of Year to Date Actual	Sum of Cash Balance
Tier 1: Strategic Themes - Theme 1: Optimizing NC Cancer Outcomes	$6,200,000	$6,660,016	-$460,016
Theme 2: Understanding Genetics in Cancer- Basic approaches & Clinical Applications	$7,105,863	$7,604,787	-$498,924
Theme 3: Develop New Cancer Treatments	$7,300,000	$6,813,422	$486,578
Tier 2: Opportunity Fund **	$9,200,000	$8,890,623	$309,377
Tier 3: Infrastructure- Clinical Excellence and Outreach	$6,875,000	$6,489,203	$385,797
Infrastructure	$7,200,000	$7,639,071	-$439,071
Grand Total	**$43,880,863**	**$44,097,122**	**-$216,259**

**Received $780,863 more in cash than budgeted.

Expenditures for Fiscal Year 2015 -		
Obj Name	Sum of Year To Date Actual	% of Expense to Total Expenditure
Faculty Salaries	$12,734,865.17	28.88%
EPA Student Salaries	$3,186,725.87	7.23%
Staff Salaries	$6,113,426.33	13.86%
Other Staff	$323,041.46	0.73%
Benefits	$5,366,494.86	12.17%
HCS Contracted Serv	$277,342.09	0.63%
Faculty/Non Faculty Benefits	$0.00	
Phy Benefits	$187,772.22	0.43%
Other Staff Benefits	$121,158.22	0.27%
Transit Tax	$64,235.77	0.15%
Consultants/Contracted Services	$481,623.45	1.09%
Employee Education	$16,144.00	0.04%
Repairs and Maint	$1,304,071.87	2.96%
Other Current Services	$4,364,974.57	9.90%
Supplies, Other	$4,319,744.36	9.80%
Travel	$346,859.55	0.79%
Freight and Exp	$0.00	0.00%
Maintenance Contracts	$861,592.37	1.95%
Advertising	$12,479.25	0.03%
Meetings & Amenities	$43,168.81	0.10%
Transfer Computer Science	$0.00	
Printing and Binding	$39,346.49	0.09%
Communication	$91,001.70	0.21%
Contracted Serv	$0.00	
Computer Services	$99,535.67	0.23%
Rental/Lease Facilities	$606,017.06	1.37%
Other Fixed Charges	$80,198.08	0.18%
Rental Equipment	$0.00	0.00%
Equipment	$1,801,123.45	4.08%
Study Subjects & Exp	$225,797.78	0.51%
Employee on Loan	$0.00	
Insurance	$100.00	0.00%
Student Support	$951,543.48	2.16%
#N/A	$0.00	
Utilities	$69,763.07	0.16%
Legal Fees	$6,975.00	0.02%
HIPAA Deduct		
Grand Total	$44,097,122.00	100.00%

UCRF Funding by Strategy and Expense

Strategy	Obj Name	Annual Budget	Current Month	Year to Date Actual
Theme 1: Optimizing NC Cancer Outcomes	Budget			
	Faculty Salaries			2,601,401.75
	EPA Student Salaries			205,560.62
	Staff Salaries			1,168,969.96
	Other staff			69,358.99
	Benefits			1,055,746.72
	Phy Benefits			4,985.94
	Other Staff Benefits			22,109.40
	Transit Tax			11,382.00
	Consultants/Contracted Services			40,230.52
	Employee Education			(1,499.00)
	Repairs and Maint			586.35
	Other Current Services			98,376.15
	Supplies, Other			384,541.13
	Travel			78,068.81
	Legal Fees			2,050.00
	Maintenance Contracts			27,852.45
	Advertising			
	Meetings & Amenities			1,176.56
	Printing and Binding			2,273.64
	Communication			46,021.78
	Contracted Serv			
	Computer Services			55,019.20
	Rental/Lease Facilities			318,557.73
	Other Fixed Charges			
	Equipment			167,250.72
	Study Subjects & Exp			205,378.60
	Student Support			94,615.98
	Equip Rental			
	HCS Residents			
Theme 1: Optimizing NC Cancer Outcomes Total		0.00	0.00	6,660,016.00

UCRF Funding by Strategy and Expense				
Strategy	Obj Name	Annual Budget	Current Month	Year to Date Actual
Theme 2:Understanding Genetics in Cancer - Basic Approaches & Clinical Applications	Budget			
	Faculty Salaries			1,798,460.51
	EPA Student Salaries			270,954.36
	Staff Salaries			1,315,172.30
	Other staff			71,291.84
	Benefits			924,172.76
	HCS Contracted Serv			
	Phy Benefits			11,301.01
	Other Staff Benefits			18,040.71
	Transit Tax			9,306.34
	Consultants/Contracted Services			150,589.18
	Employee Education			1,228.00
	Repairs and Maint			914.70
	Other Current Services			973,007.60
	Supplies, Other			1,212,268.57
	Travel			65,134.54
	Maintenance Contracts			219,298.90
	Advertising			
	Meetings & Amenities			169.00
	Printing and Binding			10,428.13
	Communication			5,515.59
	Computer Services			24,610.74
	Rental/Lease Facilities			202,990.97
	Other Fixed Charges			71,816.72
	Equipment			67,517.81
	Insurance			
	Study Subjects & Exp			25.00
	Student Support			110,808.65
	#N/A			
	Utilities			69,763.07
Theme 2:Understanding Genetics in Cancer Total		0.00	0.00	7,604,787.00

UCRF Funding by Strategy and Expense				
Strategy	Obj Name	Annual Budget	Current Month	Year to Date Actual
Theme 3: Developing New Cancer Treatment	Budget			
	Faculty Salaries			1,717,080.66
	EPA Student Salaries			538,271.25
	Staff Salaries			295,152.07
	Other staff			12,777.80
	Benefits			610,004.49
	Faculty/Non Faculty Benefits			
	Phy Benefits			
	Other Staff Benefits			13,828.67
	Transit Tax			7,119.25
	Consultants/Contracted Services			1,470.00
	Employee Education			
	Repairs and Maint			13,322.13
	Other Current Services			2,072,595.55
	Supplies, Other			599,101.77
	Travel			34,420.98
	Maintenance Contracts			205,364.15
	Advertising			
	Meetings & Amenities			60.00
	Transfer Computer Science			
	Printing and Binding			60.00
	Communication			1,391.13
	Computer Services			10,480.00
	Rental/Lease Facilities			61,030.52
	Other Fixed Charges			
	Rental Equipment			
	Equipment			563,612.67
	Employee on Loan			
	Insurance			
	Student Support			55,453.91
	#N/A			
	Legal Fees			825.00
Theme 3: Developing New Cancer Treatment Total		0.00	0.00	6,813,422.00

UCRF Funding by Strategy and Expense				
Strategy	Obj Name	Annual Budget	Current Month	Year to Date Actual
Tier 2: Opportunity Fund	Budget			
	Faculty Salaries			1,189,943.25
	EPA Student Salaries			1,070,297.10
	Staff Salaries			541,170.30
	Other staff			95,389.11
	Benefits			621,842.67
	Faculty/Non Faculty Benefits			
	Phy Benefits			17,256.50
	Other Staff Benefits			15,750.14
	Transit Tax			9,926.54
	Consultants/Contracted Services			13,415.58
	Employee Education			800.00
	Repairs and Maint			1,262,462.53
	Other Current Services			875,039.82
	Supplies, Other			1,938,662.17
	Travel			87,525.68
	Maintenance Contracts			136,793.82
	Advertising			
	Meetings & Amenities			107.25
	Printing and Binding			19,740.14
	Communication			16,717.85
	Computer Services			1,685.00
	Other Fixed Charges			2,554.78
	Rental/Lease Facilities			11,679.44
	Equipment			749,367.79
	Legal Fees			2,050.00
	Study Subjects & Exp			8,853.00
	Student Support			201,592.54
	Utilities			
Tier 2: Opportunity Fund Total		0.00	0.00	8,890,623.00

UCRF Funding by Strategy and Expense				
Strategy	Obj Name	Annual Budget	Current Month	Year to Date Actual
Tier 3: Infrastructure - Clinical Excellence and Outreach	Budget		0.00	0.00
	Faculty Salaries			3,963,218.62
	EPA Student Salaries			76,068.28
	Staff Salaries			597,040.70
	Other Staff			
	Benefits			1,011,191.49
	HCS Contracted Serv			277,342.09
	Phy Benefits			149,640.10
	Other Staff Benefits			25,006.28
	Transit Tax			12,873.53
	Consultants/Contracted Services			859.81
	Employee Education			15,615.00
	Repairs and Maint			6,908.01
	Other Current Services			207,411.18
	Supplies, Other			51,265.55
	Travel			23,562.43
	Maintenance Contracts			24,154.99
	Advertising			
	Meetings & Amenities			4,387.50
	Printing and Binding			867.89
	Communication			20,252.79
	Contracted Serv			
	Computer Services			6,724.61
	Rental/Lease Facilities			10,534.40
	Other Fixed Charges			0.00
	Equipment			
	Insurance			
	Study Subjects & Exp			150.00
	Employee on Loan			
	Student Support			4,127.75
	Rental Equipment			
	HCS Residents			
Tier 3: Infrastructure - Clinical Excellence and Outreach Total		0.00	0.00	6,489,203.00

UCRF Funding by Strategy and Expense				
Strategy	Obj Name	Annual Budget	Current Month	Year to Date Actual
Infrastructure	Budget			
	Faculty Salaries			1,464,760.38
	EPA Student Salaries			1,025,574.26
	Staff Salaries			2,195,921.00
	Other Staff			74,223.72
	Benefits			1,143,536.73
	HCS Contracted Serv			
	Faculty/Non Faculty Benefits			
	Phy Benefits			4,588.67
	Other Staff Benefits			26,423.02
	Transit Tax			13,628.11
	Consultants/Contracted Services			275,058.36
	Employee Education			
	Repairs and Maint			19,878.15
	Other Current Services			138,544.27
	Supplies, Other			133,905.17
	Travel			58,147.11
	Freight and Exp			
	Maintenance Contracts			248,128.06
	Advertising			12,479.25
	Meetings & Amentites			37,268.50
	Transfer Computer Science			
	Printing and Binding			5,976.69
	Communication			1,102.56
	Contracted Serv			
	Computer Services			1,016.12
	Rental/Lease Facilities			1,224.00
	Other Fixed Charges			5,826.58
	Equipment			253,374.46
	Insurance			100.00
	Legal Fees			2,050.00
	Study Subjects & Exp			11,391.18
	Employee on Loan			
	Student Support			484,944.65
	#N/A			
Infrastructure Total		0.00	0.00	7,639,071.00
Grand Total		0.00	0.00	44,097,122.00

APPENDIX

UCRF STRATEGIC PLAN

The following Strategic Plan, created in 2009, has guided the University Cancer Research Fund for the last five years. The Plan was refreshed in the spring of 2015, and the results of that process are included.

EXECUTIVE SUMMARY

Beginning in January 2014, Cancer Center Director Norman Sharpless, MD, initiated a thorough strategic review to analyze the outcomes of the initiatives, recruitment, and infrastructure developed under the previous University Cancer Research Fund (UCRF) strategic plan (2008). Using the outcomes of this review, we have begun planning the next five years in light of past successes, current realities, and future opportunities. This strategic plan summarizes the current state of the Cancer Center, the review process, and draft priorities and strategies for the next five years. It is a work in progress to be augmented by results from the NCI review of the UNC Lineberger Comprehensive Cancer Center; we hope to have it fully developed and implemented by Fall, 2015 (see timeline at the end of this document).

MISSION STATEMENT

With research that spans the spectrum from the laboratory to the bedside to the community, UNC Lineberger faculty work to understand the causes of cancer at the genetic and environmental levels, to conduct groundbreaking laboratory research, and to translate findings into pioneering and innovative clinical trials. Our responsibility as the state's public Comprehensive Cancer Center and the state's safety net hospital makes a broad, multidisciplinary care approach necessary, along with programs to disseminate quality care metrics, clinical research opportunities, and cancer support concepts throughout North Carolina.

OVERVIEW OF THE CANCER CENTER

The UNC Lineberger is a matrix center organized to deliver a comprehensive program of care, early detection and prevention, and to perform research in three broad areas: Basic, Clinical, and Population Sciences. In each research area, the UNC Lineberger administrative structure organizes faculty into programs featuring similar research, teaching technologies and practices. The Center facilitates inter- and intra-programmatic collaboration, as well as cross-campus and inter-institutional relationships, by multiple mechanism and investments. UNC Lineberger enjoys a remarkably collegial culture conducive to the production of world-leading research in all three major areas. In the clinical arena we are organized into 15 multidisciplinary groups, including a Comprehensive Cancer Support Program that serves our patients and the state. Our multidisciplinary teams see approximately 10% of North Carolina's new cancer cases each year.

Clinical/Translational

Clinical research encompasses therapeutic trials featuring correlative science and innovative trials design; important surgical care investigations; novel radiographic imaging; and new approaches in radiation oncology. UNC Lineberger members in the Clinical Research and Breast Cancer programs incorporate promising basic science leads into clinical investigations that in turn feed back to the laboratories to refine scientific approaches. The Center's clinical care is provided through 15 multidisciplinary disease-specific groups that provide state-of-the-art care across disciplines and serve UNC Lineberger clinical research efforts by prioritizing clinical questions and trials. Our clinical trials portfolio is increasingly guided by an understanding of genomics and tumor molecular subsets.

Population Sciences

The UNC Lineberger population science research programs, Cancer Prevention and Control and Cancer Epidemiology, are aimed at understanding cancer causation, prevention, early detection, and outcomes at the individual, community and population levels. Their objective is to reduce cancer incidence, and improve its outcome. These faculty contribute to translational science and to collaborations (e.g., between oncology; social and behavioral science; epidemiology; and genetics/genomics) that can lead to new discoveries, conceptual models, and strategies to reduce the burden of cancer in diverse populations.

Basic Research

LCCC basic research addresses fundamental aspects of cancer cell biology; cancer immunology; molecular therapeutics; oncogenic viruses; cancer vaccine development; and the genetic basis of cancer, translating the findings into the clinical arena using multidisciplinary groups of laboratory-based investigators, statisticians, clinicians and clinical researchers. The basic research programs at UNC Lineberger include Cancer Cell Biology, Immunology, Molecular Therapeutics, Virology, and Cancer Genetics.

Overarching goals:

Continue to stay on cutting-edge of cancer research, leading the nation in new discoveries leading to cures; make a demonstrable impact on cancer care and prevention in the state; and ensure financial sustainability through stewardship of Center funds.

STRATEGIC DIRECTIONS FOR THE RESEARCH PROGRAMS

Over the last five years, the UNC Lineberger has successfully recruited >100 and retained 24 faculty members; total extramural support to the UNC Lineberger members has increased from $169 to $280M; NCI funding has risen from $64M to $71M—an 11% increase during a period when national NCI funding has been flat. UNC is now ranked 7th in NIH awards and 11th in NCI awards, up from 11th and 14th, respectively. Spending on the priority areas has garnered an estimated six-year total economic impact of over $1.2B for North Carolina. Innovative Pilot Awards totaling more than $8M have led to extramural cancer-related grants totaling almost $35M.

Using state and institutional funds, the UNC Lineberger has made major investments in key areas of cancer research identified through a Center-wide strategic planning process led by the Director. The planning process first took place in 2008, and then again in 2014, as described below. Examples of significant institutional investments are expanded programs in nanotechnology and drug discovery, which have resulted in UNC being named one of 12 NCI sites for Comprehensive Chemical Biology and Drug Discovery and one of nine NCI Centers of Nanotechnology Excellence; next generation sequencers and data storage, which have allowed the UNC Lineberger to obtain renewal and leadership as a Cancer Genome Atlas site; clinical research faculty and capabilities, which have resulted in the award of three major NCI NCTN clinical trials grants; and investments in population and health services research, supporting the Carolina Breast Cancer Study Phase 3, a statewide outcomes research infrastructure (ICISS), and a 10,000-patient Cancer Survivorship Cohort.

The UNC Lineberger has developed clear parameters for strategically supporting research activities at the Center. UCRF funds should:

- Focus major resources on a limited set of opportunities in order to have the greatest impact
- Fund initiatives where UNC has the opportunity to establish a leadership position
- Be catalytic, self-sustaining, and provide leverage for additional funding from extramural sources
- Build fundamental cancer-related research capabilities that benefit UNC research programs
- Enhance North Carolina's economy by creating jobs, intellectual property, and start-up companies.

Research priorities for the UCRF established in the 2008 strategic planning process were chosen based on their ability to reduce the cancer burden in North Carolina, their potential for broad and significant leadership in the research field, and their chances of being competitive for sustainable funding so as to justify investment. Three interconnected thematic research priorities were established as key strategic focus areas:

- Understanding Genetics and its Role in Cancer Causation and Treatment,
- Developing New Cancer Treatments, and
- Optimizing NC Cancer Outcomes.

The **Cancer Genetics** initiative seeks to track down inherited differences to determine whom to target for early detection, prevention and specific therapies, and will identify the derangements in individuals' tumors in order to individualize therapy. The initiative pursues these goals by integrating and expanding strengths at UNC in genetic and molecular analysis from basic science through clinical application, and enabling integrated, high-throughput analyses. This vision is being realized through strategic recruitment of faculty in emerging fields, farsighted investment in cutting-edge technology, enhanced organizational capability for integrative analysis, and a focus on cancers that are especially amenable to this approach.

The **New Cancer Treatments** initiative seeks to devise novel therapies targeted to the specific vulnerabilities of cancers, to prevent the emergence of resistant cancer cells and to eliminate cancer initiating cells that appear to prevent cancer cure by evading therapy and repopulating tumor sites. Research also focuses on new ways of delivering cancer drugs to reduce toxicity. UNC Lineberger Chemical Biology/Drug Discovery is becoming the model for academic drug discovery and delivery research in cancer, providing an outlet for UNC investigators to test innovative ideas in drug development, which will improve delivery and efficacy of cancer therapies.

Another example of UNC's strategic leadership in this area is imaging. Institutions that have a substantial track record of cancer imaging innovations have had faculty interested in this that drove the program and helped those institutions develop world class, very expensive capabilities. Most of those were associated with departments of Radiology and imaging institutes in places such as Washington University, Massachusetts General Hospital, etc. UNC and UNC Lineberger noted a deficiency in our ability to perform and innovate in cancer imaging, particularly combining it with translational clinical trials. The cancer Center and the Department of Radiology combined to recruit eight new faculty to develop the imaging program, ranging from physics to a new head of nuclear imaging and translational research. Innovations from faculty at the college of Arts and Sciences have developed new capabilities using carbon nanotubes as an x-ray source, allowing the development of first of their kind prototypes for breast tomosynthesis and carbon nanotube sourced CT of the lung. Clinical trials have been initiated to use

these two prototypes as screening tools for breast and lung cancer with initial results demonstrating higher resolution and lower dose of x-rays. Our strategic plan over the next five years will be aimed at introducing our clinical and translational faculty into the capabilities afforded by this remarkable investment in equipment and talent. A measure of success will be the number of clinical trials and prevention studies that incorporate high end imaging capabilities.

The **Optimizing Cancer Outcomes** initiative seeks to conduct innovative research to understand how best to deliver preventative and early detection services and high quality care in populations. Working in settings that range from rural communities to physician practices to local governments, researchers from UNC's nation-leading Schools of Public Health and Medicine will systematically design, test, disseminate, implement, and evaluate methods to identify and modify cancer risk factors to ensure that all North Carolinians have an opportunity to lower their cancer risk, get appropriate treatment and to improve the quality and length of life for cancer survivors. Findings and practices found to be effective will be disseminated and implemented across the state.

Key parts of this initiative have been enabling 1) the creation of a unique, comprehensive cancer information data system that tracks cancer patients, cancer services, and cancer treatment outcomes at a level of detail unprecedented in the United States; 2) the accrual of a 10,000 cancer patient cohort at UNC Hospitals to investigate many questions related to cancer outcomes among cancer survivors including response to therapy, 3) nation-leading research in population health disparities that lead to different cancer risk profiles and poorer outcomes among African Americans and lower socioeconomic status North Carolinians; and 4) research into cost effective methods to increase adoption of evidence-based cancer prevention, early-detection, and quality of care practices by individuals, communities, health systems, and providers. No other such fully integrated and interactive system exists in the United States; North Carolina is assuming a true leadership position in this critical area.

North Carolina Integrated Cancer Information and Surveillance System (ICISS) represents "big data" for population-based cancer research. ICISS includes novel, longitudinal, data linkages between metrics of cancer incidence, health services utilization (multi-payer insurance data), psycho-social risk factors, and mortality. This novel resource can provide answers to important cancer outcomes and comparative effectiveness questions not possible through clinical trials with their more restricted and typically homogeneous populations. ICISS studies have addressed critical issues in cancer research, including cancer comparative effectiveness research (CER), some of which has changed clinical practice and reimbursement for cancer therapy as reported by the Associated Press, Reuters, Medscape, and CBS News. Examples of ICISS study findings include significant disparities of care based on race, socio-economic status, age, distance to care, gender, and geographic location. Stephanie Wheeler found, for example that colorectal screening rates are low and that they vary widely: fewer than 50% of age-eligible, federally-insured individuals received colorectal cancer testing, and geographical region (county), gender, race, age, and distance to endoscopy all predicted CRC testing rates. In other studies, it was found that African Americans, elderly and low income women are less likely to receive sentinel lymph node biopsy; African American women were less likely to initiate adjuvant endocrine therapy of early breast cancer than whites, which greatly affects the efficacy of surgery. Analysis of disparities in our catchment area of the rates of cancer and the rates of screening help us design interventions to prevent and detect cancer in all populations.

STRATEGIC PLANNING PROCESS OVERVIEW

The most recent UNC Lineberger strategic planning was launched in 2013 and continued through 2014. The goals were to evaluate the outcomes of the initiatives, recruitment, and infrastructure developed under the 2008 strategic plan and plan for the next five years in light of past successes, current realities, and future opportunities. The strategic planning firm AltshulerStaats was hired to lead the process.

AlthshulerStaats consultants worked with new Director, Norman Sharpless and the UNC Lineberger Program Planning Committee (PPC) to establish a three-phase process of evaluation and planning. The initial phase included interviews with 17 internal and external stakeholders and a survey of 500 UNC faculty members. The second phase included self-assessment and budget review of key currently-funded initiatives, external written review of these initiatives, and two program presentation sessions for internal assessment and feedback. The final phase was to bring the results of this review to LCCC and University leadership for discussion and planning of next steps.

In the current strategic review, UNC Lineberger members were surveyed about the Center's success at reaching the goals of the 2008 strategic plan, as well as their understanding of how money had been spent and opinions of what other priorities or initiatives might be worth undertaking. External reviewers provided written reports evaluating initiatives and infrastructure developed in each of the priority areas. The following specific initiatives were evaluated:

1. Carolina Breast Cancer Study
2. Cancer Information Surveillance System (ICISS)/ Tumor Registry
3. Health Registry / Survivorship Cohort
4. Health-e-NC
5. Outreach and network
6. Bioinformatics / Medical Informatics
7. Next Gen Sequencing and TCGA
8. Clinical Caner Genetics (UNCseq / RAM lab)
9. Chemical Biology / Drug Discovery
10. Nanotechnology / CHANL
11. Animal Studies (MP1U / Collaborative Cross)
12. Immunotherapy / Immunology
13. Clinical Protocol Office
14. Biomedical Research Imaging Center
15. Faculty recruitment and retention

The review had a high level of participation by UNC Lineberger members, leadership, and external experts. The faculty survey had a 36 percent return rate, and the public presentations, which were also posted on the UNC Lineberger web site, were highly attended and elicited further comments from faculty. External reviewers included 10 from the UNC Lineberger external Scientific Advisory Board (SAB), and 16 non-SAB members, all of whom provided thoughtful written reviews. The results were extremely positive: overall, it was determined that the former strategic plan had built on strengths to great effect, built faculty research capacity to the point of critical mass of expertise in the priority research areas, kept UNC on the cutting edge of research through equipment and infrastructure investment, had a broad impact across campus by catalyzing new cancer research and new researchers, and increased the stature of the UNC Lineberger and UNC nationally.

The external reviews gave excellent criticism on a program-by-program basis, providing positive feedback and recommendations for optimizing return on these investments. The following examples illustrate some of the positive feedback received:

Carolina Breast Cancer Study	• "Unique and high quality resource," will facilitate large number of key studies in future; "Investment … shows true vision"
ICISS	• An "innovative and important asset"; "Well positioned to assume national leadership in the development of a core resource for population based research in cancer care delivery"
Survivorship Cohort	• "Exactly the sort of investment the Cancer Center should be making with state funds. It is an infrastructure and resource that will continue to grow in value with direct benefits to the university and citizens of NC"
Next Generation Sequencing	• "Extraordinary success"; "remarkably productive"; provides a "critical capability"
Chemical Bio/Drug Discovery	• "This center is a real jewel"; "Remarkably cost-effective" – gets an "incredible amount done with minimal costs and staffing"
Collaborative Cross/MP1 Unit	• "Outstandingly successful" – tremendous resource for faculty. "Envy of peer institutions"

The review also highlighted some challenges going forward. Political and economic changes at the state level have created funding uncertainty, which demands closer attention to sustainability of initiatives. Also, the internal survey exposed some lack of awareness of some of the initiatives, which could affect opportunities for collaboration and for extramural support.

STRATEGIC GOALS FOR THE NEXT FIVE YEARS

The overarching strategic goal for 2015-2020 is to continue to lead the nation in research for the prevention, early detection and treatment of cancer. Through that research, we aim to have a demonstrable impact on North Carolina, implementing innovative prevention and detection strategies and improving the cost effectiveness and quality of care. We also aim to ensure good stewardship of center resources, optimizing the return on investment and emphasizing long-term sustainability.

To achieve these goals, the strategic priorities for the next 5 years include the following:

1. Direct research to areas of greatest impact
2. Position the organization for improved collaboration and decision-making.
3. Institute systems to ensure impact and sustainability
4. Improve communication for greater return

1. Direct research to areas of greatest impact

The evaluation and strategic planning process made clear that the major themes of cancer outcomes, cancer genetics, and cancer treatments remained central to UNC Lineberger strengths and potential for

greatest impact. Beyond continuing to invest in the individual areas, as the initiatives mature we will introduce new initiatives within and between these areas that emphasize translation to clinical/population impact. For example, at the nexus of Cancer Genetics and Cancer Treatments, we will introduce new initiatives in applying RNA sequencing technology and epigenetics to cancer care. Both of these areas have been identified as cutting edge areas in which UNC Lineberger has the potential to lead, and work has begun on both of them. Within Cancer Treatments, an initiative in translational immunotherapy is planned. Two new faculty have been recruited from the Baylor Cell and Gene Therapy Program, Gianpietro Dotti MD and Barbara Savoldo MD PhD, to lead this initiative, and we just finished construction of a 7,400 sf GMP facility four miles from the Cancer Center.

In Cancer Outcomes, ICISS and the Survivorship Cohort have grown remarkably over the last several years and are now full-fledged data resources for cutting-edge research into cancer disparities, quality of care, health care cost effectiveness, intervention research and many other areas. A new shared resource has just been proposed to help leverage this infrastructure for UNC Lineberger researchers seeking external funding to analyze cancer outcomes and design targeted interventions based on these data.

UCRF Innovation Awards? are intended to support new research in important areas. Dr. Sharpless brought together a team of Associate Directors (Serody, Rathmell, Ellis, Baldwin) and other leaders (Ribisl), who developed a new mechanism and guidelines over several months. The newly developed process, launched this Spring, was streamlined with twice-per-year due dates and standardized guidelines. We initiated a policy of broader participation in the review process by all UNC Lineberger faculty members, which will have the effect not only of lightening the review load on leadership but also of engaging more faculty in research being done across the Center. The major changes with the new program, however, are the addition of targeted Requests for Applications (RFAs) with each round and the addition of a new award that is larger in scope than those previously offered. The first two targeted RFAs (launched this spring) included one asking for proposals specifically about cancer disparities in the catchment area and another for proposals specifically about chemistry approaches to cancer. The former continues an important area in which the UNC Lineberger is already quite strong. The latter provides an important link with UNC chemists that will eventually enhance therapeutic pipeline development.

A new set of awards will provide up to $300,000 per year of funding to teams of researchers. The major review criteria for this award are translational potential, scientific excellence, and the likelihood that the proposed program will result in submission of multi-investigator grant applications at the conclusion of the pilot funding. Three to five investigators propose cancer research expressly aimed at developing a multi-investigator grant submission to the National Cancer Institute, such as a Program Project Grant or Specialized Program of Research Excellence (SPORE) grant. In our first round of the new mechanism, three teams have submitted program project grants.

2. <u>Position the organization for improved collaboration and decision-making</u>.

It was made clear through the strategic planning process that UNC Lineberger leaders and members at all levels have important insights crucial to the running of the UNC Lineberger research enterprise. Moreover, members expressed a desire for greater engagement with decision-making and more connections with other faculty across the Center. Dr. Sharpless has initiated many changes to meet these desires and needs: all Center programs now have two program leaders to facilitate decision making and program cohesion and effectiveness. Disease interest groups of basic, clinical and population scientists have been brought together to identify translation opportunities, help identify

recruiting and other disease-specific needs, and position UNC to garner more extramural team science awards. The UCRF "theme teams" are playing a more active role in budgeting, planning and managing the initiatives for strategies and sustainability, and have been given the administrative support to enable these activities. Program Planning Committee meetings are now devoted to discussion of ongoing UNC Lineberger science and research strategic planning.

3. Institute systems to ensure impact and sustainability

We will continue to use clear metrics and processes for review and identification of areas that are self-sustaining (or could be), as well as areas that have may not be achieving expected levels of success. The engagement described above will help us make these decisions and define scientific goals and financial sustainability expectations in an objective manner. One system will be to require each initiative receiving significant UCRF support to prepare a financial forecast to reduce dependence on UCRF support. The Program Leaders will be involved in the review of initiative, opportunity, and infrastructure spending. Questions that come up, such as how to balance salary commitments for recruitment against programmatic funding, should be broadly discussed and openly debated.

4. Improve communication for greater return

Over the course of the strategic planning review, it became clear the process was have a signficiant positive impact on internal communication at UNC Lineberger, making faculty members more aware of research opportunities, ways in which the central administration could help them meet their research goals, and providing them with a more detailed understanding of Center and State support for cancer research.

To increase understanding of the impact of Center and State (UCRF) support, a communications plan specifically for UCRF is under consideration. It was suggested that the type of public presentations made for the strategic planning process (which are now available on the web site) might become an annual event.

SPECIFIC RESEARCH PRIORITIES:

Given these principles and areas of focus, the Cancer Center Director and Senior Staff and Program leadership have identified specific areas for focused growth over the next five years (see also the table at the end of the document for additional details):

Commitment to Discovery and Translation

The Cancer Center is well-known for outstanding basic science investigation of relevance to cancer biology. The leadership plans to continue this trajectory through the next CCSG cycle with specific focus in the following areas:

- Basic Genomics Research
    - RNA biology: non-coding RNA, RNA Splicing, RNA structure
    - Epigenetics: transcriptional control, chromatin structure and biology
    - Novel analysis of genomics "Big Data"
- Cellular Mechanisms
    - How Viral products cause cancer
    - Metastases and cellular motility
    - Tumor Immunology

- Augment Drug Discovery:
    - Novel target identification and validation
    - High-throughput screening and structure-based design approaches to lead development
    - Hit-to-Lead Medicinal Chemistry
- Targeted expansion in specific disease areas:
    - Novel translational imaging
    - Hematologic malignancies
    - Certain Solid Tumors (e.g. thoracic oncology)
- Translation through Partnerships and Commercialization

Foster Innovative Clinical Research

In addition to basic cancer research, the Center will facilitate clinical innovation. Areas for concentrated focus are:

- Next Generation Sequencing in the Clinic:
    - Expansion of NextGen somatic tumor analysis into CLIA space allowing for routine clinical use
    - Assessment of tumor heterogeneity through deep sequencing to identify rare somatic variants characteristic of tumor sub-clones.
    - Assess burden of disease by sequencing circulating tumor DNA.
- Immunotherapy:
    - Perform first-in-man testing of novel CAR-T cells developed at the UNC Lineberger.
    - Collaborate with industry to test novel immunomodulatory antibodies (checkpoint inhibitors) and small molecules.

Investment in Population and Prevention Research

The UNC Lineberger has historic strength in the population sciences, considerably bolstered in through our relationship with the outstanding UNC Gillings School of Global Health. A large number of Cancer Center faculty have appointments in the School, helping UNC Lineberter make progress in several areas:

- Assess Cancer Risk Factors and Outcomes Determinants
    - Through use of LCCC big data initiative such as the integrated cancer information surveillance system
    - Translation into policy changes about cancer risk behaviors at the state and federal level.
- Delivering cancer control and quality interventions via the electronic health record (e.g. EPIC)
    - Focus on scalable, web-based interventions that can be used at the population level.
- Population Screening Interventions
    - Based on behavioral and genetic risk factors
    - Using e-health and mobile-health approaches

CONCLUSION:

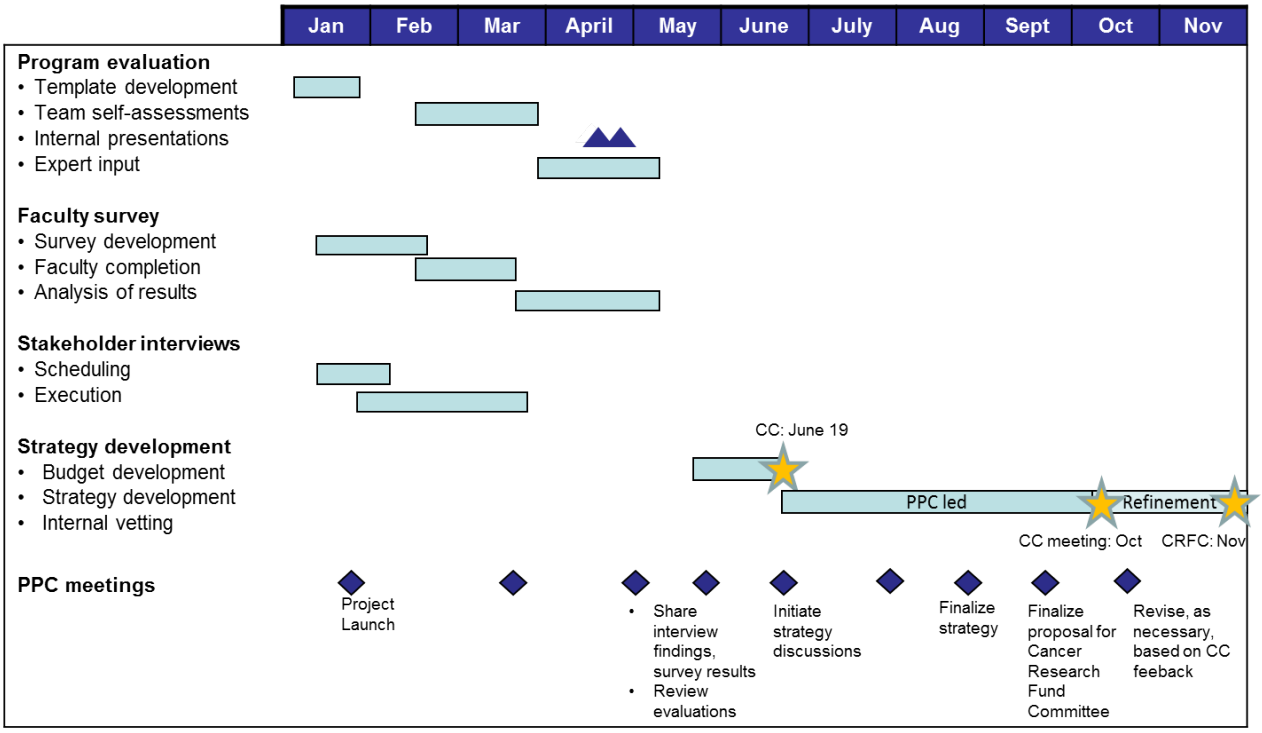
The UNC Lineberger Comprehensive Cancer Center has been on a remarkable trajectory with strong increases in research fundingand rate of production of impactful cancer science. This re-evaluation identified several areas for continued effort, a few areas for decreased emphasis, and, most importantly, areas for new initiatives (see table below).

PRIORITIES, STRATEGIES AND STATUS OF INITIATIVES AS OF MAY 2015

Strategic Priority	Strategies for Meeting Priority	Status as of 5/2015
Direct research to areas of greatest impact		
Develop areas with the intention of becoming a top five program in the world: **cancer outcomes**; **cancer genetics**; **cancer treatments**		
Outcomes: Study the determinants of cancer outcomes; use North Carolina as a lab	Continue to develop infrastructures for large scale data collection (ICISS, Survivorship Cohort, and NC Population Studies); Recruit in quality of care; Mentor and develop a large junior faculty contingent; expand PCORI funding; survivorship research across state	New Cancer Outcomes Shared Resource proposed in 2015 CCSG ICISS: Initial linkages, systems and tools development completed; entire NC registry to all payers; parallel systems development
Outcomes: develop large scale interventions to improve care	Fund pilot projects testing efficacy of dissemination; use data from ICISS for interventions to address disparities, particularly those due to race, ethnicity or socio-economic status	Health-e NC pilot project funding begun
Cancer Genetics: Use cancer genetics and genomics to guide cancer therapy, early detection and prevention	Continue upgrading of technology; recruit in analysis, bioinformatics and computational biology	
Cancer Treatments: Create a world leading academic drug discovery program	Recruitment of a critical mass of faculty Become the SGC site for kinase inhibition Emphasize epigenetic targets with recruits and existing faculty Structural and computational approaches	Senior recruits Jeff Aube and Tim Wilson
Cancer Treatments: Build a new program in cell-based immunotherapy	Develop GMP capabilities for cutting-edge human clinical trials in hematologic malignancies and solid tumors (through facility expansion and faculty recruitment)	Recruitments completed Facilities nearing final construction
Promote **faculty collaboration and success** in these areas	Develop new Developmental Awards program to stimulate external grants: streamlined process; targeted RFAs; incentives for collaboration and submission of external grants	March 2015: first round under new mechanism. Received 76 applications (3 in new multi-project category); currently under review
Position the organization for improved collaboration and decision-making		
Encourage disease interest groups of basic, clinical, and population scientists	Include discussion of ongoing science in Program Planning Committee meetings Provide meeting admin support for multi-disciplinary groups	PPC meetings increased to 2x per month to include science discussion New Developmental Award tier 3 (above) to encourage and support collaboration
Empower / engage “theme teams”	Include theme team leaders in budgeting and planning	Meetings held in coordination with UCRF review will continue Theme team leaders will present at PPC 1 meeting per month

Empower / engage Program Planning Committee	Delete some tasks and add others Invite new members to the PPC, including some core leaders and chairs, as appropriate	Preliminary new member screening moved to new Membership Committee; PPC now engaged to do ongoing evaluation of initiatives and themes
Empower / engage chairs	Give chairs role in planning	Engaged chairs with question of salary vs. programs issue (i.e., should we cap UCRF support for salary); and supplement vs. base salary issue (i.e., the need to move UCRF salary support from supplements to base salary)
Ensure impact and sustainability		
Institutionalize ongoing planning and evaluation	Institutionalize ongoing review of initiatives: scientific goals, budgets, future plans, etc.	Developed clear metrics and process for review and action; engaged PPC and theme team leaders in process
Accelerate the translation of LCCC discoveries	Encourage and support commercialization, licensing, and industry collaboration efforts	
Strengthen relationship with state	Meet regularly with state legislators	
Improve communication for greater return		
Maintain support for UCRF in the NC legislature	Continue monthly letters to the legislature, from individual faculty	ongoing
Develop internal communication plan	New external and internal web presence, more internal communications	Better website done; monthly newsletter; new director's emails; UCRF presentations on the web
Increase science communication	Leverage PPC and theme team leadership	
Increase awareness of UCRF-funded resources across LCCC and UNC and at the state level	Specific communications plan for UCRF with goals, objectives, audiences, etc.; revamp UCRF website;	Integrating UCRF content into monthly newsletter and PPC meetings Disseminating monthly legislative mailings emphasizing UCRF impact
Ensure UNC cancer patient care leadership in the state and nation		
Integrate UNC LCCC practice at UNC Hospitals with the practices in the growing network of UNC-owned hospitals throughout the state	Develop joint EPIC plans and quality metrics, and use our UNC Cancer Care algorithm to assure access to underserved and/or minority populations	Begun with Rex
Increase accrual to interventional clinical trials	Develop a seamless clinical trials program across the network Develop a single UNC IRB and contracting mechanism across all UNC Health Care System sites	

TIMELINE OF REVIEW AND PLANNING PROCESS



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APPENDIX

ECOMONIC IMPACT ANALYSIS

The Economic Impact of University Cancer Research Fund

Dramatic Economic Impact. Leveraging UCRF expenditures to secure talent, clinical benefit, national research dollars for North Carolina and commercialization that creates jobs.

October 2015

TrippUmbach
Research • Strategy • Impact

University Cancer Research Fund

Contents

Executive Summary

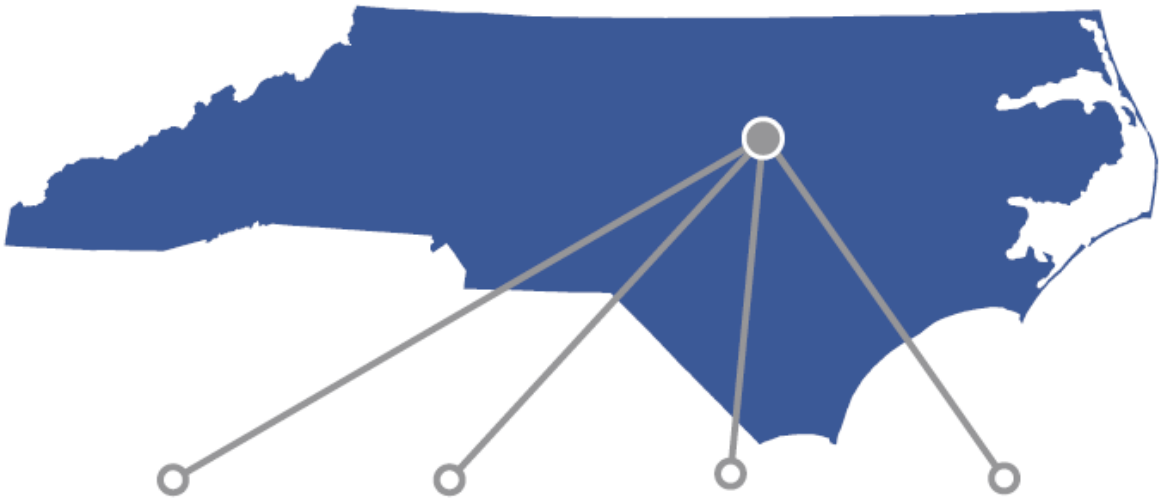
In 2007, the leaders of North Carolina developed a fund to invest in cancer research in the state. Cancer is the leading cause of death in North Carolina, and this fund was developed to benefit the health of state residents. Although cancer mortality rates have been decreasing, incidence rates of cancer have been increasing over the past decade.[1] The state is investing in this fund, ensuring that future generations of North Carolinians will develop cancer less often, and live longer and better when they do. The UNC Lineberger Comprehensive Cancer Center is one of the nation's leading public comprehensive cancer center, working to discover, innovate, and deliver top-level cancer care within the state of North Carolina. It was just accorded the top rating, Exceptional, by the National Cancer Institute's every-five year review process.

The aim of this report is to illustrate, in detail, the positive economic impact that UCRF dollars had on North Carolina's biomedical sector both in FY 2015 as well as to show the impact over the years since the Fund's inception, FY 2008- FY 2015. Through expanding the state economy, creating jobs, generating tax revenue, encouraging scientific collaboration, leveraging federal research funds, and developing commercialization opportunities in the state, these dollars have provided a significant benefit to the State of North Carolina.

The initial investment in the University Cancer Research Fund (UCRF) was $25 million in FY 2008 and has totaled nearly $345 million over the last 8 fiscal years. This year alone the FY 2015 $43.7 million investment produced an economic impact of over $340 million. This investment has translated into innovative research to detect, treat, and prevent cancer; and it is difficult to think of a better investment than one for the future health of the state.

[1] Cancer in North Carolina 2013 Report. North Carolina State Center for Health Statistics.

Key Findings



$1.69 billion

State funding allocated to the UCRF has generated **$1.69 billion in impact since the fund started in 2008.** The support of this fund by the state has returned nearly five dollars for every one invested.

1,260 jobs

State funding allocated to the UCRF has supported or sustained over **10,079 jobs since it's inception, which is on average 1,260 annual jobs since 2008.**

$48.6 million

State and local government revenue generated by the UCRF directly or indirectly has totaled **$48.6 million since the development of UCRF.**

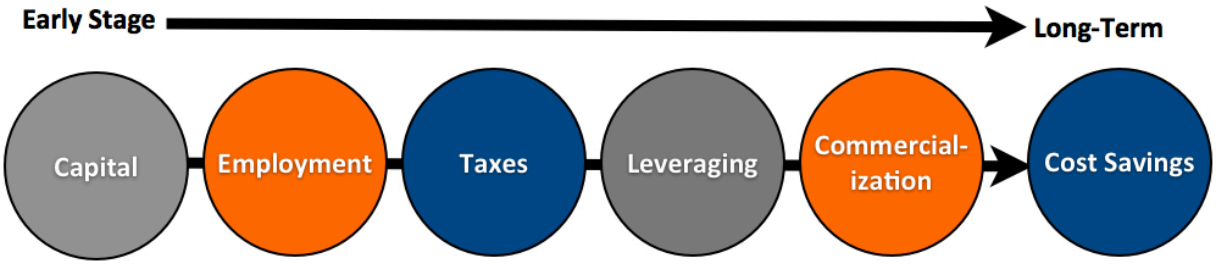
In 2015 alone...

In 2015, the state funding allocated to the UCRF generated nearly **$348.8 million** in economic impact, supported **2,288 jobs,** and over **$11.9 million** in state and local government revenue.

Impacts of UCRF

Any discussion of the economic impact of these state funds must be predicated on an understanding that research investments, by their nature, will have a multitude of impacts on a state's economy, both in the present and in the future. Short-term impacts include capital and non-capital investment, employment growth supported by the funds, and new federal medical research funding leveraged by North Carolina's funds that expand the state's economy. Longer term impacts include: a strengthened ability to compete nationally for funding and to attract world-class scientists; the economic and employment advances that will be achieved when medical research and innovation are translated into commercial products and services; and health care cost-savings to the state as a result of innovation (see Figure 1):

Figure 1: Research Return on Investment Timeline



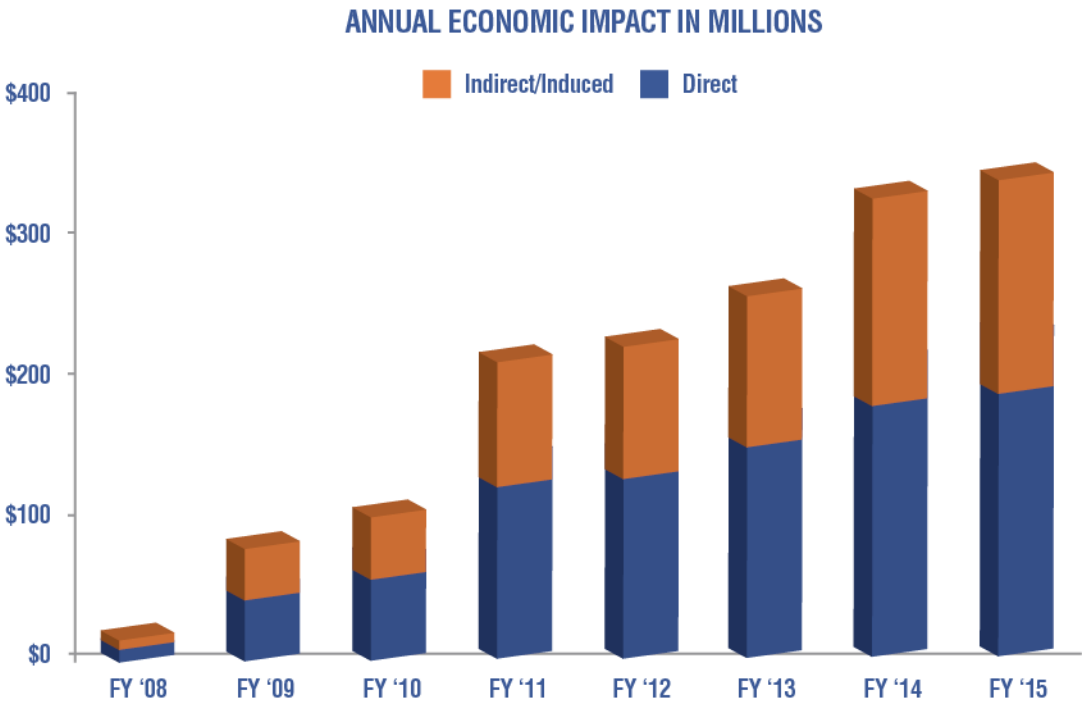
Early-Stage Economic Impact of Funding

UCRF dollars invested in research in 2015 have resulted in an expansion of the state's economy by nearly $348.8 million. This demonstrates a return in 2015 alone of $7.90 for each dollar the state provided to the research fund in statewide economic activity. Tripp Umbach's economic impact analysis indicates that even in the early stage (FY 2008 through FY 2010), program investments in capital and human resources returned greater than double the investment to the state's economy. As this research has grown and created opportunities for additional research funds to be leveraged the dollars have continued to generate additional impact. Spending attributable to the fund can be divided into two parts: direct and indirect/ induced impacts.

The direct impacts of program funding include institutional expenditures for capital improvements, goods and services, as well as the spending by researchers, research staff, subcontractors, and visitors who come to these institutions for conferences and meetings. The indirect impacts of these funds result from the direct, first-round expenditures, which are

received as income by businesses and individuals in the state and re-circulate through the economy in successive rounds of re-spending. The result is a multiplied economic impact that is a linear result of the state's investment in research.

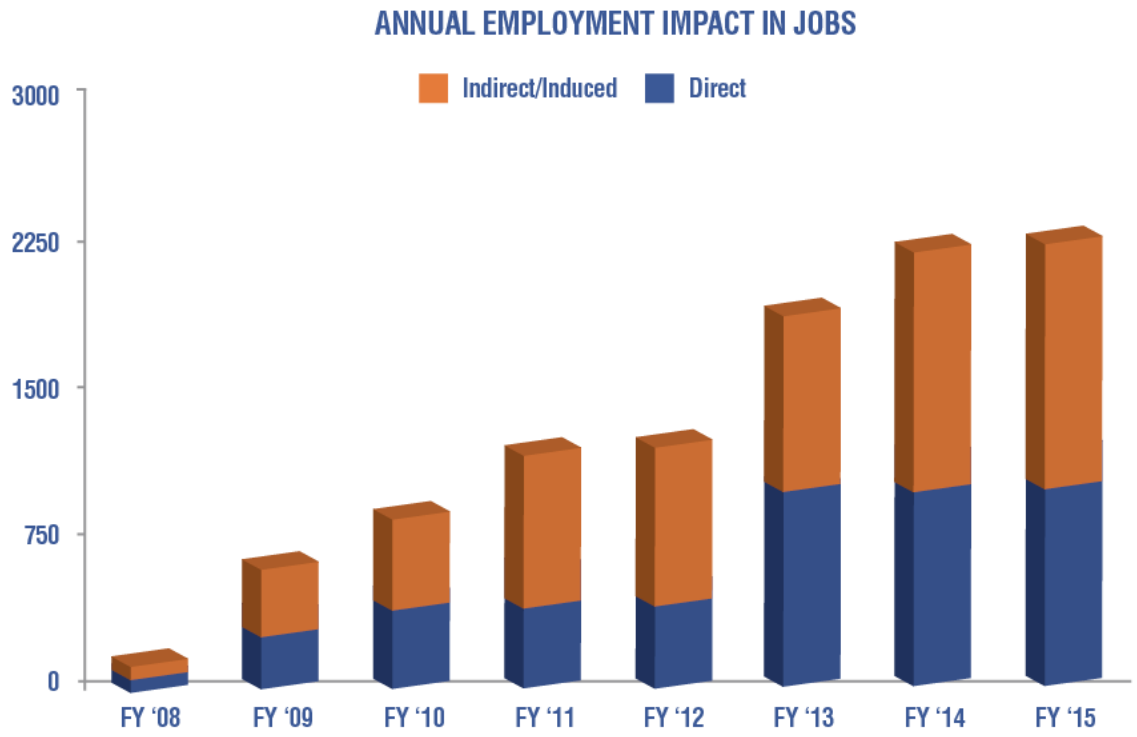
Over the past 8 years, this fund has consistently provided high levels of economic impact through the state. This impact over the last 8 years adds up to greater than $1.69 billion in economic activity in the state of North Carolina.



Early-Stage Impact of UCRF Dollars on Employment

Tripp Umbach estimates that in 2015, UCRF dollars for health care research have both created and sustained 2,288 jobs for the residents of North Carolina. This includes both the 992 high-paying research-related jobs directly attributed to UNC in addition to the 1,296 indirect and induced jobs supported throughout the state of North Carolina. The economic expansion created by the funds allocated to the UCRF has, in turn, brought about demand for additional employment in the state's economy.

Since the start of the fund, this has directly and indirectly supported or sustained many jobs on an annual basis. Over the last 8 years the employment impacts add up to 10,079 jobs[2] since inception, which is on average 1,260 jobs annually since 2008.



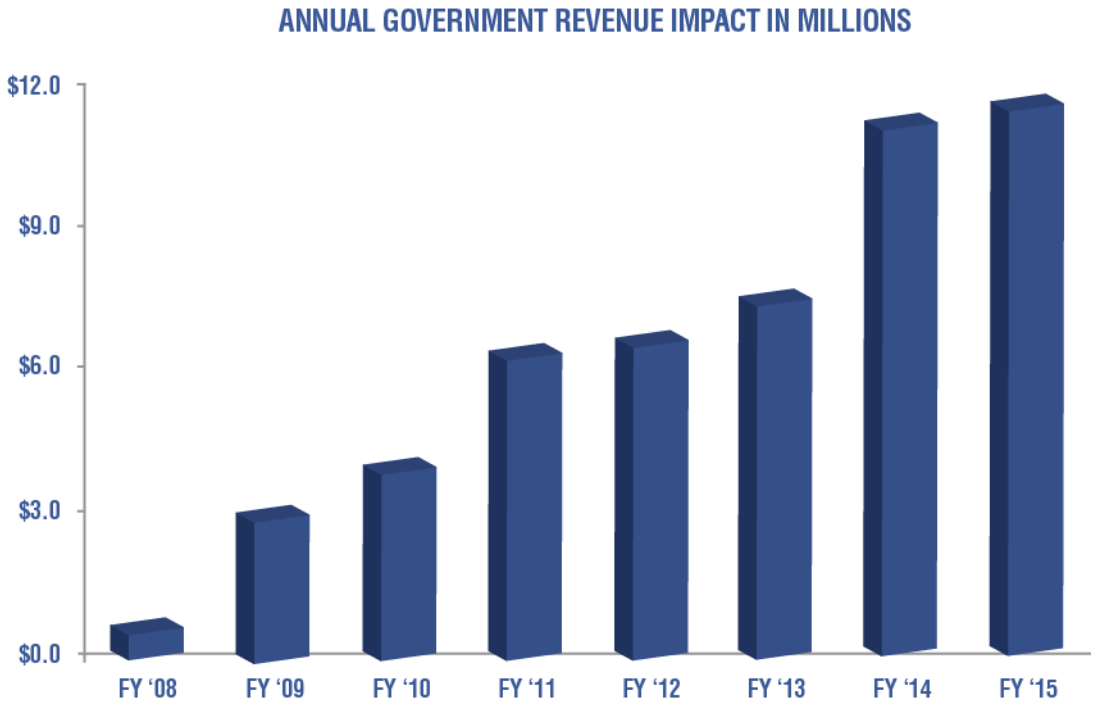
Early- and Later-Stage State Tax Impacts

Tripp Umbach estimates that funds provided in 2015 have resulted in nearly $11.9 million in tax revenues to the state of North Carolina. In-state spending by the recipient organizations and spending in the state by out-of-state parties have had a significant impact on state tax revenue. Taxes created as a result of spending in the state's economy, and generation of fresh dollars from outside of the state, are expected to grow as early-stage research is commercialized.

Since the start of the UCRF in 2008, this additional spending has generated $578,000 (on the first initial year of funding) to $11.9 million (in 2015) in tax dollars on an annual basis.

In 2015 alone, the federal tax impact was $25.5 million.

[2] Each job in this statement is a one-year job.



Impacts Associated with Leveraged Federal Medical Research Funds

The North Carolina academic medical industry and growing life sciences industry have been measurably enhanced by these state funds. This federal medical research funding helps fuel clinical enterprises. According to the Association of American Medical Colleges, North Carolina's academic medical industry is among the top 10 nationally in total annual economic impact[3].

UCRF funds have encouraged researchers at UNC to collaborate and to apply for highly competitive federal grants. Recipients of UCRF dollars and infrastructure development have been able to leverage these funds into at least $144 million in federal and other non-state health research funding in 2015 alone. These impacts of the UCRF only increase when one calculates the value provided by the program competing and providing research worthy of federal grants.

In the 8 fiscal years of the fund's existence, the State of North Carolina has provided $344.8 million dollars in research funds and UNC has used this fund to leverage an additional $544.2 million dollars from federal and other non-state sources from 2011-2015. This in turn has

[3] In 2012, North Carolina ranked 10th in Academic Medical Impact of AAMC members and COTH hospitals.

generated more than $1.69 billion dollars since the fund commenced. This is on average a $4.90 return on every dollar provided for this research in economic activity alone.

Commercialization

Additional impacts which will be realized due to the UCRF are the levels of commercialization that occur when clusters of research professionals collaborate on a specialty area of research. Tripp Umbach estimates that after ten years of funding and operations, the commercialization of the UCRF will produce discoveries and spinoff businesses which will generate additional economic activity in the State of North Carolina. Looking at projected commercialization impact in 2021, Tripp Umbach estimates this to be between $198.6 million at a conservative level of growth scenario and $437.2 using the aggressive level of growth, in additional economic activity within North Carolina. These activities will also create between an additional 1,324 high paying jobs (conservative) and 2,915 jobs (aggressive). These additional economic and employment impacts will translate into additional state and local government revenue of between $6.9 million and $14.2 million.

It is important to note that these commercialization impacts are in addition to the annual operational impacts of the UCRF and that these impacts will continue to grow as the research fund continues to be successful. These are impacts that are realized after years of research once the breakthroughs or discoveries have been made and the discoveries begin to hit the marketplace. Examples of successful spinoff businesses supported by the UNC Lineberger include Meryx, G1 Therapeutics, Genecentric, Epicypher,Epizyme, Liquidia, and many others. Since 2009, Lineberger startup companies have raised more than $300 million in non-dilutive financing from the NIH, angel investors and venture capitalists.

Tripp Umbach's projections are based on 2011 funding, and the national experience of peer academic medical centers that have implemented similar academic, clinical, research, and economic development plans over the past 20 years. Since 1995, Tripp Umbach has measured the economic impact of every U.S. academic medical center on behalf of the Association of American Medical Colleges (AAMC) and used historical trending data from this experience in making projections.

Appendix A: Definition of Terms

Study Year

Each independent Fiscal Year 2008 through and including Fiscal Year 2015.

Total Impact

The total impact of an organization is a compilation of the direct impact, the indirect impact, and the induced impact generated in the economy because of the organization.

Direct Impact

Direct impact includes all direct effects the organization has on the regional area due to the organizational operations. These items include direct employees, organizational spending, employee spending, as well as spending by patients and visitors to the organization.

Indirect Impact

The indirect impact includes the impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added. The impacts are calculated by applying direct effects to the Type I Multipliers.

Induced Impact

The response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not leakage to the regional economy. This money is re-circulated through the household spending patterns causing further local economic activity.

Multiplier Effect

The multiplier effect is the additional economic impact created as a result of the organization's direct economic impact. Local companies that provide goods and services to an organization increase their purchasing by creating a multiplier.

Appendix B: Tripp Umbach Qualifications

Tripp Umbach is the national leader in providing economic impact analysis to leading health care organizations and academic health centers. The firm has completed more than 100 economic impact studies over the past 10 years for clients such as the Mayo Clinic Rochester, The Cleveland Clinic, University of Florida Shands HealthCare, and the Ohio State University Medical Center. In addition to work on multiple occasions for the six allopathic medical schools and academic medical centers in Pennsylvania, Tripp Umbach has completed statewide studies for multiple institutions in Ohio, Virginia, South Carolina, Wisconsin, and Minnesota.

The Association of American Medical Colleges (AAMC) relies on Tripp Umbach to complete a study of all U.S. medical schools and teaching hospital affiliates. Tripp Umbach has completed five such studies for AAMC since 1995.

Tripp Umbach has also completed economic impact studies for cancer centers such as the CURE Funding for PA Cancer Alliance, The Wistar Institute, University of North Carolina's Cancer Hospital, Ohio State University's James Cancer Center and Solove Research Center, Ohio State University's Comprehensive Cancer Center, Penn State Milton S. Hershey Medical Center's Cancer Institute, Mayo Clinic/Allegheny General Hospital Cancer Services planning, UPMC Hillman Cancer Center feasibility and economic impact projections study, University of Pennsylvania projected economic impact of the Cancer Center as a component of the Civic Center project, and University of Florida Shands Healthcare economic impact projections.

For more information, please contact Tripp Umbach at www.trippumbach.com

Appendix C: Methodology

In order to fully quantify the impact of the funding of UCRF to the operations of UNC Lineberger Comprehensive Cancer Center within the various geographical areas throughout this study, it was necessary for Tripp Umbach to establish a study methodology. It was critically important that the methodology used would deliver a comprehensive, yet conservative, estimate of the operations' impact, based on information compiled using uniform and consistent techniques. In addition, the study team sought to develop a reproducible methodology, ensuring that subsequent studies could build upon the information and knowledge gained through this effort.

Tripp Umbach determined that the use of the IMPLAN Pro economic impact model software was most appropriate for this analysis. The IMPLAN econometric model operates by estimating the direct impact, indirect impacts, and induced impacts of specific economic activity. Direct economic impacts, are those attributable to the initial economic activity. For example, an operation with 10 full-time employees creates 10 direct jobs. Indirect economic impacts are those economic activities undertaken by vendors and suppliers within the supply chain of the direct activity because of the initial economic activity. For example, suppliers of goods, materials, and services used in the direct activities produce indirect economic impacts. Induced economic impacts result from the spending of wages paid to employees in local industries involved in direct and indirect activities. Tripp Umbach selected the IMPLAN model due to its frequent use in economic impact, in addition to its development independent of local influences.

Tripp Umbach collected employment information concerning the economic activity of UCRF's funding on operations themselves and followed up in-person to make certain the data was the most current available.

In this report, the impact was measured using IMPLAN datasets. The IMPLAN data files include information for 528 different industries (generally three- or four-digit SIC code breakdown) and 21 different economic variables. IMPLAN sources their employment data from ES202 employment security data supplemented by county business patterns and REIS data. Employment data utilized in the analysis includes full-time and part-time positions.

It should be noted that, at the time of performing the UCRF assessment, the most recent IMPLAN data files for the state of North Carolina were for 2012. While the data is not current, it is unlikely that the fundamental economic structure of North Carolina's economic fabric has changed to an extent that would invalidate the analysis. IMPLAN data and accounts closely follow the accounting conventions used in the "Input/ Output Study of the U.S. Economy" by the U.S. Bureau of Economic Analysis and the rectangular format recommended by the United Nations.

By deriving the direct and actual employment numbers from IMPLAN for each county, Tripp Umbach was able to conduct input/output modeling to analyze the current impact of the industry in each county. Tripp Umbach supplied additional information as required to supplement the data supplied by UNC Lineberger Comprehensive Cancer Center.

APPENDIX

LIST OF ACTIVE EXTRAMURAL AWARDS

List of Active Extramural Awards

UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Theme Invest (HTS)	Aikat, Jayashree	National Science Foundation	OCI-1245783	12/01/12	11/30/15	CC-NIE Network Infrastructure: Enabling Data-Driven Research	499,529
Retention	Allbritton, Nancy	National Inst. of Health	1-R01-DK109559-01	09/25/15	06/03/20	Development of Human Intestinal Simulacra	902,507
Retention	Allbritton, Nancy	National Cancer Institute	5-RO1-CA177993-02	08/01/14	07/31/19	Single-Cell Measurement of Lipid Signaling in Colorectal Cancer	724,891
Retention	Allbritton, Nancy	National Inst. of Health	5-RO1-EY02556-03	08/01/14	07/31/19	Generation of a Gene-Targeted Human iPS Cell Library for Macular Degeneration	586,405
Retention	Allbritton, Nancy	National Cancer Institute	1-R21-CA192004-01	01/01/15	12/31/16	Single Cell Analysis of Intratumoral Heterogeneity in Parathyroid Neoplasia	37,373
Recruitment	Amelio, Antonio	National Cancer Institute	4-ROO-CA157954-04	09/22/14	08/31/17	Convergence of CREB and MYC Pathways in Oncogenesis	249,000
Theme Investment (MP1U)	Anders, Carey	National Cancer Institute	5-K23-CA157728-05	09/01/11	08/31/16	PARP Inhibition to Treat Triple-Negative Breast Cancer Brain Metastases	173,598
Recruitment	Asher , Gary	Agency for Healthcare Research and Quality	HHSA2902012000081	08/01/13	03/31/16	Topic Refinement with Option for Systematic Review for Treatment of Major Depressive Disorder	239,251
Recruitment	Asokan, Aravind	National Inst. of Health	5-P30-AI027767-27	12/01/14	11/30/17	Combating HIV Infection by Fusion Inhibitor Gene Therapy	239,035
Recruitment	Asokan, Aravind	National Inst. of Health	5-R01-HL089221-07	01/01/14	12/31/18	Determinants of AAV Tropism	449,257
Recruitment	Asokan, Aravind	National Inst. of Health	1-PO1-HL112761-02	02/08/13	01/31/18	Neutralizing Antibody & AAV FIX Gene Therapy - Project 2	291,026
Retention	Ataga, Kenneth	National Inst. of Health	1-RO1-HL11569-04	01/01/12	12/31/16	Endothelial Dysfunction in the Pathogenesis of Sickle Cell Nephropathy	450,727
Retention	Ataga, Kenneth	National Inst. of Health	5-UO1-HL117659-03	08/15/13	05/31/18	Targeted Anticoagulant Therapy for Sickle Cell Disease	1,459,516
Theme Investment (CC)	Aylor, David	National Inst. of Health	5-ROO-ES021535-04	06/01/12	05/31/17	Epigenetics, environmental exposure, and reproduction in the Collaborative Cross	238,469

List of Active Extramural Awards

UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Innovation Award	Bae-Jump, Victoria	Department of Defense	W81XWH-12-1-0426	09/25/12	09/24/15	Pre-clinical and Clinical Investigation of the Impact of Obesity on Ovarian Cancer Pathogenesis	342,939
Innovation Award	Bae-Jump, Victoria	National Cancer Institute	5-K23-CA143154-05	09/01/10	08/31/15	Metformin as a Novel Chemotherapeutic Strategy for the Treatment of Endometrial Cancer	170,873
Theme Investment (CC)	Baric, Ralph S.	National Inst. of Health	5-U19-AI100625-04	08/05/12	07/31/17	Systems Immunogenetics of Biodefense Pathogens in the Collaborative Cross	4,144,540
Theme Investment (CC)	Baric, Ralph S.	National Inst. of Health	5-U19-AI107810-03	07/01/13	06/30/18	Characterization of Novel Genes Encoded by RNA and DNA Viruses - Project 1 Role of Uncharacterized Genes in High Pathogenic Human Coronavirus Infection	370,377
Theme Investment (CC)	Baric, Ralph S.	National Inst. of Health	5-U19-AI107810-03	07/01/13	06/30/18	Characterization of Novel Genes Encoded by RNA and DNA Viruses - Core A	188,494
Theme Investment (CC)	Baric, Ralph S.	National Inst. of Health	1-R01-AI110700-01A1	04/20/15	03/31/20	Mechanisms of MERS-CoV Entry, Cross-species Transmission and Pathogenesis	754,420
Theme Investment (CC)	Baric, Ralph S.	National Inst. of Health	1-R56-AI106006-01A1	09/01/14	08/30/16	Mechanisms of Norovirus Protective Immunity	162,193
Theme Investment (CC)	Baric, Ralph S.	National Inst. of Health	1-U19-AI109761-01	03/01/14	02/28/19	Diagnostic and Prognostic Biomarkers for Viral Severe Lung Disease	957,033
Recruitment	Baron, John	National Cancer Institute	5-R01-CA098286-13	12/01/02	07/31/17	Colorectal Chemoprevention with Calcium and Vitamin D	2,234,370
Recruitment	Baron, John	National Cancer Institute	5-R01-CA059005-18	09/30/93	07/31/15	Aspirin/Folate Prevention of Large Bowel Polyps	485,122
Recruitment	Baron, John	National Cancer Institute	5-R01-CA12217-11	10/01/10	07/31/16	Chemoprevention of Arsenic Induced Skin Cancer	39,256
Recruitment	Baron, John	National Cancer Institute	5-U01-CA086400-15	07/01/11	06/30/16	Early Detection Research Network (EDRN)	113,495
Recruitment	Baron, John	National Cancer Institute	3-RO1-CA098286-11S1	08/01/13	07/31/16	A Pilot Metabolomic Study of the Effects of vitamin D and Calcium Supplementation - Supplement	163,305
Recruitment	Baron, John	National Inst. of Health	5-R01-ES019876-05	08/16/10	03/31/16	Methods of Pathway Modeling with Application to Folate	22,000

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Recruitment	Basch, Ethan	Department of Defense	W81XWH 11-1-0639	09/30/12	09/29/15	Development of Pain End Point Models for Use in Prostate Cancer Clinical Trials and Drug Approval	581,379
Recruitment	Basch, Ethan	National Cancer Institute	5-R01-CA154537-03	01/01/13	05/31/17	Assessing PROMIS and Other Simple Patient Reported Measures for Cancer Research	10,000
Recruitment	Basch, Ethan	National Cancer Institute	1-UG1-CA189823-01	08/01/14	07/31/19	Alliance NCORP Research Base	169,387
Recruitment	Basch, Ethan	National Inst. of Health	5-U24-NR-014637-02	09/28/10	06/30/18	Refinement and Expansion of the Palliative Cooperative Group	110,620
Retention	Bateman, Ted	National Inst. of Health	5-R01-AR059221-04	04/01/11	03/31/16	Radiation-Induced Osteoporosis in Women with Cancer: Mechanisms and Prevention	303,312
Innovation Award	Bautch, Victoria L.	National Inst. of Health	5-RO1-HL116719-03	07/15/13	05/31/17	Centrosome Mis-Regulation and Blood Vessel Function	374,300
Innovation Award	Bautch, Victoria L.	National Inst. of Health	5-R01-HL043174-23	07/01/89	05/31/16	Molecular Control of Angiogenesis	346,162
Innovation Award	Bear, James E.	National Inst. of Health	5-R01-GM111557-02	09/01/14	08/31/19	The Role of the Arp2/3 Complex in Cellular Actin Dynamics	370,544
Recruitment	Bennett, Antonia	Leukemia & Lymphoma Society	Not Assigned	04/01/15	09/03/15	Implementation of Patient-Reported Outcome Endpoins i nthe Acute Myeloid Leukemia Phase IB/II Master Protocol	44,009
Recruitment/Theme Investment	Berg, Jonathan	National Inst. of Health	5-U01-HG007437-03	09/23/13	07/31/17	A Knowledge Base for Clinically Relevant Genes and Variants	2,319,188
Recruitment/Theme Investment	Berg, Jonathan	National Inst. of Health	3-U01-HG007437-03S2	09/23/13	07/31/16	Clinically Relevant Genetic Variants Resource: Admin Supplement	49,999
Recruitment/Theme Investment	Berg, Jonathan	National Inst. of Health	3-U01-HG007437-03S1	09/23/13	07/31/17	CRVR Administrative Supplement - Geisinger	165,625
Recruitment	Bowers, Albert	Arnold & Mabel Beckman Foundation	Not Assigned	09/01/14	08/31/17	Synthetic biology Approach to Scaffolding Pathways for Small Molecule Biosynthesis	250,000
Recruitment	Branca, Rosa	National Cancer Institute	5-R01-CA142842-05	04/01/10	01/31/16	Sensitive and Specific Molecular Imaging of Pulmonary Nodules	288,793

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Recruitment	Brookhart, Maurice	AMGEN Inc.	2011561720	12/16/11	12/31/15	Methodological Issues in Drug Utilization Research	244,960
Recruitment	Brookhart, Maurice	AMGEN Inc.	7200635956	11/15/13	12/31/15	Cinacalcet Persistence and Long Terms Outcomes	249,233
Recruitment	Brookhart, Maurice	AMGEN Inc.	7100163382/2011561720	07/01/14	07/01/16	The Effect of Persistent Cinacalcet Use on Biochemical Control in Patients REceiving Hemodialysis	249,720
Recruitment	Brookhart, Maurice	AMGEN Inc.	7100161394	06/01/14	12/31/15	Estimation of Short-term Fracture Risk using Machine-learning Methods	249,531
Recruitment	Brookhart, Maurice	AMGEN Inc.	7100166716	08/01/14	06/30/16	Persistence with Bone-targeting Agents in Patients with Bone Metastases from Solid Tumors	237,863
Recruitment	Brookhart, Maurice	National Inst. of Health	5-R01-AG042845-03	08/01/12	11/30/15	A Retrospective Cohort Study of the Safety of Testosterone Therapy in Older Men	215,460
Recruitment	Brookhart, Maurice	National Inst. of Health	5-R21-HD080214-02	12/01/13	11/30/15	Patterns of use Comparative Effectiveness, and Safety of Rotavirus Vaccines	185,250
Recruitment	Brookhart, Maurice	Agency for Healthcare Research and Quality	2013 APSF/ASA	01/01/14	12/31/15	Comparative Safety of Different Types of IV Fluids for Resuscitation in the OR and ICU: An Applied Pharmacoepidemiologic Approach	23,378
Innovation Award	Burridge, Keith W. T.	National Inst. of Health	5-R01-GM029860-33	04/01/81	03/31/19	Cell Adhesion and the Regulation of Rho GTPases	438,957
Theme Investment/Retention	Busby-Whitehead, Jan	National Inst. of Health	5-T35-AG038047-06	05/01/10	04/30/20	UNC-CH Summer Research Training in Aging for Medical Students	1,875
Theme Investment/Retention	Busby-Whitehead, Jan	American Federation for Aging Research	Not Assigned	07/01/15	06/30/16	John A. Hartford Foundation's Center of Excellence in Geriatric Medicine and Training	93,000
Recruitment	Calabrese, Joseph	March of Dimes	5-FY15-7	02/01/15	01/31/17	Selective Modulation of Noncoding RNA Function as a Novel Therapeutic Tool to Treat Childhood Disease	136,363
Innovation Award	Campbell, Sharon	National Inst. of Health	5-RO1-GM106227-03	06/01/13	05/31/17	Regulation of Ras by Monoubiquitination	383,229
Inovation Award	Caron, Kathleen	National Inst. of Health	5-R01-HD060860-05	04/01/09	03/31/16	Adrenomedullin Signaling At the Maternal-Fetal Interface	275,366

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Recruitment	Chavala, Sai	National Inst. of Health	5-K08-EY021171-06	03/01/11	02/28/16	Regulation of Adult Ciliary Body Progenitor Cells for Cell Replacement Therapy	236,392
Recruitment	Chen, Ronald	Accuray, Inc.	Not Assigned	06/01/12	05/31/16	Comparative Effectiveness of Management Options for Localized Prostate Cancer Parallel Study to Include Patients Treated with Cyberknife Radiation Therapy	100,000
Recruitment	Chen, Ronald	Agency for Healthcare Research and Quality	1-RO1-HS022713-01A1	07/01/14	06/30/19	NC Process: A Stakeholder-Driven, Population-Based Prospective Cohort Study	696,957
Recruitment	Chen, Ronald	Patient-Centered Outcomes Research Institute	CER-1310-06453	01/01/15	03/31/18	North Carolina Prostate Cancer Comparative Effectiveness & Survivorship Study (NCProCESS): A Stakeholder-Driven, Population-Based Prospective Cohort Study	525,285
Recruitment	Chen, Xian	National Cancer Institute	5-U24-CA160035-05	08/01/12	07/31/16	Cancer Proteome Center at Washington University, University of North Carolina & Boise State	379,563
Theme Investment (Proteomics)	Chen, Xian	W. M. Keck Foundation	Not Assigned	01/01/13	12/31/16	New Tools for Characterization of the Protein Methylome and the Histone Code	250,000
Recruitment	Chera, Bhishamjit	Eli Lilly	CCCWFU-60107	02/14/12	02/14/16	Phase I/II Trial of Combined Re-irradiation With Pemetrexed And Erlotinib Followed by Maintenance Erlotinib For Recurrent And Second Primary Squamous Cell...	9,500
Recruitment	Coghill, James	Leukemia & Lymphoma Society	6461-15	10/01/14	09/30/17	Targeting CCj-Chemokine Receptor 7 (CCR7) with Fully Human Anti-CCR7 Antibodies for the Prevention of Graft-versus-host disease	199,541
Recruitment/Innovation Award	Coghill, James	National Inst. of Health	5-K08-HL111205-04	04/01/12	03/31/16	Targeting CC-Chemokine Receptor 7 for the Prevention of Graft-versus-Host Disease	132,327
Theme Invest (HTS)	Crews, Stephen	National Inst. of Health	5-R01-NS075079-05	06/01/11	05/31/16	Molecular Genetics of Midline Glial Development	323,750
Theme Investment (HTS, CC)	Crowley, James (Jim)	National Inst. of Health	1-K01-MH094406-04	03/01/12	02/29/16	Systems Genetics of Fluoxetine-Induced Neurogenesis and Antidepressant Response	118,179
Retention	Damania, Blossom	Leukemia & Lymphoma Society	0740-14	01/01/14	12/31/15	Novel Technology for Targeting and Understanding NHL Biology	400,000
Retention	Damania, Blossom	National Cancer Institute	5-P01-CA019014-36	07/01/11	06/30/16	Herpesviral Oncogenesis, Latency and Reactivation - Project 3: Modulation of Cell Migration, Survival and Angiogenesis by KSHV	283,526
Retention	Damania, Blossom	National Cancer Institute	5-RO1-CA096500-13	09/01/13	08/31/18	Role of KSHV Viral Proteins in Signaling and Pathogenesis	281,108

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Retention	Damania, Blossom	National Inst. of Health	5-R01-DE018281-09	06/01/12	05/31/17	Innate Immunity and KSHV	365,968
Retention	Damania, Blossom	National Inst. of Health	5-R01-DE023946-04	09/17/13	07/31/18	Targeting the Epigenome of Gammaherpesviruses in Oral Disease	378,255
Retention	Damania, Blossom	National Inst. of Health	5-U19-AI109965-02	03/01/14	02/28/19	Discovery of New Innate Immune Pathways in Viral Recognition - Project 3 - Innate Recognition of Human Herpesviruses	415,872
Retention	Damania, Blossom	National Inst. of Health	5-U19-AI107810-03	07/01/13	06/30/18	Characterization of Novel Genes Encoded by RNA and DNA Viruses - Project 3 Study of Novel HHV8/KSHV Encoded Genes	421,563
Theme Invest (HTS)	Dangl, Jeff	Gordon and Berry Moore Foundation	3030	09/01/11	08/31/16	Understanding Plant Immune System Function in Complex Microbial Environments	333,333
Retention	Dayton, Paul	Department of Defense	W81XWH-12-1-0303	08/01/12	07/31/16	Piezoelectric Composite Micromachined Multi-Frequency Transducers for High-Resolution, High-Contrast Ultrasound Imaging for Improved Prostate Cancer Assessment	502,375
Retention	Dayton, Paul	National Cancer Institute	5-RO1-CA170665-04	07/01/12	06/30/16	Micro-Tumor Detection by Quantifying Tumor-Induced Vascular Abnormalities (PQ-13)	456,058
Retention	Dayton, Paul	National Cancer Institute	3-RO1-CA170665-04S1	09/01/12	06/30/16	Pilot Clinical Study of Acoustic Angiography for Improving Ultrasound Sensitivity - Supplement	196,588
Retention	Dayton, Paul	National Cancer Institute	5-R24-CA165621-02	12/01/12	06/30/16	SBIR-Quantitative Ultrasound Analysis of Vascular Morphology for Cancer Assess	160,109
Retention	Dayton, Paul	National Cancer Institute	1-R01-CA189479-02	09/04/14	08/31/18	Academic-Industrial Partnership for Translation of Acoustic Angiography	438,329
Retention	Dayton, Paul	National Inst. of Health	5-R01-EB015508-04	08/01/12	05/31/16	Dual-Frequency Intravascular Arrays for Functional Imaging of Atherosclerosis - Subcontract with North Carolina State University	107,708
Retention	Dayton, Paul	National Cancer Institute	1-R43-CA192482-01	12/01/14	11/30/15	Development of an Ultrasound-Optical Preclinical Imaging Tool	10,000
Retention	Dayton, Paul	National Cancer Institute	1-RO1-CA189281-01A1	07/17/15	06/30/18	Improving Breast Ultrasound Specificity Through SFRP2 Targeted Molecular Imaging	497,391
Innovation Award	Deshmukh, Mohanish	National Inst. of Health	1-R01-GM105612-03	04/01/13	03/31/17	Mechanism by Which Human ES Cells Prime Bax at the Golgi for Rapid Apoptosis	416,098

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Retention	DeSimone, Joseph M.	Liquidia Technologies	G-5441-2	07/01/11	12/31/15	Molecular Mosquitocides: Development of an Innovative and Robust, Platform-based Approach for Sustainable Insecticidal Control of Anopheline quitoes Mosquitocides: Development of an innovative ap	99,165
Retention	DeSimone, Joseph M.	Defense Threat Reduction Agency	HDTRA1-13-1-0045	09/05/13	09/04/16	PRINT Butyrylcholinesterase (BuChE) Delivery	883,000
Retention	DeSimone, Joseph M.	Department of Defense	313-0474	09/30/13	09/29/16	Preventing Morbidity and Mortality with Novel Preventative Therapy for Recurrent Urinary Tract Infections - Subcontract with Duke University	108,272
Retention	DeSimone, Joseph M.	EIPI Systems, Inc	Not Assigned	11/20/13	12/01/15	Research Agreement with EIPI Systems, Inc.	299,160
Retention	DeSimone, Joseph M.	Liquidia Technologies	Not Assigned	09/01/05	08/31/16	Research Agreement between UNC and Liquidia in the area of PFPE, Lithography, Microfluidics, Nanostudies and Membrane Studies	436,014
Retention	DeSimone, Joseph M.	National Cancer Institute	5-U54-CA151652-05	09/01/10	07/31/16	Carolina Center of Cancer Nanotechnology Excellence-Project 1	421,528
Retention	DeSimone, Joseph M.	National Cancer Institute	5-U54-CA151652-05	09/01/10	07/31/16	Carolina Center of Cancer Nanotechnology Excellence: Core 4 - Administration	311,636
Retention	DeSimone, Joseph M.	National Inst. of Health	5-U19-AI109784-02	07/01/14	06/30/19	Novel Nanoparticle Platform for the Delivery of Vaccines and Adjuvants: Project 1- Engineering Monodisperse Particulae Vaccines to Tailor Immunological Responses	600,148
Retention	DeSimone, Joseph M.	Liquidia Technologies	G-5441-2	07/01/11	12/31/15	Molecular Mosquitocides: Development of an Innovative and Robust, Platform-based Approach for Sustainable Insecticidal Control of Anopheline Mosquitoes	99,165
Retention	DeSimone, Joseph M.	Carbon3D	Not Available	11/28/14	11/27/15	Carbon3D Sponsored Research Program at UNC-CH	377,625
Retention	Dittmer, Dirk	National Cancer Institute	5-P01-CA019014-36	07/01/11	06/30/16	Herpesviral Oncogenesis, Latency and Reactivation - Project 4: Cellular Reprogramming by KSHV Latent Genes and Mirnas	283,416
Retention/Theme Investment (HTS)	Dittmer, Dirk	National Cancer Institute	5-P01-CA019014-36	07/01/11	06/30/16	Herpesviral Oncogenesis, Latency and Reactivation - Core B: Virogenomics Core	262,859
Retention	Dittmer, Dirk	National Cancer Institute	5-R01-CA109232-10	08/01/04	04/30/16	Regulation of the KSHV Latent Promoter	227,369
Retention	Dittmer, Dirk	National Cancer Institute	5-R01-CA163217-05	08/01/11	07/31/16	Targeted Therapies for HIV-Associated Kaposi Sarcoma and Lymphoma	305,754

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Retention	Dittmer, Dirk	National Cancer Institute	5-R21-CA177315-02	08/01/13	07/31/16	Pathobiology and Clinical Profile of HIV-Associated Cancers in India and the West	204,706
Retention	Dittmer, Dirk	National Cancer Institute	5-R21-CA180097-02	09/01/13	08/31/15	(PQD2) Why is Endemic Burkitt Lymphoma Curable with Single Agent Chemotherapy?	192,409
Recruitment	Dittmer, Dirk	National Cancer Institute	Not Assigned	09/01/15	08/31/20	AIDS Malignancy Clinical Trials Consotrium (AMC)	76,000
Recruitment	Dittmer, Dirk	National Cancer Institute	Not Assigned	09/01/15	08/31/20	AIDS Malignancy Laboratory Consorium (AMC)	53,200
Retention	Dittmer, Dirk	National Inst. of Health	5-R01-DE018304-08	09/15/13	08/31/18	ART Modulation of Viral Pathogenesis in Oral Epithelia	377,837
Retention	Dittmer, Dirk	National Inst. of Health	5-U19-AI107810-03	07/01/13	06/30/18	Characterization of Novel Genes Encoded by RNA and DNA Viruses - Core C Data Management and Resource Dissemination Core	195,118
Retention	Dittmer, Dirk	National Cancer Institute	1-R21-CA192744-01	07/01/15	06/30/17	Origin of the Kaposi Sarcoma Tumor Cell	75,673
Retention	Dittmer, Dirk	National Inst. of Health	PO 1568 G NA643	09/01/14	08/31/15	AMC - Biomarker Core (Laboratory Budget) - Subcontract with EMMES Corporation Amendment 7 (Lab)	40,462
Retention	Dittmer, Dirk	National Inst. of Health	1-R01-DA040394-01	08/01/15	07/30/20	HIV and Substances of Abuse Influence Exosomes and Endothelial Cell Function	390,942
Recruitment	Dittmer, Dirk	National Inst. of Health	110006	12/01/14	11/30/15	A5263/A5264 Biopsy Kit	36,400
Recruitment	Doerschuk, Claire	National Inst. of Health	5-R01-HL114388-04	06/01/12	03/31/17	RHO-Mediated Signaling in Lung Endothelial Cells Induced by Neutrophil Adhesion	610,264
Recruitment	Doerschuk, Claire	National Inst. of Health	5-T32-HL007106-39	07/01/75	03/31/17	Multidisciplinary Research Training in Pulmonary Diseases	415,432
Recruitment	Doerschuk, Claire	National Inst. of Health	1-K12-HL119998-03	09/01/13	05/31/18	Application of Omics in Lung Disease	269,969
Recruitment	Doerschuk, Claire	National Inst. of Health	5-P50-HL120100-03	09/19/13	08/31/18	The Impact of Tobacco Exposure on the Lungs Innate Defense System: Project 3 - Mouse Models of Smoking-related Diseases: What is the Best Mimic of Human Disease	805,503

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Recruitment	Doerschuk, Claire	National Inst. of Health	1-P50-HL120100-02S1	09/19/13	08/31/18	The Impact of Tobacco Exposure on the Lungs Innate Defense System - Supplement	99,999
Retention	Dokholyan, Nikolay	National Inst. of Health	5-R01-GM080742-09	04/01/07	03/31/16	Protein Misfolding and Aggregation	332,719
Retention	Dokholyan, Nikolay	National Inst. of Health	5-R01-AI102732-04	07/01/12	06/30/16	Immunogen Design to Target Carbohydrate-Occluded Epitopes on the HIV Envelope	497,332
Recruitment	Dotti, Gianpietro	Leukemia & Lymphoma Society		03/01/15	09/30/18	Targeting CD138 in Myelmoa	153,214
Recruitment	Dudley, Andrew	National Cancer Institute	1-R01-CA177875-01A1	09/01/14	08/31/19	Mechanisms of Tumor Escape from Anti-Angiogenic Therapy	312,777
Recruitment	Dusetzina, Stacie	American Cancer Society	RSGI-14-030-01-CPHPS	07/01/14	06/30/16	Impact of Parity Legislation on Use and Costs of Oral Cancer Medications	239,947
Recruitment	Emanuele, Michael	Susan G. Komen Foundation	CCR14298820	10/24/14	10/23/17	Altered Ubiquintin Signaling Networks Regulating Breast Cancer Proliferation	150,000
Recruitment	Emanuele, Michael	V Foundation	Not Assigned	10/01/13	09/30/15	Identification of Ubiquitin Signaling Networks as Novel Avenues for Therapeutic Intervention	99,149
Recruitment	Engel, Lawrence	National Inst. of Health	5-R01-ES020874-04	09/01/11	08/31/16	Effects of the Deepwater Horizon Disaster: The Coast Guard Responder Cohort	47,369
Retention	Evans, James	National Inst. of Health	5-U01-HG006487-04	12/01/11	11/30/15	NC GENES: NC Clinical Genomic Evaluation by NextGen Exome Sequencing	1,567,353
Recruitment	Foster, Matthew	Celator Pharmaceuticals, Inc	CLTR0301-301-CPX-351	10/04/13	10/31/15	Phase III, Multicenter, Randomized, Trial of CPX-351 (Cytarabine: Daunorubicin) Liposome Injection versus Cytarabine and Daunorubicin in Patients 60-75 Years of age with Untreated High Risk (Secondary) AML.	6,996
Recruitment	Foster, Matthew	Celgene Corporation	LCCC 1111	05/31/12	05/30/16	An Open-Label Dose-Finding Study of Lenalidomide as Reinduction/Consolidation Followed by Lenalidomide Maintenance Therapy for Adults Over 60 Years of Age with AML in Partial or Complete Response Following Induction Therapy	107,835
Recruitment	Foster, Matthew	ICON Clinical Research	B1931022	06/26/13	06/25/16	An Open-label Randomized Phase 3 Study of Inotuzumab Ozogamicin Compared to a Defined Investigator's Choice in Adult Patients with Relapsed or Refractory CD22-Positive Acute Lymphoblastic Leukemia (ALL)	15,434

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Recruitment	Fry, Rebecca	National Inst. of Health	5-R01-ES019315-05	09/20/10	05/31/16	In Utero Exposure to Arsenic, Links to Epigenetic Alterations and Disease	363,075
Recruitment	Frye, Stephen	National Inst. of Health	5-R01-GM100919-04	05/01/12	01/31/16	Discovery of Chemical Probes for Methyl-Lysine Readers	281,200
Recruitment	Frye, Stephen	National Inst. of Health	1-R01-DK101645-01A1	07/01/15	04/30/18	High Throughput Screening Assay for IP7K Inositol Pyrophosphate kinases	342,000
Recruitment	Frye, Stephen	SAIC - Frederick	29XS126/A59101	08/13/11	03/31/16	Task Order #8-NC Comprehensive Chemical Biology Screening Center	62,369
Recruitment	Furey, Terrence	National Inst. of Health	1-RO1-ES024983-02	12/01/14	11/30/16	Interpreting Molecular Role of DNA Variants Associated with Crohn's Disease Through Integrative Analysis of Open Chromatin, Epigenome and Transcriptome Data in Diverse and Relevant Tissues and Cells	300,204
Recruitment/Theme Investment (HTS)	Furey, Terrence	National Inst. of Health	5-R01-ES023195-03	08/26/13	05/31/17	Genes, Genomes and Genotoxicity: In Vivo Epigenetic Toxicology of 1,3-Butadiene	547,025
Recruitment	Garcia-Martinez, Jose Victor	American Foundation for AIDS Research	108684-55-RKMT	10/01/13	09/30/15	Mechanisms of Oral HIV transmission in Breast Milk	75,000
Recruitment	Garcia-Martinez, Jose Victor	National Inst. of Health	5-R01-AI096138-04	07/01/11	06/30/16	Next Generation Pre-exposure Prophylaxis	705,599
Recruitment	Garcia-Martinez, Jose Victor	National Inst. of Health	5-R01-AI073146-08	08/01/13	07/31/18	Prevention of HIV Acquisition by Long-Acting Antiretroviral PrEP	633,037
Recruitment	Garcia-Martinez, Jose Victor	National Inst. of Health	5-R01-AI111899-02	03/01/14	02/28/19	Plug & Purge: In Vivo Targeting of Active HIV Reservoirs that Persist Despite ART	487,157
Recruitment	Garcia-Martinez, Jose Victor	National Inst. of Health	5-RO1-AI097012-04	09/01/13	08/31/16	Mode of Action of a New Tat HIV-1 Inhibitor	185,000
Recruitment/Innovation Award	Gershon, Timothy	National Inst. of Health	5-K08-NS077978-04	04/01/13	03/31/16	Aerobic Glycolysis Regulates Apoptosis in Neurogenesis and Medulloblastoma	176,618
Recruitment	Gershon, Timothy	National Inst. of Health	1-R01-NS088219-01A1	07/01/14	06/30/19	Glycolytic Regulation of Cerebellar Development and Medulloblastoma Tumorigenesis	124,671

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Recruitment	Gershon, Timothy	St. Baldrick's Foundation	Not Assigned	07/01/14	06/30/16	Exploiting Bcl-xl Dependence to Improve medulloblastoma Therapy	75,000
Theme Invest (HTS)	Gershon, Timothy	Alex's Lemonade Stand Foundation	Not Assigned	07/01/15	06/30/17	Preclinical Development of Atr Inhibitor VE-822, Delivered Systemically in Nanoparticles, for Medulloblastoma Therapy	125,000
Innovation Award	Goldstein, Robert	National Inst. of Health	5-R01-GM083071-08	06/01/08	08/31/16	C. Elegans Gastrulation: A Model for Understanding Apical Construction Mechanisms	298,362
Retention	Gopal, Satish (Damania, Blossom)	National Cancer Institute	1-U54-CA190152-02	09/15/14	08/31/19	Addressing Herpesviruses-Associated Cancers Through the UNC-Malawi Cancer Consortium	749,896
Recruitment	Grilley-Olson, Juneko	GlaxoSmithKline	FGF117360	10/02/13	10/01/16	Multi-arm, Non-randomized, Open-label Phase IB Study to Evaluate GSK3052230 in Combination with Paclitaxel and Carboplatin, or Docetaxel or as Single Agent in Subjects with Solid Malignancies and Deregulated FGF Pathway Signaling	16,208
Recruitment	Grilley-Olson, Juneko	Morphotek, Inc	MORab-004-203-STS	07/26/13	09/18/16	A Study of the Safety and Efficacy of the Combination of Gemcitabine and Docetaxel with MORab-004 in Metastatic Soft Tissue Sarcoma	8,850
Recruitment	Grilley-Olson, Juneko	Novartis Pharmaceutical Corporation	CBKM120ZUS40	01/07/14	12/31/17	Modular Phase II Study to Link Targeted Therapy to Patients with Pathway Activated Tumors: Module 1 - BKM120 for Patients with PI3K-activated Tumors	1,121
Recruitment	Gupta, Gaorav	Burroughs Wellcome	1012285-01	01/01/15	12/31/19	DNA Damage Responses in Breast Cancer Pathogenesis	140,000
Recruitment	Gupton, Stephanie	National Inst. of Health	5-R01-GM108970-02	01/01/14	12/31/18	TRIM9 Coordinates Membrane Trafficking and Cytoskeletal Dynamics	287,252
Retention	Hahn, Klaus	National Inst. of Health	5-P01-GM103723-02	09/30/13	07/31/18	Spatio-temporal Dynamics of GEF-GTPase Networks	1,101,950
Retention	Hahn, Klaus	National Inst. of Health	5-RO1-GM102924-04	08/01/12	05/31/16	A Toolkit for Imaging and Photo-Manipulation of Signaling in Zebrafish	310,929
Retention	Hayes, D. Neil	Eli Lilly	I4E-MC-JXBA	05/21/10	05/20/16	(IMCL-CP01-0861) Phase 2 Study to Evaluate the Pharmacokinetics and Drug-Drug Interaction of Cetuximab and Cisplatin in Patients with Recurrent or Metastatic Carcinoma of the Head and Neck	3,894
Retention	Hayes, D. Neil	GeneCentric	Not Assigned	03/01/14	12/31/15	Velo3 Genecentric Agreement	158,346

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Theme Investment/Retention	Hayes, D. Neil	National Cancer Institute	5-U10-CA181009-02	03/01/14	02/28/19	Network Group Integrated Translational Science Centers Application	700,000
Retention	Hayes, D. Neil	Pharmaceutical Research Assoc	VRXP-A202	12/18/13	12/19/16	A Randomized, Double-Blind, Placebo-Controlled Study of Chemotherapy Plus Cetuximab i n Combination with VTX-2337 in Patients with Recurrent or Metastatic SCCHN	16,848
Recruitment	Hayes, Liza Makowski	Mary Kay Ash Charitable Foundation	062-13	07/01/13	07/31/16	Reversing Carcinogenic Effect of Obesity on Basal-like Breast Cancer	154,540
Recruitment	Hayes, Liza Makowski	National Cancer Institute	5-R21-CA180134-02	08/07/13	07/31/16	(PQA2) Reversing Carcinogenic Effect of Obesity on Basal-like Breast Cancer	154,570
Theme Invest (HTS)	Henderson, Gail	National Inst. of Health	5-P50-HG004488-08	09/27/07	05/31/18	Center for Genomics and Society	1,188,965
Innovation Award	Huang, Leaf	National Cancer Institute	5-U54-CA151652-05	09/01/10	07/31/16	Carolina Center of Cancer Nanotechnology Excellence-Project 2	210,838
Innovation Award	Huang, Leaf	National Inst. of Health	5-R01-DK100664-03	09/10/13	08/31/18	Hepatic Non-Viral Gene Therapy	330,600
Recruitment	Hursting, Stephen D.	National Cancer Institute	1-R35-CA197627-01	08/01/15	07/31/22	Breaking the Obesity-Cancer Link: New Targets and Strategies	762,608
Recruitment	Hursting, Stephen D.	National Inst. of Health (Subcontract with MD Anderson)	UTA14-000887	04/01/15	03/31/20	Determinants for Differential Effects on Colitis and Colon Tumorigenesis by EPA and DHA	3,462
Recruitment	Hursting, Stephen D.	The Breast Cancer Research Fund	Not Assigned	10/01/14	09/30/15	High Dose Omega-3 Gatty Acids and Weight Loss for Breast Cancer Prevention: The Role of Epigenetic Reprogramming	249,355
Retention	Ibrahim, Joseph	National Cancer Institute	5-P01-CA142538-06	04/01/10	03/31/16	Statistical Methods for Cancer Clinical Trials: Project 1 - Innovative Clinical Trial Design and Analysis	265,067
Retention	Ibrahim, Joseph	National Cancer Institute	5-P01-CA142538-06	08/01/10	03/31/16	Statistical Methods for Cancer Clinical Trials: Project 2 - Methods for Missing and Auxiliary Data in Clinical Trials	294,494
Retention	Ibrahim, Joseph	National Cancer Institute	5-P01-CA142538-06	08/01/10	03/31/16	Statistical Methods for Cancer Clinical Trials: Project 3 - Postmarketing Surveillance and Comparative Effectiveness Research	211,679
Retention	Ibrahim, Joseph	National Cancer Institute	5-P01-CA142538-06	04/01/10	03/31/16	Statistical Methods for Cancer Clinical Trials: Core B - Data Compilation Core	254,848

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Retention	Ibrahim, Joseph	AMGEN Inc.	Not Assigned	07/31/08	12/31/15	Supported Research Agreement - Amgen, Inc.	250,000
Retention	Ibrahim, Joseph	AMGEN Inc.	PO#7200322732	07/31/08	12/31/15	Supported Research Agreement	356,000
Retention	Ibrahim, Joseph	Merck & Co.	Not Assigned	07/01/09	02/28/17	Methods for Interim Analysis with Incomplete Adjudication of Events	475,401
Retention	Ibrahim, Joseph	National Cancer Institute	5-T32-CA106209-10	05/01/04	06/30/16	Biostatistics for Research in Genomics and Cancer	291,093
Retention	Ibrahim, Joseph	National Inst. of Health	5-R01-GM070335-16	03/01/96	08/31/15	Bayesian Approaches to Model Selection for Survival Data	283,068
Recruitment	Innocenti, Federico	National Cancer Institute	5-R21-CA178550-02	04/01/14	03/31/16	A New Model for Discovering Genetic Determinants of Angiogenesis and the Effect of Angiogenesis Inhibitors	198,360
Recruitment	Jamieson, Katarzyna	Astellas Pharma, Inc	0113-CL-1004	09/11/13	10/03/16	A Randomized, Double-Blind, Placebo-Controlled, Phase III Trial to Evaluate the Protective Efficacy and Safety of a Therapeutic Vaccine. ASP0113, in Cytomegalovirus (CMV)-Seropositive Recipients Undergoing Allogenic,	15,500
Recruitment	Jamieson, Katarzyna	GlaxoSmithKline	Zoster-039	08/13/13	07/13/16	A Phase III, Randomized, Observer-blind, Placebo-controlled, Multicenter Study to Assess the Safety and Immunogenicity of GSK Biologicals' Herpes Zoster HZ/su Candidate Vaccine when Administered Intramuscularly on a Two Dose Schedule	17,933
Theme Investment (HTS)	Johnson, Gary	National Inst. of Health	5-R01-GM068820-12	08/01/03	07/31/16	Function of Cerebral Cavernous Malformation Proteins	389,912
Theme Investment (CBCS,HTS)	Johnson, Gary	National Inst. of Health	5-R01-GM101141-04	04/15/12	01/31/16	Kinome Reprogramming in Response to Targeted Kinase Inhibitors	276,873
Theme Investment (Proteomics, HTS)	Johnson, Gary	National Inst. of Health	1-UO1-MH104999-02	08/01/14	04/30/16	Activation and Regulation of the Understudied Kinome Using MIB/MS Technology	395,126
Theme Investment (CBCS, HTS, MP1U)/Innovation	Johnson, Gary	Susan G. Komen Foundation	IIR12225201	01/01/13	12/31/16	Whole Kinome Profiling and Remodeling in HER2+ Breast Cancer	244,838
Theme Investment (CBCS, HTS)/Innovation Award	Johnson, Gary	National Cancer Institute	5-P50-CA058223-22	09/01/12	08/31/17	SPORE in Breast Cancer - Project 5: Defining Kinome Activity for Novel Therapies in Triple Negative Breast Cancer	301,201
Theme Investment (Proteomics)	Johnson, Gary	Children's Tumor Foundation	Not Assigned	02/03/14	01/31/17	Applying Systems Biology to Create Tools and Treatment Paradigms for NF2-associated meningioma and Vestibular Schwannoma	116,666

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Theme Investment (Proteomics)	Johnson, Gary	National Cancer Institute	1-U54-CA196519-01	07/01/15	06/30/20	Developmental and Hyperactive Ras Tumor SPORE (Omics Core)	400,702
Theme Invest (HTS)	Jones, Corbin	N.C. Biotechnology Center	2013-MRG-1110	07/01/13	12/31/15	Developing REA (Repetitive Element Assembler) Algorithm for Assembling Repetitive and Hyper-Variable Geneomic Regions	390,777
Theme Invest (HTS)	Juliano, Jonathan	National Inst. of Health	5-R01-AI089819-05	06/01/10	05/31/16	Within Host Selection of P. falciparum Variants by Artemisinin Combination Therapy	329,671
Recruitment	Kabanov, Alexander	National Cancer Institute	5-U01-CA151806-05	09/20/10	07/31/16	High Capacity Nanocarriers for Cancer Chemotherapeutics	379,186
Recruitment	Kabanov, Alexander	National Cancer Institute	1-RO1-CA184088-01A1	09/01/14	08/31/19	Liposomal Doxorubicin and Pluronic Combination for and Cancer Therapy	344,549
Recruitment	Kabanov, Alexander	National Cancer Institute	1-T32-CA196589-01	07/01/15	06/30/20	Carolina Cancer Nanotechnology Trainng Program (C-CNTP)	200,830
Recruitment	Kabanov, Alexander	National Inst. of Health	5-R01-NS051334-09	04/01/05	03/31/16	Polypeptide Modification for Enhanced Brain Delivery	340,541
Recruitment	Kabanov, Alexander	National Cancer Institute	1-U54-CA198999-01	08/01/15	07/31/20	Nano Approaches to Modulate Host Cell response for Cancer Therapy: Project 4 - High Capacity Polymeric Micelle therapeutics for Lung Cancer	517,671
Recruitment	Kabanov, Alexander	National Inst. of Health	1-R21-NS088152-01A1	09/15/15	08/31/17	Nanoformulation of the Neuroprotectant BDNF for Treatment of Stroke	411,216
Theme Investment (CC)	Kafri, Tal	National Inst. of Health	1-R01-HL128119-01	09/02/15	06/30/19	Lentiviral Vector-based Gene Therapy and the Host Genetic Background	758,060
Recruitment	Kasow, Kim	National Childhood Cancer Foundation	CTN 0601	03/01/10	02/28/16	CTN 0601 Unrelated Donor Hematopoietic Cell Transplantation for Children with Severe Sickle Cell Disease Using a Reduced Intensity Conditioning Regime	7,537
Retention	Key, Nigel	Baxter Healthcare	Not Assigned	10/14/11	10/31/15	An Observational Study of Postoperative Deep Venous Thrombosis (DVT) in Hemophilics Undergoing Major Orthopedic Surgery	150,625
Retention	Key, Nigel	National Inst. of Health	5-T32-HL007149-39	07/01/12	06/30/17	Research Fellowships in Hematology/Oncology	353,661
Retention	Key, Nigel	National Inst. of Health	5-K12-HL087097-09	05/01/14	04/30/16	Duke/UNC clinical hematology and Transfusion Research Career Development Program K12	130,491

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Retention	Key, Nigel	National Inst. of Health	1-R01-HL126542-012	09/01/14	08/31/18	Targeting Hypercoagulation to Reduce Inflammation in Treated HIV Disease	83,131
Retention	Kim, William	American Cancer Society	RSG-14-219-01-TBG	01/01/15	12/31/18	Intrinsic Subtypes of Bladder Cancer	197,774
Retention	Kim, William	Bladder Cancer Advocacy Network	Not Assigned	07/15/14	07/14/16	Immune Characterization of High-Grade Bladder Cancer	150,000
Retention	Kim, William	National Cancer Institute	5-RO1-CA142794-05	03/01/10	02/29/16	Characterization and Therapeutic Targeting of HIF in LKB1-deficient Lung Cancer	287,693
Theme Invest (HTS)	Knowles, Michael R.	Natl Heart, Lung, & Blood Inst	5-R01-HL68890-13	09/01/06	06/30/16	Gene Modifiers in CF Lung Disease	735,600
Retention	Kosorok, Michael (Lin, Danyu)	National Cancer Institute	5-P01-CA142538-06	04/01/10	03/31/16	Statistical Methods for Cancer Clinical Trials: Project 4 - Methods for Pharmacogenomics and Individualized Therapy Trials	296,699
Retention	Kosorok, Michael	National Cancer Institute	5-PO1-CA142538-06	04/01/10	03/31/16	Statistical Methods for Cancer Clinical Trials: Project 5 - Methods for Discovery and Analysis of Dynamic Treatment Regimes	248,489
Retention	Kosorok, Michael	National Cancer Institute	5-P01-CA142538-06	12/01/09	03/31/16	Statistical Methods for Cancer Clinical Trials - Core A - Administrative	220,245
Recruitment/theme Investment(HTS)	Laederach, Alain	National Inst. of Health	5-R01-HL111527-04	01/01/12	12/31/16	Non-Coding RNA Structure Change in Chronic Obstructive Pulmonary Disease	354,651
Recruitment/Theme Investment (HTS)	Laederach, Alain	National Inst. of Health	1-RO1-HG008133-01	09/01/15	06/30/18	Predicting the Causative SNPs in LD Blocks by Allele-Specific Structural Analysis	751,323
Recruitment/Theme Investment (HTS)	Laederach, Alain	National Inst. of Health	5-R01-GM101237-04	05/01/14	04/30/16	Structural and Functional Consequences of Disease SNPS on the Transcriptome	273,639
Recruitment	Lai, Samuel K.	David and Lucile Packard Foundation	2013-39274	10/15/13	10/14/18	Harnessing Antibody-mucin Interactions	174,999
Recruitment	Lai, Samuel K.	National Inst. of Health	1-R21-EB017938-02	09/30/14	06/30/16	Prevalence and Characteristics of Anti-PEG Antibodies in Humans	224,429
Recruitment	Lai, Samuel K.	National Inst. of Health	4500001411	08/01/13	10/31/15	Optimizing Plantibodies for Trapping HIV and HSV in Cervicovaginal Mucus	159,258

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Recruitment	Lai, Samuel K.	National Science Foundation	DMR-1151477	04/15/12	03/31/17	Synthetic Nanoprobes Reveal Novel Biophysical Immune Protective Mechanism of Mucus	79,999
Innovation Award	Lawrence, David	National Cancer Institute	5-R01-CA159189-05	06/01/11	04/30/16	Spatiotemporal Control of Tumor Cell Signaling	307,100
Recruitment	Lee, Carrie	GlaxoSmithKline	BRA116598/LCCC 1128	01/07/13	01/06/16	Open Label Phase 11 Trial of the BRAF Inhibitor (Dabrafenib) and the MEK Inhibitor (Trametininb) in Unresectable Stage 111 and Stage IV BRAF Mutant Melanoma; Correlation of Resistance with the Kinome and Functional Mutations	16,344
Recruitment	Lee, Carrie	Millennium Pharmaceuticals, Inc.	C15010	06/20/13	06/19/16	A Phase 1b, Open-Label, Dose Escalation, Multi-arm Study of MLN4924 Plus Docetaxel, Gemcitabine, or Combination of Carboplatin and Paclitaxel in Patients with Solid Tumors	121,692
Recruitment	Lee, Carrie	Quintiles, Inc	GP28363	12/11/13	12/10/16	A Phase Ib Study of the Safety and Pharmacology of MPDL3280A Administered with Cobimetinib in Patients with Locally Advanced or Metastic Solid Tumors	41,427
Recruitment	Lee, Yueh	National Inst. of Health	1-R41-NS086295-01A1	06/01/15	05/31/16	STTR: Automated Assessment of Leptomeningeal Collaterals on CT Angiograms	75,000
Recruitment	Lemon, Stanley	Merck & Co.	40420	02/10/12	02/09/16	Antiviral Mechanisms and Emergence of Resistance to HCV Protease Inhibitors	193,422
Recruitment/theme Investment(HTS)	Lemon, Stanley	National Cancer Institute	5-R01-CA164029-04	05/01/12	03/31/17	Murine Model of HCV-Associated Human Liver Cancer	470,695
Recruitment	Lemon, Stanley	National Inst. of Health	5-R01-AI095690-05	04/01/11	03/31/16	Micro-RNA 122 and Chronic Hepatitis C	368,389
Recruitment	Lemon, Stanley	National Inst. of Health	5-R01-AI103083-04	09/01/12	08/31/17	Membrane Hijacking: Biogenesis and Fate of Enveloped Hepatovirus	380,000
Recruitment	Lemon, Stanley	National Inst. of Health	5-U19-AI109965-02	03/01/14	02/28/19	Discovery of New Innate Immune Pathways in Viral Recognition - Project 2 - Novel Pathogen Recognition Pathways and Control of Hepatitis A Virus	408,220
Recruitment	Li, Zibo	American Cancer Society	MRSG-12-034-01-CCE	06/01/14	12/31/16	Integrin alpha2beta1 Targeted Multimodality Molecular Imaging Probes Integrin alpha2beta1 Targeted Multimodality Molecular Imaging Probes	73,803
Recruitment	Li, Zibo	National Inst. of Health	5-RO1-EB014354-03	09/23/13	06/30/17	The Tetrazine Ligation for Efficient 18F Labeling and Pretargeted Imaging/Radiotherapy of Cancer	323,853

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Recruitment	Li, Zibo	National Cancer Institute	1-U54-CA198999-01	08/01/15	07/31/20	Nano Approaches to Modulate Host Cell response for Cancer Therapy: Small Animal Imaging Core	71,907
Theme Investment/Retention	Linnan, Laura A.	Centers for Disease Control	2-R49-CE002479-01	08/01/14	07/31/19	UNC Injury Prevention Research Center	408,961
Retention	Linnan, Laura A.	Centers for Disease Control	3-U48-DP005017-01S1	09/30/14	09/29/19	SIP 14-030 UNC Coordinating Center of the Worksite Health Research Network - Supplement	66,177
Retention	Linnan, Laura A.	Centers for Disease Control	Not Assigned	09/30/14	09/29/19	SIP 14-031 UNC Collaborating Center of the Worksite Health Research Network	149,926
Retention	Linnan, Laura A.	National Cancer Institute	2-U54-CA156733-06	09/01/15	08/31/20	NCCU-LCCC Partnership in Cancer Research - Core 2 Outreach Core	22,486
Retention	Linnan, Laura A.	National Cancer Institute	2-U54-CA156733-06	09/01/15	08/31/20	NCCU-LCCC Partnership in Cancer Research - Pilot Project 1: Planning for Sustainability of Evidence-based Interventions	85,965
Recruitment	Lund, Jennifer	PhRMA Foundation	Not Assigned	08/01/14	12/31/15	Evaluating Heterogeneity of Cancer Treatment Benefits Among Older Adults	100,000
Retention	Lund, P. Kay	National Inst. of Health	5-RO1-DK40247-22	05/01/89	06/30/16	Intestinal Adaptation: Role of Hormones and Growth Factors	335,352
Retention	Lund, P. Kay	National Inst. of Health	5-R01-AG041198-04	08/01/12	06/30/17	Aging Intestinal Stem Cells and Insulin/IGF System	300,013
Theme Investment (CC)	Magnuson, Terry	National Inst. of Health	2-U42-OD010924-16	09/30/99	02/28/16	A Carolina Center to Characterize and Maintain Mutant Mice	1,399,761
Recruitment	Major, Benjamin	American Cancer Society	RSG-14-068-01-TBE	07/01/14	06/30/18	Mechanisms Controlling KEAP1 Function in Cancer	178,572
Recruitment	Major, Benjamin	Gabrielle's Angel Foundation for Cancer research	85	06/01/15	05/31/18	Molecular Rationale for WNT Inhibitor Therapy in B-Cell Lymphoma	75,000
Recruitment	Major, Benjamin	National Cancer Institute	1-R21-CA178760-02	09/01/14	03/31/16	Mass Spectrometry-Coupled Hypermorphic Functional Genomics	164,360
Recruitment	Major, Benjamin	National Cancer Institute	1-RO1-CA187799-01A1	07/01/15	06/30/20	Role of FOXP1 and WNT Signaling in 6-cell Lymphoma	307,500

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Recruitment	Major, Benjamin	National Inst. of Health	5-DP20-OD007149-05	09/01/10	09/29/15	Exploitation of Near-Haploid Human Cells for Functional Gene Discovery	220,000
Recruitment	Major, Benjamin	National Cancer Institute	2-U54-CA156733-06	09/01/15	08/31/20	NCCU-LCCC Partnership in Cancer Research - Pilot Project 2: Nrf2 Activation in Esophageal Squamous Cell Carcinogenesis In Vivo	20,788
Recruitment	Major, Benjamin	Sarcoma Foundation of America	Not Assigned	06/01/14	11/30/15	Kinase Activity Profiling in Soft Tissue Sarcoma	50,000
Recruitment/Theme Investment	Major, Benjamin	V Foundation	Not Assigned	12/01/14	11/30/17	Team Science Approach for Defining the Activation State and Dynamic Reprogramming of the Kinome in Aerodigestive Cancer	200,000
Recruitment	Marks, Lawrence	National Cancer Institute	5-R01-CA069579-15	05/01/96	05/31/15	Radiation-Induced Cardiopulmonary Injury in Humans	228,893
Theme Invest (HTS)	Matera, A. Gregory	National Inst. of Health	5-R01-GM053034-18	05/01/96	04/30/16	Biogenesis of Small Ribonucleoproteins	394,430
Recruitment/Theme Investment (HTS)	Matera, A. Gregory (Duronio, Robert J.)	National Inst. of Health	5-R01-DA036897-03	09/15/13	05/31/18	Engineering Histone Genes to Interrogate the Epigenetic Code in Space and Time	413,365
Recruitment	McRee, Autumn	GlaxoSmithKline	MEK1168833	04/30/13	04/29/16	An Open-Label, Three-Part, Phase 1/11 Study to Investigate the Safety, Pharmacokinetics, Pharmacodynamics, and Clinical Activity of the MEK Inhibitor GSK1120212, BRAF Inhibitor GSK2118436 and the Anti-EGFR Antibody Panitumumab in Combination in Subjects	9,086
Recruitment	Miao, Edward	National Inst. of Health	5-R01-AI097518-04	02/01/14	01/31/16	Inflammasome Response to Bacterial Infection	423,639
Recruitment	Miao, Edward	National Inst. of Health	1-R01-AI119073-01	05/01/15	03/30/20	Role of Caspase-11 in Innate Immunity	354,839
Retention	Miller, C. Ryan	National Cancer Institute	5-P30-CA016086-39	12/01/10	11/30/15	Cancer Center Core Support Grant- Translational Pathology Core	238,394
Retention	Miller, C. Ryan	National Cancer Institute	5-P01-CA151135-04	08/01/11	07/31/16	Epidemiology of Breast Cancer Subtypes in African-American Women: a Consortium, Core C: Biospecimen	294,390
Retention	Miller, C. Ryan	National Cancer Institute	2-U54-CA156733-06	09/01/15	08/31/20	NCCU-LCCC Partnership in Cancer Research - Core 1 Diagnostic and Molecular Histopathology Core	21,556

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Recruitment	Milowsky, Matt	Merck & Co.	MK-3475-045	01/09/15	01/09/18	A Phase III Randomized Clinical Trial of Pembrolizumab (MK-3475) versus Paclitaxel or Vinflunine in Subjects with Recurrent or Progressive Metastatic Urothelial Cancer	3,300
Recruitment	Milowsky, Matt	Janssen Pharmaceuticals, Inc	Not Assigned	06/26/15	06/26/18	A Phase II Open-label, Parallel Group Study of Abiraterone Acetate Plus Prednisone in African American and Cauasian Men and Metastatic Castrate-resistant Prostate Cancer	38,051
Recruitment	Milowsky, Matt	BIND Biosciences, Inc	BIND-014-004	06/06/13	06/05/16	An Open Label, Multicenter, Phase 2 Study to Determine the Safety and Efficacy of BIND-014- (Docetaxel nanoparticles for Injectable Suspension), Administered to Patients with Metastatic Castration-Resistant Prostate Cancer	32,764
Recruitment	Milowsky, Matt	Exelixis	XL184-306	08/28/12	08/27/17	XL184-306 A Phase 3, Randomized, Double-blind, Controlled Trial of Cabozantinib (XL184) vs. Mitoxantrone Plus Prednisone in Men with Previously Treated Symptomatic Castration-resistant Prostate Cancer	15,437
Recruitment	Milowsky, Matt	MethylGene, Inc.	MGCD0103-018	10/13/14	10/13/17	An Open-Label, Single-Arm, Phase 2 Study of Mocetinostat in Selected Patients with Inactivating Alterations of Acetyltransferase Genes in Previously Treated Locally Advanced or Metastatic Urothelial Carcinoma.	19,003
Recruitment	Milowsky, Matt	Sloan-Kettering Institute for Cancer Research	MSKCC-12-071	01/01/13	01/02/16	Phase II Study of Neoadjuvant Dose Dense Gemcitabine and Cisplatin (DD GC) In Patients with Muscle-Invasive Bladder Cancer	6,000
Recruitment	Milowsky, Matt	Sloan-Kettering Institute for Cancer Research	C11-092	05/20/13	05/19/16	A Phase 2, Randomized, 3-Arm Study of Abiraterone Acetate Alone, Abiratreone Acetate Plus Degarelix, a GnRH Antagonist, and Degarelix Alone for Patients with Prostate Cancer with a Rising PSA or Rising PSA and Nodal Disease Following Definitive Radical	12,380
Recruitment	Milowsky, Matt	Sloan-Kettering Institute for Cancer Research	MSK13-074	11/11/13	10/31/16	Randomized Phase II Trial of Paclitaxel, Ifosfamide, and Cisplatin (TIP) vs. Bleomycin, Etooposide and Cisplatin (BEP) for Patients with Previously Untreated Intermediate - and Poor - Risk Germ Cell Tumors.	13,500
Theme Investment (HTS)	Mohlke, Karen	National Inst. of Health	2-R01-DK072193-10	09/01/05	05/31/19	Targeted Genetic Analysis of T2D and Quantitative Traits	607,411
Theme Invest (HTS)	Mohlke, Karen	National Inst. of Health	5-R01-DK093757-04	09/05/11	07/31/16	Genetic Epidemiology of Rare and Regulatory Variants for Metabolic Traits	586,255
Recruitment	Moody, Cary	American Cancer Society	RSG-13-229-01-MPC	07/01/13	06/30/17	The Role of ATM Signaling in the Life Cycle of Human Papillomaviruses	167,651
Recruitment	Moody, Cary	National Cancer Institute	1-R01-CA181581-02	09/01/14	08/30/19	Regulation of Human Papillomavirus Replication by the DNA Damage Response	315,400

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Recruitment	Moorman, Nathaniel	National Inst. of Health	5-R01-AI103311-03	12/01/12	11/30/17	The Role of Host and Viral Translation Factors During HCMV Infection	442,424
Recruitment	Moschos, Stergios	Merck & Co.	SCH 900353	11/29/12	11/28/15	A Phase I Study to Evaluate the Safety, Tolerability and Efficacy of SCH 900353 in Subjects with Advanced Solid Tumors (SCH 900353/ P06203)	46,680
Recruitment	Moschos, Stergios	Merck & Co.	MK-3475-002-29	02/15/13	02/14/16	Randomized, Phase II Study of MK-3475 Versus Chemotherapy in Patients with Advanced Melanoma	187,176
Recruitment	Moschos, Stergios	National Cancer Institute	3-P30-CA016086-38S3	09/01/14	08/31/16	Cancer Center Core Support Grant - Team Leadership Award (CCITLA) - Supplement	76,000
Recruitment	Muss , Hyman	Kay Yow Cancer Foundation	Not Assigned	05/01/14	02/28/18	Impact of Physical Activity on Biomarkers of Aging and Body Composition Among Breast Cancer Survivors Age 65 and Older	249,978
Recruitment	Muss , Hyman	National Inst. of Health(Subcontract with City of Hope)	5-RO1-AG037037-04S	08/15/11	07/31/16	Clinical and Biological Predictors of Chemotherapy Toxicity in Older Adults with Cancer	23,732
Recruitment	Muss , Hyman	The Breast Cancer Research Fund	Not Assigned	10/01/10	09/30/15	P16INK4a Gene Expression of Chemotherapy Toxicity and Age	250,000
Recruitment	Nichols, Hazel (June)	National Cancer Institute	5-U24-CA1717534-04	09/01/14	08/31/17	CRN4: Cancer Research Resources & Collaboration in Integrated Health Care Systems	1,900
Recruitment	Nichols, Hazel (June)	The Avon Breast Health Access Fund	02-2014-080	01/01/15	12/31/16	MicroRNA & Breast Cancer: Functional Characterization in a Population-Based Study	200,000
Recruitment	Nielsen, Matt	National Cancer Institute	1-R21-CA191610-01	01/01/15	12/31/16	Optimizing Risk Stratification to Manage Early Stage Bladder Cancer	39,281
Recruitment	Nicholson, Wanda	Agency for Healthcare Research and Quality	1-P50-HS023418-01	09/01/14	08/31/19	Comparing Options for Management: Patient-Centered Results in Uterine Fibroids (COMPARE-UF)	336,419
Theme Investment (CBCS,HTS)	Olshan, Andrew	National Cancer Institute	5-PO1-CA151135-04	08/01/11	07/31/16	Epidemiology of Breast Cancer Subtypes in African-American Women: a Consortium, Core A: Administration	31,348
Theme Investment (CBCS,HTS)	Olshan, Andrew	National Cancer Institute	5-P01-CA151135-04	08/01/11	07/31/16	Epidemiology of Breast Cancer Subtypes in African-American Women: a Consortium: Core B CBPR	264,447
Theme Investment (CBCS,HTS)	Olshan, Andrew	National Inst. of Health	5-RO1-DE023414-02	08/01/14	07/31/19	Exome Sequencing for Head and Neck Cancer Susceptibility Genes	12,308

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Theme Investment (CC)	Pardo-Manuel de, Fernando	National Inst. of Health	5-R01-HD065024-05	05/01/10	04/30/16	Collaborative Cross: A Systems Genetics Approach to the Study of Male Infertility	332,597
Theme Investment (CC)	Pardo-Manuel de, Fernando	National Inst. of Health	1-F30-MH103925-01A1	09/08/14	09/07/18	Effects of Advanced Paternal Age on Germine Genome Stability	33,035
Theme Investment (CC)	Pardo-Manuel de, Fernando (Philpot, Benjamin)	Rett Syndrome Research Foundation	A13-0839-001	12/31/12	01/14/16	A Chemical Genetic Approach for Activating the Dormant Gene Associated with Rett Syndrome	200,000
Recruitment	Park, Steven	American Cancer Society	MRSG-14-215-01-TBG	01/01/15	12/31/19	Combined Targeting of Myc-associated Pathways for Treatment of Lymphoma	145,500
Recruitment	Park, Steven	Genentech Inc.	GO29383	12/01/14	11/30/17	A Phase Ib Study of the Safety and Pharmacology of MPDL3280A Administered with Obinutuzumab in Patients with Relapsed/Refractory Follicular Lymphoma and Diffuse Large B-Cell Lymphoma	23,815
Recruitment	Park, Steven	Seattle Genetics	LCCC 1115	04/26/12	04/25/16	A Pilot Feasibility Trial of Induction Chemotherapy with ABVD Followed by Brentuximab Vedotin (SGN-35) Consolidation in Patients with Previously Untreated Non-bulky Stage I or II Hodkin Lymphoma (HL)	65,881
Recruitment	Pecot, Chad	American Cancer Society	MRSG-14-222-01-RMC	01/01/15	12/31/19	Tumor Angiogenesis Regulation by the miR-200 Family	145,774
Recruitment	Pecot, Chad	V Foundation	Not Assigned	11/01/14	10/31/16	Tumor Angiogenesis Regulation by the miR-200 Family	99,786
Theme Invest (HTS)	Perou, Charles	National Cancer Institute	5-U24-CA143848-05S2	09/01/13	07/31/16	Gene Expression Patterns in Human Tumors Identified Using Transcript Sequencing - Supplement	300,000
Theme Invest (HTS)	Perou, Charles	National Cancer Institute	3-U24-CA143848-05S1	08/01/14	07/31/16	Gene Expression Patterns in Human Tumors Identified Using Transcript Sequencing - Supplement	500,000
Theme Invest (HTS)	Perou, Charles	National Cancer Institute	2-RO1-CA148761-06A1	03/17/10	12/31/15	Therapeutic Targeting of Breast Cancer Tumor Initiating Cells	406,933
Theme Investment (CBCS,HTS)	Perou, Charles	National Cancer Institute	5-P50-CA058223-22	09/01/12	08/31/17	SPORE in Breast Cancer - Project 3: Development and Validation of Biomarkers and Targets in Triple Negative Breast Cancers	492,221
Theme Investment (CBCS,HTS)	Perou, Charles	National Cancer Institute	5-P50-CA058223-22	09/01/12	08/31/17	SPORE in Breast Cancer - Core B: Genomics & Data Analysis	294,094
Theme Invest (HTS)	Perou, Charles	The Breast Cancer Research Fund	Not Assigned	10/01/08	09/30/15	Molecular Therapeutics for Luminal Tumor Subtypes	250,000

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Theme Invest (HTS)	Peifer, Mark	National Inst. of Health	5-R01-GM067236-11	09/01/08	07/31/16	A Model System to Study the Tumor Suppressor APC	255,910
Theme Invest (HTS)	Philpot, Benjamin	National Inst. of Health	5-RO1-MH093372-03	12/01/11	11/30/16	Epigenetic Regulation of Ube3a as a Treatment for Angelman Syndrom	607,649
Theme Investment (CC)	Pomp, Daniel	National Inst. of Health	5-P30-DK056350-15	04/01/06	03/31/16	UNC Clinical Nutrition Obesity Research Center - Core E Animal Metabolism Phenotyping (AMP) Core	152,000
Theme Invest (HTS)	Powell, Cynthia	National Inst. of Health	1-U19-HD077632-02	09/05/13	08/31/18	NC NEXUS, North Carolina Newborn Exome Sequencing for Universal Screening	1,491,558
Recruitment	Powell, Wizdom	National Inst. of Health	5-K01-DA032611-02	07/01/14	06/30/19	Neighborhoods, daily stress, affect regulation, & Black male substance use Neighborhoods, Daily Stress, Affect Regulation, & Black Male Substance Use	155,294
Theme Invest (HTS)	Prins, Jan	National Inst. of Health	1-R01-HG006272-03	07/01/12	06/30/16	Unlocking Transcript Diversity via Differential Analyses of Splice Graphs	403,681
Recruitment	Purvis, Jeremy	National Inst. of Health	3-ROO-GM120372-04	09/01/12	08/31/16	Dynamics of Cellular Senescence in Single Human Cells	279,873
Recruitment	Pylayeva-Gupta, Yuliya	American Association of Cancer Research	13-70-25-PLYA	01/01/15	06/30/18	Immunomodulatory Mechanisms in Kras-Driven Pancreatic Cancer and Metastasis	69,648
Retention	Ramsey, John (Mike)	Defense Threat Reduction Agency	W911NF-12-1-0539	09/10/12	12/09/15	Micro Ion Trap Mass Spectrometer	5,099,926
Retention	Ramsey, John (Mike)	Department of Defense	HR0011-12-2-0001	05/06/13	11/05/16	Reconfigurable Multi Element Diagnostic ReMEDx	2,186,628
Retention	Ramsey, John (Mike)	National Inst. of Health	5-R01-GM066018-12	07/01/03	06/30/16	Single Cell Electroportation	64,707
Retention	Ramsey, John (Mike)	National Inst. of Health	5-R01-HG007407-03	09/01/13	08/31/17	Nanofluidic Platforms for High Resolution Mapping of Genomic DNA	496,734
Theme Invest (HTS)	Randell, Scott H.	National Inst. of Health	5-UO1-HL111018-03	01/01/12	12/31/16	An Integrated Approach to Airway Epithelial Repair and Regeneration	214,600
Innovation Award	Redinbo, Matthew	National Cancer Institute	5-R01-CA098468-12	09/23/14	08/31/19	Improving CPT-11 Efficacy Using Structural Biology	263,899

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Innovation Award	Redinbo, Matthew	National Cancer Institute	5-RO1-CA161879-04	04/01/12	03/31/17	Development of Novel Drugs to Alleviate CPT-11 Toxicity	103,795
Recruitment	Reeder-Hayes, Katherine	Susan G. Komen Foundation	Not Assigned	05/01/15	04/30/18	Molecular, Treatment and Behavoiral Factors in Breast Cancer Race Disparities	133,250
Recruitment	Reeve, Bryce	Alex's Lemonade Stand Foundation	Not Assigned	01/01/14	12/31/15	Evaluation of the Literacy Demand and racial/Ethnic Influences for Self-Reported Symptomatic Adverse Events during Childhood Cancer Therapy	7,156
Recruitment	Reeve, Bryce	National Cancer Institute	5-R01-CA160104-05	09/09/11	07/31/16	Health-Related Quality of Life Values for Cancer Survivors: Enhancing the Application of PROMIS Measures for Comparative Effectiveness	14,588
Recruitment	Reeve, Bryce	National Cancer Institute	5-RO1-CA174453-04	09/01/12	07/31/16	PROMIS Validation in Prospective Population-Based Prostate Cancer Research Study	280,122
Recruitment	Reeve, Bryce	National Cancer Institute	5-R01-CA175759-03	04/01/13	03/31/18	Creating and Validating Child Adverse Event Reporting in Oncology Trials	625,352
Recruitment	Reeve, Bryce	National Cancer Institute	3-RO1-CA175759-02S1	09/01/14	03/31/17	Creating and Validating Child Adverse Event Reporting in Oncology Trials - Supplement	48,511
Recruitment	Reeve, Bryce	National Cancer Institute	5-RO1-CA174453-03	08/01/14	07/31/16	PROMIS Validation in Prospective Population-based Prostate Cancer Research Study - Supplement	150,000
Recruitment	Reeve, Bryce	National Inst. of Health	1-U19-AR065922-01	09/30/15	09/29/19	Enhancing Clinical Meaningfulness And Usefulness Of PROMIS Pediatric Measures Via Validation In Children And Adolescents With Rheumatic Disease, Cancer, Or Inflammatory Bowel Disease	543,090
Recruitment	Reeve, Bryce	National Cancer Institute	5-U2C-CA186878-02	09/01/14	08/31/18	The National Person-Centered Assessment Resource (PCAR)	138,990
Recruitment	Reeve, Bryce	Patient-Centered Outcomes Research Institute	ME-1303-5838	10/01/13	11/30/16	Measuring Patient-Centered Communication for Colorectal Cancer Care and Research	125,055
Recruitment	Rini, Christine	National Inst. of Health	5-P60-AR064166-03	07/19/13	06/30/18	NIAMS Multidisciplinary Clinical Research Center	214,263
Recruitment	Robinson, Whitney	National Cancer Institute	5-KO1-CA172717-03	09/01/12	08/31/17	Racial Disparities in Cancer Outcomes: Quantifying Modifiable Mechanisms	126,374
Recruitment	Rosenstein, Donald	Duke Endowment Foundation	6513-SP	01/01/15	12/31/17	Improving Cancer Survivorship Care Across North Carolina: Training Group Intervention Leaders	193,009

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Recruitment	Rosenstein, Donald	Lance Armstrong Foundation	Not Assigned	01/01/08	12/31/15	NC STRONG Center for Healthy Survivorships: Lineberger Lance Armstrong Center of Excellence and Community Partnerships	220,000
Recruitment	Rosenstein, Donald	Susan G. Komen Foundation	CGA-2014-NC101-UNCL69-000	04/01/14	06/30/16	TLC-UNC: Transforming Lymphedema Care for Underserved North Carolinians	50,000
Recruitment	Roth, Bryan	Merck & Co.	Not Assigned	06/19/14	06/15/16	Silencing Cholinergic Neurons: Validation and Pharmacological Rescue	99,036
Recruitment	Roth, Bryan	National Inst. of Health	HHSN-271-2013-00171C	09/08/08	08/29/18	NIMH Psychoactive Drug Screening Program	2,594,835
Recruitment	Roth, Bryan	National Inst. of Health	5-R01-MH61887-15	09/01/00	01/31/16	Targeting and Trafficking of 5-HT2A Serotonin Receptors	366,300
Recruitment	Roth, Bryan	National Inst. of Health	5-U19-MH082441-09	09/28/07	04/30/16	Functional Selectivity: A Novel Approach for CNS Drug Discovery	1,527,521
Recruitment	Roth, Bryan	National Inst. of Health	1-UO1-MH104974-02	08/01/14	07/31/17	Scalable Technologies for Illuminating the Druggable GPCR-ome	396,932
Recruitment	Roth, Bryan	National Inst. of Health	5-UO1-MH105892-02	09/26/14	05/31/17	DREADD2.0: An Enhanced Chemogenetic Toolkit	908,902
Recruitment	Roth, Bryan	National Inst. of Health	5-RO1-DA017204-10	09/30/03	01/31/16	Diterpines as Selective Kappa Opioid Receptor Agonists	323,294
Recruitment	Sanoff, Hanna	H. Lee Moffitt Cancer Center and Research Institute	MCC 17651	06/01/15	06/01/18	Multi Institutional Phase II Trial of Single Agent Regorafenib in Refractory Advanced Biliary Cancers	419,094
Recruitment	Sanoff, Hanna	Bayer	LCCC 1029	12/06/10	08/31/16	Randomized Phase II Study of Regorafenib in Combination with FOLFIRI (Irinotecan, r-Fluoracil, and Leucovorin) versus Placebo in Combination with FOLFIRI as Second Line Therapy in Patients with KRAS or BRAF Mutant Metastatic Colorectal	1,448,272
Recruitment	Sanoff, Hanna	National Cancer Institute	5-KO7-CA160722-05	09/01/12	08/31/16	Use and Comparative Effectiveness of Innovative Therapies for Hepatoellular Carcinoma	170,100
Recruitment	Savoldo, Barbara	National Inst. of Health	5-R01-HL114564-03	07/01/14	06/30/18	Enhancement of Stem Cell Transplants using CAR.CD30-Redirected T Lymphocytes	440,384
Retention	Schoenfisch, Mark	National Inst. of Health	1-R21-AI112029-01A1	12/01/14	11/30/16	Nitric Oxide-releasing Cystic Fibrosis Therapeutics	153,540

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Retention	Schoenfisch, Mark	National Inst. of Health	1-R01-DE025207-01	07/02/15	06/30/20	Nitric Oxide-releasing Dendrimers for the Treatment of Periodontal Disease	347,756
Innovation Award	Sekelsky, Jeff J.	National Inst. of Health	5-R01-GM099890-04	05/01/12	04/30/16	Mechanisms of Mitotic Recombination	278,661
Retention	Serody, Jonathan S.	National Cancer Institute	5-P50-CA058223-22	09/01/12	08/31/17	SPORE in Breast Cancer - Project 2: Investigating the Function of the Immune Cell Infiltrate in the Biology of Claudin-low and Basal-like Breast	279,791
Retention	Serody, Jonathan S.	National Cancer Institute	5-R01-CA166794-04	04/01/12	03/31/17	Th1/Th17 Macrophage Interactions in Cutaneous GVHD	309,342
Retention/Theme Investment (HTS)	Serody, Jonathan S.	National Inst. of Health	5-R01-HL115761-04	06/01/12	05/31/16	Targeting CCR7 for the Prevention/Treatment of GvHD	364,450
Recruitment	Sethupathy, Praveen	Fibrolamellar Cancer Foundation	Not Assigned	09/01/15	08/31/17	Discovery of RNA biomarkers of Fibrolamellar Carcinoma	50,000
Retention	Shaheen, Nicholas	Science First	DEX-P4-003	05/28/14	05/27/17	A Randomized, Double-Blind, Phase 4 Study to Evaluate the Effect of Dexlansoprazole 60 mg QD and 60 mg BID on Recurrence of Intestinal Metaplasia in Subjects who have achieved Complete Eradication of Barrett's Esophagus with Radiofrequency Ablation	24,320
Retention	Shaheen, Nicholas	RedPath Integrated Pathology	RG 0004 BE 19	12/15/14	12/14/17	RedPath Effort Agreement	54,005
Retention	Shaheen, Nicholas	BARRX	Not Assigned	03/03/06	07/01/16	Ablation of Intestinal Metaplasia Containing Dysplasia (AIM Dysplasia Trial) Multi-Center, Randomized, Sham-Controlled Trial	41,109
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	03/21/13	03/31/19	A #003 truFreeze Spray Cryotherapy Patient Registry	76,160
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	12/14/12	12/13/15	Prevalence of Dysplasia of the Gastric Cardia	98,000
Recruitment	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	08/01/13	07/31/16	Database Maintenance for the US Spray Cryotherapy Patient Registry	91,235
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	03/15/13	03/14/17	A Dose-Optimization Study for the Initial Treatment of Dysplastic Barrett's Esophagus with TruFreeze Spray Cryotherapy ("Dose" Trial)	126,595

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Total Cost $
Recruitment	Shaheen, Nicholas	National Cancer Institute	RS506502	09/01/11	08/31/16	Barrett's Esophagus Translational Research Network (BETRNet)	38,162
Retention	Shaheen, Nicholas	National Inst. of Health	5-T35-DK007386-35	05/01/80	02/29/16	Short Term Research Training	190,382
Retention	Shaheen, Nicholas	National Inst. of Health	5-K24-DK100548-03	09/17/13	08/31/18	Non-Endoscopic Surveillance for Barrett's Esophagus Following Ablative Therapy	180,349
Theme Investment (MP1U)	Sharpless, Norman	National Cancer Institute	5-RO1-CA185353-02	06/01/14	06/30/18	(PQD5) Predicting Anti-Cancer Efficacy Through Tumor Profiling	405,890
Theme Investment (MP1U)	Sharpless, Norman	National Cancer Institute	5-R01-CA163896-04	04/01/12	03/31/17	In vivo Murine Models of Metastasis for Therapeutic Testing	400,209
Recruitment	Sheeran, Paschal	John Templeton Foundation	Not Assigned	07/01/13	10/31/15	Enacting Virtue, Controlling Vice: Testing Three Strategies for Overcoming Unconscious Influences and Translating "Good" Intentions into Action	174,301
Recruitment	Shen, Dinggang	National Inst. of Health	5-R01-EB006733-07	09/30/09	08/31/16	Development and Dissemination of Robust Brain MRI Measurement Tools	497,189
Recruitment	Shen, Dinggang	National Inst. of Health	5-R01-EB009634-04	09/01/11	08/31/16	Fast, Robust Analysis of Large Population Data	323,010
Recruitment	Shen, Dinggang	National Inst. of Health	2-R01-AG041721-04	08/01/12	03/31/16	Quantifying Brain Abnormality By Multimodality Neuroimage Analysis	365,695
Recruitment	Shen, Dinggang	National Inst. of Health	1-R01-MH100217-0	08/26/13	07/31/17	Infant Brain Measurement and Super-Resolution Atlas Contruction	506,315
Recruitment	Shen, Dinggang	National Inst. of Health	2-RO1-EB008374-05A1	04/01/08	01/31/19	4D Software Tools for Longitudinal Prediction of Brain Disease	477,101
Recruitment	Shen, Dinggang	National Science Foundation	OCI-1127413	09/01/11	08/31/15	SDCI NET: Development of an Ultra-high Speed End-to-end Transport Stack based on the Packet Design Paradigm.	830,000
Innovation Award	Smith, Jennifer S	National Cancer Institute	1-RO1-CA183891-01A1	04/01/15	03/31/20	Effect of HPV Self-Collection on Cervical Cancer Screening in High Risk Women	623,988
Innovation Award	Smith, Jennifer S	National Cancer Institute	2-U54-CA156733-06	09/01/15	08/31/20	NCCU-LCCC Partnership in Cancer Research - Full Project 2: Improving Testing, Triage, and Followup for Cervical Cancer Screenng in Medically Underserved Women	192,707

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Innovation Award	Sondek, John (Hahn, Klaus)	National Inst. of Health	5-P01-GM103723-02	12/01/12	11/30/17	Spatio-temporal Dynamics of GEF-GTPase Networks - Project 1: GEF Biosensors for Living Cells	518,000
Retention	Stinchcombe, Thomas	Bristol-Myers Squibb	CA209-063	03/11/13	03/10/16	A Single-Arm Phase 2 Study of BMS-936558 in Subjects with Advanced or Metastatic Squamous Cell Non-Small Cell Lung Cancer Who Have Received at Least Two Prior Systemic Regimens	159,597
Retention	Stinchcombe, Thomas	Genentech Inc.	RC1126	05/16/12	05/16/16	A Randomized Phase II Trial of Erlotinib Alone or In Combination with Bevacizumab in Patients With Non-Small Cell Lung Cancer and Activating Epidermal Growth Factor Receptor Mutations	10,731
Retention	Stinchcombe, Thomas	National Inst. of Health	5-R21-AG042894-02	08/01/13	05/31/16	Translational Meta-analysis for Elderly Lung Cancer Patients	8,000
Innovation Award	Strahl, Brian	National Inst. of Health	5-R01-GM110058-02	06/01/14	05/31/19	Factors That Regulate Chromatin Organization and Gene Transcription	297,554
Theme Investment (ICISS)	Stuermer, Til	National Inst. of Health	2-R01-AG023178-10	12/01/03	03/31/16	Propensity Scores and Preventive Drug Use in the Elderly	320,367
Retention	Styblo, Mirek	National Inst. of Health	5-R21-ES023690-02	07/01/14	06/30/16	The Role of Diet in Diabetes Associated with Arsenic Exposure	185,421
Innovation Award	Su, Lishan	National Inst. of Health	5-R01-AI095097-04	12/01/11	11/30/16	HIV Co-Infection and HCV-induced Liver Fibrosis in vivo	370,000
Retention	Su, Lishan	National Inst. of Health	1-R21-AI118542-01	04/01/15	03/31/17	Depletion of Plasmacytoid Dendritic Cells in SIV-Infected Rhesus Macaques with a Novel Monoclonal Antibody	56,225
Retention	Su, Lishan	National Inst. of Health	5-RO1-DK095962-03	07/15/13	04/30/17	Novel Therapeutic Approaches to Treating Chronic Hepatitis B Virus Infection	551,970
Retention	Su, Lishan	National Inst. of Health	5-R01-DK098079-03	09/01/13	08/31/16	HIV-Hepatitis C Virus Interactions and Pathogenesis	92,282
Recruitment	Su, Maureen	National Inst. of Health	3-RO1-NS079683-02S1	06/01/14	05/31/17	Autoimmune Mechanism in a Novel Aire-Deficient Model of Peripheral Neuropathy - Supplement	61,292
Recruitment	Su, Maureen	National Inst. of Health	5-R01-NS079683-03	06/01/13	05/31/18	Autoimmune Mechanisms in a Novel Aire-deficient Model of Peripheral Neuropathy	394,854
Theme Invest (HTS)	Sullivan, Patrick	National Inst. of Health	3-U01-MH094421-04	05/01/12	03/31/16	1/4 Psychiatric GWAS Consortium: Genomic Follow-up Next-Gen Sequencing & Genotypi	482,383

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Theme Invest (HTS)	Sullivan, Patrick	National Inst. of Health	2-R01-MH077139-07	04/01/06	04/30/19	1/2 A Large Scale Schizophrenia Association Study in Sweden	1,171,162
Theme Invest (HTS)	Sullivan, Patrick	National Inst. of Health	5-RO1-MH095992-03	07/06/12	04/30/16	Identifying Biomarkers for Post-Partum Depression in African-American Women	888,156
Theme Invest (HTS)	Sullivan, Patrick	National Inst. of Health	3-UO1-MH094421-02S1	05/10/12	03/31/16	1/4 Psychiatric GWAS Consortium: Genomic Follow-up Next-Gen Sequencing & Genotyping - Administrative Supplement:	97,202
Theme Invest (HTS)	Sullivan, Patrick	National Inst. of Health	1-R21-MH099370-02	02/07/13	12/31/15	The MIR137 Region in Schizophrenia: Genomics, Variant Discovery & Association	190,000
Theme Invest (HTS)	Sullivan, Patrick	National Inst. of Health	2-R21-MH102814-02	07/01/14	06/30/16	The Schizophrenia Candidate Gene MIR137: functional Studies in Mouse	190,000
Theme Invest (HTS)	Swanstrom, Ronald I.	National Inst. of Health	5-R37-AI044667-14	04/01/10	03/31/16	Biological Properties of HIV-1 V3 Evolutionary Variants	324,285
Theme Invest (HTS)	Swanstrom, Ronald I.	National Inst. of Health	5-R21-AI108539-02	08/01/13	07/31/15	Development of Novel Methods to Exploit Next Gen Sequencing for HIV	190,000
Theme Investment (CC)	Tarantino, Lisa	National Inst. of Health	5-RO1-MH100241-03	04/19/13	03/31/18	Role of Maternal diet and Allelic Imbalance in Behavior	536,322
Recruitment	Tarrant, Teresa	Rheumatology Research Foundation	Not Assigned	08/15/14	08/14/16	G18 Regulates Autoimmune Pathophysiology in Arthritis	100,000
Recruitment	Tarrant, Teresa	University of California at San Francisco	8587sc	07/01/15	06/30/16	Interrogating Genetic Susceptibility Loci in CVID with Autoimmunity	27,000
Innovation Award	Thomas, Nancy	National Cancer Institute	5-R01-CA112243-10	05/13/05	01/31/16	Melanoma RAS/BRAF Mutation: Heterogeneity-Risk Prognosis	479,355
Theme Investment (CBCS,HTS)	Thorne, Leigh B. (Lawton, Thomas)	National Cancer Institute	5-P50-CA058223-22	09/01/12	08/31/17	SPORE in Breast Cancer - Core A: Tissue Procurement	129,086
Retention	Ting, Jenny P.-Y.	Multiple Sclerosis Society	RG1785G9/2	09/30/11	09/29/15	The Roles of New Innate Immune Mediators in Neuroinflammation	175,596
Retention	Ting, Jenny P.-Y.	Multiple Sclerosis Society	CA10068	04/01/14	03/31/19	Preclinical Therapeutic Development for Multiple Sclerosis	181,500

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Retention	Ting, Jenny P.-Y.	National Cancer Institute	5-RO1-CA156330-05	05/01/11	03/31/16	Colitis, Colon Cancer and the NLR Family	328,971
Retention	Ting, Jenny P.-Y.	National Inst. of Health	4-R37-AI029564-23	04/01/13	03/31/18	Plexin-A1: Regulation by CIITA and Immunologic Function	409,284
Retention	Ting, Jenny P.-Y.	National Inst. of Health	5-U19-AI109784-02	07/01/14	06/30/19	Novel Nanoparticle Platform for the Delivery of Vaccines and Adjuvants: Project 2 - Adjuvant Delivery by Print Nanoparticles	627,156
Retention	Ting, Jenny P.-Y.	National Inst. of Health	5-U19-AI109784-02	07/01/14	06/30/19	Novel Nanoparticle Platform for the Delivery of Vaccines and Adjuvants: Core A - Administrative Core	175,526
Retention	Ting, Jenny P.-Y.	National Inst. of Health	5-U19-AI109965-02	03/01/14	02/28/19	Discovery of New Innate Immune Pathways in Viral Recognition - Project 1 Novel Nucleic Acid Sensing NLRs and Innate Immunity to Viruses	414,750
Retention	Ting, Jenny P.-Y.	National Inst. of Health	5-U19-AI109965-02	03/01/14	02/28/19	Discovery of New Innate Immune Pathways in Viral Recognition - Core A - Administrative Core	182,625
Retention	Ting, Jenny P.-Y.	National Inst. of Health	1-U19-AI109965-01	08/01/14	07/31/19	Discovery of New Innate Immune Pathways in Viral Recognition - Supplement	707,959
Retention	Ting, Jenny P.-Y.	National Inst. of Health	1-U19-AI109965-01	08/15/14	08/14/15	Discovery of New Innate Immune Pathways in Viral Recognition - Supplement 2	300,000
Recruitment	Ting, Jenny P.-Y.	National Cancer Institute	1-U54-CA198999-01	08/01/15	07/31/20	Nano Approaches to Modulate Host Cell response for Cancer Therapy: Project 2 - Nanoparticle-based Immune Modulators in Cancer Therapy & Vaccines	506,312
Recruitment	Ting, Jenny P.-Y.	National Inst. of Health	2-U19-AI067798-11	08/01/15	07/31/20	Innate Immune Pathways that Mitigate Delayed Radiation-Induced Damage	346,900
Retention	Ting, Jenny P.-Y.	National Inst. of Health	5-T32-AI07273-30	07/01/84	08/31/16	Basic Immune Mechanisms Training Grant	323,037
Recruitment	Troester, Melissa	National Cancer Institute	5-PO1-CA151135-04	08/01/11	07/31/16	Epidemiology of Breast Cancer Subtypes in African-American Women: a Consortium, Project 1	181,003
Recruitment	Troester, Melissa	National Cancer Institute	5-P01-CA151135-04	08/01/11	07/31/16	Epidemiology of Breast Cancer Subtypes in African-American Women: a Consortium, Project 2	13,045
Recruitment	Troester, Melissa	National Cancer Institute	5-P50-CA058223-22	09/01/12	08/31/17	SPORE in Breast Cancer - Project 1: The Carolina Breast Cancer Study	875,054

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Recruitment	Troester, Melissa	National Cancer Institute	5-U01-CA179715-02	06/01/14	05/31/19	Biology of Race and Progression Associated Breast Tumor Gene Expression	313,159
Recruitment	Troester, Melissa	National Cancer Institute	5-R21-CA175783-02	09/01/13	08/31/16	HGF Signaling in African-American and Basal-like Breast Cancer	151,040
Recruitment	Troester, Melissa	National Inst. of Health	5-U01-ES019472-05	08/17/10	12/31/15	Pregnancy, Obesogenic Environments, and Basal-like Breast Cancer	398,555
Recruitment	Troester, Melissa	National Cancer Institute	2-U54-CA156733-06	09/01/15	08/31/20	NCCU-LCCC Partnership in Cancer Research - Full Project 3: Molecular Pathways to Breat Cancer Mortality among African American and White Women	199,069
Recruitment	Trogdon, Justin	Centers for Disease Control	15IPA1504755	07/01/15	06/30/16	Justin Trogdon IPA to CDC 070115 through 063016	35,180
Recruitment	Trogdon, Justin	Centers for Disease Control (Subcontract with Research Triangle Institute)		06/09/15	09/30/16	The Medical Costs Attributable to Breast Cancer for Younger Women	24,311
Recruitment	Valdar, William	National Inst. of Health	5-RO1-GM104125-03	09/01/12	08/31/17	Statistical Modeling of Complex Traits in Genetic Reference Super-Populations	241,086
Recruitment	Valdar, William	National Inst. of Health	5-RO1-DK088975-05	07/01/10	06/30/16	Genome-wide Fine-mapping of Metabolic Traits in Heterogeneous Stock Rats	29,483
Recruitment	van Duin, David	Natl Inst Allergies & Infectious Diseases	203 9893	12/01/13	05/31/16	Antibacterial Resistance Leadership Group (ARLG)	160,189
Recruitment	Vaziri, Cyrus	Department of Defense	W81XWH-14-1-0428	06/01/14	05/31/16	Exploiting Tumor-Activated Testes Proteins to Enhance Efficacy of First-Line Chemotherapeutics in NSCLC - Subcontract with University of Texas Southwetern Medical Center	87,499
Recruitment	Vaziri, Cyrus	National Inst. of Health	5-R01-ES009558-19	08/01/98	04/30/17	A Novel Carcinogen-Induced Cell Cycle Checkpoint	333,000
Recruitment	Vaziri, Cyrus	National Inst. of Health	5-R01-GM105883-02	01/01/14	11/30/16	Targeting the TLS DNA Damage Tolerance Pathway for Cancer Therapy	286,392
Recruitment	Vaziri, Cyrus	National Inst. of Health	1-R21-ES023895-02	09/19/14	08/31/16	Novel Rad18 functions in Histone Modification and Regulation of Gene Expression	157,500
Recruitment	Vincent, Benjamin (Rathmell, W. Kim)	Forbeck Research Foundation	Not Assigned	07/01/15	06/30/17	Immune Cell Genomic and Metabolic Profiling in Renal Cell Carcinoma	159,944

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Retention	Wallen, Eric	EDAP Technomed	G050103 EDAP TMS SA	10/16/08	12/31/17	ADAP Ablatherm Integrated Imaging High Intensity Focused Untrasound (HIFU) Indicated for Treatment of Low Risk, Localized Prostate Cancer	177,281
Recruitment	Wan, Yisong	Multiple Sclerosis Society	Not Assigned	10/01/12	09/30/15	Therapeutic Effect of Dihydro-Artemisinin on MS Through Suppressing Immune Response	185,752
Recruitment	Wan, Yisong	National Inst. of Health	5-R01-AI097392-04	05/01/12	04/30/17	The Roles of Gata3 in Controlling Treg Function	368,389
Recruitment/Theme Investment (HTS)	Wang, Gang (Greg)	Amer Society of Hematology	Not Assigned	07/01/14	06/30/16	Epigenetic Therapy of Hematopoietic Malignancies: Novel Approaches for Global and Tissue-Specific Inhibition of EZH2 and Related EZH1 Enzymes	75,000
Recruitment	Wang, Gang (Greg)	Department of Defense	W81XWH-14-1-0232	07/15/14	06/30/16	Epigenetic Therapy of Hematopoietic Malignancies: Novel Approaches for Tissue-Specific and Global Inhibition of EZH2 Enzymatic Activities	271,056
Recruitment	Wang, Gang (Greg)	Gabrielle's Angel Foundation for Cancer research	84	05/01/14	04/30/17	Novel Approaches to Target prc2 Enzymatic Complexes for the Treatment of Hematopoietic Malignancies	75,000
Recruitment	Wang, Gang (Greg)	Kimmel Foundation	SKF-14-053	07/01/14	06/30/16	Deciphering the Role of Histone Demethylation Among Hematopoietic Malignancies	100,009
Recruitment	Wang, Z. Andrew	Cerulean Pharma, Inc	LCCC1315	12/06/13	12/05/17	Phase Ib/II Study of Neoadjuvant Chemoradiotherapy with CRLX-101 and Capecitabine for Locally Advanced Rectal Cancer	71,048
Recruitment	Wang, Z. Andrew	National Cancer Institute	5-R01-CA178748-03	08/15/13	05/31/18	Nanoparticle Formulations of DNA Repair Inhibitors to Improve Chemoradiotherapy	312,079
Recruitment	Wang, Z. Andrew	National Cancer Institute	5-R21-CA182322-03	09/19/13	08/31/16	Development of 3D Organ-Specific Models of Colorectal Cancer Metastasis	260,571
Retention	Wang, Z. Andrew	National Cancer Institute	1-U54-CA198999-01	08/01/15	07/31/20	Nano Approaches to Modulate Host Cell response for Cancer Therapy: Project 3 - Combining Radiotherapy and Nanotechnology for Immunotherapy	274,918
Recruitment	Weiss, Jared	Astellas Pharma, Inc	8273-CL-0102	06/27/14	06/27/16	An Open-label, Phase 1 Dose Escalation Study of Oral ASP8273 in subjects with Non-Small-Cell Lung Cancer (NSCLC) Who Have Epidermal Growth Factor Receptor (EGFR) Mutations	55,965
Recruitment	Weiss, Jared	Celgene Corporation	LCCC 1210	08/29/12	08/29/16	AX-NSCL-PI-0069 Second Line Treatment with Nab-Paclitaxel for the Elderly Patient with Advanced Lung Cancer which has Progressed on at least 1 Prior RegimenA	119,993
Recruitment	Weiss, Jared	Celgene Corporation	LCCC 1407	10/22/14	10/31/17	Multicenter Phase II Trial of Neoadjuvant Cisplatin and Nab-paclitaxel for (N2) Defined Stage IIIA Non-Small Cell Lung Cancer (NSCLC)	505,764

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Recruitment	Weiss, Jared	Celgene Corporation	ABI-007-NSCL-005	09/02/14	09/02/17	Safety and Efficacy of Nab-paclitaxel (Abraxane) in Combination with Arboplatin as First Line Treatment in Elderly Subjects with Advanced Non-small Cell Lung Cancer (NSCLC): A Phase IV, randomized, open-label, multicenter study (ABOUND.70+)	73,441
Recruitment	Weiss, Jared	GlaxoSmithKline	LCCC 1125	06/26/12	06/25/16	Multimodality Risk Adapted Therapy Including Carboplatin/Paclitaxel/Lapatinib as Induction for Squamous Cell Carcinoma of the Head and Neck Amenable to Transoral Surgical Approaches	165,290
Recruitment	Weiss, Jared	OSI Pharmaceuticals	LCCC 1123	05/15/12	05/14/16	Phase II Study of Stereotactic Radiosurgery or Other Local Ablation Followed by Erlotinib for Patients with EGFR Mutation Who Have Previously Progressed on an EGFR-TKI	25,000
Recruitment	Weiss, Jared	Pharmaceutical Research Assoc	MEDI4736-1108	03/17/14	03/16/17	A Phase 1 Study to Evaluate the Safety, Tolerability, and Pharmacokinetics of MEDI4736 in Subjects with Advanced Solid Tumors	25,751
Recruitment	Weiss, Jared	Synta Pharmaceuticals	9090-14	05/29/13	05/26/16	A Randomized, Phase 3 Study of Ganetespib in Combination with Docetaxel Versus Docetaxel Alone in Patients with Advanced Non-Small-Cell Lung Adenocarcinoma	30,027
Recruitment	Wheeler, Stephanie	American Cancer Society	MRSG-13-157-01-CPPB	01/01/14	12/31/18	Improving Endocrine Therapy Utilization in Racially Diverse Populations	145,722
Theme Investment (CC)	Whitmire, Jason	National Inst. of Health	1-R21-AI117575-01	07/01/15	06/30/17	Genetic & Mechanistic Dissection of a Lethal Systemic Virus Infection	190,000
Theme Invest (HTS)	Wilhelmsen, Kirk C.	National Inst. of Health	3-R01-DA030976-05S1	09/30/10	05/31/16	Deep Sequencing Studies for Cannabis and Stimulant Dependence	675,976
Recruitment	Williams, David	National Cancer Institute	5-RO1-CA039687-27	07/01/13	12/31/15	Human Folylpolyglutamate Synthetase and Cancer Therapeutics	12,355
Recruitment	Williams, David	National Inst. of Health	5-RO1-HD076257-02	07/01/13	05/31/16	Dissection of the Structural Basis of MEIG1 in Assembling Sperm Flagella	10,634
Recruitment	Williams, David	National Inst. of Health	5-RO1-GM098264-05	05/01/12	04/30/17	Structural and Functional Diversity of the Methyl-Binding Domain Protein Family	284,726
Recruitment	Wood, Jr, William Allen	Mayo Clinic	Not Assigned	09/01/15	08/31/16	Assessing Physical Fitness in Cancer Patients with Cardiopulmonary Exercise Testing and Wearable Data Generation: An Alliance Pilot Study Proposal	200,000
Recruitment	Wood, Jr, William Allen	National Cancer Institute	1-R21-CA192127-01A1	07/01/15	06/30/17	Exercise in Cancer Survivors Before Allogeneic Stem Cell Transplanation	228,000

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Recruitment	Woods, Michael	Cepheid	Not Assigned	07/11/13	04/04/16	Evaluation of Xpert Bladder Assay for Detection and Monitoring of Recurrence for Bladder Cancer	17,263
Recruitment	Woods, Michael	National Cancer Institute	5-RO1-CA155388-06	08/01/12	04/30/16	Open vs Robot-Assisted Radical Cystectomy: A Randomized Trial	35,600
Recruitment	Woods, Michael	Ockham Development Group	RAD-IFN-CS-002	01/18/13	01/17/17	A Phase II, Randomized, Open Label, Parallel Arm Study to Evaluate the Safety and Efficacy of rAd-IFN/Syn3 Following Intravesical Administration in Subjects with High Grade, BCG Refractory or Relapsed Non-Muscle Invasive Bladder Cancer (NMI	35,603
Innovation Award	Xiong, Yue	National Cancer Institute	5-R01-CA163834-04	03/01/12	02/28/17	Mechanisms of Metabolic Gene Mutations in Cancer	307,100
Recruitment	Yang, Yang	National Inst. of Health	5-K01-AG036745-05	08/01/10	07/31/16	Sex Differences in Health and Longevity: A Social and Biodemographic Approach	120,339
Retention	Yeh, Jen Jen	Lustgarten Foundation	Not Assigned	05/01/13	04/30/16	Rational Identification of Combination Strategies for BKM120 Therapy	294,431
Retention	Yeh, Jen Jen	National Cancer Institute	5-R01-CA140424-05	04/08/10	01/31/16	Targeting Ras-Ral GEF-Ral Effector Signaling for Pancreatic Cancer Treatment	288,951
Recruitment	Zamboni , William C.	Merrimack Pharmaceuticals	Not Assigned	04/23/14	04/22/17	Non-GLP Development of Analytical Methods for MM-310-Encapsulated and Released Drug	69,371
Recruitment	Zamboni , William C.	National Cancer Institute	5-U54-CA151652-05	09/01/10	07/31/16	Carolina Center of Cancer Nanotechnology Excellence: Core 1 Analytical & Pharmacokinetic	105,796
Recruitment	Zamboni , William C.	National Cancer Institute	5-P30-CA016086-39	12/01/10	11/30/15	Cancer Center Core Support Grant- Analytical Chemistry and Pharmacology	112,794
Recruitment	Zamboni , William C.	Onyx Pharmaceuticals, Inc	Not Assigned	08/14/14	08/13/16	Pharmacodynamic and Efficacy Studies of PEGylated Liposomal Carfilzomib and Non-liposomal Carfilzomib in Female nu/nu Mice Bearing A549 NSCLC Orthotopic Tumor Models (Task 2)	65,304
Recruitment	Zamboni , William C.	SciDose LLC	Not Assigned	09/15/10	09/14/16	Pharmacology Studies of Curcumin-Succinate-PEG400 Conjugate compared with Curcumin in In Vivo Systems and in the Pa03C Human Pancreatic Cancer Orthotopic	247,299
Recruitment	Zeidner, Joshua	Leukemia & Lymphoma Society	4311-15	07/01/14	06/30/17	Targeting Regulatory T Cells During Lymphocyte Recovery in Newly Diagnosed AML	65,000

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Theme Investment (CC)	Zeisel, Steven H.	National Inst. of Health	5-P30-DK056350-15	04/01/06	03/31/16	UNC Clinical Nutrition Obesity Research Center	1,099,476
Recruitment	Zevallos, Jose	Amer. Head and Neck Society	352690	07/01/15	06/30/16	Targeted DNA Sequencing of HPV-Positive Oropharyngeal Cancer Treatment Failures	31,446
Recruitment	Zhang, Qing	National Cancer Institute	5-ROO-CA160351-05	02/01/13	06/30/16	Role of the EgIN2 Target FOXO3a in Breast Cancer	241,530
Recruitment	Zhang, Qing	Sidney Kimmel Fdn. for Cancer Research	SKF-14-094	07/01/14	06/30/16	Determining the Regulation of Progesterone Receptor (PR) by EgIN2 in Tamoxifen Resistant Breast Cancer	100,000
Retention	Zhang, Yanping	National Cancer Institute	5-R01-CA167637-04	09/01/12	06/30/17	The Role of the Mdm2-MdmX Interaction in p53 Regulation	305,832
Retention	Zhang, Yanping	National Cancer Institute	5-R01-CA155235-04	07/01/12	04/30/17	Mitochondrial p32 Regulation of the Mdm2-p32 Tumor Suppression Signaling and Apoptotic Cell Death	307,100
Opportunity Fund Invest Ret	Zhou, Otto	Carestream Health, Inc	Not Assigned	05/01/12	10/31/15	Portable Tomosynthesis System Using Carbon Nanotube X-Ray Source Array	238,000
Retention	Zhou, Otto	National Cancer Institute	5-U54-CA151652-05	09/01/10	07/31/16	Carolina Center of Cancer Nanotechnology Excellence-Project 4	273,076
Retention	Zhou, Otto	National Cancer Institute	5-U54-CA151652-05	09/01/10	07/31/16	Carolina Center of Cancer Nanotechnology Excellence-Project 5	172,889
Retention	Zhou, Otto	National Cancer Institute	5-R21-CA185741-02	04/01/14	03/31/16	Low-dose and High-resolution Tomosynthesis for Lung Cancer Screening	162,536
Retention	Zhou, Otto	National Inst. of Health	HHSN261201300029C	02/06/14	02/05/16	Carbon Nanotube Based Multibeam Field Emission X-Ray Tube for Stationary Digital Chest Tomosynthesis	197,164
Theme Investment (CC)	Zou, Fei	National Inst. of Health	5-R01-GM074175-08	07/01/11	08/31/16	Robust Methods for Complex Trait Association Mapping with Collaborative Cross	222,740
TOTAL							**144,391,619**