University Cancer Research Fund

Annual Financial Report to the Joint Legislative Education Oversight Committee and the Office of State Budget and Management

Submitted November 1, 2013

in accordance with G.S. 116-29.1

University Cancer Research Fund

A Message from the Chair

Since nearly 40 percent of North Carolinians are affected by cancer during their lives, improving prevention, treatment and results is critical to our state's public and economic health. Thanks to the General Assembly's support, the University Cancer Research Fund (UCRF) has helped make the UNC-Chapel Hill a national leader in the fight against this disease.

As Chair of the Cancer Research Fund Committee, I am pleased to present this annual legislative report, which details the growing economic impact the UCRF has had for North Carolina. The report also outlines investments in groundbreaking research that will help give cancer patients more effective therapies, better outcomes and more hope for the future. The UCRF has produced many positive returns for North Carolina, including:

- Hiring and retaining 149 outstanding cancer researchers at UNC;
- Publishing high-impact research findings in the world's top journals.
- Continuing increases in research funding directly attributable to UCRF investment. This year alone, UNC received $105.8 million in new research funding from outside North Carolina, thanks to the UCRF;
- Enhancing spin-off commercialization efforts and intellectual property, adding new innovations to the nation's third-largest cluster of life science industries;
- Maintaining a significant annual economic impact for North Carolina – $264.8 million for fiscal 2012-2013 and more than 1,900 new jobs. That adds up to a return of slightly more than five dollars for every dollar invested;
- Advancing large-scale projects designed to better understand the cancer problems in North Carolina from the genetic to the community level, and participating in global collaborations aimed at eradicating this disease.

Each year, almost 50,000 North Carolinians are diagnosed with cancer and more than 18,000 die from the disease. Because cancer care has many different aspects, collaboration across several medical disciplines has been vital to our research efforts. One of our most important collaborators is the State of North Carolina, which has made it a priority to invest in efforts to eradicate our state's leading cause of death. On behalf of the thousands of families in our state affected by cancer, thank you again for your ongoing support for the UCRF.

Sincerely,

Carol L. Folt, Ph.D.
Chair, Cancer Research Fund Committee

EXECUTIVE SUMMARY

Cancer became North Carolina's leading cause of death in 2007. That year, the General Assembly created the University Cancer Research Fund (UCRF) to support the fight against a disease that claims the lives of more than 18,000 North Carolinians every year.

In 2007 the legislature determined that the state should provide $50 million a year for cancer research under UNC Hospitals, the UNC Lineberger Cancer Center, or both. Supported by tobacco settlement funds, taxes on non-cigarette tobacco products (such as snuff), and state appropriations, the Fund first received $25 million in 2007 and $40 million in 2008 before reaching its full funding amount of $50 million in 2009. In 2013, the legislature reduced the UCRF to $42 million annually by eliminating the tobacco settlement funds as a source of UCRF support.

The legislature established the Cancer Research Fund Committee to ensure that UCRF funds are invested responsibly. In 2009, this committee, led by then-Chairman Erskine Bowles, former UNC President, adopted a Strategic Plan to focus UCRF resources on areas where they can have maximum impact. The plan calls for funds to be invested in the following manner:

- Strategic research priorities in **genetics**, **therapies**, and **NC cancer outcomes**;
- Selective **opportunities** that enable researchers to adapt to a rapidly changing field; and
- Clinical research and scientific **infrastructure** for technology development, training, and state outreach.

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 economy, details on expenditures of UCRF monies and outside funds leveraged by UCRF support, and other performance measures.

Our third financial report submitted under this requirement demonstrates that the UCRF continues to have a significant and positive economic impact on the state of North Carolina. According to an independent analysis by a nationally recognized consulting firm, in FY 2012-2013, the UCRF:

- Directly supported portions of nearly 1,000 employees;
- Created the equivalent of more than 900 new jobs;
- Had an overall economic impact of $264.8 million, leading to an estimated six-year total impact of more than $1.2 billion; and
- Produced a return on investment of 5.3 to 1.

UCRF has been particularly effective in one key area of economic impact: increasing funds from outside the state brought to North Carolina for cancer research. This funding growth is due to the world-class faculty members who have been recruited or retained using UCRF funding, and innovation opportunities specifically developed by the fund.

- In the current year, $105.8 million in extramural funding is directly linked to faculty who were recruited or retained by UCRF funds, or to the results of innovation grants, technology, and infrastructure investments by UCRF.
- UCRF has helped spark a significant increase in UNC's federal funding compared to other universities, at a time when overall federal funding levels are falling.

Some economic and health outcomes of the UCRF are immediate and measurable, but the long-term effects of this research on the overall health of North Carolinians will only be appreciable in the coming years. In the meantime, the Strategic Plan has guided UCRF investments that have helped make UNC a national leader in several areas of cancer research and care. Some of the research highlights include the following:

Understanding the Role of Genetics in Cancer Causation and Treatment

UNC is now a global leader in cancer genomics, thanks to important UCRF investments in critical resources such as high-content data storage, sequencing technology, bioinformatics, statistical genetics, and genetically engineered mouse models.

- The Next Generation sequencing and analysis infrastructure built by UCRF continues to yield groundbreaking findings, international recognition for UNC, and increased extramural funding. Continued leadership of the National Cancer Institute Cancer Genome Atlas project led to a fourth paper in *Nature*, one of the nation's leading science journals, on kidney cancer, following three *Nature* publications on breast, lung, and colon cancer. Fifth and sixth papers, on head and neck cancer and melanoma, are being prepared.
- Two UCRF-supported cancer genetics faculty have been joined by a third, recently UCRF-recruited pediatric cancer geneticist, who studies cancer predisposition genes. This group, relying on the UCRF sequencing and genomics infrastructure, has obtained four new major grants totaling over $20 million for the next five years. These projects enlarge our program in germline sequencing and analysis, putting UNC on par with any university in the world. One of these, the NCGENES grant, sequences the total expressed human genome and packages this large amount of genetic data much more effectively. With these data, doctors may develop individualized treatment plans based on a patient's genetic information, paving the way toward more personalized medicine. The newest grant pairs UNC with Stanford and Baylor to develop the national database for analyzing all genetic variants sequenced by National Institute of Health and other projects.
- Researchers innovatively used mouse models to test genetic theories about disease development, leading to a high-impact study published in *Cell*, another of the nation's leading biomedical science journals, and to new findings of how genetic mutations and dis-regulation of gene expression, as well as aging and other factors, may influence tumor growth in humans.

Developing Novel Therapeutics

The continued development of our mouse models, as well as the refinement of a UNC-developed proteomic technology, have allowed researchers to work within academia and with private-sector partners to test potential new therapies targeting tumor cells. This unit can rapidly test combinations of new drugs plus standard chemotherapy to search for more effective, less toxic regimens.

- A novel "humanized" mouse model with a human immune system and human liver cells for the first time allows study of how human hepatitis virus leads to liver cancer and how it might be treated or prevented.

- Collaborative research on whether anti-obesity drugs affect the way cancer cells react to therapy will lead to important new ideas on how obesity and nutrition influence tumor development and therapeutic response.
- A drug developed by the UCRF-supported chemical biology group is showing promising results in models of pediatric leukemia and adult melanoma.
- A new kind of CT scan created with UCRF support produces higher resolution with more precision and speed; the prototype is being readied for human trials, which could result in this CT technology being the preferred method for small tumor early detection.

Optimizing NC Cancer Outcomes

Improving cancer outcomes entails many facets of cancer research – from finding new ways to reduce cancer risks, to improving screening and subsequent referral for care, getting clinical trials into the community, enhancing the life of cancer survivors, and helping patients use their voice to improve their care. UNC researchers are pursuing noteworthy studies and building capacity in the field of patient-reported outcomes during and after treatment, a field of growing importance.

- Smoking is the single major cause of cancer death, and cigars, cigarettes and new methods of smoking are being marketed to teenagers and others. With the leadership of UCRF faculty, UNC recently received a new federal grant totaling $20 million over the next five years to establish a national center focusing on tobacco regulations and research. A second $20 million tobacco center grant is a collaboration with UCRF faculty and will measure the impact of new forms of smoking on lung lining cells. Questions being researched include the mechanism of lung cell destruction by new tobacco products, and how marketing small cigars affects teen smoking.
- Community-based outreach through Health-e-NC continues to yield promising results that could be more widely applicable to cancer outcomes statewide. For example, a pilot project in Concord/ Kannapolis is testing cost-effective weight loss strategies.
- Our N.C. Integrated Cancer Information Surveillance System (ICISS), developed by UCRF, gives researchers the most up-to-date state-focused data-rich resource to study cancer outcomes in the country. With ICISS data support, UCRF faculty have published more than 25 new studies in high impact journals such as *JAMA*, one of the nation's leading medical journals.

Clinical Excellence and Infrastructure

UCRF is complemented by two key capital investments that have enhanced cancer research and care in North Carolina:

- The Imaging Research Building opens January 2014, an important milestone that will greatly enhance our research efforts in drug development, nanotechnology, imaging research, and cancer biology. More than half the researchers who move into the new building will have been UCRF supported. The facility, funded by the General Assembly in 2009, will house state-of-the-art research labs and imaging equipment – some technologies available in only a few other places in the world – to help accelerate all aspects of early detection and therapy, including the discovery and testing of new cancer treatments.

- The N.C. Cancer Hospital, opened in 2009, continues to provide care for patients from all 100 counties, serving as the clinical home of the UNC Lineberger Comprehensive Cancer Center.

An important part of our mission is caring for people from all corners of our state. UCRF has helped UNC expand its clinical research network and telemedicine program, both of which enable patients to be seen by doctors close to home, yet still participate in – and benefit from – the latest advances in cancer care. Doctors across the state use the telemedicine infrastructure weekly to ask questions specific to their patients and obtain information that helps them provide state-of-the-art care.

- The telemedicine program has expanded to 42 sites in 20 North Carolina communities, linking oncologists with educational and patient-related conferences.

Summary

The University Cancer Research Fund has been a landmark investment in our state. From the economic benefits it has brought to North Carolina to its importance in strengthening our clinical and research programs, it is an investment whose gains will keep growing as UNC continues to push forward as a national leader in the fight against cancer.

ECONOMIC IMPACT

The UCRF Strategic Plan dictates that resources should be invested in a manner that helps create jobs and enhances North Carolina's economy. The Fund's economic return to our state has grown each year, exceeding a 5-to-1 return on investment in 2013. The UCRF has directly supported thousands of faculty and staff jobs, has led to vital capital investments, and has enhanced the university's research capacity and national standing. Fueled by UCRF support, UNC's rise into the top ten in National Institute of Health biomedical research funding has national impact and draws industry to North Carolina. Additional state economic benefits attributable to the UCRF include an increase in intellectual property, private-sector partnerships, spinoff and commercialization opportunities, and funding support from outside North Carolina.

Estimated Impact

To assess whether UCRF is achieving its goal of stimulating the economy, this past year UNC hired Tripp Umbach, a nationally respected consulting firm, to estimate UCRF's economic impact for FY 2013. Using a methodology similar to prior analyses, Tripp Umbach examined 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 economic impacts. Direct impact resulted from two major sources: expenditures from UCRF itself and 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 FY 2013, UCRF's total allocation (adjusted for tax receipt shortfalls) was $49.6 million. Using standard multipliers, Tripp Umbach estimated that in FY 2013 UCRF:

- Had an overall economic impact of $264.8 million. The total included $155.8 million in direct spending and $109.0 million in indirect and induced impact attributable to external grant funding;
- Generated $5.30 in economic impact for every UCRF dollar expended;

- Supported 1,919 new jobs; and
- Resulted in nearly $7.6 million in tax revenues to the North Carolina.

Using slightly different methodology, prior economic impact analyses by SRA International and the UNC Center for Competitive Economies (Frank Hawkins Kenan Institute of Private Enterprise) found that between FY 2008 and FY 2012, UCRF's cumulative economic impact was $968.0 million over the Funds' first five years. The FY13 total brings the economic impact of UCRF over its entire six year span to more than $1.2 billion.

Faculty Job Creation and Retention

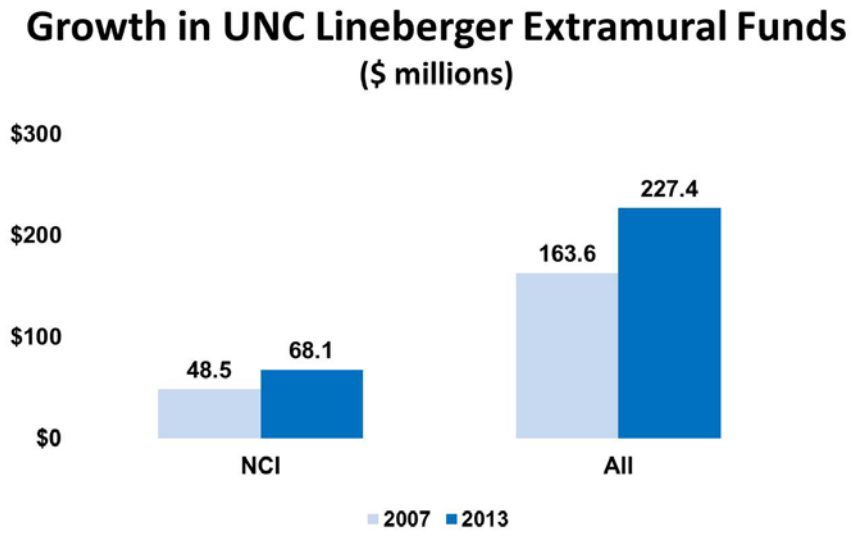
Faculty drive the UCRF. They lead the teams that conduct the groundbreaking research to push the boundaries of our knowledge and advance cancer treatment, prevention and early detection. Faculty also hire staff, evaluate technology, earn research funding from outside North Carolina, and train students and fellows. UCRF has had a tremendous positive impact on cancer research faculty at UNC during the six years from 2007 - 2013:

- **Recruitment:** UCRF has supported the recruitment of 126 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 23 faculty

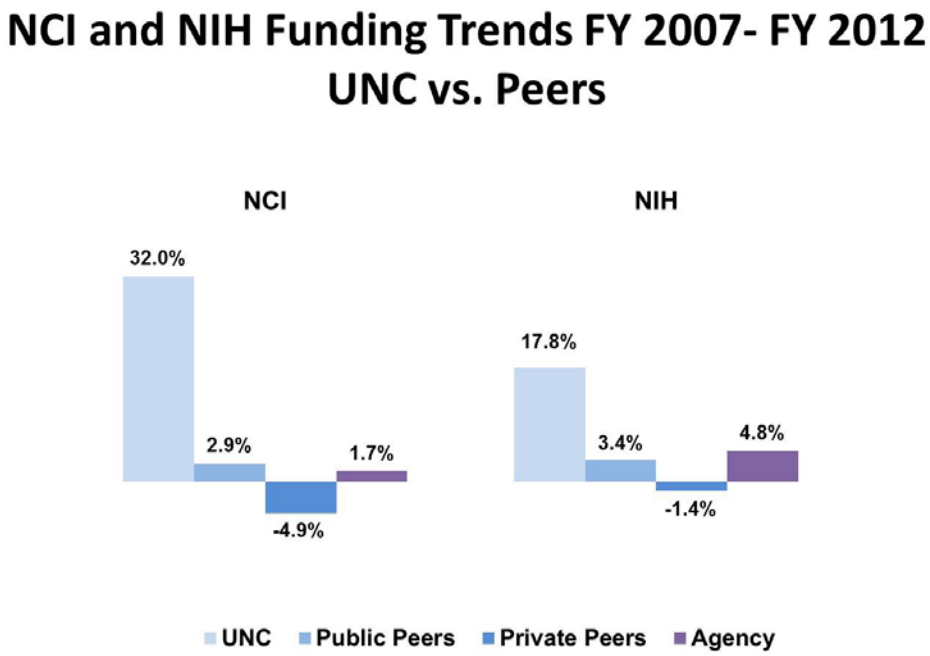
Extramural Funding Growth

Virtually all extramural funds come to UNC from outside North Carolina and add to the state's economy. The UCRF 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 very effectively. UCRF support is leveraging extramural research funds for North Carolina at a time when national funding levels are decreasing, keeping the state at the forefront of research nationally. Key trends include the following:

- FY 2013 funding from outside sources that is directly attributable to the UCRF totaled $105.8 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 2013-2014. The dollars represent one year of funding. A complete list of the awards is included in the Appendix.
    - The attributable extramural funding has risen from $5 million in 2007-2008, as the positive effects of faculty recruitment and retention, technology enhancement, and developmental projects have accumulated. 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 2013, extramural support to the UNC Lineberger Comprehensive Cancer Center increased from $163.6 million to $227.4 million; support from the National Cancer Institute grew from $48.5 million to $68.1 million.



- The National Institutes of Health (NIH) and the National Cancer Institute (one of the NIH institutes) increased awards to UNC Chapel Hill faculty between FY 2007 and FY 2012, while awards to many comparable institutions decreased during that time period.
  - NIH awards to UNC Chapel Hill increased by almost 17.8 percent, significantly ahead of public peer institutions (3.4% increase), private peer (1.4% decrease), and total agency extramural awards (4.8% increase). Peers were independently chosen by SRA.
  - NCI awards to UNC Chapel Hill increased 32%, significantly ahead of public peers (2.9% increase), private peers (4.9% decrease), and total agency extramural awards (1.7% increase). Peers are the same as for the NIH funding analysis.



- UNC Chapel Hill has outperformed many of the nation's leading academic research institutions. In 2007, UNC Chapel Hill ranked 11th in NIH and 14th in NCI award funding. Between FY 2007 and FY 2012, UNC Chapel Hill's NIH and NCI funding grew by 17.8% and 32.0%, while, as a group, the other members of the 2007 top 20 funded institutions had increases of only 7.8% and 2.3%. As a result, in FY 2012 UNC Chapel Hill ranked 9th in NIH awards and 11th in NCI awards.

Intellectual Property, Innovation, and Entrepreneurship

The UCRF focus on innovation has promoted entrepreneurship that has created jobs and spinoff companies:

- **NC Kickstart:** The UCRF, in collaboration with UNC's TraCS Institute, is developing an entrepreneurial mindset at UNC. UCRF supports specialized staff to maximize the development and licensing of university intellectual property. In the past six years, 18 startup companies have been launched or expanded their scope with direct UCRF help. These new companies are attracting external grant support and venture capital investment, as well as creating private-sector jobs.

Spinoff Companies Supported by UCRF	
BioFluidica	KynoDyn
ChemoGlo	Liquidia Technologies
Clave BioDesign	Meryx
ClinicalStandards.com	NanoGlo
Enci Therapeutics, Inc.	NeuroNano Pharma
Epizyme	NextRay
G1 Therapeutics	Qualiber
GeneCentric Diagnostics	Symberix
HealthSpan Diagnostics	XinNano Material, Inc.

RESEARCH OUTCOMES

The UNC Lineberger Comprehensive Cancer Center received an "exceptional" rating from the National Cancer Institute – a rating NCI has given to only six of the nation's 40 recently reviewed cancer centers. NCI cited the University Cancer Research Fund as a significant reason UNC earned the Institute's highest ranking.

The UCRF Strategic Plan encompasses three primary tiers of effective and responsible use of the state's investment: Research Priorities, the Opportunity Fund, and Critical Infrastructure. This section of our report highlights noteworthy successes in each tier.

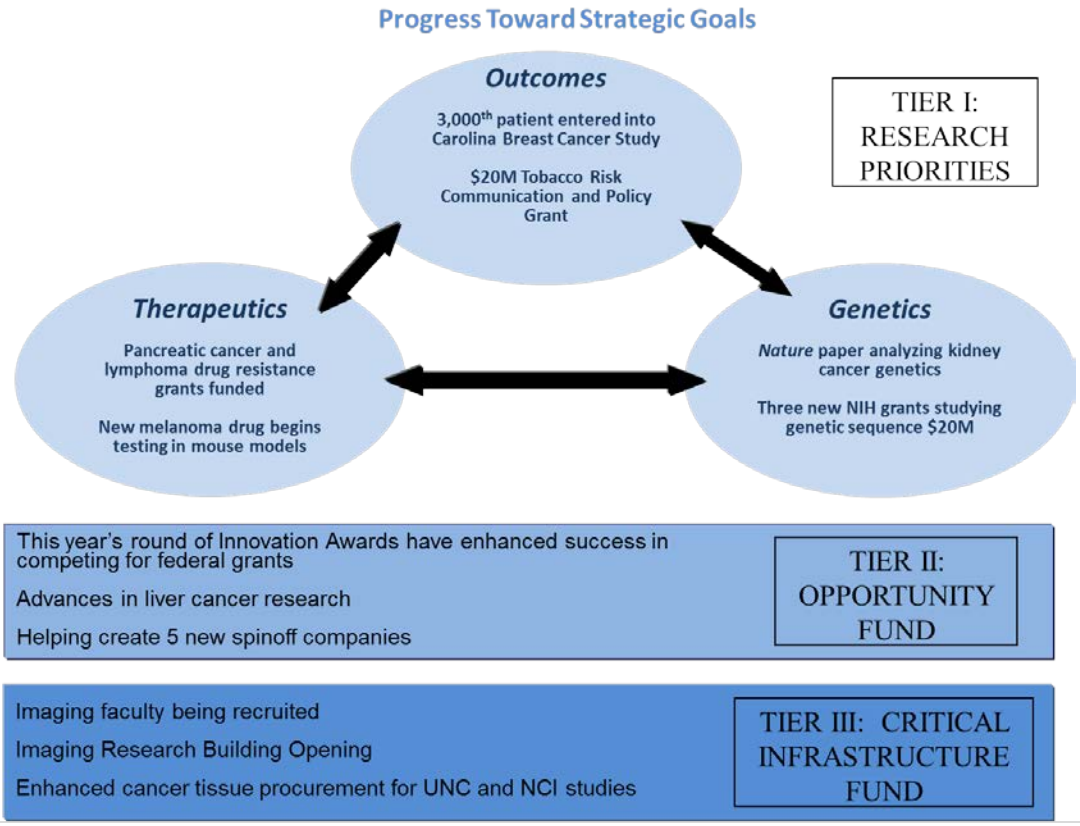
1) **Research Priorities:** Three targeted research priority areas where with focused investment in major scientific programs, disease-based initiatives, or cutting-edge research platforms, UNC could have substantial impact and become a world leader.

   - ***Understanding the Role of Genetics in Cancer Causation and Treatment*** – to discover the genes that predispose families to cancer and cancer patients to poor treatment outcomes – particularly by looking for the mutant genes in specific cancer subtypes that lead to cancer therapy failure.

- ***Developing Novel Therapeutics*** – to devise new therapies targeted to the specific vulnerabilities of treatment-resistant cancers, and to develop new ways of delivering drugs and therapies to reduce toxic side effects for patients. This research priority relates to the genetics initiative, making key observations that will be turned into clinical applications as quickly as possible.
- ***Optimizing NC Cancer Outcomes*** – to build population-based data tracking the occurrence and treatment of cancer across the state in order to support research aimed at improving community prevention and early detection, and to enhance the quality of oncology and survivor care. Our goal is to understand North Carolina's cancer problem at a level unprecedented in the nation and to design research interventions to rectify these problems at the community, health system, and practice levels.

2) **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.

3) **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. To do 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

The presence and mutation of certain genes play a critical role in the development and treatment of cancer. Genetics influence how much risk a person or a family have of getting cancer, how cancer treatments affect certain tumors, and how well a cancer patient responds to care. The gene mutations in a patient's tumor can help doctors predict the development of disease and choose the correct course of treatment. Cancer genetics, from basic work in mice to analysis of human cancer samples, is a fast-growing field. The results of these studies are in early detection, treatment, prevention and prognosis. UCRF investments have helped UNC take a national leadership role in this important area of research.

Illuminating the link between aging and cancer

Using UCRF infrastructure, UNC researchers led by Dr. Ned Sharpless, MD – who will become director of the UNC Lineberger Comprehensive Cancer Center on January 1, 2014 – have developed a new way to study aging and tumor growth in mice by using a gene from fireflies to make affected mouse cells glow.

A gene called p16 plays a role in aging and cancer suppression by activating a tumor defense mechanism called cellular senescence. The loss of this gene is seen in some families predisposed to melanoma, and most lung cancers have mutations that delete the p16 tumor suppressor pathway. In a study published in *Cell*, one of the world's highest impact journals, the group inserted a firefly gene into lab mice, creating a strain of mouse that glows in the dark when the p16 gene is activated. Everywhere the p16 gene is activated due to senescence signaling, the firefly gene is activated, causing the affected tissue to glow.

"We can visualize in real-time the activation of cellular senescence, which on the one hand serves to prevent cancer but on the other hand leads to aging of the cell or organ. We can literally see the earliest molecular stages of cancer and aging in living mice," Sharpless said.

Throughout the lifespan of these mice, they tracked the brightness and location of the glowing in each mouse to study p16 activation. Old mice were brighter than young mice, and sites of cancer formation were extremely bright because the new cancer forming cell activates senescence to prevent that specific cell from growing. This novel strain of mice has been distributed to more than 40 other research labs in the US, Europe and Japan, and researchers are using the glowing mice to test factors that promote aging, to identify nascent cancer development so that it can be studied in its earliest stages, and to study the response of tumors to early anti-cancer treatments.

Using what we learn from mice for human p16 studies

UNC researchers are applying what they have learned about p16 and cell aging to examine cancer treatment in humans, specifically studying whether p16 levels in white blood cells, which track "biologic age" of a patient rather than chronologic age, can help predict how they will respond to cancer therapy. The expression of the p16 gene has been measured in more than 1,000 patients undergoing cancer therapy at UNC; scientists hope to develop more effective and tolerable patient treatment schemes based upon the patient's cellular age rather than their chronological age. The test could eventually predict an individual's best treatment option, particularly for those in the 55 - 75 year-old age range. It can also potentially tell how cancer treatment will "age" the patient. Two UCRF

recruits, Drs. Hy Muss and Hanna Sanoff, are leading the clinical study in breast cancer, colon cancer, and other patients.

NCGENES team rises to national leadership

Jim Evans

Jonathan Berg

Bradford Powell

The UCRF investment in cancer genetics has built a world class technological and computational base for human cancer genetics. It was also used to retain its nationally recognized leader, Jim Evans, and to recruit two new faculty, Jonathan Berg and Bradford Powell, from Baylor. The cancer genetics group was recently awarded four large NIH grants, totaling more than $4M yearly, to sequence patient and newborn genomes and to be the national center joined with Stanford to catalogue all human genetic variation.

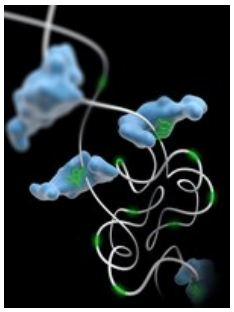
Sequencing the first human genome took over a decade, but is now accomplished on a daily basis at UNC and other major gene sequencing centers. This amazing increase in sequencing capacity has produced a significant new challenge for doctors, researchers and patient: determining how to use this wealth of data to improve human health. A UCRF-initiated project called NCGENES (North Carolina Clinical Genomic Evaluation by NextGen Exome Sequencing) aims to help researchers and clinicians diagnose genetically caused diseases, pinpoint people at high risk for diseases before they show symptoms, and guide new disease treatments.

The goal of this collaborative project is to develop processes and a supporting cyber infrastructure that will allow researchers, clinicians and patients to take full advantage of whole genome sequencing; it also includes whole exome sequencing, which applies to the full set of exons, or protein-coding parts, of the genome. Researchers hope that by studying the variants in peoples' genes they will better understand observable characteristics and conditions. Ultimately, NCGENES could represent a major step toward more personalized medicine.

Christine Rini

About 750 patients from UNC hospitals and clinics will have their genomes sequenced and analyzed through NCGENES. The study will enroll undiagnosed patients with potential genetic predisposition to disease. NCGENES could potentially reveal genetic information having lifelong impacts on the study subjects, so all patients participating in the study will receive education about the implications of their genome analysis. One arm of the study will examine how patients respond to potentially troubling genetic findings by asking some study participants to choose whether they want to receive incidental findings about untreatable conditions. Researchers will gather data on what people want (and don't want) to know about their genetics, what factors influence their decisions, and how information about genetic diseases changes peoples' attitudes and behaviors. UCRF recruit Chris Rini, PhD, is designing the patient interaction and assessment aspects for this transdisciplinary team.

Research shows RNA is vital to disease development



Genetic flow is from DNA to RNA to protein, and for years RNA was considered just an intermediary. Now that we know that greater than 80 percent of the RNA encoded in the human genome does not turn into protein, cancer researchers are working to discern the function of this mass of non-coding RNAs. Most of these RNA molecules function correctly when they fold into a three-dimensional shape. In part using UCRF RNA sequencing machines, UNC Lineberger member Dr. Kevin Weeks, Kenan Distinguished Professor of Chemistry, published an important study this spring in *Science* examining how helper molecules, or "chaperones," aid in the RNA folding process. These chaperones have wide-ranging effects – they can cause some RNAs to interact more quickly, influence other RNAs to change their forms, and even work simultaneously over large distances. In the *Science* study, Dr. Weeks's lab found that chaperones target RNAs' base pairs, which are stabilized by three hydrogen bonds instead of two, and weaken those pairs to facilitate the folding process. The discovery of this weakening process provide clues as to how RNA may perform actual work in the cell or be used to add on the complete layer of regulation needed to understand to grasp the molecular nature of cancer. This fundamental observation is helping understand the new RNA world.

SUCCESS STORY: Breast cancer lab test based on Perou's discovery gains FDA approval

A molecular laboratory test that estimates the risk of breast cancer relapse in spite of anti-hormone treatment has received approval from the U.S. Food and Drug Administration (FDA). UCRF genomics technology, computational capacity and recruitment of bioinformatics faculty (e.g., Joel Parker, PhD), was used to devise the test and develop the gene signature known as "PAM50." Led by Dr. Chuck Perou, these groundbreaking studies of gene expression in breast cancer are changing the world's view and treatment of breast cancer.

Genomic and genetic tests are increasingly important in cancer treatment, Perou said. "These tests are a major step down the road towards personalized medicine, and our approach allows us to make this test available to a global market," he said.

The test, called Prosigna™ and developed by NanoString Technologies in a collaboration between UNC and Washington University in St. Louis, the University of Utah, and the BC Cancer Agency, relies on new technology in the form of a third generation machine and a test kit. For the first time, patient tumor samples can be analyzed at centers around the country rather than being sent to one central testing laboratory. The test is approved for use in the European Union and will soon be available in the US.

Prosigna™ detects the essential gene expression levels and categorizes breast tumors into one of four main subtypes by looking at the expression of 50 genes. Perou and Parker used the information to calculate a "risk of recurrence" score based on the subtype to predict the likelihood of a patient's disease returning within the next 10 years. This score can help clinicians identify those low-risk patients for whom standard hormone therapy is sufficient to prevent relapse.

Dr. Perou, the May Goldman Shaw Professor of Molecular Oncology Research, received the 2013 Hyman L. Battle Distinguished Cancer Research Award in recognition of his accomplishments in cancer research. The award recognizes exceptional cancer research at the UNC School of Medicine.

Dr. Perou has been at the forefront of many groundbreaking studies on the subtypes of breast cancer – including one finding that genetically engineered mouse models can accurately predict human response to a standard chemotherapy drug combination commonly used in the clinic.

Research Priority 2: Drug Development and Delivery

UCRF is helping UNC scientists develop therapies and delivery methods that target vulnerabilities in cancer cells, while sparing normal tissues and having less toxic effects on patients. Comprehensive testing of a new drug takes more than 10 years, and the US Food and Drug Administration approves only about 5 percent of drugs that make it through this exhaustive process. With UCRF support, UNC is becoming a leader in finding a shorter path from discovery to the clinic – and to helping patients on a larger scale.

Mouse models improve drug development and promote collaboration

UCRF support led to the creation of the Mouse Phase I Unit, which has established multiple models of human cancer that can be bred in genetically identical mice. These mice can develop breast cancer, pancreatic cancer, lung cancer, ovarian cancer, melanoma, and other types of cancer with 100 percent incidence at defined times – providing researchers with a way to test innovative therapies quickly and accurately. These mouse models have enabled scientists to gain a better understanding of cancer's response to 86 anti-cancer regimens, including 31 in the past year alone.

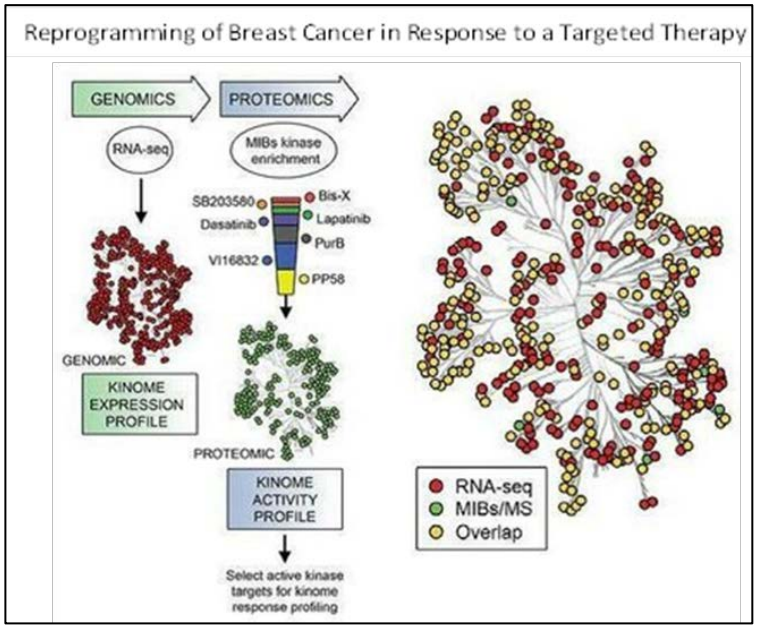
Eradicating cancer is a team effort, and UNC is part of many projects that involve partners across the country and the world. UCRF has enabled us to establish a comprehensive genetic mouse model resource available to scientists not only at UNC, but at other campuses as well. We are proud to work with researchers in North Carolina (e.g., North Carolina State University, Duke University, and NC Central University) and outside the state (e.g., Harvard, Emory, University of Michigan). This resource has proven valuable to commercial drug discovery as well, with several large and small pharmaceutical companies (e.g., Glaxo-Smith-Kline, Novartis, Merck) collaborating with the Mouse Phase I Unit.

Both industry and academic investigators have found the Mouse Phase I Unit highly valuable for developing novel therapeutics. For example, Ken Adler, a cell biologist at North Carolina State University is working on a way to stop cancer from metastasizing, or spreading through the body. Adler developed a small protein molecule, called a MANS peptide, that stops inflammation by inhibiting the movement of inflammatory cells. In a study published in *Oncogene*, Adler found that MANS was also able to stop lung-cancer cells from metastasizing in mice. He is using this information to advance a N.C. State biotech start-up.

Proteomic technology could predict patient resistance to cancer treatment

Proteomics is the study of how proteins in an organism affect cellular processes. This field of cancer research involves examining the role of a gene's kinome – a set of 518 protein kinase genes that make the kinases that regulate the growth and metabolism of normal and cancer cells. About 400 of these kinase proteins are expressed in any individual cancer, but it has been difficult to ascertain which of these proteins, and how many, are actually active in a particular tumor. A team of UNC researchers led by Dr. Gary Johnson have developed a new pan-kinome analysis technology that

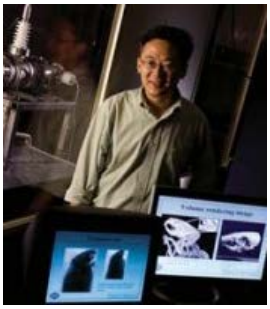
captures more than half of those kinases simultaneously, giving scientists a more comprehensive understanding of how various cancers evade treatment.



Just during the last year, new UCRF-purchased technology enabled the team to increase the test's sensitivity, raising the number of kinases captured in a single run from 170 to over 250. This can be done using smaller amounts of tumor tissue, allowing this new UCRF technology to study the kinome in small patient cancer biopsies. Drugs that inhibit the activity of kinase proteins are commonly used to treat cancer, but resistance often develops and tumors can recur over time. UNC's new proteomic technology is being used to detect resistance within one week rather than waiting for a year. This could allow the oncologist to identify new combinations of drugs to overcome resistance to therapy and continue to effectively treat cancer.

After initially being applied to the development of drugs aimed at fighting the most aggressive types of breast cancer, the technology is now being used in human clinical trials for other types of breast cancer, as well as melanoma (a trial being performed collaboratively with GSK support). A new grant from the Lustgarden Foundation will allow this testing to be used in pancreatic cancer research, and funding from the Leukemia and Lymphoma Society will support kinome analysis in lymphoma research.

Clinical and prevention trials will be aided by new CT scanner technology developed by UNC researchers



The prototype of a new CT scanner has been developed at UNC that increases the scan's precision and speed while lowering radiation dose. Positive trials would introduce a new improved CT technology for the detection of small tumors and following tumors in clinical trials.

With UCRF support, UNC Lineberger member Dr. Otto Zhou, of the Carolina Center of Cancer Nanotechnology Excellence (C-CCNE), developed this new scanner using carbon nanotubes as the x-ray source. Zhou and his C-CCNE colleagues founded a company called Xintek, which is developing on the scanner in a joint venture with Siemens, a leading company in medical imaging.

The scanner contains 52 nanotube x-ray sources and detectors arranged in a ring, which eliminates the need to spin the x-ray source around the patient as with current CT scanners. This design also improves the precision and speed of scanning. The goal of this research is to develop a dynamic micro-computed tomography (micro-CT) system with enhanced spatial and temporal resolution and provide more versatile imaging capabilities compared to the current commercial micro-CT scanners. UNC is exploring its applications for biomedical research.

This joint venture will first provide a scanner that will maximize image resolution for in vivo scanning of mice. The proposed system will use a micro-focus field-emission x-ray source. Compared to the conventional micro-focus x-ray sources with thermionic cathodes, the new carbon nanotube (CNT) based field emission x-ray source offers high resolution at significantly reduced size. These capabilities will provide new imaging modalities for biomedical research such as dynamic cardiac and pulmonary imaging of small animals, which can then be used to improve researchers' capability to detect small tumors. The CT prototype is now being prepared for lung cancer human screening trials by UCRF recruit, Yue Lee, MD, PhD.

Research on obesity's link to ovarian cancer fosters collaboration, earns DOD support

Obesity leads to increased risk and worse outcomes for ovarian cancer but little is known of the timing or length of the obesity exposure that is the most critical for ovarian cancer development. UCRF-recruited faculty member Dr. Victoria Bae-Jump, MD, PhD, has created a unique mouse model she hopes will identify when women are the most vulnerable to obesity and ovarian cancer in their lifetime. This knowledge could enable doctors to identify ovarian cancer earlier and to develop individualized treatments catered to the patient, depending on her obesity status. The US Department of Defense awarded Dr. Bae-Jump a project grant for this research.

Victoria Bae-Jump

Liza Makowski

In another Department of Defense funded study, Dr. Bae Jump and her co-investigator, UCRF recruit Dr. Liza Makowski, PhD, will assess whether two novel chemotherapeutic agents – metformin and mTOR inhibitors – increase efficacy among obese patients with ovarian cancer. Dr. Makowski was also just awarded one of the very competitive Provocative Question grants from the National Cancer Institute to further define the link between cancer outcome and obesity.

UCRF funds have supported the recruitment of Dr. Steve Hursting, PhD, a national leader in obesity and cancer, to provide senior leadership for the program. Dr. Hursting, along with two recently recruited junior faculty, Dr. Makowski and UCRF recruit Michelle Mendez, PhD, a nutritional epidemiologist developing computerized methods for obtaining dietary history, will place UNC into a national leadership position in the effort to determine how obesity affects cancer – from initiation through treatment and survival.

Michelle Mendez

Research Priority 3: Improving Cancer Outcomes

Population-based, data-rich resources will help researchers better understand our state's cancer problems so that interventions can be developed to rectify these problems. UCRF has been instrumental in developing these tools to improve community prevention and early detection of cancer, and enhance the quality of oncology and survivor care across North Carolina.

Integrated database is strong research foundation

UCRF funding has helped build and support the Integrated Cancer Information and Surveillance System (ICISS), which encompasses all of the state's cancer cases (~49,000 yearly) and links more than 80 percent of North Carolina's cancer population to clinical, population and other data sources including Medicare, Medicaid, state employees, and Blue Cross Blue Shield of North Carolina health

claims data. This data-rich resource allows scientists to measure outcomes of cancer control activities – especially among vulnerable subgroups and communities that have been traditionally under-represented – and has been used in more than two dozen published papers. For example, one study used ICISS to find that the timing of initiation of radiation was still delayed for African-American women, although public health gains have been made regarding completion of radiation therapy in low-income women. Another ICISS- supported study analyzed cost effectiveness of therapies for prostate cancer, finding that an extremely expensive proton therapy was no more effective than more traditional and more affordable treatments. This resource allows a virtually unlimited range of public health topics to be examined – current studies include looking at physician workforce characteristics, demographics related to radiation utilization, treatment outcomes in urologic cancers, racial disparities in cancer care, North Carolina's rating with regard to national quality measures, population and community patterns of colon cancer screening, the effect of groundwater arsenic on cancer incidence and outcomes, and many more.

Tobacco research funds focus on cancer prevention, biomarkers

UNC's transdisciplinary tobacco program will expand dramatically, due to the recent award of two federal grants worth $20 million apiece, making UNC home to two of the 14 established Tobacco Centers of Regulatory Science (TCORS) in the country. UCRF recruited and supported faculty were crucial to the conceptualization and competitiveness of these proposals. The communications research TCORS will be housed in UCRF space bringing together many of UNC Lineberger's prevention faculty. The epithelial biology focused TCORS will be housed in the Imaging Research Building after it opens in January, 2014. Faculty in both the Lineberger building and IRB pulmonary medicine will be involved.

The first TCORS grant will be used to develop the UNC Center for Regulatory Research on Tobacco Communication (CRRTC), which will research the communication and prevention strategies around the FDA constituent analysis of tobacco smoke. The 46 faculty, staff and students at the multidisciplinary Center will work on three major studies into reinforcing communication with the public about the dangers of alternative tobacco products such as electronic cigarettes, hookahs and smokeless tobacco; the harmful effects of chemicals found naturally in tobacco and cigarette smoke; increasing the credibility of risk communications and health risks to audiences from diverse communities; and how to optimally communicate FDA authority over tobacco products. One of the projects is a collaboration with Wake Forest School of Medicine faculty.

The second TCORS grant will support the UNC Center for Tobacco Regulatory Science and Lung Health, which will focus on better understanding which components of tobacco and which new and emerging tobacco products have an adverse effect on lung hydration and innate immune defense. The 48 faculty, staff and students in this multi-disciplinary effort based in pulmonary medicine, with major projects led by UCRF recruited faculty including Claire Doerschuk, MD. The grant will support work on four separate projects to comprehensively understand how new and emerging tobacco products such as little cigars and hookah can be harmful to lung health, including the development of chronic bronchitis, impaired innate immunity, tobacco induced lung inflammation and mucus overproduction. The overall TCORS program will bring together investigators from across the country to aid in the development and evaluation of tobacco product regulations.

Giving child patients a voice in cancer care

Children with cancer experience significant toxicities, or adverse events (AEs), while undergoing treatment. Federal agencies require that AEs be documented in clinical trials. Clinician reporting is the current standard for reporting AEs, but Dr. Bryce Reeve is looking for ways to integrate the child's perspective into the reporting process.

Dr. Reeve, who was recruited to UNC from the National Cancer Institute with the support of UCRF, received a five-year $2.5M grant for a study whose long-term goal is to create and validate a self-report measure of subjective AEs for children aged 7 years and older that will inform reporting for the National Cancer Institute's Common Terminology Criteria for Adverse Events (CTCAE). He and his colleagues recently completed a content validation study surveying nearly 200 pediatric clinicians in an effort to identify which of the 790 AEs in the current CTCAE should be included in a pediatric self-report measure. After the surveys, 64 CTCAE terms met the criteria of being subjective, relevant for use in pediatric cancer trials, and amenable to self-report by a child. The most frequent reasons for removal of CTCAE terms were that they relied on laboratory or clinical measures or were not applicable to children.

Dr. Reeve's next step is to translate these 64 AEs into child-friendly terms that will form the basis of the child-report toxicity measure. Ultimately, systematic collection of these data will improve care by enhancing the accuracy and completeness of treatment toxicity reports for childhood cancer.

New cancer-screening tools will help with early detection

Colorectal cancer is the second leading cause of cancer mortality in the country. Although screening rates for this cancer have increased in recent years, rates in Hispanic/Latino populations are among the lowest nationally. Latinos are more likely to be diagnosed with advanced stage colorectal cancer than non-Hispanic whites and have a lower probability of survival after diagnosis – and those with limited English proficiency (LEP) represent an especially vulnerable population due to communication challenges. To address this disparity, UNC Lineberger member Dr. Dan Reuland developed a Spanish language multimedia colorectal cancer screening decision aid that can be used in clinical practice.

Among the LEP Latinos in Reuland's study, knowledge of cancer screening increased by more than 50 percent after they viewed the decision aid. More than half the participants completing a follow-up survey reported discussing screening with a healthcare provider. Reuland is also testing a combined intervention involving a screening decision aid plus clinic-based bilingual patient navigator in a multi-site clinical trial at primary care clinics serving diverse, vulnerable patient populations both in North Carolina and in the Southwest US, using subjects in New Mexico.

UNC finds need for better coordination, communication with patients on survivorship care

Survivorship care plans (SCPs) are written plans used as tools to facilitate the transition from treatment to post-treatment cancer care. Though SCPs are commonly used, few studies have investigated survivor and provider preferences about the content, format, and delivery of SCPs. UCRF supported faculty member Dr. Deb Mayer, associate professor of nursing, led a pilot study to gain input from providers and survivors regarding the usefulness of SCPs in post-treatment care plans. Researchers found that while written SCPs were endorsed by all participating patients and primary care providers as helpful communication tools – but if used alone, the SCP is not sufficient to ease the transition to follow-up care. In her pilot study, Dr. Mayer found that improved communication and

care coordination were identified as important for survivorship care that went beyond what the SCP document provides.

Dr. Mayer is now expanding on her initial pilot, with the support of a Health-E-NC grant funded by UCRF, with two linked projects in four North Carolina counties. The first project will focus on the development and evaluation of paired sets of personalized survivorship care plans – one version for the patient, the other for the health care provider. Paired sets will be developed and tested for breast, colon, prostate, and lung cancer survivors who have completed cancer treatment. The second linked project will focus on enhancing coordinated care between oncology and primary care providers using the SCP and other identified communication strategies. Focus group participants – cancer survivors, primary care providers, and oncologists – will provide feedback on current versions of SCPs developed for patients and primary care providers, as well as on additional ways to improve communication and coordination of care during and after cancer treatment. Findings from the focus groups will guide a future survivorship care intervention that may influence care for cancer survivors across North Carolina and the country.

Training partnership with NC Central focuses on cancer disparities

African Americans have the highest cancer burden of any racial or ethnic group in the country. North Carolina Central University (NCCU) and UNC Lineberger have established an inter-institutional training program for undergraduate students who want to pursue careers in basic cancer research and in public health. UCRF supported faculty are involved and many of the student projects utilize UCRF-supported genomics and mouse infrastructures. The goal is to increase the number of undergraduate students from NCCU and UNC-Chapel Hill who pursue careers devoted to finding causes, cures, and prevention strategies for cancers that disproportionately affect minorities, particularly African Americans.

Community-based outreach aims to improve prevention

Health-e-NC (Health for Everyone in North Carolina) is a community-based partnership for statewide cancer strategies that aim to reduce risk factors, increase cancer screenings and referrals, help people make more informed decisions about their options for care, enhance treatment and survivorship, and improve prevention efforts across the state. UCRF-supported Health-e-NC funds a number of community-based pilot programs each year that fit with these goals.

One pilot project, Lose Now NC, hopes to reduce the risk of cancer by addressing the widespread problem of obesity. About 65 percent of NC adults were overweight or obese in 2011 Obesity has been linked to risk of several cancers, most notably breast and colon cancer, and also to decreased survival rates. Helping adults lose weight is a key strategy to reduce the cancer burden statewide, but the most effective weight-loss strategies involve intensive, individualized face-to-face counseling which is expensive and not widely accessible. Led by UCRF-supported faculty member Deb Tate, Lose Now NC studied whether a monthly face-to-face treatment in much larger groups (approximately 200 or more), coupled with an Internet program between sessions, could be an effective approach for achieving weight loss in NC communities. The study enrolled 195 people in

Deborah Tate

Mecklenburg and Cabarrus counties, and found that engagement in the program was high (75% retention at 4 months) and weight loss was significant (-3.69% of weight). Many of the Lose Now NC participants achieved clinically significant weight losses in this minimal intensity program. The Lose Now NC study showed that we could recruit a racially diverse group of study participants in a community-based program and successfully deliver a low intensity weight loss program that resulted in overall weight losses approaching clinical significance. The project used meeting space on the new Kanapolis campus.

Other pilot projects have involved promoting exercise among cancer survivors, using telemedicine to train staff of local survivorship centers, and introducing smoking cessation programs.

With UCRF support, Health-e-NC is also developing a web portal that will be a venue for evaluating state-of-the-art health promotion and cancer prevention programs and for sharing evidence-based tools and materials. Initially, the portal will offer an online resource tool called CHART (Carolina Health Assessment and Resource Tool) to be used as a core resource for Cancer Center researchers. CHART is a health behavior assessment tool offering core question modules and personalized, evidence-based and theory-guided message libraries (feedback) related to several behaviors that affect cancer outcomes. Additionally, formative research is currently being conducted to understand what online content and interactive tools adults, and particularly cancer survivors, want. Over time, mobile apps and resources will be incorporated to support optimizing cancer prevention, control, care and survivorship in our state.

SUCCESS STORY: UCRF helps recruit comparative effectiveness researcher with focus on treatment for older cancer patients

The Department of Epidemiology, with support from the UNC Lineberger and the UCRF, recruited a new assistant professor, Dr. Jennifer Lund. Dr. Lund obtained her Doctor of Philosophy in Epidemiology (2011) from The University of North Carolina at Chapel Hill. Since 2012 Dr. Lund has been a postdoctoral researcher in the Department of Clinical Epidemiology at Aarhus University in Denmark.

Dr. Lund's research focuses on pharmacoepidemiology and comparative effectiveness of medical interventions for cancer patients, especially for older persons with cancer. These data allow the evaluation of treatment efficacy and other health services research questions in a more "real world" population context than in clinical trials. Her dissertation research focused on the effectiveness of adjuvant oxaliplatin chemotherapy among older cancer patients with colorectal cancer. She is an important new epidemiology faculty member for the expanding cancer outcomes group, which includes investigators from the UNC Schools of Public Health and Medicine.

Tier 2: Opportunity Fund

As the field of cancer research evolves, the Opportunity Fund allows us to remain agile and to seize research and clinical opportunities as they arise, and enables us to provide the top minds in the field with the resources they need. UCRF funds competitive and innovative pilot projects, provides seed money to recruit top researchers, supports leading-edge technology and equipment that multiple faculty members can use, and facilitates the development of shared research resources.

UNC researchers aim to understand how Hepatitis C leads to liver cancer

Lishan Su

Two UNC scientists have received $2.35 million from the National Cancer Institute to better determine how the Hepatitis C virus affects the development of liver cancer.

Lishan Su, PhD, professor of microbiology and immunology, and Stanley Lemon, MD, professor of medicine and microbiology and immunology, lead teams that use technologies developed in each of their laboratories to collaborate on the project. Dr. Lemon was a UCRF recruit and Dr. Su's work was funded by an Innovation Award.

Stanley Lemon

Chronic Hepatitis C infection is the leading cause of liver cancer in the United States, Hepatitis B the leading cause worldwide. Lemon and Su will study whether inflammation associated with hepatitis C causes liver cancer, or whether the virus facilitates the development of cancer by affecting host cells in other ways.

Lemon and Su's work centers on a novel mouse model developed by Su; the mouse is altered so it has both a human immune system and human liver cells. Human cells are only cells that can be infected with hepatitis virus; so this work could not proceed in a normal mouse. Su's innovation has created a mouse model that can be infected with human hepatitis C virus, and when infected with the Hepatitis C virus, the mouse develops a human immune response to the virus. The inflammation leads to liver disease, fibrosis and cancer. Affecting about 3.2 million Americans, Hepatitis C is the most common chronic blood-borne infection in the country according to the Centers for Disease Control. Liver cancer is the third leading cause of death worldwide and the ninth leading cause of cancer deaths in the United States; chronic viral hepatitis account for more than two thirds of these cases. The Su / Lemon team will be able to study therapy to eliminate the virus and explore what leads from infection to cancer.

In addition to this collaborative project with Lemon, Su recently was awarded a $2 million, four-year grant from the National Institute of Health to investigate using a novel immune therapy to treat chronic hepatitis B virus (HBV) infection, which affects more than 350 million patients worldwide. Su and colleagues intend to use their innovative humanized mouse model to build a better understanding of the way in which HBV infections and the patient's immune response leads to fibrosis/cirrhosis and, eventually, liver cancer.

Building capacity in cancer research

Although the Strategic Plan concentrates about 50 percent of UCRF resources on three Tier 1 Research Priorities, the field of cancer research is continually evolving. As a result, new opportunities for strategically important research have been developing – and will continue to do so – outside the Tier 1 priorities. Recruiting and retaining outstanding faculty 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. For example, more people die of lung cancer than any other kind of cancer. This year, thanks to UCRF, we were able to recruit three outstanding faculty members from Johns Hopkins, University of Michigan, and MD Anderson specializing in lung cancer. This will enhance our research capabilities involving this most lethal cancer subtype.

One example is UCRF recruit Dr. Chad Pecot, MD, a lung cancer specialist with an interest in how RNA interference regulates cancer metastases. Trained at Vanderbilt and MD Anderson, Dr. Pecot

understands that metastases are responsible for the majority of cancer deaths. Therefore, he is devising methods to target the metastatic process using nanoparticle-based drug delivery. He was attracted to UNC over four other offers by our UCRF-developed nanomedicine program. He also will explore the cellular regulatory networks involved with metastatic lung cancer with the goal of developing microRNA-based therapies to inhibit metastases in these cancers.

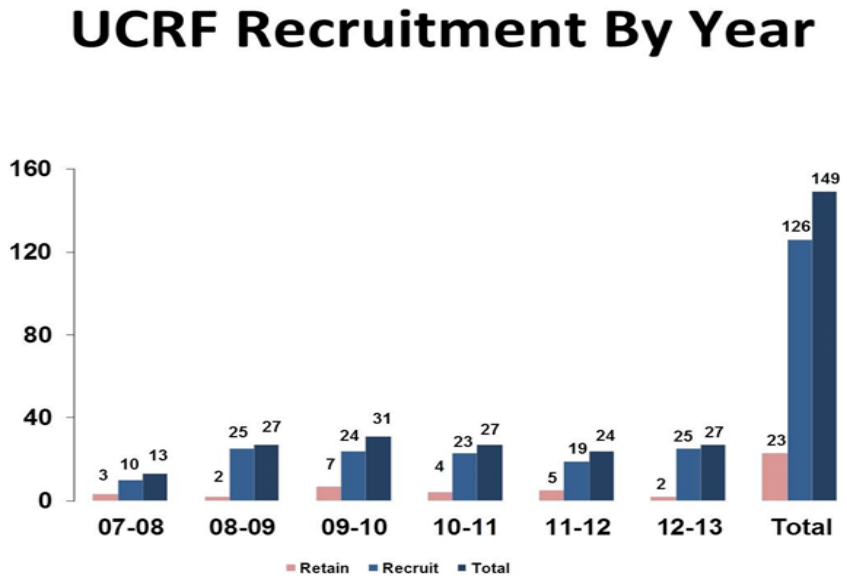
SUCCESS STORY: Rimer receives ACS Medal of Honor, leads presidential cancer panel

Barbara K. Rimer, DrPH, Dean and Alumni Distinguished Professor of the University of North Carolina Gillings School of Global Public Health, has been awarded the American Cancer Society (ACS) Medal of Honor – the Society's highest honor – for her work in cancer research. The ACS chose Dr. Rimer for "her work in breast cancer screening, which has guided national research, practice and policy for more than 20 years. Her work has evolved with the field from raising awareness of screening and increasing screening initiation, to promoting screening maintenance."

President Obama has named Rimer chair of the President's Cancer Panel, which was established as part of the National Cancer Act signed by President Nixon in 1971. The three-member panel monitors the development and execution of the activities of the National Cancer Program, and reports directly to the President on barriers to program implementation. Dr. Rimer, who has been on the UNC faculty since 2003, is a UNC Lineberger member and served as its deputy director until she was appointed dean in 2005. She serves on the Cancer Research Committee that oversees the investment of UCRF funds. Dean Rimer has been a vital partner in the development of UCRF public health projects and recruitments.

Recruitment and Retention by Year

The following graph shows the number of UCRF supported faculty recruitments and retentions in each ear of UCRF funding. The total is nearing 150 active faculty, improving UNC's ability to eliminate the cancer burden in North Carolina and the world by creating new knowledge through research.



Promoting innovation and leveraging external funds

The Innovation Awards, highly competitive internal seed grants supported by UCRF, aim to promote innovation at UNC and cultivate the next generation of cancer research. These awards have stimulated research across the public health, clinical and basic science spectrum and provide data with which to seek new external funding.

- From 2007 to 2013, UCRF conducted nine rounds of competition and received 495 applications.
- Rigorous peer reviews led to 81 awards, a funding rate of about one in six, for a total of $13.45 million.
- Follow-up results from the round 1 (2007) found that the $2.4 million in awards resulted in more than 20 extramural grant awards with projected total funding (all years) of $20.4 million.
- Initial follow-up results from rounds 2, 3, and 4 found that investigators credited funding of 42 external grant awards to their Innovation Award support. Those grants accounted for $10.7 million in external funding for FY 2013 alone. The total amount of funding across all years of support will be followed.
- In addition, awards in rounds 2, 3, and 4 directly or indirectly contributed to four patent filings, and two startup companies.

Tier 3: Infrastructure

Imaging Research Building will greatly expand cancer research space

This winter, the Imaging Research Building (IRB), located next to the Lineberger building, will open its doors, greatly enhancing our capacity for cancer research. More than half the building will be occupied by UNC Lineberger members, with one floor, 24,000 square feet of lab space, assigned to expand Lineberger building space. The IRB will house three floors of imaging technology and equipment, one floor for the NCI-funded CCNE, two floors of chemical hood intensive space for drug development efforts, and two additional floors of general laboratory space for the Department of Microbiology and Immunology and the Pulmonary Biology group, including the new TCORS epithelial biology grant.

The new facility, funded by the General Assembly in 2009, will bring the physical and chemical sciences much closer to the Lineberger headquarters building. The imaging component of the IRB will add tremendous value to our translational research efforts, bringing all small animal imaging modalities together and providing new clinical research capabilities and technology, including MRI/PET and CT/PET scanners, a 7TMRI, a cyclotron, and radiochemistry facilities. There will be space for studies following patients during cancer therapy, allowing new avenues for assessing patient response and resistance.

SUCCESS STORY: Nuclear medicine expert to be leader in cancer patient imaging research

The UCRF played a key role in the successful recruitment of Dr. Terry Wong, MD, PhD, a radiologist who has been appointed UNC's chief of nuclear medicine and leader of our translational, functional imaging research program.

When the Imaging Research Building opens, Dr. Wong's role as Associate Director for Clinical Translation of the Biomedical Resource Imaging Center will expand. He will lead collaborations with other disciplines to maximize the cutting-edge technologies that will be available for cancer clinical trials.

His research interests include PET/CT, PET/MR, advanced MR and CT, novel PET tracers, with his primary interest being the development and application of functional and anatomic imaging biomarkers to guide and evaluate cancer treatment decisions. Dr. Wong has participated in several significant studies on a variety of topics including exploring radium-based treatments for prostate patients with metastatic bone disease, and evaluating how changes in tissue due to radiation can affect the study of heart and lung conditions. He is a member of the national cancer cooperative group, ACRIN, which conducts imaging and cancer clinical trials.

Telemedicine sites expand reach of tumor expertise

The University Cancer Research Fund investment in telemedicine has extended the reach of UNC experts to 42 sites in more than twenty communities across the state. Affiliated physicians videoconference with a team of UNC experts from a wide variety of specialties who meet and discuss treatment plans for patients during weekly Multidisciplinary Oncology Tumor Boards. Doctors at Wilson Medical Center, Rex Hospitals, Moses Cone, Marion L. Shepard Cancer Center, Carteret Memorial Hospital and Mission Hospitals participate in Tumor Board conferences as patient cases warrant. This year we were also able to expand our program to Angel Medical Center in Franklin County and Chatham Hospital in Siler City by leveraging federal dollars for the USDA to install state-of-the-art telepresence systems. Cancer research conferences between East Carolina University and UNC occur on a bi-monthly basis. The videoconferencing system is also used to facilitate the distribution of Lunch and Learn lectures from Dare County to other communities. In selected specialties lacking in rural communities, physician-to-patient consultations also are provided via telemedicine. The Comprehensive Cancer Support Program provides mental health support for cancer patients. In addition, the Clinical Genetics Program offers genetics counseling to patients via Telemedicine.

Clinical excellence and outreach are vital in quality cancer care

It is a sad fact that roughly one third of patients diagnosed with cancer will die from the disease. It is our objective to change those outcomes through new knowledge and discovery. To do that, we must have a faculty that create new research knowledge in their areas of specific cancer expertise and – through our outreach programs – make those advances available to patients across the state.

UCRF has played a critical role in our efforts to assemble an outstanding group of clinical research-oriented oncologists who enable N.C. Cancer Hospital to provide the highest level of expertise. Our faculty is intimately engaged in clinical and translational research, with a commitment to helping cancer patients in North Carolina and beyond.

SUCCESS STORY: Single dads' group offers support for cancer widowers

Fathers whose spouses die from cancer are not only grieving, but taking care of their children alone – and often with few places to turn for help. In 2010, UCRF recruits Don Rosenstein, MD, and Justin Yopp, PhD, launched an educational series and support program – the first of its kind in the nation – to reach out to these widowers and give them somewhere to turn.

"Newly widowed fathers represent a potentially vulnerable population as they cope with their own grief, their children's grief, and the day-to-day demands of being a single parent," program coordinator Justin Yopp, PhD, said. "This population of fathers has been largely overlooked in the literature and we know of no previous interventions specifically tailored to their needs."

Yopp, who was recruited to UNC from St. Jude's Hospital with UCRF support, is an assistant professor of psychiatry. His co-author is Don Rosenstein, MD, professor of psychiatry and director of the UNC Comprehensive Cancer Support Program who was recruited from the National Institutes of Health.

Single Fathers Due to Cancer grew out of Rosenstein and Yopp's work with young mothers who were dying of cancer and their families. During counseling sessions, mothers expressed concerns about how their husbands and children were coping with their terminal illness and would cope after their death.

"The fathers in our support group have told us that they benefitted from the opportunity to meet with and learn from other fathers in their situation," Yopp said. "Our goal now is to develop a research agenda to systematically explore the most effective ways to intervene with these fathers, and our hope is that this publication will spur similar interest from investigators and clinicians."

BUDGET AND EXPENDITURE INFORMATION

UCRF Funding Sources and Revenue

The 2007 law establishing the UCRF 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 Fund initially received $25 million in 2007 and $40 million in 2008 before reaching its full funding amount of $50 million in 2009. The UCRF has been supported by three funding sources: tobacco settlement funds, taxes on other (non-cigarette) tobacco products such as snuff, and state appropriations. In 2013 the General Assembly eliminated tobacco settlement funds as a source of support for FY 2013-2014, reducing the UCRF to $42 million.

Since 2009, total funding has fallen slightly short of the $50 million objective stated in law due to lower than expected receipts from the tax on other tobacco products. For the fourth year in a row, these receipts less than projected. The FY 2012-2013 shortfall of $355,479 was, however, very significantly improved over the prior years' shortfalls, which ranged had ranged from ~$1.0 million to $2.1 million.

FY 12-13 Anticipated and Actual Fund Revenue	Amount *
Anticipated	
State Appropriation	$16,020,000
Tobacco Trust Fund Transfer	$8,000,000
Projected OTP Tax Receipts	$25,980,000
Total	$50,000,000
Actual	
State Appropriation	$16,020,000
Tobacco Trust Fund Transfer	$8,000,000
Actual OTP Tax Receipts	$25,624,521
Total	$49,644,521
Shortfall Due to OTP Tax Receipts	**$355,479**

*** Rounded to the nearest dollar**

Fund Balance

This year the UCRF had a carryover of $39,881. Expenses closely matched revenues, and the year-end fund balance was $83,720.

FY 12-13 Budget and Expenditures	Amount $
Anticipated Budget	
Revenue	$50,000,000
Carryover from FY12	$39,881
Total	**$50,039,881**
Actual Budget	
Revenue	$49,644,521
Carryover from FY12	$39,881
Total	**$49,684,402**
Expenditures	**$49,600,682**
Balance	**$83,720**

*** 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, by which the Fund was created, established the Fund as a special revenue fund in the Office of the President of the University of North Carolina. This law, included as an appendix to this report, established the Cancer Research Fund Committee as an oversight measure and explicitly states 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 ground rules to guide how UCRF funds would be best spent. They 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; 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 also imposed additional restrictions on the use of these funds. It was determined 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. Only 1.5 percent of the total UCRF budget is used for ongoing administrative expenses.

Categories	FY 12-13 Expenses
Strategic Plan Categories	
Tier 1: Research Priorities	
Understanding Genetics	$7,792,331
Developing Novel Therapies	$8,217,708
Optimizing Outcomes	$6,316,088
Tier 2: Opportunity Fund	$9,057,328
Tier 3: Critical Infrastructure	
Clinical Excellence – Research & Outreach	$9,614,344
Research & Tech Development and Training	$8,602,884
Total	**$49,600,682**

CONCLUSION

The University Cancer Research Fund is sparking innovative research that is changing cancer prevention, early detection and care in North Carolina and the world. UCRF is promoting collaborations with other universities and with the private sector, and is connecting communities all across our state with better resources for care. Additionally, UCRF is leveraging unprecedented amounts of outside funding. The result has been to move UNC into the top ten nationally in biomedical research funding – making the national research community take notice and creating jobs and commercialization opportunities that will benefit our economy, producing greater than a 5-to-1 return on investment.

The economic and health impacts of this investment have been significant, and will continue to be so in the years to come. We are grateful for the legislature's ongoing support of UCRF and we continue to utilize these funds responsibly and strategically. The University Cancer Research Fund has been a truly remarkable investment in cancer care that will have a lasting impact in and beyond our state. As we work every day to improve prevention, treatment and outcomes, our ultimate goal continues to be making North Carolina's deadliest disease a thing of the past.

University Cancer Research Fund

Appendix

1. Establishing Legislation
2. Cancer Research Fund Committee
3. UCRF Outreach Map
4. FY 12-13 Expenditures
5. UCRF Strategic Plan
6. Economic Impact Analysis
7. List of Active Extramural Awards

1. 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.

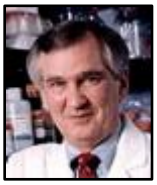
(5) Accounting of any fund balances retained by the Fund, along with information about any restrictions on the use of these funds.

2. 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

H. Shelton Earp, 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

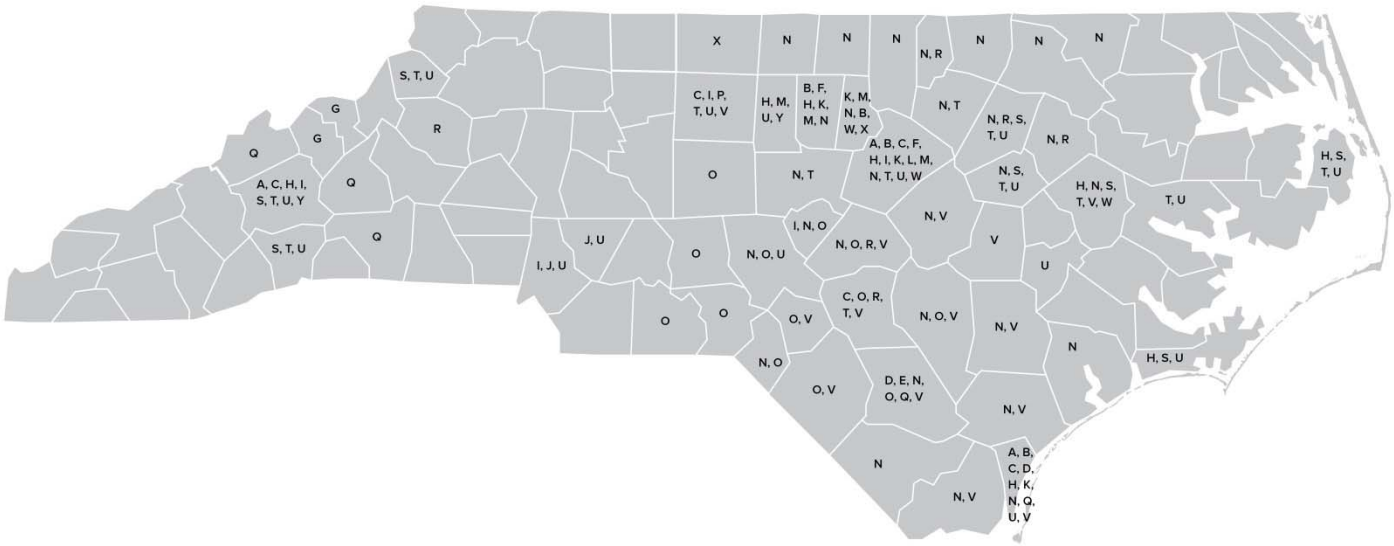
Barbara K. Rimer, DrPH
Dean
Gillings School of Global Public Health
The University of North Carolina at Chapel Hill

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

3. UCRF Outreach Map

UCRF Outreach Across North Carolina

Statewide and Regional/Local Projects



- **A** Healthy Stores, Healthy Communities
- **B** Circles of Care: Supporting African Americans with Cancer
- **C** Meeting the Needs of Cancer Survivors in North Carolina: Assessing and Improving the Medicaid Medical Home Model
- **D** Improving Colorectal Cancer Screening in NC Medicaid Beneficiaries
- **E** Addressing Cancer Disparities by Studying Issues of Coverage, Convergence & Cost in Multiple Settings
- **F** A Home-based Motivational Exercise Program for African American Breast Cancer Survivors
- **G** Reducing HPV-Attributable Cancers through HPV Vaccination — an Interactive Technology Based Approach for Adolescents in School Based Health Centers
- **H** Telemedicine Delivery of a Cancer Support Training Intervention: Partnership with Community-Based Survivorship Centers
- **I** Improving Care Quality with Virtual Tumor Boards (VTB) Using Videoconferencing Technology
- **J** Lose-Now-NC: Feasibility of a large group format community weight loss program coupled with Internet support
- **K** Improving Survivorship Care Through Enhanced Communication and Coordination
- **L** Preventing Lung Cancer through Tobacco Cessation Quality Improvement
- **M** FITShop (FITness in the Shop): Promoting Physical Activity in Black Barbershops
- **N** Intervening to increase adoption of Community Guide recommendations: Susan G. Komen NC Triangle to the Coast (Komen NCTC) / Improving Breast Cancer Screening Using Evidence-based Strategies
- **O** HPV Vaccination Project
- **P** Increasing colon cancer screening in Guilford County
- **Q** Colorectal Cancer Screening in Disadvantaged Communities: A Behavioral Economics Perspective
- **R** Improving Rates of Colorectal Cancer Screening in Community Health Centers
- **S** Patient Navigator Education to help patients with cancer overcome obstacles, systems barriers and facilitate timely access to quality medical and psychosocial care
- **T** UNC Cancer Network - Clinical Outreach
- **U** UNC Cancer Network - Clinical Trial Network
- **V** LiveSTRONG Center of Excellence in Cancer Survivorship
- **W** Research Partnerships
- **X** School Health Center Project
- **Y** Evaluation of a Self-Screening Cervical Cancer Test by Mail

4. FY 12-13 Expenditures

University Cancer Research Fund Fiscal Year 2013
Cash

Description	Desc	Cash Received
Tobacco Tax	June Collections	$3,147,417.29
	July Collections	$2,111,714.91
	August Collections	$2,066,977.40
	September Collections	$2,036,556.88
	October Collections	$1,960,087.09
	November Collections	$2,040,202.93
	December Collections	$1,891,998.59
	January Collections	$2,247,676.91
	February Collections	$1,891,057.51
	March Collections	$1,847,845.63
	April Collection	$2,190,621.09
	May Collections	$2,192,364.44
Tobacco Trust	Tobacco Trust	$8,000,000.00
State Appropriation	16011 UCRF	$16,020,000.00
Grand Total		**$49,644,520.67**

Carryover from Prior Year	$39,881.63
Total Cash Available to spend	$49,684,402.30
Total Expenditures as of June 30, 2013	$49,600,682.33
Cash Available as of June 30, 2013	**$83,719.97**

University Cancer Research Fund Fiscal Year 2013

Expenditures by Strategy

Strategy	Sum of Annual Budget	Sum of Year to Date Actual	Sum of Cash Balance
Theme 1: Optimizing NC Cancer Outcomes	$7,612,029	$7,792,331	-$180,302
Theme 2: Understanding Genetics in Cancer	$10,208,179	$8,217,708	$1,990,471
Theme 3: Develop New Cancer Treatments	$5,772,342	$6,316,088	-$543,746
Opportunity Fund	$8,582,119	$9,057,328	-$475,209
Infra 1: Infrastructure- Clinical Excellence and Outreach	$9,281,713	$9,614,344	-$332,631
Infra 2: Infrastructure	$8,228,021	$8,602,884	-$374,863
Grand Total	**$49,684,402**	**$49,600,682**	**$83,720**

University Cancer Research Fund Fiscal Year 2013		
Expenditures by Category		
Obj Name	**Sum of Year to Date Actual**	**% of Expense to Total Expenditure**
Faculty Salaries	$12,922,119.81	26.05%
EPA Student Salaries	$2,923,816.44	5.89%
Staff Salaries	$7,592,898.77	15.31%
Other staff	$824,950.61	1.66%
Benefits	$5,770,752.73	11.63%
HCS Contracted Serv	$701,110.09	1.41%
Faculty/Non Faculty Benefits		
Phy Benefits	$229,922.70	0.46%
Other Staff Benefits	$168,609.82	0.34%
Transit Tax	$58,480.95	0.12%
Consultants/Contracted Services	$380,520.25	0.77%
Employee Education	$4,331.98	0.01%
Repairs and Maint	$403,078.15	0.81%
Other Current Services	$2,952,876.70	5.95%
Supplies, Utilities, Other	$4,408,968.95	8.89%
Travel	$411,769.18	0.83%
Freight and Exp	$109,893.98	0.22%
Maintenance Contracts	$1,734,674.05	3.50%
Advertising	$19,420.35	0.04%
Meetings & Amentites	$35,060.31	0.07%
Transfer Computer Science		
Printing and Binding	$46,475.16	0.09%
Communication	$187,870.99	0.38%
Contracted Serv		
Computer Services	$32,805.43	0.07%
Rental/Lease Facilities	$443,166.41	0.89%
Other Fixed Charges	$12,640.61	0.03%
Rental Equipment	$2,341.30	0.00%
Equipment	$6,502,162.55	13.11%
Study Subjects & Exp	$176,417.96	0.36%
Employee on Loan		
Insurance		
Student Support	$480,677.22	0.97%
#N/A		
Utilities	$62,868.88	0.13%
HCS Residents		
HIPAA Deduct		
Grand Total	**$49,600,682.33**	**100.00%**

University Cancer Research Fund Fiscal Year 2013		
Expenduitures by Strategy and Expense		
Stategy	**Obj Name**	**Actual $**
Theme 1: Optimizing NC Cancer Outcomes	**Budget**	
	Faculty Salaries	2,205,443.28
	EPA Student Salaries	427,394.69
	Staff Salaries	1,594,868.44
	Other staff	196,566.76
	Benefits	1,144,012.00
	Faculty/Non Faculty Benefits	
	Phy Benefits	3,718.50
	Other Staff Benefits	39,406.46
	Transit Tax	10,663.10
	Consultants/Contracted Services	118,117.80
	Employee Education	948.00
	Repairs and Maint	156,596.39
	Other Current Services	380,921.87
	Supplies, Utilities, Other	629,493.59
	Travel	127,969.17
	Freight and Exp	38,771.74
	Maintenance Contracts	182,580.05
	Advertising	9,001.25
	Meetings & Amentites	2,203.04
	Printing and Binding	2,412.86
	Communication	45,661.93
	Contracted Serv	
	Computer Services	5,694.98
	Rental/Lease Facilities	228,642.66
	Other Fixed Charges	
	Equipment	40,197.11
	Study Subjects & Exp	108,765.16
	Student Support	92,279.97
	Equip rental	
	HCS Residents	
Theme 1 Total		**7,792,330.80**

University Cancer Research Fund Fiscal Year 2013		
Expenduitures by Strategy and Expense		
Stategy	**Obj Name**	**Actual $**
Theme 2: Understanding Genetics in Cancer	Budget	
	Faculty Salaries	1,794,939.71
	EPA Student Salaries	194,573.98
	Staff Salaries	915,734.55
	Other staff	88,336.53
	Benefits	761,887.79
	HCS Contracted Serv	
	Faculty/Non Faculty Benefits	
	Phy Benefits	6,703.86
	Other Staff Benefits	17,490.28
	Transit Tax	7,214.08
	Consultants/Contracted Services	15,788.64
	Employee Education	199.98
	Repairs and Maint	9,494.44
	Other Current Services	489,352.56
	Supplies, Utilities, Other	1,100,215.32
	Travel	37,053.07
	Freight and Exp	8,623.23
	Maintenance Contracts	547,282.89
	Advertising	
	Meetings & Amentites	(150.53)
	Transfer Computer Science	
	Printing and Binding	3,809.13
	Communication	20,913.30
	Contracted Serv	
	Computer Services	14,053.05
	Rental/Lease Facilities	198,200.28
	Other Fixed Charges	12,460.96
	Equipment	1,888,662.65
	Insurance	
	Student Support	23,795.78
	#N/A	
	Utilities	61,072.21
Theme 2 Total		**8,217,707.74**

University Cancer Research Fund Fiscal Year 2013		
Expenduitures by Strategy and Expense		
Stategy	**Obj Name**	**Actual $**
Theme 3: Developing New Cancer Treatment	**Budget**	
	Faculty Salaries	1,926,449.71
	EPA Student Salaries	239,394.51
	Staff Salaries	433,389.21
	Other staff	35,168.95
	Benefits	652,855.49
	Faculty/Non Faculty Benefits	
	Phy Benefits	
	Other Staff Benefits	13,224.61
	Transit Tax	6,346.01
	Consultants/Contracted Services	1,345.63
	Employee Education	60.00
	Repairs and Maint	55,709.36
	Other Current Services	561,764.64
	Supplies, Utilities, Other	815,177.56
	Travel	26,726.15
	Freight and Exp	7,219.94
	Maintenance Contracts	397,585.64
	Advertising	
	Transfer Computer Science	
	Printing and Binding	30,095.88
	Communication	14,971.85
	Computer Services	
	Rental/Lease Facilities	
	Other Fixed Charges	
	Rental Equipment	
	Equipment	1,080,631.14
	Employee on Loan	
	Insurance	
	Student Support	17,971.89
	#N/A	
	HIPAA Deduct	
Theme 3 Total		**6,316,088.17**

University Cancer Research Fund Fiscal Year 2013		
Expenduitures by Strategy and Expense		
Stategy	**Obj Name**	**Actual $**
Opportunity Fund	Budget	
	Faculty Salaries	940,453.20
	EPA Student Salaries	1,020,373.89
	Staff Salaries	703,657.35
	Other staff	268,070.25
	Benefits	608,367.10
	Faculty/Non Faculty Benefits	
	Phy Benefits	1,756.32
	Other Staff Benefits	17,116.26
	Transit Tax	7,079.71
	Consultants/Contracted Services	18,871.03
	Employee Education	2,469.00
	Repairs and Maint	136,540.03
	Other Current Services	603,017.01
	Supplies, Utilities, Other	1,197,559.88
	Travel	76,766.53
	Freight and Exp	27,187.30
	Maintenance Contracts	340,928.80
	Advertising	
	Meetings & Amentites	2,148.10
	Printing and Binding	40.00
	Communication	22,772.52
	Computer Services	6,353.20
	Other Fixed Charges	5.25
	Equipment	2,963,589.69
	Study Subjects & Exp	18,871.03
	Student Support	71,537.78
	Utilities	1,796.67
Opportunity Fund Total		**9,057,327.90**

University Cancer Research Fund Fiscal Year 2013		
Expenduitures by Strategy and Expense		
Stategy	**Obj Name**	**Actual $**
Infrastructure 1 - Clinical Excellence and Outreach	**Budget**	
	Faculty Salaries	4,653,152.65
	EPA Student Salaries	46,704.06
	Staff Salaries	1,141,531.84
	Other staff	57,577.19
	Benefits	1,314,933.55
	HCS Contracted Serv	678,225.71
	Faculty/Non Faculty Benefits	
	Phy Benefits	215,451.88
	Other Staff Benefits	37,730.12
	Transit Tax	14,216.46
	Consultants/Contracted Services	111,746.84
	Employee Education	170.00
	Repairs and Maint	1,335.65
	Other Current Services	560,748.69
	Supplies, Utilities, Other	228,901.16
	Travel	64,552.77
	Freight and Exp	4,332.15
	Maintenance Contracts	177,436.74
	Advertising	1,352.10
	Meetings & Amentites	3,747.38
	Printing and Binding	2,247.49
	Communication	50,784.88
	Contracted Serv	
	Computer Services	6,704.20
	Rental/Lease Facilities	16,323.47
	Other Fixed Charges	174.40
	Equipment	212,222.73
	Study Subjects & Exp	5,348.45
	Employee on Loan	
	Student Support	4,350.00
	Rental Equipment	2,341.30
	HCS Residents	
Infrastructure 1 Total		**9,614,343.86**

University Cancer Research Fund Fiscal Year 2013		
Expenduitures by Strategy and Expense		
Stategy	**Obj Name**	**Actual $**
Infrastructure 2	**Budget**	
	Faculty Salaries	1,401,681.26
	EPA Student Salaries	995,375.31
	Staff Salaries	2,803,717.38
	Other staff	179,230.93
	Benefits	1,288,696.80
	HCS Contracted Serv	22,884.38
	Faculty/Non Faculty Benefits	
	Phy Benefits	2,292.14
	Other Staff Benefits	43,642.09
	Transit Tax	12,961.59
	Consultants/Contracted Services	114,650.31
	Employee Education	485.00
	Repairs and Maint	43,402.28
	Other Current Services	347,823.48
	Supplies, Utilities, Other	437,621.44
	Travel	78,701.49
	Freight and Exp	23,759.62
	Maintenance Contracts	88,859.93
	Advertising	9,067.00
	Meetings & Amentites	27,112.32
	Transfer Computer Science	
	Printing and Binding	7,869.80
	Communication	32,766.51
	Contracted Serv	
	Computer Services	3,900.00
	Rental/Lease Facilities	
	Other Fixed Charges	
	Equipment	316,859.23
	Study Subjects & Exp	48,781.77
	Employee on Loan	
	Student Support	270,741.80
	#N/A	
Infrastructure 2 Total		**8,602,883.86**
Grand Total		**49,600,682.33**

5. UCRF Strategic Plan

UCRF Strategic Plan Overview
Table of Contents

UCRF Strategic Plan Overview

Background and Context

Introduction

Cancer has overtaken heart disease as the leading cause of death in North Carolina. An estimated 40 percent of North Carolinians will develop cancer during their lifetimes. Approximately 46,416 North Carolinians are projected to receive a cancer diagnosis in 2009 with 18,277 projected cancer deaths this year. These numbers will increase as the population ages unless cancer prevention, early detection, and therapeutic research intervene. And as with other diseases, the impact of cancer falls disproportionately on disadvantaged communities. For example, African-Americans in North Carolina experience higher cancer incidence and mortality rates compared with other groups.

This growing challenge motivated the state legislature to fund the NC Cancer Hospital and, in August 2007, to create the University Cancer Research Fund (UCRF) "only for the purpose of cancer research under UNC Hospitals, the Lineberger Comprehensive Cancer Center, or both." With up to $50 million of funding per year from the Tobacco Trust Fund, an increased tax on smokeless tobacco products, and general revenue, the UCRF provides a unique opportunity to develop leading national (and international) cancer research and innovation while improving cancer outcomes for the people of North Carolina.

> "The UCRF's mission is to ensure that future generations of North Carolinians will develop cancer less often and live longer and better when they do. Research creates new knowledge, turns that knowledge into innovative treatment, screening, and prevention, and then assures delivery of innovations across the state – that research is the key unlocking the doors to a new and better future. The UCRF is helping make that research possible." (UCRF 2007-2008 Annual Report)

Strategic planning process overview

In order to most effectively realize the vision of improving cancer outcomes in North Carolina and to maximize the return on the State's investment, UNC and its Lineberger Comprehensive Cancer Center (LCCC) sought to develop a UCRF strategic plan, with a focus on clear goals with measurable outcomes and metrics of success. To that end, the strategic planning firm AltshulerGray was hired to lead the planning process and SRA International was retained to develop an evaluation plan.

AltshulerGray consultants worked with the LCCC Program Planning Committee (PPC) to establish a two-phase process that included a range of university stakeholders as well as outside experts. The initial phase included interviews with 50 internal and external stakeholders, a survey of 243 UNC faculty members, and six listening sessions conducted by UNC leaders to gather feedback from communities across the state, in addition to regular meetings of the PPC and reports to the UNC Oversight Committee, chaired by

Dean and Health System CEO Bill Roper, and the governance committee by the UCRF statute, the Cancer Research Fund Committee, chaired by President Erskine Bowles. (See Appendix A for the membership of the Cancer Research Fund Committee, the UNC Oversight Committee, and the LCCC Program Planning Committee.) This outreach and extensive faculty input built consensus around a vision, guiding principles, and a framework to help determine initial research strategies. The result was the definition of a three-tier investment strategy for UCRF funds, comprised of *Research Priorities*, an *Opportunity Fund*, and *Critical Infrastructure*, described in greater detail below.

Initial faculty feedback and subsequent discussions led to the identification of a list of potential research priorities. (See Appendix B.) These opportunities were evaluated according to three criteria:

- Will it address the needs of North Carolina, 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?

As a result of extensive analysis and faculty feedback, including a faculty-wide survey, three interconnected thematic research priorities were identified as the initial key strategic focus areas:

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

These three areas were the top priority areas identified in the faculty survey. (See Appendix C for survey results.)

In the second phase of strategic planning, three "theme teams" comprised of 5-7 faculty were charged with creating strategic and investment plans for each prioritized research area. In addition to laying out a vision of what would be possible with focused investment, the teams were asked to delineate the rationale for investment (i.e., why should this be done now, and why at UNC), current strengths and gaps at UNC, a potential funding model (e.g., how UCRF investment would be expected to generate increased funding from other sources, such as federal funding), and an implementation and launch plan. External experts from leading centers across the U.S. are being brought in to review the plans and provide constructive feedback to the proposals. (See Appendix D for list of external advisors.)

At the same time, faculty groups were convened to evaluate opportunities for disease-focused UCRF investment. 51 faculty members served on 12 disease teams. Each team produced a report outlining the opportunities and resource needs for its specific disease area and highlighting how research in these areas could best leverage investments in the three prioritized research initiatives. The theme teams used this disease team input to further refine their own plans. Critical needs identified by the disease teams to bolster clinical excellence and outreach – essential for conducting UNC and state-wide clinical cancer research – were considered as part of the planning for UCRF critical infrastructure investment.

Guiding principles and philosophy

Based on the stakeholder interviews in the first phase of strategic planning, the PPC developed guiding principles for investment:

- The UCRF should fund breakthrough innovation and excellence in cancer research, propelling UNC to national and international leadership
- UCRF research should focus on areas of great concern to the citizens of North Carolina
- UCRF research should have a real and tangible impact on the health of the state of North Carolina and beyond

Following from these guiding principles, a clear set of ground rules was established for determining how UCRF funds would be best spent. Specifically, it was agreed that 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.

At the same time, it was agreed that UCRF funds *should not*:

- Invest diffusely in an attempt to make incremental improvements everywhere
- Provide in perpetuity 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.
- Negatively impact other research on campus, for example by appropriating shared research infrastructure or resources

Strategy Overview

The UCRF strategic plan is comprised of three tiers: Research Priorities, Opportunity Fund and Critical Infrastructure Fund.

The term *Research Priorities* refers to a limited number of initiatives, where with focused investment in major scientific programs, disease-based initiatives, or cutting-edge research platforms, UNC could have a substantial impact and achieve recognition as a world leader.

The initial UCRF research priorities are:

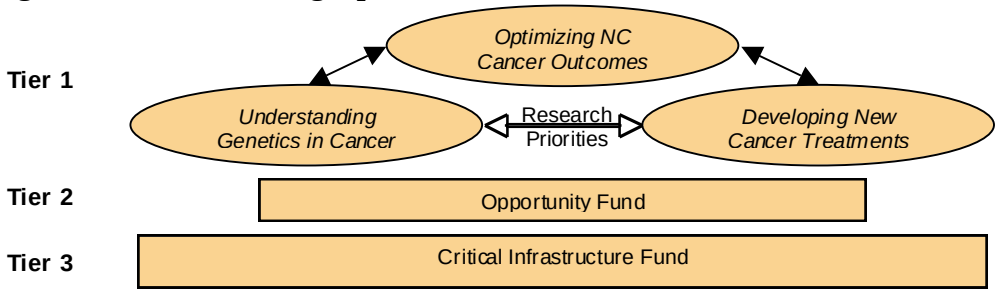
- Understanding Genetics and its Role in Cancer Causation and Treatment
- Developing New Cancer Treatments, and
- Optimizing NC Cancer Outcomes.

The first two will interrelate, making fundamental observations that will, as quickly as possible, be turned into clinical applications. The third will seek to understand North Carolina's cancer problem at a level unprecedented in the United States, and design research interventions to rectify these problems at the community, health system, and practice level.

The *Opportunity Fund* will ensure that the UCRF will remain nimble, allowing the opportunistic pursuit of programs, projects and capability development that cannot be foreseen in a strategic plan and would expand the capacity of the major initiatives.

Finally, the *Critical Infrastructure Fund* will enable these major initiatives by providing critical resources for cancer research that are not readily obtainable by extramural funding but upon which future progress relies. (See Figure A).

Figure A. UCRF strategic plan three-tier structure



Further detail on each of these strategic investment areas is provided below.

Research priorities

Supporting high-priority research is at the core of the UCRF strategic plan, as reflected in the guiding principles described above. In considering which areas to identify as initial research priorities, the PPC and UNC leadership assessed the relative merits of selecting specific cancer types or broader research themes. Understanding that basic and clinical discoveries often cut across multiple diseases, it was concluded that the UCRF would have the greatest impact if structured around addressing a set of critical research questions that could catalyze breakthroughs in all cancer types while extending the reach of UCRF investment beyond the fund itself (e.g. through resource acquisition and development available to all UNC). Nevertheless, disease-specific UCRF investment is seen as critical, and will occur within the initiatives, as well as via the Opportunity Fund and the clinical excellence infrastructure investment. Creating individual clinical/ translational research efforts led by visible clinician-scientists will be central to the national recognition to which UNC, with the help of UCRF, aspires.

A broad review of UNC strengths and key opportunities led to the selection of *Understanding Genetics and its Role in Cancer Causation and Treatment*, *Developing New Cancer Treatments*, and *Optimizing NC Cancer Outcomes* as the three initial research priorities. These three research themes span the basic, clinical, and public health research spectrum, but in a focused manner that will add critical knowledge – from improving our understanding of the underlying causes and progression of cancer, to developing novel therapies based on this new understanding, to optimizing the

dissemination and delivery of state-of-the-art care to the citizens of North Carolina. An overview of each thematic initiative is provided below.

Understanding Genetics and its Role in Cancer Causation and Treatment

Goal: To discover the genes that predispose families to cancer, and cancer patients to poor treatment outcomes. To investigate the mutant genes in specific cancer subtypes that lead to cancer therapy failure.

Why do certain cancers run in some families and not others? Why do patients respond to treatment differently? The answer to these questions lies in the genes we inherit from our parents. And cancer itself is caused by the mutation of these inherited genes. Although tremendous progress has been made in our understanding of genetics over the past two decades culminating in the sequencing of the entire human genome, these advances have not been sufficiently focused on the practical matter of human health and have yet to enter the clinical arena and tangibly improve the care of patients. Integrating basic research with clinical care will enable us to detect earlier and more curable forms of cancer and to develop more effective, highly targeted therapies. With significant expertise across the genetic spectrum enhanced by extraordinary support from UCRF, UNC is well positioned to realize the promise of the "Genetic Revolution".

The UCRF Cancer Genetics initiative will seek 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 will pursue these goals by integrating and expanding existing strengths at UNC in genetic and molecular analysis from basic science through clinical application, and enabling integrated, high-throughput analyses. This vision will be 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. This collaborative and multi-disciplinary strategy will incorporate disparate disciplines into a unified effort with the ultimate goal of improving our ability to prevent, detect, and treat cancer in North Carolina and beyond. This strategy will also provide fundamental knowledge upon which the next initiative will base its attempt to create new therapies.

Greater detail on the vision and plan for the UCRF cancer genetic/genomics effort will be provided in Appendix F.

Developing New Cancer Treatments

Goal: To devise novel therapies targeted to the specific vulnerabilities of treatment resistant cancers. To develop new ways of delivering therapeutic agents to reduce toxic side effects for all patients.

Of the 1.5 million people who will get cancer next year, fully 500,000 will die with untreatable forms of cancer. Some who receive curative treatment will have to live with debilitating side effects. Clearly, today's armamentarium is insufficient to deal with

many forms of advanced cancer. In addition, our therapies need to be based on biologic principles rendering them more effective and less toxic. Tremendous progress in our understanding of cancer has set the stage for new methods. However, it is true that many elegant basic cancer research observations never prove of value in the clinic. For example, although nearly 50,000 papers have been published on p53, a protein that is known to be involved in preventing cancer, our understanding of how to exploit this molecule for therapeutic endpoints remains virtually nil. For a novel discovery to benefit an actual human cancer patient, the new understanding must provide a "druggable" approach to therapy – the overriding challenge with regard to curing cancer.

The UCRF New Cancer Treatments initiative will seek to devise novel therapies targeted to the specific vulnerabilities of cancers, to prevent the emergence of resistant cancer cells and to eliminate the small proportion of cancer initiating cells which appear to prevent cancer cure by evading therapy and repopulating tumor sites. To reduce the toxicity of existing and novel therapies, research will also focus on new ways of delivering those drugs. In doing so, it will become 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. Through a framework of collaboration and significant financial support for new therapeutic ideas, this initiative will 1) find and convincingly validate new targets for cancer therapies, 2) develop small molecule compounds to modulate identified targets, and 3) provide better delivery and formulation of promising therapeutics.

As a result of these efforts, patients at our hospital will initially benefit from a larger portfolio of novel clinical trials involving agents that underwent some portion of pre-clinical development at UNC. In the longer term, we expect to see this initiative bring new start-up companies to the region that will employ North Carolinians, attract venture and federal funding, and eventually lead to discoveries with the potential to treat, ameliorate, and possibly even cure cancer.

Appendix G will detail the vision and plan for the UCRF New Cancer Treatments initiative.

Optimizing NC Cancer Outcomes

Goal: To use the state of North Carolina as a laboratory tracking the occurrence and treatment of cancer through data systems and large population- and hospital-based studies. To use these data to initiate research aimed at improving community prevention, early detection in the population, and the quality of oncology and survivor care.

There is a strong evidence base of prevention, early detection, and quality-of-care precepts that, if applied uniformly, would improve cancer outcomes and reduce the burden of cancer in North Carolina. But while advances in medical care and treatment have had a notable impact on improving cancer outcomes in some areas, there remain enormous challenges in closing the gap between what is known to work to reduce cancer burden and what actually takes place. In addition, the application of prevention and quality care are not uniform across our state or among its constituent populations.

As an additional opportunity for this UCRF initiative, the nation is about to undergo health care reform, and many are concerned about the potential "rationing" of critical cancer care services. Thus, the time is especially ripe to answer the questions: What works in cancer prevention and early detection? How do we make it cost effective? Do cancer risk factors and outcomes vary across our state? How do we ensure that lower socioeconomic populations receive the best preventive and cancer care services? And how do we get doctors and health departments to adopt evidence-based practices?

The UCRF Optimizing Cancer Outcomes initiative will seek to optimize cancer outcomes in North Carolina by conducting 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.

UCRF funds will make this work possible by 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. Since no such fully integrated and interactive system exists in the United States as envisioned here, North Carolina will be able to assume a true leadership position in this critical area.

Appendix H will provide greater detail.

Opportunity Fund

Goal: To promote innovation broadly by funding novel approaches and taking advantage of emerging technologies. To sponsor recruitments that bring new directions to the research initiatives and contribute to the overall UCRF mission.

The UCRF is committed to ongoing innovation and renewal. Recognizing that science is dynamic and that a research-focused strategic plan must be nimble, the UCRF will designate funds to support emerging opportunities outside the initial three identified research priorities. This Opportunity Fund will consist of three main components: a competitive peer-reviewed innovative pilot projects program; a competitive peer-reviewed technology and equipment acquisition program; and support for high-profile faculty with significant potential to enhance the UCRF's mission.

Innovative Pilot Projects

This competitive peer-reviewed effort continues the successful Innovation Award program ongoing during the UCRF's first two years. Projects funded by the Innovation Awards have and will continue to produce data that allow researchers to obtain external funding to expand their research. Opportunity Fund pilot projects will complement those funded by the three research priority initiatives, diversify the UCRF's portfolio of innovative cancer research, and build research funding and excellence at UNC. Moreover, the Opportunity Fund pilot projects will provide an antidote to the current extramural peer-reviewed funding systems, which has been criticized for its conservative investment in incremental, rather than innovative, research.

Innovative Technology and Equipment

Being at the technologic-forefront increasingly distinguishes leading research universities from the rest and provides a competitive advantage in research funding. Leading-edge techniques enable leading-edge research and discovery. The Opportunity Fund technology and equipment program will support the acquisition of novel, leading-edge technology and equipment for the use by multiple faculty members and the development of shared research resources. As with the Innovation Awards, this program will be competitive and rigorously peer-reviewed.

High-Impact Faculty Recruitment

UNC has the opportunity to attract faculty with significant potential for a positive effect on the UCRF mission – but who do not fit neatly into one of the three research priorities. This third portion of the Opportunity Fund will support the opportunistic recruitment of promising or established faculty. For example, the vast majority of our patients who die do so from metastatic cancer. The mutant genes driving metastasis will be the purview of the Cancer Genetics initiative and the drugging of targets promoting metastasis will be an outstanding aim for the New Cancer Treatments initiative. The Opportunity Fund will seed the recruitment of scientists in epithelial motility, metastasis genes, cell signaling systems biology, etc. and would enable the major research initiatives as well as the disease-specific programs. Opportunity Fund recruits over the next five years will include fundamental, translational, and population scientists. Prominent academic clinicians would be a high priority. They will propel UNC to national leadership in a particular clinical care specialty while helping to anchor a research program in that specialty.

Critical Infrastructure Fund

Goal: To expand the clinical care and research excellence of our faculty and provide all UNC researchers with the core resources necessary for clinical and translational cancer research. To initiate and maintain an outreach program beyond UNC for performing clinical care and quality of care research. To develop core resources in imaging, informatics, and fundamental research that will serve all faculty members. To plan and implement the UCRF research effort including its cancer research educational mission.

Innovative cancer research builds upon and is promoted by a strong, underlying infrastructure. External funding (NIH, etc) to enhance this infrastructure is lacking, despite acknowledgement that a healthy and proactively advanced research infrastructure

is critical to innovative research and necessary to compete successfully for external research funding. To complement the three research priority initiatives and the Opportunity Fund, the UCRF will establish a Critical Infrastructure Fund. Initially, this Fund will focus on four critical underlying research infrastructure components: clinical excellence and outreach, informatics, imaging, and key existing shared research resources and services. Investing in this critical infrastructure will enable and enhance not only UNC's cancer research; it will also strengthen the infrastructure and effectiveness of the campus's entire research enterprise.

Clinical Excellence and Outreach

Maintaining a strong foundation of quality cancer care and outreach at UNC Chapel Hill is critical for enabling leading-edge clinical research and its successful translation into community practice. The new NC Cancer Hospital provides an ideal setting for pioneering clinical research. The Critical Infrastructure Fund will help UNC recruit oncologists to expand the patient base for enhanced clinical and translational research. In addition, the NC Cancer Hospital, combined with UCRF Infrastructure support, will provide the videoconferencing/telemedicine hub that links UNC with cancer centers and oncologists across the state. These links and other services will increase physician collaboration, both promoting research and patient care quality, while increasing statewide access to UNC clinical trials.

Informatics

Modern research methods, such as high-throughput sequencing and other genomics approaches, generate vast pools of data. Informatics is the alchemy transforms that base information into knowledge. Informatics takes raw output from across the research spectrum and creates well-characterized, well-managed data from across the spectrum of research that can be powerfully linked together and then mined and analyzed. Although fundamental to innovative science and the UCRF's research priorities, informatics, particularly bio-and clinical informatics, is in short supply at UNC and at most research institutions. The Critical Infrastructure Fund will support development of informatics at UNC by recruiting faculty scientists who can push the envelope of this emerging field.

Imaging

In the years ahead, imaging will drive many vital advances in cancer research, diagnosis and treatment. By providing researchers and clinicians with the ability to literally see in real-time the cancer tumor inside the patient (or animal, in the case of research), powerful new imaging technologies offer significant promise of diagnosing cancer earlier than previously possible and of more closely monitoring response to treatment (whether experimental, or in the clinic). UNC is extremely well-positioned to lead in developing and applying these new imaging capabilities via its Biomedical Research Imaging Center and the under-construction Imaging Research Building. Supported by a forward-looking investment from the State of NC, the Imaging Research Building will be the largest research facility on campus. The UCRF will leverage this investment by the state and others by supporting purchase of key equipment and the recruitment of leading faculty and staff. The Imaging Research building will also have designated space for expanding the Developing New Cancer Therapies/Initiative both for drug development and nanomedicine as well as additional wet lab cancer research space.

Other Resources and Services

UCRF Critical Infrastructure funds will also help develop and expand other key research core facilities (such as tissue procurement and proteomics), clinical trials infrastructure, trainee support for the next generation of researchers, and research administration (including clinical trial contracting, clinical research administration, and other research administration). These resources will directly benefit the three research priorities, but will also have a broader impact -- benefiting all UNC researchers as well as partners outside of the university.

***

Taken together, the three-tiered UCRF investment strategy ensures that UNC maintains a strong focus on a few key areas where it can leverage existing strengths, achieve breakthrough results in cancer research, *and* make a tangible impact on cancer outcomes in North Carolina and beyond.

Investment Plan

In the first two years of the UCRF, while a long-term strategic and investment plan was being developed, funds were directed towards building or expanding clinical excellence to prepare for the opening of the North Carolina Cancer Hospital; critical research infrastructure; basic, population and clinical science faculty; the technological base for topnotch genetic and animal models cancer research; and a state-wide outreach program for both clinical and public health research. Key faculty recruitments and retention in areas of UNC strength were accomplished in the first two years. Many of these initial investments were prescient, laying important groundwork for what have now been identified as UCRF strategic priorities. The investment plan presented in this document begins in year 3 of the UCRF, with a fully-funded budget of $50 million per year, but builds on the critical investments of the first two years.

For the next five years the Strategic Plan would, on average, allocate $8 million yearly to the three initiatives (Cancer Genetics, New Cancer Treatments and Optimizing Cancer Outcomes). These initiatives will benefit, as will all UNC cancer research, from the $16-17 million yearly Critical Infrastructure investments in clinical excellence faculty recruitment, clinical and translational research core resources, and imaging and informatics. A $9-10 million Opportunity Fund will drive innovation, technology development and translational research opportunities that initially fall outside the research themes. The interrelatedness of cancer biology and discovery, and their translation from model systems to human applicability make it highly likely that research initiatives will also benefit from these recruitments and investments in innovation.

To accomplish the aims of UCRF in each of its three-tiered components, faculty must seek extramural funding to expand the overall capacity of UNC cancer research. The objective is for the UCRF investment to produce funding replacing existing expenditures, thereby freeing up UCRF funds for re-investments. Cancer research is a dynamic process and UCRF investments, if used correctly, will be catalytic in not only expanding the size of UNC's overall cancer research effort but also its accomplishments and reputation.

Appendix E will provide the UCRF five-year investment plan.

Organization and Implementation

The Cancer Research Committee—Erskine Bowles, Chair

The legislation creating the UCRF specified that allocations be made at the discretion of a Cancer Research Committee that would consist of five ex officio members and two appointed members. The five ex officio members are the President of The University of North Carolina, the Director of the Lineberger Comprehensive Cancer Center, and the Deans of the School of Medicine, School of Pharmacy, and School of Public Health. The remaining two members shall be selected from persons holding a leadership position in a nationally prominent cancer program. This group elected Ed Benz, President of Dana

Farber Cancer Institute, and John Mendelsohn, President of MD Anderson. The Cancer Research Committee meets at least quarterly. The committee has been operating for two years and during its quarterly meetings has made decisions initiating many aspects of the research initiatives and critical infrastructure. They have received interim reports from the strategic planning process and will ultimately be responsible for approving and implementing the plan.

The Oversight Committee—William Roper, Chair

An Oversight Committee chaired by Dr. Roper, Dean of the UNC School of Medicine, CEO of the UNC Health Care System, and Vice Chancellor for Medical Affairs, provides ongoing monitoring of the UCRF. This committee includes leaders from throughout the Health Affairs Schools and the College of Arts and Sciences and is scheduled to meet quarterly to: monitor progress; provide advice on within year budget alterations; approve the award of innovation, program development, and research initiative pilot and project funding. They will also assess that expenditures and recruitments are congruent with the precepts of UCRF and the Cancer Research Committee.

UNC Lineberger Senior Leadership and Research Initiative Committees

The day-to-day management, planning, and coordination for the UCRF will be the responsibility of the LCCC senior leadership in frequent consultation with the Office of the Dean of the School of Medicine. The long-standing senior leadership team consisting of the director and associate directors for clinical research, basic science, population science, and outreach will be expanded to include the leaders of the three UCRF research initiatives. These will be considered to be at the associate director level. Each of the initiatives will be led by a committee that will consist of a rotating membership comprised of faculty members and senior scientists with specific expertise. Broad faculty input will come to the Cancer Center senior leadership through the program planning committee and the initiative leadership committees.

Other members of the senior leadership team will assume responsibility for the Opportunity Fund and Critical Infrastructure components of the UCRF. The full senior leadership will meet on a weekly basis to discuss activities and make decisions that affect the entire LCCC. Thus, UCRF leaders will be made aware of, and will participate in decision-making regarding, issues that extend beyond the UCRF. At the same time, a subcommittee of the senior leadership comprised of UCRF leaders may choose to meet to address UCRF-specific issues as they arise.

Each initiative committee will also be advised by a set of leaders in their relevant fields from top cancer centers across the United States. These advisors will meet with the committees at least yearly to review plans and observe the progress of each thematic area. These advisors will also be invited to join the LCCC Board of Scientific Advisors.

The LCCC senior leadership, in consultation with the School of Medicine Dean's Office, will develop and revise plans and propose detailed budgets for upcoming fiscal years. Those plans and budgets will be presented to the UCRF Oversight Committee, chaired by

Dean William Roper, and if approved by that committee, presented to the Cancer Research Fund Committee, chaired by UNC President Erskine Bowles.

Ensuring Success

Defining success and measuring progress

While it will be years before the full effect of North Carolina's visionary investment in cancer research will be fully evident, it will be possible, and indeed, essential, to track progress and to adjust the strategy as needed. Specifically, it will be important to assess in an ongoing way whether UCRF funds are being spent most wisely and are being clearly directed towards improving the health of North Carolinians.

Is the UCRF being invested to generate the greatest possible return?

While it is impossible to predict where research will lead and what finding will emerge, it is possible to evaluate whether funds are being invested in such a way as to maximize their return. That is the purpose of this strategic plan – to focus UCRF funds on their best use -- however, the plan may need to be modified over time.

As described above, the LCCC Board of Scientific Advisors will be asked to evaluate the scientific progress associated with UCRF investment. As part of this evaluation, they will be asked explicitly to assess whether the funds are being used most effectively.

In addition to this qualitative review, there are other, more quantitative ways of measuring whether UCRF funds are being most effectively spent. One key metric is the growth in extramural funding, and in particular, in federal research funding. If UCRF funds are spent wisely, UNC researchers will be able to compete more successfully for additional research support. An increase in federal grants will serve as an important validation of the quality and value of UCRF investments. It will also satisfy a critical goal for the UCRF articulated during the planning process – to be catalytic, self-sustaining, and provide leverage for additional funding from extramural sources.

Estimating precise increases in extramural funding levels is difficult, as the federal research budget in the last decade has been extremely variable, doubling over the first five years and remaining flat over the most recent five years. However, with substantial resources from UCRF, a good strategic plan, and continued recruitment of outstanding faculty, UNC should significantly increase its funding relative to other major public and private universities. UNC currently ranks in the top 15 nationally in funding from the National Cancer Institute with $44 million (total annual costs). Over the next seven years, we should aspire to move into the top five among cancer centers, as assessed by a combination of funding, high-impact publications, and peer assessment. Space for new recruitment is a major constraint and the BRIC building will come open in four years, thus the use of the seven year timeframe. The combination of UCRF and new space would be needed to achieve this aspiration. With respect to overall funding from federal, foundation, and private sources, which now totals ~$700 million to UNC at Chapel Hill,

it's reasonable to assume that the $50 million UCRF should at least generate a 4:1 stimulation, thus adding $200 million to the university's overall funding.

Will the UCRF directly impact the health of NC citizens?

It will take a long time before efforts can be measured as improvement in health at the state level or beyond, but important interim steps can, should, and will be tracked. In some cases, there will be clear and tangible benefits in the short term.

For example, the Optimizing NC Outcomes initiative includes activities designed to test the impact of interventions in defined communities across North Carolina, with a focus on counties that disproportionately contribute to the cancer burden in the state. If successful, these communities will see a direct benefit, and the findings will be disseminated more broadly across NC. Investments designed to bolster the level of cancer clinical care at UNC will have an immediate impact on the care of cancer patients, while providing the necessary conditions for cutting edge clinical research. The number of patients engaged in clinical trials, and thus able to benefit from important new therapies, will thus be an important metric to be tracked. Finally, the development of novel therapeutics can take years, but ultimately are expected to have widespread impact. Interim steps, as described in the New Cancer Treatments plan in Appendix G, include the development of promising drug candidates for pre-clinical and clinical testing.

An outside, independent evaluation will be conducted based on this strategic plan. A process to identify the organization that will conduct the evaluation is underway.

Contingencies that could hinder progress

Space constraints

One major potential threat to achieving UCRF goals is the current lack of adequate research space to carry out the strategic plan. This space constraint will be alleviated to some extent when two new buildings, the Imaging Research Building and the Genome Sciences Building, come on line in four years. However, the recruitment of both junior and particularly senior faculty requires more space than is currently available. This will either delay some of the major components of the plan, or interim solutions must be found. There is the potential to rent some space offsite for core facility development and expansion. In order to recruit the high-quality faculty necessary to achieve the objectives of the plan, they will need to be offered laboratory space on the Chapel Hill campus. One potential is to use some UCRF funds for renovation of campus space, for example, in the Mary Ellen Jones building, or for short-term utilization of other space being constructed on the campus, for example, the new Dental Research building. If for any reason sufficient space is not made available, this will curtail UNC's ability to recruit new faculty and to carry out the specific activities described in this strategic plan.

Ongoing evaluation and refinement of the strategic plan

While the strategic plan lays out a roadmap and expected budgetary priorities for future years, it is expected that specific opportunities and needs will require modifying these plans over time. As described above, the LCCC Executive Committee, advised by the LCCC Board of Scientific Advisors, will regularly review progress and will adjust the

plans accordingly. As well, in the fourth year of the five-year strategic plan period, UCRF leadership will undertake a thoroughgoing review of UCRF performance to date, as well as an assessment of emerging opportunities in cancer research, as part of developing a new five-year strategic plan.

Appendices

A. UCRF Committee Membership

Cancer Research Fund Committee

Erskine Bowles, Chairman
President, the University of North Carolina

Edward J. Benz, MD
President and CEO, Dana Farber Cancer Institute

Robert Blouin, PharmD
Dean, UNC School of Pharmacy

H. Shelton Earp, MD
Director, UNC Lineberger Comprehensive Cancer Center

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

Barbara K. Rimer, DrPH
Dean, UNC Gillings School of Global Public Health

William L. Roper, MD, MPH
Dean, UNC School of Medicine

UCRF Oversight Committee

William L. Roper, MD, MPH, Chairman
Dean, UNC School of Medicine

Robert Blouin, PharmD
Dean, UNC School of Pharmacy

H. Shelton Earp, MD
Director, UNC Lineberger Comprehensive Cancer Center

Etta D. Pisano, MD
Vice Dean, Academic Affairs, UNC School of Medicine

Barbara K. Rimer, DrPH
Dean, UNC Gillings School of Global Public Health

Holden Thorp, PhD
Chancellor, the University of North Carolina

Marschall Runge, MD, PhD
Chair, Department of Medicine, UNC School of Medicine

Kevin FitzGerald, MPA
Executive Associate Dean for Finance and Administration, UNC School of Medicine

Joseph DeSimone, PhD
Chancellor's Eminent Professor of Chemistry, UNC

Tony Waldrop, PhD
Vice Chancellor for Research and Economic Development, UNC Chapel Hill

LCCC Program Planning Committee

Albert S. Baldwin, Jr., PhD
Professor, Cancer Cell Biology
LCCC Associate Director, Basic Research

Andrew F. Olshan, PhD
Professor, Cancer Epidemiology

Charles M. Perou, PhD
Associate Professor, Department of Genetics

Joseph DeSimone, PhD
Chancellor's Eminent Professor of Chemistry

Gary L. Johnson, PhD
Professor and Chair, Department of Pharmacology

Howard McLeod, PharmD
Fred Eshelman Distinguished Professor of Pharmacogenetics and Individualized Therapy
UNC Eshelman School of Pharmacy

Joel E. Tepper, MD
Professor and Chair, Department of Radiation Oncology

Jonathan S. Serody, MD
Thomas Associate Professor of Medicine and Immunology

Lisa A. Carey, MD
Associate Professor of Medicine
Medical Director of UNC Breast Center

Marci Campbell, PhD, MPH, RD
Professor, Cancer Prevention and Control

William F. Marzluff, PhD
William Rand Kenan Professor, Department of Biology

Cathy Melvin, PhD
Associate Professor, Cancer Prevention and Control

Norman E. Sharpless, MD
Associate Professor of Medicine and Genetics

Nancy Raab-Traub, PhD
Professor, Virology

Jenny Ting, PhD
Alumni Distinguished Professor, Immunology

Richard M. Goldberg, MD
Distinguished Professor, Clinical Research

Thomas C. Shea, MD
Professor of Medicine
Associate Division Chief, Division of Hematology/Oncology

Terry Magnuson, PhD
Sarah Graham Kenan Professor
Chair, Department of Genetics

David G. Kaufman, MD, PhD
Professor and Vice Chair for Research Development, Department of Pathology

Yue Xiong, PhD
William R. Kenan, Jr. Professor, Department of Biochemistry and Biophysics

B. Potential UCRF Research Priorities Considered by Planning Committee

Potential thematic areas for investment

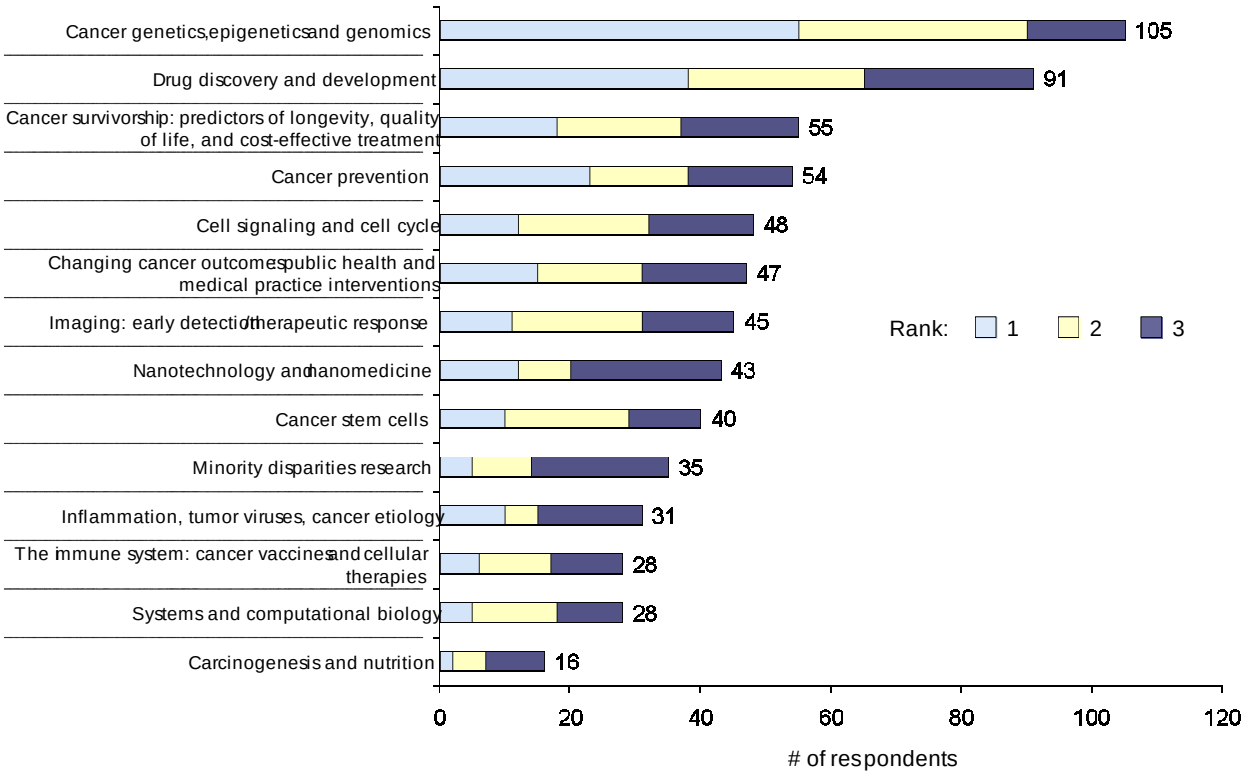
- Cancer Genetics, Epigenetics and Genomics: Basic and Applied
- Cancer Stem Cells
- Minority Disparities Research: From Biology to Health Services
- Drug Discovery and Development: New Targets, Their Structure and Novel Therapeutics
- Imaging: Early Detection and Therapeutic Response
- Inflammation, Tumor Viruses, and Cancer Etiology
- Changing Cancer Outcomes: Public Health and Medical Practice Interventions
- Cell Signaling and Cell Cycle: Pathways and Intracellular Visualization
- The Immune System: Cancer Vaccines and Cellular Therapies for Human Cancer
- Systems and Computational Biology
- Nanotechnology and Nanomedicine
- Cancer Prevention: Primary Prevention, Screening, and Early Detection Research
- Carcinogenesis and Nutrition

Potential technology/capability platforms for investment

- NC-wide collection of tissue with clinical annotation
- Upgrade and operation of genetics and genomics platforms
- Creation and assessment of animal models for drug development
- Imaging, instrumentation and analysis: from mouse to man
- Biomarkers/translational core facilities for tissue
- Improved state tumor registry and cancer surveillance
- Development and support of bioinformatics resources
- Clinical informatics: clinical database development
- Oncologist network across the state for clinical trials
- Oncology training programs
- Technology transfer and commercialization
- Microscopy: intracellular imaging and methods development

C. Faculty Survey: Top Priorities for UCRF Investment

Q. The following were suggested as potential thematic areas for major investment. Please indicate your top 3 choices. Use 1 for your top choice, 2 for your second choice, 3 for your third choice.



Source: UCRF Faculty Survey

D. UCRF Strategic Planning External Advisors

Understanding Genetics and its Role in Cancer Causation and Treatment

Peter Byers, MD
Professor, Pathology & Medicine (Medical Genetics)
University of Washington

Stacey Gabriel, PhD
Director, Genetic Analysis Platform
Broad Institute of MIT & Harvard

Allan Balmain, PhD, FRSE
Barbara Bass Bakar Distinguished Professor of Cancer Genetics
University of California, San Francisco

Developing New Cancer Treatments

R. Kiplin Guy, PhD
Chair, Chemical Biology & Therapeutics
St. Jude Children's Research Hospital

Tyler Jacks, PhD
David H. Koch Professor of Biology
Director, David H. Koch Institute for Integrative Cancer Research
Massachusetts Institute of Technology

Steven L. McKnight, PhD
Distinguished Chair in Basic Biomedical Research
Sam G. Winstead and F. Andrew Bell Distinguished Chair in Biochemistry
University of Texas Southwestern Medical Center

Karen L. Wooley, PhD
James. S. McDonnell Distinguished University Professor
Professor, School of Arts & Sciences, Department of Chemistry
Professor, School of Medicine, Department of Radiology
Washington University in St. Louis

Optimizing NC Cancer Outcomes

Graham Colditz, MD, DrPH, FAFPHM
Niess-Gain Professor of Surgery & Professor of Medicine
Department of Surgery
Associate Director Prevention and Control
Alvin J. Siteman Cancer Center
Deputy Director, Institute for Public Health
Washington University School of Medicine

Karen Emmons, PhD
Deputy Director, Center for Community Based Research
Professor, Dept of Society, Human Development & Health
Associate Dean of Research
Harvard School of Public Health

Jane Weeks, MD, MSc
Division Chief, Population Sciences
Director, Center for Outcomes and Policy Research
Professor of Medicine, Harvard Medical School

E. UCRF Investment Plan/Financial Model

University Cancer Research Fund (UCRF) - by tier and theme
All numbers $000

	2009 (Year 3)	2010	2011	2012	2013	5-year total
Resource needs						
Genetics	**$7,650**	**$10,400**	**$12,685**	**$13,240**	**$12,720**	**$56,695**
Faculty recruitment and startup	$1,400	$3,300	$4,775	$4,725	$3,975	
Research platforms / large initiatives	$4,000	$4,060	$4,440	$4,770	$5,000	
(sequencing/genotyping, survivorship cohort, bioinformatics, clinical genetics)						
Core resources	$750	$1,060	$1,165	$1,165	$1,165	
(RAM lab, collaborative cross, biostatistics)						
Innovation / project funding	$500	$1,400	$1,600	$1,800	$1,800	
(keystone projects, seed funding)						
Space, renovation, project management	$1,000	$580	$705	$780	$780	
Developing New Treatments	**$7,225**	**$10,255**	**$11,155**	**$11,855**	**$12,055**	**$52,545**
Faculty recruitment and startup	$1,150	$3,700	$4,500	$5,100	$5,300	
Research platforms / large initiatives	$2,500	$2,500	$2,500	$2,500	$2,500	
(small molecules core, mouse phase I unit, nanofabrication, tech/business devt)						
Core resources	$2,025	$2,300	$2,250	$2,150	$2,150	
(CHANL, clinical pharmacology / GLP, protein expression, animal models / imaging)						
Innovation / project funding	$1,000	$1,300	$1,400	$1,600	$1,600	
(preclinical testing, pilot projects)						
Space, renovation, project management	$550	$455	$505	$505	$505	
Optimizing NC Outcomes	**$6,375**	**$9,280**	**$10,180**	**$10,755**	**$11,155**	**$47,745**
Faculty recruitment and startup	$925	$1,900	$2,350	$2,800	$3,050	
Research platforms / large initiatives	$2,250	$3,400	$3,800	$3,900	$4,050	
(Carolina Breast Study 3, UNC survivorship, ICISS)						
Core resources	$2,000	$2,000	$2,000	$2,000	$2,000	
(community engagement, dissemination, rapid case, NC tumor registry, health communication, population biostats)						
Innovation / project funding	$500	$1,250	$1,500	$1,500	$1,500	
(NC survivorship, prevention / cancer control intervention, comparative effectiveness)						
Space, renovation, project management	$700	$730	$530	$555	$555	
Infrastructure	**$16,705**	**$17,205**	**$17,205**	**$17,205**	**$17,205**	**$85,525**
Clinical Excellence & Oncologist Recruitment	$4,630	$4,630	$4,630	$4,630	$4,630	
Clinical Research Program Development and Strategic Needs	$2,050	$2,050	$2,050	$2,050	$2,050	
Telemedicine & Outreach	$1,000	$1,500	$1,500	$1,500	$1,500	
(statewide patient navigation and survivorship, telemedicine tumor boards)						
Clinical/Translational Core Resources	$6,050	$6,050	$6,050	$6,050	$6,050	
(clinical trials network, informatics, BRIC)						
Basic Science Core Resources	$725	$725	$725	$725	$725	
Graduate Education & Training	$1,000	$1,000	$1,000	$1,000	$1,000	
Evaluation, Planning, & Research Support	$1,250	$1,250	$1,250	$1,250	$1,250	
Opportunity Fund	**$9,850**	**$10,350**	**$10,350**	**$10,350**	**$10,350**	**$51,250**
Ongoing recruitment	$2,100	$2,100	$2,100	$2,100	$2,100	
Opportunistic recruitment	$1,000	$3,000	$3,000	$3,000	$3,000	
Innovation Awards, Equipment / Technology Development, and Core Pilot Projects	$5,250	$5,250	$5,250	$5,250	$5,250	
Unassigned	$1,500	-	-	-		
Unallocated	**$2,195**	**$0**	**$0**	**$0**	**$0**	
Revenue						
Target revenue	**$0**	**$6,000**	**$10,100**	**$11,900**	**$12,000**	**$40,000**
Genetics	$0	$2,400	$4,700	$5,200	$4,700	
Treatments	$0	$2,300	$3,200	$3,900	$4,100	
Outcomes	$0	$1,300	$2,200	$2,800	$3,200	
Resource needs	**$50,000**	**$57,490**	**$61,575**	**$63,405**	**$63,485**	**$295,955**
Target revenues	**$0**	**$6,000**	**$10,100**	**$11,900**	**$12,000**	**$40,000**

6. Economic Impact Analysis

The Economic Impact of

University Cancer Research Fund

Current economic, employment, government revenue, and generated research funds which assist with the recruiting and retaining of local research talent due to the UCRF at University of North Carolina Lineberger Comprehensive Cancer Center

October 2013

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Contents

Executive Summary

In 2007, the state leaders of North Carolina developed a fund to invest in cancer research in the state. Cancer is one of the leading causes of death in North Carolina, and the fund was developed to demonstrate a commitment to the health of the state residents. Currently, one in three North Carolinians will develop cancer during his/her lifetime. One-third of the state's patients will not live five years after a cancer diagnosis. 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. To accomplish this goal, the state has extensive discoveries statewide through expanded outreach to clinics, health systems, and underserved populations.

The initial investment in 2007 to the University Cancer Research Fund (UCRF) of $25 million grew to $50 million by 2009 and the fund has maintained that level of state funding annually since that time. This investment has translated into innovative research to detect, treat, and prevent cancer. This was an opportunity for UNC to become home to one of the nation's leading public comprehensive cancer center. This gives the state an even greater ability to continue its tradition of care for all North Carolinians. It is an investment in making the best care in the world available in North Carolina, and it is hard to think of a better investment than that.

People and place are the keys to the Fund's success. The Fund is about investing in people – promising researchers with the best ideas for cancer research, master clinicians who know how to bring those findings to patients, and others. UNC Chapel Hill and its UNC Lineberger Comprehensive Cancer Center have a culture of collaboration – both across the University and with partners beyond the University's walls – that is essential to promote discovery and then turn those discoveries into new ways to treat, find, and prevent cancer. Outside of the obvious impacts this National Cancer Institute Comprehensive Cancer Center provides to North Carolina, there are additional impacts that the UCRF provides to the state the dollars that directly and indirectly impact the state economy and job numbers.

The aim of this report is to illustrate in detail the positive economic impact that UCRF dollars have on North Carolina's biomedical sector in 2013; it is important to note that these impacts have been **annual** since the fund's inception. Through expanding the state economy, creating jobs, generating tax revenue, encouraging scientific collaboration, and leveraging federal research funds, these dollars have provided a significant benefit to the State of North Carolina.

Key Findings

- **Expanding the state economy.** UCRF generated nearly $264.8 million in total economic impact in North Carolina in 2013. This includes direct spending of more than $155.8 million within the state much of which is a result of the generation of greater than $105.8 million from national grants due to research activities. The ripple effect of in-state spending accounts for nearly $109.0 million additional dollars; representing downstream spending by employees, vendors, and contractors. This is just the impact of the current year (2013). Tripp Umbach estimates that through the commercialization of the discoveries made from this research, the impact by 2023 will be dramatically larger.

- **Creating jobs.** UCRF directly supported employment in 2013 of more than 993 jobs in North Carolina and an additional 926 jobs through both the indirect and induced impacts of those direct jobs and the spending generated from the UCRF within North Carolina. This means the total impact of this fund is more than 1,900 jobs.

- **Generating tax revenue.** Tripp Umbach estimates that UCRF provided nearly $7.6 million in local and state tax revenue in 2013.

- **Encouraging scientific collaboration and leveraging federal research funds.** These funds have encouraged recipient institutions to collaborate, as well as to apply for and win, highly competitive federal grants. Recipients of these state research funds have leveraged federal research funds which have amounted to nearly $106 million in research grants in 2013 alone. This would not have been possible without the UCRF funding, which lead to a North Carolina NCI Comprehensive Cancer Center.

Impacts of UCRF in 2013

Any discussion of the economic impact of these state funds must be predicated on an understanding that research investments, by their nature, 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 and 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 healthcare cost-savings to the state as a result of innovation (see Figure 1):

Figure 1: Research Return on Investment Timeline

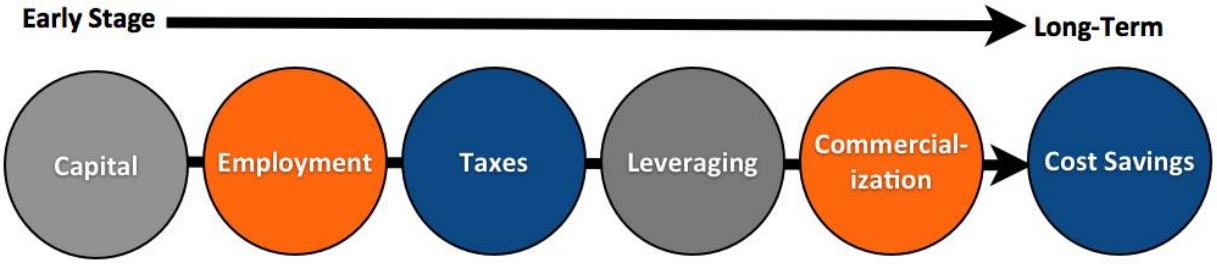
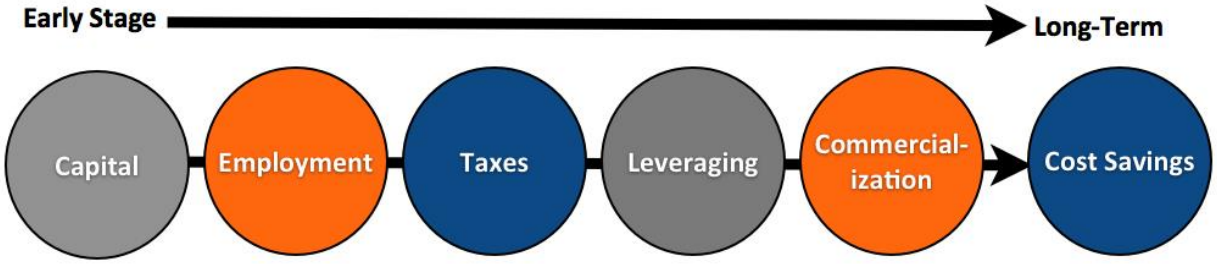


Figure 1: Research Return on Investment Timeline



Early Stage Economic Impact of Funding

UCRF dollars invested in research in 2013 have resulted in an expansion of the state's economy by nearly $264.8 million. Tripp Umbach's economic impact analysis indicates that even in the early stage (2007-2011), program investments in capital and human resources have returned greater than three dollars to the state's economy for every one dollar invested. In 2013, this

amount has risen to more than five dollars for every dollar invested. 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 tobacco funds result from these 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 end result is a multiplied economic impact that is a linear result of the state's investment in research.

Early Stage Impact of UCRF Dollars on Employment

Tripp Umbach estimates that in 2013, UCRF dollars for healthcare research have created and sustained 1,922 high-paying research-related jobs throughout the state of North Carolina. The economic expansion created by the funds allocated to the UCRF have, in turn, brought about demand for additional employment in the state's economy.

Early and Later Stage State Tax Impacts

Tripp Umbach estimates that funds provided in 2013 have resulted in nearly $7.6 million in tax revenues to the North Carolina. In-state spending by the recipient organizations and spending in the state by out-of-state parties have 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.

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[1].

These funds from the states UCRF have encouraged researchers at the recipient organization to collaborate to apply for and win highly competitive federal grants. These funds have enabled

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

recipients of UCRF dollars to leverage at least $105.8 million in federal health research funding in 2013 alone.

Healthcare Cost-Savings

While this study does not include detailed economic impact models that calculate the potential cost-savings attributable to research activities, a growing body of literature provides some potential insights. Breakthrough research by Silverstein et al. (1995) documented $69 billion in annual economic savings resulted from NIH-supported research. The return on investment calculated by Silverstein was $7 in healthcare cost-savings for every dollar invested in NIH-sponsored research[2].

Selected Research Impacts

Recipients of UCRF are currently using these funds to conduct projects such as:

For patients and families

- UNC Lineberger physicians have been offering multi-disciplinary, patient-centered care for more than a quarter-century, giving patients the benefit of many medical and patient support specialists in one place, often in one visit. UNC's system has been used as a model by other cancer centers and oncology programs across the nation.
- UNC is applying the latest technology to cancer diagnosis and treatment, offering Intensity Modulated Radiation therapy (IMRT), Intraoperative Radiation Therapy (IORT), advanced virtual and 3D imaging for breast biopsies, PET scanner, and laparoscopic and robotic surgeries for select surgeries.
- The North Carolina Cancer Hospital provides the latest technology to diagnose and treat cancer, including genetic counseling and testing for some cancers.
- The UNC Lineberger Comprehensive Cancer Support Program provides compassionate and effective support programs for all North Carolina cancer patients and their families. The program's mission includes providing outstanding clinical and educational programs

[2] Cost-Savings Resulting from NIH Research Support, NIH Publication No. 93. Silverstein, H.H. Garrison and S.J. Heinig, 1995.

for cancer patients and their caretakers, and a world-class training and research site for healthcare professionals who work with cancer patients.

- The Center's community directed programs for cancer prevention, early detection, and cancer survivorship extend throughout North Carolina to reduce cancer incidence and mortality. UNC Lineberger programs in cancer epidemiology and cancer prevention and control, examine patterns of cancer in the community to understand the complex interaction among genetics, biology, environmental exposures and behaviors that cause cancer. Center faculty work in North Carolina communities to promote cancer screening services and encourage healthy lifestyles that can reduce cancer risk.

For prevention

- The Carolina Community Network, funded by the National Cancer Institute, aims to reduce breast, prostate, and colorectal cancers in adult African-Americans. The network will include cancer treatment centers, research components of UNC, community groups, and health promotion-oriented institutions and organizations.

- Prostate Cancer Project scientists in North Carolina and Louisiana seek to understand why some men get more severe prostate cancer than others. This project is supported by prostate cancer survivors, community advocates, state cancer registries, and the U.S. Department of Defense Prostate Cancer Research Program.

For the future

- UNC Lineberger is home to internationally recognized research programs in Cancer Cell Biology, Immunology, Molecular Carcinogenesis, Cancer Genetics, Molecular Therapeutics, and Virology that investigate the molecular and genetic basis of cancer and progression.

- UNC Lineberger researchers are conducting molecular analysis of cancers to identify patients who can benefit significantly from treatment. Researchers are also identifying molecular targets for new therapies and are developing the methods necessary for genetic therapy.

Appendix A: Definition of Terms

Study Year

Fiscal Year 2013

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 as a result 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 recirculated 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 healthcare 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.

Tripp Umbach recently completed its fifth national study of all U.S. medical schools and teaching hospital affiliates for the Association of American Medical Colleges.

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, 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 2011. 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.

7. List of Active Extramural Awards

List of Active Extramural Awards

UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Theme Invest (HTS)	Aikat, Jayashree	National Science Foundation	OCI-1245783	12/1/2012	11/30/2014	CC-NIE Network Infrastructure: Enabling Data-Driven Research	499,529
Innovation Award	Allbritton, Nancy	National Cancer Institute	5-R01-CA139599-05	3/1/2009	1/31/2014	Multiplexed Measurement of Kinase Activity in Single Cancer Cells	505,646
Retention	Allbritton, Nancy	National Inst. of Health	3-R01-HG004843-03S1	2/23/2009	1/31/2014	Rapid Genetic Engineering of Stem Cells - Supplement	410,702
Retention	Allbritton, Nancy	National Inst. of Health	5-R01-HG004843-03	2/23/2009	1/31/2014	Rapid Genetic Engineering of Stem Cells	495,505
Innovation Award	Allbritton, Nancy	National Inst. of Health	5-R01-EB011763-04	4/1/2010	1/31/2014	Protectides: A Tool for Drug Target Assays in Myeloma	565,311
Retention	Allbritton, Nancy	National Inst. of Health	5-R01-EB012549-03	2/1/2011	1/31/2014	Arrays for Cloning Growth Suppressed Cells	451,651
Theme Invest (MP1U)	Anders, Carey	National Cancer Institute	5-K23-CA157728-03	9/1/2011	8/31/2016	PARP Inhibition to Treat Triple-Negative Breast Cancer Brain Metastases	173,089
Recruitment	Armistead, Paul	National Inst. of Health	5-K08-HL113594-02	5/1/2012	2/28/2015	Leukemia Stem cell Antigen Discovery Using Advanced Genomic and Proteomic Methods	132,088
Retention	Ataga, Ken	National Inst. of Health	1R01HL111659-02	1/1/2012	2/31/2016	Endothelial Dysfunction in the Pathogenesis of Sickle Cell Nephropathy	438,932
Retention	Ataga, Ken	National Inst. of Health	1U01HL117659-01	8/15/2013	8/31/2018	Targeted Anti-Coagulaent Therapy for Sickle Cell Disease	1,693,341
Theme Investment (CC)	Aylor, David	National Inst. of Health	1-K99-ES021535-02	6/1/2012	5/31/2014	Epigenetics, Environmental Exposure, and Reproduction in the Collaborative Cross	87,921
Retention	Bae-Jump, Victoria	DoD / Ovarian Cancer Research Program	W81XWH-12-1-0426	9/25/2012	9/24/2014	Preclinical and Clinical Investigation of the Impact of Obesity on Ovarian Cancer Pathogenesis	147,667
Retention	Bae-Jump, Victoria	DoD / Ovarian Cancer Research Program	W81XWH-13-1-0164	6/1/2013	5/31/2015	Obesity Across the Lifespan on Ovarian Cancer Pathogenesis	189,996
Innovation Award	Bae-Jump, Victoria	National Cancer Institute	5-K23-CA143154-04	9/1/2010	8/31/2015	Metformin as a Novel Chemotherapeutic Strategy for the Treatment of Endometrial Cancer	170,873
Innovation Award	Bae-Jump, Victoria	National Cancer Institute	1-R03CA176796-01	3/1/2013	2/28/2015	Transporters in Metformin Treatment of Endometrial Hyperplasia	76,000
Theme Investment (CC)	Baric, Ralph	National Inst. of Health	5-U19-AI100625-02	8/5/2012	7/31/2017	Systems Immunogenetics of Biodefense Pathogens in the Collaborative Cross	4,030,980

List of Active Extramural Awards

UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Theme Investment (CC)	Baric, Ralph	National Inst. of Health - Oregon Health and Science University	AVGTIO103 (U54 AI081680 subcontract)	3/1/2010	2/28/2014	Systems Pathogenomics of Severe Acute Respiratory Virus Infection (Subcontract Pacific Northwest Regional Center for Excellence in Biodefense and Emerging Infectious Disease)	648,505
Recruitment	Baron, John	National Cancer Institute	5-R01-CA059005-18	9/30/1993	7/31/2014	Aspirin/Folate Prevention of Large Bowel Polyps	485,122
Recruitment	Baron, John	National Cancer Institute	Not Assigned	7/1/2001	6/30/2014	GLNE 010: Validation and Comparison of Biomarkers for the Early Detection of Colorectal Adenocarcinoma - Subcontract with University of Michigan	54,194
Recruitment	Baron, John	National Cancer Institute	2-R01-CA098286-11	12/1/2002	7/31/2017	Colorectal Chemoprevention with Calcium and Vitamin D	2,871,949
Recruitment	Baron, John	National Cancer Institute	3001861664	7/1/2010	6/30/2015	Early Detection Research Network (EDRN) - Subcontract with University of Michigan	122,777
Recruitment	Baron, John	National Cancer Institute	44706-D	10/1/2010	7/31/2015	Chemoprevention of Arsenic Induced Skin Cancer - Subcontract with University of Chicago	44,430
Recruitment	Basch, Ethan	Department of Defense	W81-XWH 11-1-0639	9/30/2012	9/29/2014	Development of Pain Endpoint Models for Use in Prostate Cancer Clinical Trials and Drug Approval	289,915
Recruitment	Basch, Ethan	National Cancer Institute	5-U10-CA031946-32	9/1/2012	3/31/2014	Cancer and Leukemia Group B (CALGB) - Subcontract with Brigham and Womens Hospital	39,333
Recruitment	Basch, Ethan	National Cancer Institute	63014976	1/1/2013	5/31/2017	Assessing PROMIS and Other Simple Patient Reported Measures for Cancer Research - Subcontract with Mayo Clinic	70,000
Recruitment	Batrakova, E	National Inst. of Health	7R01NS057748-05	9/29/2008	6/30/2014	Inflammatory Cells for Transport of Therapeutic Polypeptides Across the BBB	293,266
Innovation Award	Bautch Victoria (Kushner)	National Inst. of Health	F32 HL113296-01A1	7/1/2013	7/31/2015	Centrosome Over-duplication and Blood Vessel Function	52,190
Innovation Award	Bautch, Victoria	National Inst. of Health	1-R01-HL116719-01	7/15/2013	5/31/2017	Centrosome Mis-regulation and Blood Vessel Function	361,760
Theme Invest (HTS)	Beck, Melinda	National Inst. of Health	5-R01-AI082298-03	4/1/2010	3/31/2014	Viral Adaptation to Host Selenium Status	366,300
Recruitment	Bennett, Antonia	Amer. Soc. of Colon and Rectal Surgeons	Not Assigned	3/1/2013	12/31/2013	Randomized Early Intervention Study to Improve Bowel Function in SPS Patients - Subcontract with Memorial Sloan Kettering Institute for Cancer Center	5,893

List of Active Extramural Awards

UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Recruitment	Bensen, Jeannette	Department of Defense	PO#41749/12-2029	9/30/2011	9/29/2014	Vitamin D and Related Genes, Race and Prostate Cancer - Subcontract with University of South Carolina	16,754
Recruitment	Bensen, Jeannette	Department of Defense	12084021/98040295	7/1/2012	6/30/2015	Genetic Variatins in Mitochondria and Prostate Cancer Aggressiveness and Profressin in Caucasian and African American Men - Subcontract with University of Texas MD Anderson Cancer Center	35,195
Recruitment	Berg, Jonathan	National Inst. of Health	1-U01-HG007437-01	9/23/2013	7/31/2017	A Knowledge Base for Clinically Relevant Genes and Variants	1,400,000
Recruitment	Bowers, Albert	Amer Assoc Colleges/Pharmacy	Not Assigned	1/14/2013	1/13/2014	Biosynthetic Engineering Thiazolyl Peptide-based Inhibitors of FoxM1	9,942
Recruitment	Branca, Rosa Tamara	National Inst. of Health	7-R21-DK090758-03	9/20/2010	8/31/2014	Novel Magnetic Resonance Approach to Detect BAT Distribution and Temperature	199,000
Recruitment	Branca, Rosa Tamara	National Inst. of Health (Duke)	203-1797	2/1/2012	1/31/2014	Sensitive and Specific Molecular Imaging of Pulmonary Nodules-Subcontract with Duke University	87,003
Theme Invest (ICISS)	Brookhart, M Alan	Amgen	138938/7100060173	1/1/2012	6/30/2014	Patterns of Anemia Management in End-Stage Renal Disease	145,728
Theme Invest (ICISS)	Brookhart, M Alan	Amgen	7100093578/138938	11/1/2012	10/31/2013	The Epidemiology of Hospitalizations Among Patients with End-Stage Renal Disease	176,910
Theme Invest (ICISS)	Brookhart, M Alan	Amgen	142969	4/30/2013	12/30/2015	Examination of the risks and benefits of ESAs in End-Stage Renal Disease	31,250
Theme Invest (ICISS)	Brookhart, M Alan	Amgen	7100116225/138938	7/1/2013	12/31/2014	Patterns of Cinacalet Use Among Patients with End-stage Renal Disease	249,468
Theme Invest (ICISS)	Brookhart, M Alan	National Inst. of Health	5-R01 AG042845 - S1	9/1/2012	8/31/2014	A Retrospective Cohort Study of the Safety of Testosterone Therapy in Older Men - Supplement	33,000
Theme Invest (ICISS)	Brookhart, M Alan	National Inst. of Health	5-R01 AG042845 - 1	9/1/2012	8/31/2014	A Retrospective Cohort Study of the Safety of Testosterone Therapy in Older Men	215,460
Theme Invest (ICISS)	Brookhart, M Alan (Sturmer, Til)	AHRQ	HHSAA290020050 0401	7/15/2010	7/15/2013	MASTER AGREEMENT--Developing Evidence to Inform Decisions about Effectiveness: The DEcIDE NetworkComparative -- Effectiveness of IV Iron Formulations in End-Stage Renal Disease	945,549
Innovation Award	Burridge, Keith	National Inst. of Health	5-R01-GM029860-32	4/1/1981	8/31/2014	Cell Adhesion and the Regulation of Rho GTPases	409,684

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Recruitment	Carpenter, William	National Cancer Institute	5-U54-CA153602-03	9/1/2010	8/31/2015	Carolina Community Network Center to Reduce Cancer Health Disparities (CCNII) - Research Program - Pilot Research Project	82,039
Recruitment	Chavala, Sai	National Inst. of Health	5-K08-EY021171-02	3/1/2011	2/28/2016	Regulation of Adult Ciliary Body Progenitor Cells for Cell Replacement Therapy	236,392
Recruitment	Chavala, Sai	North Carolina Biotec hnology Center (NCBC)	2013-1DG-1022	4/15/2013	4/14/2014	Micron III Imaging System to Advance Stem Cell, Gene Therapy, and Angiogenesis Research at the University of North Carolina at Chapel Hill	199,000
Recruitment	Chen, Ronald	Accuray Inc.	Not Assigned	6/1/2012	5/31/2014	Comparative Effectiveness of Management Options for Localized Prostate Cancer Parallel Study to Include Patients Treated with Cyberknife Radiation Therapy	50,000
Recruitment	Chen, Ronald	Conquer Cancer Foundation	Not Assigned	7/1/2013	6/30/2014	The Impact of New Technology and Clinical Evidence on Patterns of Care for Localized Prostate Cancer	53,431
Recruitment	Chera, Bhishamjit	Eli Lilly	CCCWFU-60107	2/14/2012	2/14/2015	Phase I/II Trial of Combined Re-irradiation With Pemetrexed And Erlotinib Followed by Maintenance Erlotinib For Recurrent And Second Primary Squamous Cell...	59,028
Recruitment	Coghill, James	National Inst. of Health	5-K08-HL111205-02	4/1/2012	3/31/2016	Targeting CC-Chemokine Receptor 7 for the Prevention of Graft-versus-Host Disease	132,327
Theme Invest (HTS)	Copenhaver, Greg	National Science Foundation	MCB-1121563	8/1/2011	7/31/2014	Identifying and Characterizing Genetic Interactors of DMC1	210,000
Theme Invest (HTS)	Crews, Steve	National Inst. of Health	5-R01-NS075079-03	7/1/2011	5/31/2016	Molecular Genetics of Midline Glial Development	312,419
Theme Invest (HTS, CC)	Crowley, James J	National Inst. of Health	1-K01-MH094406-02	3/1/2012	2/29/2016	Systems Genetics of Fluoxetine-Induced Neurogenesis and Antidepressant Response	156,686
Retention	Damania, Blossom	Burroughs Wellcome	1006269	7/1/2006	6/30/2014	Role of Viral Signaling Proteins in the Pathogenesis of Kaposi's Sarcoma-Associated Herpesvirus	80,000
Retention	Damania, Blossom	National Cancer Institute	5-P01-CA019014-34	7/1/2011	6/30/2016	Herpesviral Oncogenesis, Latency and Reactivation - Project 3	249,862
Retention	Damania, Blossom	National Cancer Institute	2-RO1-CA096500-11A1	9/1/2013	8/31/2018	Role of KSHV Viral Proteins in Signaling and Pathogenesis	376,771
Retention	Damania, Blossom	National Inst. of Health	5-R01-DE018281-07	6/1/2012	5/31/2017	Innate Immunity and KSHV	351,329
Retention	Damania, Blossom	National Inst. of Health	1-U19-AI107810-01	7/1/2013	6/30/2018	Characterization of Novel Genes Encoded by RNA and DNA Viruses - Project 3	417,841

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Retention	Damania, Blossom	National Inst. of Health	1R01DE023946-01	9/17/2013	7/31/2018	Targeting the Epigenome of Gammaherpesviruses in Oral Disease	378,255
Theme Invest (HTS)	Dangl, Jeff	Gordon and Betty Moore Foundation	3030	9/1/2011	8/31/2016	Understanding Plant Immune System Function in Complex Microbial Environments	333,333
Theme Invest (HTS)	Dangl, Jeff	National Science Foundation	NSF-IOS-0929410	9/1/2009	8/31/2014	Arabidopsis 2010: Mechanisms of NB-LRR Disease Resistance Protein Function	228,723
Retention	Dayton, Paul	Department of Defense	W81XWH-12-1-0303	8/1/2012	7/31/2015	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-CA170665-02	7/1/2012	6/30/2016	Micro-Tumor Detection by Quantifying Tumor-Induced Vascular Abnormalities (PQ-13)	428,695
Retention	Dayton, Paul	National Cancer Institute	1-R24-CA165621-01	12/1/2012	11/30/2013	SBIR-Quantitative Ultrasound Analysis of Vascular Morphology for Cancer Assess	48,091
Retention	Dayton, Paul	National Inst. of Health	5-R01-EB008733-04	4/1/2009	2/28/2014	Precision Engineering of Ultrasonically-targeted Drug Delivery Vehicles - Subcontract with North Carolina State	107,058
Retention	Dayton, Paul	National Inst. of Health	R01-EB015508	8/1/2012	5/31/2016	Dual-Frequency Intravascular Arrays for Functional Imaging of Atherosclerosis - Subcontract with North Carolina State University	107,708
Innovation Award	Demore, Nancy	National Cancer Institute	5-R01-CA142657-04	7/1/2010	5/31/2015	SFRP2 and NFAT are Therapeutic Targets in Angiosarcoma	280,015
Innovation Award	Deshmukh, Mohanish	National Inst. of Health	5-R01-GM078366-08	9/1/2006	8/31/2014	Cytochrome C Degradation: A Mechanism Restrict Apoptosis in Postmitotic Cells	345,466
Retention	DeSimone, Joseph	Colorado State University (subcontract)	G-5441-2	7/1/2011	6/30/2014	Molecular Mosquitocides: Development of an Innovative and Robust, Platform-Based Approach for Sustainable Insecticidal Control of Anopheline Mosquitoes	49,583
Retention	DeSimone, Joseph	Liquidia Technologies	SRA 04-0113	9/1/2010	8/31/2013	Research Agreement With Liquida Technologies	318,808
Retention	DeSimone, Joseph	National Cancer Institute	5-DP1-CA174425-05	9/30/2009	7/31/2014	Delivery of Biological Therapeutics: Using Engineered Particles and Novel Delivery (PIONEER)	710,622
Retention	DeSimone, Joseph	National Cancer Institute	5-U54-CA151652-04	9/1/2010	7/31/2015	Carolina Center of Cancer Nanotechnology Excellence	2,058,365

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Retention	DeSimone, Joseph	National Inst. of Health	5-R01-EB009565-04	5/1/2009	4/30/2014	Engineered Organic Particles of Controlled Size, Shape, and Surface Chemistry for the Programmed in vitro and in vivo Delivery of siRNA	311,584
Retention	DeSimone, Joseph	Office of Naval Research	N00014-10-1-0550	1/30/2012	1/31/2014	Novel Perfluoropolyether and Fouling Release Coatings: Investigation of Structure	80,678
Retention	DeSimone, Joseph	Office of the Director, National Institutes of Health	5-DP1-OD006432-05	9/30/2009	7/31/2014	Delivery of Biological Therapeutics	710,622
Retention	Dittmer, Dirk	National Cancer Institute	5-R01-CA109232-09	8/1/2004	4/30/2015	Regulation of the KSHV Latent Promoter	220,337
Retention	Dittmer, Dirk	National Cancer Institute	2-P01-CA019014-34A1	7/1/2011	6/30/2016	Herpesviral Oncogenesis, Latency and Reactivation - Project 4	249,734
Retention	Dittmer, Dirk	National Cancer Institute	2-P01-CA019014-34A1	7/1/2011	6/30/2016	Herpesviral Oncogenesis, Latency and Reactivation - Core B	224,961
Retention	Dittmer, Dirk	National Cancer Institute	5-R01-CA163217-03	8/1/2011	7/31/2016	Targeted Therapies for HIV-Associated Kaposi Sarcoma and Lymphoma	287,409
Retention	Dittmer, Dirk	National Cancer Institute	1-R21-CA177315-01	4/1/2013	3/13/2015	Pathobiology of AIDS-Associated Cancers in India and the West	206,901
Retention	Dittmer, Dirk	National Cancer Institute	1-R21-CA180097-01	7/1/2013	6/30/2015	(PQD2) Why is Endemic Burkitt Lymphoma Curable with Single Agen Chemotherapy	165,300
Retention	Dittmer, Dirk	National Inst. of Health	1-U19-AI107810-01	7/1/2013	6/30/2018	Characterization of Novel Genes Encoded by RNA and DNA Viruses - Core C	193,537
Retention	Dittmer, Dirk	The EMMES Corporation	PO 1568 G NA643	9/1/2010	8/31/2013	AMC Biomarker Core	77,558
Recruitment	Doerschuk, Claire	National Inst. of Health	5-T32-HL007106-37	7/1/1975	3/31/2017	Multidisciplinary Research Training in Pulmonary Diseases	428,109
Recruitment	Doerschuk, Claire	National Inst. of Health	5-R01-HL114388-02	6/1/2012	3/31/2017	Rho-Mediated Signaling in Lung Endothelial Cells Induced by Neutrophil Adhesion	589,819
Recruitment	Doerschuk, Claire	National Inst. of Health	1-K12-HL119998-01	9/1/2013	5/31/2018	Application of Omics in Lung Disease	123,320
Recruitment	Doerschuk, Claire (Tarran)	National Inst. of Health	1P50HL120100-01	9/9/2013	8/31/2018	Mouse Models of Smoking Related Diseases	805,503
Retention	Dokholyan, Nikolay	National Inst. of Health	5-R01-GM080742-07	4/1/2007	3/31/2016	Protein Misfolding and Aggregation	269,353

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Retention	Dokholyan, Nikolay	National Inst. of Health	5-F31-AG039266-02	12/1/2010	11/30/2013	Identification of Drug Leads Targeting SOD1 Dissociation for the Treatment of ALS	30,526
Retention	Dokholyan, Nikolay	National Inst. of Health	5-R01-AI102732-02	7/1/2012	6/30/2016	Immunogen Design to Target Carbohydrate-Occluded Epitopes on the HIV Envelope	478,299
Retention	Dokholyan, Nikolay	National Inst. of Health	HDTRA-1-12-C-0074	8/6/2012	8/5/2016	Novel Bioscavengers Against OP Nerve Agents	184,250
Retention	Dokholyan, Nikolay	National Inst. of Health	5-F31-NS073435-03	2/1/2011	1/31/2014	The Impact of Post-Translational Modification of SOD1 Aggregation in ALS	30,526
Recruitment	Dudley, Andrew	National Cancer Institute	5-R00-CA140708-06	9/1/2009	8/31/2014	Tumor Endothelial Cell Abnormalities	234,060
Theme Investment (HTS)	Earp, Shelton	National Cancer Institute	2-P50-CA058223-20	8/5/2012	8/31/2017	SPORE in Breast Cancer	1,691,744
Theme Investment (CBCS,HTS)	Earp, Shelton	Susan G. Komen Foundation	Not Assigned	5/1/2012	4/30/2015	Carolina Breast Cancer Study: PHASE III	247,267
Recruitment	Engel, Lawrence	National Cancer Institute	BD515011	2/1/2011	4/30/2014	Study of Exposures, Behaviors, and Biomarkers in Cancer Epidemiology - Subcontract with Sloan Kettering	21,762
Recruitment	Engel, Lawrence	National Inst. of Health	Not Assigned	5/1/2011	4/30/2014	IPA for Lawrence Engel to the NIEHS	66,092
Recruitment	Engel, Lawrence	National Inst. of Health	PO753538/2331	9/1/2011	8/31/2016	Effects of the Deepwater Horizon Disaster:the Coast Guard Responder Cohort - Subcontract with Uniformed Services University	22,384
Retention	Evans, James	National Inst. of Health	5-U01-HG006487-02	12/1/2011	11/30/2015	NC GENES: NC Clinical Genomic Evaluation by NextGen Exome Sequencing	1,684,163
Retention	Evans, James	National Inst. of Health	5-U01-HG006487-02S1	12/1/2011	11/30/2015	NC GENES: NC Clinical Genomic Evaluation by NextGen Exome Sequencing - Supplement	59,882
Recruitment	Foster, Matthew	Celgene Corporation	LCCC 1111	5/31/2012	5/30/2015	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	62,089
Recruitment	Fry, Rebecca	National Inst. of Health	3-R01-ES019315-03S2	9/20/2010	5/31/2015	In Utero Exposure to Arsenic, Links to Epigenetic Alterations and Disease - Supplement	153,816
Recruitment	Fry, Rebecca	National Inst. of Health	5-R01-ES019315-04	9/20/2010	5/31/2015	In Utero Exposure to Arsenic, Links to Epigenetic Alterations and Disease	373,977

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Recruitment	Fry, Rebecca	Society of Toxicology	None Assigned	7/1/2012	12/31/2013	SOT-Syngenta Fellowship-Human Health Applications-Julia Rager	20,000
Recruitment	Frye, Stephen	National Cancer Institute / SAIC Frederick	A56768/29XS126	7/1/2010	11/15/2013	Task Order #7-Basic Ordering Agreement as a Comprehensive Chemical Biology Screening Center	950,351
Recruitment	Frye, Stephen	National Cancer Institute / SAIC Frederick	29XS126/A59101	2/1/2011	4/30/2014	Task Order #8-NC Comprehensive Chemical Biology Screening Center- Subcontract with SAIC Frederick	406,527
Recruitment	Frye, Stephen	National Cancer Institute / SAIC Frederick	BOA 29XS126	10/21/2011	8/31/2013	NC Comprehensive Chemical Biology Screening Center- ROR2 Task Order #18 Subcontract with SAIC Frederick	341,904
Recruitment	Frye, Stephen	National Inst. of Health	5-R01-GM100919-02	5/1/2012	1/31/2016	Discovery of Chemical Probes for Methyl-Lysine Readers	271,358
Recruitment	Furey, Terrence	UCSF	6648SC	10/1/2010	9/30/2013	Characterizing and Targeting Androgen Receptor Pathway-Independent Prostate Cancer	45,000
Recruitment	Garcia-Martinez, Jose	National Inst. of Health	5-R33-AI071940-06	9/20/2006	8/31/2013	Implementation of a Vaginal/Rectal HIV Transmission Model to Evaluate Microbicies	370,000
Recruitment	Garcia-Martinez, Jose	National Inst. of Health	5-R01-AI096138-03	7/1/2011	6/30/2015	Next Generation Pre-exposure Prophylaxis	1,053,496
Recruitment	Garcia-Martinez, Jose	National Inst. of Health	5U19AI096113-03	7/8/2011	6/30/2016	BLT Model of Latency and Eradication	741,255
Recruitment	Garcia-Martinez, Jose	National Inst. of Health	5-R21-AI096937-02	9/23/2011	8/31/2014	Towards Therapy-Induced Lethal HIV Mutagenesis	247,830
Recruitment	Garcia-Martinez, Jose	National Inst. of Health	2-R01-AI073146-06A1	7/1/2013	6/30/2018	Prevention of HIV Acquisition by Long-Acting Antiretroviral PrEP	595,276
Recruitment	Gershon, Timothy	American Cancer Society	207069	1/1/2012	12/13/2014	Glycolytic Metabolism as a Novel Therapeutic Target in Medulloblastoma	165,000
Recruitment	Gershon, Timothy	National Inst. of Health	5-K08-NS077978-02	4/1/2013	3/31/2016	Aerobic Glycolysis Regulates Apoptosis in Neurogenesis and Medulloblastoma	176,618
Recruitment	Gershon, Timothy	St. Baldrick's Foundation	Not Assigned	7/1/2011	6/30/2014	Jak-Stat Signaling: a Driving Force and Novel Target for Medulloblastoma	110,000

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Innovation Award	Goldstein, Robert	National Science Foundation	IOS-0917726	7/1/2009	6/30/2014	Cell Polarization in Response to Wnt Signaling in C. Elegans	103,500
Recruitment	Grilley-Olson, Juneko	Bayer	14856	12/2/2010	12/1/2013	An Open-label, Phase I, Dose-escalation Study to Characterize the Safety, Tolerability, Pharmacokinetics and Maximum Tolerated Dose of BAY1000394 Given a 4-week On / 2-week Off Schedule in Subjects with Advanced Malignancies	45,293
Recruitment	Grilley-Olson, Juneko	Bayer	BAY 80-6946	10/13/2011	10/12/2014	A Phase 1 Study of BAY 80-6946 (Phosphatidylinositol-3 Kinase Inhibitor) in Combination With Gemcitabine (Treatment A) or Cisplatin Plus Gemcitabine (Treatment B) in Subjects With Advanced Solid Malignancy	289,799
Recruitment	Grilley-Olson, Juneko	GlaxoSmithKline	P3K113794	12/22/2010	12/21/2014	A Phase I Open-Label, Dose Escalation Study to Investigate the Safety, Pharmacokinetics, Pharmacodynamics, and Clinical Activity of GSK2126458 and GSK 1120212 Combination Therapy in Subjects with Advanced Solid Tumors	83,055
Recruitment	Grilley-Olson, Juneko	Kyowa Hakko Kirin Pharma	CEP-37250-KHK-2804-001	1/26/2012	1/25/2014	Two-Part, Open-Label, Multi-Center Phase 1 Study of Monoclonal Antibody CEP-37250/KHK2804 in Subjects with Advanced Solid Tumors	9,981
Recruitment	Grilley-Olson, Juneko	Peredine Phamaceuticals	LCCC 1030	2/18/2011	2/17/2014	A Phase I Study of Bavituximab plus Carboplatin and Pemetrexed in Untreated Locally Advanced or Metastatic Non-squamous NSLC	209,458
Recruitment	Grilley-Olson, Juneko	Ziopharm Oncology, Inc.	IPM 3001	3/8/2011	3/7/2014	IPM 3001 A Phase III Multicenter, International, Randomized, Double-blind, Placebo-controlled Study of Doxorubicin plus Palifosfamide-tris vs.	10,536
Retention	Hahn, Klaus	American Heart Association	12POST10950000	7/1/2012	6/30/2014	Spatiotemporal Dynamics of ICAM-1-to-Rho Signaling in Transendothelial Migration	41,000
Retention	Hahn, Klaus	Angelman Syndrome Foundation	PD201104	7/1/2011	6/30/2014	Designing Therapeutic Strategies for Angelman Syndrome by Identifying Upstream Regulators of Ube3a	56,000
Retention	Hahn, Klaus	Arthritis Foundation	5536	10/1/2011	9/30/2013	Spatio-Temporal Dynamics of Rho Family Signaling in Leukocyte TEM	50,000
Retention	Hahn, Klaus	Autism Speaks	7760	2/1/2012	1/31/2014	Bi-Directional Regulation of Ube3a Stability by Cyclic AMP-Dependent Kinase	60,000

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Retention	Hahn, Klaus	Human Frontier Science Program	RGP0022-2010	8/1/2010	7/31/2014	Optogenetics for Small G-proteins and Protein Kinases in Neuroscience	50,000
Retention	Hahn, Klaus	National Inst. of Health	5-R01-GM090317-05	9/1/2009	8/31/2014	Quantitative Imaging of Signaling Networks-Subcontract with Harvard	432,323
Retention	Hahn, Klaus	National Inst. of Health	412K285	8/1/2012	5/31/2014	A Toolkit for Imaging and Photo-Manipulation of Signaling in Zebrafish - Subcontract with University of Wisconsin	306,676
Retention	Hahn, Klaus	National Inst. of Health	55431-11504-UNC	7/1/2013	6/30/2014	Assembly, Dynamics and Evolution of Cell-Cell and Cell Matrix Adhesions - Subcontract with Sanford Burham Medical Research Institute	159,077
Retention	Hahn, Klaus	National Inst. of Health	1-P01 GM 103723-01	9/30/2013	7/31/2018	Spatio-temporal dynamics of GEF-GTPase networks	1,125,220
Retention	Hayes, D Neil	Covance	GO28076	11/15/2012	11/14/2014	A Phase II, Open-Label, Randomized Study of MEHD7954A Versus Cetuximab in Patients with Recurrent/Metastic Squamous Cell Carcinoma of the Head and Neck Who Have Progressed During or Following Platinum-Based Chemotherapy	15,126
Retention	Hayes, D Neil	GeneCentric	Not Assigned	1/1/2012	12/31/2014	Validation of Lung Observations	31,959
Recruitment	Hayes, Liza Makowski	Mary Kay Ash Charitable Foundation	062-13	7/1/2013	6/30/2015	Reversing Carcinogenic Effect of Obesity on Basal-like Breast Cancer	86,956
Recruitment	Hayes, Liza Makowski	National Cancer Institute	1-R21-CA180134-01	7/1/2013	6/30/2015	(PQA2) Reversing Carcinogenic Effect of Obesity on Basal-like Breast Cancer	192,411
Theme Invest (HTS)	Henderson, Gail	National Inst. of Health	2-P50-HG004488-06	9/27/2007	5/31/2018	Center for Genomics and Society	1,247,480
Retention	Ibrahim, Joseph	Merck & Co.	Not Assigned	7/1/2009	2/28/2014	Methods for Interim Analysis with Incomplete Adjudication of Events	235,185
Retention	Ibrahim, Joseph	National Cancer Institute	5-T32-CA106209-08	5/1/2004	6/30/2016	Biostatistic for Research in Genomics and Cancer	261,947
Retention	Ibrahim, Joseph	National Cancer Institute	5-P01CA142538-03	4/1/2010	3/31/2015	Methods for Post Marketing Surveillance and Comparative Effectiveness Research (Subproject)	129,291
Retention	Ibrahim, Joseph	National Inst. of Health	5-R01-GM070335-15	3/1/1996	8/31/2015	Bayesian Approaches to Model Selection for Survival Data	272,896
Retention	Ibrahim, Joseph	Novartis Pharmaceuticals Corporation	65201018	6/1/2008	12/31/2013	Supported Research Agreement with Novartis Pharmaceuticals Corporation	10,000

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Recruitment	Innocenti, Federico	Alliance for Clinical Trials	Not Assigned	9/23/2009	8/31/2014	Proposal for SNP Analyses in CALGB 80303 and AVITA	155,286
Recruitment	Innocenti, Federico	National Cancer Institute	5-K07-CA140390-06	9/23/2009	8/31/2014	Genome-Wide Molecular Epidemiology of Treatment Outcome and Cancer Risk	130,043
Recruitment	Jin, Jian	National Inst. of Health	1-R01-GM103893-01	7/1/2013	5/31/2016	Creating in Vivo Chemical Probes for Lysine Methyltransferases G9A and GLP	327,258
Innovation Award	Johnson, Gary	Department of Defense	W81XWH-12-1-0129	9/30/2012	9/29/2014	Targeted Therapy for MAP3K1 and MAP2K4 Mutant Estrogen Receptor Positive Breast Cancer	118,251
Theme Invest (Drug, HTS, MP1U)	Johnson, Gary	National Inst. of Health	5-R01-GM101141-02	4/15/2012	1/31/2016	Kinome Reprogramming in Response to Targeted Kinase Inhibitors	272,756
Theme Invest (MP1U)	Johnson, Gary	Susan G. Komen Foundation	IIR12225201	1/1/2013	12/31/2016	Whole Kinome Profiling and Remodeling in HER2+ Breast Cancer	224,825
Theme Invest (HTS)	Jones, Corbin	North Carolina Biotechnology Center (NCBC)	2013-MRG-1110	7/1/2013	6/30/2015	Developing REA (Repetitive element Assembler) algorithm for assembling repetitive and hyper-variable geneomic regions	130,028
Theme Invest (HTS)	Juliano, Jonathan	National Inst. of Health	5-R01-AI089819-04	6/1/2010	5/31/2015	Within Host Selection of P. falciparum Variants by Artemisinin Combination Therapies	306,961
Recruitment	Kabanov, Alexander	National Cancer Institute	5-U01-CA151806-04	9/20/2010	7/31/2015	High Capacity Nanocarriers for Cancer Chemotherapeutics	376,556
Recruitment	Kabanov, Alexander	National Inst. of Health	5-R01-NS051334-08	4/1/2005	3/31/2015	Polypeptide Modification for Enhanced Brain Delivery	334,428
Recruitment	Kasow, Kim	National Marrow Donor Program	16664	11/22/2011	11/21/2014	09-MRD The Role of Minimal Residual Disease Testing before and after Hematopoietic Cell Transplantation for Pediatric Acute Myeloid Leukemia	1,000
Opportunity Fund Invest Ret	Keku, Temitope	National Cancer Institute	5-R01-CA136887-05	5/1/2009	2/28/2014	Intestinal Microbiota, Diet and Risk of Colorectal Adenomas	280,014
Retention	Key, Nigel	Baxter Healthcare Corporation	NA	10/14/2011	10/13/2013	An Observational Study of Postoperative Deep Venous Thrombosis (DVT) in Hemophilics Undergoing Major Orthopedic Surgery	60,000
Retention	Key, Nigel	Hemostasis and Thrombosis Research Society	NA	7/1/2012	6/30/2014	Exploratory Study to Assess the Potential Contribution of Tissue Factor and Microparticles to Disease Pathogenesis and the Activated State of Coagulation in Inflammatory Bowel Disease	75,000

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Retention	Key, Nigel	Hemostasis and Thrombosis Research Society	NA	7/1/2013	8/31/2014	FELLOW:BUCKNER, T Award in Hemophilia and Rare Bleeding Disorders	111,000
Retention	Key, Nigel	HTRS	Not Assigned	7/1/2012	6/30/2014	Exploratory Study to Assess the Potential Contribution of Tissue Factor and Microparticles to Disease Pathogenesis…	150,000
Retention	Key, Nigel	National Inst. of Health	5-U01-HL072355-10	9/30/2002	8/31/2014	Clinical Trials in Transfusion Medicine and Hemostasis	159,688
Retention	Key, Nigel	National Inst. of Health	5-T32-HL007149-37	7/1/2012	6/30/2017	Research Fellowships in Hematology/Oncology	338,588
Theme Invest (HTS)	Knowles, Michael R.	National Inst. of Health	5-R01-HL68890-11A1	9/1/2006	6/30/2015	Gene Modifiers in CF Lung Disease	714,582
Recruitment	Laederach, Alain	National Inst. of Health	5-R01-HL111527-02	1/1/2012	12/31/2016	Non-Coding RNA Structure Change in Chronic Obstructive Pulmonary Disease	342,769
Recruitment	Laederach, Alain	National Inst. of Health	5-R01-GM101237-02	5/1/2012	4/30/2016	Structural and Functional Consequences of Disease SNPs on the Transcriptome	264,062
Recruitment	Lai, Samuel	National Inst. of Health - Boston University	9500241409	8/1/2012	7/31/2013	Optimizing Plantibodies for Trapping HIV and HSV in Cervicovaginal Mucus	139,961
Recruitment	Lai, Samuel	National Science Foundation	DMR-1151477	4/15/2012	3/31/2017	Synthetic Nanoprobes Reveal Novel Biophysical Immune Protective Mechanism of Mucus	80,000
Innovation Award	Lawrence, David	National Cancer Institute	5-R01-CA140173-05	5/1/2009	2/28/2014	Signaling Network Dynamics in Metastatic Prostate Cancer	386,344
Recruitment	Lee, Carrie	Millennium Pharmaceuticals, Inc.	C15010	6/20/2013	6/19/2016	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	14,720
Recruitment	Lee, Carrie	Quintiles	NA	11/10/2011	11/9/2014	E7050-703 An Open-Label, Multicenter, Randomized, Phase Ib/II Study of E7050 in Combination with Cisplatin and Capecitabine versus Cisplatin and Capecitabine Alone in Patients with Advanced or Metastatic Solid Tumors and Previously Untreated Gastric Cancer	5,745
Recruitment	Lee, Yueh	RSNA Research and Education Fund	RMS 1320	7/1/2013	6/30/2014	PET/MR for the Evaluation of Lymphoma	3,000

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Recruitment	Lemon, Stanley	Merck & Co.	40420	2/10/2012	2/9/2015	Antiviral Mechanisms and Emergence of Resistance to HCV Protease Inhibitors	193,422
Recruitment	Lemon, Stanley	Merck & Co.	Not Assigned	4/1/2013	3/31/2014	High-Fidelity Primer ID Sequencing of NS5A-Coding RNA in Patient Samples	126,682
Recruitment	Lemon, Stanley	National Cancer Institute	5-R01-CA164029-02	5/1/2012	3/31/2017	Murine Model of HCV-Associated Human Liver Cancer	442,453
Recruitment	Lemon, Stanley	National Inst. of Health	1-R01-AI095690-03	4/1/2011	3/31/2016	Micro-RNA 122 and Chronic Hepatitis C	368,389
Recruitment	Lemon, Stanley	National Inst. of Health	1-R01-AI103083-02	9/1/2012	8/31/2017	Membrane Hijacking: Biogenesis and Fate of Enveloped Hepatovirus	357,200
Retention	Linnan, Laura	National Cancer Institute	5-U54-CA156733-04	9/1/2010	8/31/2015	NCCU-LCCC Partnership in Cancer Research - Full Project 3	113,777
Retention	Lund, Pauline	National Inst. of Health	5-RO1-DK40247-21	5/1/1989	6/30/2015	Intestinal Adaptation: Role of Hormones and Growth Factors	323,692
Retention	Lund, Pauline	National Inst. of Health	2-R01-DK047769-14	7/1/2008	3/31/2014	Growth Factors and Inflammatory Bowel Disease	373,654
Theme Investment (CC)	Magnuson, Terry	National Inst. of Health	8-U42-OD010924-14	9/30/2010	2/28/2015	A Carolina Center to Characterize and Maintain Mutant Mice	1,372,998
Recruitment	Major, Michael	National Inst. of Health	1-DP20-OD007149-03	9/1/2010	6/30/2015	Exploitation of Near-Haploid Human Cells for Functional Gene Discovery	400,636
Recruitment	Marks, Lawrence	National Inst. of Health	5-U58-DP003414-03	9/30/2011	9/29/2014	Improving Access and Utilization of Support Services in Young Breast Cancer Survivors	260,242
Theme Invest (HTS)	Matera, Arnold	National Inst. of Health	5-R01-GM053034-17	5/1/2011	4/30/2015	Biogenesis of Small Ribonucleoproteins	300,753
Recruitment	McRee, Autumn	Merck & Co.	MK-0646-025	12/17/2012	12/16/2015	MK-0646-025-011 A Phase IIA Open Label, Adaptive, Randomized Clinical Trial of Dalotuzumab (MK-0646) Treatment in Combination with Irinotecan Versus Cetuximab and Irinotecan for Patients with Metastatic Rectal Cancers (mRC) Expressing High IGF-1/Low IGF-	14,884
Recruitment	McRee, Autumn	Novartis Pharmaceutical Corporation	LCCC 1036	5/1/2012	12/31/2014	A Phase I Study of BKM120 with mFOLFOX6 in Patients with Advanced Solid Tumors with Expansion Cohorts in KRAS Wild Type Metastatic Colorectal and Metastatic Pancreatic Cancers	48,616

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Recruitment	McRee, Autumn (O'Neil)	Aptium Oncology	AGICC 11 PAN 01	9/7/2011	9/6/2014	A Phase II/III, Multi-center, Randomized, Controlled Study to Compare the Efficacy and Safety of Gemcitabine Alone vs. ON 01910.Na Combined with Gemcitabine in Patients with Previously Untreated Metastatic Pancreatic Cancer	274,521
Recruitment	Milowsky, Matthew	Dendreon Corporation	N10-1	6/20/2012	6/19/2015	A randomized, Phase 2, open-label study evaluating DN24-02 as adjuvant therapy in subjects with high risk HER2+ urothelial carcinoma	14,720
Recruitment	Milowsky, Matthew	Exelixis	XL184-306	8/28/2012	8/27/2017	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	12,800
Recruitment	Milowsky, Matthew	Sloan-Kettering Institute for Cancer Research	MSKCC-12-071	1/1/2013	1/2/2016	Phase II Study of Neoadjuvant Dose Dense Gemcitabine adn Cisplatin (DD GC) In Patients with Muscle-Invasive Bladder Cancer	6,000
Theme Invest (HTS)	Mohlke, Karen	National Inst. of Health	5-R01-DK072193-08	9/1/2010	5/31/2015	Targeted Genetic Analysis of T2D and Quantitative Traits	599,486
Theme Investment (HCBCS,HTS)	Mohlke, Karen	National Inst. of Health	5-R01-DK093757-01-03	9/5/2011	7/31/2016	Genetic Epidemiology of Rare and Regulatory Variants for Metabolic Traits	578,939
Recruitment	Moody, Cary	American Cancer Society	Not Assigned	7/1/2013	6/30/2017	The Role of ATM Signaling in the Life Cycle of Human Papillomaviruses	167,651
Recruitment	Moody, Cary	National Cancer Institute	5-R00-CA137160-05	9/20/2008	8/31/2013	The Role of Caspase Activation in the Differentiation-Dependent Life Cycle of HPV	241,530
Recruitment	Moorman, Nathaniel	National Inst. of Health	1-R01-AI103311-01	12/1/2012	11/30/2017	The Role of Host and Viral Translation Factors During HCMV Infection	344,561
Recruitment	Moschos, Stergios	Merck & Co.	MK-3475-002-29	2/15/2013	2/14/2016	Randomized, Phase II Study of MK-3475 Versus Chemotherapy in Patients with Advanced Melanoma	75,296
Recruitment	Muss, Hyman	National Inst. of Health	23030.914940.6695	8/15/2011	8/14/2015	Clinical and Biological Predictors of Chemotherapy Toxicity in Older Adults with Cancer - Subcontract with City of Hope	30,852
Recruitment	Muss, Hyman	The Breast Cancer Research Fund	Not Assigned	10/1/2010	9/30/2013	The Effect of Chemotherapy on Aging in Older Women with Breast Cancer	240,000

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Recruitment	Nicholson, Wanda	National Inst. of Health	1-R21-DK095189-01A1	4/1/2013	3/31/2015	A Transgenerational e-Intervention for Gestational Diabetics and their Offspring	228,000
Recruitment	Noar, Seth (Ammerman)	Blue Cross Blue Shield of North Carolina Found	UNC-HDHP-1012-1113	12/1/2012	4/30/2015	BCBS Healthy School Meal Pilot - Social Marketing and Evaluation Plan	99,584
Theme Invest (CBCS, HTS)	Olshan, Andrew	National Cancer Institute - Roswell Park Cancer Institute	76-01	8/1/2011	7/31/2014	Epidemiology of Breast Cancer Subtypes in African-American Women: a Consortium	864,454
Theme Invest (CC)	Pardo Manuel de Villena, F	National Inst. of Health	5-P50-HG006582-05	9/30/2009	8/31/2014	An Interdisciplinary Program for Systems Genomics of Complex Behaviors	802,132
Theme Invest (CC)	Pardo-Manuel de Villena, F	National Inst. of Health	1-R21-MH096261-02	4/1/2012	3/31/2014	Effect of Paternal Age on Mutational Burden and Behavior in Mice	177,600
Theme Invest (CC)	Pardo-Manuel de Villena, F	National Inst. of Health - Jackson Lab	2-P50GM-076468-06, subcontract	7/1/2012	6/30/2014	Genome Dynamics: Evolution, Organization and Function	217,676
Theme Investment (CC)	Pardon Manuel de Villena, Fernando	National Inst. of Health	5-R01-HD065024-04	5/1/2010	4/30/2015	Collaborative Cross: A Systems Genetics Approach to the Study of Male Infertility	318,130
Recruitment	Park, Steven	Allos Therapeutics, Inc.	Not Assigned	2/8/2011	2/27/2014	Prospective, Longitudinal, Multinational Registry of Patients with Newly Diagnosed Peripheral T-Cell Lymphoma	4,500
Recruitment	Park, Steven	GlaxoSmithKline	OMB110928	2/13/2012	2/12/2015	Ofatumumab versus Rituximab Salvage Chemoimmunotherapy followed by ASCT in Relapsed or Refractory DLBCL	31,407
Recruitment	Park, Steven	Millennium Pharmaceuticals, Inc.	C14011	9/14/2011	9/13/2014	A Multicenter, Phase 1-2 Study of MLN8237, an Oral Aurora A Kinase Inhibitor, in Patients With Relapsed or Refractory Aggressive B-Cell Lymphoma Treated With Rituximab and Vincristine	33,169
Recruitment	Park, Steven	Seattle Genetics	LCCC 1115	4/26/2012	4/25/2015	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)	58,000

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Theme Invest (HTS)	Perou, Charles	Alliance for Clinical Trials in Oncology Foundation	NA	9/1/2011	8/24/2014	Genomic Analysis of CALGB 40603, a Neoadjuvant Trial for Triple-Negative Breast Cancer Patients	139,333
Theme Invest (HTS)	Perou, Charles	National Cancer Institute	5-U24-CA143848-05	9/29/2009	7/31/2014	Gene Expression Patterns in Human Tumors Identified Using Transcript Sequencing	3,777,133
Theme Invest (HTS)	Perou, Charles	National Cancer Institute	5-RO1-CA148761-04	3/17/2010	12/31/2014	Therapeutic Targeting of Breast Cancer Tumor Initiating Cells - Subcontract with Baylor College of Medicine	184,112
Theme Invest (HTS)	Perou, Charles	Susan G. Komen Foundation	Not Assigned	4/1/2012	3/31/2014	Single Cell Genomics to Study the Microenvironment and Tumor Evolution	55,906
Theme Invest (HTS)	Perou, Charles	The Breast Cancer Research Fund	Not Assigned	10/1/2008	9/30/2013	Molecular Therapeutics for Luminal Tumor Subtypes	240,000
Theme Invest (HTS)	Philpot, Benjamin	National Inst. of Health	1-R01-MH093372-02, 02S1	12/9/2011	11/30/2016	Epigenetic Regulation of UBE3A as a Treatment for Angleman Syndrome	772,722
Theme Invest (HTS)	Powell, Cynthia (Berg, Jonathan)	National Inst. of Health	1-U19HD077632-01	9/5/2013	8/31/2018	NC NEXUS, North Carolina Newborn Exome Sequencing for Universal Screening	1,151,384
Theme Invest (HTS)	Prins, Jan	National Inst. of Health	1-R01-HG006272-02	5/23/2012	3/31/2015	Unlocking Transcript Diversity via Differential Analyses of Splice Graphs	395,553
Retention	Pruthi, Raj	GTx, Inc.	Not Assigned	8/12/2011	8/9/2013	G20075 Phase II, Open Label, Dose Finding Study of the Effect of GTx-758 on Total and Free Testosterone Levels in Men with Prostate Cancer Compared to a Luteinizing Hormone Releasing Hormone Agonist	37,302
Recruitment	Purvis, Jeremy	National Inst. of Health	4-R00-GM102372-02	9/1/2012	8/31/2016	Dynamics of Cellular Senescence in Single Human Cells	248,330
Retention	Ramsey, J Michael	Defense Threat Reduction Agency	W911NF-12-1-0539	9/10/2012	12/9/2014	Micro Ion Trap Mass Spectrometer	2,642,157
Retention	Ramsey, J Michael	Department of Defense	HR0011-12-2-0001	5/6/2013	11/5/2016	Reconfigurable Multi Element Diagnostic ReMEDx	2,359,635
Retention	Ramsey, J Michael	National Inst. of Health	2-R01-GM066018-09	7/1/2003	7/31/2013	Single Cell Electroportation - Subcontract with University of Pittsburg	64,707
Retention, Theme Invest (HTS)	Ramsey, J Michael	National Inst. of Health	1-R01-HG007407-01	9/1/2013	7/31/2017	Nanofluidic Platforms for High Resolution Mapping of Genomic DNA	534,246

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Retention	Ramsey, J Michael	Waters Technology Corp	Not Assigned	1/1/2006	12/31/2013	Micro Chip HPLC	181,188
Theme Invest (HTS)	Randell, Scott	National Inst. of Health	1-U01 HL 111018-02	1/1/2013	12/31/2016	An Integrated Approach to Airway Epithelial Repair and Regeneration - UNC MPI Subcontract	193,140
Recruitment	Reeder-Hayes, Katherine	Dana Farber Cancer Institute	TBCRC 012	4/3/2013	4/2/2016	ABCDE: A Randomized Trial of Becacizumab and Metronomic Chemotherapy Versus Observation in the Post-preoperative Setting	143,500
Recruitment	Reeve, Bryce	Children's National Medical Center	Not Assigned	1/2/2012	1/1/2014	Preliminary Content Validation Steps for the Pediatric Oncology Patient Self-Report CTCAE - Subcontract wtih Children's Hospital National Medical Center	8,803
Recruitment	Reeve, Bryce	National Cancer Institute	1-R01-CA160104-01	9/9/2011	9/8/2016	Health-Related Quality of Life Values for Cancer Survivors: Enhancing the Application of PROMIS Measures for Comparative Effectiveness - Subcontract with H. Lee Moffitt Cancer Center and Research Institute	45,009
Recruitment	Reeve, Bryce	National Cancer Institute	5-RO1-CA174453-02	9/1/2012	7/31/2016	PROMIS Validation in Prospective Population-Based Prostate Cancer Research Study	263,315
Recruitment	Reeve, Bryce	National Cancer Institute	1-R01-CA175759-01	4/1/2013	3/31/2018	Creating and Validating Child Adverse Event Reporting in Oncology Trials	698,123
Recruitment	Rini, Christine	National Inst. of Health	5-R01-AR057346-03	9/20/2010	6/30/2014	Internet-Based Pain Coping Skills Intervention	658,632
Recruitment	Rini, Christine	National Inst. of Health	1-P60-AR064166-01	7/19/2013	6/30/2018	Clarifying Critical Processes Linking Partner Support to Insufficiently Active	279,769
Recruitment	Robinson, Whitney	National Cancer Institute	1-K01-CA172717-02	9/1/2012	8/31/2017	Racial Disparities in Cancer Outcomes: Quantifying Modifiable Mechanisms	128,922
Recruitment	Rosenstein, Donald	Lance Armstrong Foundation	Not Assigned	1/1/2008	12/31/2013	NC STRONG Center for Healthy Survivorships: Lineberger Lance Armstrong Center of Excellence and Community Partnerships	220,000
Recruitment	Rosenstein, Donald	Lance Armstrong Foundation	772238	1/1/2013	12/31/2013	LIVESTRONG Center of Excellence Network Survivorship Study for Young Adults with Canccer - Supplement Subcontract wtih Fred Hutchinson Cancer Res Center	76,836
Recruitment	Rosenstein, Donald	Livestrong Foundaton	776647	1/1/2013	12/31/2013	Use of Patient Reported Outcomes in Facilitating Survivorship Care and Determining Risk of Adverse Outcomes in Cancer Survivors - Supplement	9,900

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Recruitment	Sanoff, Hanna	Bayer	LCCC 1029	12/6/2010	8/31/2014	Randomized Phase II Study of Regorafenib in Combination with FOLFIRI (Irinotecan, r-Fluoracil, and Leocovorin) versus Placebo in Combination with FOLFIRI as Second Line Therapy in Patients with KRAS or BRAF Mutant Metastatic Colorectal Cancer	1,651,177
Recruitment	Sanoff, Hanna	National Cancer Institute	7-KO7-CA160722-03	9/1/2012	8/31/2016	Use and Comparative Effectiveness of Innovative Therapies for Hepatoellular Carcinoma	170,100
Recruitment	Sanoff, Hanna	Novartis Pharmaceutical Corporation	CSOM230DUS22T	9/22/2011	12/31/2013	Phase II Single Arm Study of Everolimus and Pasireotide (SOM230) in Patients with Advanced or Metastatic Hepatocellular Carcinoma (HCC)	62,088
Theme Investment (ICISS)	Schenck Anna	Robert Wood Johnson Foundation	70339	9/1/2012	8/31/2014	Exploring new methods and measures to assess the impact of the economic recession on public health outcomes	45,308
Retention	Schoenfisch, Mark	National Inst. of Health	5-R21AI097539-02	7/1/2012	6/30/2014	Temporal Analysis of Nitric Oxide as Potential Sepsis Biomarker	207,292
Retention	Schoenfisch, Mark	National Science Foundation	DMR-1104892	8/1/2011	7/31/2014	Silica-derived nitric oxide delivery vehicles as anti-plaque agents	154,456
Retention	Schoenfisch, Mark	Novan	1R43DK093119-01	9/1/2011	8/31/2014	SBIR-Improving Host Response to Implantable glucose Sensors via Nitric Oxide Release	148,365
Retention	Schoenfisch, Mark	Novan	Not Assigned	8/15/2013	8/14/2015	Nitric oxide-releasing chitosan oligosaccharides	58,924
Retention	Serody, Jonathan	National Cancer Institute	5-R01-CA166794-02	4/1/2012	3/31/2017	Th1/Th17 Macrophage Interactions in Cutaneous GVHD	290,781
Retention	Serody, Jonathan	National Inst. of Health	1-R01-HL1157761-02	6/1/2012	5/31/2016	Targeting CCR7 for the Prevention/Treatment of GvHD	352,240
Innovation Award	Serody, Jonathan	Susan Komen for the Cure Foundation	KG 100307	7/19/2010	7/18/2013	Combined Modality Therapies For The Treatment Of Metastatic Breast Cancer	199,706
Recruitment	Sethupathy, Praveen	National Inst. of Health	4-R00-DK091318-02	6/1/2012	5/31/2015	Discovery of Micro-RNA Regulatory Modules Controlling Human Pancreatic Islet Funct	239,849
Retention	Shaheen, Nicholas	American Society for Gastrointestinal Endoscopy	2012 ASGE	9/1/2012	8/30/2014	Stratifying Risk in Barrett's Esophagus: Towards Biomarker-Based Patient Management	157,500

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Retention	Shaheen, Nicholas	BARRX	Not Assigned	3/3/2006	7/1/2014	Ablation of Intestinal Metaplasia Containing Dysplasia (AIM Dysplasia Trial) Multi-Center, Randomized, Sham-Controlled Trial	48,109
Retention	Shaheen, Nicholas	Coviden	Not Assigned	8/17/2009	6/30/2014	B500 HALO Patient Registry Ablation of Barrett's Esophagus	64,125
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	5/15/2012	5/14/2016	Study Design, Development, and Consult Services with CSA	206,696
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	8/1/2012	7/31/2013	TruFreeze effectiveness in eliminating Barrett's Esophagus	126,233
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	12/14/2012	12/13/2015	Prevalence of Dysplasia of the Gastric Cardia	40,000
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	3/15/2013	3/14/2015	A Dose-Optimization Study for the Initial Treatment of Dysplastic Barrett's Esophagus with TruFreeze? Spray Cryotherapy (	49,838
Retention	Shaheen, Nicholas	CSA Medical, Inc	Not Assigned	3/21/2013	3/31/2019	CSA 003 truFreeze Spray Cryotherapy Patient Registry	5,760
Retention	Shaheen, Nicholas	ICON Clinical Research	SPD668-206	5/29/2012	5/28/2014	Phase 2b, Double-blind, Randomized, Placebo-controlled, Dose-finding Study to Evaluate Efficacy of a Novel Selective 5-HT4 Receptor Agonist, SSP-002358 Taken in Addition to a Proton Pump Inhibitor in Subjects with Gastroesophageal Reflux Disease with…	54,337
Retention	Shaheen, Nicholas	National Cancer Institute	5-U54-CA156733-03	9/1/2010	8/31/2015	NCCU-LCCC Partnership in Cancer Research - Full Project 1	159,522
Recruitment	Shaheen, Nicholas	National Cancer Institute (Case Western)	RS506502	9/1/2012	8/31/2016	Barrett's Esophagus Translational Research Network (BETRNet)	88,162
Retention	Shaheen, Nicholas	National Cancer Institute (University of Arizona)	Not Assigned	6/26/2009	12/31/2013	Clinical Study of Ursodeoxycholic Acid in Barrett's Patients with Low Grade Dysplasia - Subcontract with University of Arizona	36,657
Retention	Shaheen, Nicholas	National Inst. of Health	5-T35-DK007386-33	5/1/1980	2/29/2016	Short Term Research Training	155,119
Retention	Shaheen, Nicholas	National Inst. of Health	1-K24-DK100548-01	9/17/2013	8/31/2018	Non-Endoscopic Surveillance for Barrett's Esophagus Following Ablative Therapy	177,185
Theme Invest (MP1U)	Sharpless, Norman (Ned)	National Cancer Institute	5-UO1-CA141576-04	9/1/2009	8/31/2014	LKB1 Tumor Suppressor and Human Cancer - Subcontract from the University of Texas Southwestern Medical Center	192,961

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Theme Invest (MP1U)	Sharpless, Norman (Ned)	National Cancer Institute	5-R01-CA163896-02	4/1/2012	3/31/2017	In vivo Murine Models of Metastasis for Therapeutic Testing	376,196
Innovation Award	Sharpless, Norman (Ned)	National Inst. of Health, G1	5-R44AI084284-04	9/1/2009	8/31/2013	SBIR-NIAID Advanced Technology SBIR: Organismal Radioprotection Through Pharmacological Quiescence	72,488
Recruitment	Shen, Dinggang	National Cancer Institute	5-R01-CA140413-04	7/6/2010	12/31/2014	Online Collection of Patient-Specific Information for Daily Prostate Segmentation	315,017
Recruitment	Shen, Dinggang	National Inst. of Health	5-R01-EB008374-04	7/15/2009	8/31/2014	Continued Development of 4-Dimensional Image Warping and Registration Software	320,080
Recruitment	Shen, Dinggang	National Inst. of Health	5-R01-EB006733-05	9/30/2009	8/31/2016	Development and Dissemination of Robust Brain MRI Measurement Tools	468,755
Recruitment	Shen, Dinggang	National Inst. of Health	5-R01-EB009634-03	9/1/2011	8/31/2015	Fast, Robust Analysis of Large Population Data	314,019
Recruitment	Shen, Dinggang	National Inst. of Health	R01-AG041721-02	8/1/2012	5/31/2015	Quantifying Brain Abnormality By Multimodality Neuroimage Analysis	376,144
Recruitment	Shen, Dinggang	National Inst. of Health	1-R01-MH100217-01A1	8/26/2013	7/31/2017	Infant Brain Measurement and Super-Resolution Atlas Contruction	583,849
Recruitment	Smith, Jennifer S	AHRQ	1-R13-HS022795-01	9/30/2013	9/29/2014	Issues in Implementation of Adolescent Vaccination in Schools	34,984
Recruitment	Smith, Jennifer S	Depart./Health & Human Service (JBS International)	Not Assigned	1/21/2013	9/13/2013	Evidence-based Interventions: Building Capacity Among CCFA State Partners	10,000
Recruitment	Smith, Jennifer S	GlaxoSmithKline	Not Assigned	5/1/2013	10/31/2014	Multi-site HPV Vaccine Acceptability Study	339,174
Recruitment	Smith, Jennifer S	National Cancer Institute	1-U54-CA156733-03	9/1/2010	8/31/2015	NCCU-LCCC Partnership in Cancer Research - Pilot Project 2	9,789
Recruitment	Smith, Jennifer S	National Cancer Institute	5-U54-CA156733-03	9/1/2010	8/31/2015	NCCU-LCCC Partnership in Cancer Research - Pilot Project 1	98,888
Recruitment	Smith, Jennifer S	National Cancer Institute (Duke Univ)	Not Assigned	7/1/2010	6/30/2015	Disparities in Cervical Cancer Precursors and Deregulation of Imprinted Regulation - Subcontract	22,891
Recruitment	Smith, Jennifer S	Right To Compare	Not Assigned	10/1/2009	9/30/2013	Right to Care HPV, Cytology and Visual Inspection Validation for Cervical Cancer Screening in HIV-positive Women	60,146
Theme Invest (CC)	Sparling, P Frederick	National Inst. of Health	5-U54-AI057157-11	3/1/2012	2/28/2014	SERCEB Administrative Supplement Request to support inbreeding and genotyping of the CC	495,485

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Retention	Stinchcombe, Thomas	BiPar Sciences, Inc.	Not Assigned	9/23/2010	9/22/2013	20090321 Randomized Phase 3 Trial of Gemcitabine/Carboplatin With or Without BSI-201 (SAR240550) (a PARP1 Inhibitor) in Patients with Previously Untreated Stage IV Squamous Non-Small Cell Lung Cancer (NSCLC)	66,045
Retention	Stinchcombe, Thomas	Bristol-Myers Squibb	CA209-063	2/18/2013	2/15/2015	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	52,612
Retention	Stinchcombe, Thomas	Genentech Inc.	LCCC 0825/ AVF4499s	9/18/2009	9/17/2014	A Multicenter Phase II Trial of Carboplatin, Pemetrexed, and Bevacizumab Followed by Pemetrexed and Bevacizumab Maintenance Therapy in Patients with a Light...	70,286
Retention	Stinchcombe, Thomas	GlaxoSmithKline	LCCC0921	3/18/2010	3/17/2014	A Non-Randomized, Multi-Center Open Label Phase II Study of Pazopanib and Pemetrexed or Pazopanib Alone in Stage IIIB/IV Non-Squamous Non-Small Cell Lung Cancer After Progression on First Line Therapy Containing Bevacizumab	46,000
Retention	Stinchcombe, Thomas	GlaxoSmithKline	Not Assigned	6/7/2012	6/6/2014	BRF113928 A Phase II study of the selective BRAF kinase inhibitor GSK2118436 in subjects with advanced non-small cell lung cancer and BRAF mutations	15,863
Retention	Stinchcombe, Thomas	GTx, Inc	G300505	5/30/2012	5/9/2015	Phase III, Randomized, Double-Blind, Placebo-Controlled Study of the Effect of GTx-024 on Muscle Wasting in Patients with Non-Small Cell Lung Cancer on First Line Platinum Plus a Non-Taxane Chemotherapy	47,338
Retention	Stinchcombe, Thomas	PPD Pharmaco	OAM4971G	11/12/2012	11/11/2015	OAM4971g A Radnomized, Phase III, Multicenter, Double-Blind, Placebo-Controlled Study Evaluating the Efficacy and Safety of Metmab in Combination with Tarceva (Erlotinib) in Patients with Met Diagnostic Positive Non-Small Cell Lung Cancer (NSCLC) Who Have...	18,619
Theme Invest (ICISS)	Sturmer, Til	National Inst. of Health	R01 AG023178	4/1/2012	3/31/2015	Propensity Scores and Preventive Drug Use in the Elderly	302,747
Theme Invest (ICISS)	Sturmer, Til	PCORI	PFA 12001	10/31/2012	12/31/2014	Methods to Increase Validity of Comparative Effectiveness Research in the Elderly	336,698

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Theme Investment (ICISS), Innovation Award	Sturmer, Til (Carpenter, William)	AHRQ	HHSA29020050040I	10/9/2012	7/24/2014	DEcIDE-2 Task Order 3: Developing and Evaluating Methods for Record Linkage	418,371
Theme Investment (ICISS), Innovation Award	Sturmer, Til (Carpenter, William)	AHRQ	HHSA29020050040I	1/23/2013	7/24/2014	DEcIDE-2 Task Order 3: Developing and Evaluating Methods for Record Linkage	275,300
Theme Investment (ICISS), Innovation Award	Sturmer, Til (Chen Ronald)	AHRQ	HHSA29020050040I	8/9/2010	7/14/2013	Cancer DEcIDE: Comparative Effectiveness of Management Options for Localized Prostate Cancer	1,126,088
Innovation Award	Su, Lishan	Baylor University Research Institute	Not Assigned	6/1/2012	5/31/2014	Modeling Novel HCV Vaccines in Humanized Mice in vivo	221,622
Innovation Award	Su, Lishan	National Inst. of Health	5-R01-AI095097-02	12/1/2011	11/30/2016	HIV Co-Infection and HCV-induced Liver Fibrosis in vivo	347,800
Theme Investment (HCBCS,HTS)	Sullivan, Patrick	National Inst. of Health	5-R21-MH097173-02	4/1/2012	3/31/2014	Biomarkers of Olanzapine-induced Weight Gain in Mice	177,600
Theme Investment (HCBCS,HTS)	Sullivan, Patrick	National Inst. of Health	1-U01-MH094421-02, 02S1	5/10/2012	3/31/2016	1/4 Psychiatric GWAS Consortium: Genomic Follow-up Next-Gen Sequencing & Genotyping	466,976
Theme Invest (HTS)	Swanstrom, Ronald	National Inst. of Health	5-R37-AI044667-13	4/1/2010	3/31/2015	Biological Properties of HIV-1 V3 Evolutionary Variants	304,976
Theme Invest (HTS)	Swanstrom, Ronald	National Inst. of Health	1-R21-AI108539-01	8/1/2013	7/31/2015	Development of novel methods to exploit next gen sequencing for HIV	205,155
Theme Invest (CC)	Tarrantino, Lisa and Valdar, William	National Inst. of Health	1-R01-MH100241-01	4/19/2013	3/31/2018	Role of Maternal Diet and Allelic Imbalance in Behavior	602,068
Innovation Award	Thomas, Nancy	National Cancer Institute	5-R01-CA112243-09	5/13/2005	1/31/2015	Melanoma RAS/BRAF Mutation: Heterogeneity-Risk Prognosis	467,820
Recruitment	Troester, Melissa	National Cancer Institute	HHSN261201200418P	9/20/2012	9/19/2013	Tumor Subtyping in NCI Malaysian Case Control Study - Supplement	40,736
Recruitment	Troester, Melissa	National Inst. of Health	5-U01-ES019472-04	7/1/2010	6/30/2015	Pregnancy, Obesogenic Environments, and Basal-like Breast Cancer	403,291
Recruitment	Troester, Melissa	National Inst. of Health	3-U01-ES019472-04S1	8/28/2012	5/31/2014	Pregnancy, Obesogenic Environments, and Basal-like Breast Cancer - Supplement	92,168

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Recruitment	Valdar, William	National Inst. of Health	5-RO1-DK088975-04	7/1/2010	6/30/2015	Genome-wide Fine-mapping of Metabolic Traits in Heterogeneous Stock Rats - Subcontract with the Medical College of Wisconsin	28,838
Recruitment	Valdar, William	National Inst. of Health	1-RO1-GM104125-02	9/1/2012	8/31/2017	Statistical Modeling of Complex Traits in Genetic Reference Super-Populations	232,648
Recruitment	Vaziri, Cyrus	National Inst. of Health	5-R01-ES009558-17	8/1/1998	4/30/2017	A Novel Carcinogen-Induced Cell Cycle Checkpoint	326,340
Recruitment	Vaziri, Cyrus	National Inst. of Health	5-R01-ES016280-05	8/1/2008	5/31/2014	A Novel Role for the Franconi Anemia Pathway in Replication of B[a]P-Adducted DNA	293,736
Retention	Wallen, Eric	EDAP Technomed	G050103 EDAP TMS SA	10/16/2008	12/31/2017	ADAP Ablatherm Integrated Imaging High Intensity Focused Untrasound (HIFU) Indicated for Treatment of Low Risk, Localized Prostate Cancer	177,281
Recruitment	Wan, Yisong	Lupus Research Institute	Not Assigned	1/1/2011	12/31/2013	Functional Instability of Treg Cells in SLE	150,000
Recruitment	Wan, Yisong	Multiple Sclerosis Society	Not Assigned	10/1/2012	9/30/2015	Therapeutic Effect of Dihydro-Artemisinin on MS Through Suppressing Immune Response	185,752
Recruitment	Wan, Yisong	National Inst. of Health	1-R01-AI097392-02	5/1/2012	4/30/2017	The Roles of Gata3 in Controlling Treg Function	353,389
Recruitment	Wang, Gang	National Cancer Institute	1-R00-CA151683-04	9/1/2012	8/31/2015	Cancer Epigenetics: Understanding Histone Methylation in Leukemia Stem Cells	249,000
Recruitment	Wang, Zhuang (Andy)	Lung Cancer Research Foundation	Not Assigned	12/1/2012	11/30/2013	Development of nanoparticle formulations of DNA double-strand break repair inhibitors to improve chemoradiotherapy	50,000
Recruitment	Wang, Zhuang (Andy)	National Cancer Institute	1-R01-CA178748-01	8/15/2013	5/31/2018	Nanoparticle Formulations of DNA Repair Inhibitors to Improve Chemoradiotherapy	312,079
Recruitment	Wang, Zhuang (Andy)	National Cancer Institute	1-R21-CA182322-01	9/19/2013	8/31/2016	Development of 3D Organ-Specific Models of Colorectal Cancer Metastasis	194,451
Recruitment	Weiss, Jared	Acceleron Pharma, Inc	A041-03	3/27/2012	3/26/2015	An Open-label Phase 2 Study of ACE-041 in Patients with Recurrent or Metastatic Squamous Cell Carcinoma of the Head and Neck	26,788
Recruitment	Weiss, Jared	Celgene Corporation	LCCC 1103/ABX 270	9/8/2011	9/7/2014	A Phase II Study of Carboplatin, Nab-Paclitaxel and Cetuximab for Induction Chemotherapy for Locally Advanced Squamous Cell Carcinoma of the Head and Neck	21,000

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Recruitment	Weiss, Jared	Celgene Corporation	LCCC 1210	8/29/2012	8/29/2014	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	1,283
Recruitment	Weiss, Jared	GlaxoSmithKline	LCCC 1125	6/26/2012	6/25/2015	Multimodality Risk Adapted Therapy Including Carboplatin/Paclitaxel/Lapatinib as Induction for Squamous Cell Carcinoma of the Head and Neck Amenable to Transoral Surgical Approaches	24,040
Recruitment	Weiss, Jared	OSI Pharmaceuticals	LCCC 1123	5/15/2012	5/14/2015	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	49,518
Recruitment	Weiss, Jared	Synta Pharmaceuticals	9090-14	5/29/2013	5/26/2016	A Randomized, Phase 3 Study of Ganetespib in Combination with Docetaxel Versus Docetaxel Alone i nPatients with Advanced Non-Small-Cell Lung Adenocarcinoma	14,080
Recruitment	Weiss, Jared	University of Pennsylvania	UPCC15039	3/10/2011	3/9/2014	A Phase II Study of Capecitabine and Lapatinib in Squamous Cell Carcinoma of the Head and Neck - Subcontract with University of Pennsylvania	40,200
Theme Invest (HTS)	Wilhelmsen, Kirk	National Inst. of Health	5-R01-DA030976-04	9/30/2010	5/31/2015	Deep Sequencing Studies for Cannabis and Stimulant Dependence	3,150,292
Recruitment	Williams, David	National Inst. of Health	PD302900-SC-105276	7/1/2013	5/31/2014	Dissection of the Structural Basis of MEIG1 in Assembling Sperm Flagella - Subcontract with Virginia Commonwealth University (VCU)	10,588
Recruitment	Williams, David	National Inst. of Health	PD300785-SC105154	7/1/2013	12/31/2014	Human Folylpolyglutamate Synthetase and Cancer Therapeutics - Subcontract with Virginia Commonwealth University (VCU)	6,177
Recruitment	Wood, Jr, William	National Inst. of Health	0000739817	5/1/2012	8/31/2013	Fluorescence Conjugated Antibodies and Flow Cytometry Analysis Pilot 1 - Subcontract with Fred Hutchinson Cancer Research Center - Woods Pilot 1	47,465
Recruitment	Wood, Jr, William	National Inst. of Health	0000739819	5/1/2012	8/31/2013	Fluorescence Conjugated Antibodies and Flow Cytometry Analysis: Project 2 - Subcontract with Fred Hutchinson Cancer Research Center	47,465
Recruitment	Wu, Jing	MD Anderson Cancer Center	BTTC09-01	7/31/2013	7/31/2016	A Phase I-II Trial Everolimus and Sorafenib in Patients wtih Recurrent High-Grade Gilomas - MD Anderson Subcontract	5,000

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Recruitment	Wu, Jing	University of Texas Medical Branch	BTTC11-01	3/14/2012	3/14/2014	Randomized, Double-Blind , Placebo-Controlled Trial of Lacosamide for Seizure Prophylaxis in Patients with Malignant Gliomas - Subcontract with University of Texas MD Anderson Cancer Center	5,000
Innovation Award	Xiong, Yue	National Cancer Institute	5-R01-CA163834-02	3/1/2012	2/28/2017	Mechanisms of Metabolic Gene Mutations in Cancer	288,674
Recruitment	Yang, Yang	National Inst. of Health	5-K01-AG036745-04	8/1/2010	7/31/2015	Sex Differences in Health and Longevity: A Social and Biodemographic Approach	120,339
Innovation Award	Yeh, Jen Jen	Lustgarden Foundation	Not assigned	5/1/2013	4/30/2014	Rational identification of combination strategies for BKM120 therapy / Kinome landscape of pancreatic cancer	326,708
Innovation Award	Yeh, Jen Jen	National Cancer Institute	5-R01 CA140424-04	4/8/2010	1/31/2015	Targeting Ras-Ral GEF-Ral effector signaling for pancreatic cancer treatment	280,014
Recruitment	Zamboni , William	American Brain Tumor Association	NA	7/1/2012	10/31/2013	Nanoparticle Agents for the Treatmetn of Metastatic and Central Nervous System Malignancies	50,000
Recruitment	Zamboni , William	NanoVector, Inc	Not Assigned	9/28/2012	9/27/2014	NanoVector Phase II SBIR: Multifunctional Therapeutics Using Engineered Plant Virus Nanoparticles	95,000
Recruitment	Zhang, Qi	March of Dimes	5-FY12-561	2/1/2013	1/31/2015	The Role of RNA Conformational Dynamics in the Biogenesis of miR-1, an Essential MicroRNA in Cardiovascular Development and Disease	75,000
Recruitment	Zhang, Qing	National Cancer Institute	4-ROO-CA160351-03	2/1/2013	6/30/2016	Role of the EgIN2 Target FOXO3a in Breast Cancer	234,060
Recruitment	Zhang, Qisheng	National Inst. of Health	5-R01-GM098894-03	9/26/2011	8/31/2014	High-throughput Screens to Identify Modulators of Phospholipase C Isozymes	271,358
Recruitment	Zhang, Qisheng	National Inst. of Health	5-R01-GM086558-03	9/1/2011	8/31/2016	Developing Small Molecule ARFGAP Regulators to Dissect Cell Signaling	268,325
Retention	Zhou, Otto	Carestream Health, Inc.	NA	4/30/2012	4/29/2014	Portable Tomosynthesis System Using Carbon Nanotube X-Ray Source Array	150,000
Retention	Zhou, Otto	National Cancer Institute	5-R01-CA134598-04	5/1/2009	4/30/2014	Next Generation Digital Breast Tomosynthesis Scanner	395,157
Retention	Zhou, Otto	US Dept of Homeland Security (Duke University)	12-DHS-1035	9/23/2011	9/22/2013	X-Ray Scatter and Phase Imaging for Explosive Detection - Duke University Subcontract	180,775
Theme Invest (CC)	Zou, F	National Inst. of Health	2-R01-GM074175-07	4/1/2006	8/31/2015	Robust Methods for Complex Trait Mapping with Collaborative Cross	214,945

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UCRF	Current PI	Sponsor	Number	Begin Date	End Date	Title	Annual Total Cost $
Theme Invest (Drug)	Zylka, M	National Inst. of Health	5-R01-NS067688-05	9/25/2009	8/31/2014	Harnessing Ectonucleotidases to Treat Chronic Pain	708,206
TOTAL							**105,827,845**