**Facilities and Other Resources**

**Duke University**

[**https://www.duke.edu**](https://www.duke.edu)

This project will be conducted at Duke University, a private institution created in 1924 by James Buchanan Duke as a memorial to his father, Washington Duke. It consists of 10 schools, which had 6,471 undergraduate and 8,379 graduate or professional students enrolled in Fall 2014. As of fall 2014, the most recent statistics available, there are 3,398 total faculty and 35,998 employees, the majority of whom work for the medical center and health system. Duke’s campus is located on 939 acres in the city of Durham, NC, which itself is part of the Research Triangle area of North Carolina. Duke University is led by an executive team consisting of: President Richard Brodhead, Provost Sally Kornbluth, Executive Vice President Tallman Trask III, and Dr. A. Eugene Washington, Chancellor for Health Affairs and President and CEO of the Duke University Health System. The Dean of the School of Medicine is Dr. Nancy Andrews. President Brodhead reports to the Duke University Board of Trustees.

A major research university, Duke includes schools of nursing, medicine, engineering, environment, divinity, law, business, public policy, and arts and sciences. Because its schools are located on a single campus in Durham, NC, the availability of a wide range of research expertise is available to all faculty. Moreover, Duke’s institution-wide dedication to knowledge in the service to society has generated numerous opportunities to engage with communities in Durham and around the globe. Duke is a strong supporter of interdisciplinary collaboration, with 6 interdisciplinary institutes, 4 interdisciplinary initiatives, and dozens of interdisciplinary research centers.

**Duke Health (formerly Duke Medicine)**

[**https://www.dukehealth.org**](https://www.dukehealth.org)

The term “Duke Health” encompasses the health-focused entities at Duke, including the Health System, Medical Center, School of Nursing, and School of Medicine. The dual role as Chancellor for Health Affairs and CEO and President of DUHS is the Chief Executive responsible for Duke Health (A. Eugene Washington), with oversight from President Brodhead and the Board of Trustees.

The Duke University Health System is Duke’s patient care umbrella and provides most patient care for the City of Durham, a substantial portion of care in the Research Triangle area of North Carolina, and care for many referrals from across the state and country. Its network links the tertiary care Duke University Hospital with regional and community hospitals in Durham, Raleigh, and nearby counties and with specialty and primary care practices across the region and in community settings with particular focus on managing chronic disease. Duke is consistently ranked in the top 10 hospitals and top 10 medical schools by US News & World Report and they named Duke University Hospital as the 2015-16 "Best Regionally Ranked Hospital.” The Health System has annual operating revenue of more than $2 billion and employs over 14,000 people. There are almost 900 residents and fellows and 1,700 clinical faculty. In FY 2010, health system-wide there were over 61,000 inpatient admissions and 1.8 million outpatient visits, a large portion of which are individuals over 65 years of age – the region’s population is both growing and aging. Duke Health System also conducts a great deal of work in the community, including operation of school-based wellness clinics, neighborhood clinics, and chronic disease management programs for Medicaid participants in their homes. In short, Duke has an outstanding milieu for the conduct of translational and clinical research related to patients with chronic conditions including kidney disease, cardiovascular disease, and hypertension. Duke’s primary hospital and outpatient facilities include: 1) Duke University Hospital, consistently rated as one of the best hospitals in the United States, is known around the world for its outstanding care and groundbreaking research, it has 957 inpatient beds and offers regular and intensive care inpatient units, comprehensive diagnostic and therapeutic facilities, including a regional emergency/trauma center; a major surgery suite containing 51 operating rooms; an endosurgery center; an Ambulatory Surgery Center with nine operating rooms and an extensive diagnostic and interventional radiology area; 2) Duke Regional Hospital -- a 369 bed acute care community hospital serving residents of Durham and surrounding counties, offering a comprehensive range of medical, surgical and diagnostic services, including orthopedics, weight loss surgery, women's services, and heart and vascular services; 3) Duke Raleigh Hospital -- an acute care facility, with special areas to care for the entire family from newborns to seniors; 4) Duke University Affiliated Physicians -- a network of 180 physicians in 10 primary specialties, formed in 1994 and covering 14 locations across several counties; 5) Private Diagnostic Clinic (PDC) -- the PDC Clinic is an integrated, multi-specialty faculty practice offering pediatric and adult specialty services, urgent care facilities, and prevention and wellness services; and 6) Community Clinics (CPDC) – a network of Duke University Faculty and Duke Clinic physicians who provide care to the surrounding communities.

**Duke University School of Medicine**

[**https://medschool.duke.edu**](https://medschool.duke.edu)

The Duke University School of Medicine is among the top research medical schools in the country; it is annually ranked among the top 10 schools in funding from the National Institutes of Health and in the top 10 schools by U.S. News and World Report. Its primary teaching hospital is Duke University Hospital, which has Magnet in Nursing status and is consistently ranked in the top 10 hospitals by U.S. News and World Report. The medical school’s most recent annual research expenditures were over $600 million of which the vast majority is from federal contracts and grants, including roughly $330 million from the NIH.

Duke hosts more than 50 institutional training grants (T & K level awards), which together support nearly 300 pre- and post-doctoral fellows and junior faculty and 100 individual fellowships. About 15 percent of Duke medical students are enrolled in the Medical Scientist Training Program, which leads to awarding of both MD and PhD degrees. The medical school has a rich history of research training thanks to 25-plus years of reserving the full third year for student research or related scholarly pursuits. In 2011, the first cadre of students entered the school’s new Primary Care Leadership Track, a four-year curriculum that will teach and train primary care physicians in team-based care, continuity of care, preventative and personalized care, and other emerging aspects of American health care in the 21st century.

**Duke Department of Medicine**

[**https://medicine.duke.edu**](https://medicine.duke.edu)

The Duke Department of Medicine is the largest of the departments within the Duke University School of Medicine. The Department serves as the academic home for more than 1,600 faculty, staff, residents, and fellows engaged in research, education, and patient care. The Department has 14 subspecialty divisions which are: Cardiology; Nephrology; Clinical Pharmacology; Endocrinology, Metabolism, and Nutrition;

Gastroenterology; General Internal Medicine; Geriatrics; Hematological Malignancies and Cellular Therapy; Hematology; Infectious Diseases; Medical Genetics; Medical Oncology; Pulmonary, Allergy, and Critical Care Medicine; and Rheumatology and Immunology.

**Duke Division of Nephrology**

[**https://medicine.duke.edu/divisions/nephrology**](https://medicine.duke.edu/divisions/nephrology)

Within the inpatient facilities at Duke University Medical Center and the immediately

adjacent Durham Veterans Affairs Medical Center, the Duke Division of Nephrology operates four services. These include: (1) the Acute Nephrology Service at DUMC; (2) the 7800 Transplant Service and (3) Inpatient Dialysis Service at DUMC, and (4) the VA Nephrology Service. The Acute Nephrology Service performs nephrology consultation on most of the wards in Duke Hospital, concentrating specifically on patients with

acute renal failure in the intensive care units. Each year ~150 kidney transplants are performed at DUMC. The Transplant Service provides care for patients with kidney or kidney/pancreas transplants admitted with medical problems, patients in the Emergency Room and those patients awaiting imminent deceased donor renal transplantation. The Inpatient Dialysis Service provides oversight for maintenance dialysis patients who have

been admitted to the hospital except those in the intensive care units. The VA Nephrology Service provides general nephrology care for veterans at the Durham VA Medical Center, including acute and chronic dialysis, inpatient consultation, outpatient services and pre- and post-transplant care. Along with its requisite outpatient general nephrology and transplant clinics, the Division also operates a network of 8 outpatient dialysis units providing services to more than 700 patients with end stage renal disease (ESRD). The breadth of our clinical program provides an outstanding environment for clinical training and access to sufficient patient volumes to support clinical research studies. The Division of Nephrology houses multiple externally funded research programs: basic and clinical aspects of hypertension and diabetic kidney disease; pathogenic roles of hypertension and FGF23 in development of left ventricular injury, heart failure and death; translational and clinical research focused on the effects of

disordered mineral metabolism, FGF23 and acid-base homeostasis on chronic kidney disease (CKD) progression and cardiovascular disease (CVD); effects of diet and dietary interventions on blood pressure, FGF23, and disparities in CKD-CVD; and mechanisms of sudden death in end stage renal disease. Duke Nephrology faculty have national and international reputations for excellence in research and education with a

robust pipeline of trainees. Nephrology physician-scientists maintain dual clinical and research programs, have outstanding track record with trainees, and integrated across campus with basic and clinical departments, other Centers and Institutes, and collaborative programs. For more than 50 years, the Division of Nephrology has been a leader in all aspects of renal medicine.

**Duke O’Brien Center for Kidney Research (DOCK)**

[**http://www.dukekidneycenter.org**](http://www.dukekidneycenter.org)

The Duke O’Brien Center for Kidney Research (DOCK) is supported by an established administrative infrastructure that is housed in the Division of Nephrology. This integration into Duke’s existing administrative structure supported DOCK’s initial rapid launch in 2012 and will help optimize its continued operational and scientific success. This support ensures our Center’s efficiency and frees our team to focus on the science. The DOCK provides an opportunity to focus this unique combination of resources onto one of the most daunting clinical problems facing the kidney community, and indeed one of the most daunting problems facing patients with kidney disease, since cardiovascular disease is the leading cause of death among patients with kidney disease. Furthermore, the existing collaborative relationships between DOCK researchers with relevant expertise across kidney disease and cardiovascular disease form our foundation, allowing us to have meaningful impact. Finally, the scope of our Core services spanning basic discovery to support for clinical trials is a powerful mechanism for facilitating movement of ideas and discoveries between bench, bedside, and populations.

**Duke Kidney Transplant Program**

[**https://www.dukehealth.org/treatments/transplant-program/kidney-transplant**](https://www.dukehealth.org/treatments/transplant-program/kidney-transplant)

The Duke Kidney Transplant Program is a nationally recognized kidney transplant program that cares for patients in all phases of kidney transplantation. In 1965, the Program performed the first kidney transplant in the state of North Carolina; now, 50 years later, more than 3000 patients have been transplanted at Duke. The multidisciplinary team consists of 3 full time transplant nephrologists, 8 abdominal transplant surgeons, 12 coordinators, 2 program specialists, 3 secretaries & a fully dedicated transplant scheduling hub.  The transplant program receives nearly 1200 referrals each year with an annual growth rate of 10%, of which 60% are evaluated & 40% are listed, with an average wait list size of 650 patients (~70% active, status I) & a wait list mortality under 1%. The program transplants ~ 160 patients each year (140 kidneys alone; 20 kidneys transplanted with other organs, including liver, pancreas, lung & heart) 40% of which were living donors; approximately 25% of the deceased donor transplants come from African American donors.  The program operates out of the Duke Hospital Clinic (2C) in conjunction with the Liver Transplant Team. There, the providers have daily clinic for return patients (20 to 25 nephrology return visits per day) & operate two to three new patient clinics (10 evaluations per session) per week. Transplant patients are cared for in the inpatient hospital, which is a 957 bed, tertiary care hospital, which was ranked in the top 15 nationally by US News & World Report for 2014.

The Kidney Transplant program is dedicated to basic, translational & clinical research. There are currently 4 industry sponsored trials at Duke with two more coming on line. We operate an Abdominal Transplant Repository in to which we longitudinally bank serum, plasma, urine, peripheral blood mononuclear cells & biopsy specimens. Our repository has recently merged with that of Dr. Alan Kirk, Chair of Surgery at Duke. To support our research mission within the Abdominal Transplant Division, we employ 3 full time research nurses who reside in our Transplant Office space in the Hanes House, adjacent to our Clinic space. These coordinators provide research support 24 hours per day, 7 days per week, including consenting patients & collecting specimens for the Repository. There are currently 2 NIH supported trials utilizing specimens from the Repository. Clinically, we are actively involved with Ebony Boulware, MD & her TALKS study, aimed at increasing living donation rates amongst African American recipients and we participate in and contribute to the RaDIANT study (PIs Emily Patzer & Stephan Pastan) which aims to understand and eliminate racial disparity in kidney transplantation in the southeastern United States (ESRD Network 6).

The Duke Transplant Program has provided clinical data to studies in the past & therefore already has a robust, accurate & timely way to furnish and analyze data through Duke’s electronic medical record (MaestroCare). Dr. Ellis has dedicated office space, computer access & administrative support to execute the activities requested.

**Duke Office of Clinical Research (DOCR)**

[**https://medschool.duke.edu/research/clinical-and-translational-research/duke-office-clinical-research**](https://medschool.duke.edu/research/clinical-and-translational-research/duke-office-clinical-research)

The Duke Office of Clinical Research (DOCR), led by Denise Snyder, MS, RD, LDN, the Associate Dean for Clinical Research in the School of Medicine, provides standardized navigation, tools, and training for the start-up, conduct, and close-out of on-site clinical research. DOCR teams comprise more than 75 trained research professionals who support training, education, and mentorship for investigators, staff, and students. DOCR offers support in many areas, including: grant and budget development support and review, IRB protocol development, data management and honest broker services, recruitment plan development and review, data security planning, mHealth support, regulatory policy navigation, and support of study operation via a research coordinator pool. In collaboration with the Office of Research Informatics, DOCR also provides data and infrastructure support spanning analyses of small data sets to large health informatics initiatives. Through the Duke Clinical and Translational Science Award (CTSA), DOCR offers a suite of training and mentorship to help early-career clinical and translation investigators develop robust and efficient research practices. Individual REDCap and Maestro build consultations as well as study planning sessions are offered by a team of seasoned scientists and coordinators to guide the development of a streamlined plan for study operation; from patient enrollment processes, through data access and security practices, to robustly planned analysis and reporting. Grant review, manuscript review, and mentorship/training plan development services are also provided. Since inception of DOCR study planning and grant review services approximately 140 individual investigators have taken advantage of these CTSA-subsidized services. Over 270 scheduled Research management team consultations occurred in 2016, in addition to numerous office hour consultations. During the same time, DOCR provided CT.gov registration support for 79 investigators, reporting support for 24 investigators, Maestro Care builds for 302 investigators, and Beacon builds or order sets for 154 investigators. In addition, over 30 clinical research-specific training courses are offered at least annually.

**Duke Clinical Research Institute**

[**https://dcri.org**](https://dcri.org)

The Duke Clinical Research Institute (DCRI) is the world’s largest academic clinical research organization. We combine the clinical expertise and academic leadership of a premier teaching hospital with the full-service operational capabilities of a major contract research organization. With over 1300 faculty and staff, the DCRI is capable of conducting any clinical research project, from the smallest pilot study to truly global megatrials, medical device trials to outcomes and quality of life analyses. Our experience stretches from Phase I to Phase IV and beyond, encompassing post-approval analyses and health economics.

We provide every service needed for successful research, including project management, data management, site management and clinical monitoring, biostatistics, safety surveillance, and medical communications. This full portfolio of abilities means our clients, who include pharmaceutical and medical device makers, biotech companies, and government agencies, can find a tailored research plan that meets their needs.

But without effective and powerful communications, all of that research cannot achieve the DCRI’s mission of improving the practice of medicine. Our faculty focus strongly on disseminating research results, publishing more than 600 articles per year in peer-reviewed journals. Their effects on patient care and the state of medicine are felt around the world. The DCRI has:

* Conducted studies at more than 37,000 sites in 65 countries
* More than 1.2 million patients enrolled in DCRI studies
* More than 9,300 publications in peer-reviewed journals
* More than 1000 Phase I-IV trials and outcomes research projects completed
* More than 5,000 investigators worldwide

**Duke Clinical and Translational Science Institute**

[**https://www.ctsi.duke.edu**](https://www.ctsi.duke.edu)

The administrative and leadership of the Duke Clinical and Translational Science Award (CTSA) is provided by the Duke Clinical and Translational Science Institute (CTSI). The CTSI was established in August 2016 as the academic hub for accelerating the translation and implementation of scientific discoveries into health benefits for patients and communities. The CTSI replaces the Duke Translational Medicine Institute (DTMI). Building on efforts begun in 2006 by DTMI, the CTSI will focus on leveraging the vast research resources at Duke University and facilitating collaborations that provide or enhance the infrastructure, education, and resources needed to take promising ideas from concept, through development and testing, and into patient care. The Institute will encompass faculty and staff along the entire spectrum of translational science – from early research in the laboratory, through clinical trials in humans, to the successful implementation of new ideas in clinical and community settings. The goal of the CTSI is to serve as a catalyst for translational science by facilitating collaborations across Duke departments, institutes, schools and the community that help us advance health together.

In October 2006, Duke received one of the first Clinical and Translational Science Awards (CTSA) from the National Institutes of Health, which is now represented at Duke as the CTSI. The CTSA is the NIH’s largest single investment in biomedical research. The awards are given to institutions to create academic homes for translational research. The goal is to address the development and implementation of national standards and best practices for the full range of translational medicine – from discovery science through clinical research and community health. In October 2013, the NIH renewed Duke’s CTSA grant, committing to $47 million over five years. Duke uses the CTSA funds to provide resources such as biostatistical and regulatory expertise, funding to move ideas from the laboratory through early-phase clinical trials, project management support, data sharing and informatics tools, and education for current and future translational medicine researchers. Dr. Ebony Boulware is the Principal Investigator for Duke’s CTSI. As a CTSA award recipient, Duke is part of a consortium that includes more than 60 institutions across the country.

**Duke Center for the Study of Aging and Human Development**

[**https://sites.duke.edu/centerforaging/**](https://sites.duke.edu/centerforaging/)

The Center for the Study of Agingand Human Development at Duke is a resource for the entire Duke University and Medical Center community with 130 associated faculty members spread across many departments of both schools. The Offices of the Director and some of the most closely associated faculty and staff are located in an 18,000 square foot wing of the Medical Center, adjacent to the main university campus and to Duke's biomedical research buildings. The Directors office also houses the administrative personnel funded by the Aging Center to provide financial and grants management for the Duke OAIC. The Center's computing and statistical laboratory with several interconnected workstations and multiple terminals permits easy access to large databases and statistical analysis software packages. Both faculty and trainees can also access this facility through personal and laptop computers throughout the building or via modem or DSL facilities from other campus locations or at home (through use of Virtual Private Network for security). Statistical support to aid investigators and trainees in planning studies, analyzing data and learning how to use statistical software packages is also available in the computing laboratory. This expert statistical assistance is freely available and given through one-on-one tutoring so trainees and faculty can learn to develop the most appropriate study designs and use the most effective data analysis programs available. On the same hallway as the computing laboratory is a social science data archive with multiple resources and local help for interpretation and recoding problems with these data sets if this should be necessary. The Aging Center also maintains a subject registry to aid investigators in finding appropriate human subjects for their research and to ensure that investigators keep within the appropriate guidelines for human subject research. The Aging Center houses the NIA funded Claude Pepper Older Americans Independence Center which has been funded for over 25 years. The Center also houses a post doctoral research training program (T32) in aging which has been continuously funded for the past 28 years and provides an outstanding source of trainees to work with the Duke OAIC in areas of mutual interest.

**Duke Cancer Institute**

[**http://www.dukecancerinstitute.org**](http://www.dukecancerinstitute.org)

The Duke Cancer Institute (DCI), a National Cancer Institute (NCI) Designated Comprehensive Cancer Center, is the home of coordinated multidisciplinary oncology care, treatment, research and training. Patient care and clinical research activities are carried out at the main outpatient clinical center, a 267,000-square-foot state-of-the-art facility that sits adjacent to Duke University Hospital on Duke University’s Medical Center campus, as well as at clinical sites in the surrounding area. DCI member’s cancer research laboratories occupy over 100,000 square feet of lab space, including nearly 30,000 square feet of laboratory space in a building newly dedicated to cancer research. The DCI cares for more than 60,000 individuals each year, representing virtually every county in North Carolina and every state in the nation. More than 300 clinicians and researchers within the DCI represent 19 basic and clinical departments. These researchers are dedicated to a broad spectrum of cancer research and the translation of that research into the latest in patient care. The DCI comprises eleven disease-site groups within nine approached-based NCI Research Programs representing areas of specialized expertise and focus on basic, translational, clinical and population sciences research. The disease-site programs include Brain and Spinal Cord Tumors, Breast, Gynecologic, Thoracic, Gastrointestinal, Hematologic Malignancies and Cellular Therapy, Genitourinary, Head and Neck, Endocrine Neoplasias, Melanoma, Sarcoma and Pediatric cancers. The approached-based programs include Tumor Biology, Cancer Genetics and Genomics, Cancer Control and Population Sciences, Neuro-Oncology, Women’s Cancer, Hematologic Malignancies and Cellular Therapies, Solid Tumor Therapeutics, Radiation Oncology and Imaging and Developmental Therapeutics. In addition, the DCI together with the Duke School of Medicine supports 13 formal and 4 developing Shared Resources that provide access to technologies, services, and scientific consultation.

**Shared Resources of DCI**

Bioinformatics:The Bioinformatics Shared Resource supports complex genomic data management, data integration, computing and statistical analysis. It provides high-quality, service-oriented, coordinated and cost efficient bioinformatics infrastructure which increases collaborations across DCI programs, and among the DCI, other Duke programs and external investigators. It adheres to sound data provenance and statistical principles, literate programming, and reproducible analysis and covers every facet of analysis of high-dimensional genomic data, from the design stage to preprocessing (background, normalization and summarization of RNA microarrays; genotype and copy number calling from genome-wide association study [GWAS] platforms; and alignment, normalization (RNA-seq) and SNV calling (DNA-seq) of next-generation sequencing [NGS] platforms), high-level association analyses with complex phenotypes, and genomic annotation of results.

Biostatistics:The Biostatistics Shared Resource (BSR) provides access to state-of-the-art expertise in biostatistics methods for study design, analysis, and reporting. The BSR has embedded Masters and Doctoral level biostatisticians in each disease group and Program to provide ongoing assistance and collaboration in the development of research, grant applications, and clinical protocols from concept, active trial operations to publications of study outcomes and results. This service extends to translational research and clinical trials, as well as health services research, observational studies, epidemiology, basic sciences, and others. The BSR participates in and co-leads the development and testing of appropriate systems for trial data management and linkages through Medidata Rave, Medidata Balance, RedCap, and other tools. It also provides assistance with clinical trial compliance, reporting, oversight and provides scientific review of all research protocols.

Biospecimen Repository and Processing Core:The Biospecimen Repository and Processing Core/Shared Resource (BRPC) provides investigators fresh, frozen, or paraffin-embedded solid tissue samples, extracted DNA/RNA, serum, plasma, and PBMC DNA necessary for their research. The BRPC functions with IRB approval and obtains informed consent of patients willing to donate tissue samples to research. Patients may consent to donate “excess tissue” from surgical events as well as “additional tissue” (paired needle core breast biopsies, for example) along with blood samples. The BRPC functions under the favored “honest-broker” model of biobanking.

The director of the BRPC is a pathologist responsible for maximizing patient tissue available for research while ensuring that sufficient, intact tissue is available for clinical diagnostic assessment and reporting. Governance of biospecimens is provided by disease group leadership. The BRPC provides investigators with fee-for-service *a la carte* services such as archival sample recut requests, DNA/RNA extraction on non-BRPC samples, and non-BRPC-consented research tissue embargo services. BRPC meets the needs of researchers requiring retrospective access to clinical tissue archives under their own IRB-approved protocol by providing assistance with cohort identification, block selection, and facilitation of technical work under this cost recovery model. BRPC advocates for maximized research access to human tissue samples while maintaining compliance with federal regulations.

Cancer Center Isolation Facility:The Cancer Center Isolation Facility (CCIF) provides the physical plant and supports work with hazardous materials at biosafety level 2 or 3, recombinant DNA, chemotherapeutics, as well as the maintenance of immunosuppressed and specific pathogen free rodents. Immunocompromised mice (outbred athymic nude mice and inbred Nod SCID gamma (NSG) mice) are produced at a reduce cost for DCI projects and are available to all investigators who have an approved IACUC animal protocol. The CCIF also maintains numerous xenograft lines derived from both pediatric and adult primary and metastatic tumors, including various brain tumors, sarcomas, melanomas, and breast cancers. CCIF provides assistance with breeding services, veterinary or diagnostic services, animal and experimental protocol development, inoculation or testing of cell lines, preferable location of such inoculations, and other information pertinent to performing safe and efficient research. CCIF contains facilities for the conduct of efficacy and toxicity studies that meet Good Laboratory Practice (GLP) regulations as required by the Food and Drug Administration.

**Integrative Cancer Genomics:** Duke’s campus-wide Integrative Cancer Genomics Shared Resource (ICGSR) enables comprehensive consultation, seamless management of complex projects that span multiple services, enhanced operational flexibility, and economies of scale for support services. The ICGSR provides researchers with comprehensive genomic solutions with the latest and most complementary technologies readily available including. Detection and measurement of Genetic Variation (Targeted variant discovery, SNP frequency and genotyping, Exome sequencing, Whole genome sequencing, Microbiome and Metagenomics;Functional genomic assays (ChIP-seq assays, Chromatin configuration assays (ATAC-seq, DNase-seq); Measurement of gene expression [RNA-Sequencing, RT-PCR and Fluidigm Biomark HD, Microarrays (Affymetrix and Agilent platforms), miRNA assays with arrays and sequencing, Single cell gene expression assays,vFFPE gene expression assays]

Flow Cytometry:The Flow Cytometry Shared Resource (FCSR) operates, maintains, and upgrades instrumentation for flow cytometric analysis and cell sorting of cells prepared by investigators and brought to the FCSR. In addition to cell sorting, acquiring, analyzing, archiving, and preparing flow data for publication, the FSCR staff provides consultation, technical advice, collaboration, and maintains a library to disseminate technical information to potential users. The FCSR staff has experience in all areas of flow cytometric analysis and cell sorting applications and helps investigators develop new applications, troubleshoot new protocols, and analyze data. The FSCR operates four cell sorters: a Beckman-Coulter Astrios (4 lasers), a B-C MoFlo XDP (4 lasers), a Becton Dickinson DiVa (3 lasers) and a BD FACSVantage SE (2 lasers). It also operates five cell analyzers: two BD FACSCanto II (3 lasers), a BD FACSCalibur (2 laser), a BD FACScan (1 laser) and an Amnis Imagestream X (4 lasers).

High Resolution NMR Spectroscopy:The High Resolution NMR Spectroscopy Shared Resource provides access to and technical support for state-of-the-art instrumentation essential for modern magnetic resonance spectroscopy, and links to the NMR Facility at the North Carolina Research Campus in Kannapolis, NC, which has one of only two 950MHz instruments in the United States. It provides expertise in biological NMR and stable isotope labeling techniques.

Information Systems:The Duke Cancer Institute Information Systems group (DCI IS) provides information systems in support of clinical, translational, and basic biomedical research and comprehensive computational support to enable researchers to use technology in the most efficient manner possible to accomplish their research goals. DCI IS is organized into three teams: (1) the service desk/systems team, (2) the application development team, and (3) the database management team. Staff experience includes strong proficiency in clinical trial building and management, web, application and database development, and information technology infrastructure. Resource personnel provide systems management, network administration, database development/administration, and web/application development/support, plus server and desktop support for 90 servers and for approximately 1000 users in DCI member laboratories. DCI IS also provides support for software for the DCI’s Biostatistics and Bioinformatics Shared Resources.

Light Microscopy, Optical Molecular Imaging and Analysis:The Light Microscopy Core Facility (LMCF) provides access to confocals (eight), live cell fluorescence microscopes, spinning disk, multiphoton, TIRF and more to allow fluorescence imaging of samples ranging from fixed immunofluorescence slides and live cell tissue culture models, to model organisms and intravital imaging of mice. All standard optical sectioning modalities are present - confocal, resonant scanning confocal, multiphoton, widefield deconvolution, TIRF and spinning disk confocal - allowing a variety of methods - standard imaging, live cell imaging with several modalities, long-term incubated time-lapse, laser capture microdissection, photokinetic experiments and a broad range of analysis capabilities are available. Training is provided for all aspects of use and the facility is staffed by three full-time PhD research scientists. The Optical Molecular Imaging and Analysis (OMIA) Shared Resource provides a variety of optical imaging services, technologies, equipment and expertise to support (1) Optical imaging and spectroscopy, (2) Window chamber surgery training and support, (3) User training in techniques, (4) Scientific guidance on experimental design, data analysis and interpretation.

Pharmaceutical Research:The Pharmaceutical Research Shared Resource provides a broad spectrum of pharmacological and pharmaceutical services essential to conduct preclinical and clinical research in cancer biology, drug discovery, drug evaluation. It is composed of two services: the Investigational Chemotherapy Service (ICS) and the Pharmacokinetics/ Pharmacodynamics (PK/PD) service. The ICS is a part of the Department of Pharmacy and is located within the Cancer Center Infusion Pharmacy. The ICS prepares and dispenses investigational drug products, maintains drug accountability records and investigational drug inventories according to FDA and CTEP guidelines, and provides design consultation, professional staff education, and implementation services for clinical research studies. The ICS is managed by a clinical pharmacist in the Department of Pharmacy, and is staffed by a clinical pharmacist, a clinical research coordinator and a clinical research specialist. The PK/PD services are provided by the PK/PD Core which is located in a custom-designed analytical laboratory area contiguous with the new Duke Cancer Center building.

Proteomics and Metabolomics:The Duke Proteomics/Metabolomics Shared Resource (PMSR) is a nationally recognized facility providing world-class qualitative/quantitative protein and metabolite analyses, using state-of-the-art ultra-performance liquid chromatography and tandem mass spectrometry (UPLC/MS/MS) as its primary tool. It is designed to provide all needed capabilities for mass spectrometry for identification and quantitation, including biomarker discovery and biomarker verification experiments, qualitative and quantitative metabolite characterization. For identification and biomarker discovery experiments (‘omic-scale qualitative and quantitative analyses), the laboratory is equipped with four high resolution accurate mass tandem mass spectrometers (MS/MS), each coupled to a dedicated UPLC or UPLC/UPLC system. Three of these systems are hybrid quadrupole time-of-flight systems, while the fourth system is a hybrid quadrupole-orbitrap system.

Transgenic and Knockout Mouse:The Transgenic and Knockout Mouse Shared Resource provides services for the production of custom designed, genetically altered, transgenic and gene targeted mice, as well as cryopreservation. The resource provides 1) BAC recombineering service, 2) transgenic and gene targeted mouse service, and 3) rodent husbandry service. These include: construction & design of embryonic stem cell (ESC) targeting vectors by BAC Recombineering, with primers for screening & control vector; ESC targeting, selection, PCR Screening with expanding & freezing multiple clones; validation of targeted clones by SA & LA PCR & Southern blotting; injection of validated ESC clones to create chimeric mice; breeding & expansion of chimeric mouse lines; cryopreservation of mouse embryos & sperm; DNA microinjection to produce transgenic mice; CRISPR construct microinjection into 1 cell embryos and related activities.

Clinical Trials Office:The Clinical Trials Office (CTO) provides Protocol and Data Management (CPDM) services to DCI’s extensive breadth of oncology trials. The CTO provides infrastructure for oversight and quality control functions, including centralized education and training services for clinical research personnel. The CPDM services are a joint effort between staff in the Cancer Protocol Committee (CPC), clinical trials monitoring team, Safety Oversight Committee (SOC), and DCI Information Technology (IT) shared resource to provide start-to-finish clinical trials services to Cancer Institute members. The CPDM facilitates database development, training users to collect, track, and generate reports,engaging the cancer patient community to recruit potential research subjects, reporting portfolio metrics in large collaboration-based grant applications, enabling the Protocol Review and Monitoring System to analyze data on protocol startup and approval times, and compliance with all federally-mandated ClinicalTrials.gov and NCI Clinical Trials Reporting Program (CTRP) requirements. The CPDM facilitates design and development of clinical trials in a 21CFR Part 11 compliant electronic data capture platforms such as Oracle Clinical (C3D) and NCI approved Medidata Rave. All cancer research participants are registered in Velos eResearch database.

Behavioral health and Survey Research:This Core provides extensive experience with survey design, qualitative research, and materials development that can assist investigators to answer their scientific questions across the full continuum of cancer disparities research. The BHSRC provides research consultation and technical support in three essential areas: *Needs Assessment*: to manage and implement all aspects of needs assessment research, including developing interview guides, facilitating focus groups and structured interviews, coding and analyzing qualitative data. *Survey Development*: identify or develop the survey instruments for specific study purposes. *Patient Education Materials*: Evidence-based communication services to provide researchers and clinicians with materials and strategies for study recruitment, intervention, education, and retention.

Population and Molecular Epidemiology:Population and Molecular Epidemiology (PME) Core supports collaborative cancer research needs of basic, translational, clinical studies at the population level. The PME Core assists investigators with epidemiology study design (including selection of study cases and controls), questionnaire design, interview and data collection, blood collection, processing and storage for biomarker assays, and epidemiology data analysis.

Patient-Derived Explant (PDX) Core:PDX models, generated by rapid engraftment of patient tumors into immunodeficient mice, are proving to be more clinically applicable murine models to further understand the biology underlying malignancies and to discover better treatment options for patients with malignancies. The histology, biology and drug sensitivities of PDXs are similar to the corresponding patient tumors, including after multiple passages. The PDX Core generates cancer PDXs from racially and ethnically diverse patient populations across a number of tumor types, including colorectal, prostate, lung, ovarian and breast. To date, more than 150 PDXs have been generated from both primary and metastatic tumor sites and have been passaged beyond 3 generations to ensure reliability and reproducibility in growth. In addition, the PDX Core characterizes the explants histologically and biologically, including growth rate. Subsets of the PDXs are also characterized genomically, including gene expression profiling and whole exome sequencing. Standard operating procedures ensure standardization in the development, testing and validation of the PDXs. Finally, the PDX Core also derives cell lines from the PDXs. To date, many of these cell lines have been validated for retention of histopathological features and gene expression patterns.

**Durham Veterans Affairs Health Services Research and Development Center**

[**http://www.durham.hsrd.research.va.gov**](http://www.durham.hsrd.research.va.gov)

Founded in 1982, the Durham Veterans Affairs Health Services Research and Development (HSR&D) Center’s objective is to develop strategies that enhance the delivery, quality, and cost-efficiency of primary care among veterans. These objectives are strategically pursued through support of research investigators, funded research, and teaching programs. We also maintain academic affiliations for teaching and research collaborations with Duke University and the University of North Carolina at Chapel Hill (UNC-CH). We currently support 215 full-and part-time staff, comprised of M.D. (12) and Ph.D. (16) core researchers. The Durham HSR&D Center maintains close organizational ties with the DVAMC primarily through Ambulatory Care and Medicine Service, the Geriatric Research Education and Clinical Center

(GRECC), and the VISN 6 Mental Illness Research Education and Clinical Center (MIRECC). We achieve our goals by partnering with VHA stakeholders including our medical center and VISN 6 leadership, and national VA program offices such as the National Center for Health Promotion and Disease Prevention (NCP).

Core Resources: To support our research and training goals, we have aligned faculty and staff into functional groups (Cores) that provide scientific and operational support as follows: 1) Administrative Core provides broad support including grant submissions, establishing and managing financial accounts for specific projects, human resources, acquisitions, contracting, and payroll function for faculty and staff; 2) Information Technology (IT)/Data Core provides infrastructure support for all aspects of our data acquisition and storage (including network function). This Core also helps design and test IT solutions that become central components of our interventions; 3) Implementation Lab provides support for all aspects on dissemination of research products and provides infrastructure for focused implementation of interventions discovered to be effective; 4) Biostatistics Core oversees all grant design and development; data analysis, storage, and access; and project management; 5) Health Economics Core provides methodologic expertise in all projects that utilize VA secondary data as well as cost-effectiveness analyses for our intervention studies; 6) Training Core provides leadership and mentoring for our fellowship, career development and didactic training portions of our mission; 7) Intervention Core provides multidisciplinary expertise to design, implement, and evaluate strategies that are feasible and pragmatic; and 8) Evidence Synthesis Core maintains one of four VA HSR&D funded Evidence Synthesis Projects serving operational partners as well as Center faculty for all their evidence needs.

Computing Resources and Data Protection: Our computing infrastructure is comprised of a network, end-user and server hardware, software and applications, PCs, laptops, printers, and scanners. The computer network connects the end-user hardware to shared resources such as CoE specific servers, and to local facility, VISN, and national data warehouses and computing resources. Full-time computer and network support staff support ensure efficient operation of computer equipment, network, and servers. The server room is equipped with dedicated climate control and power protection systems. Both VPN access and Citrix Access Gateway connections are available to networked equipment. The various servers provide file storage, databases and supporting tools such as report generators, web applications, and a .NET infrastructure to support various locally developed applications. The CoE maintains a full complement of sophisticated software applications for statistical analysis, project management, and data management including Microsoft SQL 2000, DatStat Illume and Discovery (web-based data survey tools), ACCESS, SAS, Stata, AMOS, SPSS, and R, as well as locally developed intervention software. All computerized data entry systems are backed by a series of related SQL data tables that reside on certified and accredited VA servers which are accessible only by designated systems administrators. CoE computer users have access to all hospital resources such as internet/intranet connectivity, CPRS, Outlook email, and hospital data storage resources. Of primary importance in all study activities is the security and protection of veterans’ protected health information (PHI). The server power protection system is configured to page IT and CoE personnel upon detecting problems and sends a test notice weekly. Data are backed up to tape and backups are run daily. CoE operating systems, database servers and internet information servers are patched monthly or more frequently for critical updates. Individual workstations, desktop PCs or laptops, are patched using the VA standard and laptops are encrypted using the VA standard tool Symantec’s Endpoint Encryption. Workstations are equipped with anti-virus and firewall software. PHI is handled according to appropriate Health Insurance Portability and Accountability Act of 1886 (HIPAA) privacy and security regulations. Research staff who work with PHI are required to complete all appropriate HIPAA and information security training.

Data Management and Systems Development: The Center has both a Statistical Core and Programming Core. Members of both Cores are integral members of the research teams with involvement from project submissions through analyses and dissemination. The Statistical Core consists of five PhD-level statistical faculty who provide both methodological expertise and project oversight in the area of data management, and six master’s-trained statisticians who perform the majority of data management and analyses (in conjunction with statistical faculty). The statisticians have extensive experience in prospect trials occurring at multiple VA sites where patients are managed within a tracking and intervention database. The Programming Core consists of three programmers who specialize in development and maintenance of study-specific databases for tracking, screening, survey administration, and intervention delivery.

The information technology solution that will serve to facilitate research activity will be based on a series of asynchronously connected database applications over which a comprehensive data model is deployed. Each database application will function independently as a discrete system. All data transactions within and between subsystems will run through controlled, secure transactions to ensure the preservation of database integrity and privacy. Study data will be maintained on secure servers for the duration of the study and for a period of time after the completion of the study that will be compliant with all VA regulations in place at the time of study closure. Access to the data is only granted to IRB-approved study personnel via approved software applications used for study participant tracking, data collection, and reporting.

All server hardware has built-in redundant systems. Technicians constantly monitor server hardware, operating system and database service performance. Workstations, laptops, and any other mission-critical devices receive periodic booster support in order to ensure high performance and secure operation. The primary database engine technology is a Microsoft SQL Server. The system is configured to notify the HSR&D IT Group if an automated process fails to run successfully. All data collected during in-person interviews is entered using our third party survey application named “DatStat Illume” running on an encrypted, password-protected laptop (www.datstat.com/). Data is stored directly onto the Illume SQL server database or in a series of XML files on the laptop until it is synchronized with the Illume server then removed from the laptop. We have chosen DatStat Illume 4.7 because of industry standard acceptance as a reliable and flexible method for collecting and storing research survey information. All data collected can be exported into a number of standard formats including SAS, MS Access, and SQL Server. We have used similar methods of data entry in our prior studies and internal audits show excellent reliability.

Space and Facilities: The Durham HSR&D Center currently occupies two floors of VA-leased space at 411 W. Chapel Hill St, Suite 500, Durham NC, which is conveniently located close to the DVAMC in approximately 22,000 square feet of space. This space includes faculty and staff offices, 6 conference rooms, patient interview rooms, and spaces with common computing resources. The Center also has 1,760 square feet of space in the main VA hospital, used primarily for patient interviewing. Access to all floors is card access only. All faculty have access to the Duke Medical Center library and all the services that it provides. This includes over 300,000 volumes, 134 print-only subscriptions and about 5,000 electronic journal submissions. The DVAMC also has an onsite medical library with inter-library loan services.

Faculty and staff at the Durham VAMC will have sufficient office space and support, including administrative, computer, data and statistical management, systems development, and library resources to be a productive and effective HSR&D Center of Innovation.

**Duke Division of General Internal Medicine**

[**https://medicine.duke.edu/divisions/general-internal-medicine**](https://medicine.duke.edu/divisions/general-internal-medicine)

The research will be conducted in the Duke Division of General Internal Medicine which is a Division of the Department of Medicine in the Duke University School of Medicine. A combined 314 faculty and staff in both clinical and research environments strive to promote excellence in patient care through new discoveries and improvements in the practice of primary and internal medicine as well as clinical, behavioral, and implementation studies that translate to advances in patient care and yield improved patient outcomes.

**Analysis and Data Management Support:** The GIM Biostatistics Core is available to provide consultation and analytic support for research and quality improvement investigations, from study conceptualization through final reporting. It is comprised of a core team of PhD and MS trained biostatisticians, led by Dr. Jane Pendergast, senior faculty member in the Duke Department of Biostatistics and Bioinformatics (B&B), and supplemented with involvement from other PhD B&B faculty as well as B&B graduate students as research assistants/interns. These individuals have expertise and experience in designing and evaluating data arising from randomized designs (e.g., clinical and pragmatic trials), human genome studies, epidemiologic studies, implementation science and health organization studies, health effectiveness, observational studies (e.g., based on health claims data (Medicare, Medicaid, Private), electronic medical health records, and federal databases (USRDS, NHANES, BRFSS, etc.). Their statistical areas of expertise are broad, including comparative effectiveness, longitudinal, genetic association studies, time-to-event, data reduction, generalized linear/nonlinear and latent variable methods. All members of the GIM Biostatistics Core are screened and hired in partnership with the Duke CTSA Biostatistics Core, housed in B&B. As such, they have access to approximate 40 B&B faculty members for help/advice, if needed. In addition to statistical expertise, access to experts in the analysis of qualitative data, database design, tracking systems, data collection systems, and custom programming are available to support all data-driven needs of the project.

In the study conceptualization and pre-award period, members of the GIM Biostatistics Core can work with researchers on grant development, study design, protocols, analytic approach and power calculations. Post-award analytic support is usually written into the grant, and if funded, it is expected that either GIM Bios Core staff members or new hires will join the research team to follow through on the work.

**Location:** The research division is located at 411 W. Chapel Hill St, Suite 500, Durham, NC in close proximity to the Duke main campus and Duke University Medical Center and occupies 5,270 square feet of space with 19 offices, 33 cubicles and 6 additional rooms (conference rooms, storage, etc.).

**Computers/Servers:**The computing environment consists of Dell, Lenovo, and Apple desktops and laptops. All machines are running a minimum of Windows 7/ OSX10.6 or higher. All machines are licensed to run Office and Symantec Anti-Virus. Per Duke policy all laptops and mobile devices are to be encrypted with either PGP or Filevault. For storage purposes, all lab and shared data is housed on our Duke servers currently running at \\duhsnas-pri\dudom\_gim. Dudom\_GIM is backed up via the guidelines below:

Every four weeks a separate backup of the GIM data is captured and retained as a "monthly" backup in a folder on the central NAS which only administrators have access to. These snapshots contain a copy of the files from that point in time and are retained for at least six years. Overall, the backups provide multiple daily snapshots for 30 days and monthly snapshots for six years.

**Duke General Internal Medicine Affiliated Research Resources, Centers and Institutes**

**Duke Primary Care Research Consortium**

[**https://www.dcri.org/our-research/primary-care**](https://www.dcri.org/our-research/primary-care)

The Duke Primary Care Research Consortium (PCRC) is a primary care research network composed of the academic and community practices within the Duke University Health System (DUHS) and surrounding communities. The original and current PCRC model consists of a group of dedicated clinical research nurses trained by the network office. The central office coordinates contract and financial services for all network practices and ensures that study milestones are completed according to timelines. Use of this model ensures quality data collection, provides enhanced allocation of site personnel, and protects the sites from fiscal responsibility for a full-time study coordinator position. The PCRC is organizationally placed within the Division of General Internal Medicine.

The current PCRC Administrative Group consists of a Director, Research Advisory Board Chair, a Project Manager, and Regulatory Manager. Rowena J. Dolor, MD, MHS has been the Director of the PCRC since its inception in 1997 and is an Associate Professor in General Internal Medicine at Duke University Medical Center. Ranee Chatterjee, MD, MPH is a PCRC faculty member and Chair of the Research Advisory Board. Dr. Chatterjee is an Assistant Professor in General Internal Medicine and a clinician at Sutton Station Internal Medicine, a Duke Primary Care practice. Megan Churchill, MHA is the Program Director who oversees all the day-to-day clinical research administrative duties of the study coordinators within the Division of General Internal Medicine (DGIM). Tara Strigo, MPH is the Director of Research Programs who supervises the regulatory aspects within DGIM and oversees all research staff within the division. The PCRC administrative group is responsible for maintaining the interface with study sponsors for administrative issues, project timelines, and milestone definition. Contracts and finances are centrally managed for all the practices within the PCRC. The Duke University Medical Center Institutional Review Board (IRB) acts as the central IRB for PCRC studies. The central office handles IRB submissions, modifications, annual renewals, and assists the study coordinator group with adverse event reporting.

The PCRC Study Coordinator Group consists of 1 Clinical Research Coordinator and 1 Clinical Research Specialist. They assist the sites in IRB submission, protocol training, patient identification, enrollment, data collection, case report form completion, and in the case of clinical trials, regulatory compliance, and patient follow-up visits. Although each of the coordinators may work on multiple ongoing studies, one coordinator is designated the protocol specialist for each study. Centralized study coordination ensures uniform training of the coordinators to improve the completeness and accuracy of data collection.

The PCRC administrative staff communicates weekly to discuss the status of study enrollment, contracts, budgets, IRB submissions or renewals, and new potential studies. Our project manager interacts with the other study staff on a weekly, if not daily, basis by electronic mail, phone or in person to discuss operational details of studies unique to each coordinator. Once month, all PCRC personnel meet monthly to review study milestones and discuss general coordination topics (e.g. recruitment strategies, regulatory issues, computer training). Communication with clinicians occurs via electronic mail, faxing, on-site practice meetings, or through daily interactions with the regional research coordinators.

Computer resources currently available to serve the extensive computing and information-sharing needs in the DCRI include over 1100 Pentium-class PC desktops linked by a fully-switched network to over 60Microsoft Windows and Sun Solaris servers and, a central storage subsystem with over 8 TB of disk space and a capacity of 32 TB. Server and storage subsystem are located in a secure, environmentally controlled room with battery and generator power backup. A high-speed enterprise backup system is implemented with both on-site and off-site storage of backup tapes. Databases are maintained with capabilities for point-in-time recovery. A 1-Gbps backbone Ethernet network with 100-Mbps to the desktop provides quick response and efficient data transfer. A secure FTP file server is used for transfer of data to and from remote sites. Internet access is restricted with a computer firewall to the Duke Medical Center Common Services Network. The computing resources also include networked laser printers, scanners for black-and-white and color scanning, and FAX services for delivery of documents from the desktop. SAS for Windows is installed on the network. DCRI also maintains multiple 4-processor Sun Sunfire servers with 8-16 GB of memory running current versions of SAS, S-PLUS, and Oracle software.

Office space for all staff and support personnel in this project is located in NC Mutual Building. This facility includes multiple conference rooms, adequate space for computer resources, and open work areas for ease of collaboration (in addition to individual office space). The PCRC research staff has three additional offices (620 square feet) at the Duke Health Center located on 4020 N Roxboro Rd Durham NC. In addition, the area includes a laboratory for processing clinical specimens and a records storage room.

Duke Primary Care: Duke Primary Care (DPC) physicians are part of a network of clinics and a continuum of care in the Duke University Health System. The network formed in 1994 and now covers over 30 locations in eight counties serving the greater Triangle (Raleigh/Durham/Chapel Hill, North Carolina) area. Over 200 providers (physicians, physician assistants and, nurse practitioners) and over 500 clinical staff provide health care to 250,000 unique patients with 540,000 clinical encounters per year. DPC clinicians provide high quality and efficient patient care through a comprehensive primary care network. They strive to respond to our community's changing health care needs. These physicians have appointments as consulting associate faculty with Duke in the respective Departments of Community and Family Medicine, Medicine, and Pediatrics. DPC supports Duke University Health System's (DUHS) mission of education, research and patient care through the development and integration of a full-service primary care network. DUHS is the dominant health care provider for the Durham community as well as the largest employer in the area. DUHS is a wholly owned subsidiary corporation of Duke University, aligned with the Medical Center and partnering with local healthcare providers.

All DPC clinics use similar computerized systems (e.g. MaestoCare/EPIC) with the full capabilities of an electronic health record for medication prescribing, scheduling, billing, laboratory and radiology results and ordering, clinical notes, and disease management. Payor mix is 23% Medicare, 5% Medicaid, 55% Managed Care, 2% Self pay, and 15% Commercial and other insurers.

**Duke Center for Population Health Sciences**

The Duke Center for Population Health Sciences aims to identify determinants of health and the most effective means for improving health. This multi-disciplinary center comprises faculty members from a variety of disciplines including epidemiology, health services research and policy, health economics, health measurement and behavior, and implementation science who share an interest in answering complex questions about the drivers of health in populations. The center fosters active collaborations with the Duke Margolis Center for Health Policy, the Duke Global Health Institute, the Center for Community and Population Health Improvement, the Duke Clinical Research Institute, the Duke University Health System, and other entities engaged in the science of population health.

**Duke Center for Integrative Health Research**

[**https://www.dukeintegrativemedicine.org**](https://www.dukeintegrativemedicine.org)

The Duke Center for Integrative Health Research (DCIHR) is a multidisciplinary research center dedicated to the optimization of health and wellbeing using methodologies based in complementary and integrative medicine, nutrition, fitness, and health behavior change. The purpose of the center is to understand the biological, physiological, psychosocial and spiritual effects of existing and potential therapies, and disseminate key research findings into clinical practice. The DCIHR is driven by four core areas of research: (1) diet, nutrition, and supplements; (2) physical activities, manual therapies, and recovery; (3) environment; and (4) mind-body medicine. DCIHR is housed within Duke Integrative Medicine (Duke IM), an outpatient clinical space of 27,000 square foot, first-of-its-kind green facility designed with the principles of integrative medicine in mind. This $11.5 million "living laboratory" was opened in November 2006 and creates an ideal setting in which to implement integrative models of health care. An integrated café offers on-site highly nutritional options for patients and guests of Duke IM while they receive services or tour the facility. In addition to space within the integrative medicine-specific building, DCIHR has three offices dedicated solely to research personnel. DCIHR shares a 26-acre campus with the Duke Center for Living. This campus itself is composed of multiple clinical and research programs aimed to improve patients' lifestyles through mind-body-spirit approaches to medical care, such as exercise training, nutrition interventions, psycho-social education, and meditation-based approaches to care. All facilities are JCAHO-approved and handicapped-accessible. The facilities are welcoming and offer convenient parking. The design of the facilities effectively separates areas used for administrative functions, clinical services, patient education, and laboratory functions.

**Duke Palliative Care Research**

[**https://medicine.duke.edu/divisions/general-internal-medicine/patient-care/palliative-care**](https://medicine.duke.edu/divisions/general-internal-medicine/patient-care/palliative-care)

The Duke Center for Palliative Care (DCPC) is committed to improving quality of life for those with serious illness and their loved ones, through outstanding clinical care, patient- and family-centered research, and innovative educational initiatives. Clinical services include an inpatient consult service, outpatient clinic, and hospice and community care programs. Research efforts focus on improving patient and family biomedical, psychosocial and spiritual needs through attention to areas of communication, decision-making, psychosocial interventions and healthcare disparities. The team has particular expertise in intervention development, testing and implementation. Educational initiatives are aimed at increasing the information needs of patients and families and equipping clinicians with primary palliative care skills. The Palliative Care Fellowship is an ACGME-approved 12-month program providing physician training for physicians leading to board certification in palliative medicine.

The Duke Center for Palliative Care (DCPC) is guided by a population-based approach to palliative care, which incorporate principles of education, outreach, analysis, and policy to improve palliative care in communities. In the same way that public health strategies have been used to improve the health of communities, DCPC is developing and evaluating innovative strategies of provider education, social marketing, community outreach, and scalable interventions to improve palliative care outcomes for communities. The Center’s overarching goal is to integrate palliative care resources into the fabric of health systems and communities in a way that is community-focused, payer-agnostic, and independent of demographic and socioeconomic characteristics.

DCPC faculty come from the Duke University School of Medicine and School of Nursing, and from schools and Institutes across the Duke campus. Faculty are funded by grants from the National Institutes of Health, the Department of Veterans Affairs, and a wide range of private foundations.

**Duke Center for Community and Population Health Improvement**

[**https://www.dcri.org/HealthServicesResearch/duke-center-for-community-and-population-health-improvement**](https://www.dcri.org/HealthServicesResearch/duke-center-for-community-and-population-health-improvement)

The Duke Center for Community and Population Health Improvement (CCPHI) is a multi-disciplinary center that leverages academic, health system, and community partnerships to improve community and population health. Recently established in 2015, the Center builds from a long-standing history of community engaged programs and partnerships at Duke to (1) establish shared priorities for improving regional health among partners, (2) create a relevant research and academic agenda to address community and population health needs, and (3) enhance capacity within Duke and the community to improve health through multi-sector community engagement. The Center conducts research and pragmatic programs to understand and address key biomedical, behavioral, and contextual health determinants to improve community and population health and well-being. Through four key programs, the Center tackles numerous health conditions affecting persons across the life course, while focusing on those needs viewed as most pressing by the community.

**1. Multi-sector Community Stakeholder Engagement Program.** This program engages leaders from Durham County Government, Public Health, Commerce, Justice, Safety and Social Services, and the Arts to advance shared missions around community and population health. Leaders meet quarterly to discuss ongoing local and regional initiatives, addressing common goals and establishing common agendas that can work synergistically to improve health. Through an annual Health Summit, groups from all sectors gather to establish annual priorities to partner and address health priorities.

**2. Community Engaged Population Studies Program.** This research program seeks to identify, measure, and address determinants of poor health and to establish the effectiveness and sustainability of pragmatic programs to improve and sustain community and population health and health equity. Though multiple externally funded projects, academic researchers with expertise in a broad range of methodologies, including clinical epidemiology, geospatial science, biomedical informatics, implementation science, social science, health policy, and precision medicine approaches work in concert to address high priority health needs, established through partnerships with the community. Community engagement undergirds the research program, which features (1) a standing network of established community leaders representing local non-profit organizations, local health sector leaders (including City and County Public Health agencies), local health systems, patients, and their families, (2) a standing community advisory board, (3) a program of ongoing colloquia to bring researchers together with community members to collaboratively engage in research, and (4) Duke-sponsored education and match-making programs to enhance researcher readiness to engaged with community members and to enhance community readiness for research.

**3. Policy Action Program.** This program leverages Duke leadership in population management programs sponsored by North Carolina Medicaid as well as Duke engagement in accountable care shared savings programs to identify opportunities to implement established interventions into policy supported initiatives. It also conducts funded (e.g., through foundations or government) demonstration projects to establish novel models of care for future adoption.

**4. Education and Teaching.** The Center seeks to build a pipeline of academic leaders in community and population health research through an advanced seminar series featuring lectures from senior scholars at Duke focused on methods for conducting community engaged population studies, research works in progress, and invited speakers. Attendees include students, residents, clinical and research fellows, and faculty members conducting community engaged population studies.