

THE GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

The Gillings School of Global Public Health is consistently recognized as a leading public health school. The school was ranked the top public school of public health in the nation by U.S. News & World Report (2016 edition) and placed second among all public health schools. Home to the top public health leaders and students for more than 75 years, the mission of the Gillings School is to improve public health, promote individual well-being and eliminate health inequities across North Carolina and around the world. Dedicated to our mission, the school is constantly moving forward to anticipate future health threats and accelerate public health solutions. A commitment to excellence is part of everything they do: teaching, research, scholarship, practice and bridging the gap between academic research and practical public health solutions. Our work “from the well to the world” extends to all 100 North Carolina counties, throughout the United States, and to more than 60 countries spanning 6 continents. In FY16, the Gillings School received \$83 million for global research projects.

Gillings is one of 67 schools of public health in the United States, Puerto Rico and Mexico accredited by the Council on Education for Public Health. We are comprised of 233 faculty members, 332 staff members and 1698 students from over 50 countries. We consist of 8 departments/units, including Biostatistics, Environmental Sciences and Engineering, Epidemiology, Health Behavior, Health Policy and Management, Maternal and Child Health, Nutrition, and the Public Health Leadership Program. Our newly designed MPH degree features a global health concentration designed to train professionals to solve public health problems locally and globally in partnership with governmental and non- governmental organizations, research institutions and the private sector in alignment with different cultures, contexts and resources.

An Associate Dean for Global Health leads global efforts in partnership with the Research, Innovation and Global Solutions office, who work to promote and advance the School’s global health activities in research, service, practice and teaching through partnerships, internships, outreach and communications.

Research is performed in many public health areas, having particular strengths in global health, population health, machine learning and data science, implementation science and environment. The Gillings School sponsors more than 20 specialized centers and institutes focused on critical areas of public health. In FY18, principal investigators in the Gillings School received \$194 million in external grants and contracts funding; they accounted for 22% of all external funding to UNC-CH.

Campus-Level UNC Research Centers

These pan-campus research centers report of the Vice Chancellor for Research. They are all interdisciplinary and work with faculty from multiple departments and schools to address some of the most difficult issues facing North Carolina and the world. All Centers work collaboratively with faculty from around campus, and many work specifically with NC TraCS.

The Carolina Population Center (CPC) is a community of scholars and professionals collaborating on interdisciplinary research and methods that advance understanding of population issues. The CPC works to create new knowledge about population size, structure, and processes of change, develop new sources of data to support population research, promote the development and use of innovative methodologies, build skills and capacity and train the next generation of scholars, and disseminate data and findings to population professionals, policy-makers, and the public. CPC faculty and students work together on path-breaking research to address population issues in 85 countries and across the U.S., as well as locally, in central North Carolina. Based at UNC, the center is rich in expertise, with 57 active faculty fellows (representing 15 departments in 5 schools or colleges), 67 predoctoral and postdoctoral scholars, and a highly skilled staff.

Research services include cores that work together to provide services to the center's researchers to address a wide variety of population issues. Cores are described below.

- The **Research Programming and Data Support Core** provides CPC researchers with support for original data collection, complex data set and variable creation, and statistical analysis.
- The **Web Services Core** works closely with CPC researchers to offer services and tools to provide information about the center and its projects, to disseminate data, and to create and manage databases and information management systems that improve the efficiencies of the center and its projects.
- The **Library and Research Translation Core** provides reference services, facilitates access to materials, assists with creating and managing bibliographic databases, provides assistance with manuscript reference checking, compliance with the NIH Public Access Policy, and development of publications lists for progress reports and project websites. Staff develop and disseminate media announcements, research briefs, and feature stories describing research findings to facilitate the interpretation of complex results by diverse audiences, domestically and internationally.
- The **Publications and Graphics Services Core** develops graphic presentations that facilitate interpretation of complex results by broad audiences; provides freelance editing of manuscripts; works with projects to brand their work for the web and for data collection efforts; and develops materials that are disseminated through the web, PowerPoint and electronic presentations, publications, books, and posters.

- The **Computer Systems and User Service Core** provides a state-of-the-art, stable and secure computing environment to support the research and training missions of the center, including desktop support, servers, computing hardware and software, and the web infrastructure. It works with campus IT to extend campus resources to the CPC community and not duplicate them.
- The **Spatial Analysis Core** facilitates the use of state-of-the-art spatial data and tools in population research. It promotes the incorporation of spatial perspectives and assists in project development, provides cost-effective support to CPC projects using spatial data and methods, and encourages innovation in blending of social and spatial tools and perspectives.
- The **Statistical and Spatial Methods Consultative Core** ensures that CPC researchers are using the latest and most appropriate statistical and spatial methods in their research. Faculty fellows who serve in this core assist with problems that arise, and aid CPC researchers in the interpretation of their empirical results, mostly through individual consultation. Core members also offer high-end workshops in cutting-edge techniques as well as more introductory workshops for less familiar methods when these are not covered elsewhere on campus.

The Center for Developmental Science is an inter-institutional, multidisciplinary hub for the advanced study of human development. The center is home to over 100 faculty and fellows who conduct research and provide training to undergraduates, predoctoral students, postdoctoral fellows and early career scientists through the Carolina Consortium on Human Development training program. CDS faculty specialize in as anthropology, behavioral genetics, clinical psychology, developmental psychology, developmental psychobiology, education, epidemiology, experimental psychology, internal medicine, behavioral neurobiology, nursing, pediatrics, psychiatry, public health, and sociology. Representing over 20 disciplines, CDS faculty have primary appointments at UNC, UNC-Greensboro, NC State University, NC Central University, Meredith College, Wake Forest University and Duke University.

The center comprises the following three branches that focus on training, research, and administrative support, respectively.

- The Carolina Consortium on Human Development, the center's training branch, provides developmental science educational opportunities for undergraduates, predoctoral students, postdoctoral fellows, and faculty at all levels.
- The research branch is organized around four core areas of study: developmental processes within educational settings, social and cognitive development, developmental psychopathology and health risk behaviors, and developmental methodology.
- The administrative branch provides financial, grants management, IT, human resources, and other research support services for CDS faculty and fellows as well as leadership to guide the activities of the CDS.

The Frank Porter Graham Child Development Institute researchers study parent and family support; early care and education; child health and development; early identification and intervention; equity, access and inclusion; and early childhood policy. The institute creates reports, videos, magazines, booklets, podcasts and other materials that cover a wide range of topics for parents, providers, policy makers and others. In addition, the citations database may be searched for scholarly articles, chapters, and books written by institute researchers.

The Highway Safety Research Center conducts interdisciplinary research aimed at reducing deaths, injuries and related societal costs of roadway crashes. The center currently conducts projects in alcohol impairment, driver behavior, occupant protection, pedestrian and bicycle safety, roadway design, and young drivers.

The mission of the Injury Prevention Research Center is to build the field of injury prevention and control through a combination of interdisciplinary scholarly approaches to research, intervention, and evaluation as well as through the training of the next generation of researchers and practitioners. The center offers services related to biostatistics, program evaluation, proposal development, and database management. Many services are limited to center members and affiliates.

The Institute for the Environment in the Department of Biology includes every aspect of environmental study. Its mission is three-fold: (1) Strengthen environmental research capacity across UNC by supporting a multi-disciplinary community of scholars that enhances collaboration, increases sharing of knowledge, and identifies solutions to the world's critical environmental problems; (2) Work in partnership across UNC and with external partners to coordinate and deliver 21st century educational programs that provide students with the experience and skills to thrive in a growing global economy; and (3) Put new environmental knowledge into action by engaging and serving communities, here in North Carolina and around the world.

The institute researches the following three critical foci that lie at the heart of our most pressing environmental challenges. Each issue is addressed by campus-wide collaborations between an Institute center and other groups of faculty, students and staff, integrating research and education.

- Sustainability of Communities is coordinated through the Institute's Center for Sustainable Community Design, which studies the ways in which communities of the future – their buildings, transportation systems, and other aspects – must be designed to make them environmentally, economically and socially sustainable.
- Watershed Science and Management, coordinated through the Institute's Center for Watershed Science and Management, focuses on the ways in which changes in the landscape – development, conservation, engineered change – affect human health and the natural services of ecosystems.

- Coordinated through the Institute's Center for Environmental Modeling for Policy Development, Environmental Modeling concentrates on the development of advanced computational and visualization tools needed to understand the relationships between environmental policies, environmental processes and key indicators of environment and health.

The David H. Murdock Research Institute (DHMRI) in Kannapolis, NC, is a nonprofit research institute established to improve human health by collaborating with scientists at the North Carolina Research Campus as well as with organizations and researchers from universities, government and industry throughout the world. DHMRI's collaborators on the Research Campus include scientists from Duke University and seven members of the University of North Carolina System – UNC-Chapel Hill, NC State University, Appalachian State University, UNC-Greensboro, UNC-Charlotte, NC A&T and North Carolina Central University.

Located at the heart of the North Carolina Research Campus in the \$100 million, state-of-the-art David H. Murdock Core Laboratory Building, the DHMRI occupies over 110,000 sq. ft. of space and is staffed by highly trained scientists who have the advantage of working in extremely well-equipped laboratories that bring together a variety of technical disciplines under one roof.

DHMRI's expertise includes genomics, metabolomics, proteomics, NMR spectroscopy and *in vivo*, *in vitro* and informatics sciences. This broad suite of capabilities allows the DHMRI to seamlessly tackle scientific problems using different disciplines as new scientific questions arise throughout the lifetime of a project. These laboratory strengths are combined with an IT infrastructure that provides data curation, annotation and analysis with a high degree of accuracy, security and reliability.

- The Genomics Laboratory is equipped with an Illumina iScan for performance of microarray studies. A Sequenom MassARRAY system supports a variety of DNA analysis applications, including SNP genotyping, DNA methylation analysis and somatic mutation profiling. The lab also has multiple ABI 7900HT real-time PCR machines with 96 and 384 well plate capacity. DNA sequencing studies are supported by two Illumina HiSeq 2500 systems and anticipate having a PacBio Sequel online in December 2016. Genomics Laboratory staff can also perform single-cell transcriptomics and generate long-range sequence data using the 10X Chromium Platform. Genomics-specific bioinformatics support is varied, scalable, and customizable to meet the needs of the project specific aims. The bioinformatics capabilities include but are not limited to gene expression, *de novo* assembly, microbiome analysis, methylation analysis, exome and SV analysis using both commercial and popular open source software and tools.
- Established by the NIH Common Fund, UNC NIH Eastern Regional Comprehensive Metabolomics Research Core is directed by **Susan Sumner, PhD**, Professor, UNC Nutrition Research Institute. The center is one of six Regional Comprehensive

Metabolomics Resource Cores in the U.S. The center strives to (1) Establish national standards for metabolomics, (2) Increase national capacity to provide metabolomics profiling and data analysis services to basic, translational, and clinical investigators, (3) Foster collaborative translational research that uses metabolomics approaches, and (4) Facilitate institutional development of pioneering research, metabolomics training, and outreach.

For NC TraCS investigators, the UNC RCMRC has the following instrumentation to facilitate broad spectrum and targeted analysis of endogenous and exogenous metabolites and to determine metabolic flux: nuclear magnetic resonance (NMR) spectroscopy, liquid chromatography-mass spectrometry (LC-MS/MS, UPLC-Q-TOF-MS), gas chromatography-mass spectrometry (GC-MS, 2D-GCTOFMS), and inductively coupled plasma mass spectrometry, Orbitrap, and MALDI imaging.

The RCMRC analyzes cells, organ tissue (e.g., liver, uterus, testes, brain), biological fluids (e.g., urine, serum, plasma, amniotic fluid), and exhaled breath collected from human subjects or animal models. Following signal detection, statistical and mathematical tools, e.g., Umetrics, Spotfire, and SAS, identify data trends that show the correlation of specific signals with the phenotypic response under investigation. Identified signals are mapped to biochemical pathways through the use of specialized software (GeneGo). Biochemists derive biomarkers and mechanistic insights.

It should be noted that the NC TraCS Translational Advancements Resources helps NC TraCS investigators access and use a separate metabolomics service at UNC-CH, the UNC Metabolomics Facility.

- The Proteomics Laboratory includes a GE AKTA liquid chromatography system, an ABI 4800 MALDI-TOF/TOF available for rapid protein identification and quantitation. This instrument can also be coupled to a Tempo LC MALDI spotting system for automated liquid chromatography-based sample fractionation and on-target deposition prior to analysis. The facility has a Thermo LTQ Orbitrap with an ETD for direct large-scale analysis of digested proteins and corresponding PTMs. There are 3 Waters nanoAquity Ultra Performance Liquid Chromatography (UPLC) systems, 1 Waters Aquity UPLC, and 1 Dionex UltiMate nanoLC system. A series of mass spectrometry systems includes a Thermo TSQ triple quadrupole mass spectrometer and an ABI 4000 QTRAP.
- The NMR Laboratory is equipped with four high-field Bruker NMR instruments with field strengths of 400 MHz, 600 MHz, 700 MHz and 950 MHz, respectively. Three of these systems are equipped with cryogenically cooled probes. The 600-MHz system is coupled to an Agilent 1200 high-performance liquid chromatography system and a BACS robot for automation. The 700-MHz NMR is equipped with a SampleJet automation system for large scale automation.

- The In Vitro Sciences Laboratory is equipped with a Bio-Rad BioLogic LP Chromatography System, a Perkin Elmer EnVision Multilabel Reader, a Molecular Devices SpectraMax M2 Plate Reader, a Bio-Rad Universal Hood III Gel Imager System, 2 NanoSight Nanoparticle Tracking Analysis platforms, an Olympus AU400e Clinical Chemistry Analyzer, an ACL Elite Coagulation Analyzer, 3 Hematology Analyzers (Beckman Coulter and Horiba) and Flow Cytometry (x 3) with up to 17-color flow cytometry capabilities to characterize expression of surface and intracellular proteins and fluorescent markers. The laboratory also has Multiplexed protein immunoassay capabilities using both a Meso Scale Discovery Sector Imager and a Luminex (BioPlex) Bead-Based Immunoassay Reader to quantify candidate proteins with pg/mL sensitivity.

The Nutrition Research Institute is the Nutrition Obesity Research Center's partner research center in Kannapolis, NC, immediately adjacent to the David H. Murdock Research Institute. The institute is dedicated to understanding why there are individual differences in metabolism and nutrient requirements. The institute comprises web labs with sophisticated analytic equipment for nutrigenomics; clinical facilities that include examination rooms and equipment, a pharmacy, phlebotomy laboratory, specimen laboratory, consultation rooms, a metabolic research kitchen; and metabolic rate assessment and body composition equipment. State-of-the-art facilities for human nutrition research include the following.

- **Metabolic Research Kitchen** (1,200 sq. ft.): This facility is utilized to prepare and deliver meals of exact composition. Staff are able to monitor consumption of meals, and to calculate the exact amounts of nutrients, micronutrients, and bioactives delivered. Four independent work stations, each with its own set of tools with the exception of large appliances, which are shared), one Dell Computer for kitchen office (Optiplex 780) and two Dell computers (Optiplex 780 Ultra Small Form) to sync with Ohaus scales (two each); HP Laserjet M3027; Mettler Toledo scales (two daily use scales and one analytical balance);
- **Software:** Nutrition Data Systems for Research, ProNutra, ProNessy, Food Processor; Bally walk-in refrigerator/freezer; commercial kitchen appliances.
- **Body Composition Laboratory** (320 sq. ft.): This laboratory includes Lunar iDXA scanner (GE Healthcare): The DXA scanner's body composition analysis software enables evaluation of fat mass, lean mass, bone density, and total mass for the entire skeleton and for individual sub-regions; BOD POD (Life Measurement, Inc.) that uses air displacement plethysmography to determine body fat; Xario Ultrasound (Toshiba) used in studies that require determination of fat composition of internal organs.
- **Metabolic Rate Assessment Laboratory** (250 sq. ft.): This includes two ParvoMedics TrueOne 2400 metabolic carts, one for measuring resting energy expenditure and another for measuring exercise induced changes in energy expenditure; electrocardiogram machine (Quinton), TrackMaster Treadmill; stationary bike (Lode Corival Bike Ergometer).

- **Metabolic Chamber** (415 sq. ft.): The Advanced Biosolutions Whole Room Calorimeter measures a person's energy expenditure to an accuracy of within 35 calories per day. This device represents a slight improvement over the metabolic chambers installed at the NIH Clinical Center.
- **Phlebotomy Lab and Examination Rooms** (1,000 sq. ft.): Dedicated space for blood and urine collection, with a sample processing laboratory with a Thermo Sorvall RT1 Centrifuge; Biolis 24 Chemistry Analyzer with the capability to perform 100 diagnostic chemistry tests. In addition, the institute is in the process of purchasing a hematology analyzer.
- **Physical Examination Rooms** (320 sq. ft.): This includes four examination rooms equipped with Midmark examination tables, sinks, privacy curtains, Welch- Allyn Integrated Systems that includes blood pressure cuff, digital thermometer, otoscope, and ophthalmoscope.
- **Pharmacy Suite:** The 231-square-foot pharmacy suite is a locked room for storage of pharmaceuticals, placebos, or other treatments needed for clinical studies.
- **Behavioral Assessment Suite:** A networked dual camera to digital video disc system is part of two testing and observation rooms. Two EEG rooms include a 128-channel EGI electrophysiology system, an EGI photogrammetry system, a SmartEye Eye Tracking System, a BioPac System to measure autonomic nervous system functions, an Electric Maze to measure higher-order cognitive function and many elicited imitation props to measure memory. The behavioral assessment suite includes a mother's room with a hospital grade Medela Breast Pump. There is a spacious play room outfitted with toys, art supplies, and age-appropriate furniture, as well as many high chairs, for effectively conducting behavioral tests on small children.

The oldest facility of its kind in the U.S. (founded 1924), and one of the oldest in the world, the Howard W. Odum Institute for Research in Social Science, directed by **Todd BenDor**, has long played an important role in supporting the research of UNC's social science faculty, and also in undergraduate and especially, graduate instruction in social science methods. Some institute services are available to researchers elsewhere, and to the general public, on a cost-recovery basis. The institute supports the social science teaching and research mission at UNC. Odum provides a range of consulting services on quantitative and qualitative methods, GIS and spatial analysis, survey research, and data management. They offer more than 70 workshops every year, a graduate certificate program in survey research methods, and a number of summer courses through ICPSR and for graduate students from under-represented groups through NSF's AGEP program. They operate a world-renowned data archive that continues to be a leader in archive tool and support development. They help researchers develop grant proposals as well as provide full pre- and post-award support. They also partner with other scholars, research teams, and Centers and Institutes to pursue research grants consistent with our mission.

Over the years, Odum has pursued a number of special projects. On an annual basis, they serve more than 2,000 unique users in their computer labs, log more than 3,200 individual consultations, and offer more than 3,600 seat hours of instruction through our over 70 workshops. They generate about \$350,000 in grant support every year to support their operations, not to mention the number of grants they assist others in securing. In short, Odum is a key part of the core research and teaching infrastructure for social scientists at UNC. They seek to lead locally, nationally, and internationally UNC's continued effort to remain one of the world's best universities in social science research and education.

The center provides the following services.

- **Data Archives** – The institute maintains the country's third-largest archive of computer-readable social science data. Holdings include national and international economic, electoral, demographic, financial, health, public opinion, and other types of data to meet a variety of research and teaching needs.
- **Grant Services** – The Institute assists with the development and submission of research proposals and the administration of grants for social science faculty and graduate student researchers.
- **Survey Methodology** – The institute provides consultation in survey methodology, construction of measurement instruments, sample design, and selection of appropriate data collection methods, especially the use of personal, telephone, and mail surveys.
- **Statistical and Computing Services** – The Institute's statistical and computing services include short courses and individual consultation in data analysis, data management, programming, and use of hardware. The Odum Institute's Open Lab in the Research Hub provides access to computing software, hardware, and expertise in data analysis.
- **Other Services** – The Institute sponsors interdisciplinary faculty working

groups; provides faculty research awards; offers short courses in data access, grants, statistical computing, survey research, and text analysis; and occasionally

sponsors faculty colloquia.

RENCI (Renaissance Computing Institute) develops and deploys advanced technologies to enable research discoveries and practical innovations. RENCI partners with researchers, government, and industry to engage and solve the problems that affect North Carolina, our nation, and the world. A UNC institute, RENCI was launched in 2004 as a collaboration involving UNC, Duke University, and North Carolina State University. RENCI is directed by **Dr. Stan Ahalt**; its deputy director is **Dr. Ashok Krishnamurthy**. RENCI is described in more detail in Computer Support below.

The Cecil G. Sheps Center for Health Services Research seeks to improve the health of individuals, families, and populations by understanding the problems, issues and alternatives in the design and delivery of health care services. This is accomplished through an interdisciplinary

program of research, consultation, technical assistance and training that focuses on timely and policy-relevant questions concerning the accessibility, adequacy, organization, cost and effectiveness of health care services and the dissemination of this information to policy makers and the general public. The center is directed by **Dr. Mark Holmes**, Associate Professor, Department of Health Policy and Management. **Dr. Timothy Carey**, Sarah Graham Kenan Professor in the Departments of Medicine and Social Medicine was immediate past director of the center.

The Sheps Center was started in 1968 with funding from the National Center for Health Services Research (now the Agency for Healthcare Research and Quality, AHRQ). It was one of the first five health services research centers in the country. The Sheps Center currently focuses the majority of its research, technical assistance, information dissemination, and educational activities in the following 11 concentrations: aging, disability, and long-term care; child and adolescent health services; health care economics and finance; health care organization; health disparities; primary care; medical practice and prevention; mental health and substance abuse services and systems; rural health; health workforce; and women's health services. The Center, however, remains responsive to new issues.

The value of conducting studies in each of these areas is assessed continuously, and other areas of potential concentration are explored periodically to ensure that the center applies its resources as productively as possible to questions of particular importance. In addition, since 1994 the North Carolina Institute of Medicine (NC•IOM) has been administratively linked with the Sheps Center.

The UNC Center for Health Promotion and Disease Prevention addresses pressing health problems by collaborating with communities to conduct research, provide training, and translate research findings into policy and practice. The center seeks to reduce health disparities through an emphasis on community-based participatory research to ensure that the community is involved in every stage of research. In 1985, the deans of the UNC schools of Dentistry, Medicine, Nursing, Pharmacy and Public Health created a research center dedicated to health promotion and disease prevention. The following year, the Centers for Disease Control and Prevention funded the center as one of the agency's first three Prevention Research Centers.

Our mission is to collaborate with research and community partners to

- enhance the ability of public health practitioners, as well as individuals, groups and communities to promote health and prevent disease,
- identify funding opportunities and support high quality research,
- conduct, evaluate and disseminate innovative, community-based research, and
- develop education and training programs to translate research into public health practice.

Today, the center connects more than 120 UNC researchers with communities, organizations, and agencies for the purpose of using research-based approaches to promote good health outcomes. Our Community and Policy Boards include representatives from these groups who help guide our research, training, and service activities. While our primary focus is the health concerns of North Carolinians, our reach extends nationally and internationally. **Dr. Alice Ammerman**, Professor, Department of Nutrition, is director of the center.

Updated 1/8/2020