

PUBLIC HEALTH DISCOVERY

RESEARCH IMPROVING HEALTH IN NORTH CAROLINA AND WORLDWIDE

A photograph showing a young boy from behind, wearing a blue life vest and a red shirt, standing on a white boat. A light-colored dog is sitting next to him, also looking out over a large body of water. The background shows a shoreline with trees and some buildings.

*Growth in the Triangle Leads to
Examination of Jordan Lake Reservoir*
COVER STORY

Office of Research Annual Report - 2009
Gillings School of Global Public Health
University of North Carolina at Chapel Hill

GROWTH IN THE TRIANGLE LEADS TO EXAMINATION OF JORDAN LAKE RESERVOIR

The surge in population and the building of homes, resorts and recreational facilities along U.S. coastlines and inland waters has transformed the landscape and has potentially contaminated the waters.

Environmental sciences and engineering assistant professor Jill Stewart develops novel techniques to study water quality and to evaluate the impact that urbanization of U.S. water has on human health. Fecal contamination has long been considered a major source of water pollution. However, cleaning up waters can be difficult because 60 to 80 percent of contamination now comes from “nonpoint source pollution.” This type of pollution does not come out of pipes, but includes diffuse runoff, as well as leaking septic tanks and sewer lines. “We need tools to identify sources of contamination in waters impacted by nonpoint source pollution,” says Stewart.



Stewart

In North Carolina, the Research Triangle is experiencing rapid growth leading to increased nonpoint source pollution and water body impairment of freshwater supplies. Impacted waters include Jordan Lake, which is located within an urbanizing watershed and serves as a source of drinking water for surrounding communities. Regulators and community groups have expressed a commitment to protecting and restoring these waters. However, the magnitude, mechanisms and timing of contaminants entering the lakes are not well understood, but are critical determinants in designing an efficient program for water quality improvement.

The number one cause of health problems from North Carolina water is pathogens, as measured by fecal indicator bacteria like *Escherichia coli*. There are many causes of pathogen contamination, including those introduced by human contact, land use issues and storm water.

With funding from the Water Resources Research Institute of UNC and in collaboration with Dr. Larry Band of the UNC Institute for the Environment, Stewart will evaluate contamination sources of the Jordan Lake watershed. Using cutting-edge tools and techniques, Stewart will identify the specific breakdown of contamination from land use, infrastructures and rainfall. This will shed light on how the contaminants are mobilized and transported and how these processes differ due to weather or seasonal conditions. This research will also evaluate the relationship between the pathogens in Jordan Lake and the risks to human health in the area. The current indicators for health risk associated with drinking water do not take into account the differences between bacterial and viral pathogens. Identification of the types of pathogens in public drinking water sources could alert resource managers and public health officials to a potential health risk.

Stewart’s work on the Jordan Lake watershed will produce data that will help local officials dedicated to implementing cost effective and appropriate remediation strategies to mitigate nonpoint source pollution. Suggestions could include adding pet waste clean-up stations, expanding sewer lines, and targeting storm water best management practices.

Stewart is at the forefront of developing technologies for real-time, continuous monitoring of waterborne pathogens. Her work in this area paves the way for new policies and reporting requirements to let people know what risks they are facing from their drinking water supply right here in the Triangle.

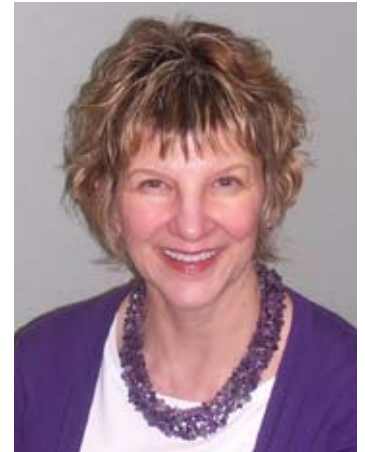


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Message from the Associate Dean for Research

This has been an outstanding year for research at our Gillings School of Global Public Health at the University of North Carolina at Chapel Hill. This year, our faculty received more than \$150 million dollars in research awards, an all time high. These funds will be used to conduct ground-breaking public health research to help us advance our mission of improving public health, promoting individual well-being, and eliminating health disparities across North Carolina and around the world.



Martin

Our faculty is helping to solve some of the most pressing health problems in North Carolina and worldwide by conducting research in many areas, such as cancer, air and water pollution, global health problems, health disparities, obesity, and heart and lung disease. These complex issues are tackled by research that takes many different approaches, from studies of genetics in a research laboratory to environmental studies in the field. Much of this work is conducted by interdisciplinary teams, each team member contributing his/her expertise to help solve the problem at hand. Virtually all of these research teams include both our faculty and our students, giving students the opportunity to work on real world problems in which they can apply the approaches that they have learned in the classroom.

This report documents only a few of the many research projects currently being conducted at our School. I feel confident that when you read these stories, you will see how our School is making a positive difference in the lives of persons in North Carolina, our nation, and our world.

A handwritten signature in black ink that reads "S L Martin".

Sandra L. Martin, PhD
Associate Dean for Research
Professor, Department of Maternal and Child Health

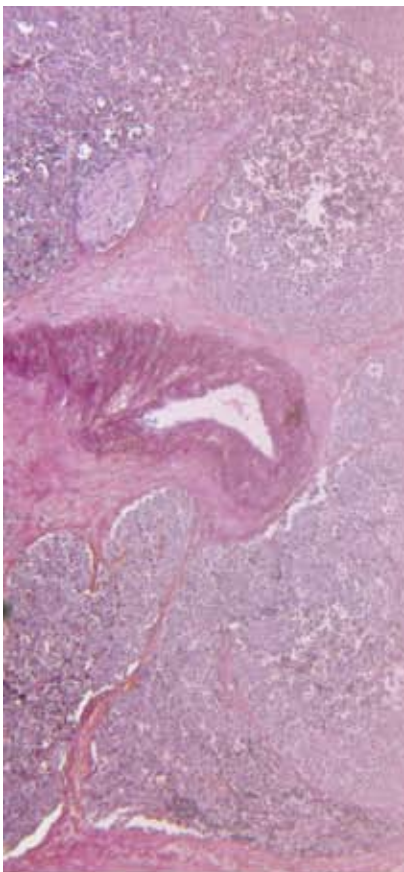
ACKNOWLEDGMENTS

Writing & Editing: Christin Minter, Sandra Martin, Ramona DuBose, Chris Perry, Linda Kastleman, Jill Stewart, Francesca Florey, Tracy Kennedy, Barbara K. Rimer

Design: Todd Brown (www.toddbrown.biz)

We would like to thank those involved in compiling this report including Communications, the Dean's Office, the Department Chairs, Carolina Public Health Solutions and the faculty whose work is highlighted within. We would also like to thank Sterling Bell, MSPH '65 (ESE) for his generous gift in honor of his former wife Margaret Bell, MPH '65 (PH Nursing) for whom the Office of Research is named.

All photos in this report are courtesy of istock.com; UNC Gillings School of Global Public Health Communications, Office of Research and the investigators highlighted within. For specific questions about photographs, please contact the Office of Research at (919) 966-0123.



GETTING THE MESSAGE ACROSS

The way information is presented makes a big difference in the medical decisions people make. Carol Golin, MD, associate professor of health behavior and health education, is uncovering the best ways to share information with people to help them make the best decisions for their own health.

Prostate screening is a good example because many men say they don't really know whether the screenings actually reduce risks and save lives. Although more than half of all American men, aged 50 or older, have had one or more prostate-specific antigen (PSA) test, most men correctly answer less than one third of questions about the benefits of screening and early detection.

Golin examined two different strategies for presenting information about the PSA test. Results showed that men understood the benefits of PSA tests better if the information was presented along with information about other men's health issues than if only PSA tests were discussed.

Knowing how patients learn about their health, and correcting misperceptions, are critical these days as patients assume greater control of their own health care and need to make informed decisions.



Golin

OUR IMPACT

CURIOUS TRENDS IN LIVER CANCER

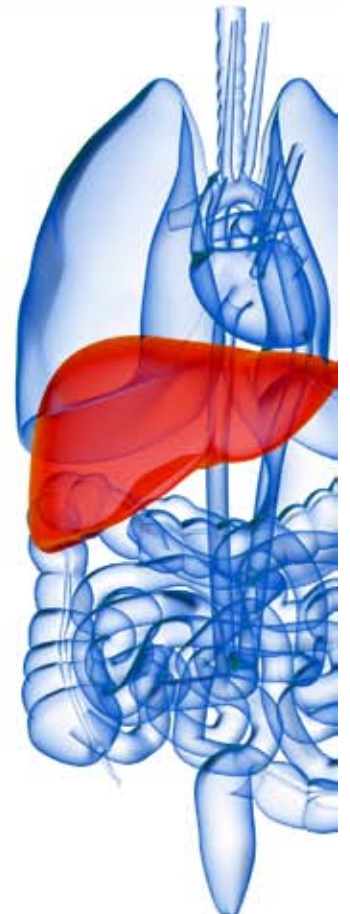
While the incidence of many major cancers has declined over the past 30 years, liver cancer cases are still on the rise. Hepatocellular carcinoma is the fifth most common cancer worldwide and the third leading cause of cancer death.

Ivan Rusyn, MD, PhD, associate professor of environmental sciences and engineering, conducts research to determine how the increase in liver cancer incidence may relate to chronic diseases (such as hepatitis C), lifestyle factors (including alcohol abuse) and environmental agents (such as fungal toxins).

Rusyn and collaborators at Kansas University Medical Center use animal models to understand the pathogenesis of human disease. Rusyn says one of the challenges in understanding the combined effects of chronic viral infection and an environmental toxin is the lack of animal models, since mice tend to be resistant to human hepatitis C infection. However, it is possible to create mice that can be studied in this way by inserting viral DNA into the mouse genome. Rusyn's lab research using these transgenic mice has shown that exposure to a fungal toxin called aflatoxin B1 has doubled the incidence of liver tumors. Human studies have shown similar outcomes but these mouse experiments provide a useful model for understanding how the disease may develop in the liver.



Rusyn



Rusyn continues to explore the mechanisms of how cancer causing agents interact so that researchers may find new ways to prevent and treat cancers.

CLUES FOR PREVENTING & CONTROLLING BREAST CANCER

Melissa Troester, PhD, studies why some women are more susceptible than others to various forms of breast cancer. Her genomic studies are paving the way for understanding which types of surgeries (e.g. mastectomy or breast conserving surgery) are needed for different types of tumors. Troester, an assistant professor of epidemiology, and her multi-center team of researchers perform microarrays on normal tissue samples from women undergoing various types of breast surgery. Then, they investigate the relationship between the gene expression in the normal tissue and that of the adjacent breast tumor. The researchers also study how other breast cancer risk factors (including reproductive history, breast density, and age) are associated with specific genomic changes in normal breast tissue.



Troester

Troester's early results suggest the normal tissue microenvironment collaborates with the breast tumor during the progression of cancer, and how they collaborate affects the prognosis. Now, Troester is identifying biomarkers with improved discriminatory accuracy in predicting breast cancer risk. "Studying normal breast tissue represents a unique and understudied yet promising approach for elucidating new cancer prevention and control strategies," she says.

on cancer

COLLABORATING FOR BETTER CANCER CARE

In marriages, team sports and building construction, things always seem to work better when all the people involved communicate well with each other.

The same is true with cancer care.

"Improving cancer care quality requires clinician and non-clinician scientists to work collaboratively in multidisciplinary research teams," says Bryan Weiner, PhD, associate professor of health policy and management.

That's why Weiner, with funding from the National Cancer Institute, has examined the quality of cancer care when specialists, primary care physicians and other health care professionals work together with various groups and centers to conduct clinical trials.

Weiner shows various organizations involved in cancer care how beneficial strong communication and cooperation can be – from early detection, screening and diagnosis, to treatment and care of survivors. He includes not only health care providers, but also administrators, policy makers and financial officials in the interdisciplinary "communities of research." As a result, he has helped groups develop better ways to make decisions, develop protocols, train investigators and set up mentoring systems.



Weiner

MALARIA NETS SAVE LIVES AND REDUCE COSTS

Malaria still causes the deaths of many persons worldwide, even though insecticide-treated bed nets can virtually prevent malaria. The problem is that less than ten percent of Sub-Saharan African households can afford to own nets.

Frieda Behets, PhD, associate professor of epidemiology, and team members evaluated the cost-effectiveness of distributing free malaria bed nets to 17,893 pregnant women attending 28 clinics in Kinshasa in the Democratic Republic of Congo. They found that the nets prevented 414 infants from dying and another 587 infants from suffering low birth-weight complications. Paying for nets, rather than health treatment for malaria, saved \$17.22 per case for disability-adjusted life-years, \$15.70 per case for life-year saved, and \$411.13 per infant deaths averted. These findings provide guidance for healthcare agencies in Sub-Saharan Africa regarding investments in the prevention versus treatment of malaria.



OUR

IMPACT

SUPPORTING PREGNANT WOMEN WHO TEST FOR HIV

What kinds of support and services are most helpful to pregnant women being tested for HIV infection? Suzanne Maman, PhD, associate professor of health behavior and health education, is talking with women from one of South Africa's poorest townships to find out.

In the South Africa HIV Antenatal Care Post-test Support Study (SAHAPS), funded by the National Institute of Child Health and Development, Maman and others evaluate whether enhanced post-test support for HIV-positive and HIV-negative pregnant women works better than standard care. Enhancements include additional counseling sessions and access to ongoing support groups and legal services free of charge.

Almost one-third of pregnant women in South Africa tested positive for HIV in 2005, so finding interventions that best reduce transmission is critical.

Maman and colleagues hope the enhanced intervention will result in:

- More women participating in available health services;
- Better health and psychosocial outcomes for women;
- Reduction of transmission risk between partners; and
- Fewer instances of mother-to-child HIV/AIDS transmission.



FROM THE ARCTIC TO THE AMAZON: LINKING DIET AND DISEASE

Nutrition associate professor Sangita Sharma, PhD, travels the world to see what people eat. Looking for associations between diet and health in multiethnic populations, she hopes to find clues that will help reduce the prevalence of chronic disease in vulnerable populations worldwide.

In Arctic Canada, Sharma and her team are linking environmental changes to changes in nutrition, showing that climate change may be affecting the dietary intake of Inuit. In Brazil, Sharma has developed a dietary assessment method to look at total dietary intake, including fruits and vegetables, for Japanese-Brazilian populations to compare their risk of colorectal cancer with Japanese populations living in Tokyo and Honolulu.

Using a combination of nutritional science, epidemiology, and dietary assessments, Sharma has also conducted research in Barbados, Cameroon, England, Indonesia, Jamaica, Nepal and the United States, including Alaska. In addition to research, she works with government and non-government organizations to conduct dietary interventions to help improve the public's diet and reduce the risk of chronic disease.



on global health

REACHING GLOBALLY FOR ACCESS TO HEALTHCARE

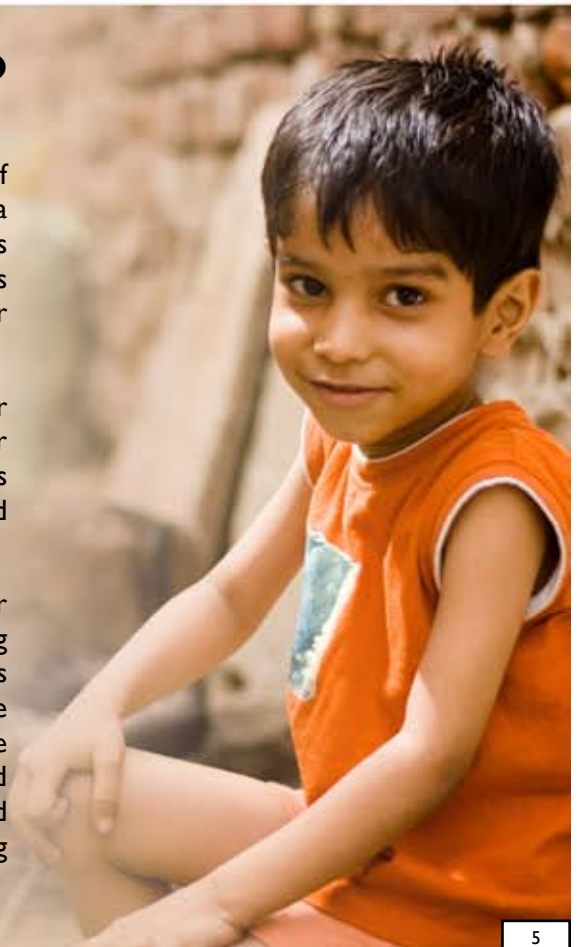


Speizer

Fifty percent of the world's population consists of the urban poor. Urban populations in Africa and Asia are expected to double between 2000 and 2030. This growth will bring greater need for services that address maternal and infant mortality, family planning and other issues related to living in poverty.

Maternal and child health research associate professor Ilene Speizer, PhD, is leading a six-year, \$22 million dollar project funded by the Bill & Melinda Gates Foundation to evaluate programs that provide women and families living in the slums of sub-Saharan Africa and South Asia with choices regarding family planning.

Speizer is leading the Measurement, Learning and Evaluation (MLE) for the Urban Reproductive Health Initiative project aimed at improving contraceptive choice in India, Nigeria, Kenya and Senegal. Based at UNC's Carolina Population Center, her team will identify the most cost-effective ways to improve the quality of and access to family planning and reproductive health services for the urban poor. The project will also: build research and evaluation capacity in the four countries; disseminate findings globally; and encourage the use of data for decision-making with the goal of reducing unintended pregnancies and thus reducing maternal and infant mortality.



PROTECTING BABIES BEFORE PREGNANCY

Premature infants face increased risks for serious health problems, such as developmental disabilities, learning and behavioral problems, cerebral palsy, lung problems, and vision and hearing loss, according to the March of Dimes. African American women have a 70% higher risk of having a preterm birth than other women in the United States. Vijaya K. Hogan, DrPH, associate professor of maternal and child health, is working to eliminate this – and other maternal and infant health disparities.

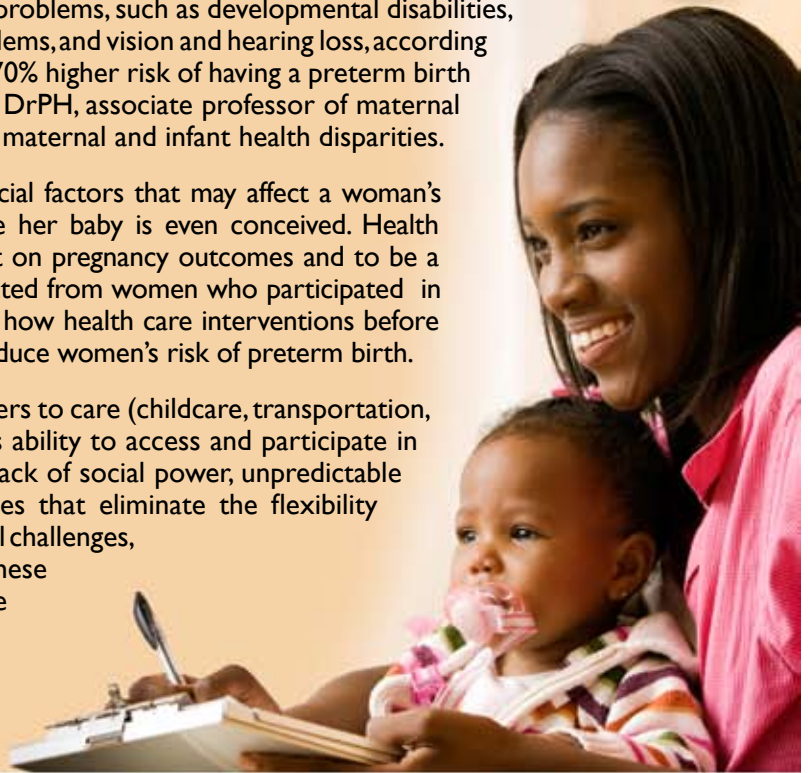
Hogan and colleagues want to identify the underlying social factors that may affect a woman's health status and her participation in health care before her baby is even conceived. Health status before pregnancy is thought to have a huge impact on pregnancy outcomes and to be a large determinant of disparities. They are using data collected from women who participated in the largest study in the United States to date that tested how health care interventions before pregnancy – called interconceptional health care – may reduce women's risk of preterm birth.

So far, Hogan is finding that even when other known barriers to care (childcare, transportation, etc.) are addressed, several other factors affect women's ability to access and participate in interconceptional health care. Multiple burdens, racism, lack of social power, unpredictable

social emergencies, and institutional rules that eliminate the flexibility women require to adapt to emergent social challenges, are just some of these factors. Defining these social factors and finding a way to reduce them will improve preventive care and help reduce the risk of preterm birth among this group of women.



Hogan



OUR IMPACT

MALTREATMENT IN CHILDHOOD CAN AFFECT HEALTH FOR LIFE



Hussey

It has been estimated that more than 2 million U.S. children are victims of childhood maltreatment each year, which can have serious lifelong effects on health. Research assistant professor in maternal and child health, Jon Hussey, PhD, studies health consequences of childhood maltreatment. Using data of more than 15,000 people being followed from adolescence into adulthood in the National Longitudinal Study of Adolescent Health, Hussey and his team examined four types of maltreatment: supervision neglect, physical neglect, physical assault and contact sexual abuse.

Remarkably, Hussey's findings indicate that physically assaulted and (particularly) neglected children are more likely to drink, smoke, use marijuana and report poor health than peers not experiencing child maltreatment. This is the first nationally representative longitudinal study to link childhood maltreatment to poor health and use of unhealthy substances later in life.

As health indicators in adolescence and early adulthood are predictive of future chronic disease risk, Hussey is now extending his work to include looking at other significant childhood factors that could affect long-term health and plans to increase the length of time he follows people into adulthood. The major

objective of the next phase is to explore the pathways linking early life exposures to racial disparities seen in chronic disease risk. It is this work that will likely yield significant policy and practice implications.

BREASTFEEDING: BEST FEEDING FOR BABIES

In North Carolina, African American women are 30 percent less likely than white women to breastfeed their infants, even though studies have shown that breastfeeding helps protect infants from many types of health problems. Tamar Ringel-Kulka, MD, research assistant professor of maternal and child health, is working to change that dynamic. Through community-based participatory research, she leads an effort to promote breastfeeding among African American women in Durham, N.C.

With the Community Health Coalition in Durham and other community organizations, businesses and individuals, Ringel-Kulka has developed the Durham Breastfeeding, Education and Support Team (BEST) Alliance, a group aimed at increasing the rates of breastfeeding among African American women who are pregnant or who have newborns.

The first step was to complete a comprehensive community needs assessment examining breastfeeding. The assessment consisted of reviewing data from focus groups with African American mothers, fathers and grandmothers, and conducting interviews with community stakeholders. Ringel-Kulka's assessment provided detailed information about the disparity in breastfeeding in the Durham community, identified barriers that limit breastfeeding, and identified potential strategies that may effectively increase breastfeeding. The findings are being used to develop, implement and evaluate a pilot breastfeeding promotion intervention tailored to the needs of the Durham, N.C. community.



on health disparities

BEHAVIORAL HEALTH BENEFITS FOR FAMILIES ENGAGED IN THE CHILD WELFARE SYSTEM



Wells

How can child welfare agencies in the U.S. connect children and their parents with behavioral health services they need? What resources do they need to facilitate these connections? Those questions interest Rebecca Wells, PhD, associate professor of health policy and management at UNC Gillings School of Global Public Health. Using data from a national survey of families engaged with the child welfare system, Wells and her colleagues analyze agency practices that may affect children's access to mental health services.

Among Wells' initial findings:

- Caseworkers devote comparable effort to obtaining a range of health services for black and white children once they have identified need, but are less likely to report black children as needing mental health services;
- Youth engaged with child welfare agencies are more likely to receive substance abuse treatment when their caseworkers had better cooperation with schools, courts, and other agencies; and
- When caseworkers had social work degrees, parents were more likely to report receiving family counseling as well as mental health treatment for themselves.

Partnering with child welfare agencies, Wells works to close gaps and improve access to behavioral health care for families in the child welfare system.



CHANGING BEHAVIORS CAN CHANGE GENETIC PREDISPOSITION TO HIGH BLOOD PRESSURE

What causes some individuals to have high blood pressure? Is it their genetic makeup or their lifestyle? Nora Franceschini, MD, research assistant professor of epidemiology, has found that these factors are not so separate. In fact, she has discovered that changing some behaviors can lead to changes in genetic predisposition and, as a result, can decrease risks for high blood pressure levels and improve overall health.



Franceschini

Franceschini has analyzed data from the Strong Heart Family Study, which provides details about environmental, behavioral, and genetic markers on 3,600 American Indians. She is examining how interactions between behavioral, socioeconomic, and genetic factors may influence health outcomes. She has found that certain behaviors – whether or not a person smokes, drinks alcohol and/or exercises – can actually change genetic susceptibility to high blood pressure. Education (less than 12 years of school compared to 12 or more years of education) also had an impact on the person's genetic risk for high blood pressure.

Physicians and public health practitioners already screen patients for these behaviors to identify people who are more susceptible to common blood pressure problems. Franceschini's findings support current public health efforts to promote lifestyle changes that will improve people's health for the long-term.

OUR

IMPACT

TARGETING TREATMENTS FOR COPD



LaVange

Chronic Obstructive Pulmonary Disease (COPD), a progressive disease that makes breathing difficult, is a leading cause of death and illness worldwide. UNC's Collaborative Studies Coordinating Center (CSCC) is leading a project that will study genetics and biomarkers in COPD patients nationwide, looking for characteristics that will help researchers target treatments more effectively.

CSCC has a 7 year, \$8 million contract from the National Heart, Lung and Blood Institute to serve as the coordinating center for SPIROMICS (short for SubPopulations and InteRmediate Outcome Measures in COPD), a multi-institutional study. Lisa LaVange, PhD, biostatistics professor of the practice and CSCC director, is leading the project.

Participants at six centers across the country will undergo a thorough baseline examination, including lung function, CT imaging, and biospecimen collection. Subjects will be seen annually for three years, repeating tests and procedures conducted at baseline, to comprehensively phenotype COPD. The study will provide new insights into COPD subtypes, COPD natural history and will generate novel biomarkers of disease progression that can be used for other studies about COPD.

"The results from this study have the potential to rapidly accelerate the development of new therapies for COPD and its clinical subtypes," LaVange said. "We are very excited to be working with colleagues from all across the UNC-Chapel Hill campus in this exciting and important study."

GETTING TO THE HEART OF THE RISK

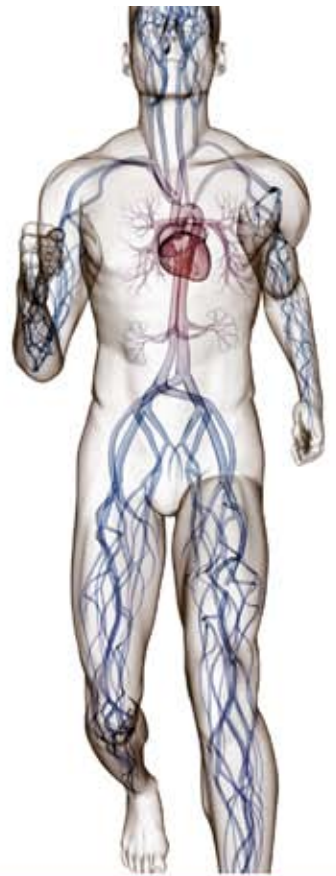


North

If the genes and environmental factors that influence cardiovascular disease could be identified, then people could know from childhood whether they are at increased risk. If they know, then they can make lifestyle choices that will reduce their risks and help them lead longer, healthier lives. Also, treatments could be better targeted to the root causes of cardiovascular disease.

Epidemiology associate professor Kari North, PhD, is working on discovering such factors. With funding from the National Institutes of Health, North and colleagues are detecting, mapping and identifying genes that influence such risk factors as blood pressure, cholesterol, obesity, clotting factors, heart rate, lung function, and measures of carotid artery wall thickness. This mapping – and the larger task of identifying relevant functional mutations – is crucial to determining how genes increase susceptibility to the disease. Her work also shows how genes are influenced by environmental factors, and how interactions between genes and the environment differ between populations.

With a better understanding of the abnormalities that accompany cardiovascular disease risk, researchers may be able to develop more targeted prevention measures and treatment options, including customized drug therapy.



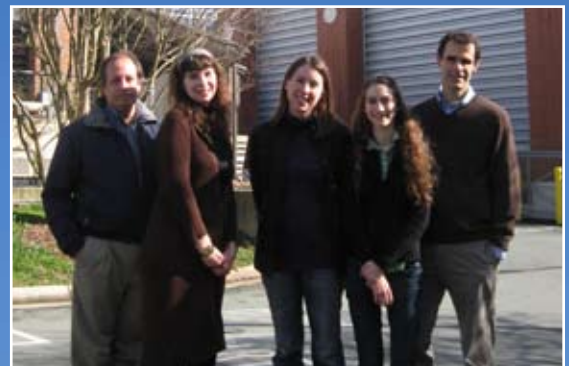
on heart & lung health

NAVIGATING LINKS BETWEEN AIR POLLUTION AND HEART DISEASE

Short-term exposure to low concentrations of small particles in the air we breathe may increase the risk of coronary heart disease, according to research by Eric A. Whitsel, MD, research assistant professor of epidemiology. His research shows that the increase in risk may be related to effects of the particles on heart rate variability, myocardial ischemia, and ventricular ectopy, all of which can lead to sudden cardiac death.

Whitsel leads a team of researchers investigating air pollution exposure in a cohort of 68,132 post-menopausal women, aged 50-79 years who were examined in 40 clinical centers between 1993 and 2004. Whitsel uses geographic information science combined with epidemiology and medicine to examine environmental and built environmental risk factors for coronary heart disease.

Whitsel's results involving air pollution were published in the *Journal of Toxicology and Environmental Health* (January 2009), *American Journal of Epidemiology* (March 2009), *Environmental Health Perspectives* (May 2009), and *Epidemiology* (January 2010). In light of his findings, Whitsel helped reassess the U.S. Environmental Protection Agency's National Ambient Air Quality Standards for particulate matter (December 2009).



Whitsel (right) and research team

BUDDY SYSTEM HELPS VETS STAY HEALTHY



Allicock



Campbell

Our nation's veterans have higher rates of overweight and obesity than the general population. Nutrition assistant professor Marlyn Allicock, PhD, works with the Veterans Administration to help vets shed unwanted pounds. Her project called MOVE! Buddy, is an enhancement to the Veteran Administration's MOVE! (Managing Overweight/Obesity for Veterans Everywhere) program led by nutrition professor Marci Campbell, PhD. It incorporates individual peer-to-peer support, group support therapy and other measures to help vets become more physically active and eat a healthy diet. Allicock collaborated on the development of the training DVD for MOVE! Buddy volunteers and is evaluating this volunteer veteran peer counselor program as it rolls out at five intervention sites across the country.

The findings from this study will help the Veterans Affairs system, the largest health care organization in the U.S., to determine the value of adding peer support to the current MOVE! program to improve the health and well-being of our nation's veterans.



OUR IMPACT



SALT, SWEETS, SODAS AND THE SMALL SCREEN

Exercise is important. Eating healthy is wise. Watching too much television is bad. Although we are familiar with these tenants of healthy lifestyle, we know surprisingly little about the relationship between these three behaviors. Biostatistics professor David Couper, PhD, worked with a team of epidemiologists and nutritionists from the UNC Gillings School of Global Public Health to discover the odds of becoming fat or eating unhealthy foods based on TV-watching habits.

The research, led by epidemiology research associate professor Kelly Evenson, PhD, and doctoral student Anne-Marie Meyer involved more than 15,000 adults and was the first to measure the data prospectively over a six-year time period. The team found that those who watched the most TV were up to 40 percent more likely to be insufficiently active. Those same people were the most likely to eat too many salty snacks, sweets and sweetened drinks, and they ate fewer healthy foods such as fruits and vegetables.

This work by Couper and the team provides strong evidence that too much television often goes hand-in-hand with poor diet, playing a significant role in the burgeoning obesity epidemic.



Couper



Evenson



EATING TOO MUCH FAT DURING PREGNANCY IMPAIRS FETAL BRAIN DEVELOPMENT

Nutrition assistant professor Mihai Niculescu, MD, PhD, has found that mouse mothers fed high-fat diets before and during pregnancy had offspring with an under-developed hippocampus, an area of the brain associated with memory and emotion.

Working at UNC's Nutrition Research Institute in Kannapolis, NC, Niculescu and his team used highly sophisticated procedures to examine the epigenetic effects of diet on brain development. The techniques allow researchers to look at how non-genetic factors, like diet, cause genes to express themselves differently, changes that can cause developmental problems in the offspring.



Niculescu

Using a technique called methylation profiling, Niculescu also discovered that maternal high-fat diets may affect the expression of genes within the whole brain of the fetuses, raising the question whether other brain areas may be functionally altered as well. These findings, part of which are published in the November 2009 issue of the *International Journal of Developmental Medicine*, are among the first to show a link between diet and brain growth and development at the epigenetic level, findings that have important implications for human health.

on obesity

A COMMUNITY APPROACH TO WEIGHT LOSS

In the U.S., low-income women are the most likely to be overweight or obese. The extra weight increases their risk for developing diabetes, heart disease, and other chronic illnesses. Nutrition professor Carmen Samuel-Hodge, PhD, works with churches and other community groups to help develop interventions tailored for low-income women that will help them lose weight, manage their diabetes, and lower their risk for cardiovascular disease.

Interventions based on behavior modification have shown tremendous promise within clinical settings. Samuel-Hodge is pioneering the effort to move these interventions out of the clinic and into real life settings within diverse groups of people.

One example is Samuel-Hodge's diabetes self-management program, called A New DAWN. This intervention was the first church-based randomized controlled trial among people with type 2 diabetes. Now, she is working with 240 low-income women throughout North Carolina who are overweight or obese. Her findings will help government and other public health providers make better-informed decisions about health-care delivery, resource allocation, and workforce preparation needed to reduce obesity in low-income women.



Samuel-Hodge (right)



A VENETIAN TALE OF ENVIRONMENTAL PROGRESS



Gray

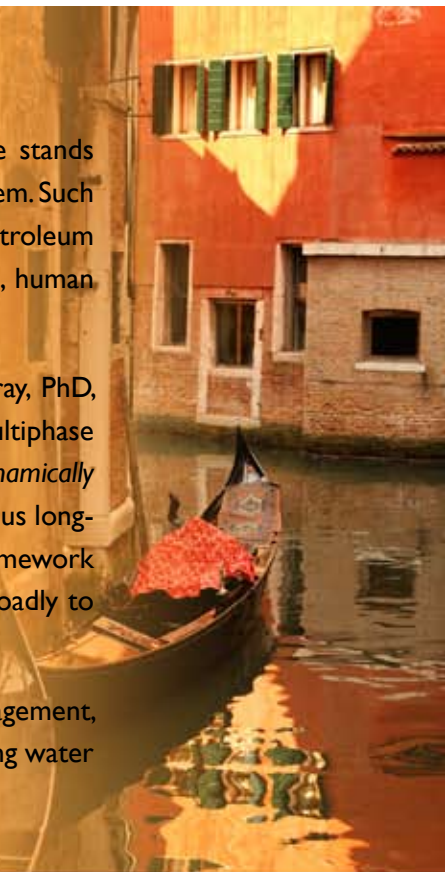


Miller

You've probably heard of that famous sinking city in Italy. Venice stands upon a flawed structure known as a multiphase porous medium system. Such systems are all around us, for example: groundwater systems, petroleum reservoirs, geothermal heat sources, water filters, fuel cells, plants, human skin, and even our lungs.

Environmental Sciences and Engineering professors William G. Gray, PhD, and Cass T. Miller, PhD, and their colleagues and students work on multiphase porous media systems. Together, they developed the *thermodynamically constrained averaging theory*. This theory resolves many of the previous long-standing problems with modeling such systems and provides a framework to advance models of varying sophistication that can be applied broadly to multiphase porous medium systems.

Miller and Gray's work in this area provides tools that will improve design and management, and guide policy change for a wide range of health and environmental problems, including water supply, environmental quality restoration, and global climate change.



OUR IMPACT

EASING THE BURDEN OF INDUSTRIALIZATION IN THE UAE

The United Arab Emirates is one of the most remarkable development stories of the modern world. In less than two generations, the UAE has grown from a collection of small coastal settlements to a modern, cosmopolitan nation with skyscrapers, modern industries, and superhighways – achieving what has taken other nations six generations. This development has improved quality and length of life, but has also placed an environmental burden on the health of its people.

Environmental health is measured by the excess number of deaths and illnesses due to exposure to pollutants in air, water, soil, and food as well as global climate change. Referred to as the “environmental burden of disease,” experts at UNC have found that each year approximately:

- 200-1100 deaths are linked to outdoor air pollution
- 100-410 deaths are linked to indoor air pollution
- 60,000-200,000 doctor's visits are due to coastal water pollution
- 16,000-63,000 doctor's visits are due to drinking water contamination

To improve environmental health in the UAE, the Environment Agency—Abu Dhabi (EAD) selected and funded our School through a competitive proposal process to lead the National Environmental Health Project. Led by environmental sciences and engineering assistant professor, Jacqueline MacDonald Gibson, PhD, the project represents global interdisciplinary teamwork at its best. More than 20 faculty at the School work with numerous outside partner agencies in teams to assess outdoor air pollution, indoor air quality, water contamination and diet/exercise in the UAE.



Paerl



A CAPTAIN ON BOARD FOR WATER QUALITY

Environmental sciences and engineering Kenan Professor, Hans Paerl, PhD, sets sail aboard a ferry in North Carolina's Pamlico Sound to discover how water quality is affected by chronic problems like pollution, and temporary problems like record droughts and tropical storms.

He heads the FerryMon program (Ferry-based Monitoring of Surface Water Quality in North Carolina) recently featured in *Science* and *Environmental Science & Technology* magazines. In this program, the ferries are fitted with a flow-trough system equipped with sensors that continuously analyze the water and send information concerning water quality to the program lab. The collected data provides needed information to scientists and water quality managers in many agencies, including the Department of Environment and Natural Resources, the Environmental Protection Agency, the National Oceanographic and Atmospheric Administration, and even the local fisheries, tourists and residents living on the water's edge. Information on water quality status of the Sound and Neuse River Estuary is available on FerryMon's website (www.ferrymon.org).

The FerryMon program, the first of its kind to be conducted in the United States, ensures that scientists and others are provided with real-time water quality information, allowing them to discover how changing events in our environment affect our coastal water resources.

on water and environment

SOMETHING IN THE AIR AFFECTS SOME MORE THAN OTHERS

Air pollution is a problem, but does it affect some persons more than others? Air pollution causes about 2 million premature deaths worldwide each year, according to the World Health Organization. Biostatistics professor Haibo Zhou, PhD, develops statistical models to explain how our genetic makeup may influence our response to air pollution.

He is studying the relationships between genetics, ozone air pollution, and lung disease. He recently found that persons with a particular genotype (GSTM1) experience much greater airway inflammation when breathing in ozone polluted air compared to other persons. Zhou's work may eventually lead to the development of special alerts for people with particular genetic susceptibilities.

In addition to his research on lung disease and air pollution, Zhou also studies the effects of environmental toxins in other areas of health, such as fertility and pregnancy.



Zhou

The School is committed to recruiting a diverse group of faculty members who share a vision for a better world with improved public health practices. In fiscal year 2009, 89 percent of assistant professors on tenure track were investigators on at least one grant or contract, 62 percent being lead investigators.



Clare Barrington, PhD, Assistant Professor, Health Behavior and Health Education

Dr. Barrington studies how social networks influence health behaviors, in particular, sexual behaviors related to HIV. Her current research focuses on populations disproportionately affected by HIV/AIDS, such as male clients of female sex workers in the Dominican Republic. She finds that males are strongly influenced by those within their social network, and are significantly more likely to report using condoms if they perceive that their social network contacts use condoms. Barrington's insights into the behaviors associated with promoting safe sex may help to reduce risky sex behaviors in global populations experiencing high rates of HIV and other sexually transmitted infections.

Rebecca Fry, PhD, Assistant Professor, Environmental Sciences and Engineering

Dr. Fry studies how exposures to environmental metals, like arsenic, affect humans and lead to disease. Arsenic pollutes the water of approximately 40 million people around the globe including populations in the United States and leads to cancer of the skin, bladder, lung, liver, prostate and kidney. Dr. Fry is researching why this is the case. Human cells from genetically diverse populations display a massive range of responses to the same toxic agents, therefore, Dr. Fry focuses on identifying genes that predict and control our cellular response to these agents. With this knowledge, she identifies gene biomarkers to determine who is most susceptible to disease and who is most likely to respond to chemotherapy.



John Vernon, PhD, Assistant Professor, Health Policy and Management

Dr. Vernon is an internationally recognized expert on pharmaceutical pricing and Research & Development investment who joins the School with PhDs in both management science and economics. He frequently testifies before Congress and advises the FDA, Department of Commerce, and President's Council of Economic Advisers. His research is widely cited in top newspapers and on radio and cable news programs. Recently he demonstrated that the cost of drug development is underestimated due to outdated methods of calculating such costs. Vernon also recently brought to light the considerable economic benefit if the U.S. were to expand programs, guidelines and education for adolescent vaccines.

Marcel Yotebieng, PhD, Research Assistant Professor, Epidemiology

Dr. Yotebieng recently finished his PhD in Epidemiology, with a minor in Biostatistics at the UNC Gillings School of Global Public Health. He is now based in Kinshasa, Democratic Republic of Congo. He primarily studies HIV in children living in sub-Saharan Africa. He recently developed new reference guidelines for predicting success of anti-retroviral therapy (ART) used in children battling HIV in South Africa. Yotebieng also works to identify perceptions and behaviors associated with condom use in young men living in Nairobi, Kenya, with the hope of identifying areas for improvement and education regarding the prevention of sexually-transmitted infection, including



STUDENT RESEARCH

In March 2009, the Office of Research co-sponsored our Annual Spotlight on Student Research Poster Presentation Event with the UNC Theta Chapter of Delta Omega and the Health Sciences Library. During this event, student presenters share the results of their research projects with faculty, students, and others.

This year, four of the student presenters, Mejs Hasan, Lucia Leone, Regina Rutledge and Michelle Sonia Wilkinson were selected to submit their research projects to the annual Delta Omega National poster competition.

Michelle Sonia Wilkinson, a May 2009 MSPH Program graduate in health policy and management, analyzed the cost-effectiveness of screening high-risk women for mutations in the BRCA genes, the genes that have been linked to breast and ovarian cancer. Her project was selected by Delta Omega for presentation at the national American Public Health Association meeting.

Mejs Hasan, a student in the MS Program in environmental sciences and engineering, presented a Bayesian analysis of the areas in Middlesex County, New Jersey most contaminated with carcinogenic industrial waste commonly used in medical production companies within the area.

Lucia Leone, a PhD student in nutrition, presented research showing that obesity is associated with lower colorectal cancer screening rates in white women, but not in African American women.

Regina Rutledge, a May 2009 graduate of the MPH Program in maternal and child health, studied adolescent pregnancy trends, finding that adolescent pregnancy rates are higher in rural counties than their urban counterparts.



From left to right: Hasan, Leone, Wilkinson, Rutledge

Dennis Gillings, PhD, CBE, and Joan Gillings pledged \$50 million in 2007, providing our School with critical resources to anticipate emerging public health challenges, accelerate solutions, and improve people's lives across North Carolina and around the world. Funded research programs, known as Gillings Innovation Labs (GILs), focus on solving big public health problems.

Can eating locally address obesity, the environment, and economic viability?



Alice Ammerman, DrPH, professor of nutrition and Director of the Center for Health Promotion and Disease Prevention, leads a large collaborative team gathering health, environmental and economic data within North Carolina that will bridge academia, local farming communities and North Carolina state agencies, and contribute to a broader understanding of food systems, with national and international relevance. Tobacco is becoming less economically important in NC, thus farms are in transition. Ammerman uses an innovative array of approaches including case studies, documentary photography, and quantitative data analysis, to explore the environmental benefits of smaller scale sustainable farming practices; determine nutrition and health-related benefits;

and conduct an economic analysis of opportunities and barriers for developing integrated local and sustainable food systems.

Laboratory for molecular surveillance of tropical diseases opens in the Congo

Infectious diseases remain the leading cause of death and disability in developing countries. To more effectively combat tropical diseases, we need to know how many people have these diseases and where they live. New molecular and demographic methods can help national and international health organizations track data and map tropical diseases such as malaria and African sleeping sickness, and can also help in evaluating the effectiveness of treatment. Steve Meshnick, MD, PhD, professor of epidemiology, leads a global team that will focus on the poor in the Democratic Republic of Congo. Meshnick will identify the "hot spots" of disease requiring immediate attention in the DRC and the data will also serve as a model for how to combat and eradicate disease elsewhere around the world.



Meshnick



Styblo

Some drinking water is shockingly high in arsenic contamination

About 60 million people in South/Southeast Asia have dangerously high exposure to arsenic in their drinking water. At least 13 million Americans are exposed to arsenic in drinking water at levels that exceed the U.S. EPA Maximum Contaminant Level and the level recommended by the World Health Organization. Most of this arsenic is naturally-occurring; some is from industrial output. Chronic exposure to arsenic is associated with several cancers, vascular diseases, cardiovascular diseases, hypertension, and diabetes. Miroslav Styblo, PhD, associate professor of nutrition has combined a team of experts in environmental health, medicine, biochemistry, toxicology and chemistry to improve risk assessment and treatment of diseases associated with

exposures to arsenic.

GILs beginning in 2009-2010 include: *Removing Nitrogen, Recovering Energy from Hog Waste to Protect Air and Water in NC* (Mike Aitken, Environmental Sciences & Engineering); *Innovative Statistical Approach to the Relationship between Genomics and Disease* (Danyu Lin & Fred Wright, Biostatistics); *Getting Safe, Effective Drugs to Those Who Need Them* (Til Stürmer, Epidemiology); and *A Seamless, Accessible, 21st-Century Global Classroom* (William Zelman, Health Policy & Management).

RESEARCH WORLDWIDE

Faculty and staff in the UNC Gillings School of Global Public Health conduct research throughout most of the 100 North Carolina counties, in other states, and in more than 50 countries around the world. Globally, our faculty conduct research in nutrition, HIV/AIDS treatment and prevention, malaria, TB, water and sanitation, land use, healthcare policy, health disparities, family planning, child health, infant feeding, obesity, and domestic violence to name some examples.

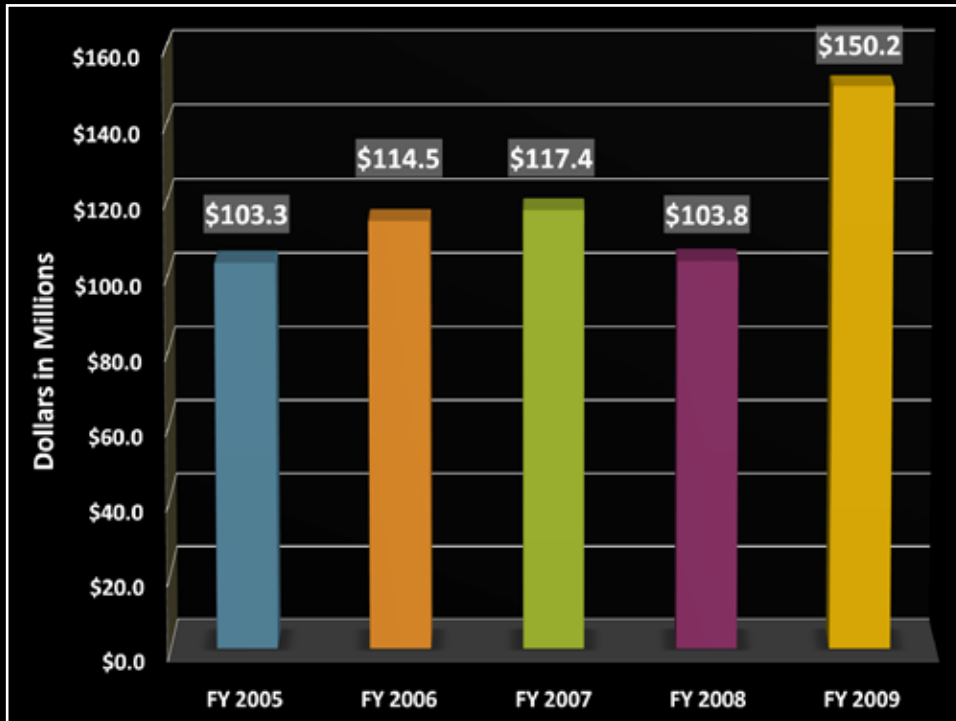
Our faculty worked in the following countries and territories during fiscal year 2009:

Argentina	DR Congo	Honduras	Moldova	South Africa
Bangladesh	Dominican Republic	India	Morocco	Sweden
Botswana	Ecuador	Indonesia	Nepal	Tanzania
Brazil	Egypt	Iran	Nicaragua	Thailand
Cambodia	Fiji	Jamaica	Nigeria	Turkey
Canada	France	Japan	Norway	UAE
Chile	Guatemala	Jordan	Peru	Uganda
China	Georgia	Kenya	Phillippines	United Kingdom
Colombia	Germany	Madagascar	Puerto Rico	Uruguay
Costa Rica	Ghana	Malawi	Russia	Vietnam
Czech Republic	Haiti	Mexico	Somalia	Zimbabwe



DOLLARS AWARDED FROM GRANTS & CONTRACTS TO PRINCIPAL INVESTIGATORS IN THE UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

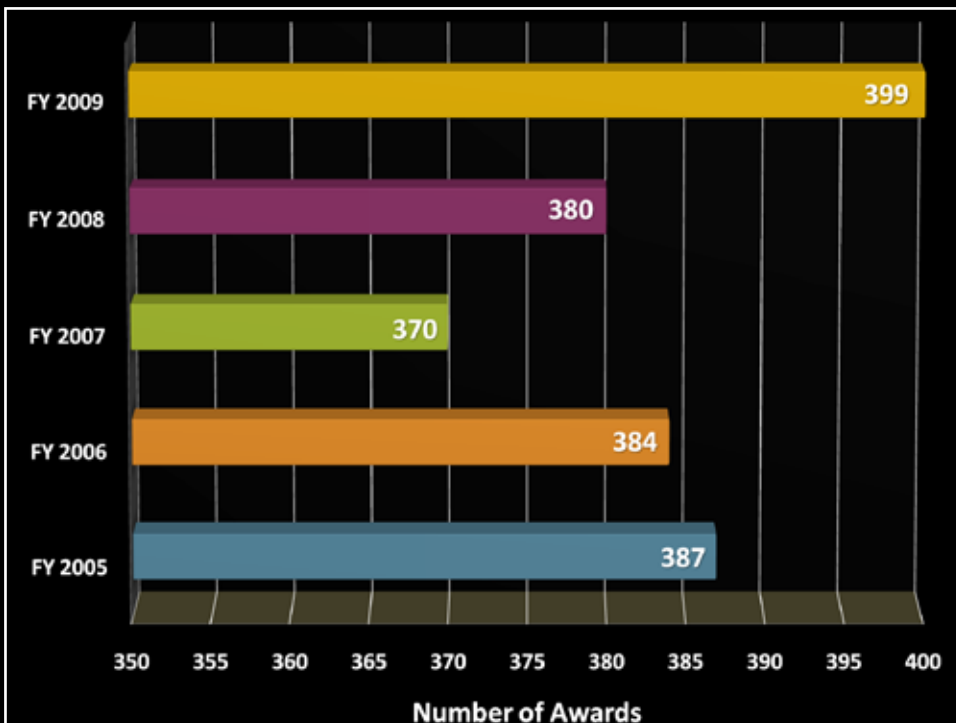
(Fiscal Years ending June 30)



The School's faculty were awarded more than \$150 million for grants and contracts in Fiscal Year 2009.

NUMBER OF AWARDS FOR GRANTS & CONTRACTS TO PRINCIPAL INVESTIGATORS IN THE UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

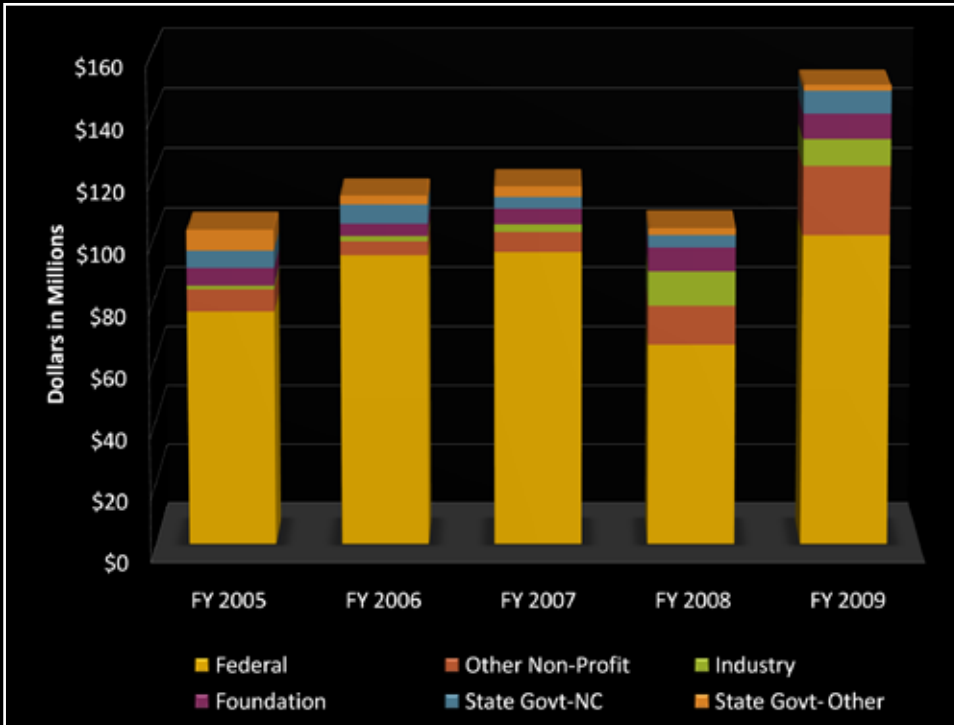
(Fiscal Years ending June 30)



399 grants and contracts were awarded to Principal Investigators in the School during Fiscal Year 2009. This translates to 2.7 per faculty PI.

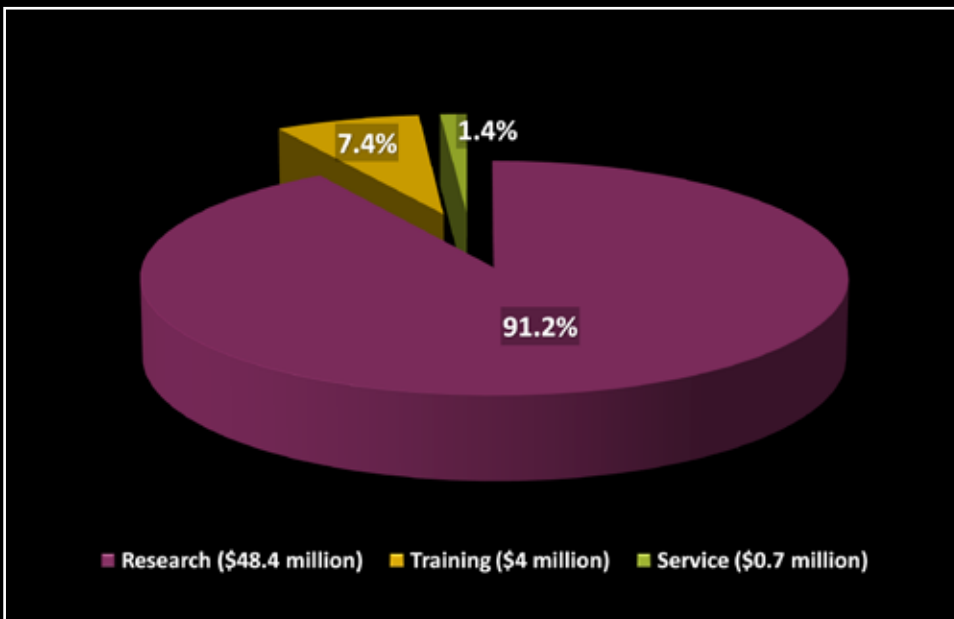
TYPES OF FUNDING FOR GRANTS & CONTRACTS AWARDED TO PRINCIPAL INVESTIGATORS IN THE UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

(Fiscal Years ending June 30)



The majority of external funding (60%) in Fiscal Year 2009 was from the federal government.

PERCENTAGE OF DOLLARS AWARDED FOR NIH RESEARCH, TRAINING AND SERVICE GRANTS AND CONTRACTS IN THE UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH FOR FISCAL YEAR 2009



Total Funding from NIH in Fiscal Year 2009 was \$53.1 million, with the majority awarded for research.

COLLABORATIVE WORK

Participation in interdisciplinary research, education and service is of great importance to solving today's most challenging problems. Research centers and institutes offer an interdisciplinary mix of expertise and resources to aid faculty, staff and students in answering significant questions for science and society. Our School has a long history of collaborative work, and many faculty members have appointments within UNC centers and institutes. In fiscal year 2009, over a third (36%) of grants and contracts awarded to our School's principal investigators were administered through centers and institutes. The lists provided below include examples but may be incomplete. See <http://research.unc.edu/services/offices.php> for current lists of UNC's centers, institutes and core labs.

Service to North Carolina:

The largest institute within the School, often called "the Institute," is the North Carolina Institute for Public Health (NCIPH). Other, smaller centers and programs reside within the NCIPH.

Centers and institutes that are part of our School include:

- Center for Environmental Health and Susceptibility
- Carolina Global Breastfeeding Institute (Maternal & Child Health)
- Center for Innovative Clinical Trials (Biostatistics)
- Collaborative Studies Coordinating Center (Biostatistics)
- Nutrition Obesity Research Center (Nutrition)
- Survey Research Unit (Biostatistics)
- UNC-GSK Center for Excellence in Pharmacoepidemiology and Public Health (Epidemiology)

Faculty, staff and students also work with these UNC research centers and institutes as well as others:

- Carolina Vaccine Institute
- Center for AIDS Research
- Center for Environmental Medicine, Asthma, and Lung Biology
- Center for Global Initiatives
- Center for Health Statistics Research
- Center for Infectious Diseases
- Center for Maternal and Infant Health
- Institute for Disaster Studies
- Institute for Global Health and Infectious Diseases
- Institute for the Environment
- Lineberger Comprehensive Cancer Center
- Neurodevelopmental Disorders Research Center
- Parr Center for Ethics
- Thurston Arthritis Research Center
- Translational and Clinical Research Institute (TraCS)

Faculty, staff and students work in these UNC centers and institutes under the purview of the Vice Chancellor for Research for Economic Development:

- Carolina Population Center
- Cecil G. Sheps Center for Health Services Research
- Center for Galapagos Studies
- Center for Health Promotion & Disease Prevention
- Center of Excellence for the Study of Natural Disasters, Coastal Infrastructure, and Emergency Management
- FPG Child Development Institute
- Highway Safety Research Center
- Injury Prevention Research Center
- Institute of Marine Sciences
- Institute of Renaissance Computing
- Institute on Aging
- Nutrition Research Institute
- Odum Institute for Research in Social Science

The Office of Research exists to strengthen the research enterprise at the UNC Gillings School of Global Public Health. We help to assure that we meet four broad research objectives.

Objective 1: Continue our School's strong productivity in research grants and contracts

Objective 2: Strengthen research productivity and research training experiences among emerging faculty and student scholars

Objective 3: Facilitate innovative, interdisciplinary research that contributes to public health improvements in North Carolina and worldwide

Objective 4: Disseminate research findings to research and practice communities to enhance scientific knowledge and to translate research to practice



Minter

Kennedy

The Office of Research is one of the Central Administrative Units at the UNC Gillings School of Global Public Health. We receive advice from the Research Council, which is comprised of faculty representatives from various departments in the School. Offering such services as biostatistical consulting, editing for proposals, grant writing workshops, dissemination of funding announcements, facilitation of strategic partnerships, and reporting on measures of performance, productivity and impact, the Office of Research help to enhance the research activities of the faculty, staff and students in the School.

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More information is available on the Office of Research website: http://www.sph.unc.edu/research/office_of_research/

*Our mission is to improve public health, promote individual well-being,
and eliminate health disparities across North Carolina and around the world.*



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GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH