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DR. PIERRE BUEKENS

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A LEGACY OF CARING FOR WOMEN AND CHILDREN



A public health nurse gives a boy instructions to take home to his family (circa 1940).

In 1936, the sixth year of the Great Depression, adults still faced a 17 percent unemployment rate. Millions lived in grinding poverty, and the southeast endured the dubious distinction of having the nation's highest infant and maternal death rates.

"It was children who were dying disproportionately of malnutrition, malaria and measles," says Jonathan Kotch, MD, MPH, who until his recent retirement was the Carol Remmer Angle Distinguished Professor of Children's Environmental Health at the Gillings School.

Poor nutrition among North Carolina boys during the Depression had taken such a toll that, by the time they were teenagers, about half were rejected by the military.

This context framed the UNC School of Public Health's founding in 1940. It also framed the sustained effort, from the School's earliest days, to improve health outcomes for women, infants, children and adolescents.



DR. JONATHAN KOTCH

SPOTLIGHT ON IMPACT

Dr. Arden Miller



“I became interested in children’s health advocacy for two reasons. The first was the realization that one-on-one care was not going to accomplish very much for the children and their families and their countries. Second was the realization that we were poorly equipped to understand how to do anything else.”

—Arden Miller, MD
Former professor and chair
Department of Maternal and Child Health

A tireless advocate for children, Dr. Arden Miller served as president of the American Public Health Association (1974–1975); on the Institute of Medicine task force on prevention of low birth weight (1983–1985) and the Southern Governors’ task force on infant mortality (1984); as chair of the board of the Allan Guttmacher Institute; and as visiting professor of maternal and child health at Shenyang Medical University in China (1988). In 1984, Miller received APHA’s Martha Mae Eliot Award for extraordinary health services to mothers and children. (See tinyurl.com/apha-miller.)

Seventy-five years later, although many women’s and children’s health challenges remain, huge improvements in this area rank as a top achievement in U.S. public health.

“Sometimes we forget about how well we have done [in the U.S.] in women and children’s health,” says Kotch. “We’ve reduced child mortality from infectious disease by over 99 percent in the last 100 years. Very few children in the U.S. now die of extreme malnutrition in infancy or early childhood.”

CROSS-DISCIPLINARY COLLABORATION AND A RESEARCH-TO-PRACTICE APPROACH LEAD TO GLOBAL IMPACT

“[Since its founding, the Gillings School] has linked maternal and child health priorities at the state, national and international levels and has linked research and action,” remarks former UNC maternal and child health professor and



DR. PIERRE BUEKENS



Photo by Lauren Kennedy



chair Pierre Buekens, MD, now W.H. Watkins Professor and dean of Tulane University's School of Public Health and Tropical Medicine. With the addition of a department of maternal and child health in 1950, the School gave this focus the institutional muscle necessary to make significant headway.

"Today," Buekens says, "UNC plays the strongest role in maternal and child health [in the nation]."

School leaders aim to:

- Increase access to comprehensive family planning domestically and globally;
- Improve nutrition for pregnant mothers and infants;
- Increase breastfeeding in N.C., the U.S. and around the world;
- Prevent childhood obesity;
- Reduce pregnant women's exposures to heavy metals and other toxins;
- Reduce HIV transmission;
- Improve the quality of child-care centers in the U.S.;
- Increase HPV vaccination in the U.S.; and
- Prevent injuries and interpersonal violence among teens domestically and globally.

SPOTLIGHT ON IMPACT

Strengthening child-care centers

For 16 years (1997–2013), Jonathan Kotch, MD, MPH, led the National Training Institute for Child Care Health Consultants. Through this train-the-trainer program, School faculty and staff members helped develop a national infrastructure of qualified health and child-care professionals, an approach shown to improve quality of child-care programs.

15

MODULES DEVELOPED

20

TOOLKITS CREATED

477

INSTRUCTORS TRAINED

5,600

CHILD-CARE HEALTH CONSULTANTS TRAINED

100%

U.S. STATES AND TERRITORIES WITH QUALIFIED HEALTH AND CHILD-CARE PROFESSIONALS



Photo by Lauren Dunnington



Photo by Emily Zuenike



Photo by Lady Dragonfly/Creative Commons



Photo by Peggy Bentley

Along the way, School faculty members helped establish the internationally



DR. A.M. SIEGA-RIZ

renowned Carolina Population Center (*cpc.unc.edu*), even as a number of School affiliates and others founded important global nonprofit organizations, such as the International Fertility Research Program (which has since evolved into FHI 360), Population Services International and Ipas.

“When we tackle complex problems, such as adverse birth outcomes or obesity, we all have to work together,” says Anna Maria Siega-Riz, PhD, professor of epidemiology and nutrition and the School’s associate dean for academic

affairs, explaining why cross-disciplinary approaches to maternal and child health have paid off.

The School’s commitment to implementation also has been essential.

“We work with public health practitioners to test interventions,” Kotch says. “If an efficacy study demonstrates we can do something that actually improves people’s health, then we can take the next step and determine whether disseminating that study beyond the experiment can have real impact on the community.”

GLOBAL IMPACTS, REPRODUCTIVE HEALTH

“It’s hard to overestimate the importance of the connections School faculty

members have—and have had historically—with the Carolina Population Center (CPC) in the area of maternal and child health,” says Jason Smith, PhD, clinical associate professor of health behavior and deputy director of CPC’s Monitoring and Evaluation to Assess and Use Results (MEASURE) Evaluation program.

In 1964, faculty members Drs. Bernard Greenberg, John Gentry and Sydney Chapman had the prescience to join a pan-campus effort to establish the CPC, with Dr. Moye Freymann, professor of health policy and administration, recruited to be its first director. The venture brought together researchers from many disciplines, including maternal and child health, who were interested in

SPOTLIGHT ON IMPACT

Breastfeeding

Miriam Labbok, MD, MPH, Professor of the Practice of maternal and child health and director of the Gillings School’s Carolina Global Breastfeeding Institute (CGBI), won three national awards in 2013–2014 for her impact upon women and children and for her applications of evidence-based research.

As a faculty member since 2007, and as founding CGBI director, Labbok has overseen development of a comprehensive program of research and service to local and global communities and education related to breastfeeding and optimal reproductive health.

“Among the strongest new research findings are those in support of exclusive breastfeeding,” says Labbok. “Four major preventable causes of infant mortality—premature infant death, Sudden Infant Death Syndrome, respiratory disease and infection—as well as obesity and diabetes, can be reduced by breastfeeding.”

Among other efforts, she and colleagues have developed a national collaborative that accelerates systematic implementation of *Ten Steps to Successful Breastfeeding*, an effective tool maternity hospitals can use to support breastfeeding in their own communities.

“I have worked in 54 countries, carrying out applied research for program development and improvement, turning the evidence into action,” Labbok says. “Our research, service and training are designed to enable women to succeed in breastfeeding and to build future leaders in this field. This interconnectedness also applies to local/global. By staying on the national scene, we help the state, and vice-versa. The global interest is always there, so through this leadership, we also make national and international headway.”



DR. MIRIAM LABBOK

population welfare. From its beginning in 1964, the CPC and its public health school affiliates trained health providers in family-planning methods, supported by major funding from the U.S. Agency for International Development (USAID). With the arrival of Dr. J. Richard Udry, maternal and child health and sociology professor and chair—and CPC director from 1977 to 1992—CPC shifted its focus to research. Under Udry's leadership, CPC affiliates applied for and received numerous National Institute of Health (NIH) grants. (See tinyurl.com/2012-udry-obit.)



DR. RICHARD UDRY

Former maternal and child health professor Amy Tsui, PhD, now professor of population, family and reproductive health at the Johns Hopkins Bloomberg School of Public Health, senior scholar at the Bill & Melinda Gates Institute for Population and Reproductive Health and member of the Gillings School's external advisory committee, led the CPC to greater levels of influence by launching, with USAID funding, the Evaluation Project (1991) and then MEASURE Evaluation (1996).



DR. AMY TSUI

The project, awarded \$180 million in 2014 to embark on Phase IV work, is USAID's most important mechanism

to support population, health and nutrition monitoring and evaluation. It has helped 44 developing countries identify critical health needs (including nutrition, family planning, reproductive health, HIV/AIDS prevention, and maternal and child health) and then target scarce resources to achieve greatest impact.

Many Gillings School faculty members are MEASURE Evaluation researchers, including project director Jim Thomas, PhD, associate professor of epidemiology; research associate professor Siân Curtis, PhD, and research assistant professors Gustavo Angeles, PhD, Shelah Bloom, ScD, and Kavita Singh Ongechi, PhD, all of maternal and child health; adjunct assistant professor Heidi Reynolds,



Research by Dr. Anna Maria Siega-Riz helped establish the Institute of Medicine's 2009 guidelines for weight gain during pregnancy.



Photo by Kent Kessinger

Women and children wait to be seen at a clinic in Honduras.

PhD, also of maternal and child health; and Sharon Weir, PhD, research assistant professor of epidemiology. Many more contribute as well.

Through better measurement, combined with widespread implementation of life-saving interventions, maternal mortality has declined in many developing countries over the past 15 years, with some achieving more than 50-percent reductions in maternal deaths, according to a 2014 World Health Organization (WHO) report.

Yet, maternal mortality rates are still very high, and enormous challenges remain.

“Ninety-nine percent of all maternal and newborn deaths occur in developing countries,” says Bert Peterson, MD, Kenan Distinguished Professor and former chair of maternal and child health.

With colleagues, Peterson is widening the School’s impact in this area. He directs UNC’s WHO Collaborating Center for Research Evidence for Sexual and Reproductive Health, which has played a key role in developing—and supporting uptake of—WHO’s evidence-based guidance for family planning. These guidelines are now used in more than

50 national programs around the world, where there previously had been *no* guidelines. Such efforts, which help prevent premature deaths of thousands of women worldwide, are part of a field known as implementation science, an area in which the Gillings School is an early leader. (See page 56.)

DIET AND NUTRITION

Research on maternal and child nutrition has flourished through robust interdisciplinary collaboration and applied research.

“I became interested in nutrition as an undergrad,” Siega-Riz says. “I saw that it was an important predictor of preterm delivery. That experience made me want to come back to grad school at UNC. I was interested in understanding nutritional determinants of poor reproductive outcomes.”

At Carolina in the 1990s, Siega-Riz began collaborating with former epidemiology chair David Savitz, MD



DR. DAVID SAVITZ

SPOTLIGHT ON IMPACT

Linking science and policy to protect teen drivers



DR. LEW MARGOLIS

In 1997, N.C. was one of the first two states to adopt graduated driver licensing, a process that allows new drivers to acquire more experience before they are fully licensed. With colleagues at the UNC Center for the Study of Young Drivers, **Lewis Margolis, MD, MPH**, maternal and child health associate professor, has demonstrated declines in teen motor-vehicle deaths of 25 percent to 30 percent and declines of 25 percent in teen motor-vehicle hospitalizations. These findings led to adoption of graduated driver’s licenses by every state in the U.S.

(now at Brown University), on the Pregnancy, Infection and Nutrition (PIN) study, which recruited more than 3,000 pregnant women and followed them into the first year postpartum.

“That cohort,” says Siega-Riz, “has been extremely influential in the field of reproductive and perinatal health.”

Specifically, the research improved assessment and analysis of maternal dietary intakes and provided the basis of the Institute of Medicine’s 2009 weight-gain recommendations for women during pregnancy. (See tinyurl.com/IOM-pregnancy-weight-gain.) The guidelines reach millions of women through health-care providers and information campaigns, giving them important benchmarks that show how diet and weight gain affect the course of pregnancy and the health of the unborn.

The work of Steve Zeisel, MD, PhD, Kenan Distinguished Professor of nutrition and director of the Nutrition Research Institute, in Kannapolis, N.C., has been similarly influential. With colleagues, he discovered that insufficient choline during pregnancy can affect fetal cognitive development and memory. His findings led to changes in IOM recommendations for pregnant women.



DR. STEVE ZEISEL

GLOBAL IS LOCAL, AND LOCAL IS GLOBAL.

One core value of the Gillings School has been its dual focus on local and global populations.

“I always believed in the local-global connection and the importance of having a perspective that crosses cultures,” says Peggy Bentley, PhD, Carla Smith Chamblee Distinguished Professor of nutrition and the School’s associate dean for global health.

Bentley’s research has taken her to Peru, India, Malawi and across North Carolina. In collaboration with researchers from UNC’s School of Medicine and the Centers for Disease Control and Prevention, her research in Malawi on providing antiretroviral medication to infants of HIV-positive, breastfeeding mothers played a major role in changing WHO policy recommendations.



DR. PEGGY BENTLEY

The School’s local impact is significant too.

“We have grads who lead maternal and child health clinics in local health departments, who are local health directors, who do work in the state women’s and children’s section [ncdhhs.gov/dph/wch]. In that way, probably more than any other, we have made a real impact on the health of North Carolinians,” says Kotch.

Moreover, close ties between Gillings School faculty members and alumni have helped facilitate widespread early adoption in N.C. of nationally recognized interventions, including NAP-SACC, The Nutritional and Physical Activity



DR. DIANNE WARD

Self-Assessment for Child Care (gonap-sacc.org). Developed and tested by Dianne Ward, EdD, nutrition professor, it was one of three programs identified by the White House Task Force on Childhood Obesity as being effective at combatting early-childhood obesity. NAP-SACC has been adopted by child-care centers nationwide.



DR. REBECCA FRY

Also in North Carolina, Dr. Rebecca Fry, associate professor of environmental sciences and engineering and deputy director of the UNC Superfund Research Program, focuses on children’s environmental health. She studies effects of prenatal exposure to metals such as arsenic, cadmium and lead on the **epigenome**. (See definition below.)



What is the epigenome?

A genome is the complete set of DNA in a cell. DNA carries instructions for building the proteins that make each creature unique. The epigenome (“above” the genome) consists of chemical compounds that mark the genome in a way that tells it what to do, and when and where to do it. The marks, not part of the DNA itself, can be passed from cell to cell as cells divide, and from one generation to the next.

—National Human Genome Research Institute
(genome.gov)

“Prenatal arsenic exposure in humans results in potentially harmful epigenetic changes in newborns, and long-term health consequences in human populations are pronounced,” says Fry, summarizing her recent research results.

Finding the sources of such exposures is a challenge. In one study of private well water in N.C., Fry and colleagues identified counties in which inorganic arsenic is “off-the-charts high.” Dangerous levels of metals are found in foods as well, including such staples as apples and rice.

“There is currently no regulation of toxic metals in our food,” Fry says.

Fry also has carried out children’s environmental health-related work in Mexico, Thailand and (with Kotch) in Vietnam.

Stephanie Engel, PhD, associate professor of epidemiology, examines the impact of prenatal exposure to chemicals commonly found in consumer products such as shampoo, deodorant, medications and cosmetics.

With regard to tackling persistent disparities in birth outcomes in the U.S., Vijaya Hogan, DrPH, clinical associate professor of maternal and child health, has studied how the social environment and historical factors translate into adverse maternal and infant outcomes.

The research of Michael Kosorok, PhD, Kenan Distinguished Professor and chair of biostatistics, related to cystic fibrosis (CF) screening, was highly influential in the CDC’s decision to recommend newborn screening for the disease. In 1997, only three states required CF newborn screening;

by 2004, there were 12 states. Now, all 50 states have CF newborn screening programs.

ADOLESCENT HEALTH

Contributions to adolescent health are another legacy of the Gillings School. Dick Udry, PhD, professor of maternal and child health and sociology from 1965 to 2004, was among the first to integrate biological and sociological models of human behavior.

In the 1990s, Udry designed the National Longitudinal Study of Adolescent Health (Add Health), an extremely ambitious study of teens in grades seven to 12. (See tinyurl.com/cpc-add-health.) Four waves of data combine information on teens’ social, economic, psychological and physical well-being with contextual data on family, neighborhood, community, school, friendships, peer groups and romantic relationships. Carolyn Halpern, PhD, professor and interim chair of maternal and child health, is Add Health’s current deputy director and a co-investigator.

Udry developed strategies that made his valuable data available to other researchers while protecting research participants. For more than two decades, Add Health has provided unrivaled opportunities for more than 2,000 researchers to study how teens’ social environments and behaviors are linked to their health and achievement outcomes. Collectively, study publications have influenced dozens of disciplines, including sociology, psychology, criminology, education, economics, biostatistics, epidemiology, medicine, genetics

and aging. That research approach has been profoundly actionable.

Health behavior professors Karl Bauman, PhD (emeritus), Susan Ennett, PhD, and Vangie Foshee, PhD, followed Udry’s lead in developing similarly complex data sets on the social contexts of teen health and behavior. These data in turn informed development of effective interventions focused on alcohol and tobacco prevention (Bauman, Foshee and Ennett), understanding the social context of teen alcohol and drug use (Ennett), and preventing teen dating violence (Foshee and Bauman).

To date, Foshee’s Safe Dates program has been adopted by school systems across N.C. and used throughout the world. As of 2013, more than 8,400 Safe Dates curricula have been purchased, and well over 1.68 million young people have been introduced to the program.

“We have so much opportunity with kids to help shape health behaviors and help prevent risky behaviors when they are young,” says Ennett. “From an intervention standpoint, focusing on early adolescence is an opportunity to do prevention before there is the acceleration in those behaviors.”

—Elizabeth French & Rachel Gillman



DR. KARL BAUMAN



DR. SUSAN ENNETT



DR. VANGIE FOSHEE