

ACKNOWLEDGMENTS

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The history project was initiated through the vision of Drs. Elizabeth Mayer-Davis and Margaret Bentley.

Much of what has been saved about the early years was recorded in Robert Korstad's *Dreaming of a Time*, a 50th anniversary history of the UNC School of Public Health (1939-1989), commissioned by then-dean Michel Ibrahim. Korstad's careful research and analysis were essential to this work. Dr. Ibrahim's availability to talk about the nutrition department during his tenure also is appreciated. (His interview is among those online.)

Dr. Victor Schoenbach, professor emeritus of epidemiology at the UNC Gillings School, is the School's unofficial but devoted historian. He provided encouragement and materials, especially video interviews with the late Dr. John Anderson, professor emeritus of nutrition, and Lana Dial, MSPH, MPH, nutrition alumna. His efforts, with Judith Winkler, to develop a history for the Gillings School's Department of Epidemiology served as a model for this document.

Other special thanks go to the reference librarians at UNC's Wilson Library for their patient assistance in locating relevant materials, to executive assistant Rachel Thimke for administrative help, to facilities manager Brent Wishart, for helping unearth some of the School's archived materials, and to members of the Nutrition

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Linda Craven Kastleman
December 2021

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Dr. Elizabeth Mayer-Davis (Photo by Jennie Saia)

FOREWORD

The State of the Department (2021-2022)

On our 75th anniversary, we are excited to have compiled a written history that celebrates our thriving Department of Nutrition here at the UNC Gillings School. We look forward to making even more of the materials we have collected available online at sph.unc.edu/nutr.

Allow me to boast a bit about the current state of the department.

In 2021, the UNC Gillings School's Department of Nutrition is a global leader in research, training and public policy. As the only academic nutrition program in the United States located in both a school of public health and a school of medicine, the department's 56 full-time faculty members are uniquely positioned to engage in innovative approaches to move quickly from discovery to delivery. The physical location of the department on the UNC

campus – in close proximity to all the UNC health affairs schools (public health, medicine, nursing, dentistry, pharmacy) – enhances the potential for collaboration.

Nearly one-third of the department's faculty members are based at the Nutrition Research Institute. This has resulted in a number of important synergies between the department and the institute – and between the communities of Chapel Hill and Kannapolis. As chair, I have been privileged to work with Steve Zeisel, and now, with

Stephen Hursting, to optimize opportunities both for the department and NRI. Together, we can substantially improve health through nutrition both for communities and individuals.

Our faculty's expertise spans the molecular to the societal, capitalizing on interdisciplinary approaches to identify and deliver optimal nourishment for the planet and train the leaders of tomorrow. Students and faculty share and benefit from an unusual breadth of scientific, research and policy expertise as they work to improve and enhance the public's health through better nutrition across North Carolina and around the world.

As associate chair for research, Dr. Raz Shaikh oversees the department's many research projects. Grant funding, including from the National Institutes of Health, ranges between \$20 and \$30 million each year. The department's research can be divided into four primary categories — precision nutrition, diet, health and disease, fundamentals of nutrition and metabolism, and understanding and changing diet-related behavior.

In January 2022, the department received two of 14 contracts – totaling \$170 million over five years – awarded by the NIH Common Fund as part of Nutrition for Precision Health (NPH), powered by the All of Us Research Program. The All of Us Research Program aims to develop algorithms that predict individual responses to food and dietary patterns. To support that effort, Dr. Susan Sumner and I each received funding to open an NIH NPH center. I will oversee a \$13 million Clinical Center, and Dr. Sumner, a \$19 million Metabolomics and Clinical Assay Center. These will provide numerous opportunities for current and future faculty members and students to advance the field of nutrition.

Students in the department benefit from an engaged faculty, a cutting-edge curriculum, and a number of course formats to accommodate their personal and professional needs.

Dr. Melinda Beck, associate chair for academics, oversees the department's multiple degree offerings. Undergraduate students can pursue a degree in nutrition with a focus on science and research or health and society. Graduate-level students can


choose a Master of Public Health in Nutrition, an MPH with registered dietitian (RD) training, a Master of Science in nutrition, or a Doctor of Philosophy degree.

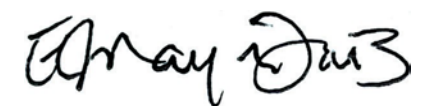
As of 2017, both the MPH Nutrition and the MPH RD degrees are available as residential or online courses of study.

Of the **367 students** enrolled in courses for a nutrition degree in 2021-2022:

- **79** are bachelor's students in the nutrition science and research track;
- **21** are bachelor's students in the nutrition health and society track;
- **31** are seeking the Master of Public Health in nutrition;
- **75** are students in the MPH Nutrition, Registered Dietitian program;
- **71** are in the MPH@UNC Nutrition program;
- **36** are in the MPH@UNC RD program;
- **5** seek a Master of Science degree in nutrition; and
- **49** are working toward the Doctor of Philosophy degree in nutrition.

In short, the state of the department is strong.

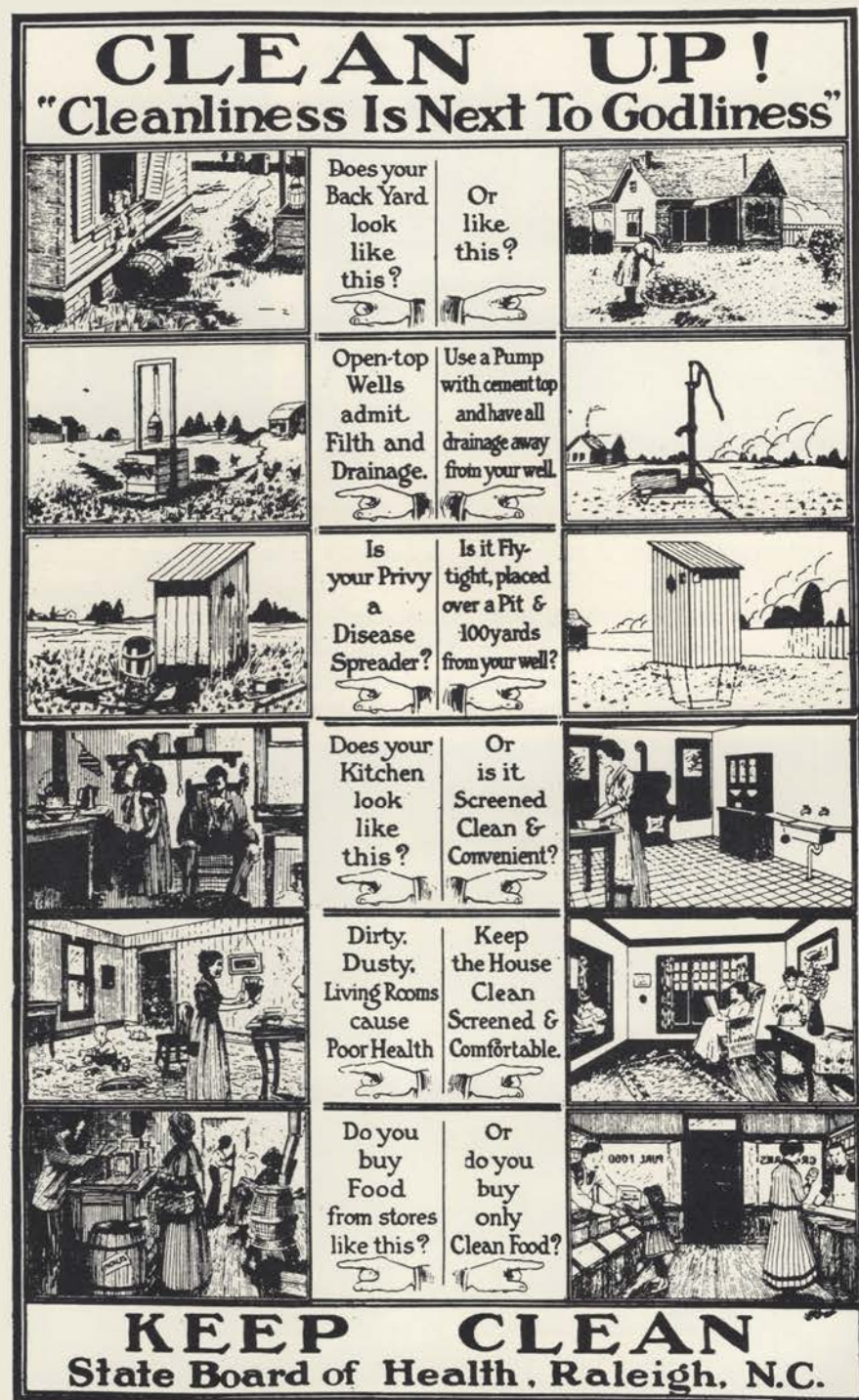
It is an absolute joy to serve as chair because of the incredible talent and dedication of our faculty and staff. I am particularly inspired by the expertise and dedication of our current students and recent alumni. Their work holds promise for the myriad challenges the department and the field of nutrition will face in the coming decades. I have full confidence in the capacity of the department to advance our vision — to achieve optimal nutrition for all people around the globe. 



Elizabeth Mayer-Davis, PhD, RD

Cary C. Boshamer Distinguished
Professor of Nutrition and Medicine
Chair, Department of Nutrition
Co-director, UNC Nutrition
Obesity Research Center

January 2022



This graphic, which appeared in an issue of the Bulletin of the N.C. State Board of Health in June 1917, presented some of the many public health challenges of the time.

CHAPTER 1

The Beginnings of UNC's Public Health School (1877-1940)

To describe the trajectory of the nutrition department at the UNC-Chapel Hill Gillings School of Global Public Health requires a sense of the unique public health school within which it was established.

From **1877**, when the N.C. state health board was instituted, its directors worked to improve the health of North Carolinians. Diseases related to poverty and lack of sanitation had grown exponentially after the Civil War. Early progressive efforts by the board dealt with stemming the spread of tuberculosis, improving sanitation and the potability of the water supply, and prevention and treatment of hookworm disease.

A successful hookworm eradication program in N.C. was made possible through funding from the John D. Rockefeller Foundation, whose leaders already were experienced with diseases usually found in developing countries – a state of affairs quite similar to that in the economically impoverished South. A relationship with the Foundation provided financial support at key times in North Carolina's public health endeavors and later opened the door to projects abroad that

“It is scarcely an overstatement to say that nutrition is public health problem number one in the southern section of our country, and it is my opinion that the time has arrived to set up a department of nutrition in the School of Public Health.”

— MILTON ROSENAU TO THE ROCKEFELLER FOUNDATION, NOV. 8, 1945



helped bolster the global expertise of UNC public health faculty.

In the **1930s**, university administrators and faculty members became increasingly aware of the roles they might play in training much-needed health workers in the state.

Visionary leadership on the part of Carl V. Reynolds, North Carolina’s state health officer, Charles Mangum, dean of the UNC medical school, and others, intersected with some great good luck to bring Milton Rosenau, renowned Harvard epidemiologist, to Chapel Hill to lead such a public health program.

At the time, Harvard’s mandatory retirement age for faculty was 65, an age Rosenau reached in **1934**. Reynolds and Mangum felt they had nothing to lose by asking

Rosenau, still vibrant and in the prime of his scholarship, to start a new program from scratch.

To their delight, he accepted.

Beginning in **1936**, Rosenau became inaugural director of the public health division in the UNC School of Medicine. Through federal contacts, he found funding to hire Robert Fox, director of county health work for the State Board of Health, as a professor of public health administration, and Herman Glenn Baity, director of the N.C. Public Works Administration, as a professor of sanitary engineering. Courses offered through the nascent program included ones in public health administration, child hygiene, epidemiology, vital statistics and principles of sanitation. These early efforts later led to the formation of

the school’s departments of epidemiology, environmental sciences and engineering, and health policy and management.

Rosenau’s vision and rigor resulted in an independent school of public health in 1940. That year, the new school was tasked with its first research effort – to study why so many potential military recruits suffered from venereal diseases and to determine how to mitigate the problem. Dr. William Fleming, the school’s first professor of syphilology, and epidemiologist Dr. John Wright were hired. The need to educate and care for North Carolina communities afflicted with venereal and other communicable diseases called for the establishment of a Department of Public Health Nursing.

By **1942**, the need for more community health education workers led to a Department of Health Education, which was headed by Yale-educated Lucy Morgan. Morgan’s awareness that communities of color could best be served by Black educators and health care providers led her to invite students from the North Carolina College for Negroes in Durham (now North Carolina Central University) to take part in her health education courses and to help establish a master’s training program in health education at the college.

A department of nutrition had been part of Rosenau’s plan for the public health school from the beginning of his time at UNC. The need to include a department

People waiting for care pose at a hookworm treatment center in Lincoln County, N.C., circa 1911.



of nutrition in a school of public health now seems obvious, if not essential – but at that time, and to this date, departments of nutrition are most often found in universities with a school of agriculture. This made Rosenau’s plan to include nutrition in the UNC School of Public Health visionary, even revolutionary.

In **1945**, Rosenau wrote to the Rockefeller Foundation’s General Education Board that “it is scarcely an overstatement to say that nutrition is public health problem number one in the southern section of our country, and it is my opinion that the time has arrived to set up a department of nutrition in the School of Public Health.”¹

Thanks to Rockefeller Foundation funding, the nutrition department was established in **1946**, six years after the founding of the public health school. Unfortunately, this was Rosenau’s final gift to the School, as he died that year, by cardiac arrest, at age 77.

The mission of the UNC Gillings School of Global Public Health – *to improve public health, promote individual well-being, and eliminate health inequities across North Carolina and around the world* – has led generations

of students to seek an education at the school Rosenau founded. His eloquent words make clear why the study of public health is both altruistic and essential:

Preventive medicine dreams of a time when there shall be enough for all, and every [person] shall bear [a] share of labor in accordance with [one’s] ability, and every [person] shall possess sufficient for the needs of [the] body and the demands of health.

These things shall [all] have as a matter of justice and not of charity.

Preventive medicine dreams of a time when there shall be no unnecessary suffering and no premature deaths; when the welfare of the people shall be our highest concern; when humanity and mercy shall replace greed and selfishness; and it dreams that all these things will be accomplished through [human] wisdom [...].

Preventive medicine dreams of these things, not with the hope that we, individually, may participate in them, but with the joy that we may aid in their coming to those who shall live after us.

[For] when [the young] have vision, the dreams of [their elders] come true.²

The school was the first to train all members of the public health team – public health nurses, health educators, biostatisticians, sanitary engineers, nutritionists and epidemiologists.³ It relatively quickly became recognized as one of the finest schools of public health in the world, as it took on a broad range of scientific and educational endeavors and responded flexibly to changes in the public health agenda. There is still room to improve upon Rosenau’s lofty vision, but there continue to be administrators,

faculty members and students who capably face the challenge.

On the occasion of the UNC nutrition department’s 75th anniversary in 2021, Elizabeth Mayer-Davis, PhD, department chair and Cary C. Boshamer Distinguished Professor of Nutrition and Medicine, has commissioned a work that records and reflects upon the department’s many achievements and looks ahead to the promises and challenges of the field in the decades to come.

This is the beginning of that document. 📖

The UNC public health faculty attends a meeting in 1948. At far left, in the foreground, is nutrition chair Hughes Bryan. At far right, at the head of the table, is Dean Edward McGavran.



Timeline 1940-2022

1940

UNC School of Public Health is founded.

1946

UNC Department of Public Health Nutrition is established, with Hughes Bryan as founding chair, through a grant from the Rockefeller Foundation.



1959

Rebecca Broach (later Bryan) joins the faculty.

1951

First graduating class of three MPH students. Students entering the one-year program were required to have an undergraduate degree in food, nutrition, dietetics or home economics. The students' training was supported by funding from the federal Children's Bureau, which later became the U.S. Health Resources and Services Administration's Maternal and Child Health Bureau.

1968

The Registered Dietitian credential was first required for qualification as a practicing dietitian. Previously, one needed only to be a member of the American Dietetic Association.

1966

Carolina Population Center opens.

1970

Hughes Bryan dies; Rebecca Bryan serves as interim chair.

1971



Joseph Edozien becomes chair.

1976

The BSPH degree program is established.

1977

DrPH degree program is established.

1978

The first four BSPH students graduate.

1972

A two-year MPH program is added. Students are admitted with undergraduate degrees in the basic sciences, behavioral sciences and humanities, not only nutrition, dietetics or home economics.

1984-1985

- By 1985, the department had graduated 363 MPH students, 14 DrPHs and 97 BSPH students.
- Department staff includes a business manager, registrar, laboratory analyst, part-time computer programmer and four full-time secretaries.

1986

- UNC Center for Health Promotion and Disease Prevention is established.
- Boyd Switzer serves as interim chair.

1987

- Mildred Kaufman is selected as chair.
- Coordinated master's program (MPH-RD) receives initial accreditation; graduates are qualified to sit for the registered dietitian credentialing exam.



CONTINUE →

← CONTINUED



1990

- Steven Zeisel selected as chair
- Department becomes jointly based in the schools of medicine and public health.

1991

- PhD program established
- Department organized into three divisions: biochemistry, intervention and policy, and nutritional epidemiology

1999
NIH-funded UNC Nutrition Obesity Research Center established

2003
Cynthia Bulik becomes inaugural director of UNC Center for Excellence in Eating Disorders.

2004

Interdisciplinary Obesity Center established

2005

June Stevens is selected as chair.



2006

Nutrition Training grant begins

2008

Nutrition Research Institute, directed by Steven Zeisel, opens in Kannapolis.

2009

The DrPH degree program is discontinued.

2010

The department has 65 faculty members (21 professors, 4 associate professors, 3 assistant professors, 19 clinical research professors, 15 adjuncts and 3 professors emeriti); 134 students (43 doctoral, 58 master's, 33 BSPH); and 22.5 staff (14 research and 8.5 administrative).

2013

Elizabeth Mayer-Davis is selected as chair.



2016

Mayer-Davis becomes co-director, with Steven Zeisel, of NORC.

2018

The Gillings School launches its MPH@UNC virtual program. Nutrition was among the program's first concentrations, offering the MPH@UNC RD and MPH@UNC Nutrition degrees.

2019

The department hosts the inaugural Interdisciplinary Nutrition Sciences Symposium. The next in-person event is planned for summer 2022.

2020

In March, 102 years after the last devastating pandemic, the U.S. shuts down as a result of COVID-19. School faculty members provide essential teaching, research and service to address the challenges, relying on virtual venues and selected lab work highly controlled for safety.

2021

- 361 students are enrolled in nutrition programs, 80 more than in 2020 and more than double the number in 2016. A BSPH Health and Society track is added, with 21 students enrolled.
- Stephen Hursting is named director of the Nutrition Research Institute, where about 30% of the department's faculty members are based.
- Raz Shaikh becomes co-director, with Mayer-Davis, of the Nutrition Obesity Research Center; John Easterbrook becomes NORC's managing director. NIH funding for the center is secure through 2026.

2022

- The NIH awards the department 2 of 14 national centers in a 5-year, \$170M precision nutrition study. The centers are led by Mayer-Davis (clinical) and Susan Sumner (metabolomics).
- In FY2021, the department's grant funding was \$27M.
- Current academic programs (and enrollments) are: BSPH-Nutrition Science and Research Track (79); BSPH-Nutrition Health and Society Track (21); MPH (31); MPH-Registered Dietitian (75); MPH@UNC Nutrition (71); MPH@UNC RD (36); MS (5); PhD (49).

NOW



Dr. Hughes Bryan examines a sample in the department's laboratory, circa 1947.

CHAPTER 2

The Department's Early Years (1946-1970)

After Dean Rosenau's death in 1946, faculty members John Wright and H.G. Baity took on the leadership of the school and managed the search for a new dean. They selected Albert Hughes Bryan, MD, to head the new Department of Public Health Nutrition.

Bryan had earned a Doctor of Medicine at Harvard and taught at the University of Chicago before entering the U.S. Public Health Service Commissioned Corps during World War II. The son of a sugar chemist with the U.S. Department of Agriculture, Bryan was tasked with assembling laboratory equipment and planning renovations for the structure on the medical school campus (known as 'Building C') that would serve as the department's temporary home.

In the words of Dean Emeritus Fred Mayes, in a 1975 report, the

Department of Public Health Nutrition had been "created to meet the growing needs of malnourishment throughout the world."⁴

However, mostly due to inadequate funding, the department grew little during the immediate postwar period and certainly did not quickly develop its present global reach or reputation. While post-Depression-era private philanthropy and government programs had promoted the health of each for the betterment of all, a vibrant postwar economy meant that

public health issues were not prioritized, and the disadvantaged were at risk of becoming more so.

Frances MacKinnon was an early faculty member. A nutritionist and dietitian skilled in teaching and public health practice, she joined the faculty in 1949. The following year, the nutrition department accepted its first three Master of Public Health students. Rebecca Broach (later Bryan, as she married the chair) enrolled in the MPH program for the 1951-1952 academic year.

From 1951 to 1972, students admitted to the graduate program in public health nutrition were required to have an undergraduate degree in food, nutrition, dietetics or home economics.

As historian Robert Korstad reports, Rebecca Bryan remembered of that time:

I had a feeling that the faculty felt they were learning as much from the students as



Frances MacKinnon joined the faculty in 1949.

we were from them, and they probably were. The Department was being funded by the Children's Bureau, and most students were here on Children's Bureau scholarships. When the visiting chiefs from Washington came, we were a part of the thinking. I felt I had my thinking stretched a mile.⁵

The department's strengths, Korstad observed, were in teaching and service, but:

[Hughes] Bryan continued to do both laboratory and field

In 1957-1958, three of the 154 public health students were in nutrition. No nutrition students graduated in 1958-1959, and five received degrees in 1959-1960.



Nutrition students and faculty members pose for a photograph in 1958. Hughes Bryan is at far right; Rebecca Broach is third from left on the back row.

research. He began a study with [Bernard] Greenberg [then chair of the UNC biostatistics department, later dean of the public health school] in the early 1950s on the growth of school-age children. With money from the Public Health Service, they expanded the project in 1955 to look more closely at the relation of diet to growth patterns. Like other [faculty] members at the School, Bryan repeatedly complained that the lack of space prevented

him from undertaking any larger research projects.⁶

Hughes Bryan was widowed in spring 1957. Rebecca Broach joined the faculty in 1959, and sometime later, was married to Bryan.

In the late 1960s, only Hughes Bryan and Rebecca Bryan were full-time faculty in the department. Located on the second floor (north wing) of Rosenau Hall, the department had space for the chair's office, secretary's office, a library and a laboratory room.

As no one on the faculty was conducting bench science, the Department of Epidemiology was given use of the lab.

Registered dietitians at the UNC Hospital taught public health nutrition. Elizabeth (Lib) Brannon, MS, RD, who worked at the hospital's Child Development Center, also taught classes.⁷

Because of its small size, scope and budget, the department does not appear to have manifested itself in areas of social justice and equity during the turbulent 1960s, as was the case in other departments. This was a decade at the School during which student activists supported a strike by UNC food workers for better pay and working conditions, founded an inclusive student leadership council, and contributed to other movements for social change.

Environmental Sciences and Engineering faculty members and students became outspoken about the ravages of pollution and other environmental harms. Epidemiology faculty began their supervision of a health project in Malawi for prevention and treatment of tuberculosis. Health Education continued its practice of training people of

CAROLINA POPULATION CENTER FOUNDED IN 1966

In 1964, as a result of the biostatistics department's growing expertise and access to international data, the public health school began to consider the establishment of a population studies center. "The idea was to coordinate ongoing research and teaching on population issues, to expand consulting services to state and local health agencies as well as to foreign countries, and to increase theoretical research on population at the university."⁸

The Carolina Population Center, founded in 1966 with support from the Ford Foundation, focused first on urgent problems in developing countries. Its work would attract many nutrition faculty members in the coming decade and serve to hone the faculty's global research and service interests. In the 1970s, several faculty members took offices at the center, and collaborative relationships were established that have continued for more than 50 years. Faculty members including Barry Popkin, Penny Gordon-Larsen, Peggy Bentley, Lindsey Smith Taillie, Stephanie Martin and Linda Adair are among those who also were CPC fellows.

color to work in public health in U.S. and foreign communities.

A number of foreign students, especially from South and Central America and the Middle East, enrolled in the public health school and awakened the UNC community to the scope of the need for improved global public health. The nutrition department continued to focus on something it did quite well – training master's-level students who worked with health departments, hospitals, government agencies and nongovernmental organizations, and others across the state and the U.S.

Dean Mayes had described Hughes Bryan as "serious, attentive, deliberate in thought and motion; basically a research scientist at heart, turned inspired teacher in later years." Bryan's primary concern, Mayes wrote, was "with translating basic scientific information, via the applied sciences, into intelligent programs of individual and community action."⁹

Dean Michel Ibrahim agreed that Bryan was "softspoken, competent, and interested mostly in the laboratory and chemistry aspects of nutrition."¹⁰ An obituary written by someone at the School noted that "[Bryan] was a modest man who shunned the spotlight and sought peaceful surroundings to enable him to achieve excellence in all his pursuits."¹¹ Though a capable physician and laboratory scientist, a "gentleman and a scholar," in the words of his obituary, Bryan may not have had the breadth of vision to move the department forward in the new directions required by the times.

Bryan died at age 67 in 1970. Rebecca Bryan, still a faculty member, succeeded her husband as interim chair. Rebecca Bryan died in 2007 at the age of 96.¹² 📖



Dr. Joseph Edozien

CHAPTER 3

The Developing Years (1971-1990)

Dean Bernard Greenberg's report to the UNC Chancellor in November 1971 recommended reorganization of the School such that a Division of Community Health Practice and Administration would house the departments of health administration, health education, maternal and child health, mental health, public health nursing and public health nutrition.

As only about 18% of the School's \$7.1 million budget in 1970-1971 came from state funding, federal research grants were an increasingly essential source of revenue.¹³ The more service- and community-driven departments thus were organized in a way that gave them a collective voice, even while diminishing their individual entities.

A national search for a new department chair led to the selection in 1971 of **Dr. Joseph Chike Edozien**, member of a prominent family in Asaba, Delta State, Nigeria. Edozien's father, descended from the founder of Asaba, and mother, daughter

of an Asaba chief, provided him with an education at the National University of Ireland in Dublin. There he earned Bachelor of Science (1948) and Master of Science (1950) degrees in physiology and a Bachelor of Medicine and Bachelor of Surgery degree (1954), the equivalent of the Doctor of Medicine.

His son, Joseph II, later described Edozien by saying, "He was trained as a scientist from an early age because he was a prodigy. He believed ... in the beneficent power of logic, reason, observation, application, science and technology."¹⁴



Alice Ammerman



John Anderson



Jan Dodds



MaryAnn Farthing

After returning to Nigeria to teach at the University of Ibadan, Edozien developed a reputation for conducting important research in nutrition, and in 1962, he was appointed dean of the university's faculty of medicine. His career in Nigeria was cut short in 1967, when he was forced to leave the country during a coup and resulting civil war. He was able to escape to the U.S., where he was hired as a professor of nutrition by the Massachusetts Institute of Technology. He left MIT in 1971 for UNC.

Edozien aimed to expand the size and scope of the department. Among his first hires in 1972 were **Dr. John J.B. Anderson**, a biologist with a strong body of research in calcium and bone health, and **Dr. Boyd Switzer**, biochemist and researcher in human diseases. Under his tenure, the department expanded from two faculty members to about 10, with an additional 10 having joint appointments in public health and medicine.¹⁵

In the realm of teaching, Anderson was tasked with developing a bachelor's degree program (instituted in 1976), and Switzer led development of a Doctor of Public Health degree program (established in 1977). Later, when **Mildred Kaufman** (1977) and **MaryAnn Cross Farthing** (1978) joined the faculty, they were charged with expanding the Master of Public Health degree to include two tracks – the established one-year degree and a two-year program. These additions increased the size of the master's program to about 20 students and included students who had undergraduate degrees in the basic sciences, behavioral sciences and humanities. During this period, the department's reputation was based primarily upon the quality of its master's-level program.¹⁶

Dean Fred Mayes, who captured many of the School's faculty members in vivid verbal imagery in his 1975 retrospective report, described Edozien this way:



Pam Haines



Barry Popkin



Boyd Switzer

*He is of average height, stocky, well-knit with a sure-footed, resolute gait; intrepid in his resolve to build a department with greater breadth and depth; an enthusiastic, irrepressible basic researcher, leaving no stone unturned; impatient with 'time's a-wasting' trivialities; a fast learner; tenacious and persuasive in his endeavors to strengthen the department; determined to complete a successful, meaningful and satisfying career, even after suffering ... traumatic emigration, enforced, frustrating and painful disruption of scientific work, and other personal and family hardships attributable to a native homeland in civil war.*¹⁷

"In 1979," remembers MaryAnn Farthing, "Edozien nearly worked me to death with a nutrition training program grant – it was a federal grant to teach nutrition to teachers. His wife said he only slept four or five hours a night – and I believe it, because he got so much done."¹⁸

Administratively, Edozien developed three divisions in the department – public health nutrition, nutritional epidemiology and nutritional biochemistry. The first two of these shared a community-based focus. In public health nutrition, Kaufman and Farthing, and later **Dr. Jan Dodds**, were among those who developed successful programs to educate and serve communities. **Dr. Pam Haines**, **Dr. Alice Ammerman** and others applied principles of nutritional epidemiology to population groups to promote healthy food choices, and **Dr. Barry Popkin** used epidemiology to describe nutrition habits of U.S. and global populations. In contrast, nutritional biochemistry engaged laboratory scientists, including Anderson and Switzer, in describing the relationship of food intake to various health and disease conditions.¹⁹

"Over the years," Switzer says, "largely because of research funding, the main research divisions became Nutritional

Epidemiology and Nutritional Biochemistry. [The latter] has used molecular biology and genetics to explore the relationship of food components on biochemistry and development of diseases such as diabetes, heart disease, cancer and osteoporosis.”²⁰

Indeed, Edozien had reclaimed laboratory space for the department and courted students

interested in biochemical research – so much so that a 1976 internal review committee reported that the department may have become too research-oriented.²¹

Edozien brought two major grant contracts to the nutrition department – an evaluation of the Women, Infants and Children (WIC) program and a grant for soybean production in Bolivia. The

former became controversial when the U.S. Department of Agriculture contested the findings. The three-year study had determined that the WIC program increased the weight and health of infants and children and decreased incidence of anemia in mothers.

Dr. Michel Ibrahim, then chair of the epidemiology department and later dean of the School, was asked by Dean Greenberg to chair a select committee to evaluate the project’s findings. “Our committee’s conclusion,” Ibrahim wrote, “was that Edozien and his faculty followed sound scientific principles in conducting the project, and the complaints raised by the USDA were unfounded and probably politically motivated” and “that the program was successful in helping the population [WIC] it served.”²²

In 1977, Edozien hired Dr. Barry Popkin, now W.R. Kenan Jr. Distinguished Professor, and the following year, Popkin also became a fellow at the Carolina Population Center. He immediately was selected to take part in a U.S. Department of Agriculture evaluation of the federal school lunch and breakfast programs.

“That launched ... a long-term collaboration [with USDA],” Popkin wrote in 2021, “and began ... 43 years of research on U.S. diet patterns, trends, disparities and related issues.”²³

Around the same time, in 1976, Alice Ammerman, now Mildred Kaufman Distinguished Professor and director of UNC’s CDC-funded Center for Health Promotion and Disease Prevention, was completing an undergraduate degree in African studies at Duke University. That work fueled an interest in the 1977 boycott against Nestle, a Swiss manufacturer of baby formula.

During the 1960s and early 1970s, many new mothers in western countries had chosen to breastfeed their babies rather than use the prepared formula developed post-World War II and marketed for the convenience of working women. This led to a decrease in sales for the product in the U.S., and as a result, Nestle began an aggressive campaign to sell formula in Africa.

As Ammerman knew well, mixing the powdered formula with contaminated water meant certain

A nutrition student in the 1970s (right) works with a mother and child to develop healthful meal plans for the family.



illness and often death for infants (see sidebar), especially when the formula was left unrefrigerated or diluted with additional water to make it last longer. Taking part in the boycott convinced Ammerman to pursue a master's degree in nutrition at UNC.²⁴

Throughout her long tenure in the department (she earned a Master of Public Health in 1981, a Doctor of Public Health in 1990, and was appointed research assistant professor in 1991), Ammerman has seemed to keep in mind that initial motivation to study public health. In her career, she said in 2021, "two main streams have come together – chronic disease prevention among underserved populations and healthy food access, along with economic opportunities, for low-income communities – a food system focus."²⁷

As the 1980s began, the political climate led funding agencies to seek alternatives to "entitlement" programs for addressing the challenges of poverty. In 1982, Mildred Kaufman (whom Edozien had hired in 1977), along with Dr. Jonathan Kotch, from the UNC Department of Maternal and Child Health, and Dr. Robert Cefalo, from the UNC School of Medicine,

INFANT FORMULA USE IN DEVELOPING COUNTRIES

Dr. Mark Belsey, head of the World Health Organization's Maternal and Child Health Division in 1991, said that infants in the developing world fed exclusively on infant formula were 16 times more likely to die in infancy than babies fed only breast milk.²⁵

UNICEF estimated that over several decades, more than 1.5 million infants died each year in developing countries as a result of aggressive promotion of formula.²⁶

headed a project funded by the March of Dimes. The program aimed to improve the nutrition of pregnant women by training health professionals as counselors to the women. Education was helpful in reducing death rates for infants, but it was clear that low-income women still needed more direct and practical interventions, such as those offered through WIC, if they were to be sufficiently nourished.²⁸

Public health leaders in the U.S. recognized the need for a nationwide network of applied

public health researchers, and in 1981, such a network was proposed. In 1984, Congress authorized a Centers for Disease Control and Prevention-administered program that would fund select academic health centers to conduct community-based public health research. UNC's Center for Health Promotion and Disease Prevention (HPDP), along with centers at the University of Texas and University of Washington,

became one of the first three national Prevention Research Centers (PRCs) funded in 1986. As of 2021, there are 26 PRCs.²⁹

Ammerman, who became officially affiliated with HPDP in 1990, says the Center has been her "research home." As center director since 2004, she has brought a strong nutrition-based and community-engaged focus to the program and has increased cross-campus and statewide collaborations.

UNC's Center for Health Promotion and Disease Prevention became one of the first three national Prevention Research Centers, funded by the CDC in 1986.

(ALICE AMMERMAN HAS BEEN AFFILIATED WITH THE HPDP SINCE 1990 AND HAS SERVED AS DIRECTOR SINCE 2004.)



Mildred Kaufman

Kaufman serves as chair, 1987-1990

Edozien's 15 years as nutrition chair enhanced the department's international reputation. He increased the size of the student body from two students to more than 20, negotiated increasing amounts of money from the School and University to grow the faculty and expand the number of classes available, and encouraged faculty members to write grants.

In 1986, Edozien took a leave from his administrative duties. First intended as a year's absence, the leave became permanent. Dr. Boyd Switzer served as acting chair until a new leader could be named.

When Michel Ibrahim became dean in 1982, his priorities included recruiting qualified new chairs for all the departments and attempting to increase the number of women in leadership positions.

"I asked Mildred Kaufman to chair the department for three years," Ibrahim said in 2021. "She was a senior faculty member, liked by her colleagues, and she enjoyed a good national reputation. Her tenure as chair, although brief, was wonderful, as she provided a smooth transition to the next chair while facilitating harmonious relationships among faculty and staff and lifting their morale."³⁰

Kaufman's reputation had been made in the world of public health practice, and one of her strengths was an ability to provide real-world experiences for her students.

"She provided our class with a wonderful trip to Washington, D.C., meeting amazing people and seeing great work being done," recalls alumna Eloise Clark. "I believe it was because of Mildred that my classmates and I had great opportunities for our weekly practical North Carolina experiences, our summer clinical internship at Johns Hopkins Hospital in Baltimore, and our summer independent internships."³¹

"I think [Mildred] really promoted the role of the department in the true spirit and practice of public health," said her student,

Alice Ammerman, who now holds a professorship in Kaufman's honor. "Mildred wrote the textbook we used, so it was clear she had a prominent role in public health nutrition. [But] as we began attending national conferences and reading more of the ... literature, it became clear that [she] was widely respected nationally ... and was an advocate for the field."³²

As chair, recalled Barry Popkin, "Mildred hired a second registered dietitian (RD) nutritionist, MaryAnn Cross Farthing, and together, they built what was the first public health nutrition department with community nutrition as a specialty, [one that had the qualifications] to get RD-certified. [That] was an amazing battle with the American Dietetics Association [now the Academy of Nutrition and Dietetics], but Mildred accomplished this."³³

In 1990, Edozien was appointed as chair of the Nigerian Institute of Medical Research and also was named the 13th Asagba, or tribal king, of his home city, Asaba. He retired from UNC and returned to Nigeria in 1991.³⁴ In 2021, he celebrated his 96th birthday as an active and respected Nigerian leader.³⁵ 🏠



Dr. Steven Zeisel works in his lab at the UNC Nutrition Research Institute in Kannapolis, N.C., in 2018. (Photo by Robert Singh)

CHAPTER 4

An Explosion of Scientific Activity (1991-2014)

In the 1990s, the obesity epidemic became a funding priority at the National Institutes of Health and other important research sponsors, and the strong connection between obesity and nutrition catapulted the department's research program.

Funding opportunities spanned from cell to society, resulting in increases in research funding for all three of the department's divisions. Popular interest in personal diet and fitness also was increasing, as were concerns about inadequate resources for low-income and other disadvantaged people in N.C. and around the world. The twin pandemic of undernourishment and overweight posed a spectrum of challenges.

Zeisel: 'The Right Person for the Moment'

There is consensus that **Steven Zeisel, MD, PhD**, was the "right person for the moment" when he arrived as chair of the nutrition department in 1990. He was "a visionary scientist and leader,"³⁶ "energetic, with a strong resume in research,"³⁷ one who could transform the department and expand exponentially its research and teaching efforts, who "had a clear vision and agenda for accomplishing what he set out to do."³⁸



Steve Zeisel discusses his choline research with students in the 1990s. (Photo by Vic Cotto)

Zeisel, who trained at Harvard, Massachusetts Institute of Technology and Yale, was a physician and professor at Boston City Hospital and Boston University School of Medicine for eight years prior to his coming to UNC.

In short order, he made dramatic changes, working to develop a department that was the first to be housed in both a school of public health and school of medicine – a change that facilitated medical students’ learning more about the tenets of public health and public health students becoming versed in the science of medicine.

As part of that aim to interlock the two disciplines, he designed a

teaching tool for medical students that contained lectures on various aspects of nutrition. The lectures were recorded on compact discs and distributed to medical schools across the country free of charge.³⁹

Zeisel collaborated with the faculty to develop a Doctor of Philosophy degree program in nutrition in addition to the Doctor of Public Health degree. Then, he redesigned the curriculum to offer core training in nutritional biochemistry, nutrition epidemiology, and nutrition policy and intervention, such that doctoral students could specialize in one of the core areas.

He worked with faculty to build an internationally recognized research program, which led to the department’s being ranked by the National Science Foundation in 2005 as one of the top five in the country. During this period, the department was awarded a National Institutes of Health training grant that is still funded 20 years later.

“After I became chairperson, I believe that the faculty members were first motivated by hope that the department could become the best in the world,” Zeisel says. “Once we succeeded in this goal,



The Nutrition Research Institute in Kannapolis undergoes finishing touches in 2007.

our faculty members were proud of their new stature and wanted to continue to be respected by their peers. These were powerful forces that helped us recruit and retain outstanding faculty members. When I arrived, we had 11 full-time faculty; by 2005, we had 35 full-time primary faculty and about 20 joint appointments with many other departments.”⁴⁰

Zeisel’s efforts led to support from Bristol Myers Squibb to establish a center of excellence; the company’s multimillion dollar award enabled new faculty hires. Gatorade awarded the department a \$4 million gift that provided

funds for recruitment, research and interventions, including the Get Kids in Action program.⁴¹ In 1998, the department was selected by the NIH to be one of 12 Centers of Excellence in Nutrition, resulting in continuous funding since then for the department’s Nutrition Obesity Research Center (NORC), at the level of more than \$1.25 million each year. (As of 2021, Drs. Elizabeth Mayer-Davis and Saame “Raz” Shaikh are NORC’s co-directors, and current funding is in place until 2026.)

“On the side,” as Barry Popkin joked,⁴² Zeisel and his team were conducting transformative



(L-R) Carolyn Barrett, Steve Zeisel, Jan Dodds and others staff an information booth about the UNC Department of Nutrition in 1994. (Photo by April Hoyle)

research on choline, proving that it is an essential nutrient for people. This discovery led in 1998 to the National Academy of Medicine's setting Dietary Reference Intakes for choline intake; in 2016, the European Food Safety Authority also set choline intake recommendations. The U.S. FDA officially set choline intake and food labeling rules in 2017.

Zeisel's team has studied the role of choline in infant brain development. In 2007, the U.S. FDA required that all infant formulas contain the amount of choline present in human milk. In 2018, the American Medical Association and American Academy of Pediatrics issued

policy statements saying that choline was essential for children's brain development.

Most recently, Zeisel's team has focused on precision nutrition, showing that dietary requirements for choline are modulated by common genetic variations. Their work triggered interest in the field of precision nutrition, and in 2021, the National Institutes of Health added this area to its strategic plan and has funded it in excess of \$170 million in grants in 2021.

In 2005, Zeisel stepped down as chair to focus on his involvement with a new UNC Nutrition Research Institute being built in Kannapolis, N.C.⁴³ An initial

investment of \$750 million by David Murdock, chief executive officer of Dole Foods, established a 350-acre campus with a half-million square feet of work space devoted to nutrition. The NRI was housed in a 125,000' sq. building on the campus.

"The concept was to bring together several universities on the campus and recreate the success of the Research Triangle Park investment 30 years earlier," Zeisel says. "UNC-Chapel Hill was allocated about one-third of the campus's funding, and I was asked to build a world-class research program focused on precision nutrition."

Zeisel was based at NRI beginning with its opening in 2008. By 2021, the NRI supported 18 faculty members and 100 full-time employees and was receiving more than \$8 million each year in grant funding, primarily from the NIH.

Among the faculty hired during Zeisel's tenure as chair were [Rosalind Coleman](#) (1991), [Martin Kohlmeier](#) (1992), [Melinda Beck](#) (1996), [Dianne Ward](#) and [Margaret Bentley](#) (1998), [Mirek Styblo](#) (1999), [Penny Gordon-Larsen](#) (2000), the late [Jessie Satia](#) (2002), [Cynthia Bulik](#) and [Carmen Samuel-Hodge](#) (2003), and [Deborah Tate](#) (2004).

A surge in interest and funding for nutrition research

The decades between 1990 and 2010 spurred a new scientific and popular interest in the ways food and exercise shape human health, and the department, given a number of cross-disciplinary faculty members, was well positioned to make significant contributions in many areas.

"The concept [for the NRI] was to bring together several universities and recreate the success of the Research Triangle Park. UNC-Chapel Hill [received] one-third of the campus's [\$750M] funding, and I was asked to build a ... program focused on precision nutrition."

— DR. STEVEN ZEISEL



Dr. Barry Popkin (back row, second from left) was convener of the 2013 Bellagio Conference in Bellagio, Italy. Faculty member Dr. Shu Wen Ng (front row, fourth from left) also attended. The international meeting examined program and policy options for preventing obesity in low- and middle-income countries.

Among those faculty members are:

Linda Adair, a biological anthropologist, studies factors related to healthy pregnancy, birth outcomes and early child growth, investigating how early life factors relate to health in adulthood. She has led the Cebu (Philippines) Longitudinal Health and Nutrition Survey since 1990 and has worked with COHORTS, an international collaboration that has yielded insights regarding early origins of obesity and cardiometabolic diseases in low- and middle-income countries. Her work in Malawi and Rwanda focused on the prevention of mother-to-

child transmission of HIV and on ways that breastfeeding and complementary feeding influence infant growth and survival.

Peggy Bentley, a medical anthropologist, focused her career on women's and infants' nutrition on the global stage. She was an investigator for a product called plumpy doz, a peanut butter paste supplement used in Honduras to prevent malnutrition and growth stunting in young children. She has led NIH-funded interventions to improve child growth and development in India and to prevent obesity among infants and toddlers in North Carolina.

She also conducted behavioral research on sexually transmitted diseases, including HIV, and on community-based interventions for nutrition and health.

Cynthia Bulik, based in psychiatry, examines ways to treat eating disorders, including bulimia and anorexia, and to improve the psychological and physical health of those affected. She conducts laboratory, epidemiological, twin and molecular genetic studies of eating disorders and weight regulation. Anorexia increased by 36 percent about every five years between the 1950s and 2005, according to a PBS "Nova" presentation.⁴⁴ At least 8 million people suffer from the disorder, most of them women between 15 and 24.

Pediatrician **Rosalind Coleman**, who was appointed by Zeisel to lead the department's nutritional biochemistry division, has had a far-reaching impact on the field of lipid metabolism, especially regarding the ways excess synthesis of triacylglycerol links obesity with defective insulin signaling. **Martin Kohlmeier**, also a physician, has studied metabolic effects of diet and drug interventions and developed methods for the analysis of



Dr. Dianne Ward (right) answers questions at a news briefing on girls and obesity in 2000.

nutritionally related risk indicators in large populations. A major focus of his research has been the impact of common genetic variants on nutritional sufficiency.

Barry Popkin, an agricultural economist, developed the concept of the Nutrition Transition, the study of the dynamic shifts in dietary intake and physical activity patterns and trends around obesity and other nutrition-related noncommunicable diseases. His work in the U.S. and in low-

and middle-income countries around the world focuses on policy decisions that can have an impact on population health. He has helped institute and is evaluating the effect of taxes on the purchase of sugar-sweetened beverages and junk foods in a number of countries. His 2009 bestselling book, *The World Is Fat: The Fads, Trends, Policies and Products That Are Fattening the Human Race* (New York: Avery), argues that our social and physical environments, fostered by government and multinational corporations, not individuals' poor dietary choices, are responsible for the obesity epidemic and its resultant nutrition-related noncommunicable diseases.

Deborah Tate, a joint professor in health behavior, has focused her research on 1) strategies for obesity prevention and treatment, and 2) the translation of behavioral interventions using digital platforms. Tate conducted several of the first randomized trials using the internet and mobile technologies to deliver behavioral treatments for obesity. She continues to study innovative

ways to use technology for healthy lifestyle behavior change with a focus on creating personalized and precision health digital programs that are designed to maximize success for the individual using a cost-effective approach.

Dianne Stanton Ward, with a doctorate in education, led the Gatorade-funded Get Kids in Action program in the early 2000s, a program that encouraged physical activity for young children. She later developed the Nutrition and Physical Activity Self Assessment for Child Care (NAP SACC) to help child care centers in North Carolina boost their food quality, improve physical activities offered, and augment staff-child interactions for children ages 2 to 5. The outreach was expanded through Go NAP SACC, an online tool that helps child-care programs set goals for improving menus and meal-time environments, increasing and enriching active play, and instituting other healthful changes. The programs aligned with First Lady Michelle Obama's *Let's Move!* campaign.



Dr. June Stevens

June Stevens appointed chair

June Stevens, PhD, American Institute for Cancer Research/World Cancer Research Fund Distinguished Professor of nutrition and epidemiology, was appointed chair in 2005.

An obesity epidemiologist, she was educated at Pennsylvania State University (MS, 1980) and Cornell University (PhD, 1986), and received postdoctoral training at

The New England Epidemiology Institute and the Medical University of South Carolina.

Stevens maintains a large research program focusing on the causes, consequences and prevention of obesity in different populations. Her grants have generated more than \$26 million to support her research, and she has collaborated on projects with

other investigators to secure millions of dollars in funding.

She has coordinated a series of large, multicenter national trials that have tested behavioral interventions aimed at improving children's health through lifestyle changes. Notable among these is the project, "Trial of Activity for Adolescent Girls (TAAG)," a \$9+ million grant from the National Heart, Lung and Blood Institute, which continued from 2000 to 2009.

"At the time I became chair," Stevens recalled in 2021:

the structure of the department, which featured divisions of biochemistry, epidemiology and intervention, was strongly embraced by the faculty, was making the department more prominent at a national level and was popular with students.

In 2005, obesity was already among the top three stated priorities of federal, private and charitable agencies that funded health-related research. Our department had impressive strengths in obesity research, and the faculty supported a cell to society approach that was cutting-edge and came naturally, given the wide range

of scientific approaches already represented among our faculty.

I decided to concentrate on supporting faculty to achieve even greater levels of productivity by keeping their administrative and departmental committee work at a reasonable level, listening and responding to faculty concerns, and dealing with barriers and weak spots in our systems. I also committed to keeping our standards for promotion and tenure high, as an outstanding faculty is critical to the future success of the department.⁴⁵

During Stevens' years as chair, the department faced deep, impactful cuts in state funding as a result of conservative political movements in the state and the effects of the Great Recession in 2008-2009 and beyond. Still, she led improvements in the teaching program, including a redesign of the curriculum in intervention and refinement of the MPH program.

"Retirements, together with the robust research funding secured by our faculty and the development of the Kannapolis campus, made it possible to hire several new faculty members," Stevens said.

Among those were **Kimberly Parker Truesdale** (2006), **Amanda Holliday** (2007), **Shufa Du** and **Elizabeth Mayer-Davis** (2008), **Ian Carroll**, **Shu Wen Ng** and **Amanda Thompson** (2009), **Derek Hales** (2010), **Philip May** (2011), **Katie Meyer** (2012) and **Kyle Burger** (2013).

Stevens commented on the importance of hiring Holliday, among others. "Amanda was hired to lead our already highly regarded MPH/RD program," Stevens said, "and has been transformative in nutrition and dietetics education and practice."

Stevens noted that during her time as chair, student applications and grant funding increased, faculty publications doubled, and the graduate teaching program became one of three in the country to receive the National Research Council's highest ranking.

"Thanks to decades of devoted faculty members, exceptional students and the obesity epidemic," she said, "the department had grown [significantly] from its modest beginnings."

According to Gillings School Dean Barbara Rimer, Stevens' "academic productivity was astounding, especially given, but even irrespective of, her being department chair." Rimer noted that Stevens also made the department stronger by developing a system for mentoring faculty and identifying leadership opportunities for faculty and staff.⁴⁶

Photos on the following pages are of selected Department of Nutrition faculty members during the 1990s.



Linda Adair



Barbara Ainsworth



Alice Ammerman



John Anderson



John Longenecker



Dexter Louie



Robert McMurray



Melva Okun



Ganesh Bhat



Carolyn Barrett



Steve Chaney



John Cidlowski



Barry Popkin



Charles Rasberry



Anna-Maria Siega-Riz



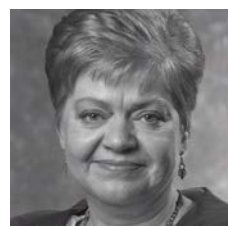
June Stevens



Rosalind Coleman



Kerry-Ann da Costa



Barbara Dennis



Jan Dodds



Boyd Switzer



Susan Fussell



Anthony Hackney



Pamela Haines



Melissa Johnson



Betty Kirkley



Lenore Kohlmeier



Martin Kohlmeier



Amy Levine



Dr. Beth Mayer-Davis (in pink, at right) meets with her student research team in 2014.
(Photo by Linda Kastleman)

CHAPTER 5

Pathway to the Future (2014-Present)

With the discontinuation of the DrPH degree in nutrition in 2009 and a growing number of faculty and students involved in substantive research and grant-getting, the department continued to advance its standing as a model nutrition department for the 21st century.

Elizabeth Mayer-Davis becomes chair

In 2013, June Stevens stepped down as chair to immerse herself more fully in her research, and **Elizabeth Mayer-Davis** was appointed to the leadership position. Mayer-Davis said she had felt privileged to be mentored by Stevens.

"Over the years, [June] brought me in as associate chair for finance and administration and mentored me," Mayer-Davis said, "helping me to know the nuts and bolts of running the department. Then I

was interim chair when she took a semester's sabbatical at University of Cambridge (U.K) in 2013. When she decided to step down and I was selected as chair [I felt especially prepared]."⁴⁷

As chair, Mayer-Davis maintains an impressive portfolio of research, primarily on diabetes. Her studies, totaling more than \$36 million since she arrived at UNC, have included culturally and regionally diverse populations and address the many ways in which nutrition can have an impact on the risk for developing

It will take concerted, bold actions on the part of individuals, families, communities, industry and government to achieve and maintain the healthy diet patterns and levels of physical activity needed to promote the health of the U.S. population.

2015 DIETARY GUIDELINES FOR AMERICANS

diabetes and on the risk of complications from the disease.

She was principal investigator for the UNC site of the SEARCH for Diabetes in Youth Study and serves as the national co-chair for that landmark multi-center epidemiologic study of diabetes diagnosed in childhood. Her current focus is on Type 1 diabetes in youth and young adults.

Mayer-Davis's national reputation in the study of diabetes is a source of pride for the department. She is active in the American Diabetes Association and was the 2011 president for health care and education for the association. She served on the board of directors for the American Society for Nutrition and currently serves on the ASN Foundation Board. She was an appointee of President Obama to the presidential Advisory Group on Prevention,

Health Promotion and Integrative and Public Health, and recently was appointed to the 2020 Dietary Guidelines Advisory Committee (DGAC) by the Secretaries of the U.S. Department of Health and Human Services and Department of Agriculture.

Another UNC professor was a member of the 2015 DGAC. Anna Maria Siega-Riz, PhD, then professor of nutrition and epidemiology and associate dean for academic affairs, now dean of public health at UMass-Amherst, was among a panel of international experts who spent two years preparing the 2015 edition of the Dietary Guidelines for Americans. The report, presented to the U.S. Departments of Health and Human Services and Agriculture, identified as being associated with positive health outcomes dietary patterns high in vegetables, fruits, whole grains, seafood, legumes



Dr. Alice Ammerman (left) serves her vegetarian chili at a chili cook-off in Robeson County, N.C., in March 2016. Ammerman has adapted several recipes that allow Southern cuisine to be more healthful. (Photo by Catherine Rohweder)

and nuts; moderate in low- and nonfat dairy products; lower in red and processed meat; and low in sugar-sweetened foods and beverages and refined grains.

A notable statement in the report read:

It will take concerted, bold actions on the part of individuals, families, communities, industry and government to achieve and maintain the healthy diet patterns and the levels of physical activity needed to promote the health of the U.S. population.

These actions will require a paradigm shift to an environment in which population health is a national priority and where individuals and organizations, private business, and communities work together to achieve a population-wide 'culture of health' in which healthy lifestyle choices are easy, accessible, affordable, and normative – both at home and away from home.⁴⁸

Dean Barbara Rimer noted that "in making this recommendation, the committee has provided both a lifesaving vision and a massive challenge for the United

States. ...I expect that the report will drive food policies and programs for years to come.”⁴⁹

Mayer-Davis’s strong, intentional focus on health equity no doubt will serve the department well in the renewed journey toward population health.

Working to increase student enrollment

In 2015, it became clear to Mayer-Davis that the path to financial stability for the department included strategic increases in student enrollment. Advanced degree programs not only should support the department’s mission – to improve health through nutrition – but should serve students’ career goals. Increases in enrollment also must not detract from agreed-upon standards for faculty teaching, such that faculty could keep a clear focus on cutting-edge research.

Based on an environmental scan of other nutrition departments, recommendations from an external program review committee, student input and extensive faculty deliberation, it was decided that departmental divisions for the doctoral program would be eliminated, with the goal of

facilitating greater flexibility.

Input determined that the size of the doctoral program (typically 8 to 12 new doctoral students admitted per year) was on target.

Course offerings at the bachelor’s and master’s degree levels were evaluated and broadened.

The department retained a firm commitment to strong research and teaching across the spectrum of nutrition sub-disciplines from basic science to policy.

In 2018, the School launched its MPH@UNC online degree.⁵⁰

The degree strengthened the School’s online offerings and shared them with a broader and more diverse audience. The first cohort of about 70 students worked toward a Master of Public Health degree that was newly designed for both residential and online programs.

Nutrition was one of the initial concentrations offered by the MPH@UNC program.

Mayer-Davis noted that many dietitians are employed in health departments, hospitals and other locations in which having an MPH degree would increase their capacity to improve health outcomes.



In 2019, doctoral student Jessica Soldavini (center front, with orange tote) worked with No Kid Hungry NC volunteers to plan affordable, easy-to-prepare recipes. Now a faculty member, Soldavini is involved in a number of projects supporting school and summer nutrition programs in North Carolina.

“To be able to provide an excellent education in nutrition so that our students can serve populations at high risk for nutrition-sensitive conditions is really a tremendous advance for our school,” she said.⁵¹

A new requirement by the Academy of Nutrition and Dietetics, which accredits registered dietitians (RDs), calls for RDs to have a graduate degree. The new online UNC program allows people to earn the master’s degree in a way that fits with their family and work lives.

In 2021-2022, 71 students were enrolled in the MPH@UNC nutrition concentration, and

36 were enrolled in the MPH@UNC RD concentration. The residential program continued with 75 students in the MPH-RD concentration, and 31 in the MPH-Nutrition concentration.

In fall 2019, the Gillings School transformed master’s degree offerings by discontinuing department-based MPH degrees and developing a single MPH degree with multiple concentrations. Under the leadership of Dr. Melinda Beck, associate chair for academics, and Amanda Holliday, director of the department’s Practice Advancement and Continuing

Education Division, an MPH-RD and MPH-Nutrition were two of the 13 concentrations in this new schoolwide degree.

Led for many years by Dr. Mirek Styblo, the BSPH-Nutrition degree program flourished, training many students for careers in science and medicine. Undergraduates showed an emerging interest in nutrition from a broader, societal perspective, wanting to consider issues of food insecurity and access to healthy foods. Consistent with student interest and aligned with an intent to increase enrollment, Styblo led the development of a two-track approach to the degree – the BSPH-Nutrition Research and Science and the BSPH-Nutrition Health and Society. In fall 2021, 76 new students were enrolled in the traditional Research and Science track, and 21 students entered the new BSPH-Nutrition Health and Society track.

In total, student enrollment in the department's academic programs more than doubled between 2016 and 2021.

Impact of the Pandemic

The political maelstrom between 2016 and 2020⁵² promoted a devaluation of science and public health that unnecessarily prolonged the COVID-19 pandemic of 2020–2022. The pandemic served as an impediment to advances in the field but also spurred new areas of inquiry and understanding. It became even clearer how many people in local and global communities were facing social injustice and discrimination, had no health care, and/or were teetering on the edge of food insecurity, homelessness, and economic ruin.

With the start of the COVID-19 pandemic in the U.S. in March 2020, the department faced a number of delays and setbacks. Classroom learning and research projects were disrupted when students and faculty members were unable to participate in person. Faculty members were heroic in preparing online classes and felt fortunate to have access to technology that allowed their students to continue learning. With the Gillings School's careful planning to keep the School community safe, students, staff

and faculty alike served as role models for preventing the spread of COVID and watching out for those in need.

As the pandemic took its toll in 2020 and 2021, **Dr. Penny Gordon-Larsen**, in her role as the Gillings School's associate dean for research, was instrumental in the leadership of the School's COVID-19 research response. While UNC epidemiologists, including Dr. Ralph Baric, made early headlines with essential information about vaccines and contagion, nutrition faculty members also studied various aspects and impacts of COVID – and provided nutrition-related services where needed.

Dr. Stephanie Martin⁵³ contributed to work on the impact of the pandemic on exclusive breastfeeding in Kenya.

Research associate **Katherine Souris, MPH**, and doctoral fellow **Angelica Cristello Sarteau, MSPH**, worked with **Dr. Elizabeth Mayer-Davis** to examine the ways youth with diabetes were affected by the closure of social distancing procedures in pediatric clinics in several countries.⁵⁴

Dr. Jessica Soldavini, along with others at the UNC Center for Health Promotion and Disease

Prevention (HPDP), has focused on efforts to analyze food insecurity and determine how meal programs can best adapt during the pandemic.⁵⁵ With No Kid Hungry NC, Soldavini supported meals for children during school closures.⁵⁶

Dr. Dianne Stanton Ward co-authored an award-winning paper about staff wellness in child care centers.⁵⁷

Drs. Barry Popkin, Shufa Du and **Melinda Beck** completed an analysis showing that obesity is a major risk factor for COVID-19 complications.⁵⁸ Popkin also led a study to improve nutritional labeling on foods, given the need for people to not take in excess calories during the pandemic.⁵⁹

Dr. Alice Ammerman and partners at HPDP provided food to those who needed it.⁶⁰

NC TRACS and Sanofi provided funding to **Ammerman and others** to advance research and service related to the pandemic.⁶¹

Alumnus **Samuel Haddad** helped with pandemic preparation in Laos.⁶²

Master's student **Kayla Ferro** continued her outreach to the homeless during the pandemic.⁶³

Diversity, Equity and Inclusion

In 2020, the department responded to the growing social movement highlighting racial disparities and police brutality by intentionally committing itself to the advancement of diversity, equity and inclusion (DEI) within its personnel and practices.

To this end, the DEI Committee was established. Its inaugural co-chairs, **Drs. Kimberly Truesdale** and **Dianne Ward**, along with 20 committee members, began their work by offering inclusion trainings to faculty members and hosting town halls to provide forums for students, faculty and staff members to discuss these issues.

Their efforts were continued the following year, when the committee was chaired by Truesdale and **Drs. Molly DeMarco** and **Delisha Stewart**. A three-year action plan⁶⁴ formalized the committee's goal to support the diversity and climate of inclusiveness in the department and to take steps in support of the department's mission statement on inclusive excellence. The plan was reviewed by Dr. Leah Cox, UNC-Chapel Hill's chief diversity officer, and Jeffrey Simms, interim

DEPARTMENT OF NUTRITION STATEMENT ON DIVERSITY, EQUITY AND INCLUSION

The Department of Nutrition calls on each of its students, faculty and staff to commit to nurturing an environment of inclusion, equity and belonging. We actively value diversity of perspectives and background, support the success of all members of our community and affirm that we are strongest when we embrace diversity in all its forms, including race, spirituality, sexuality, gender identity, culture, ability, age and socioeconomic status.

The department and its members must first acknowledge that we have contributed to the crises of racism, inequities and health disparities through our policies, hiring practices, clinical practices, education and research. We now commit to listening and learning to address these crises through thoughtful and intentional action within our department.

associate dean for inclusive excellence at the Gillings School.

In tandem with this internal work, the department aims to promote and support diversity in

the field as a whole. In 2021, the UNC NORC Pilot and Feasibility Program awarded a \$50,000 grant to Dr. Dana Carthron, assistant professor in the Department of Nursing at North Carolina Central University (NCCU). Carthron will pilot a targeted, culturally-tailored diabetes self-management intervention for 50 rural Black men to improve diabetes-related outcomes. In addition to providing financial support and access to UNC NORC resources, the award provides networking opportunities, mentoring, workshops, and practical biostatistical and grant management support from UNC NORC members and personnel.

The department also has received funding from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) for the North Carolina Consortium for Diversity Career Development in Nutrition, Obesity and Diabetes Research project. Through this project, three predominantly white institutions (UNC-Chapel Hill, Duke University and Wake Forest University) will collaborate with three Historically Black Colleges and Universities (North Carolina Agricultural and Technical State University, North Carolina Central University and Winston-Salem State University). The collaboration

will facilitate the success of diverse faculty members who are engaged in research directly responsive to the mission of NIDDK and which builds on the extensive infrastructure already in place within and across the institutions.

New annual symposium advances nutrition science

In 2019, the department instituted a groundbreaking annual Interdisciplinary Nutrition Sciences Symposium,⁶⁵ aimed at advancing scientific rigor in nutrition studies with an initial focus on the heterogeneity of obesity and its associated comorbidities.

The INSS has a three-part mission: 1) to promote translational nutrition science and generate ideas for proposals and collaborative projects; 2) to increase and enrich partnerships between academics and industry; and 3) to enhance diversity and support early-career investigators.

The theme of the inaugural symposium, held July 24-25, 2019, was "Synergizing Animal and Human Obesity Research."⁶⁶

Researchers from industry and academics sought to bridge

the gap between human and mouse studies used to model factors that lead to the development of obesity.

The symposium's 2019 findings were published in *Advances in Nutrition*.⁶⁷ Co-authors include **Drs. Penny Gordon-Larsen, Raza Shaikh, John French, Saroja Voruganti, Elizabeth Mayer-Davis** and **Delisha Stewart**, from the UNC nutrition faculty, and **Dr. John Easterbrook**, managing director of the Nutrition Obesity Research Center (NORC).

Consolidating such information can help health-care providers develop precision obesity treatments, which use targeted approaches specific to a person's genetic or physiological susceptibility. The initial efforts were tied closely to the UNC Obesity Creativity Hub⁶⁸ led by **Penny Gordon-Larsen** and others, including a precision obesity trial led by **Dr. Deborah Tate**, who studies the effects of different diets, meal frequency and exercise approaches, with the aim to discover genetic, microbial and other factors that predict the best diet for a given individual.

After a pause in 2020 due to the pandemic, the 2021 symposium,

"Heterogeneity in Obesity: Implications for Cancer and Related Obesity-Associated Outcomes," was held virtually on June 21-22, 2021.⁶⁹ The 2022 event, "Diet and Chronic Unresolved Inflammation: Implications for Obesity-Associated Outcomes," is scheduled for July 21-22.

"The INSS has become a signature event for the department," Mayer-Davis said. "It is a venue through which we can demonstrate our leadership to advance the field, and most importantly, through which we can encourage creative collaborations and provide opportunities for early-stage investigators who are the future of the field."⁷⁰

NRI's Precision Nutrition Short Course


Another continuing effort to foster interactions and networking among researchers is the annual 3.5-day, workshop-style Nutrigenetics, Nutrigenomics and Precision Nutrition (NGx) Short Course (see [UNCNRI.org/NGx](https://uncnri.org/NGx)). Developed by nutrition faculty at NRI and first held in 2016, the course brings together graduate students, health professionals, and academic and industry scientists


from around the world to learn fundamental NGx concepts and examine ways to better translate research findings to the public.

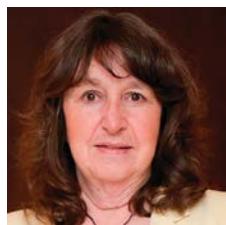
New faculty hired

Faculty members hired during Mayer-Davis's tenure as chair, many of whom are based in Kannapolis at the Nutrition Research Institute, include **Drs. Folami Ideraabdullah** and **Saroja Voruganti** (2013), **Sandra Albrecht, Molly De Marco, Stephen Hursting, Natalia Krupenko, Sergey Krupenko** and **Lindsey Smith Taillie** (2014), **Eric Klett** and **Carmina Valle** (2015), **Susan Smith, Susan Jenkins Sumner** and **Heather Wasser** (2016), **Stephanie Martin, Wimal Pathmasiri, Saame Raza Shaikh, Delisha Stewart** and **Stephanie Thomas** (2017), **Seema Agrawal** and **Sandra Mooney** (2018), **Ximena Bustamante-Marin, John French** and **Brooke Nezami** (2019), **John Batsis, Yuan Li, Blake Rushing** and **Emma Tzioumis** (2020), and **Anna Kahkoska, Jessica Soldavini** and **Isis Trujillo-Gonzales** (2021).

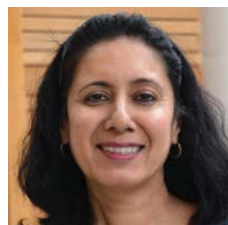
The growing number of faculty in the department and their increasingly wide range of interests and expertise speak well for the continuation of the department's excellent research, teaching and service. Department faculty also have a strong commitment to the university at large, and many hold elected campus-wide leadership roles.

"In recent years," Mayer-Davis said, "the University has been rocked with a number of political and social crises, but I've stayed because it's still the place I want to be. The collaboration and science are still strong, our academic programming is solid and the future is bright."⁷¹ 

 Photos on the following pages are of current (2021-2022) UNC nutrition faculty members.



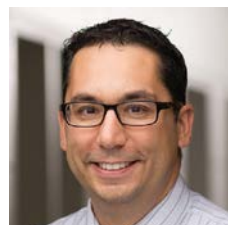
Linda Adair



Seema Agrawal



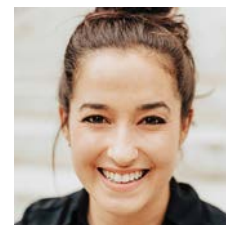
Alice Ammerman



John Batsis



Folami Ideraabdullah



Anna Kahkoska



Eric Klett



Martin Kohlmeier



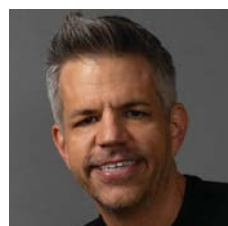
Melinda Beck



Margaret Bentley



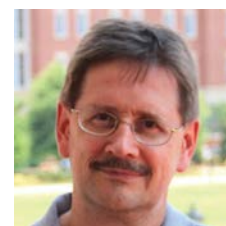
Cynthia Bulik



Kyle Burger



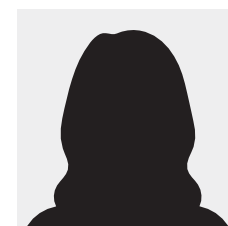
Natalia Krupenko



Sergey Krupenko



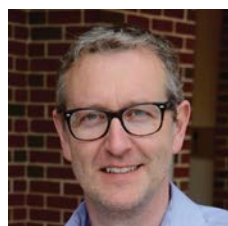
Yuan Li



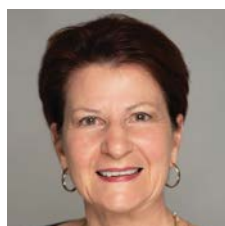
Nobuyo Maeda



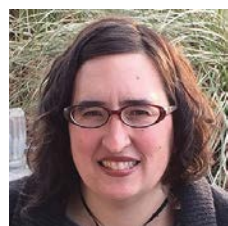
X. Bustamante-Marin



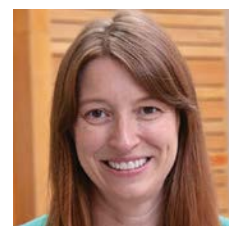
Ian Carroll



Rosalind Coleman



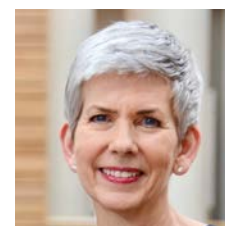
Molly De Marco



Stephanie Martin



Philip May



Elizabeth Mayer-Davis



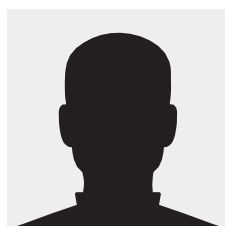
Katie Meyer



Janice Dodds



Shufa Du



John French



Penny Gordon-Larsen



Sandra Mooney



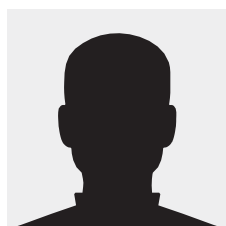
Brooke Nezami



Shu Wen Ng



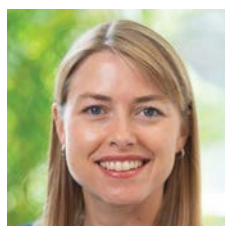
Wimal Pathmasiri



Anthony Hackney



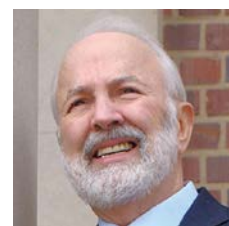
Derek Hales



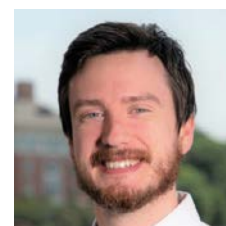
Amanda Holliday



Stephen Hursting



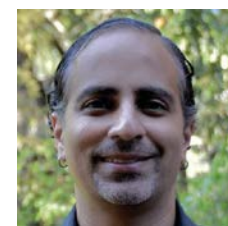
Barry Popkin



Blake Rushing



Carmen Samuel-Hodge



Saame "Raz" Shaikh

A SCRAPBOOK:

Then & Now



Susan Smith



Lindsey Smith Taillie



Jessica Soldavini



June Stevens



Delisha Stewart



Mirek Styblo



Susan Sumner



Deborah Tate



Stephanie Thomas



Amanda Thompson



K. Parker Truesdale



Isis Trujillo-Gonzalez



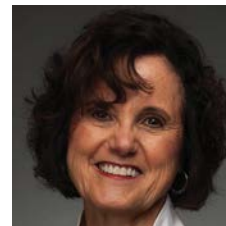
Emma Tzioumis



Carmina Valle



Saroja Voruganti



Dianne Stanton Ward



Heather Wasser



Steven Zeisel



Students prepare healthy recipes in the Nutrition Kitchen in the 1990s (with instructor **Carolyn Barrett**, at left) and in 2013. (Photo at left by Vic Cotto; at right, by Linda Kastleman)



(Right) Nutrition biochemistry student **Tina Vrabnik** uses a microscope in the 1990s (photo by Vic Cotto). At left, a student uses a microscope in the Nutrition Obesity Research Center lab in 2013 (photo by Linda Kastleman).

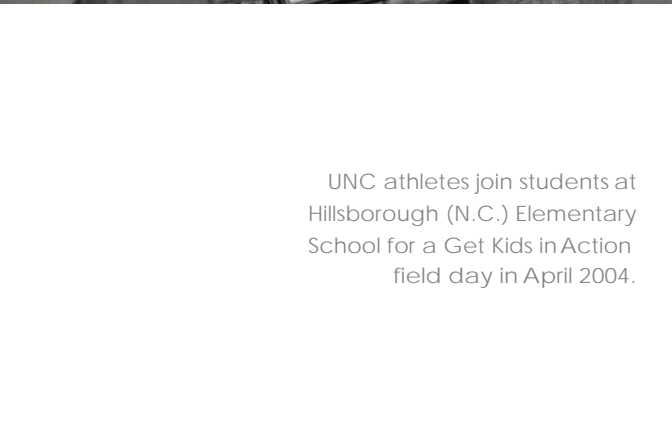


Then & Now



Dean Michel Ibrahim presents the School’s Staff Excellence Award to department registrar JoAnn Roth in 1993.

Three others from the department have won the Schoolwide award: administrative assistant Janet Scearce (2005), registrar JoAnne Lee (2014), and student services manager Jonathan Earnest (2018).

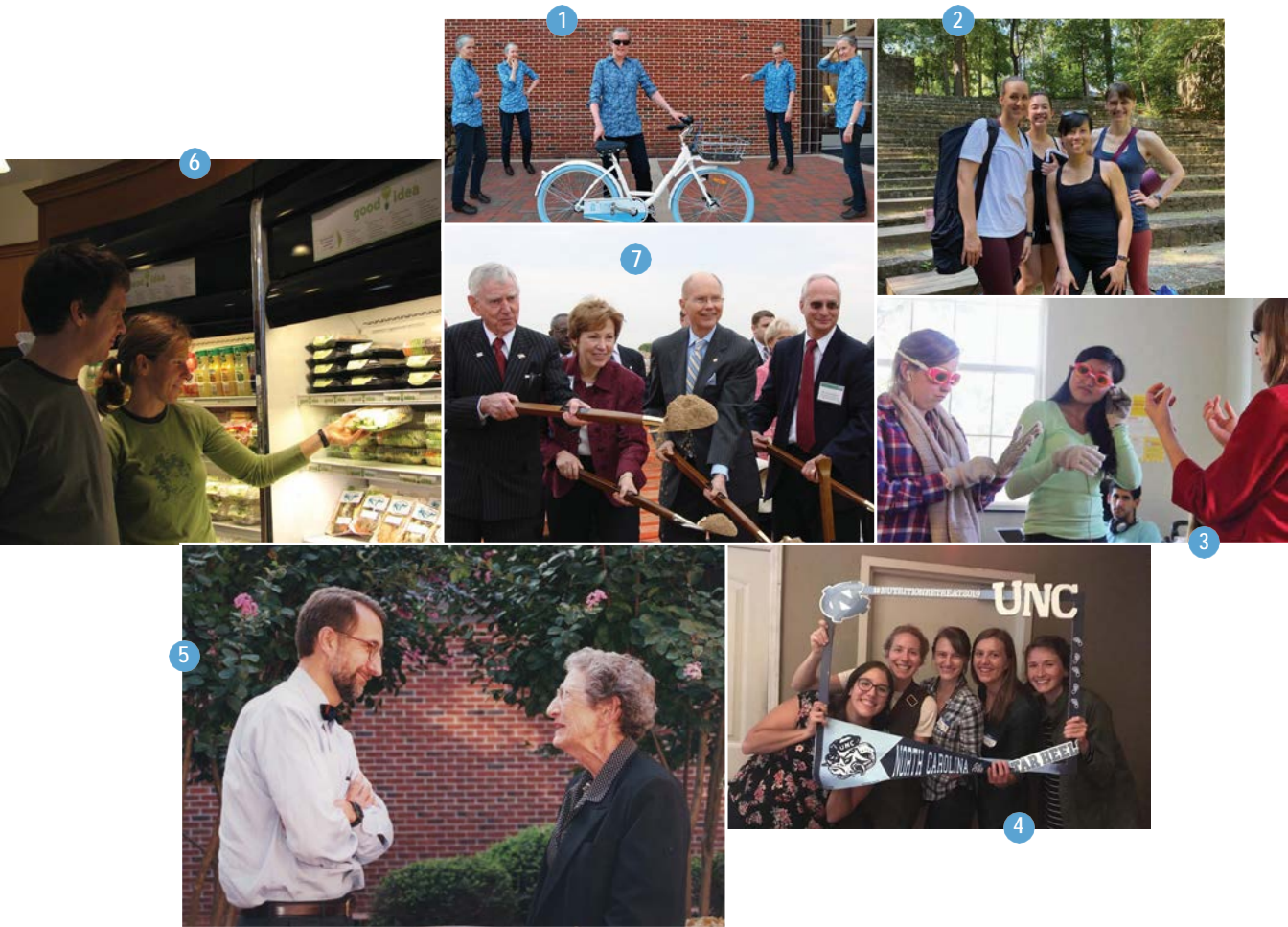


UNC athletes join students at Hillsborough (N.C.) Elementary School for a Get Kids in Action field day in April 2004.



The student-led Nutrition Coalition hosts a farmers market in the Gillings School’s Armfield Atrium in April 2011.

Then & Now



(Clockwise from top) 1) Dr. Alice Ammerman poses with one of the Gillings School’s Borrow-a-Bikes in 2016. The program was an initiative of Dean Barbara Rimer. Ammerman pedaled to commencement to support fitness and decreased use of fossil fuels. 2) Dr. Shu Wen Ng (front, in black) poses with students (l-r) Gabriela Serrati, Alexandra Ross and Caitlin Lowery after an outdoor yoga class in 2021. 3) Amanda Holliday, at right, helps her students understand some of the challenges of aging. 4) Dr. Lindsey Smith Taillie, second from left, poses at a 2019 department social with students (l-r) Natalia Rebolledo, Caitlin Lowery, Sarah Frank and Emily Duffy. 5) Professor and Chair Emerita Mildred Kaufman (right) talks with Dean William Roper at the Gillings School’s Kaufman Lecture in 1999. 6) Students David Cavallo, left, and Amy Paxton initiated the ‘Good Idea’ program in the Gillings School’s Atrium Café in 2008, educating customers about which meals were most nutritious. 7) Celebrating at a 2007 ‘topping off’ ceremony prior to NRI’s opening in Kannapolis, N.C., are (l-r) David Murdock, chief executive officer of Dole Foods and NRI benefactor, Dr. Margaret Dardess, senior adviser in the UNC medical school and former interim public health dean, UNC Chancellor James Moeser and Dr. Steven Zeisel.

Endnotes

¹ Korstad, Robert, *Dreaming of a Time: The School of Public Health, The University of North Carolina at Chapel Hill (1939-1989)*, Chapel Hill: UNC Printing, 1990, p. 54. Letter from MJ Rosenau to AR Mann, Nov. 8, 1945.

² Korstad, quote on back cover, edited for gender-inclusiveness.

³ Korstad, pp. 178-179.

⁴ Mayes, Fred. *UNC SPH Relates to the Needs of a Changing Society: A Selective and Interpretive Account, with Emphasis on the Decade of the 60s*. 1975. UNC Wilson Library G 36 510: U58.

⁵ Korstad, p. 97.

⁶ Korstad, p. 97.

⁷ Interview with Boyd Switzer, Aug. 30, 2021.

⁸ Korstad, p. 115.

⁹ Mayes

¹⁰ Interview with Michel Ibrahim, Aug. 31, 2021.

¹¹ <https://sakai.unc.edu/access/content/user/vschoenb/Public%20Library/Organizations/UNCCH/UNCSPH/SPHnewsletters/BodyPolitic/TheBodyPolitic-197301.pdf>

¹² <https://www.tributearchive.com/obituaries/1730093/Rebecca-B-Bryan>

¹³ Greenberg, Bernard. Report to the Chancellor, 1971. Wilson Library reference C378U2pu23.

¹⁴ Azikiwe, Ifeoha. *Asagba: Prof. Joseph Chike Edozien: His Thoughts, Words, Vision*. (eBook) Prologue by J.C. Edozien II. (Author House, 2015). <https://bit.ly/37jH9fy>

¹⁵ Switzer interview

¹⁶ Interview with Steven Zeisel, Aug. 24, 2021.

¹⁷ Mayes

¹⁸ Telephone interviews and written correspondence with MaryAnn Farthing, Sept. 2021 to Feb. 2022.

¹⁹ Switzer interview

²⁰ Ibid.

²¹ Korstad, p. 157.

²² Ibrahim interview

²³ Interview with Barry Popkin, Aug. 19, 2021.

²⁴ Interview with Alice Ammerman. Aug. 20, 2021

²⁵ <https://www.latimes.com/archives/la-xpm-1991-05-19-mn-2981-story.html>

²⁶ <https://lat.ms/3uaHeet>

²⁷ Ammerman interview

²⁸ Korstad, p. 157.

²⁹ CDC, Prevention Research Centers, <https://www.cdc.gov/prc/index.htm>

³⁰ Ibrahim interview

³¹ Interview with Eloise Clark, Aug. 29, 2021.

³² Ammerman interview

³³ Popkin interview

³⁴ <https://www.washingtonpost.com/archive/lifestyle/1990/11/18/from-mortarboard-to-crown/cc085b88-b519-4cb0-9fcc-9e5d2059efa0>

³⁵ <https://www.vanguardngr.com/2020/07/okowa-salutes-asagba-of-asaba-at-96>

³⁶ Interview with Peggy Bentley, Jan. 30, 2022.

³⁷ Farthing interview

³⁸ Popkin interview

³⁹ <https://web.archive.org/web/19970708173233/http://www.sph.unc.edu/nutr>

⁴⁰ Zeisel interview

⁴¹ <https://goheels.com/news/2004/12/9/205491518.aspx>

⁴² Popkin interview

⁴³ <https://sph.unc.edu/schools-nutrition-research-institute-gearing-up-in-kannapolis-nc>

⁴⁴ PBS, "Nova," https://www.pbs.org/wgbh/nova/thin/program_t.html.

⁴⁵ Interview with June Stevens, Feb. 7, 2022.

⁴⁶ Barbara Rimer, email, Dec. 9, 2021.

⁴⁷ Interview with Beth Mayer-Davis, Jan. 5, 2022.

⁴⁸ Dietary Guidelines, Report of the Advisory Committee, 2015. <https://health.gov/sites/default/files/2019-09/Scientific-Report-of-the-2015-Dietary-Guidelines-Advisory-Committee.pdf>, p. 7.

⁴⁹ <https://sph.unc.edu/sph-news/siege-riz-and-other-members-of-2015-dietary-guidelines-advisory-committee-release-report>

⁵⁰ <https://sph.unc.edu/cphm/the-gillings-schools-mphunc>

⁵¹ Ibid.

⁵² *Nature*, A four-year timeline of Trump's impact on science, Oct. 5, 2020, doi: <https://doi.org/10.1038/d41586-020-02814-3>

⁵³ <https://sph.unc.edu/sph-news/looking-at-the-impact-of-covid-19-on-exclusive-breastfeeding-in-kenya-and-beyond>

⁵⁴ <https://sph.unc.edu/sph-news/covid-19-creates-challenges-and-improvements-to-care-for-youth-with-diabetes-around-the-world>

⁵⁵ <https://sph.unc.edu/sph-news/addressing-pandemic-problems>

⁵⁶ <https://sph.unc.edu/sph-news/no-kid-hungry-nc-carolina-hunger-initiative-support-meals-for-children-during-covid-19-school-closures>

⁵⁷ <https://sph.unc.edu/sph-news/groundbreaking-study-on-staff-wellness-in-child-care-centers-named-paper-of-the-year>

⁵⁸ <https://sph.unc.edu/sph-news/obesity-is-a-major-risk-factor-for-covid-19-complications>

⁵⁹ <https://sph.unc.edu/sph-news/as-covid-19-highlights-obesitys-harms-clear-labels-on-unhealthy-foods-emerge-as-key-strategy-to-improve-nutrition>

⁶⁰ <https://sph.unc.edu/sph-news/chatham-food-hub-helps-communities-access-local-food-during-covid-19-pandemic>

⁶¹ <https://sph.unc.edu/sph-news/department-of-nutrition-receives-new-funding-to-advance-research-service-related-to-covid-19>

⁶² <https://sph.unc.edu/sph-news/haddads-pandemic-preparation-pays-off-in-laos>

⁶³ <https://sph.unc.edu/sph-news/the-gillings-community-responds-to-covid-19-outreach-to-vulnerable-communities>

⁶⁴ <https://sph.unc.edu/wp-content/uploads/sites/112/2022/01/DEI-Action-Plan-Report-January-2022.pdf>

⁶⁵ <https://www.interdisciplinarynutrition.org>

⁶⁶ <https://www.interdisciplinarynutrition.org/2019>

⁶⁷ <https://academic.oup.com/advances/article-abstract/12/5/2023/6246429>

⁶⁸ <https://research.unc.edu/creativity-hubs/projects/winners-2018>

⁶⁹ <https://www.interdisciplinarynutrition.org/2021>

⁷⁰ Elizabeth Mayer-Davis,
personal correspondence

⁷¹ Ibid.

