# Candidate Information and Goals for Career Development

I am a postdoctoral fellow at the National Institute of Environmental Health Sciences within the Biostatistics and Computational Biology branch. **Broadly speaking, my career goal is to transition into an independent research career focusing on the role of co-occurring modifiable factors to prevent disease unique to women transitioning into midlife past their reproductive years.** The sections that follow demonstrate how my background, including work experience and training, have supported my career goals, led me to the research proposed here, and informed my next steps outlined in the training objectives.

## Candidate background

1. **Prior graduate and applied research**

My masters-level academic degrees in population health, demography, and biostatistics converged into my position as a biostatistician at the University of North Carolina, Department of Psychiatry for more than eight years. In this role, I collaborated with a diverse group of researchers ranging from undergraduate students to faculty in psychiatry and psychology who were writing manuscripts based on both clinical and observational data. This opportunity allowed me to advance my statistical analysis skills in structural equation modeling, learn all aspects of manuscript writing, and observe principal investigators engage in successful grant writing. In applying advanced analytic methods to data from population health studies, these rich experiences motivated my long term goal to establish myself as an independent investigator focusing on public health outcomes.

1. **Dissertation research (University of North Carolina)**

In a decision to further my career goals to become an independent researcher in public health, I enrolled in the doctoral program in Epidemiology at the University of North Carolina, Chapel Hill. My coursework in epidemiology enabled me to study methods focusing on the occurrence of disease as a means to better understand and identify causes of disease. During my training in cardiovascular and genetic epidemiology, I developed a dissertation under the mentorship of Dr. Kari E. North that characterized early infant child growth in a cohort of Chilean infants and its impact on lipid levels in adolescence. My aims, similar to my postdoctoral work described below, centered on a set of biomarker measures – in this case lipid biomarkers related to cardiovascular disease risk. To fund my dissertation work, I obtained an external two-year American Heart Association predoctoral fellowship award (16PRE29200008). When determining the extent to which associations exist between infant growth and lipid outcomes, I furthered my knowledge of longitudinal methods that I had first learned as a statistician working in the UNC Department of Psychiatry, including nonlinear mixed effects models and latent class growth mixture modeling, to characterize growth as an exposure. I used an initial paper I independently developed examining the best measures to characterize infant growth1 to inform my approach in assessing a longitudinal measure of anthropometric measures as an exposure. Within my three aims I was able to: 1) characterize determinants of infant growth applying advanced longitudinal analytic methods;2 2) assess the association between infant growth including latent growth patterns and lipid levels (under review at AJE); and 3) determine if infant growth functions as an effect modifier of candidate genetic variants associated with lipid levels.

1. **Postdoctoral studies (National Institute of Environmental Health Studies)**

Extending my interest in longitudinal exposures and health outcomes in epidemiological research, I have strengthened my experience in time-to-event models with a focus on breast cancer incidence in a large contemporary U.S.-wide study. At the start of my postdoctoral studies I studied familial correlation of age of onset in sisters3 with implications for underlying early life exposures and genetic factors. More recent work continues my focus on biomarkers within the Sister Study, examining serum iron biomarkers and their: a) association with breast cancer incidence;4 b) association with common lifestyle predictors; and c) and correspondence with toenail measures. My work with the Sister Study data sources has strengthened my understanding of the unique and promising aspects of this rich and well-characterized longitudinal data source, preparing me to conduct the proposed research. Research spanning both my dissertation work and postdoctoral fellowship enabled me to conceptualize research problems for both longitudinal exposures within a life course perspective and time-to-event data as it will be applied to a sample of postmenopausal women.

My goals are to apply the knowledge I have gained in methodological and epidemiological research areas to the study of lifestyle exposures and their relationship with cancer and all-cause mortality as women move into their post-reproductive years. To do so I will require further training in aging research, lifestyle exposures, as well as joint analysis models that are part of nascent research that combines both longitudinal exposures and time to event models.

## Career goals and objectives

**Building research that focuses on modifiable factors and changing risk of disease over age and time focused on women’s post-reproductive years within epidemiology is a long-term goal of mine with the ultimate purpose to prevent breast cancer cases and premature mortality.**

Following my work experience and training in statistical and epidemiological methods focusing on biomarkers and risk of disease, I am planning a new direction in research that is aligned with my long-term career goals. Certain lifestyle characteristics figure strongly during the postmenopausal years in women’s risk of breast cancer and number as some of the top ten risk factors for mortality and chronic disease, emphasizing the ability to cross over into study of other outcomes such as mortality. My training objectives and mentoring plan are designed to enhance my knowledge of these lifestyle factors and support the successful completion of my three aims to understand how modifiable factors of lifestyle co-occur, change over time, and relate to disease risk. Once I establish that knowledge, I plan to launch my R00 independent research phase in which I will first investigate associations between the well-defined lifestyle factor changes and breast cancer incidence and all-cause mortality. After that step, I will investigate the role that lifestyle may influence the genetic association with breast cancer risk and all-cause mortality. By focusing on lifestyle factors specific to the postmenopausal age range, the proposed research work would focus on these factors as they operate through a life course perspective. Results from this work could inform areas of lifestyle change that could improve the health of adults as they age – both goals in the NIA strategic plan.5 I plan to capitalize on the knowledge I have gained of factors associated with breast cancer risk and their dependency on certain age and time periods. At the same time, I will rely on my training plan during the K99 phase to extend my research in a direction spanning advanced structural equation modeling, joint analysis, and lifestyle exposures that will set me on a path independent from that of my mentor.

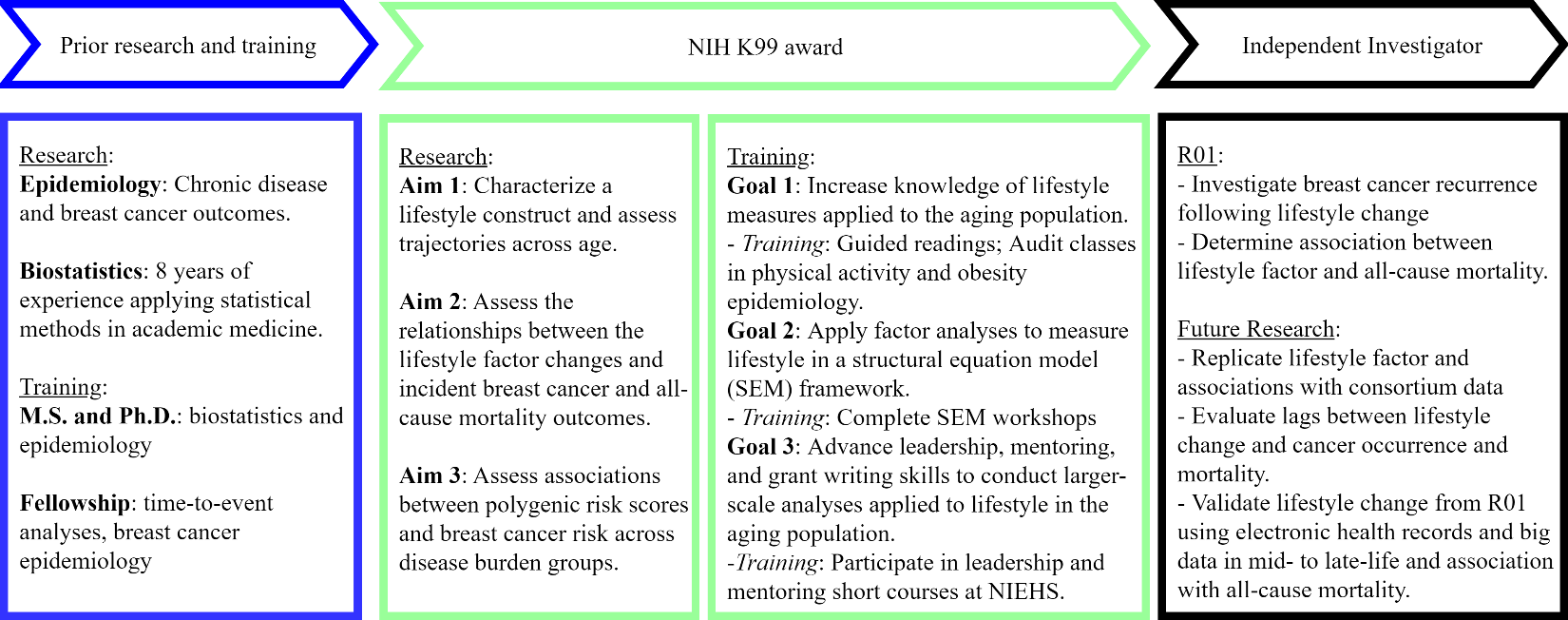


Figure 1: Career timeline

## Career development and training

To best attain my outlined career goals and address the three proposed research aims (Figure 1), I will take advantage of the training opportunities described below to establish myself as an independent investigator studying modifiable lifestyle change following midlife to prevent disease.

### Mentoring team and collaborators

I have assembled a mentoring team that will provide excellent support and guidance as I embark on a new research path involving common modifiable factors and outcomes such as breast cancer in a group of postmenopausal women (Table 1). My primary mentor, **Dr. Clarice R. Weinberg**, a pioneer in the field of epidemiologic methods and a principal investigator for the Sister Study, will continue guiding me as I follow my K99 training period during the first two years. As a postdoctoral fellow in her lab, I meet with her on a weekly basis to plan, develop and write manuscripts related to work based on Sister Study samples. My mentor and co-mentor, **Dr. Clarice Weinberg** and **Dr. Dale Sandler**, are experts in breast cancer epidemiology as well as possessing an extensive and accomplished history of mentorship. Being the principal investigators for the Sister Study, they will guide me regarding lifestyle change within this ongoing contemporary cohort. As I launch into the independent investigator path, I will also draw on the expertise of my mentoring committee, each member fitting within distinct areas of research in which I will need guidance. I will rely on **Dr. Shanshan Zhao’s** expertise in time-to-event modeling as I conduct joint model analyses to understand the relationship between longitudinal factors and risk in a sample of postmenopausal women. As an expert in structural equation models, **Dr. Nisha Gottfredson’s** mentorship will be essential to conduct best practices when capturing the lifestyle information through factor analysis. **Dr. Mary Beth Terry** will play a crucial role as I conduct epidemiologic research related to lifestyle and genetic factors following menopause and their relationship with breast cancer incidence. As I learn from and collaborate with these mentors, I will be able to work independently, but I will also embrace the value in their guided perspectives that can set my career trajectory on an effective and productive course. This mentoring plan will include continuing my weekly meetings with my mentor and having as-needed individual correspondence in the form of email and meetings with my mentorship team (Table 2) as I develop, analyze the data, and write the manuscripts for these proposed projects. Guidance from my mentorship team will be paramount as I search for faculty positions and start my own research group.

Table 1: Mentorship Team

| **Name** | **Associated Specific Aims / Training Goals** | **Position** | **Proposed Role** | **Expertise** |
| --- | --- | --- | --- | --- |
| Clarice R. Weinberg, Ph.D. | Research: 1, 2, 3; Training: 1, 3, 4 | Principal Investigator, Biostatistics and Computational Biology Branch, NIEHS | Primary mentor | Breast cancer, methods and genetic epidemiology |
| Dale P. Sandler, Ph.D. | Research: 1, 2, 3; Training: 1, 3, 4 | Principal Investigator, Epidemiology Branch, NIEHS | Secondary co-mentor | Lifecourse and breast cancer epidemiology |
| Shanshan Zhao, Ph.D. | Research: 1, 2, 3; Training: 2 | Principal Investigator, Biostatistics and Computational Biology Branch, NIEHS | Advisor, statistical methodology | Biostatistics, time-to- event analyses |
| Mary Beth Terry, Ph.D. | Research: 1, 2, 3; Training: 1, 3 | Professor, Epidemiology, Columbia Mailman School of Public Health | Advisor, lifestyle and genetic epidemiology | Genetic and cancer epidemiology |
| Nisha Gottfredson, Ph.D. | Research: 1, 2, 3; Training: 2 | Assistant Professor, Department of Health Behavior, UNC | Advisor, statistical methodology | Factor analysis, longitudinal methods |
|  |  |  |  |  |

### Training objectives

My training objectives in the first two years of the proposed award will draw on the rich interdisciplinary resources available in the Research Triangle Park area and online offerings from across the United States. These activities will include attending seminars, auditing classes, and individual guided readings through mentoring activities (Table 2).

Table 2: Training Timeline

| **Milestones/Benchmarks** | **K99** | | **R00** | | |
| --- | --- | --- | --- | --- | --- |
| **Year 1** | **Year2** | **Year1** | **Year2** | **Year3** |
| **Mentoring Meetings** |  |  |  |  |  |
| Weekly meetings with primary mentor | x (5%) | x (5%) |  |  |  |
| Bi-annual meeting with mentorship committee |  | x (1%) | x (1%) | x (1%) | x (1%) |
| Individual meetings and/or communication on an as-needed basis regarding unanticipated analytic and/or subject matter problems | x (2%) | x (5%) | x (2%) | x (1%) | x (1%) |
| **Research** |  |  |  |  |  |
| Statistical analyses of lifestyle factor and its longitudinal change (Aim 1) | x (55%) | x (25%) |  |  |  |
| Draft and submit manuscript (Aim 1) | x (20%) | x (20%) |  |  |  |
| Statistical analyses of lifestyle factor and breast cancer risk |  | x (10%) | x (40%) | x (25%) |  |
| Draft and submit manuscript (Aim 2) |  |  | x (30%) | x (20%) |  |
| Statistical analyses of polygenic risk scores and lifestyle risk burden (Aim 3) |  |  |  | x (30%) | x (40%) |
| Draft and submit manuscript (Aim 3) |  |  |  |  | x (50%) |
| **Coursework** |  |  |  |  |  |
| Audit "Physical activity epidemiology and public health (EPID 810)" | x (10%) |  |  |  |  |
| Audit "Obesity Epidemiology (EPID 814)" |  | x (10%) |  |  |  |
| **Seminars, workshops, journal clubs** |  |  |  |  |  |
| UNC Bowles Center for Alcohol Studies Spring Seminar Series | x (1%) | x (1%) |  |  |  |
| NIEHS reproductive journal club | x (1%) | x (1%) |  |  |  |
| UNC Odum Institute short course: Introduction to structural equation models | x (2%) |  |  |  |  |
| American Society on Aging summer short course: Managing Health & Chronic Conditions in Older Adults | x (2%) |  |  |  |  |
| **National meetings** |  |  |  |  |  |
| Attend 1-2 meetings per year including SER, ASPO, AACR, and ASHG | x (2%) | x (2%) | x (2%) | x (2%) | x (3%) |
| **Faculty job search and grant writing** |  |  |  |  |  |
| Conduct academic faculty job search |  | x (15%) |  |  |  |
| R01 idea development |  | x (5%) | x (25%) | x (20%) |  |
| R01 submission |  |  |  | x (1%) | x (5%) |

**Training objective 1: Increase knowledge of lifestyle measures relevant to the aging population.**

I will audit physical activity (year 1) and obesity epidemiology (year 2) classes. I will attend the spring seminar series at UNC Bowles Center for Alcohol Studies (<https://www.med.unc.edu/alcohol/spring-2019-seminar-series/>) (years 1 and 2). To gain knowledge of modifiable lifestyle factors in the aging population, I will attend a summer short course, “Managing Health & Chronic Conditions in Older Adults,” offered by American Society on Aging and the USC School of Gerontology (Summer, year 1).

**Training objective 2: Apply factor analyses to measure lifestyle in a structural equation model (SEM) framework.**

Training will include completion of a SEM summer short course offered by Inter-university Consortium for Political and Social Research (ICPSR) in collaboration with the Odum Institute (year 1). During the first and second years I will consult with Dr. Gottfredson regarding the lifestyle factor analyses during the analyses for aim 1, and I will follow any guidelines for directed readings related to my work.

**Training objective 3: Present research at nationally representative conferences.**

This objective will serve multiple goals of: 1) networking as I conduct my search for a faculty position, 2) interacting with experts and leaders who can offer new perspectives and opinions that I can use to improve the proposed work and inform my R01 application, and 3) bringing awareness of the completed scientific work in this proposal.

**Training objective 4: Advance leadership, mentoring, and grant writing skills to conduct larger-scale analyses applied to lifestyle in the aging population.**

I will participate in leadership and mentoring short courses at NIEHS, which include the “Management Bootcamp” offered by the NIEHS Office of Intramural Training and Education (OITE) to learn management concepts independent of the research environment but necessary to develop constructive leadership skills and expand my work by leading a research lab. I will also take advantage of the grant-writing workshops and seminars offered by the OITE. Furthermore, my mentoring team, all of whom have successfully written large-scale grants, will provide individual advice when I start the R01 application process (years 4-5).

### Plans for transition to independence

I can take these learning steps towards these goals to develop an independent research career trajectory as an epidemiologist leveraging advanced methods to focus on modifiable exposures in postmenopausal women as they relate to cancer and mortality outcomes. Pursuing this work will build on work accomplished by my primary mentor but also diverge in a new direction of lifestyle factors, separate from environmental factors, as an exposure in the domain of breast cancer incidence and all-cause mortality.