# Introduction

After working as a statistician for eight years, I decided to pursue my Ph.D. in epidemiology because I find scientific research personally rewarding, and, more specifically, I am passionate about understanding and preventing the causes of disease. As a graduate student in epidemiology, I knew I wanted to weave my statistical background into my epidemiological research with the application of advanced methods, and consequently in my dissertation work I focused on repeated anthropometric measures as an exposure when studying the connection between early life growth characteristics and cardiovascular disease predictors in adolescence. Transitioning to my current role as a postdoctoral researcher, I have leveraged my knowledge of longitudinal analyses in my current research interests, which include a focus on survival analysis to assess changing breast cancer risk over age and time in relation to risk factors such as a relative’s age at diagnosis and body size. My future research plans will be to continue my current research focus on breast cancer incidence with the joint application of longitudinal and survival methods to study the role of changing modifiable lifestyle risk factors. My overarching goals and interests are to capture patterns of changing exposures over age and time to inform both the prevention and study of underlying causes of breast cancer.

# Summary of previous research

In my dissertation research, I wanted to better understand associations between early infant growth and lipid levels in adolescence. The “Developmental Origins of Health and Disease” theoretical framework informed my three aims, which, similar to my postdoctoral work, centered on a set of biomarker outcomes -- in this case the lipid biomarkers related to cardiovascular disease risk. To fund my dissertation work, I was fortunate to obtain an individual two-year American Heart Association predoctoral fellowship. When determining the extent to which associations exist between infant growth and lipid outcomes, I used a combination of methods including a nonlinear mixed effects model and latent class growth mixture modeling to characterize growth as an exposure. Through the three years I spent developing the ideas and plans, analyzing the data, and interpreting the results, I had some unexpected findings that included the association between relatively faster growth and a favorable lipid profile in the first five months of life. I also found in my first aim that the socioeconomic position of an infant’s family can play a role in growth even at the earliest times of life, with lower socioeconomic position linked with slower, and less favorable growth. These findings are not in line with most evidence to date and could point towards windows of time having distinct growth profiles and unique associations that may not be consistent over age.

# Summary of current research

Following my doctoral work studying links between infant growth and lipid levels in adolescence, I transitioned to postdoctoral work with a focus on breast cancer outcomes. This postdoctoral research experience has been challenging to learn best practices in breast cancer research, but also rewarding to now have productive research spanning both cardiovascular disease and cancer outcomes, two of the most frequently occurring diseases in the United States. My methodological focus on longitudinal changes shifted from mixed effects and latent class models to survival models with time-dependent covariates. The first manuscript from my postdoctoral work, just published this month in the International Journal of Epidemiology, addresses familial correlation of breast cancer age of onset. Our goal was to determine if a woman currently without a breast cancer diagnosis and with a sister diagnosed with cancer has higher breast cancer risk when closer to the age at diagnosis of the affected sister. We found evidence supporting an increase in risk around the age of the sister’s diagnosis, and this original work offers the potential for use in diagnostic screening of women with affected sisters.

Several in-progress projects that also involve breast cancer outcomes include a multi-aim project focusing on serum iron biomarkers, and a descriptive analysis of the change of associations between body mass index (BMI) and breast cancer risk over age and time according to pre- and postmenopausal status. Having concluded the analyses for the latter project in a large consortium, we have preliminary evidence suggesting a stronger association between BMI and breast cancer risk over age-time for postmenopausal women relative to premenopausal women. This descriptive epidemiology can inform future hypothesis-driven research efforts to understand the etiology of BMI and breast cancer risk as it switches from a protective association during premenopause to an adverse association during postmenopause.

# Future research

In my future research, which I am currently developing as a K award application to be submitted to the National Institute of Aging in 2021, my plan is to advance knowledge of lifestyle change and its relationship with cancer incidence and mortality. To accomplish this aim, my methods will include a joint regression model simultaneously combining longitudinal and Cox models. To date, most research centers on cross-sectional lifestyle measures, missing the potential to capture variability over time. These lifestyle exposures, which include body mass index, physical activity, alcohol use, and smoking, are also a good opportunity to teach students advanced epidemiologic methods related to common public health exposures. In considering future research directions, my goal is to include high-impact modifiable exposures relating to breast cancer incidence and to build upon the methodological work I have done with my dissertation and postdoctoral work, namely longitudinal, latent growth mixture modeling, and time-to-event methods. Specifically, I am interested in measuring a lifestyle construct, its change as a woman ages, and its relation to breast cancer incidence and all-cause mortality. In fact, a recent study has found that fewer than 10 percent of federally-funded research projects consider more than one of the top ten risk factors for mortality at a time. To address this research gap, I plan to expand my research and consider multiple risk factors for breast cancer. In sum, I am motivated and enthusiastic about pursuing an independent research program to better understand the role of common modifiable lifestyle factors in the role of breast cancer and mortality. To be able to follow this path at the George Mason University's College of Health and Human Services would be a welcome opportunity, where my research would mesh well with existing public health research teams and where I can collaborate in the development of a teaching program in advanced training in research methods and data analysis.