IMPROVING SURVIVAL, ENDURING DISPARITIES: INFANT AND CHILD MORTALITY IN A SMALL SOUTHERN TOWN, 1915-2015

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ABSTRACT

Despite substantial improvements in public health and medical care in the United States during the twentieth century, inequalities in health outcomes have persisted across populations. These disparities are shaped by interactions between biological factors and social determinants of health, including race, public policy, and structural inequality. This study examines long-term patterns of infant and child mortality in Ayden, North Carolina, a small rural Southern community, between 1915 and 2015. Data were drawn from the Ayden Mortality Dataset, a demographic database containing vital records for more than 9,000 individuals who lived, died, or were buried in Ayden during the study period. Logistic regression models were used to examine the likelihood of infant death (under age one) and child death (ages 1–17) as a function of race, sex, death year, and historical period (Jim Crow versus post–Jim Crow). Based on previous research, I predicted that mortality would decline over time, males would experience higher mortality risk than females, and racial disparities would decrease following the end of the Jim Crow era while remaining present due to persistent structural inequalities. Results indicate that infant and child mortality declined substantially across the twentieth century, consistent with broader improvements in public health, living conditions, and access to medical care. Contrary to

expectations, no significant differences in mortality were observed between males and females. However, persistent racial disparities were evident throughout the study period. Black individuals experienced significantly higher odds of infant and child mortality than White individuals, even as mortality declined for both groups. Among infants, racial disparities widened following the end of Jim Crow because mortality declined more rapidly among White infants than among Black infants. Among children, Black individuals consistently experienced higher mortality risk regardless of historical period. These findings demonstrate that dramatic improvements in population health can coexist with enduring inequalities and highlight the lasting influence of structural factors on survival outcomes across generations.

Improving Survival, Enduring Disparities: Infant and Child Mortality in a Small Southern Town, 1915-2015

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CHAPTER 1: INTRODUCTION

Infant and child mortality, particularly mortality under age five, are widely regarded as key indicators of overall population health (Park & Won, 2025). Over the past century, infant and child mortality in the United States has decreased substantially, reflecting broad improvements in public health, medical care, and living conditions. However, these gains have not been distributed equally across populations. Persistent inequalities in healthcare access, socioeconomic conditions, and public policy continue to shape patterns of survival, producing substantial variation in mortality within and between populations (Bettenhausen et al., 2021; Bhatia et al., 2019; Cunningham et al., 2018; Rogers et al., 2017).

Contemporary mortality patterns are shaped by long-term structural and epidemiological transitions (Cutler & Miller, 2005). At the beginning of the twentieth century, infectious diseases such as pneumonia, tuberculosis, and diarrheal illnesses were among the leading causes of death in the United States. Children under the age of five experienced a disproportionate share of mortality and accounted for approximately 40% of these deaths (Cunningham et al., 2018). This age group, which includes infants, has underdeveloped innate and adaptive immune systems, making them more susceptible to infectious diseases (Li et al., 2025). Elevated mortality rates during this period were also closely tied to inadequate sanitation and underdeveloped public health infrastructure and resources. These conditions facilitated the rapid spread of infectious diseases (Bhatia et al., 2019; Cutler & Miller, 2005).

By 1940, however, mortality, largely from infectious disease, declined by an estimated 40% in the United States (Cutler & Miller, 2005), reflecting a major epidemiological transition driven in large part by improvements in public health policies and regulations, water and sewage systems, and other public health interventions aimed at disease control, especially in urban areas (Bhatia et al., 2019; Cutler & Miller, 2005). Therefore, these public health improvements fundamentally altered the landscape of infant and child mortality. In the late twentieth century, deaths from infectious disease among children had declined dramatically, from approximately 62% of child deaths in 1900 to 2% by the end of the twentieth century (Bhatia et al., 2019). As infectious disease mortality declined, the leading causes of death among children older than one shifted toward accidental injuries, such as motor vehicle crashes, intentional injuries, such as homicide and suicide, cancer, and genetic abnormalities (Cunningham et al., 2018; Centers for Disease Control and Prevention, n.d.-a). For infants, the leading causes of death changed to genetic abnormalities along with sudden infant death syndrome (SIDS) and disorders stemming from low birthweight and preterm delivery (Centers for Disease Control and Prevention, n.d.-b). Therefore, this epidemiological transition reflects not only advances in medicine and public health, but also broader changes in the social and environmental conditions that shape child health in contemporary populations.

Despite these population-level improvements, declines in infant and child mortality have not been evenly experienced across geographic populations. In particular, infants and children living in rural areas face persistent and significant health disadvantages relative to their urban counterparts. For example, children living in rural areas have a 25% higher all-cause mortality rate than children living in urban settings (Bettenhausen et al., 2021). These disparities reflect enduring structural inequalities, including poverty and limited access to health care facilities and providers, indicating that healthcare provisioning in these areas has been neglected. Geographical isolation further exacerbates these challenges by increasing emergency response times and delaying access to critical care (Bettenhausen et al., 2021; Cunningham et al., 2018; Ziller & Milkowski, 2020).

Social and demographic processes further shape disparities in child health. A growing literature emphasizes that health outcomes are the product of interacting biological and social determinants, which structure exposure to risk and access to preventative resources over the life course. Biological factors such as sex, age, and genetic predispositions influence individual susceptibility to disease and mortality (Ahmed, 2025; Gay et al., 2021; Schacht et al., 2020). At the same time, the social determinants of health, such as race, gender, socioeconomic status, and public policy, play a critical role in shaping health behaviors, environmental exposures, and access to care (Ahmed, 2025; Centers for Disease Control and Prevention, 2024a; Centers for Disease Control and Prevention, 2024b; Mehta et al., 2013; Phillips, 2005). These factors are often unequally distributed across rural populations, where structural disadvantages and historical inequalities can amplify vulnerability to poor health outcomes.

Despite increasing scholarly attention to health disparities, significant gaps remain in understanding how these processes unfold in specific regional contexts. In particular, child health outcomes in rural areas remain relatively understudied, despite evidence that high levels of socioeconomic deprivation, environmental risk exposure, and limited healthcare infrastructure interact to produce distinct patterns of vulnerability (Bettenhausen et al., 2021). More broadly, disparities based on race and ethnicity also continue to receive comparatively less attention in research on variation in child health outcomes (Mehta et al., 2013). This limitation is especially consequential given growing racial and ethnic diversity in the United States. (Rogers et al., 2017). For instance, between 1990 and 2012 the population of Latino children in the U.S.

increased from 12% to 24% (Annie E. Casey Foundation [AECF], 2014, p. 7, as cited in Rogers et al., 2017). These demographic shifts raise concerns about the potential amplification of existing health inequities, particularly in structurally disadvantaged settings such as rural areas. Thus, with diversity on the rise, both in general and in rural areas, greater attention to the emergence and possible widening of disparities is warranted, given their implication for population-level health outcomes (Bettenhausen et al., 2021; Rogers et al., 2017). Addressing these gaps requires a more integrated focus on how biological and social determinants jointly shape health outcomes among marginalized child populations.

To address these gaps in the literature, I examine patterns of infant and child mortality among individuals under the age of 18 using death certificate data from a small Southern community spanning 1915 to 2015. By drawing on a century of mortality records, this study is well positioned to assess how large-scale epidemiological shifts and persistent structural inequalities shape child health outcomes over time. Specifically, I evaluate how key demographic factors, such as sex and race, interact with specific time-periods to structure patterns of mortality across early life. By considering individual-level characteristics within broader temporal and social contexts, I aim to clarify the extent to which disparities in infant and child mortality reflect enduring inequalities versus changing risk environments that are caused by epidemiological shifts and public health interventions. In doing so, the study provides a long-run perspective on infant and child health disparities, with particular attention to how demographic and temporal processes jointly contribute to unequal mortality outcomes.

CHAPTER 2: LITERATURE REVIEW

Sex as a Determinant of Health

Sex is a biological factor that significantly influences individual health outcomes. Across nearly all stages of the life course, males exhibit higher mortality rates than females, a pattern referred to as the female survival advantage (Zarulli et al., 2018). This pattern extends beyond humans to many other mammalian species, suggesting shared underlying biological mechanisms. Key contributions to this disparity include greater male allocation of energy to the development and support of secondary sexual characteristics (Lemaître et al., 2020) and susceptibility to infectious disease due to hormonal and genetic factors (Gay et al., 2021). Males also have an increased tendency to engage in risk-taking behaviors, resulting in more accidental and violent deaths. For example, male children are at higher risk of injury-related mortality, such as firearm and drowning deaths, and this disparity widens with age (Cunningham et al., 2018). However, although males live shorter lives on average due to these acute and fatal conditions, the lives of females are often plagued by more chronic and extended illnesses. This phenomenon is known as the morbidity-mortality paradox, and it presents a tradeoff to the female survival advantage (Advic et al., 2019; Muszynska-Spielauer et al., 2026; Ostan et al., 2016).

Patterns in sex ratios at birth (SRB) further support the biological vulnerability of males, indicating that the female survival advantage begins even before birth. Research examining demographic datasets regularly finds that environmental stressors and adverse ecological conditions are associated with lower SRBs (i.e., fewer males born; Catalano et al., 2007; Schacht et al., 2019; Williams et al., 2023). For example, in the U.S. state of Utah, during the Spanish Influenza Pandemic (1918–1920) and the Great Depression (1929–1939), fewer male births were observed compared to the more prosperous Roaring Twenties. These findings suggest that more energetically costly male fetuses are more vulnerable under adverse conditions, leading to reductions in male births during periods of stress (Schacht et al., 2019). However, male infants that do survive gestation under adverse conditions are often more robust, indicated by lower infant and adult mortality among males from more heavily selected cohorts (Bruckner & Catalano, 2007; Bruckner et al., 2026). Thus, cohort-level SRBs can serve as proxies for the environmental conditions into which children are born, providing a signal for potential changes in mortality profiles (Bruckner et al., 2026; Williams et al., 2023).

Hormonal differences also play a key role in shaping sex-specific mortality patterns. Following adolescent puberty (9-14 years old), higher estrogen levels in females enhance immune function by regulating response pathways and increasing antibody production, which decreases susceptibility to serious infections and promotes wound healing (Dias et al., 2022; Gay et al., 2021; Harding & Heaton, 2022; Shirtcliff et al., 2009). Conversely, higher levels of androgens, especially testosterone, in males have immunosuppressive effects and may be associated with increased susceptibility to bacterial and parasitic infections (Dias et al., 2022; Gay et al., 2021; Trigunaite et al., 2015). While these effects contribute to male vulnerability, elevated androgen production is necessary for typical male development and the expression of secondary sexual characteristics, highlighting evolutionary tradeoffs underlying our species-specific pattern of sexual dimorphism (Lemaître et al., 2020). While adolescent puberty also increases androgen levels in females, their levels are not as high as in males. Therefore, the immunosuppressive effects of androgens do not negatively impact the female immune system to the same extent as males, but low levels of androgens may contribute to autoimmune disorders, which females are more susceptible to (Roy et al., 2026; Sciarra et al., 2023; Trigunaite et al., 2015).

Genetic mechanisms further contribute to sex differences in survival. In humans, females typically possess two X chromosomes (XX), while males usually possess one X and one Y chromosome (XY). The X chromosome is larger than the Y chromosome and contains numerous genes associated with immune function (Angum et al., 2020; Gay et al., 2021; Libert et al., 2010). Because males have only a single X chromosome, deleterious mutations are more likely to be expressed, and their increased susceptibility to infections is a likely consequence (Angum et al., 2020; Libert et al., 2010). Among females, while one X chromosome is largely inactivated during embryonic development (Gay et al., 2021; Libert et al., 2010), approximately 15% of genes avoid inactivation (Gay et al., 2021), thereby allowing for partial dual expression that may enhance immune responsiveness. This potential advantage, however, comes with a tradeoff because heightened immune activity increases the likelihood of dysregulated immune responses, contributing to the higher prevalence of autoimmune disorders among females (Angum et al., 2020; Gay et al., 2021; Libert et al., 2010). Taken together, these hormonal and genetic mechanisms highlight the biological foundations of sex differences in survival, but they do not fully account for observed variation across populations and historical contexts.

Gender, Behavior, and Parental Investment

While biological factors shape baseline differences in male and female survival, cultural behaviors and societal expectations further influence mortality patterns by structuring gender roles and exposure to risk (Phillips, 2005). Cultural norms shape how individuals interact with their environments, affecting exposure to disease, injury, and assistance. Historical evidence helps to illustrate this dynamic. For example, a study on infectious disease risk among children in Massachusetts found that, prior to 1890, girls in the United States experienced higher mortality from infectious disease than boys. A proposed explanation for this finding was the female role as primary caregivers and their resultant increased exposure to sick family members in virulent pathogenic environments. In contrast, males were more likely to spend time outside the home, thereby contributing to their lower disease and mortality risk (Goldin & Lleras-Muney, 2019).

Parental care strategies also vary across societies and can contribute to sex-based differences in health outcomes. Across societies, families typically exhibit a son or daughter preference, influencing postnatal care, including feeding practices, supervision, and access to healthcare and education. Son-preference has been documented across societies, particularly among sub-Saharan African groups, as well as those in East and South Asia (Hassan et al., 2019). This preference is often linked to patrilineal inheritance systems and parental expectations that sons will provide financial support for their parents later in life. In contrast, daughter preference is often present in contexts where females contribute more to domestic labor or household wealth through marriage (Cronk, 1991; Hassan et al., 2019). For example, among the Mukogodo of Kenya, parents invested more heavily in daughters' healthcare despite expressing no explicit preference, likely contributing to higher male neonatal mortality. One explanation for this observed higher parental investment in daughters is that they were more likely to marry into households of higher socioeconomic status compared to sons, who sometimes did not marry at all (Cronk, 1991).

The structure of households also contributes to parental investment and the resulting patterns in mortality. Children living in single parent households have an increased risk of serious injuries and mortality from accidents and delinquent activities (Amato & Patterson, 2020). For instance, a study using data from the Wide-Ranging Online Data for Epidemiologic Research (WONDER), the Current Population Survey (CPS), the American Community Survey (ACS), and the U.S. Decennial Census for the years 1968-2010 found a positive relationship between the percentage of children living in single parent households and deaths due to accidents and homicides (Amato & Patterson, 2020). Key contributors to this include elevated financial hardship and interpersonal stress among single parents, resulting in lower levels of investment in children. In particular, single parents often have less time to spend with their children and supervise their activities, likely contributing to the increased risk of premature mortality in single parent homes (Amato & Patterson, 2020).

Gender norms in the United States have also been shown to shape health-related behaviors and contribute to disparities in male and female mortality. Females are generally more likely than males to seek preventive medical care, leading to the earlier detection and treatment of illness. In contrast, males are more directly encouraged to engage in risk-taking behaviors and are disproportionately represented in deaths due to accidents, violence, and suicide (Avdic et al., 2019; Lawrence et al., 2024; Schacht et al., 2020). In sum, gender norms and parental investment patterns can serve to either dampen or reinforce biological vulnerabilities, contributing to variable sex differences in mortality across time and place.

Social Determinants of Health

While biological and behavioral factors shape individual risk, health outcomes are also structured by broader social environments. The social determinants of health, such as public policy, race, and socioeconomic status, are nonmedical factors that shape exposure to risk and access to resources (Centers for Disease Control and Prevention, 2024a; Centers for Disease Control and Prevention, 2024b; Mehta et al., 2013). These determinants shape lived experiences, affecting when, where, and how individuals encounter health risks.

A growing area of research highlights the role of early life conditions on health outcomes across the life course. Specifically, exposures early in development result in distinct patterns of morbidity and mortality. For example, children raised in poverty often experience chronic stress associated with unstable housing, limited resources, and unsafe environments. Prolonged exposure to such conditions can lead to “toxic stress,” which disrupts physiological development and increases the risk of both acute and chronic conditions such as asthma, cardiovascular disease, and mental health disorders (Francis et al., 2018). Similarly, Black Americans who continually experience exposure to racism have a higher risk for chronic conditions like hypertension, stroke, and diabetes. These conditions can then alter prenatal and post-natal environments, putting the next generation at greater risk for unfavorable birth outcomes, such as low birth weight and preterm birth. Later in life, the lingering effects of this exposure have also been attributed to chronic conditions like heart disease (Gravlee, 2009). Thus, early-life exposures to poverty and racism demonstrate how social environments become biologically embodied, producing lasting effects on health outcomes.

Social Determinants of Health: Race and Public Policy

Race is a powerful social determinant of health. Although race is not a biologically determined category, it is a socially constructed classification that becomes embodied through the incorporation of social, physical, and environmental experiences, ultimately shaping health outcomes (Dressler et al., 2005; Gravlee, 2009; Lujan & DiCarlo, 2024). Historical and contemporary forms of racism create socioeconomic conditions that operate as structural violence, exposing marginalized populations to ongoing symbolic, psychological, and physical harms. Over time, these cumulative stressors influence health trajectories, producing advantages for those with greater social and political power while disadvantaging those with less. In this way, structural violence reproduces and sustains health and social inequalities across generations (Farmer, 2003; Harrison, 2005).

In the United States, racial inequality has been historically structured through policies and institutions that systematically disadvantage Black Americans. Following the abolition of slavery, Jim Crow laws emerged across the American South during the late 19th century, legally enforcing racial discrimination and advancing White supremacy through segregation and the restriction of Black Americans' access to education, employment, housing, healthcare, and political participation (Krieger et al., 2014). These laws were maintained through both legal and extralegal violence, including vigilante lynchings, physical intimidation, and other forms of racial terror (Kihlstrom & Kirby, 2021). As a result, the lived experience of Black Americans in the South was characterized by profound social and economic oppression, contributing to the Great Migration, during which millions of Black Americans relocated to northern and western states between 1916 and 1970 (Kihlstrom & Kirby, 2021). Those who remained in the South often continued to be tied to plantation-style agricultural systems through tenant farming and sharecropping arrangements. Well into the 20th century, the continued productivity of southern plantations remained highly dependent on the work of Black tenant households, including children, whose economic opportunities were constrained by segregation and racial discrimination. Consequently, Black families were disproportionately exposed to environments marked by poverty, inadequate infrastructure, and elevated disease burdens. For example, Black families in Arkansas in the early 1900's experienced higher child mortality, in part because they were concentrated in plantation regions where infectious diseases such as malaria and tuberculosis were prevalent (Elman et al., 2025).

More generally, during the Jim Crow era, mortality rates among Black children were approximately 58% higher than those among White children (Elman et al., 2025). These disparities were driven in part by segregated healthcare systems that severely restricted Black Americans' access to quality medical care. As segregation persisted, an increasing proportion of White women gave birth in hospitals, while many Black women continued to deliver at home with the assistance of Black midwives (Muigai, 2019). Even when Black Americans gained access to physicians or hospitals, they frequently received unequal and inadequate treatment (Largent, 2018; Smith, 2005). For example, in 1957, C. A. Darden, a Mississippi NAACP representative, reported that hospitals admitting Black patients often confined them to overcrowded hallways and basement wards, reflecting the deeply unequal conditions of segregated healthcare facilities (Smith, 2005).

These experiences fostered widespread mistrust of the American healthcare system among Black communities and contributed to persistently poorer maternal and infant health outcomes. As a result, many Black mothers chose to rely on traditional birth attendants rather than physicians when alternatives were available, despite continued higher rates of infant and maternal mortality (Largent, 2018; Muigai, 2019; Smith, 2005). Black midwives, particularly in the South, remained central figures in maternal healthcare because of their longstanding role in assisting births during both slavery and the Jim Crow era. This historical relationship fostered trust and community support, enabling Black midwives to continue serving as primary caregivers for Black families well into the 20th century (Muigai, 2019).

The passage of the Civil Rights Act of 1964 marked the formal end of Jim Crow policies, leading to desegregation and expanded access to healthcare and other resources. These changes contributed to some measurable improvements in health outcomes, such as declines in Black infant mortality. Specifically, the Black infant mortality rate in Jim Crow states declined from 49.1 per 1000 in 1960-1964 to 32.9 per 1000 in 1970-1974 (Krieger et al., 2013). However, Black infant mortality remains significantly higher than White infant mortality to this day, and the Black population overall continues to experience an increased risk of premature mortality (Krieger et al., 2013; Krieger et al., 2014).

Despite desegregation, racism continues to exist both interpersonally and structurally in healthcare. Interpersonal racism may result in longer wait times, poor doctor-to-patient communication, doctors spending less time with patients, and a lack of empathy (Ramsoondar et al., 2023). On the other hand, structural racism also affects the resource and funding availability of health care facilities that largely treat underrepresented racial groups, such as health care facilities in poor and marginalized communities (Ramsoondar et al., 2023). For instance, areas with high residential populations of Black Americans have been reported to have a lack of primary care physicians and an increased volume of public hospital shutdowns. Such circumstances can be referred to as the healthcare version of "White flight", comparable to residential White flight, where hospitals and health care providers relocate to more high-income, less diverse suburban neighborhoods. In some cases, unequal medical treatment and lack of access to health care in marginalized areas may become normalized, leading residents to misleadingly believe that their medical needs are being addressed (Caldwell et al., 2017).

Over time, these experiences, both during Jim Crow and post-Jim Crow, have contributed to the mistrust of the healthcare system among marginalized populations, leading to underutilization of preventive care and delays in seeking treatment (Campbell et al., 2025; Ramsoondar et al., 2023). In addition, other factors such as limited access to healthy food and inadequate infrastructure in predominantly minority neighborhoods can further increase the risk of negative health outcomes, including the development of chronic diseases like obesity, stroke, and diabetes (Caldwell et al., 2017; Hruschka, 2012; Obuaku-Igwe, 2015; Wang et al., 2022). Together, these processes demonstrate how racial inequality becomes embodied, shaping health outcomes across generations.

Public Health Policy, Rurality, and Poverty

Other public policy and legislative changes also play a central role in shaping population-level health in the United States. For example, because infectious diseases typically spread more rapidly in densely populated areas, public health interventions in the US have historically focused on urban locales (Bhatia et al., 2019; Cutler & Miller, 2005; Ziller & Milkowski, 2020). Measures such as the expansion of clean water infrastructure, sanitation systems, and health care facilities, resulted in the decline of infectious disease very generally across American cities during the 20th century (Bhatia et al., 2019; Cutler & Miller, 2005).

However, these improvements were not evenly distributed. Rural areas were often excluded from large-scale public health investments, contributing to persistent health disparities among rural populations, particularly children (Bettenhausen et al., 2021; Ziller & Milkowski, 2020). Furthermore, more than 20% of rural children live in poverty, and many belong to non-White racial groups (Bettenhausen et al., 2021). Poverty is another form of structural violence that limits access to food, health care, and other essential resources while simultaneously increasing vulnerability to infectious disease (Farmer, 2003; Harrison, 2005). Beyond its immediate consequences, childhood poverty can also have lasting negative effects across the life course, as it is associated with increased risk of morbidity and premature mortality in adulthood (Colvin et al., 2025; Schickedanz et al., 2021). Thus, poverty and rurality are closely linked to health disparities, and although public health policies improved overall population health, they also served to reinforce and, in some cases, exacerbate geographic inequalities in health outcomes.

Study Context and Hypotheses

Taken together, the literature demonstrates that health outcomes are shaped by interactions between biological, behavioral, and social factors across the life course. Sex-based differences in survival reflect hormonal and genetic mechanisms, while social determinants, including race, public policy, and structural inequality, shape access to resources and exposure to risk. These processes interact to produce systematic variation in infant and child mortality across populations and historical periods.

To examine these patterns empirically, this study draws on the Ayden Mortality Dataset, a demographic database containing information on over 9,000 individuals who lived, died, or were buried in Ayden, North Carolina between 1915 and 2015. Ayden is a small rural town in eastern North Carolina, a region shaped by a long history of slavery, racial segregation, and persistent social inequality (Alexander et al., 2006; Equal Justice Initiative, 2022). Importantly, the study period spans both the Jim Crow era and the post–Jim Crow era, providing a unique opportunity to examine how sex- and race-based disparities in infant and child mortality change across periods of major social and political transformation within a rural southern context. Given this historical and demographic context, Ayden provides an appropriate setting for investigating long-term patterns of inequality in infant and child survival.

Based on the preceding literature, the following predictions are proposed:

A. Temporal Change

Infant and child mortality will decline over time, reflecting the epidemiological transition and improvements in public health infrastructure and policy, sanitation, and medical care.

B. Sex Differences in Mortality

Male infants and children will exhibit higher mortality risk than female infants and children across all time periods, consistent with established biological vulnerabilities and behavioral patterns. The magnitude of this difference is expected to decrease across time.

C. Race and Historical Inequality

Racial disparities in infant and child mortality will decrease following the Civil Rights era, with a pronounced decline in mortality among Black infants and children after the passage of the Civil Rights Act of 1964. However, disparities are expected to persist due to enduring structural inequalities.

The first prediction on temporal change is an expected secular trend that should be reflected in the data. The sex differences in infant and child mortality that are predicted in the second prediction are based on the hormonal and genetic differences in males compared to females as well as the differences in their observed gender norms, behaviors, and parental investment. Lastly, the race and historical inequality prediction is supported by literature on how the social determinants of health shape lived experiences. Depending on the time period, race and public policy can influence health disparities in distinct ways. Therefore, these three predictions will guide this study on race and sex differences in infant and child mortality over time, specifically in the Jim Crow and post-Jim Crow eras.

CHAPTER 3: METHODS AND RESULTS

Field Site

The southern, rural town of Ayden, North Carolina serves as the focal site for this study. Ayden was officially established in 1891 by William Henry Harris as a railroad depot, and its early economic development was closely tied to both the railroad and tobacco industries (The University of North Carolina at Chapel Hill School of Government, n.d.; Town of Ayden, n.d.). By 1900, less than a decade after its founding, the town's population totaled 557 residents (U.S. Census Office, 1901). Over subsequent decades, Ayden expanded through the development of businesses, medical clinics, recreational facilities, churches, and other private and public institutions (Town of Ayden, n.d.). By mid-century, the population had grown to 2,277 residents (U.S. Census Bureau, 1952). However, in 1979, Ayden experienced the beginning of a significant economic downturn following the rerouting of a main highway away from its downtown area by the North Carolina Department of Transportation, contributing to a deceleration in population growth (The University of North Carolina at Chapel Hill School of Government, n.d.). However, by 2000, the town had a population of approximately 4,622 residents (U.S. Census Bureau, 2002).

Geographically and politically, Ayden is situated within a broader region in the American South historically shaped by of slavery, racial segregation, and systemic discrimination. During the early twentieth century, Black families were largely concentrated on the outskirts of town due to entrenched patterns of residential segregation, while those residing within town limits often lived in White households as domestic servants. The opening of a pickle processing plant around 1950 expanded employment opportunities for Black residents, coinciding with the increased development of Black-owned businesses and churches in the area (East Carolina University, n.d.-

b). Institutional growth also occurred in education, as South Ayden High School, originally constructed in 1923 to serve Black students, expanded in 1951 and 1958 to include additional facilities such as a lunchroom, band room, gymnasium, and other educational buildings (East Carolina University, n.d.-c). Despite these mid-century gains, racial segregation in Ayden persisted across most public domains until the end of the Jim Crow system. The passage of the Civil Rights Act of 1964 marked a critical turning point, facilitating desegregation and greater integration in the latter half of the twentieth century. In the realm of education, this transformation culminated in the closing of South Ayden High School and the establishment of the integrated Ayden-Grifton High School in 1971 (East Carolina University, n.d.-a; East Carolina University, n.d.-b).

Although the town of Ayden encompasses just over three square miles, its location within Pitt County provides access to health and economic infrastructure in the nearby city of Greenville, located approximately six miles to the north (Town of Ayden, n.d.). As both the county seat and home to East Carolina University, Greenville serves as a key source of employment opportunities, public services, and medical care for Ayden residents. As of 2025, Ayden has a population of 5,263 residents (U.S. Census Bureau, n.d.-a), with approximately 24% under the age of 18 as of 2024 (Census Reporter, n.d.). The town has also maintained a relatively stable racial composition over time, with about 36% of residents identifying as Black and about 52% identifying as White (U.S. Census Bureau, n.d.). Taken together, Ayden's historical context and geographic positioning make it a well-suited site for examining patterns of child health and mortality.

Data Collection

The specific data that I analyzed to evaluate my predictions came from the Ayden Mortality Dataset, a large demographic health-based database that houses vital records and mortality data of 9,102 individuals who lived, died, or were buried in Ayden, North Carolina from 1915 to 2015. The information within this database was primarily sourced from physical copies of death certificates from Pitt County's Register of Deeds Office in Greenville, North Carolina. Figure 1 provides an example death certificate and highlights the key variables targeted during data collection, which were place of residence, place of death, and place of burial. If Ayden was listed as the location for any of these variables, the corresponding death certificate was scanned and uploaded into the database. Then, after entering, cleaning, and organizing the scanned data during the summer and fall of 2025, I used R, a programming language (R Core Team, 2024), and RStudio, a programming software (Posit Team, 2025), to perform descriptive and statistical analyses.

Furthermore, due to the relatively small proportion of individuals under the age of 18 in the database, in my analysis, infant mortality was defined as any individual born alive and who died before the age of 1 (0-364 days old), and child mortality was defined as any individual who died after infancy and before the age of 18 (365-6569 days old). The U.S. Centers for Disease Control (CDC) defines infant mortality in a similar manner, stating that infant mortality refers to anyone who died before their first birthday (Centers for Disease Control and Prevention, 2024c). Conversely, both the National Institutes of Health (NIH) and the CDC's National Survey of Children's Health (NSCH) classify a child as anyone under the age of 18 (National Institutes of Health, 2015; U.S. Census Bureau, n.d.-b).

Statistical Approach

I first performed descriptive statistics to outline and summarize the data. Next, I modeled the binary outcomes of infant death (0=no, 1=yes) and child death (0=no, 1=yes) using logistic regression analysis in R Studio. The predictor variables for the models were race (0=White, 1=Black), sex (0=female, 1=male), death year, and time period, specifically the Jim Crow era (post-Jim Crow death=0, Jim Crow death=1). Both analyses for infants and children also included a model with an interaction term between race and time period. For each logistic model, log coefficients for each of the predictor variables were calculated. However, because log coefficients are non-linear and can be difficult to interpret, I exponentiated the coefficients to interpret them as odds ratios (OR). This allows for the quantification of the relationship between the binary outcome and predictor variables (Gelman & Hill, 2007). That said, some exponentiated coefficients were interpreted as percentages for better understanding by subtracting their odds ratios from 1.00 and then multiplying by 100. The Akaike information criterion (AIC) was then used as a model comparison tool to determine which infant and child mortality models were the better fit for the data. The lowest AIC score indicated the better model (Brown & Simcock, 2022).

Results: Descriptive Analysis

In total, there are 8,765 individuals within the dataset that I analyzed, with 1,152 under the age of 18. Specifically, my sample included 742 infants, 410 children, and 7,613 adults. Given these counts, 8.5% are infants, 4.7% are children, and 86.9% are adults. A mortality profile of infants and children within the dataset (Figure 2) presents the distribution of deaths in each under 18 years old age category, showing the disproportionate number of infant deaths compared to the other age categories. The mean age at death for infants was 71 days while the mean age at death for children was 2,500 days (6.8 years). Furthermore, there are 4,008 Black individuals and 4,726 White individuals within the dataset. Additionally, there are 4,540 males and 4,194 females within the dataset. The race and/or sex of 31 individuals was unknown, so they were excluded from formal analyses.

Tables 1-4 show the proportion of infant and child deaths by race, sex, and time period. In the Jim Crow era, about 19% of all individuals died during infancy (Table 1) and about 11% of all individuals died during childhood (Table 3). Overall, more Black infants and children died during this period compared to White infants and children, but this disparity was larger for infants. Black infants accounted for 24% of Black deaths and 13% of all deaths in the Jim Crow era. Conversely, White infants accounted for 14% of White deaths and 7% of all deaths in the Jim Crow era. Regarding children during the Jim Crow era, Black children accounted for 12% of Black deaths and 6% of all deaths while White children accounted for 10% of White deaths and 5% of all deaths. Additionally, for both infants and children, there was only a 1% difference in the percentages of males and females that died in the Jim Crow era. In the post-Jim Crow era, only about 2% of all individuals died during infancy (Table 2) and about 1% of all individuals died during childhood (Table 4). Therefore, the percentages of infant and child deaths decreased for both races. Black infants accounted for 4% of Black deaths and 2% of all deaths in the post-Jim Crow era. Conversely, White infants accounted for 1% of White deaths and 1% of all deaths in the post-Jim Crow era. Regarding children in the post-Jim Crow era, Black children accounted 2% of Black deaths and 1% of all deaths, and White children accounted for 1% of White deaths and 1% of all deaths. Similarly to the Jim Crow era, in the post-Jim Crow era for both infants and children, there was only a 1% difference in the percentages of males and females.

In Figure 3, the percentages of infant, child, and adult deaths across time are further examined in ten-year increments (except for 2005-2015 which is eleven years), beginning with 1915-1924 and ending with 2005-2015. Infant and child deaths combined to make up more than half the deaths in the population from 1915-1924. Child deaths declined by about 9% in 1925-1934, but the percentage of infant deaths remained largely the same until 1935-1944 when they declined by about 9%. The percentage of child deaths began to plateau in 1945-1954, and, by 1955-1964 through 2005-2015, they accounted for less than 3% of all deaths. On the other hand, infant mortality declined slower than child mortality. However, in 1965-1974, at the beginning of the post-Jim Crow era, infant mortality declined by more than 7%, the biggest decrease in infant mortality in decades. By 1975-1984, infant mortality, like child mortality, also fell below 3% and plateaued, remaining that way through 2005-2015. Overall, both the percentages of infant and child deaths decreased across time while the percentage of adult deaths increased, showing the expected temporal change.

Results: Logistic Regression Models

For my first set of analyses (Model 1), I performed logistic regression with infant death as the outcome variable. Model 1a included race, sex, death year, and time period as predictor variables while Model 1b included sex, death year, and an interaction term between race and time period as the predictor variables. The employment of AIC as a model comparison tool indicated that Model 1b (AIC = 4077.8) was a better fit for the data as it had a lower AIC score than Model 1a (AIC = 4088.5). Therefore, the results of Model 1b will be discussed moving forward. According to the results of this model, all terms except sex were statistically significant, including the interaction term (OR = 0.460, $p < 0.001$). During the Jim Crow era, White individuals had 3.1 times higher odds of infant death and Black individuals had 1.4 times higher odds of infant death compared to the post-Jim Crow era (OR = 3.11, $p < 0.001$). These results indicate that the mortality risk decreased for both racial groups across time, but it decreased more steeply for White infants. Furthermore, during the Jim Crow era Black individuals had 1.9 times higher odds of infant death than White individuals. However, during the post-Jim Crow era, Black individuals had 4.2 times higher odds of infant death than White individuals (OR = 4.22, $p < 0.001$). Thus, the relative risk of infant mortality between Black and White individuals was wider in the post-Jim Crow era compared to the Jim Crow era, despite overall mortality declining. Additionally, for every consecutive year, the odds of infant mortality decreased by 3.1% regardless of race or sex (OR = 0.969, $p < 0.001$). Regarding the sex variable, there was no statistically significant difference in the number of male and female infant deaths across time (OR = 1.08, $p > 0.10$).

For my second analysis (Model 2), I examined child mortality using the same modeling approach described above. Unlike the infant mortality model, the interaction between race and time period in Model 2b was not statistically significant (OR = 0.967, $p > 0.10$), and model comparison using AIC indicated that the simpler main-effects model (Model 2a) provided a better fit to the data (AIC = 2748.4) than the interaction model (AIC = 2750.4). Accordingly, Model 2a was retained for interpretation. In this model, all predictors except sex were statistically significant. Black individuals had 1.3 times higher odds of dying during childhood than White individuals (OR = 1.26, $p < 0.05$), while no significant sex differences were observed (OR = 1.20, $p > 0.10$). Child mortality declined significantly over time, with a 5.0% reduction in the odds of death per year (OR = 0.950, $p < 0.001$). The Jim Crow period was also associated with lower odds of child mortality after controlling for race and year (OR = 0.590, $p < 0.05$), however this coefficient should be interpreted with caution.

The interpretation of the Jim Crow term is complicated by collinearity with death year (VIF = 3.5). Because Jim Crow reflects a historically bounded interval, earlier years are closely associated with the Jim Crow era and later years with the post–Jim Crow era, causing both variables to capture overlapping temporal information. As a result, the model may have difficulty separating the independent contribution of the historical period from the broader decline in mortality over time, leading to instability in their individual coefficients. Given that death year already accounts for the pronounced long-term reduction in child mortality, the Jim Crow coefficient is best understood as reflecting residual variation after adjustment for temporal trends rather than a direct historical comparison between periods. Consequently, this result should not be interpreted as evidence of lower child mortality during the Jim Crow era; child mortality is demonstrably higher.

To evaluate the contribution of this variable, I estimated a supplemental model that excluded the time period variable (Jim Crow; Supplemental Model 1). The remaining coefficients were largely unchanged, but model fit deteriorated (AIC = 2751.1), exceeding that of both Model 2a and Model 2b. Therefore, Model 2a was retained as the preferred specification. Beyond improving model fit, inclusion of the Jim Crow variable remains theoretically important because a primary objective of this study is to examine how mortality patterns differed between Jim Crow and post–Jim Crow social contexts.

CHAPTER 4: DISCUSSION

Based on my predictions and analyses, four main findings emerge. First, infant and child mortality declined substantially over time, although the specific role of the epidemiological transition cannot be directly evaluated with the available data. Second, no significant differences in mortality were observed between males and females for either infants or children. Third, for infants, the interaction between race and time period was statistically significant, indicating that the effect of race varied across historical periods. Although infant mortality was substantially higher for both Black and White individuals during the Jim Crow era, Black individuals experienced higher infant mortality risk in both periods. Moreover, while absolute racial differences in infant mortality declined over time, relative racial disparities were larger in the post–Jim Crow period because mortality declined more rapidly among White infants than among Black infants. Finally, for children, the interaction between race and time period was not significant. Instead, Black individuals consistently experienced approximately 1.3 times higher odds of death during childhood than White individuals, regardless of historical period. Together, these findings suggest that although child survival improved dramatically across the twentieth century, racial inequalities in mortality persisted across time.

Temporal Change in Mortality

The substantial decline in infant and child mortality observed in Ayden from 1915 to 2015 followed the expected secular trend. During 1915-1924, infants and children accounted for more than half of all deaths. At the beginning of the twentieth century, infectious disease deaths were among the leading causes of death in the United States, and children under five represented a disproportionate share of mortality (Cunningham et al., 2018). Because infants and young children possess underdeveloped immune systems, they are particularly vulnerable to infectious disease. Consequently, advances in childhood vaccination programs and maternal immunization likely contributed substantially to infant and child survival by reducing susceptibility to infectious disease during critical developmental stages (Li et al., 2025).

Broader public health improvements also contributed to declining mortality. Investments in sanitation systems, clean water infrastructure, public health programs, and medical care dramatically reduced infectious disease mortality during the 20th century (Bhatia et al., 2019; Cutler & Miller, 2005). Although rural areas often benefited less than urban areas (Bhatia et al., 2019; Ziller & Milkowski, 2020), Ayden's proximity to Greenville provided residents with access to health services. In particular, the establishment of Pitt County Memorial Hospital in 1951 expanded access to medical care within the region (East Carolina University, 2001). Consistent with these trends, infants and children combined to represent fewer than 2% of all deaths by 2005-2015. Additionally, infant mortality declined by approximately 3% every year, while child mortality declined by approximately 5% every year.

Although these findings are broadly consistent with the epidemiological transition, the present study cannot directly attribute mortality declines to changing causes of death because cause-specific mortality was not examined. Nevertheless, existing research indicates that infectious diseases, such as malaria, tuberculosis, and diarrheal illnesses were major contributors to mortality in rural southern populations during the early twentieth century (Elman et al., 2025; Fee & Brown, 2004). Other recent studies show that congenital malformations, prematurity, and sudden unexpected infant death (SUID) have become increasingly prominent causes of infant mortality (Centers for Disease Control and Prevention, n.d.-b; Hirai et al., 2014) while motor vehicle crashes, firearm injuries, and cancer have become increasingly prominent causes of child mortality (Cunningham et al., 2018). Thus, the mortality decline observed in Ayden is consistent with broader epidemiological changes documented elsewhere in the United States.

Sex Differences in Mortality

Contrary to expectations, no significant differences in mortality risk were observed between males and females for either infants or children. This finding contrasts with extensive literature documenting a female survival advantage across much of the life course (Zarulli et al., 2018). Biological mechanisms such as hormonal differences, sex chromosome composition, and immune system functioning are frequently cited as contributors to sex differences in mortality (Gay et al., 2021; Trigunaite et al., 2015). One explanation may involve the age structure of the sample. The mean age at death among children was approximately 6.8 years, indicating that many deaths occurred before the onset of puberty. Because hormonal changes associated with puberty generally emerge between ages 9 and 14 (Shirtcliff et al., 2009), the physiological mechanisms often used to explain sex differences in mortality may not have been fully expressed among the children represented in this dataset. Similarly, among infants, hormonal surges associated with mini puberty are relatively brief (Serbis et al., 2025) and may not exert strong effects on mortality risk.

Social and cultural factors may also help explain the absence of sex differences. Contemporary research suggests that parents in the United States generally express a preference for having both sons and daughters rather than a strong preference for one sex over the other (Jones et al., 2023). If this preference translates into relatively similar levels of parental investment, healthcare utilization, and caregiving, mortality differences between boys and girls may be reduced. At the same time, researchers have identified subtle son preferences across some family households not directly related to survival. For example, parents are more likely to marry and less likely to divorce if their first child is a son (Dahl & Moretti, 2008; Jones et al., 2023). Since children living in single-parent households face elevated risks of accidental injury and mortality (Amato & Patterson, 2020), differences in family structure could contribute to variation in health outcomes. However, because household-level characteristics were not available in the present study, future research should examine whether household composition and family structure help explain the absence of detectable sex differences in infant and child mortality here.

Another possibility involves variation in family organization and parental expectations across racial groups. Black families in the United States have historically relied on strong female-centered kin networks, shaped in part by the legacy of slavery and subsequent structural barriers that limited educational and economic opportunities, particularly for Black men (Harrison, 2005; Hill, 2001). As a result, Black women have historically maintained high levels of labor force participation and household responsibility. These circumstances may contribute to different expectations and socialization patterns for sons and daughters (Harrison, 2005; Hill, 2001). In addition, Black males continue to experience disproportionately high rates of violence and premature mortality during adolescence and young adulthood (Jones-Eversley et al., 2020), leading some scholars to suggest that parents may perceive sons and daughters as facing different future opportunities and risks (Hill, 2001). Although the present study contains no family-level data and cannot directly evaluate these mechanisms, such differences in parental investment, family structure, and child socialization could potentially influence health trajectories and mortality risk. Future research on infant and child mortality in Ayden could benefit from examining how race and sex intersect within family and community contexts to shape health outcomes.

Race, Historical Context, and Infant Mortality

Race emerged as one of the strongest predictors of infant mortality in this study. Consistent with extensive literature on the social determinants of health, Black individuals experienced higher infant mortality risk than White individuals throughout the study period. During the Jim Crow era, infant mortality was higher for both Black and White populations than during the post–Jim Crow period. However, Black individuals had an elevated infant mortality risk relative to White individuals in both historical periods.

The significant interaction between race and time period reveals a more complex pattern. During the Jim Crow era, Black individuals experienced approximately 1.9 times the odds of infant death relative to White individuals. In the post–Jim Crow era, however, Black individuals experienced approximately 4.2 times the odds of infant death relative to White individuals. Thus, while infant mortality declined substantially for both groups, the proportional difference between Black and White infants became larger over time. This finding highlights the distinction between absolute and relative inequality. Absolute differences in mortality declined following the Jim Crow era because mortality fell sharply across the entire population. However, mortality improvements were proportionally greater among White infants, producing larger relative disparities. In other words, overall population health improved, but racial inequality in infant survival grew.

The persistence of these disparities likely reflects the long-term effects of structural inequality. During the Jim Crow era, Black families faced restricted access to healthcare, segregated medical facilities, and widespread social and economic discrimination (Krieger et al., 2014; Largent, 2018; Muigai, 2019). These conditions likely affected maternal health, prenatal care, and infant well-being. Because infant health is highly dependent on prenatal and early-life conditions, discrimination experienced by mothers has important consequences for infant survival (Owens & Fett, 2019). The mean age at death among infants in the sample was approximately 71 days, indicating that many deaths occurred during a period when prenatal and perinatal conditions exert particularly strong effects.

Following the Civil Rights Act of 1964, many formal barriers to healthcare access were removed, and infant mortality declined substantially among both racial groups. However, structural inequalities persisted. Black Americans continued to experience unequal treatment within healthcare settings, higher rates of maternal mortality, elevated risks of preterm birth, and disproportionate exposure to neighborhood-level environmental and social stressors (Chambers et al., 2022; Dreyer, 2021). Consequently, although mortality levels improved dramatically, substantial racial disparities in infant health and survival remained, and structural violence persisted against Black Americans in measurable ways.

Race and Child Mortality

The patterns observed for child mortality differed somewhat from those observed for infant mortality. Unlike the infant model, the interaction between race and historical period was not statistically significant. Instead, Black individuals consistently experienced approximately 1.3 times greater odds of child death than White individuals regardless of time period. This finding suggests a more stable pattern of racial inequality across the twentieth century. Although child mortality declined substantially for all groups, Black children continued to face disadvantages associated with unequal exposure to social and economic stressors. Research demonstrates that chronic exposure to racism, discrimination, poverty, and neighborhood disadvantages can produce long-term physiological consequences through chronic and toxic stress responses

(Francis et al., 2018). These processes become biologically embodied, increasing vulnerability to poor health outcomes and premature mortality across the life course.

Poverty is one of the most important mechanisms through which structural inequality influences child health. Children raised in poverty experience greater exposure to environmental risks, food insecurity, unstable housing, and barriers to healthcare access (Schickedanz et al., 2021). Because Black children continue to experience disproportionately high rates of poverty relative to White children, these conditions may contribute to the persistent mortality disadvantage observed in the present study. Although the current dataset cannot directly evaluate socioeconomic mechanisms, the findings are consistent with broader evidence linking structural inequality to unequal health outcomes among children.

Conclusion

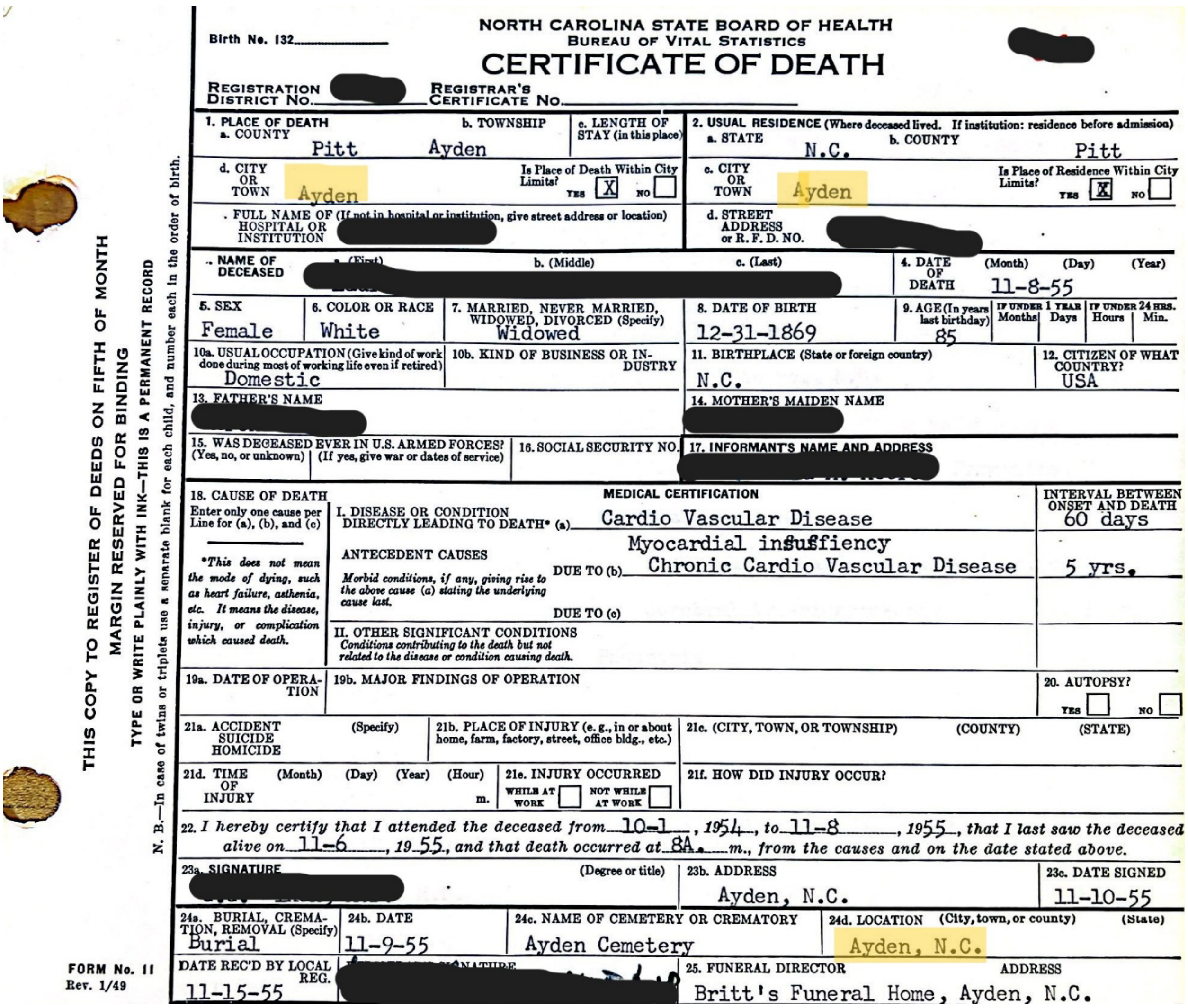
Mortality declined dramatically for both infants and children in Ayden between 1915 and 2015, reflecting broad improvements in public health, healthcare access, and living conditions. However, these gains were not experienced equally. While no significant differences in mortality were observed between males and females, persistent racial disparities remained evident throughout the study period.

The results reveal distinct patterns for infants and children. Among infants, racial disparities varied across historical periods. Although infant mortality declined markedly following the end of Jim Crow, Black individuals continued to experience elevated infant mortality, and relative racial disparities became larger in the post–Jim Crow era because mortality declined more rapidly among White infants. Among children, racial disparities remained relatively stable across time, with Black individuals consistently experiencing higher child mortality than White children.

Taken together, these findings demonstrate that improvements in population health do not necessarily eliminate underlying inequalities. Even as infant and child mortality declined to historically low levels, racial disparities persisted across generations. The results therefore highlight the enduring influence of structural inequalities on health outcomes and underscore the importance of examining mortality not only in terms of overall improvement but also in terms of who benefits most from those improvements. Children in the United States continue to experience higher mortality rates than those in other high-income countries, due in part to persistent structural inequalities that disproportionately affect minority populations, especially Black Americans (Rogers et al., 2017). As the United States continues to become more diverse, understanding the persistence and evolution of health disparities remains essential for improving population health and reducing preventable mortality. Ultimately, the history of infant and child mortality in Ayden is one of both remarkable progress and enduring inequality, demonstrating that improvements in survival do not automatically eliminate the structural forces that shape health disparities.

TABLES AND FIGURES

Figure 1: Death Certificate Example



THIS COPY TO REGISTER OF DEEDS ON FIFTH OF MONTH
MARGIN RESERVED FOR BINDING
TYPE OR WRITE PLAINLY WITH INK—THIS IS A PERMANENT RECORD
N. B.—In case of twins or triplets use a separate blank for each child, and number each in the order of birth.

Birth No. 132

NORTH CAROLINA STATE BOARD OF HEALTH
BUREAU OF VITAL STATISTICS
CERTIFICATE OF DEATH

[redacted]

REGISTRATION DISTRICT NO. [redacted] REGISTRAR'S CERTIFICATE NO.

1. PLACE OF DEATH a. COUNTY Pitt b. TOWNSHIP Ayden c. LENGTH OF STAY (in this place)
2. USUAL RESIDENCE (Where deceased lived. If institution: residence before admission) a. STATE N.C. b. COUNTY Pitt
d. CITY OR TOWN Ayden — Is Place of Death Within City Limits? YES [X] NO [ ]
c. CITY OR TOWN Ayden — Is Place of Residence Within City Limits? YES [X] NO [ ]
e. FULL NAME OF HOSPITAL OR INSTITUTION (If not in hospital or institution, give street address or location) [redacted]
d. STREET ADDRESS or R. F. D. NO. [redacted]

3. NAME OF DECEASED a. (First) b. (Middle) c. (Last) [redacted]
4. DATE OF DEATH (Month) (Day) (Year) 11-8-55
5. SEX Female
6. COLOR OR RACE White
7. MARRIED, NEVER MARRIED, WIDOWED, DIVORCED (Specify) Widowed
8. DATE OF BIRTH 12-31-1869
9. AGE (In years last birthday) 85 — IF UNDER 1 YEAR Months Days — IF UNDER 24 HRS. Hours Min.
10a. USUAL OCCUPATION (Give kind of work done during most of working life even if retired) Domestic
10b. KIND OF BUSINESS OR INDUSTRY
11. BIRTHPLACE (State or foreign country) N.C.
12. CITIZEN OF WHAT COUNTRY? USA
13. FATHER'S NAME [redacted]
14. MOTHER'S MAIDEN NAME
15. WAS DECEASED EVER IN U.S. ARMED FORCES? (Yes, no, or unknown) (If yes, give war or dates of service)
16. SOCIAL SECURITY NO.
17. INFORMANT'S NAME AND ADDRESS [redacted]

18. CAUSE OF DEATH — MEDICAL CERTIFICATION
Enter only one cause per Line for (a), (b), and (c)
*This does not mean the mode of dying, such as heart failure, asthenia, etc. It means the disease, injury, or complication which caused death.
I. DISEASE OR CONDITION DIRECTLY LEADING TO DEATH* (a) Cardio Vascular Disease — INTERVAL BETWEEN ONSET AND DEATH 60 days
ANTECEDENT CAUSES — Morbid conditions, if any, giving rise to the above cause (a) stating the underlying cause last.
Myocardial insuffiency
DUE TO (b) Chronic Cardio Vascular Disease — 5 yrs.
DUE TO (c)
II. OTHER SIGNIFICANT CONDITIONS — Conditions contributing to the death but not related to the disease or condition causing death.

19a. DATE OF OPERATION
19b. MAJOR FINDINGS OF OPERATION
20. AUTOPSY? YES [ ] NO [ ]
21a. ACCIDENT SUICIDE HOMICIDE (Specify)
21b. PLACE OF INJURY (e. g., in or about home, farm, factory, street, office bldg., etc.)
21c. (CITY, TOWN, OR TOWNSHIP) (COUNTY) (STATE)
21d. TIME OF INJURY (Month) (Day) (Year) (Hour) m.
21e. INJURY OCCURRED WHILE AT WORK [ ] NOT WHILE AT WORK [ ]
21f. HOW DID INJURY OCCUR?

22. *I hereby certify that I attended the deceased from* 10-1, 1954, *to* 11-8, 1955, *that I last saw the deceased alive on* 11-6, 1955, *and that death occurred at* 8A. m., *from the causes and on the date stated above.*

23a. SIGNATURE [redacted] (Degree or title)
23b. ADDRESS Ayden, N.C.
23c. DATE SIGNED 11-10-55
24a. BURIAL, CREMATION, REMOVAL (Specify) Burial
24b. DATE 11-9-55
24c. NAME OF CEMETERY OR CREMATORY Ayden Cemetery
24d. LOCATION (City, town, or county) (State) Ayden, N.C.
DATE REC'D BY LOCAL REG. 11-15-55
REGISTRAR'S SIGNATURE [redacted]
25. FUNERAL DIRECTOR ADDRESS Britt's Funeral Home, Ayden, N.C.

FORM No. 11
Rev. 1/49

Figure 2: Infant and Child Mortality Profile

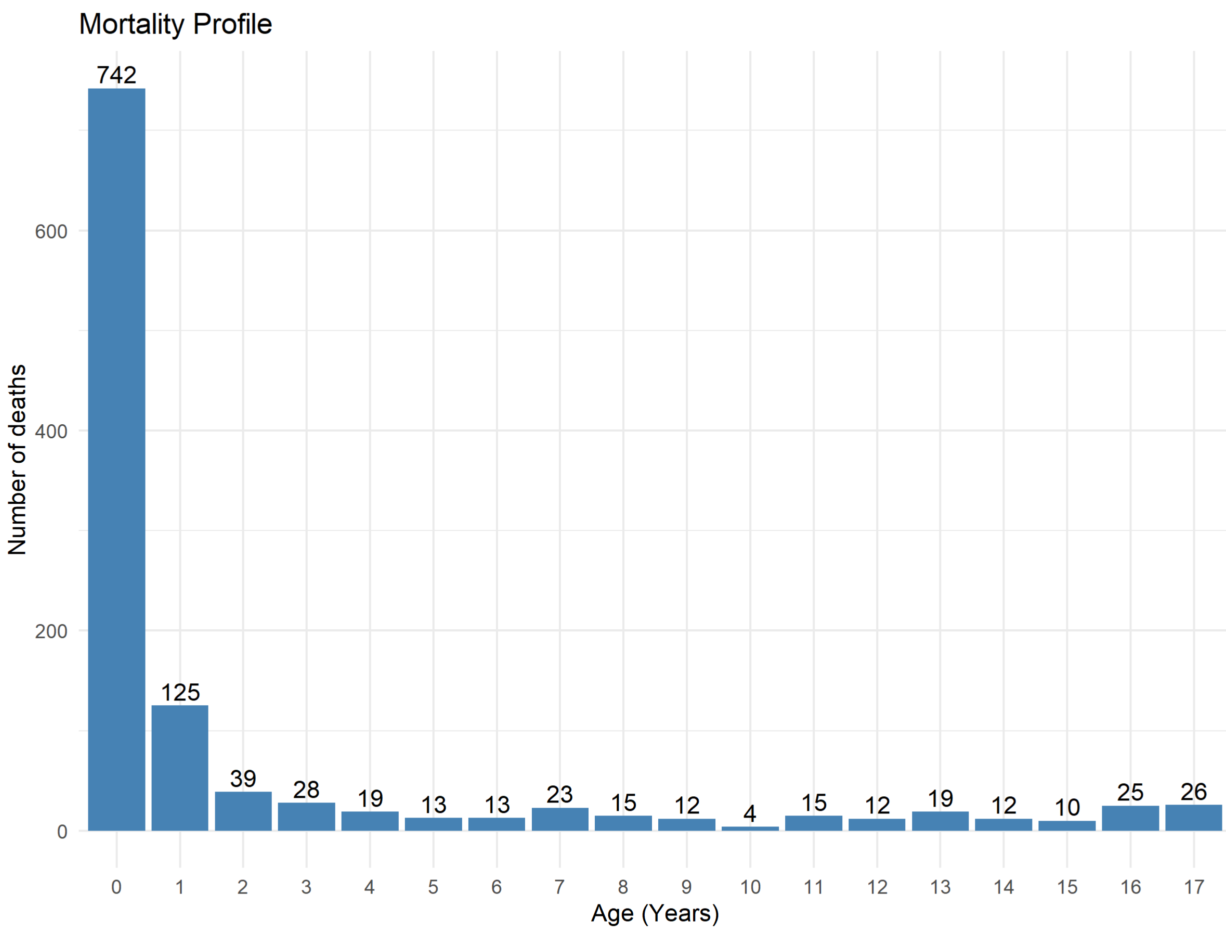


Table 1: Proportion of Infant Deaths Given All Deaths in Ayden Based on Race and Sex, Jim Crow Era 1915-1964

	Female	**Male**	**Total**
Black	171/761 = 0.22	219/874 = 0.25	**390/1635 = 0.24**
White	87/611 = 0.14	123/871 = 0.14	**210/1482 = 0.14**
Total	**258/1372 = 0.19**	**342/1745 = 0.20**	**600/3117 = 0.19**

Table 2: Proportion of Infant Deaths Given All Deaths in Ayden Based on Race and Sex, Post-Jim Crow Era 1965-2015

	Female	**Male**	**Total**
Black	53/1162 = 0.05	46/1211 = 0.04	**99/2373 = 0.04**
White	16/1660 = 0.01	16/1584 = 0.01	**32/3244 = 0.01**
Total	**69/2822 = 0.02**	**62/2795 = 0.02**	**131/5617 = 0.02**

Table 3: Proportion of Child Deaths Given All Deaths in Ayden Based on Race and Sex, Jim Crow Era 1915-1964

	Female	**Male**	**Total**
Black	78/761 = 0.10	112/874 = 0.13	**190/1635 = 0.12**
White	64/611 = 0.10	80/871 = 0.09	**144/1482 = 0.10**
Total	**142/1372 = 0.10**	**192/1745 = 0.11**	**334/3117 = 0.11**

Table 4: Proportion of Child Deaths Given All Deaths in Ayden Based on Race and Sex, Post-Jim Crow Era 1965-2015

	Female	**Male**	**Total**
Black	19/1162 = 0.02	19/1211 = 0.02	**38/2373 = 0.02**
White	13/1660 = 0.01	25/1584 = 0.02	**38/3244 = 0.01**
Total	**32/2822 = 0.01**	**44/2795 = 0.02**	**76/5617 = 0.01**

Figure 3: Percentages of Infant, Child, and Adult Deaths in Ayden Across Time

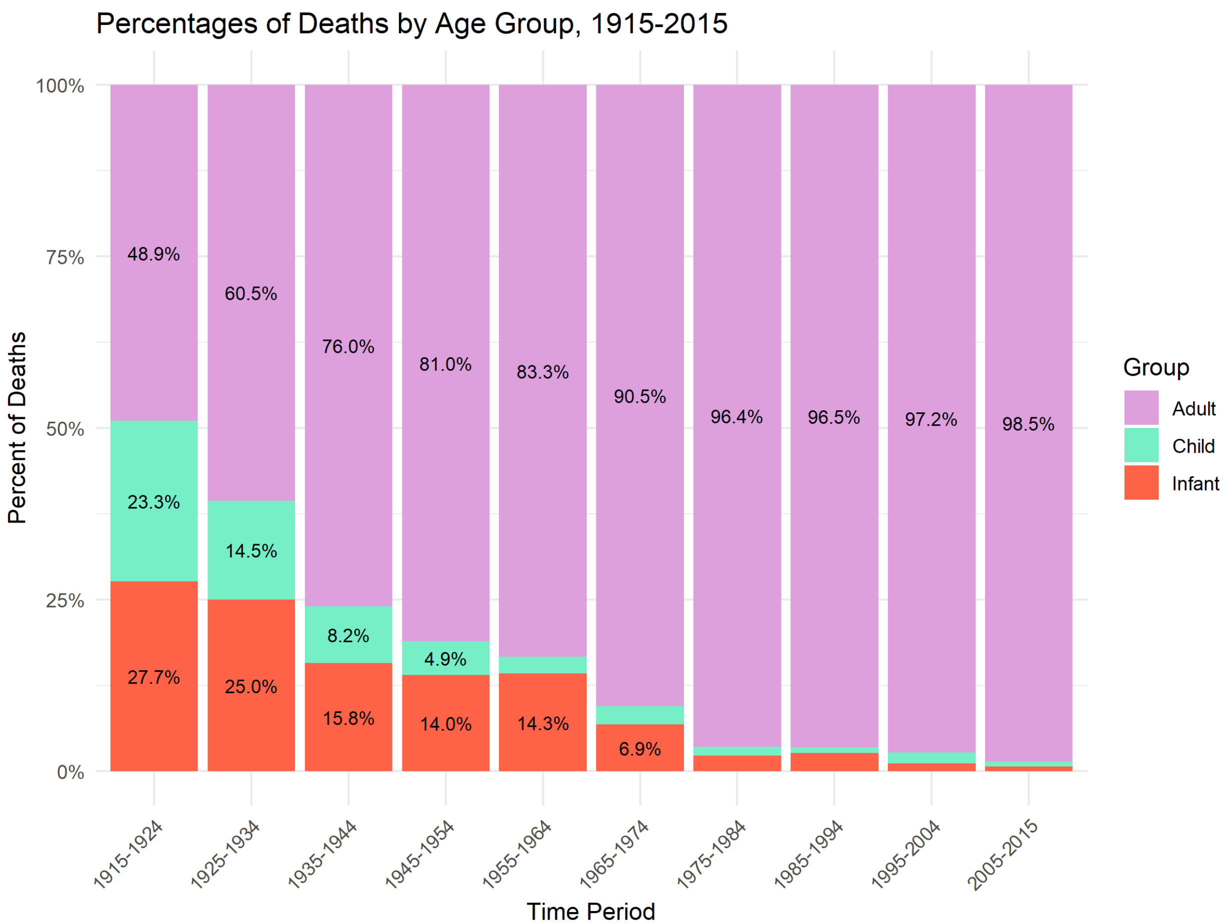


Table 5: Model 1a: Infant Mortality Logistic Regression Model without Interaction

Variable	Coefficient	Standard Error	P-Value
Race (Black=1)	0.819508	0.086182	< 2e-16 ***
Time Period (Jim Crow Death=1)	0.592061	0.179352	0.000963 ***
Sex (Male=1)	0.083749	0.083297	0.314692
Death Year	-0.032073	0.002957	< 2e-16 ***

Table 6: Model 1b: Infant Mortality Logistic Regression Model with Interaction

Variable	Coefficient	Standard Error	P-Value
Race (Black=1)	1.44017	0.20559	2.47e-12 ***
Time Period (Jim Crow Death=1)	1.13471	0.24608	4.00e-06 ***
Sex (Male=1)	0.07696	0.08312	0.354524
Death Year	-0.03174	0.00295	< 2e-16 ***
Interaction (Race x Time Period)	-0.77751	0.22695	0.000613 ***

Table 7: Model 2a: Child Mortality Logistic Regression Model without Interaction

Variable	Coefficient	Standard Error	P-Value
Race (Black=1)	0.232727	0.106515	0.0289 *
Time Period (Jim Crow Death=1)	-0.527464	0.244522	0.0310 *
Sex (Male=1)	0.184386	0.107007	0.0849
Death Year	-0.051630	0.004092	< 2e-16 ***

Table 8: Model 2b: Child Mortality Logistic Regression Model with Interaction

Variable	Coefficient	Standard Error	P-Value
Race (Black=1)	0.259463	0.231973	0.2634
Time Period (Jim Crow Death=1)	-0.509551	0.281052	0.0698
Sex (Male=1)	0.184112	0.107024	0.0854
Death Year	-0.051617	0.004093	< 2e-16 ***
Interaction (Race x Time Period)	-0.033877	0.261114	0.8968

Table 9: Supplemental Model 1: Child Mortality Logistic Regression Model without Time Period Variable

Variable	Coefficient	Standard Error	P-Value
Race (Black = 1)	0.221935	0.106192	0.0366 *
Sex (Male = 1)	0.175490	0.106729	0.1001
Death Year	-0.044337	0.002225	< 2e-16 ***

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