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Weathering the Storm: An Examination of Fetal Loss, Maternal Age, and Norms of Race and Sexuality

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WEATHERING THE STORM: AN EXAMINATION OF FETAL LOSS, MATERNAL AGE, AND NORMS OF RACE AND SEXUALITY

By

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ABSTRACT

This dissertation tests if fetal loss can be applied as an extension of prior literature on the weathering hypothesis. To do so, this study extends upon the weathering hypothesis: the observation that blacks experience substantially higher levels of stress than their white counterparts in the United States, that this gap only increases as individuals become older, and that this resulting stress is correlated with negative health outcomes, especially chronic disease. This outcome is proposed to be caused by subtle racist events and broader institutional racism, resulting in the literal accumulation of stress in the body. The outcome of weathering can be measured in physical responses of the individual's body such as cortisol levels and blood pressure (referred to collectively as allostatic load). Because negative events lead to these stress responses being more common in blacks than whites, resulting in higher allostatic load, there is a corresponding increase in the incidence of health problems such as chronic inflammation. In prior research, the impact of weathering on maternal and child health has been tested for by examining the choice of early childbearing among black mothers. This is a time period where the gap in allostatic load measures is smaller across race. Prior studies examining the weathering hypothesis have determined that for minority women, and minority women only (particularly black women), the risk of maternal mortality, premature birth, low birth weight, and infant mortality is smaller when women become pregnant in adolescence as opposed to young adulthood. However, in spite of a fetal loss gap by race that is similar to the aforementioned maternal and child health outcomes, there is a lack of research into if effects associated with the weathering hypothesis occur with fetal loss. Two analyses are performed to test this relationship. The first analysis consists of a series of multilevel logistic models on approximately seventeen thousand pregnancy outcomes in the National Longitudinal Survey of Adolescent to Adult

Health (Add Health), examining the relative risk of fetal loss based on racial and age characteristics of mothers at the time of pregnancy. The second analysis follows with a series of logistic regressions examining approximately four million pregnancies in the National Vital Statistics Survey (NVSS) for the years 2016 and 2013, also examining the influence of the mother's race, age, and its interaction on fetal loss risks in each year. These analyses find that for each sample (including both years of the NVSS), black women overall have higher risks of fetal loss than their white counterparts. However, for black and Hispanic-black women, the risk of fetal loss was lower in adolescent pregnancies than adult pregnancies, consistent with the weathering hypothesis. The findings from this dissertation suggest that the effects of weathering on maternal and child healthcare outcomes can in fact be extended to the issue of fetal loss, thereby suggesting that stress resulting from racism has a broader collection of harms than previously recognized.

CHAPTER 1

INTRODUCTION

In the United States, one of the broad sociological areas of research has observed and concluded that various forms of social disadvantage are intimately tied into tangible negative outcomes in key life domains. One example of these life domains is health, where social advantages and disadvantage result in health disparities across racial groups. For example, blacks in the United States have lower rates of insurance, are less likely to have an adequate number of doctors in their area and have consistently lower quality of healthcare (Institute of Medicine 2001). In the long term, this results in dramatically different health outcomes. Among those that are commonly cited include higher rates of heart attack, hypertension, birth outcomes such as infant mortality, and overall lower life expectancy; all of which are markedly worse for blacks in the United States (Mensah et al. 2005). This also extends into sociological and behavioral based predictors of health, for example, alcoholism, obesity, socioeconomic status (SES)/poverty, and educational outcomes. This study draws upon this literature and focuses on the racial distinctions in maternal and child health outcomes, particularly fetal loss. In doing so, this study extends the literature examining how racial differences in societal expectations, lived reality, and behaviors can impact an individual's health outcomes.

The theory of focus in this project, built from the broad area of cumulative disadvantage, is known as the weathering hypothesis. This hypothesis "…posits that Blacks experience early health deterioration as a consequence of the cumulative impact of repeated experience with social or economic adversity and political marginalization" (Geronimus et al. 2006: 826). Similar to the geological term, weathering describes the slow wearing down of an individual through the stress of these negative interactions, which eventually leads to physical changes known as

allostatic load, resulting in the eventual health deterioration. As a result, the weathering hypothesis describes a medical, sociological, and life-course based concept that addresses how institutional and personal exposure to racism is associated with differences in racial health outcomes. In the United States, some groups tend to have better health outcomes (e.g. whites and often Asians), while others tend to end up worse (e.g. blacks and Hispanics) although these patterns depend on specific outcomes. The weathering hypothesis thus explores how racism in a sense literally gets "under the skin" (Das 2013), by the accumulation of stress on the body of an individual. This cumulative stress then leads to an associated set of negative, long-term, impacts on one's health. Physical measures of these stress responses are referred to as allostatic load and include common medical risk factors such as blood pressure and cortisol levels (Das 2013; Thoits 2010). This effect is observed even when other major issues such as poverty and education are accounted for in the population (Geronimus et al. 2006). Prior negative events which cause weathering is most typically associated with eventual early-onset chronic inflammation, whose effects ripple through the long-term health of individuals (Das 2013).

The potential health impacts associated with weathering's impact on allostatic load are not particularly subtle: The average life expectancy difference between the races in the United States is between 4 and 6 years longer for white men and 3 to 4 years longer for white women than their black counterparts (CDC 2015; Williams and Sternthal 2010). Effects of weathering can be observed as early as birth: preterm delivery rates in the past decade have been at 16% for black women while the rate for white women is nearly half at 8.4% (Anath et al. 2001; CDC 2016a). Further, neonatal mortality (death within the first year), which may be partly caused by accumulation of stress in mothers, is nearly two times higher for blacks in the United States than whites (Geronimus 1987).

Under the context of these statistics, one of the major avenues of exploration regarding the weathering hypothesis has been maternal and child health in the United States. A common stereotype that has been invoked to explain these disparities in maternal health is the idea of reproductive immaturity (Geronimus 1987; 2003). Reproductive immaturity is the idea that teenage pregnancies are an equally risky proposition irrespective of race, and black women happen to engage in it disproportionally due to a hypothetical race-specific culture of irresponsibility. This leads to a cultural assumption in the United States that the disparities of maternal and child health can be blamed on the behavior of racial minorities as individuals, instead of systemic racism (Geronimus 2003).

In the past few decades, a branch of sociological work drawn from the weathering hypothesis has disputed the cultural norm blaming black women for these negative pregnancy results—by reversing the direction of the correlation. Instead of blaming poverty, those researchers propose that higher rates of teenage pregnancy among black mothers are instead a response to racism in the United States. In this model, black mothers are not individuals who passively suffer, but instead that a mix of conscious or unconscious decisions by black women, their families, and uniquely black institutions/expectations have responded in logical ways that promote an overall healthier life in the context of black individual's disadvantageous circumstances (Geronimus 1987; 2003). This has been in part supported by attacking the underlying principle of reproductive immaturity: when one examines teenage pregnancies among black women, research does not find that the early childbearing increases risks to the mother or child. Instead, sociological research suggests black mothers who have teenage/earlier pregnancies live longer lives (Spence and Eberstein 2009), have heavier birth weights (e.g. Geronimus 1996; Swamy et al. 2012), lower risk of preterm births (e.g. Ananth et al. 2001;

Collins, Rankin, and David 2011), and lower neonatal mortality rates (e.g. Geronimus 1987; Masho and Archer 2010). As such, a literature has developed looking at birth and post-birth outcomes, and its unique relationship to black women in the context of racism in the United States.

However, although birth and post-birth markers have been extensively studied, there has not been a study that examined one other logical potential outcome: the higher rate of fetal loss by race. Black women have been found to have rates of miscarriage for their pregnancies about twice as high as white women (Mukherjee et al. 2013). Stillbirths disparities are even higher, at about a 2.2 times higher rate for black women than white women (Willinger, Ko, and Reddy 2009). This general observation about fetal loss by race exists as far back as Geronimus' 1987 first conceptualization of the weathering hypothesis. However, there is no large-scale study that directly examines if the conclusions of the weathering hypothesis extend into the area of fetal loss.

This is surprising because if fetal loss is associated with weathering effects, it would suggest that the magnitude of the problem has thus far been underestimated. In addition to previously researched issues such as infant mortality and low birth weight, black women may also be suffering from never achieving desired birth outcomes due to the increased rate of fetal loss events. As a result, this study examines if weathering has thus far potentially been underestimated as an effect in prior literature. To remedy these gaps in research, this study examines the following research question: Does the protective effect of black mothers' teenage pregnancy as opposed to adult pregnancy extend into the area of fetal loss? To address this question, I utilize the National Longitudinal Study of Adolescent to Adult Health—a large and nationally representative dataset that covers in part relationship history. In addition, data is

pulled from the National Vital Statistics Survey—a census-level record of birth and fetal death certificates that are organized across the United States and covers nearly 4 million pregnancy outcomes annually.

To understand the implication of these racial differences on birth outcomes, this study first outlines the extent and impacts of the weathering hypothesis broadly in relation to maternal and child health (Chapter 2). To determine both if this effect impacts fetal loss rates and to what extent weathering occurs in fetal loss, this study examines if the protective interaction of young childbearing age and race through three samples. Chapter 3 outlines the samples under study (Survey of Adolescent to Adult Health and the National Vital Statistics Survey [Years 2016 and 2013]) and their analysis strategies, while Chapter 4 outlines the results of the analysis on the samples. Chapter 5 discusses the results, followed by an exploration of policy implications, limitations in analysis, and finally overall conclusions of the dissertation.

CHAPTER 2

THE WEATHERING HYPOTHESIS: EXAMINATIONS OF SOCIAL DISADVANTAGE, CHOICE, AND MEDICAL OUTCOMES

2.1 Outline of Literature Review

The literature review below discusses sociological theories and studies related to race in the United States and the weathering hypothesis by arguing that racism, stress, and pregnancy outcomes are all linked. First, this review explores general health disadvantage among blacks in the United States, followed by defining the biopsychosocial model which focuses on how racism and measures of health are correlated in the United States. The second major section connects these areas to the weathering hypothesis—the idea that low-level race-based stressors accumulates over time to cause premature aging. This review closes with a discussion of the prior research on maternal and child health outcomes, concluding with how a focus on fetal loss as an outcome would extend the prior literature on these topics.

2.2 Race and Health: An Outline

2.2.1 History and Present of Health by Race, a Baseline

In the United States, there is a history of observing that there are distinct differences between health outcomes of the different races in the United States. Sociologists as early as W.E.B. Du Bois (1899; 1903) noted differences between the types of medical care, social resources, and well-being that existed between the races. Du Bois (1899) found that tuberculosis was a leading cause of death in black neighborhoods because it was improperly managed by broader institutions. This resulted in the black neighborhoods he studied having higher death rates than surrounding areas. Connecting the public and the personal, he hypothesized that the lack of proper sanitation systems in many black neighborhoods was contributing to these higher

tuberculosis rates (Du Bois 1899: 150-152). In its most direct form today, life expectancy for whites is notably higher than for blacks, averaging about 4-5 years overall and with whites having a notably greater chance of living to older ages (Geronimus et al 1996; Williams and Sternthal 2010). Blacks in the United States today have higher rates of incidence for 13 of 15 leading causes of death (National Center for Health Statistics 1994). Beyond just risk of death, blacks also have higher incidence of chronic illnesses such as heart disease, cancers, and stress related diseases that have impacts far before the time of death (Williams and Collins 1995). As a result, blacks in the US are the second most likely racial category to have disabilities (after Native Americans/Alaskans) (CDC 2018). These health outcomes in total result in a reduction of quality of life, with blacks in the US suffering from both less years of life and less healthy years of life.

2.2.2. Racism and Stress

Research suggests that beyond just medical concerns, racism itself has physical effects that over time translate to future health risks and disease. Blacks in the United States score higher on measures of stress symptoms including: higher blood pressure, faster heart rates, and a greater likelihood of plaque buildup in their bloodstream (Borrell et. al. 2012). Chronic illnesses are also known to be associated with stress, and blacks in the US have a higher likelihood hypertension, yeast infections, and diabetes (Pascoe and Richman 2009). Stress directly connects with measures of negative mental health. Meta-analysis of current psychological literature has found that depressive symptoms, anxiety, and post-traumatic stress (PTSD) are all higher among blacks than whites in the United States (e.g. Pascoe and Richman 2009; Thoits 2010; Turner, Wheaton, and Lloyd 1995).

Considering stress is particularly salient today: Logically many of these health outcomes discussed before can all be tired to stress, and research suggests this is one of the most likely avenues that explains how these health disparities maintain race-based distinctions. In sociology, the biopsychosocial model of racism is the term that explores this intersection of psychology, sociology, and its biological outcomes. Biopsychosocial research examines how cumulative stress due to perceived discrimination, exposure to overt acts of discrimination, and underlying sociological elements such as average lower socioeconomic status (SES) come together to cause detrimental health outcomes through the aforementioned accumulated stress (Clark et al. 1999; Gee 2002; Taylor 2008). Research consistently suggests that stressors of everyday discrimination has a significant impact on health (Schmitt et al. 2014). Difference in stress level accounts for between 23 and 50% of differences in some mental illnesses, the most common of which is depression (Turner, Wheaton, and Lloyd 1995). Racism also appears to be one of the largest potential sources of stress, having greater impact than other day-to-day stressors such as work, income-related stressors, and even in some cases overt acts of discrimination (Clark et. al 1999; Harrell 2000; Hudson-Banks et al. 2006). This outcome is hypothesized to be caused in part to be due to the relatively strong sense of helplessness that racism can engender. Individuals have limited ability to control the event, racist events reinforce a sense of inferiority, and often people perceive that the event will not be believed or handled by the criminal justice system (Clark et al. 1999).

Taking these observations into account, two major explanations have emerged to explain why these racial differences occur. The first, although not under focus here, examines poor health outcomes as a result of coping behavior. This hypothesis suggests these health problems are connected to stress by behavioral changes: stress leads to unhealthy coping behaviors such as

alcoholism and smoking[1] (Bennett et al. 2010; Harrel 2000) and differences in health outcomes tied to behavior such as obesity (Das 2013). The second major theory is known as the weathering hypothesis and will be the major focus of this study: The weathering hypothesis is the idea that stress slowly degrades both physically and mentally a person over time, with the physical mechanism being an accumulation of stress hormone, resulting in premature aging in the body and chronic inflammation (e.g. Das 2013; Geronimus 1992; Geronimus et al. 2006).

2.3 Weathering Hypothesis and Delayed Childbearing as Strategic Adaptation

2.3.1 Weathering Hypothesis

As a sociological and biological observation, the weathering hypothesis is an independent idea born out of the broader biopsychosocial model. The weathering hypothesis refers to an accumulation of stress, particularly in black and other minority individuals, caused by fairly consistent exposure to minor racist acts and a socio-economic structure that disadvantages these groups (Geronimus 1992). The weathering hypothesis is a transition of classical theories about racism: Where previously racism was mostly thought to cause harm by individual overt acts of discrimination or prejudiced laws, the weathering hypothesis says that racism causes premature aging, in a sense literally making institutional racism an issue that gets "under the skin" (Das 2013). This weathering has the impact of making blacks in the United States "…biologically older than whites of the same chronological age due to the cumulative impact of repeated exposure to and high-effort coping with stressors." (Geronimus et al. 2010: 20). The weathering

[1] It is worth noting, although smoking rates has historically been higher among Blacks than Whites in the United States, recent data shows that this gap has diminished greatly, with some data pointing to higher smoking rates among whites today nationally (CDC 2018). However, blacks are still much more likely to be obese, and this is currently the most obvious distinction between the races. However, as a result, this first model would typically be better suited to a group such as American Indians, who have higher rates of alcoholism, smoking, and issues such as suicide (CDC 2018).

portion of the weathering hypothesis is akin to the geological term: referring to the small, individual acts of race-based stress that over time results in biological aging (Geronimus et al. 2006)

Considering prior discussion, it is worth noting that stress in and of itself is not an entirely harmful bodily function. Stress is a natural and adaptive response of the human body which allows it to prepare for situations it may not otherwise be able to handle, most associated with the idea of a fight or flight response to danger (McEwen 1998). Under normal circumstances, the body can effectively regulate the complex series of effects on the body involved in stress, primarily through the release of a stress hormone called cortisol (Thoits 2010; Turner 1995). However, these systems can have a cost to physical health, with the most common issue being when they are overly frequently activated. This "…physiological burden imposed by stress" (Geronimus et al. 2006: 826) or cost imposed on the body is referred to as allostatic load (McEwen 1998: 22), and in the case of this research the driving mechanism that causes eventual allostatic load is the concept of weathering in the weathering hypothesis.

This stress system is not intended to be on a state of constant alert, which over time causes unintended changes in hormone levels, blood pressure, etc.—as a result, continuous activation is known to generally cause long term harm on the human body regardless of the source (Benson 2014; Sapolsky et al. 2000) and is associated with various forms of chronic illnesses and medical risk factors (Clark et al. 1999; Thoits 2010). Overactivation tends to have a cumulative effect on the body over time in areas such as cardiovascular function, inflammation, metabolism, and as discussed here reproduction (Sapolsky et al. 2000). It is these chronic metabolic and inflammation issues that are most commonly explored as an explanatory

mechanism for the disparate outcomes associated with weathering (e.g. Das 2013; Geronimus et al. 2006; 2010; Lu and Halfon 2003).

As discussed previously in brief, one of the earliest areas that explored this connection of biological, medical, and social forces was the work that examined disparities in maternal and child health. One of the underlying principles that have been explored in the medical field is the idea that oxidation and antioxidants play a role in the pregnancy process, and that a state of continuous stress is likely a causative factor in an imbalance of these mechanisms (Gupta et al. 2007). The most well-known example of oxidative imbalances involves the fairly common practice of folic acid supplementation during pregnancy (Gupta et al. 2007). Another mechanism for a possible increase of fetal loss rate is related to blood pressure, with stress response resulting in the allostatic load that causes long-term increases in blood pressure. It is well established that black mothers are more likely to have hypertension, and that hypertension is a known risk factor in pregnancy outcomes (Peoples, Thrower, and Danawi 2014). The broadest commonly cited system involves disparate socioeconomic outcomes for black women, that the stress of greater rates of poverty, housing discrimination issues, etc. has been noted particularly for risk of preterm deliveries (Rich-Edwards and Grizzard 2005).

It is important to explore that the transition of racist attitudes in America from overt discrimination to more subtle forms (e.g. Bonilla-Silva 2010; Kinder and Sanders 1996) is salient regarding the weathering hypothesis, since research suggests that exposure to daily but lower level forms of racism is more consistent with negative health outcomes, particularly later in life (Clark et. al 1999; Williams, et al. 1997). One of the observations relevant to this outside of typical mortality statistics is the disability gap—higher levels of disability reported among blacks than whites in advanced age (Taylor 2008; Williams and Collins 1995). In discovering this

connection, longitudinal data has been particularly helpful in confirming the weathering hypothesis within the biopsychosocial model. In earlier work related to weathering, a common criticism was the inability to separate out other causes of health such as insurance availability, doctors, and SES from weathering (Gee 2002). Use of longitudinal data has determined that the issue of health disparities on race could not entirely accounted for unless weathering was also considered (Taylor 2008).

More generally, the perception of racism has been found in multiple lines of research to elicit the necessary psychological and physiological stress responses necessary for the long-term harm associated with allostatic load increases, resulting in negative health outcomes on multiple levels. Regarding behavior, perceived racism has been found to be correlated with coping activity (e.g. drinking or smoking) as would be expected of psychological harm (Clark et al. 1999). Other psychological based measurements such as depressive symptoms or anxiety have also been observed to be associated with experiencing racism or perceived discrimination, (Harrell 2000; Hudson-Banks et al. 2006; Turner 1995). In addition, more direct physical measurements of allostatic load such as abnormal sugar and blood pressure regulation (e.g., hemoglobin, cortisol levels, blood pressure, triglycerides (fats), etc.) have all been found to be associated with both perceived racism and resultant negative health outcomes (e.g. Das 2013; Geronimus et al. 2006; Lu and Halfton 2003; Rich-Edwards and Grizzard 2005). What defines allostatic load is often dependent on the availability of markers in a dataset, and the ideas as measured is not entirely consistent between studies, with both physical and psychological measurements having been studied. Regardless of how it is measured, and consistent with the weathering hypothesis broadly, not only is there evidence allostatic load is higher for blacks than

whites at all ages, but findings suggest that the difference only increases with age (Geronimus et al. 2006).

In addition, this effect is not only racialized and impacted by age but is also gendered—with black women bearing a larger amount of allostatic load compared to either black men or white women (Geronimus et al. 2006; Geronimus 2013). Supporting these findings on allostatic load as it relates to weathering, psychological research suggests that men and women experience racial discrimination differently, with daily discrimination having been found to impact men's depressive symptoms more, but for women, it is associated with anxiety symptoms instead (Hudson et al. 2013).

2.3.2 Dealing with Racial Reality

Although the difference of mortality rate among blacks and whites is one of the most evident observations related to the modern weathering hypothesis, the idea utilized in this study was born out of the observation that the black infant mortality rate both was and currently is approximately twice as high as whites (CDC 1999; Geronimus 1987: 245). Derived from the biopsychosocial model, Arline Geronimus early on defined the weathering hypothesis by examining that "…the health of African-American women may begin to deteriorate in early adulthood as a physical consequence of cumulative socioeconomic disadvantage." (1992: 217). These observations have opened a space in maternal and child health research that examines how instead of blaming a moral failing for negative pregnancy outcomes, health issues related to the intersection of race and childbearing may instead involve strategic choices by black women to take control and improve their outcomes in a disadvantaged environment.

Although this is not the primary concern of this study, it is worth preemptively addressing one possible and critical criticism: this literature and research supposes a racial

dynamic that is considered by some not to exist. Put another way—what if racism is no longer relevant? Although the idea of racism existing in the United States tends to be accepted by sociologists, it is possible to argue that if racism were not an issue, these differences would be spurious and have be explained by other measures.

To articulate this argument in a basic form—through various metrics, it is possible to argue that race and the issue of racism in America could be over. By measures of white opinion, racism appears to have disappeared in some aspects: While 54% of whites agreed with segregated transportation in 1944, only 12% did by 1972 (The question was then removed for low percentages). Only 8% of whites said they would not vote for a black candidate in 1996 (and considering Obama's election, that arguably held true); and only 4% said whites and blacks should not go to the same schools in 1995 (Schuman et al. 1997). Scholars note that many Americans, especially but not exclusively whites (Bonilla-Silva and Dietrich 2011), believe us to be in a post-racial period that can be defined as a meritocracy (Gallagher 2003).

This study will not attempt to summarize an entire alternate body of extensive literature and debate that is only tangentially related to the broader research question; however, research on racism tends to find the idea that racism is dead not true. To explore one area in brief: at least one leading vein of sociology argues that we exist in a period of "color-blind" racism, that the dominant white culture attempts to deny the lived reality of racism by needlessly concluding that issues of race have been resolved when cultural reality reflects otherwise (Bonilla-Silva 2003). First, it is highly unlikely that racism in America is dead, as one observation in the race research highlights about the contradiction of racism: "…whites who say that blacks could be as well off as whites if only they tried are also inclined to believe that blacks are dangerous, lazy, and stupid…" (Kinder and Sanders 1996: 268). Not surprisingly, only 8.8% of non-Hispanic blacks

report never experiencing daily forms of discrimination (Kessler et al. 1999), with nearly a third of blacks reporting having experienced some form of larger discriminatory event in the last year (Hudson et al. 2013). For the purposes of this study, this environment of non-overt but active racism at an institutional and personal level is a foundational assumption that underlies the argument and hypotheses under examination.

Teenage pregnancy has been called a social pandemic in the United States (Selvakumari, Amu, and Brook 2012), and a higher rate of teenage pregnancy exists among black women than whites (Geronimus 1991). In addition, rates of preterm delivery, low birth weight, and child mortality are all worse for black mothers than their white counterparts (e.g. Ananth et al 2001; Geronimus 1987; Bennett et al. 2010). As such, in theory a line could be drawn between these two associations. Correlational studies have long accurately pointed out that lower socio-economic status is correlated with higher rates of teenage pregnancy. This results in a "common sense" notion that the two issues are related (Geronimus 1991: 464), which has tended towards blaming the individual woman by the broader society.

This observation, and the fact that this idea has been used to blame black women in particular is not surprising; feminist scholars have long argued that black women occupy a unique position politically. This unique position represents an intersection with the reality of racism in the United States today (Collins 2000), particularly involving historical narratives about black hypersexuality and controlling images such as the jezebel archetype (Collins 2000; 2005). Beyond stereotypes and images, multiple scholars have noted a stigma placed on blacks, and especially black mothers, that ties together the broader social politics of sexuality with these negative views and stereotypes about black sexuality (e.g. Ford et al. 2007; Geronimus 2003; Harris 2010; etc.). For example, one common idea would be the continuing idea of the welfare

queen: a black woman who abuses her sexuality in a way that is typically viewed as robbing the government instead of supporting her children (Collins 2000; 2005)

Using the weathering hypothesis, sociologists have recontextualized the system that blames the perceived failings of racial minorities and challenges the assumption of prior ideas that implicate only poverty and moral failings. Scholars such as Geronimus propose that teenage pregnancy is a mix of active and unconscious choice by black women with positive long-term health outcomes. Describing this series of choices using the term adaptive strategy: early childbearing has been found to lower rates of infant mortality (Geronimus 1996), reduce the risk of widowhood (Geronimus 2003), and even serve to increase the life expectancy of black mothers (Spence and Eberstein 2009). These effects appear to be explicitly racialized, with the greatest benefits appearing for later childbirth for whites and for earlier childbirth for blacks (Geronimus 2003; Spence and Eberstein 2009). Geronimus (2003) points to these differences as a form of adaptive strategy, changes made in the context of local conditions for the benefit of a group, which have long term consequences for these social groups[2].

This idea of black women and culture using adaptive practices combines earlier observations about racial disparities and health outcomes, exploring how social dimensions influence the lived choices by minority groups. As Geronimus argued on the subject, lower life expectancy for black parents and grandparents has the effect of encouraging young black mothers to have their first pregnancy early (Geronimus 1987). This is in part due to different family dynamics, with younger black mothers having greater assistance from parents and grandparents than their white counterparts, in part because of lower expectations living

[2] Although this description makes it seem as if adaptive strategy is a purely positive idea, the literature makes it clear this is a double-edged sword. Geronimus (2003) argues that for whites, the use of victim blaming when dealing with teenage pregnancy is also an adaptive strategy.

independent or living with the father of their child (Geronimus 1987). As multiple scholars have argued, this is not just an explanation solely due to issues such as poverty, but instead an alternative life-course choice that embraces multi-generational households and has tangible relations to lived racial reality for individual choices (Burton 1990; Geronimus 1987; 1992). Even in this context, although black mothers are not living with the fathers of their children, outside of the context of marriage there is a greater expectation among black Americans than white Americans a father will still be involved in their child's life (Burton 1990). These dynamics have been found to encourage black women to have their children younger, in part by lowering the stress associated with having these earlier pregnancies and has as a result indicated through multiple studies in the past few decades to have tangible benefits for black mothers.

Over the past few decades, a robust series of research projects have consistently begun to conclude on Geronimus' idea of black women's response to the weathering hypothesis: teenage pregnancies among black women showcase a uniquely race and age based protective effect for maternal health. Three major categories of outcomes have been primarily explored thus far in maternal health research: premature birth/delivery, low birth weights, and neonatal mortality.

Beginning with preterm births and low birth weight, it has been argued that these negative forms of delivery can be considered akin to a chronic disease: preterm and low birth weights have similar racial distribution disparities and have a magnitude of impact on the child's long-term outcomes akin to SES. In addition, these outcomes have other medical corollaries such as hypertension and behavior that explain part of the effect (Rich-Edwards and Grizzard 2005). Research suggests that for black women over the age of 15, the risk of low birth weights is three times higher than white women, with very low birth weight having four times higher risk than more affluent white counterparts (Geronimus 1996). The effect of race on low birth weight

becomes even more pronounced when health behavior is controlled for (Reichman et al. 2008), suggesting that race has significant, independent, effects from SES factors.

Examining the other side of the process, protective effects have been found for these younger black pregnancies: with lower relative risks of preterm birth compared to older pregnancies (Rich-Edwards and Grizzard 2005). These protective effects have been found to persist even when health behaviors are controlled for (Holzman et al. 2009). These same protective effects do not occur in samples for white pregnancies (Geronimus 1996; Love et al. 2010). The benefits of delayed childbearing can even be explored to some degree based solely on location, with more segregated areas having statistically more likely preterm births in the general population (Osypuk and Acevedo-Garcia 2008). Although explored less frequently, differences in neonatal mortality rate are known to be twice high for black mothers and heavily correlated to birth weight (Geronimus 1987). Findings also suggest that the impact of an earlier maternal age benefits black mothers at older ages, with some evidence that later pregnancies from a formerly teenage mother are themselves safer (Geronimus 1992). A final, but less studied area, has been maternal life expectancy: black mothers with teenage pregnancies have longer life expectancy than black mothers with later first pregnancies (Geronimus 2001; Spence and Eberstein 2009).

2.4 Why Study Fetal Loss

These lines of research showcase that in the realm of maternal and child health, the weathering hypothesis supports the notion that the adaptive strategy of teenage pregnancy has a protective effect on multiple simultaneous health outcomes for black mothers in the United States, and that earlier pregnancies may in fact be a uniquely logical choice to minimize the impact of race-based allostatic load disparities. However, although the past few decades have

continued to show support for this general finding, there is one area that was noted all the way back in 1987 (Geronimus) and is similarly known to have racial disparities that lacks this research: fetal loss. This is not particularly surprising—fetal loss data in general is much less common and harder to obtain. In addition, the topic has an air of controversy and stigma, in part because it can be associated indirectly with abortion research which is viewed as highly controversial. As a result, it is harder to research generally than birth weight and outcomes (Williams et. al 1997). It is known that the clinical miscarriage rate is approximately 10% of all pregnancies, with it being estimated that the risk of miscarriage may be as high as 25% during the first six weeks of a pregnancy (Zinaman et al. 1996). Although it is known that the issue is underreported in self-reported data, little research suggests that reporting of fetal loss is nonrandom (Williams et al. 1997) and not of value to the discussion of the weathering hypothesis.

Examining fetal loss as a part of the weathering hypothesis is significant for at least three reasons. First, it is immediately and logically relevant to prior research: the racial distribution of fetal loss is akin to other maternal health outcomes, with black mothers suffering more miscarriages and stillbirths. If stressors which lead to chronic inflammation are likely to cause negative outcomes such as low birth weight or premature birth, there is a logical path which extends into fetal loss, which essentially represents an earlier outcome relative to these other effects. Second, although fetal loss is harder to examine than birth, it is certainly possible to do so with reasonably large datasets. Lastly, expansion of research into fetal loss allows for remedy of a statistical issue that is often nearly impossible to resolve in the analysis of other outcomes—left censuring, or the loss of a member of a population before they can be measured due to issues such as mortality. Examining fetal loss accounts for this issue to some degree, adding in one

additional variable (if significant) which inevitably produces a more accurate estimate of excess mortality caused by weathering effects. If the results are found to be concordant with the weathering hypothesis, it would suggest that the impact of race-based events leading to increased allostatic load reaches another area of racial maternal and child healthcare. Resulting in the possibility it is more extensive an effect than previous findings have indicated.

2.5 Hypotheses

For each dataset, a series of models tests the following hypotheses, which are developed from Arline Geronimus' weathering argument. Because of increased rates of accumulated stress due to racism, black women in the United States suffer from a form of premature aging, which results in long-term negative consequences for their birth outcomes (e.g. Geronimus 1992; 2003). Weathering accumulates with time, and regardless of race and sex, allostatic load as a result tends to increase over time (Geronimus et al. 2006). In addition, social structures and expectations in the black community lower the barrier of stress for black women to have earlier childbearing, to quote: "...the vitality of the community may be enhanced by early childbearing norms coupled with a normative family structure that is multigenerational and extends the responsibility for children's well-being beyond the biological parents" (Geronimus 2003: 885). However, it is also known that the rate is different across racial groups: while 5% of whites and 8% of blacks are in high allostatic load categories at 18-24 years, this rises to 83% of blacks and 64% of whites by age 55-64 (Geronimus et al. 2006: 828). Because of this difference in the rate of stress accumulation, black women are in a position where their health is relatively strong at earlier ages and deteriorates more quickly over time. Applying this series of observations to fetal

loss, this argument leads to in the following hypothesis with regards to the comparison between adolescent (age 19 and younger) and younger adult (age 20 through 39) pregnancies:

> **Hypothesis 1**: The risk of fetal loss will be smaller in adolescence than young adulthood for racial minority mothers, particularly black/African American and potentially for Hispanic individuals. (Add Health and NVSS).

The gap in stress accumulation is also likely grow further apart with time, which leads to the following hypothesis regarding the comparison between young adulthood and middle adulthood (40 and older):

> **Hypothesis 2:** Risks of fetal loss will increase faster between young adulthood and middle adulthood for blacks than whites in the sample (NVSS only).

The last hypothesis tests the counter idea to the biopsychosocial model/weathering hypothesis by drawing upon the standard conventions of what the typical US transition pathway to adulthood would expect as an ideal time to begin having children. If teenage pregnancy/reproductive immaturity is a moral failing that harms all infants equally, we would expect the following pattern based only on typical risk increases due to age if race played no role in fetal loss rates:

> **Hypothesis 3**: The risk of fetal loss will be slightly higher in adolescence (age 19 or younger) than young adulthood (20-39) for all racial categories (both Add Health and NVSS), and it will then increase dramatically in later years (40+) for all racial groups (only applicable to NVSS).[3]

[3] Because the age of the Add Health sample maxes at 34, and the lowest age of expected acceleration of risk related to fetal loss occurs in the late 30's (and more commonly at age 40), only NVSS 2013 and 2016 can be used for certain hypotheses.

CHAPTER 3

METHODS

3.1 Overview of Datasets/Introduction

This study used thee samples drawn from two datasets to examine pregnancy outcomes: The National Longitudinal Study of Adolescent to Adult Health (Add Health) and the National Vital Statistics Survey (NVSS). As a result, the sample used in this study project is drawn from different sources considering two slightly different but related populations. Add Health is a longitudinal study of a nationally representative population of the United States, collected from adolescents in grades 7-12 during the 1994-95 school year. Answers from Wave I (collected in 1995 and 96) in addition to Wave IV (collected in 2007 and 08, with respondents now aged 24 to 34). In a somewhat similar manner, the NVSS can be thought of as an attempt to collect the universe of national population of pregnancy outcomes for the United States by looking at official records. For the NVSS, analysis consisted of a fused dataset combining the national collection of all results of the Standard Certificate of Live Birth and the Standard Report of Fetal Death (typically referred to as birth and fetal death certificates) in two separate years: 2013 and 2016.

3.2 The National Longitudinal Study of Adolescent to Adult Health (Add Health)

3.2.1 Overview

The initial wave of Add Health data was collected from September 1994 through August 1996, when most respondents were in grades 7 through 12. This wave was collected under three project grants of the National Institute of Child Health and Human Development (NICHD) through the University of North Carolina and the North Carolina Population Center in

conjunction with outside universities and federal organizations (Harris 2009). These respondents were selected using a multi-stage stratified sampling technique. First, all high schools in the US were given unequal probabilities of selection, depending on region, degree of urbanization, proportion of white students, and enrollment size. In total, 80 high schools and 52 feeder middle or junior high schools which sent students to those high schools were selected. In 1994, questionnaires were administered at each school to students who were present on that day (in-school survey, N= 90,118). About six months later, in-depth, structured interviews were conducted at respondents' homes for a subset of respondents from each school (in-home survey, N = 20,745) (Harris 2009). A total of three follow-up interviews have been conducted, with only Wave IV of in-home utilized in this analysis. Collection for Wave IV was conducted between 2007 and 2009, resulting in 15,680 respondents between the ages of 24 and 34 (Harris 2009).

3.2.2 Sample Definition

The dataset used in this study is taken from a fusion of all four waves of the National Longitudinal Study of Adolescent to Adult Health (Add Health). For most questions in Wave I and II of Add Health, an in-home interview was conducted over approximately 1 to 2 hours by the interviewer; however, due to the sensitive nature of the topic under discussion and the youth of the sample, this section was handled by giving the respondent a laptop in which to answer their own questions about pregnancy history without giving direct answers to the interviewer. By Wave III and IV, all respondents were of an adult age at which parental consent was not necessary and most of the respondents were of an age wherein the interviews were conducted in their own home; however, this remained a section where the respondents answered their questions in private instead of with an interviewer.

However, an examination of individuals does not present the final sample for this study, since the primary unit of observation in this study is pregnancies instead of individuals. As a result, this study examines 7,705 individuals from the sample with a combined total of 16,835 pregnancy events. The average age of the mother for the pregnancies examined is 23 years and 10.6 months—with pregnancy events from as young as age 10 and as old as age 33. Much of the sample had completed high school by Wave IV (89.6%) and had parents who have also completed high school (77.4%). Depression was considered using a five-item version of CESD scale, which was included in Wave IV, and most individuals exhibited no signs of depression. The number of pregnancies per woman, ignoring 0 cases, is a mode value of 2 pregnancies with a mean of 3.27 pregnancies. Although this is a sizable number of people in total, this study has had to contend with the relative rarity of fetal death in the United States, and as such a larger dataset with a more limited focus set is also utilized to examine the issue of fetal loss and death in the United States via the NVSS, explored later in this study.

3.2.3 Analytical Plan

Because the hypothesis and research question are only considering the issue of fetal loss from a women's perspective, the operational sample only includes women. The unit of analysis for a basic logistic model would use individual pregnancies, instead of an individual woman, accounting for data clustering (women reporting multiple pregnancies) by using multilevel models. Respondents provided pregnancy information within the section about relationship context. Specifically, they first listed their past and current relationships, the nature of their relationship, and how many pregnancies resulted during the relationship for all prior relationships in addition to pregnancies retrospectively across their lifetime. In the final analysis,

this results in 7,705 individuals from the sample with a combined total of 16,835 pregnancy events under examination. Because a multilevel logistic regression is conducted, a unique identification variable was utilized to separate out the effects of person-level variables on their pregnancies.

The dependent variable of involuntary fetal loss was derived from the following question in Add Health in Wave IV: "How did this pregnancy end?" This question resulted in a respondent self-report about the outcome of each of their pregnancies. Each respondent had the following options for Wave IV: you are still pregnant, abortion, stillbirth, miscarriage, ectopic and tubal pregnancies, and refusal to answer. Fetal loss is defined in this study for Add Health as any pregnancy loss due to stillbirth, miscarriage, or ectopic/tubal pregnancy[4].

Involuntary fetal loss was a dichotomous variable constructed that indicated any pregnancy lost due to miscarriage, stillbirth, or ectopic/tubal pregnancy (16.75% of final sample) against a pregnancy that concluded with birth. The key independent variable of teenage pregnancy was a dichotomous variable comparing pregnancies that ended when the respondent was nineteen years and nine months old or younger (coded 1; 8.93% of sample) versus the category of any pregnancy ending when a respondent is older than nineteen years and nine months. Ongoing pregnancies and abortions were treated as missing data for the sample. In multivariate models, the level-one unit was individual pregnancies, and the second level unit was individual women. Control variables in the model measured forms of social capital via parental and respondent education at the person level.

[4] In Wave IV, it was technically possible to break down the risk of fetal loss across different types. However, because of the relative rarity of the event, especially for ectopic/tubal losses, a lot of statistical power would be lost in the models if analyzed in this manner. In addition, attempting to focus the study on a breakdown of different types of fetal loss creates issues related to the accuracy of a diagnosis and estimate of the time of loss that falls outside of the scope of this study's research question. Future research should consider a breakdown of miscarriage versus stillbirth, since miscarriages in particular could be conceptualized as being more similar to premature birth or infant mortality in some manners.

The independent variables under examination included race and age (teenage pregnancy versus adult pregnancy). Race is measured via respondent self-report in Wave I as a set of dummy variables including non-Hispanic white, non-Hispanic black, Hispanic (of any race), Asian, Native American, and other. The minority of multi-racial respondents were narrowed to the one racial category with which they most identified utilizing a follow-up question, to avoid the issues that arises of treating multi-racial respondents as one homogenous group. Teenage pregnancies were defined using the standard definitions of most health services: a pregnancy that occurred when a respondent is nineteen years of age or younger (World Health Organization 2014). There was one inherent issue related to Add Health regarding age we addressed: the age of the respondent at the time of pregnancy termination was not asked directly, only the time when the pregnancy began. This results in a risk that a pregnancy began as a teenager would terminate in a non-teenager age. To handle this issue, teenage pregnancy was calculated through the following method: First, a date of birth was identified from the respondents Wave 1 interviews. Second, a variable was constructed from respondents' self-reports of when the pregnancy ended, with an assumed day of termination on the 15th due to a lack of data on the end day in the dataset. The date of pregnancy termination was then subtracted by the birthdate of the respondent, resulting a calculated age at the time of pregnancy termination. Because there is no question that addresses when the pregnancy started, I use the most liberal interpretation of 9 possible months to termination. This results in teenage pregnancies being coded as a dummy variable where a pregnancy was considered a teenage pregnancy if the respondent is 19.75 years of age at termination or less. Although this does give a possibly overly broad range of what typically constitutes a teenage pregnancy, this would only be expected to result in a more conservative overall model than other strategies.

Analyses for Add Health consisted of a series of multilevel logistic regressions on the likelihood of a pregnancy terminating due to involuntary fetal loss. The resulting coefficients were used to interpret the relative impact of each variable and compute a predicted probability. Six models were estimated. The first model tested only the impact of teenage pregnancy on the dependent variable. The second added race as a set of dummy variables. The third added controls related to social capital (respondents' and parents' completion of high school) to examine the possible impact of issues such as social mobility on pregnancy risk. The fourth model added variables related to health as measured by a diagnosis of diabetes or hypertension during the pregnancy, which are two of the most noted issues in health literature for pregnancy outcomes. The fifth added the interaction of teenage pregnancy and race into the model to examine the effect of teenage pregnancy on different racial groups' relative fetal loss risks as predicted by the weathering hypothesis. Finally, the sixth added depressive symptoms as a control measure of mental health.

3.2.4 Add Health: Methodological Considerations

There are several methodological issues to consider in the use of Add Health, although they should not undermine its potential use. Primarily, as discussed in the literature review, abortion is a complicated issue conceptually—it acts neither as a live birth outcome or a form of involuntary fetal loss because it is a form of elective fetal loss. Abortion in the dataset was also the most common result of a pregnancy that was not a live birth, at nearly fifteen percent of all pregnancy outcomes in the sample. There was no reasonable manner to predict the likelihood of a pregnancy's outcome if abortion had not occurred, particularly because most abortions occur early in pregnancy (Guttmacher 2016). As such, for purposes of my analysis, pregnancies that result in abortion were excluded. Similarly, although not addressed as much in the literature,

there is a possible distinction between miscarriage and stillbirths to be made. Medical technology has changed the landscape of fetal viability, with babies born in the early to mid-20 weeks of gestation (notably before the typical stillbirth cutoff of 28 weeks) surviving more often in developed countries (Patel et al. 2017). Because Add Health consists of self-reports, this project does choose not to make a distinction between the types of fetal loss, but this is a possible consideration for the future. Third, people are known to underreport their abortions, with this risk being particularly with magnified in teenage pregnancies, with the most likely lie being a claim of an involuntary fetal loss (e.g. Ashcraft et al. 2013; Guttmacher 2016). Although a consistent problem that is known in the literature, Add Health's methodology maximized privacy for this section of questions by following best practices regarding privacy on sensitive issues (Ashcraft et al. 2013). Questions of this nature from the start of this study up to the most recent wave have been done by giving respondents their own personal take-home laptop and being guided by computer prompt instead of an interviewer. This conferred both a maximum amount of privacy and familiarity with the approach by the time of the data used in Wave IV. Research using this approach to ask such sensitive questions about abortion and other birth outcomes has been known to improve reliability (Ashcraft et al. 2013). In addition, the former adolescents are now in all cases adults in at the time of measurement, increasing the likelihood that they have the privacy and personal autonomy necessary to feel safe honestly answering questions of this nature.

3.3 National Vital Statistics System (NVSS)

3.3.1 Overview

The second dataset under examination is the National Vital Statistics System (NVSS). The National Vital Statistics System, originally out of the department of the census, is one of the

oldest government collections and reviews of data in the United States (Hetzel 1997). Now currently under the National Center for Health Statistics (NCHS), publicly available reports from the NVSS exist from as far back as 1890. Other datasets are contained in the broader NCHS, including the National Survey of Family Growth (NSFG) and the National Death Index. Data for the NVSS are collected for birth, death, marriage, divorce, and fetal death events for the 50 States, 2 cities (Washington, DC, and New York City), and 5 US territories (Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands) through varied systems involving state and local government collections (Hetzel 1997). Although each entity is given leeway to establish its own system based on its individual need, the guidelines for collection indicate that over 95% of the certificates collected are electronic and produce valid data (CDC 2001). Unlike Add Health, which has an extensively outlined interview protocol, the specifications in the NVSS center on the birth and fetal loss certificates. This leads to a focus on completeness of collection. This is done by attempting remove the capacity for the person inputting to respond with an answer as unknown/default, ensuring that certain areas can have only one valid response, and creating systems that properly integrate with state systems (CDC 2001). Although it is not explicitly specified, these guidelines suggest that doctors are expected to submit the data.

To confirm this information is an accurate portrayal of implementation, I contacted a hospital and discussed birth record collection with staff. The contact confirmed what the guidelines suggest: data are derived in this system primarily from medical records, with answers for questions such as mother's education, previous live births, and racial identity asked of the patient at the time of service (Tallahassee Memorial Hospital Birth Records 2017). In cases of demographic information where the record already exists, they stated that they do ask the patient

for confirmation. Consistent with the Centers for Disease Control (CDC) guidelines, the hospital confirmed that the information is entered and processed in an electronic system. The hospital stated that information is mostly collected by nurses, with doctors or birth records staff used for collection if necessary (Tallahassee Memorial Hospital Birth Records 2017).

The primary history of data collection under the NVSS is one of standardization of reporting, changes to collect additional variables, and attempts to deal with multiple different institutions for collection more accurately for said data. These revisions are typically carried out every 10 to 15 years (Hetzel 1997). The Standard Certificate of Live Birth is on its 11th issue and the Standard Report of Fetal Death is on its 7th with both revisions having occurred during 2003. Examples of these standardized forms can be found in appendix A and B of this study. It is worth noting that part of the issue of standardization noted in the guide is that variables introduced in newer forms are not made part of the public distribution until enough states have accurately implemented the new format (Hetzel 1997). The primary providers of the data related to birth and fetal loss come from hospitals across the United States, making up 98.5% of the total collection of birth and fetal loss data (Hetzel 1997).

In addition to these changes adding relevant variables to the study outlined in this prospectus, the NVSS stands as the largest and most comprehensive catalogue of confirmed fetal losses in the United States.

3.3.2 Sample Definition and Comparison of 2016 versus 2013 Data

For this study, I examine two years of data. For the primary dataset of this study, I examine the collection in 2016: this year was the most recent at the time of writing that contained a complete record of both birth and fetal loss records with an available codebook. The

2016 data consisted of a total of 4,007,503 pregnancies, of which 51,391 resulted in fetal loss (1.28%). The changes in the most recent revisions of data included potentially relevant variables for the study: improved measures of health specifying if a mother had a health issue was gestational in nature or not, measurements of the mother BMI, redefinition of the racial categorization, and if the mother was a smoker. This study also uses the data for the year of 2013: This year was selected to serve as a check on analyzing just one year of data, and a way of examining if the results of a prior methodology before the most recent revisions were incorporated into the NVSS provided consistent results. For the year 2013, a total of 51,490 fetal losses (1.29%) out of 3,988,733 total births were recorded in the NVSS.

3.3.3 Measures and Analytical Plan

Analysis in this study utilize data from both 2016 and 2013. Because of the nature of the dataset outlined below, instead of looking for causation, this dataset will instead serve to look more broadly at two questions related to the research question and the weathering hypothesis: 1) Are the correlations between race and teenage pregnancy consistent with previous research about other birth factors, and thus suggest a racial differences in teenage pregnancy outcomes for fetal loss?; and 2) Are findings about weathering potentially extendable to older pregnancies, as might be expected from the cumulative nature of stress.

NVSS data brings with it mostly issues of known uploading problems and a bias in favor of birth over fetal loss data. Birth data appear to be the primary focus of concern in the way the NVSS is constructed, with the most revisions to the certificate, a lower amount of missing data, and usually 1-2 years of lead time on fetal loss data in publication. All datasets when downloaded consist of very large text files that only have alphanumeric data typically of single

digits grouped into smaller clusters. Although the NVSS has a single dataset that covers infant mortality and birth records as linked data, there is no one dataset that covers births and fetal losses simultaneously. As such, the dataset for this project was constructed by matching the birth records and fetal death records from the two relevant datasets for each year, and then fully merged into one final dataset.

In NVSS, the dependent variable of involuntary fetal loss was defined as all cases included in the fetal death data file. While pregnancies from the live birth file are considered as not having resulted in fetal loss[5]. Like Add Health, it was possible for these to be broken down by stillbirth and miscarriage; however, unlike the respondent self-report, the NVSS data defines miscarriage as a termination before 20 weeks and a stillbirth as post-20 weeks, estimated under the discretion of the doctor diagnosing fetal death instead of the individual. Similar to Add Health, although this distinction exists and has considerations related to race and infant mortality, I chose not to break down the fetal loss by type due to loss of N, potential inconsistency due to doctor estimation, and the specifics falling outside the scope of the exploratory research question being explored. For purposes of examining fetal loss, the NCHS utilized the definition of fetal death first constructed by the World Health Organization (WHO) in 1950 under the third revision of vital statistics recommendations: "death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy…" (Mrkić 2014: 3). As such, it was assumed all fetal deaths reported in the fetal death dataset meet this criterion.

Like the other dataset, the independent variables in NVSS included race and age of the mother at pregnancy. Unlike Add Health, an additional consideration needed to be made

[5] Approximately 10,000 pregnancies for each year were removed from the final sample for being from non-citizens who gave birth in the United States, since the effect under study is a US-specific effect.

regarding age: the NVSS has a wider age range[6]. This study separated the relative risks based on age by trichotomizing the variable into: teenage pregnancies (age 19 or younger), adult pregnancies (20-39) [Reference], and late adult pregnancies (40 and older).

Race was measured in two separate ways, differing between 2016 and 2013. The 2016 data had a much simpler method of determining race: a long ordinal list of about 26 racial category combination that allowed for a series of nominal racial variables to be constructed. A second question asked about Hispanic origin and was also accounted for in a later model. A person could also select multi-racial and then if they chose to do so, list all their racial categories[7]. Race in the 2013 dataset is determined using multiple variables in the dataset. First, a race variable gave the mother's race as either White, Black, American Indian or Alaskan Native (one option), or Asian or Pacific Islander (also one option). Another variable indicated whether the mother had Hispanic origin. By fusing these answers, new groups were constructed as dummy variables that create the more common racial groups: non-Hispanic white, non-Hispanic black, Hispanic, Native American, and Asian/Pacific Islander.

Teenage pregnancy is defined under the standard definition of a pregnancy where the mother is listed as 19 years of age or younger. Since there is no method in the dataset to calculate anything more precise than the year, no real modification of the variable can be made akin to the Add Health dataset. The age of the mother was determined by the variable listed in the NVSS

[6] Two ages are typically identified in the literature as a risk factor for fetal loss in late pregnancies: the age of 35-39 and the age of 40 and older (Andersen et al. 2000; Cleary-Goldman et al. 2005). The age of 35 is sometimes used because it is the age when the relative risk of miscarriage and stillbirth begins to rise, while the age of 40 and above it usually noted as being the period where the rise begins to plateau. In early analysis for this project, both a 35 and older and 40 and older category were tested, and results were found to be similar but with slightly smaller coefficients to the 40 and older category.

[7] Because a person could choose to directly identify as multiracial, instead of asking the person to select one primary race later, it is kept as-is in the NVSS 2016 analysis. Also, unlike Add Health, an N of nearly 4 million is large enough for a more meaningful analysis of the category.

codebook as the "Mother's Single Year of Age"[8]. Of the nearly 4 million pregnancies in the dataset for 2016 and 2013, 214,781 cases (5.37%) in 2016 and 156,329 cases (3.9%) in 2013 were teenage pregnancies.

A few concerns exist within the NVSS dataset, the biggest of which for this study is a distinct lack of sociodemographic variables to act as controls. In the 2013 data, the education level of the mother is not collected, no information about the mother's parents is collected, and only some information is collected on the father or their relationship (e.g. if they are married). In 2016, some of the background-related variables were improved, for example the mother's education; however, almost all possible control variable generates a huge amount of missing data that is biased towards losses in the fetal loss portion. One example, consistent with many of these variables, controlling for mother's education would result in a loss of 1.71% of the total dataset. This might initially seem minor, but while only 1.31% of total live births would be lost by including the variable, 37.0% of all fetal losses would be newly lost due to missing data.

As a result, the analysis for both NVSS datasets focuses on control variables with relatively low numbers of missing data, with the control variables chosen because of the combination of their prior-known impact and the relatively small loss of the N of fetal loss. As a result, control variables in the NVSS focus on health issues in this study—particularly diabetes and hypertension, two issues associated with fetal loss during pregnancy (Miranda et al. 2010) and are collected relatively reliably in both years the NVSS under examination. Issues that could not immediately be resolved in the analysis include the general lack of possible control variables in the NVSS, potential unreliability due to a broad possible array of collection styles, and a less

[8] No multi-racial option exists in the dataset for 2013, and it is consistent with the guidelines for the certificate that the person preparing the certificate would likely be required to place only one answer. As such Multi-racial is not given in 2013 analysis.

precise age variable than the Add Health dataset. In addition, a woman may appear multiple times in the data file due to multiple pregnancies within a year, but because a lack of person-level id numbers, this data clustering could not be accounted for in the same way as in the Add Health data.

CHAPTER 4

ANALYSIS, RESULTS, AND SUMMARY OF FINDINGS

4.1 Results for the National Longitudinal Study of Adolescent to Adult Health (Add Health)

4.1.1 Descriptive Statistics

Before presenting results from multivariate models, I present descriptive results outlining the variables under examination for Add Health. Table 1 shows a summary of descriptive statistics for characteristics of pregnancies from the operational sample, using pregnancies as the unit of analysis.

The average age at which pregnancy occurred for the final sample is 23.71 (23 years and 8.5 months) with a standard deviation of 3.68 years. Of all pregnancies, 10.13 percent were teenage pregnancies. The age ranges for Wave IV of Add Health varied from 23 to 34, with the majority being between 24 and 32. The final operational sample (N=16,835) removes pregnancies reported by women who had missing data at the individual level, current pregnancies, and the 15.7% of all cases that resulted in abortion for the reasons outlined in the prior chapter.[9] The average age of pregnancy does not directly differ greatly by race, with the oldest average pregnancies occurring at 24.84 years of age among Asians and the youngest pregnancies averaging 23.27 years for Black pregnancies. Overall, teenage pregnancies are an uncommon event in the sample, consisting of only 8.93% of all pregnancies. However, as articulated in prior literature (e.g., CDC 2015), we see a racial divide with lower numbers of Asian and white teenage pregnancies overall (5.29% and 7.3% respectively) and higher rates of black pregnancies (11.96%). These general findings are similar regarding the fetal loss rate, the

[9] Three pregnancy cases were removed from the final sample where the respondents' stated date of pregnancy termination placed them at ages 8 and 9.

overall rate is 16.75% of sample pregnancies, with white pregnancies being at the sample average, while blacks are fairly higher (17.84%). Asians and American Indians have the lowest rate of fetal loss at about 14%, while the "other" racial category has the highest at 18.67%. Examination of race and teenage pregnancy hints at the disparity in teenage pregnancy rates better than general variables: Although Black pregnancies make up about half as many of the total sample as Whites, they make up almost as many of the total teenage pregnancies in the analysis.

Table 2 presents descriptive statistics for each of the control variables utilized in the full models. Overall, the sample tends to be from families who have at least one parent who graduated high school, with 77.35% of the sample overall having this attribute. However, it is notable that Hispanics are extremely less likely to have parents with this education level, with just over half (51.11%) having any parent who completed high school. In contrast, Whites have the highest rate in the sample at 83.63%. These differences are not as dramatic when it comes to the respondents themselves, with 89.59% having competed high school or a GED, with the lowest rate still being among Hispanics, but only at an 84.83% rate versus the highest of Asians with 92.38%. It is worth noting that the racial difference is consistent with general observations about the US population. Examining the unusual outcomes for health variables, the sample has fairly low rates in the sample of both diabetes and hypertension, likely explained by the relative youth of the sample.

4.1.2 Multilevel Logistic Regression Analysis

Table 3 presents the results of the multilevel logistic regression analyses. Model 1 only included teenage pregnancy as a predictor and indicates an insignificant relationship at the $\alpha=.05$

level between teenage pregnancy and the likelihood of involuntary fetal loss. There is a significant amount of personal-level variance ($\chi 2=530.19$; $p<0.000$) which suggested that there is a multi-level model, able to account for person-level variance, is a better fit than a logistic model[10]. When Model 2 added dummy variables for race, one of them (black) was found to be significant at $\alpha=.01$ ($b=0.193$). Model 3 added social capital variables and was not found to change the coefficient of either the teenage pregnancy or race variables. Model 4, using the addition of health variables, has an association of diabetes with higher risk of fetal loss ($b=0.629$); however, the coefficient of teenage pregnancy remained insignificant. Model 5, with the addition of interaction terms, is the first model to show a significant difference in the risk of fetal loss based on the independent variables. Among whites, teenage pregnancy was associated with an increased risk of fetal loss ($b=0.490$, $p<.001$) relative to white adult pregnancies. The effect of teenage pregnancy can be calculated by adding the teenage pregnancy main effect (.490) and the interaction term (-1.030), which comes out to be -0.54. Because this value is negative, the result indicates that teenage pregnancy is negatively associated with fetal loss (i.e., protective effect) among blacks. This supports the major expectation of Hypothesis 1. No other racial interactions were found to be significant.

In order to more clearly demonstrate the difference between white and black women in the association between teenage pregnancy and fetal loss, rates of fetal loss per 1,000 live births were calculated using Model 5.[11] Figure 1 presents these findings for respondents with the mode values for parental and respondent education (successful high school completion for both).

[10] This significance in the difference between the multilevel logistic and a logistic regression appeared in all models in Add Health. The logistic regression model results can be found in Appendix D

[11] Fetal loss per 1000 births was calculated utilizing the predicted probabilities associated with each race and age combination, using the following formula: (1000/(Probability of live birth))-1000.

The relative rate of fetal loss for white teenage pregnancies in this population is 173.61 fetal losses compared to 82.62 fetal losses per 1000 live births in the black population. In contrast, white adult pregnancies in the model have an expected fetal loss rate of 107.03 fetal losses compared to 143.28 fetal losses for blacks per 1000 live births. These numbers show that when person-level characteristics are accounted for, race and women's age are jointly associated with the relative risk of fetal loss. Among whites, adult pregnancies are safer than teenage pregnancies. This is not the case for black pregnancies. Black adult pregnancies are the riskier category and black teenage pregnancies are instead less risky. Indeed, the difference is such that the risk of fetal loss is nearly halved (82.62 versus 143.28) among Black teenage pregnancies. This finding is consistent with the hypothesis 1 and supports that the weathering hypothesis can be extended into fetal loss. The final model, Model 6, adds depressive symptoms as a measure of mental health. Mild depression (b=0.169, p<.01) and moderate depression risk (b=0.196, p<.05) were found to be significant for an increased risk of fetal loss[12]. The addition of depressive symptoms decreases the coefficient for all the significant race and age variables in Model 5.

Overall, results from Add Health appear to be entirely consistent with the expectations of Hypothesis 1. For all models prior to the addition of the interaction terms, the impact of teenage pregnancy on the risk of fetal loss was never found to be independently significant. When interaction terms were added, contrasting implications on the rate of fetal loss for white and black adult and teenage pregnancies were formed, and the direction is completely consistent with the expectations of the weathering hypothesis. Although teenage pregnancies among other minority races do also have rates of fetal loss for teenage pregnancies that are safer than their

[12] The null result for severe depression risk is likely due to the low frequency--less than 1% of all respondents reported enough symptoms to fall in the category, compared to about 4 and 18% for moderate and mild respectively. A larger sample or more focused study with additional measures of depression would likely be needed to account for the effects of severe depression risks (e.g. an actively medicated diagnosis of depression).

adult counterparts, none of these other groups was found to be statistically significant. Although not as strong statistically, and not reflected in the predicted probability calculations, the marker of mental health was also found to have slight mediation effects on the risk of teenage pregnancy and the protective effect.

Although not shown here, logistic regressions were also performed in this study, and can be found in Appendix D. Generally speaking, the results of the logistic model are consistent with the multilevel variant: teenage pregnancy is insignificant initially, when interaction terms are added the models become significant, and the directions of the coefficients are the same general direction as the multilevel model. The only major difference is that the effect of teenage pregnancy is notably larger, and the interaction effect of teenage pregnancy and Black is slightly weaker in the equivalent Model 5. When predicted probabilities are calculated, this yields fetal loss rates that average about twice as high as the multi-level model across all racial categories.

4.2 National Vital Statistics Survey (NVSS)

4.2.1 National Vital Statistics Survey 2016 Descriptive Statistics

Tables 4 and 5 present a summary of variables under examination for the 2016 dataset of the NVSS—for both the population consists of the combined independent datasets for live birth and fetal death datasets reported for the United States in their respective year. The dependent variable, involuntary fetal loss, measures fetal loss via a US Standard Report of Fetal Death to the National Center for Health Statistics (NCHS).

Overall, most pregnancies in the sample resulted in live birth, instead of fetal loss (1.28%), as expected of an event that is considered fairly rare. Although the birth rates do not exactly match the population percentages of the United States as a whole (e.g. 13.3% US population (United States Census 2017) versus 14.94% births in 2016 data), these numbers do

not seem too out of line with other sources of birth rate. Racial differences are of some note: While 60.7% of the overall US population is non-Hispanic white, only 51.88% of births come from that population. In contrast, black/African American represents 13.4% of the US population but 14.26% of births (United States Census 2017). About mother's age, 5.37% of pregnancies in the sample are teenage pregnancies, 93.75% are between the ages of 20 and 39, and 3.16% are from mothers 40 years of age or older.

Consistent with Geronimus' observations in the literature, teenage pregnancies are disproportionately represented in the black and Hispanic minority portion of the sample, in addition to the multiracial category. In the opposite age category, only Asians have disproportionately more pregnancies among mothers 40 and older combined with a notably low number of teenage pregnancies. Fetal loss rates in the descriptive statistics appear to lend mixed support to the hypotheses. For hypothesis 1, the risk of fetal loss was found to be lower for teenage pregnancy among blacks (1.76% among teenage pregnancies vs 1.90% among adult pregnancies) while increasing for whites (0.80% among teenage pregnancies vs 1.00% among adult pregnancies) among teenage pregnancies compared to adult pregnancies (20-39), although only to some degree. Hypothesis 2, suggesting an increasing rate of weathering as the mothers age increases does not appear on face observation to be supported. While there is, an increase of a .8% rate of fetal loss to 1.95% (2.43x increase) between adult and older white pregnancies, the rate of increase is only from 1.9% to 4.76% (2.51x increase) between black pregnancies. If hypothesis 2 was accurate, we would expect to see a faster form of age acceleration, instead of a proportional one. Hypothesis 3, predicting the category of younger adult pregnancies (20-39) as the safest, has some limited support. The overall rate across the sample of fetal loss was slightly higher in teenage pregnancies (1.27%) and much higher at 40 and older (3.29%).

Of note, some unexpected results, particularly on some of the less explored racial categories of the literature are revealed in the descriptives. Although pregnancies from mothers 40 or older are consistently riskier, Hispanic-black and multi-racial mothers are much more likely to experience fetal loss (12.92% and 20.10% respectively, compared to less than 5% for all other groups). Although the sample's total rate of fetal loss is higher among teenage pregnancies, all other racial groups but whites and Asians have less risky teenage pregnancies than young adult pregnancies. Black, Hispanic-White, Hispanic-black, American Indian, Pacific Islander, and multi-racial mothers all have lower risks with teenage pregnancy, failing to support part of hypothesis 3.

When examining health variables, risks vary greatly by race: American Indian mothers are the most likely to have diabetes and be smoking, Asian mothers have the highest rate of gestational hypertension, but the lowest rate of diagnosed hypertension and the highest rates of either an underweight or normal BMI. Comparing white and black mothers, whites are much more likely to be smoking and slightly more likely to have gestational versions of diabetes and hypertension, in contrast, black mothers are more likely to be obese or extremely obese and have slightly higher rates of diabetes. Overall, although health differences can be identified, there is not a clear racial category to point to as having the greatest fetal loss risk regarding health problems.

4.2.2 National Vital Statistics Survey 2013 Descriptive Statistics

Table 6 presents the descriptive statistics for the major variables under observation in NVSS 2013. Overall, the 2013 data showed patterns akin to the 2016 data. 4.91% of the pregnancies in the sample are teenage pregnancies, the clear majority at 92.02% are between the

ages of 20 and 39, and 3.06% are from mothers 40 years of age or older. Table 5 presents the percentages of total fetal loss based on pregnancy age and racial characteristic for 2016 data.

Although rates of fetal loss were slightly higher than in 2016 (1.35% in 2013 versus 1.28% in 2016), fetal loss was still a rare outcome for a pregnancy. The trend of racial differences in pregnancy rate are approximately consistent between years: 53.99% of pregnancies in 2013 come from non-Hispanic whites versus 51.88% in 2016. Black/African American is once again overrepresented at 13.4% of the US population but 14.97% of births (versus 14.26% in 2016) (United States Census 2017). Regarding the mother's age, 7.01% of pregnancies in the sample are teenage pregnancies, 89.92% are between the ages of 20 and 39, and 3.17% are from mothers 40 years of age or older. This results in a higher teenage pregnancy rate in the 2013 dataset, with slightly lower rates for the older two categories.

To a slightly greater degree than 2016, teenage pregnancies are disproportionately represented in the black and Hispanic minority portion of the sample. Asians continue to be the only racial category to have disproportionately more pregnancies among mothers 40 and older combined with a notably low number of teenage pregnancies. Fetal loss rates in the descriptive statistics appear to lend mixed support to some of the hypotheses. Hypothesis 1 continues to be supported for fetal loss: the difference in fetal loss risk for black teenage pregnancy compared to younger adult pregnancies is consistent in direction with Add Health and is even slightly larger than 2016 data (1.73% among teenage pregnancies vs 2.09% among adult pregnancies). In 2013 data, while the risk of fetal loss it is still technically increasing for whites (1.00% among teenage pregnancies vs 1.04% among adult pregnancies), the difference is much smaller in this respect than 2016 data. Hypothesis 2 examining the acceleration of fetal loss risk with age, continues to not be supported. The risk ratio between younger and older adult pregnancies is similar to 2016

data, being more disadvantageous for whites than blacks as age transitions from younger (20-39) to older (40+) adult pregnancies. Hypothesis 3, predicting the category of younger adult pregnancies (20-39) as the safest, is not supported in the descriptives of the 2013 data. Teenage pregnancy is actually the safest category in regard to fetal loss (1.23% versus 1.29% for younger adult pregnancies). Pregnancies from mothers 40 or older continue to by far riskier than younger pregnancies.

In contrast to 2016, the only health variables under examination in the 2013 NVSS dataset are diabetes, hypertension, and prehypertension. Diabetes is highest among Asians (10.07%) whole white-Hispanics have the highest rates of both hypertension (3.19%) and prehypertension (5.88%). Comparison of 2016 and 2013 numbers suggest that the earlier collection treated gestational diabetes and pre-pregnancy diabetes as the same thing, since Asians have a low rate of diabetes but a high rate of gestational diabetes in 2016 versus a high rate of diabetes in 2013. Similar to 2016, no group can be pointed towards as a single race with the greatest number of medical risk factors.

4.3 Results

4.3.1 Introduction

Overall, a broad overview of the same suggests teenage pregnancy was found not to be a primary risk factor for fetal loss, consistent with prior literature. The fetal loss rate across the US for teenage pregnancies was approximately proportional with younger adult pregnancy and fetal loss rates shown in the prior tables: pregnancies between 20 and 39 are only slightly safer overall at 88% of fetal losses versus 93% of all pregnancies. However older pregnancies to mothers 40 or older are representative of a fetal loss rate nearly three times higher than the average

pregnancy rate, consisting of only about 3% of pregnancies, but 8.25% of fetal losses. Also consistent with prior literature (Ashcraft et al. 2013; Miranda et al. 2010), race appears on initial examination to be a factor regarding the risk of fetal death. Whites and Asians are underrepresented in fetal deaths, while Hispanics are slightly overrepresented and black mothers are much more likely to have a fetal loss (approximately 24% of fetal loss vs 15% of pregnancies in the sample).

The above summary statistics examined the effects of race and pregnancy age separately, but in order to examine the effects more thoroughly, in addition to possible interaction effects, a series of multilevel logistic regressions are performed on both 2016 and 2013 data. The first model for both 2016 and 2013 data examines the risk of teenage pregnancies based only on the age of the mother with a reference category of ages 20 and older. The second model compared teenage pregnancies of 19 and under, the reference category of younger adult pregnancies from ages 20 to 39, and late adult pregnancies of mothers who are 40 and older. The third model examines the effect of race and age independently. The fourth model examines if there is a difference between white and black Hispanics[13]. The fifth model adds the interaction terms of teenage pregnancy with race. The sixth adds interaction terms for race with all three age categories. The seventh varies based on the year of dataset, but in both cases adds controls for health. In 2013 data, it controls for hypertension and diabetes, while in 2016 data health related control variables are broken down into prior to pregnancy and gestational forms of the risk factors. The eighth serves as a supplemental analysis for 2016, adding the possible risk factors of

[13] As discussed in prior literature (e.g. Geronimus 1994; Fishman et al. 2018), Hispanics exist in what has been referred to as a "paradox", having at least some of the racial disparities of black/African Americans in the United States, but with overall less negative birth outcomes. Splitting the Hispanic category attempts to examine if there is relevant differences in Hispanic outcome when broken down on other racial dimensions.

obesity and smoking. I consider this model supplemental because it is based on a slightly smaller sample that is heavily biased against the fetal loss subset of the population.

4.3.2 NVSS 2016 Results

Table 7 presents the results of the logistic regression. Overall, results are consistent with expectations of both prior literature and Hypothesis 1. Model one was insignificant for all variables. In model 2, teenage pregnancy was found to be slightly riskier than an adult pregnancy (b=0.042, p<.05); however, when converted to odds ratios, pregnancies from mothers 40 or older have nearly 2.7 times greater odds of involuntary fetal loss than younger adult pregnancies. This general trend persists in model 3, which added race; however, teenage pregnancies are now found to be slightly protective against fetal loss at an α=.001. Regarding racial minorities, the expected greater odds of fetal loss were found for black, Hispanic, and Asian, Pacific islander, and multiracial pregnancies, with only Indian groups having equal odds of fetal loss to whites. Splitting the Hispanic white and black categories in model 4 shows that the two groups appear face different risks of fetal loss, with coefficients that suggest 35% greater odds of fetal loss for white Hispanics and 5 times greater odds for black Hispanics compared to the reference of white non-Hispanics. Model 5's addition of interaction terms suggests a similar relationship between the interaction of age and race as the Add Health analysis, with a positive coefficient for white teenage pregnancies, a positive coefficient for black adult pregnancies, and a negative, protective, coefficient for the unique interaction of black teenage pregnancies.

To compare how meaningful these differences are, estimated fetal loss rates per 1000 births[14] were calculated using the risks per race and age group associated with Model 6. Figure 2

[14] Fetal loss per 1000 births was calculated utilizing the predicted probabilities associated with each race and age combination, using the following formula: (1000/(Probability of live birth))-1000 using Model 6.

presents this calculated fetal loss per 1000 birth rates for NVSS 2016 data using model 5. For white adult pregnancies, the overall safest group, the estimated fetal loss was calculated at 8.06 per 1000 births, compared to 10.00 for white teenage pregnancies, and 19.89 for those from mothers over the age of 40. The riskiest overall racial group was from mothers who identified as both black and Hispanic, with adult pregnancies being nearly 5 times riskier compared to white adult pregnancies, resulting in a rate of 41.23 fetal losses per 1000 births. This is especially true for pregnancies to mothers age 40 or older, which are extremely risky: at an estimated 148.11 per 1000 births resulting in fetal loss. Consistent with Hypothesis 1, this minority group has safer teenage pregnancies compared to adult pregnancies—at an estimated 19.16, less than half the risk of the adult pregnancies among the same category. Non-Hispanic black mothers show a similar general profile of fetal loss risk, with 19.37 per 1000 births for adult pregnancies, slightly safer teenage pregnancies at 17.92 per 1000, and much riskier late pregnancies at a rate of 49.98 fetal losses per 1000. Overall, these results are consistent with expectations from the weathering hypothesis [Hypothesis 1]: for all racial categories except whites and Asians, teenage pregnancies have the least risk of fetal loss, later adult pregnancies have slightly higher risk than teenage pregnancies, and rates of fetal loss that increase by about three times for mothers 40 and older (Note: this is only statistically significant from white 40 year old pregnancies among white and black Hispanic pregnancies 40 and older, but does trend across age categories in the predicted risks). In contrast, whites and Asians have pregnancies between 20 and 39 as the safest category, slightly riskier teenage pregnancies, and risk that are about 2.3 times higher for the category of mothers 40 and above. This is consistent with the protective effect found in prior research for teenage pregnancies, in addition to suggesting that there is an acceleration of the fetal loss rate that occurs slightly more dramatically at older ages.

Returning to Table 7, supplemental models 7 and 8 examine if health variables impact the effects of race and age on pregnancy outcomes. In model 7 this study examines hypertension, diabetes (pre-pregnancy and gestational), and smoking. In model 8, this is done with the addition of BMI. For model 7, all health variables were found to be significant at the α=.001 level. In an unexpected result, gestational versions of both diabetes and hypertension were both found to have negative associations. In contrast, a diagnosis before the pregnancy are associated with increased risks of fetal loss, as is smoking before pregnancy. In both cases, diabetes has the larger coefficient. When BMI is controlled for in model 8, overweight BMI's are associated at a α=.001 level with increasingly greater risks of fetal loss; however, being underweight was not significantly different than the reference category of a normal BMI. The addition of health variables in the models showcases some potential mild mediation effects for most racial categories, with slightly lower coefficients. Because these changes are also associated with lower N's, it is difficult to directly point to mediation. However, there were dramatic effects in Model 8 shown on both groups of Hispanics and the multiracial category. Because the differences on these two groups were much more dramatic than other racial categories, further examination of data was performed. In depth look at the numbers reveals the reason for the disproportionate level of some changes: the removal of a third of the fetal losses begins to result in major losses of N's, particularly for these smaller minority groups. For example, there are only 2 multiracial teenage pregnancies that resulted in a fetal loss in Model 8, compared to 18 for models 1-6. This suggests that particularly vulnerable minorities may be hard to meaningfully sample in such datasets, and that their underrepresentation in data collected incorrectly suggests a possible source of systematic error in either collection or reporting.

4.3.3 NVSS 2013 Results

Table 8 presents the results of the logistic regression on NVSS 2013 data. Utilizing NVSS 2013 as a form of double checking[15], we examine a similar series of models with a few major changes: Only 7 models are used because of less robust health variables (only having access to diabetes and hypertension related variables) and fewer racial categories are measured due to a difference in how race was collected. In model 1 at α=.01, teenage pregnancies were slightly safer than age 20 and older. Model 2 is nearly identical to the later year, with pregnancies from mothers 40 and older being 2.9 times riskier than younger adult pregnancies. In model 3, black and Asian pregnancies were still found to be riskier. The only difference from 2016 data was that what was an insignificant difference in NVSS 2016 for American Indians is instead had a lower rate of fetal loss than the white reference category. Model 4 showcases the same effect of race on risk as 2016 data, differences based on Hispanic identity is significant, once again having the same direction, and even very similar coefficients (*b*=0.402 versus 0.482 in 2016). Model 5 contains a similar suggestion of protective interactions seen in the prior dataset: while a positive coefficient exists for white teenage pregnancies compared to the reference, and a positive coefficient showcases that Black 20-39-year-old pregnancies are riskier, the interaction of black teenage pregnancies continues to have a negative coefficient and thus an expected protective effect compared to black adult pregnancies as a category. Model 6 showcases the only other difference to be found in the examination of NVSS years 2013 versus 2016: while coefficients for both Hispanic white and black pregnancies of mothers 40 and older

[15] Utilizing both NVSS 2016 and 2013 was done to compensate for certain conceptual issues including: 1) The NVSS is periodically revised, and there was a transition in the past few years to new birth and fetal loss certificates (See appendices A and B for newest forms) which increased the risk of changes in results, 2) Unlike Add Health, a multi-level model was impossible due to lack of an identification variable, and thus consideration for if the effects are consistent needed to be addressed, and 3) Although unlikely due to a near population-level sample, a statistical fluke is technically always a risk. Unlike Add Health, the possibility of examining more than one year of data was available for this dataset.

are significantly significant the 2016 dataset, only black Hispanic is statistically different in the 2013 sample (although with similar coefficients for both variables between years).

Figure 3 presents the calculated fetal loss estimates by race for Model 6. Just like the 2016 data, fetal loss rates per 1000 births were calculated for each race and age group using results from Model 6. White adult pregnancies continue to be the overall safest group for the race, with a rate of fetal loss calculated at 10.10 per 1000 births, compared to 11.33 for white teenage pregnancies, and 29.65 for those from mothers over the age of 40. The riskiest overall group in this year was also from mothers who identified as black and Hispanic, with adult pregnancies still being about 5 times higher rate compared to white adult pregnancies—at 55.41 fetal losses per 1000 births. Pregnancies in this group to mothers age 40 or older are even riskier than in 2016 data, with 246.88 per 1000 births estimated to result in fetal loss. Still consistent with NVSS 2016 and Hypothesis 1 about the weathering hypothesis, this minority group has somewhat safer teenage pregnancies compared to adult pregnancies at an estimated 28.91, just over half the risk of the adult pregnancies. Non-Hispanic black as a group reflects a similar profile of fetal loss risk to their Hispanic counterpart—with lower rates of fetal loss at 21.14 per 1000 births for adult pregnancies, slightly safer teenage pregnancies at 18.02 per 1000, and much riskier late pregnancies from older mothers at a rate of 62.13 per 1000 births.

Supplemental model 7 only examines three health variables compared to the 6 major ones of NVSS 2016: If the mother has a diagnosis of hypertension, prehypertension, or diabetes (with no differentiation if it is gestational or pre-pregnancy). Akin to NVSS 2016, these health variables disproportionally cause a loss in the sample for those pregnancies that resulted in fetal loss. However, the findings continue to suggest somewhat similar issues as seen in the 2016 data. Health problems at first appears to mediate the effect of teenage pregnancy completely for

whites, while showcasing partial mediation for almost all other racial categories. However, once again, a dive into the numbers suggests this may be more of an issue about loss of N's than a pure health correlation, especially for smaller racial minority groups (especially American Indians)[16]. Of note though is that prehypertension showcases a weak negative association with fetal loss, while hypertension has positive association. Diabetes is insignificant. This continues to support the observation in 2016 that less severe health issues appear to have slightly protective correlations, though any attempt to explain why would be outside of the scope of this study.

Regardless, the findings of both years of the NVSS are extremely consistent: the weathering hypothesis continues to be supported, finding a unique protective effect for certain racial minorities found among teenage pregnancies that does not exist among similar pregnancies from other racial groups, particularly whites.

[16] Among the unresolved issues is that the reduced N's is not sufficient to explain why the white racial category is fully mediated, since whites likely have enough variance even with the sample size loss. A future study should consider if there is a possible model that could more accurately account for this issue. Alternatively, an exploration of why the fetal-loss portion of the sample is so disproportionately affected could be used to compensate for the present quantitative limitations.

Table 1: Summary of All Pregnancy Outcomes (Wave IV: N=16,835 Pregnancies)

	Number of Pregnancies	***Percent of Sample***	***Mean Age of Pregnancies (SD in parentheses)***	***Number of Teenage Pregnancies***	***Teenage Pregnancy Rate***
Final Sample:	16835	100%	23.89 (3.62)	1503	8.93%
By Race:					
White	8668	51.49%	24.16 (3.52)	633	7.30%
Black	4473	26.57%	23.27 (3.65)	535	11.96%
Hispanic	1127	6.69%	24.02 (3.81)	102	9.05%
Asian	643	3.82%	24.84 (3.65)	34	5.29%
American Indian	151	0.90%	23.28 (3.37)	15	9.93%
Other	225	1.34%	23.93 (3.52)	20	8.89%
Birth Outcome:	**Birth**	**Fetal Loss**	**Fetal Loss Rate**	**Abortion Rate [Not in analysis]:**	
Sample:	14015	2820	16.75%	15.72%	
By Race:					
White	7217	1451	16.74%	11.10%	
Black	3675	798	17.84%	22.05%	
Hispanic	939	188	16.68%	14.39%	
Asian	552	91	14.15%	21.91%	
American Indian	129	22	14.57%	14.89%	
Other	183	42	18.67%	12.77%	

Table 2: Descriptive Statistics of the Control Variables in the Final Operational Sample (N=16,835 Pregnancies)

Sociodemographic Controls	**Overall**	**White**	**Black**	**Hispanic**	**Asian**	**American Indian**	**Other**
R's Parent Graduated High School (Wave I)	77.35%	83.63%	80.37%	51.11%	80.09%	76.82%	77.78%
R Graduated High School (Wave IV)	89.59%	91.02%	88.53%	84.83%	92.38%	80.13%	92.44%
Health [Wave IV]							
Diabetic	1.65%	1.89%	1.30%	1.60%	1.56%	1.32%	1.33%
Hypertension	4.59%	4.22%	5.93%	2.57%	3.27%	7.95%	3.56%
Depression Symptoms [Wave IV]							
No Depression [Ref]	76.76%	79.66%	70.18%	81.63%	79.78%	63.58%	72.89%
Mild Depression	18.00%	15.29%	23.12%	15.00%	17.11%	33.77%	22.67%
Moderate Depression	4.22%	4.23%	5.28%	2.40%	2.49%	2.65%	4.44%
Severe Depression	0.98%	0.80%	1.39%	0.71%	0.62%	None	None

Table 3: Coefficients of Multilevel Logistic Regression of Risk of Fetal Loss Based on Pregnancy Age and Race (Add Health)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Teenage Pregnancy	0.120	0.105	0.124	0.132	0.490***	0.315***
	(0.088)	(0.088)	(0.088)	(0.088)	(0.115)	(0.093)
Black		0.193**	0.191**	0.194**	0.294***	0.166***
		(0.068)	(0.068)	(0.068)	(0.070)	(0.050)
Hispanic		0.037	0.084	0.086	0.073	0.034
		(0.120)	(0.121)	(0.121)	(0.126)	(0.091)
Asian		-0.102	-0.107	-0.107	-0.034	-0.116
		(0.158)	(0.158)	(0.157)	(0.160)	(0.118)
American Indian		-0.056	-0.044	-0.045	0.039	-0.060
		(0.324)	(0.323)	(0.323)	(0.332)	(0.240)
Other		0.092	0.097	0.100	0.153	0.196
		(0.257)	(0.257)	(0.256)	(0.264)	(0.180)
Teenage*Black					-1.030***	-0.797***
					(0.202)	(0.167)
Teenage*Hispanic					0.092	0.187
					(0.331)	(0.266)
Teenage*Asian					-1.537	-1.293
					(0.835)	(0.744)
Teenage*American Indian					-1.076	-1.220
					(1.200)	(1.066)
Teenage*Other					-0.644	-0.616
Controls						
R High School Graduate			0.144	0.151	0.146	0.151*
			(0.103)	(0.103)	(0.103)	(0.072)
R's Parents HS Graduate			0.148*	0.152*	0.157*	0.109*
			(0.074)	(0.074)	(0.074)	(0.052)
Diabetic				0.629**	0.626**	0.674***
				(0.198)	(0.198)	(0.138)

Table 3 - continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Hypertension				0.002	-0.012	0.006
				(0.131)	(0.132)	(0.098)
Mild Depression						0.169**
						(0.053)
Moderate Depression						0.196*
						(0.100)
Severe Depression						-0.019
						(0.220)
Constant	-2.194	-2.244	-2.494	-2.510***	-2.542***	-1.927***
	(0.047)	(0.054)	(0.119)	(0.119)	(0.120)	(0.081)
Observations	16,835	16,835	16,835	16,835	16,835	16,825
Number of groups	8,274	8,274	8,273	8,270	8,270	8,270

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table 4: Summary of Dependent and Independent Variables (NVSS 2016)

	Total Sample		*Adult Pregnancy [REF]*		*Teenage Pregnancy*		*40 and Older*	
Total Pregnancies:	3,997,166		3,656,048	**89.92%**	214,781	**7.02%**	126,777	**3.06%**
Fetal Losses	51,291		44,418		2719		4,165	
Fetal Loss Rate	1.28%		1.21%		1.27%		3.29%	
	Total Pregnancies/Percent							
White	2,073,755	**51.88%**	1,935,030	**52.93%**	79432	**36.98%**	59293	**46.77%**
Black	569,876	**14.26%**	509,025	**13.92%**	44312	**20.63%**	16539	**13.05%**
Hispanic-White	854,348	**21.37%**	756,352	**20.69%**	68,422	**31.86%**	29574	**23.33%**
Hispanic-Black	68,058	**1.70%**	60,108	**1.64%**	5,573	**2.59%**	2377	**1.87%**
Indian	38,058	**0.95%**	33,407	**0.91%**	3,897	**1.81%**	754	**0.59%**
Asian	278,153	**6.96%**	260,396	**7.12%**	3,297	**1.54%**	14460	**11.41%**
Pacific Islander	11,716	**0.29%**	10,604	**0.29%**	757	**0.35%**	355	**0.28%**
Multi-Racial	103,202	**2.58%**	91,126	**2.49%**	9,091	**4.23%**	2985	**2.35%**
	Fetal Loss/Fetal Loss Percent (by race)							
White	17423	**0.84%**	15,475	**0.80%**	791	**1.00%**	1157	**1.95%**
Black	11254	**1.97%**	9,685	**1.90%**	781	**1.76%**	788	**4.76%**
Hispanic-White	9749	**1.14%**	8,216	**1.09%**	606	**0.89%**	927	**3.13%**
Hispanic-Black	2794	**4.11%**	2,382	**3.96%**	105	**1.88%**	307	**12.92%**
American Indian	316	**0.83%**	272	**0.81%**	29	**0.74%**	15	**1.99%**
Asian	3204	**1.15%**	2,809	**1.08%**	52	**1.58%**	343	**2.37%**
Pacific Islander	283	**2.42%**	254	**2.40%**	12	**1.59%**	17	**4.79%**
Multi-Racial	6270	**6.08%**	5,327	**5.85%**	343	**3.77%**	600	**20.10%**

Table 5: Summary of Control Variables (NVSS 2016)

Control Variables	*Diabetes*	*Hypertension*	*Gestational Diabetes*	*Gestational Hypertension*	*Smoking*	*Underweight (<18.5)*	*Normal (18.5-24.9)*	*Obese (30-34.9)*	*Extremely Obese (35.0+)*
White	0.71%	1.62%	5.28%	6.37%	10.44%	3.36%	46.67%	24.04%	25.93%
Black	0.94%	1.05%	6.49%	4.79%	1.65%	2.56%	37.40%	28.81%	31.23%
Hispanic-White	1.10%	1.85%	6.32%	5.55%	2.46%	2.73%	34.46%	27.87%	34.94%
Hispanic-Black	1.22%	3.63%	4.78%	7.35%	5.99%	3.00%	32.08%	25.64%	39.28%
American Indian	2.20%	2.13%	8.87%	7.34%	14.95%	2.17%	31.77%	26.71%	39.35%
Asian	0.90%	0.93%	10.86%	3.60%	0.60%	7.45%	58.56%	21.13%	12.86%
Pacific Islander	1.89%	1.49%	8.23%	5.71%	4.05%	1.77%	25.89%	26.21%	46.13%
Multi-Racial	0.89%	1.83%	5.77%	5.98%	11.48%	3.36%	41.19%	24.87%	30.58%

Table 6: Summary of Variables: Dependent, Independent, and Control Variables (NVSS 2013)

	Total Sample		***Adult Pregnancy [REF]***		***Teenage Pregnancy***		***40 and Older***	
Total Pregnancies:	3,986,128		3,584,387	**89.92%**	279,646	**7.02%**	122,095	**3.06%**
Fetal Losses	53,947		46,065		3,443		4,439	
Fetal Loss Rate	1.35%		1.29%		1.23%		3.64%	
	Total Pregnancies/Percent							
White	2,151,995	**53.99%**	1,979,100	**55.21%**	109,743	**39.24%**	63,152	**51.72%**
Black	596,660	**14.97%**	516,546	**14.41%**	64,221	**22.97%**	15,893	**13.02%**
Hispanic-White	868,078	**21.78%**	752,582	**21.00%**	88,898	**31.79%**	26,598	**21.78%**
Hispanic-Black	53,905	**1.35%**	46,615	**1.30%**	5,719	**2.05%**	1571	**1.29%**
American Indian	46,321	**1.16%**	39,660	**1.11%**	5,822	**2.08%**	839	**0.69%**
Asian	269,169	**6.75%**	249,884	**6.97%**	5,243	**1.87%**	14,042	**11.50%**
	Fetal Loss/Fetal Loss Percent (by race)							
White	22,799	**1.06%**	19,841	**1.00%**	1,140	**1.04%**	1,818	**2.88%**
Black	12,826	**2.15%**	10,785	**2.09%**	1,112	**1.73%**	929	**5.85%**
White-Hispanic	11,517	**1.33%**	9,655	**1.28%**	876	**0.99%**	986	**3.71%**
Hispanic Black	2,979	**5.53%**	2,489	**5.34%**	179	**3.13%**	311	**19.80%**
Indian	330	**0.71%**	284	**0.72%**	34	**0.58%**	12	**1.43%**
Asian	3,496	**1.30%**	3,011	**1.20%**	102	**1.95%**	383	**2.73%**

Control Variables	Diabetes	Hypertension	Prehypertension
White	5.43%	1.44%	5.19%
Black	6.45%	0.93%	3.75%
Hispanic-White	5.38%	3.19%	5.88%
Hispanic-Black	6.09%	1.53%	4.11%
Indian	8.69%	0.94%	5.68%
Asian	10.07%	1.56%	2.94%

Table 7: Coefficients of Logistic Regression of Risk of Fetal Loss Based on Pregnancy Age and Race (NVSS 2016)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Teenage Pregnancy	-0.014	0.042*	-0.119***	-0.121***	0.230***	0.221***	0.266***	0.364***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.037)	(0.037)	(0.041)	(0.044)
Late Pregnancy (40+)		1.017***	1.018***	1.019***	1.019***	0.904***	0.748***	0.611***
		(0.016)	(0.017)	(0.017)	(0.017)	(0.031)	(0.038)	(0.045)
Black			0.871***	0.871***	0.881***	0.878***	0.843***	0.802***
			(0.012)	(0.012)	(0.013)	(0.013)	(0.015)	(0.017)
Hispanic [Fused]			0.482***					
			(0.012)					
Hispanic-White				0.304***	0.323***	0.309***	0.049**	0.051**
				(0.013)	(0.013)	(0.014)	(0.018)	(0.020)
Hispanic-Black				1.617***	1.666***	1.633***	0.552***	0.241***
				(0.021)	(0.021)	(0.022)	(0.042)	(0.055)
American Indian			0.010	0.010	0.020	0.018	0.169**	0.183**
			(0.057)	(0.057)	(0.060)	(0.061)	(0.065)	(0.070)
Asian			0.278***	0.278***	0.285***	0.302***	-0.095***	-0.136***
			(0.019)	(0.019)	(0.020)	(0.021)	(0.029)	(0.034)
Pacific Islander			1.073***	1.073***	1.101***	1.113***	0.686***	0.657***
			(0.061)	(0.061)	(0.062)	(0.064)	(0.091)	(0.102)
Multi Racial			2.041***	2.041***	2.079***	2.041***	-0.440***	-0.353***
			(0.015)	(0.015)	(0.016)	(0.016)	(0.055)	(0.058)
Black*					-0.302***	-0.299***	-0.245***	-0.282***
Teenage Pregnancy					(0.052)	(0.052)	(0.059)	(0.064)
Indian*					-0.314	-0.312	-0.360	-0.525*
Teenage Pregnancy					(0.199)	(0.199)	(0.215)	(0.244)
Asian*					0.181	0.164	-0.549	-0.397
Teenage Pregnancy					(0.146)	(0.146)	(0.282)	(0.294)
Hispanic-White*					-0.442***	-0.427***	-0.226***	-0.300***
Teenage Pregnancy					(0.056)	(0.056)	(0.065)	(0.071)
Hispanic Black*					-1.019***	-0.986***	-0.792***	-0.476*
Teenage Pregnancy					(0.107)	(0.107)	(0.184)	(0.202)
Pacific Islander*					-0.630*	-0.642*	-0.343	-0.158
Teenage Pregnancy					(0.300)	(0.300)	(0.369)	(0.372)
Multiracial*					-0.719***	-0.681***	-0.063	-0.124
Teenage Pregnancy					(0.067)	(0.068)	(0.169)	(0.178)
Black*						0.044	-0.060	-0.015
Late Pregnancy						(0.049)	(0.062)	(0.072)
Indian*						0.002	-0.009	-0.437
Late Pregnancy						(0.270)	(0.301)	(0.419)
Asian*						-0.103	-0.034	-0.049
Late Pregnancy						(0.066)	(0.094)	(0.116)
Hispanic-White*						0.177***	0.018	0.132
Late Pregnancy						(0.047)	(0.066)	(0.075)

Table 7 - continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Hispanic-Black*						0.376***	0.198	0.228
Late Pregnancy						(0.072)	(0.147)	(0.197)
Pacific Islander*						-0.186	-0.104	-0.047
Late Pregnancy						(0.258)	(0.372)	(0.428)
Multiracial*						0.496***	-0.099	-0.107
Late Pregnancy						(0.057)	(0.246)	(0.278)
Pre-Pregnancy Diabetes							1.028***	1.051***
							(0.036)	(0.039)
Pre-Pregnancy							0.573***	0.559***
Hypertension							(0.031)	(0.033)
Gestational Diabetes							-0.546***	-0.450***
							(0.032)	(0.034)
Gestational Hypertension							-0.371***	-0.308***
							(0.029)	(0.031)
Smoker							0.314***	0.393***
							(0.020)	(0.022)
Underweight								-0.052
								(0.039)
Overweight								0.101***
								(0.016)
Obese								0.229***
								(0.019)
Extremely Obese								0.466***
								(0.025)
Constant	-4.342	-4.398***	-4.815***	-4.815***	-4.829***	-4.821***	-5.118***	-5.402***
	(0.005)	(0.005)	(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.013)
Observations	3,997,166	3,997,166	3,997,166	3,997,166	3,997,166	3,997,166	3,952,738	3,842,282

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table 8: Coefficients of Logistic Regression of Risk of Fetal Loss Based on Pregnancy Age and Race (NVSS 2013)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Teenage Pregnancy	-0.069**	-0.012	-0.120***	-0.121***	0.116**	0.116**	-0.013
	(0.023)	(0.023)	(0.023)	(0.023)	(0.040)	(0.040)	(0.049)
Late Pregnancy (40+)		1.067***	1.073***	1.078***	1.078***	1.075***	0.446***
		(0.016)	(0.016)	(0.016)	(0.016)	(0.025)	(0.035)
Black			0.728***	0.728***	0.736***	0.736***	0.360***
			(0.011)	(0.011)	(0.011)	(0.012)	(0.016)
Hispanic (Fused)			0.402***				
			(0.011)				
Hispanic-White				0.229***	0.243***	0.241***	-0.024
				(0.012)	(0.012)	(0.012)	(0.017)
Hispanic-Black				1.706***	1.736***	1.702***	0.656***
				(0.020)	(0.020)	(0.021)	(0.041)
American Indian			-0.375***	-0.375***	-0.388***	-0.372***	-0.187**
			(0.056)	(0.056)	(0.058)	(0.059)	(0.062)
Asian			0.165***	0.164***	0.161***	0.191***	-0.298***
			(0.018)	(0.018)	(0.018)	(0.020)	(0.030)
Black*Teenage Pregnancy					-0.276***	-0.275***	-0.198**
					(0.058)	(0.058)	(0.069)
Indian*Teenage Pregnancy					0.029	0.013	0.061
					(0.206)	(0.206)	(0.216)
Asian*Teenage Pregnancy					0.496***	0.465***	0.487*
					(0.137)	(0.137)	(0.209)
Hispanic-White*Teenage Pregnancy					-0.390***	-0.388***	-0.148*
					(0.061)	(0.061)	(0.075)
Hispanic-Black*Teenage Pregnancy					-0.802***	-0.767***	-0.577**
					(0.114)	(0.114)	(0.201)
Black*Late Pregnancy						0.003	0.135*
						(0.043)	(0.062)
Indian*Late Pregnancy						-0.342	-0.287
						(0.298)	(0.363)
Asian*Late Pregnancy						-0.247***	-0.210*
						(0.060)	(0.104)
Hispanic-White*Late Pregnancy						0.020	-0.007
						(0.042)	(0.066)
Hispanic-Black*Late Pregnancy						0.418***	0.286
						(0.071)	(0.156)
Diabetes							-0.048
							(0.024)
Hypertension							0.892***
							(0.028)
Prehypertension							-0.300***
							(0.031)

Table 8 - continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	-4.286**	-4.344***	-4.588***	-4.588***	-4.594***	-4.594***	-6.210***
	(0.004)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)	(0.016)
Observations	3,986,128	3,986,128	3,986,128	3,986,128	3,986,128	3,986,128	3,953,639

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

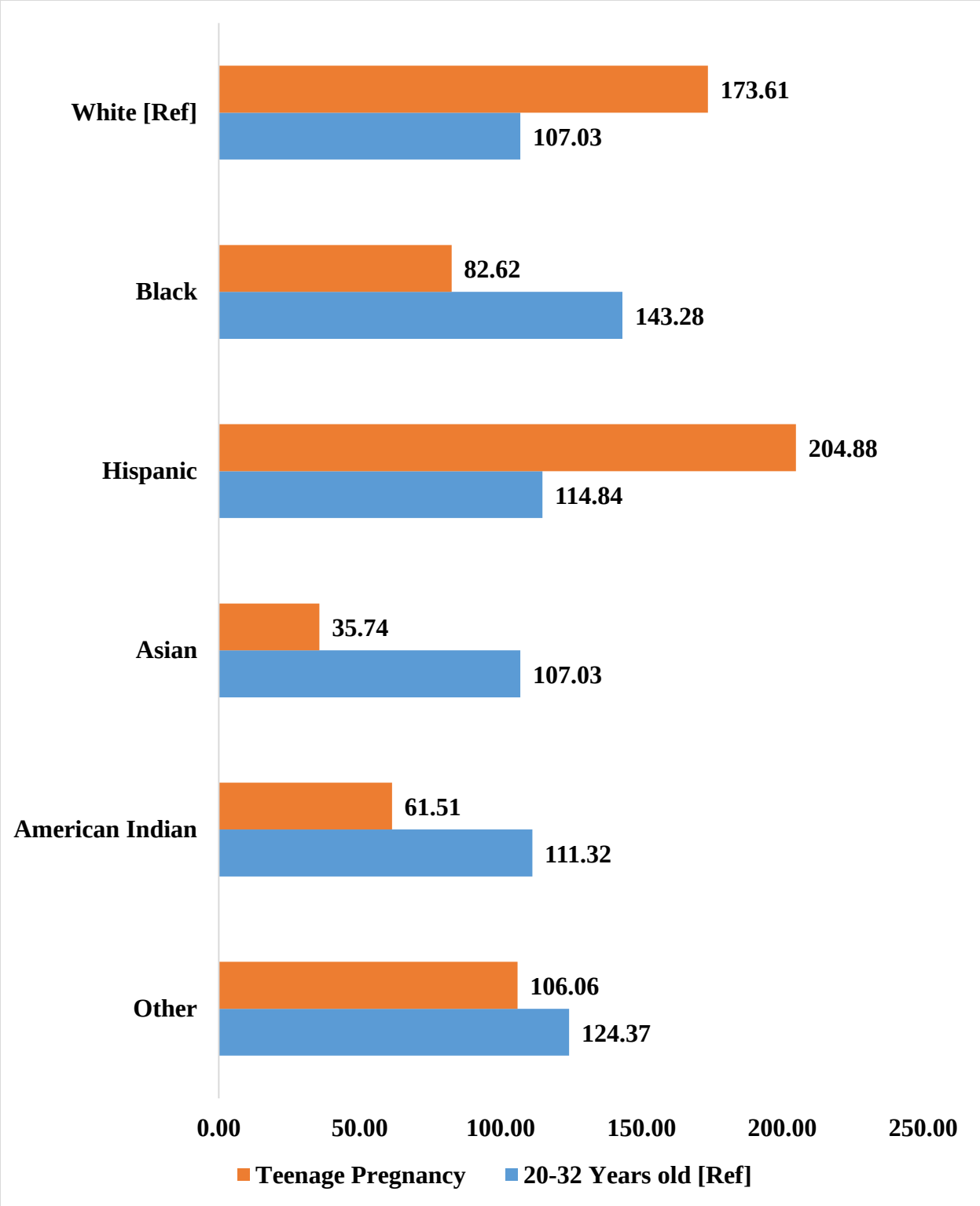


Figure 1. Fetal Loss Rate per 1000 Live Births, by Pregnancy Age and Race (Add Health, Multi-Level Logistic Regression)

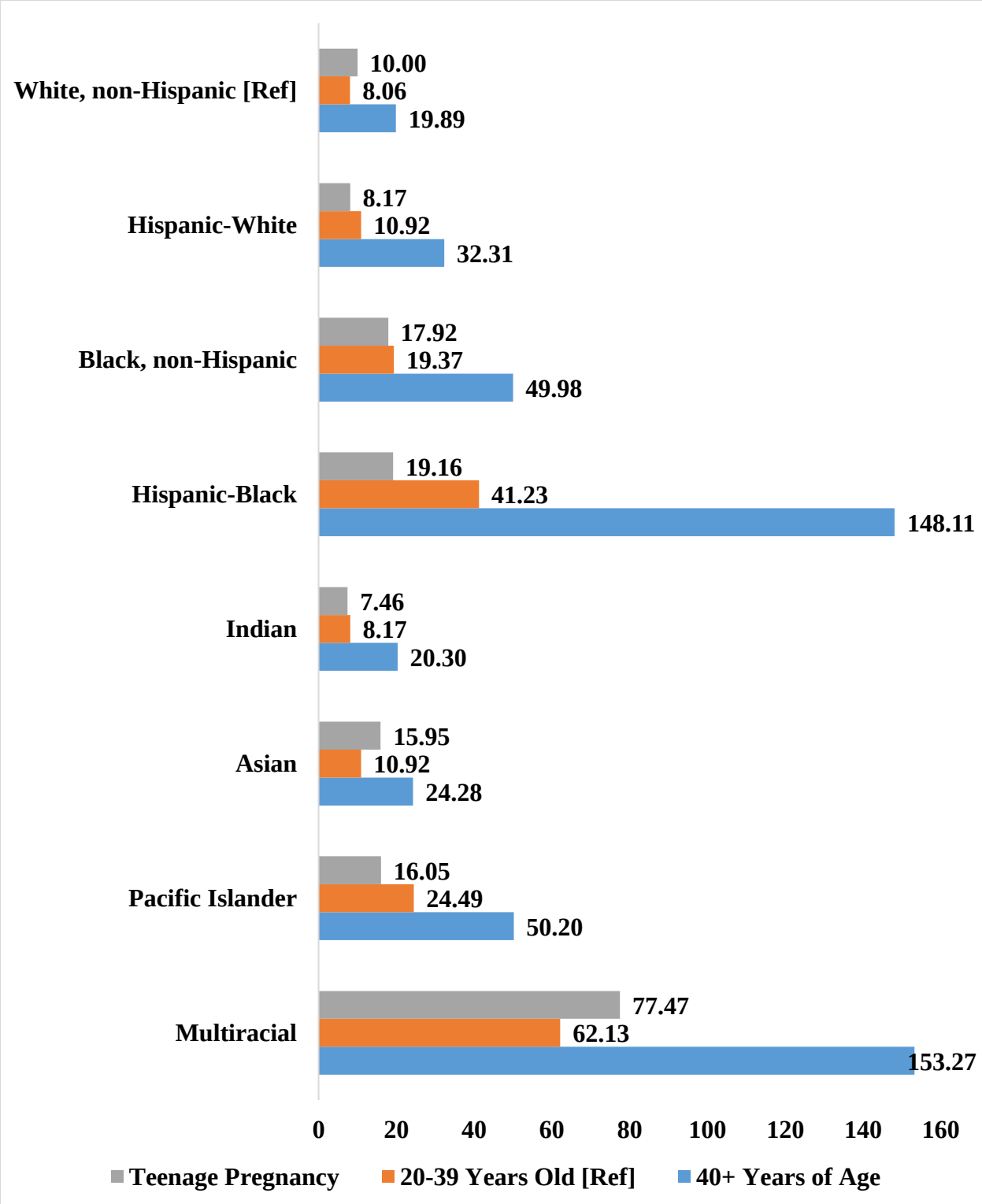


Figure 2: Fetal Loss Rate per 1000 Live Births, by Pregnancy Age and Race (NVSS 2016)

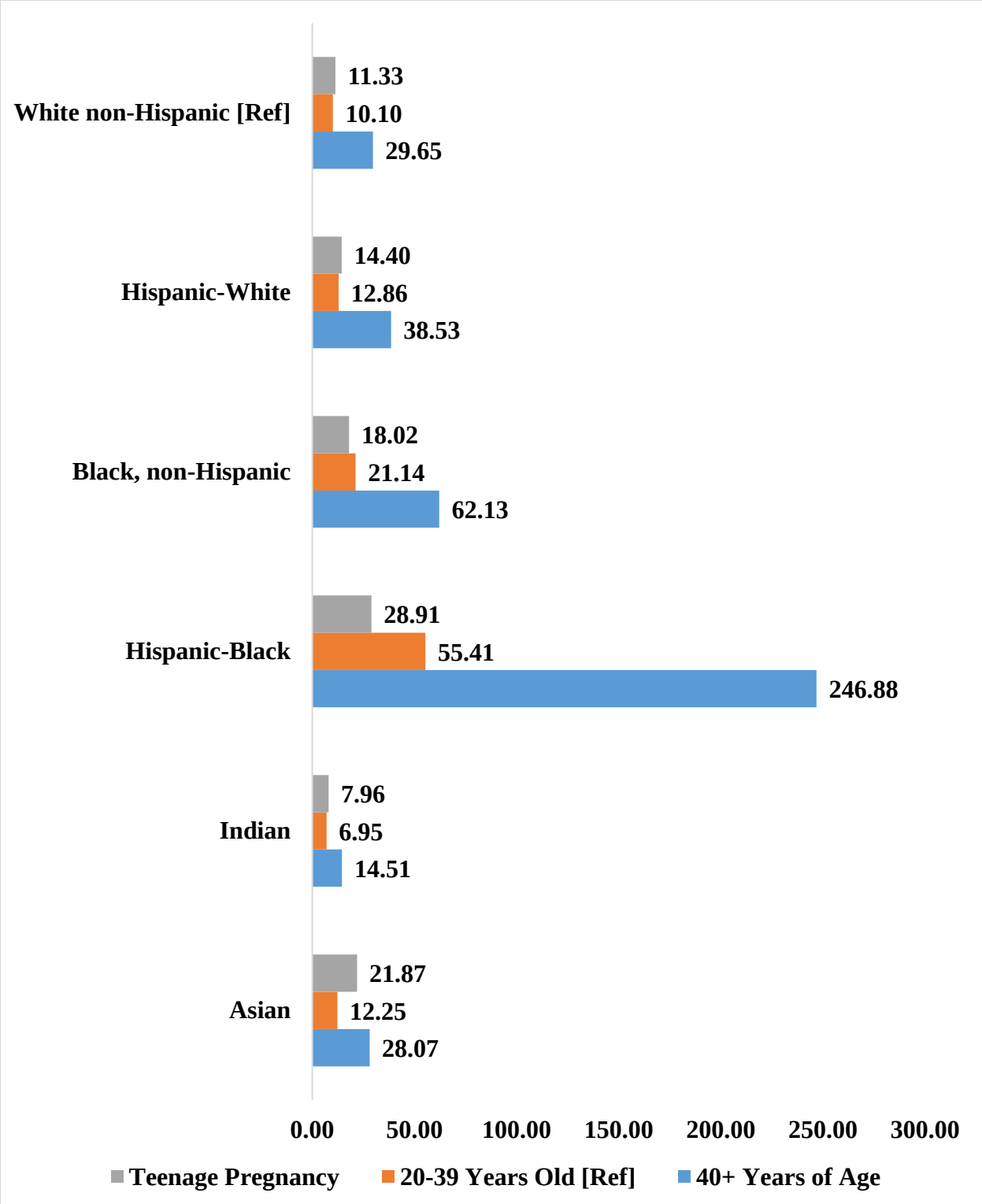


Figure 3: Fetal Loss Rate per 1000 Live Births, by Pregnancy Age and Race (NVSS 2013)

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND CONCLUSIONS

5.1 Discussion

Overall, results in this study suggest that there is, across all datasets, findings consistent with the weathering hypothesis—resulting in racial differences in outcomes that can be applied to the issue of fetal loss. Bluntly, pregnancies among mothers who were black, with special note for Hispanic-black and multi-racial mothers, have risks associated with pregnancy across all age categories that are especially unsafe. In all cases and across all samples, as presented in figures 1-3, the group representing the social ideal of a non-teenage, aged between the twenty's and thirties, pregnancy is uniquely riskier for black pregnancies than white pregnancies. When combined with prior literature about black women's increased risk of low-birth weight (e.g. CDC 2016a; Geronimus 1996) and infant mortality (Geronimus 1996; James 1993; CDC 2016b), what has been observed before as a form of double jeopardy for black mothers (maternal and infant birth outcomes) instead appears to be a form of triple jeopardy. This results in one additional area of risk for consideration for black mothers having successful wanted pregnancies. Overall, this study concludes that fetal loss risks—just as in infant/maternal mortality, premature birth, and birth weight before it—are a manifest risk factor for pregnancies that have a notable interaction based on race and maternal age.

This is not to say there is not cause for some optimism in this study: consistent with the weathering hypothesis and this study's Hypothesis 1, across all three samples under observation, results suggested that some of these risks were mitigated for fetal loss among certain groups of minority mothers who had earlier/teenage pregnancies. In the case of Add Health, fetal loss rates were found to fall for all racial minorities when having teenage pregnancies except whites and

Hispanics, to the point where black, Asian, and American Indian teenage pregnancies were safer than either white teenage or adult (20-32) pregnancies (although this was only statistically significant for the black population). In the case of NVSS data, although the results present a less dramatic reduction in risk than Add Health—for non-Hispanic black mothers, the odds of fetal loss fell by approximately 12% among teenage versus younger adult pregnancies, while the risks for Hispanic-blacks were cut nearly in half. This suggests what other findings related to maternal and child health research have shown: pregnancies for racial minorities earlier, when less stressful events have occurred (resulting in lower gaps in allostatic load), results in lower risk pregnancies.

Although the primary Hypothesis 1 was supported, two of the hypotheses had more mixed results in the data. Due to the age of the group under observation, Add Health was unable to test if either there was a notable acceleration in the risks of fetal loss, based on race, as mothers became older (Hypothesis 2) or if fetal loss risks would follow an order of risk that would ascend from younger adult pregnancies (20-39), to teenage pregnancies (19 or less), and finally older adult pregnancies (40+) (Hypothesis 3). Hypothesis 2 was not supported in either NVSS 2016 or 2013 data, with the risk of fetal loss accelerating at nearly identical rates for most races (at about 2.5 times the risk) between younger and older adults. When fetal loss rates were calculated, two notable exceptions emerged among the Hispanic-black and Multiracial categories; however, more in-depth analysis and a lack of significance on the interaction term for the oldest age category and race makes it difficult to remove the possibility that the result is instead due to collinearity. Hypothesis 3 generally was not supported in the manner that was expected, but instead suggests that the perception of higher fetal loss rate among teenage pregnancies is in part due to population demographics. Teenage pregnancies appear to have

nearly identical rates to younger adult pregnancies of fetal loss when viewed as an all-race population. However, this appears to be because whites make up just over half of all pregnancies, while simultaneously being the major racial group that has riskier teenage pregnancies. As such, this effect slightly skews the descriptive statistics and makes teenage pregnancies appear slightly riskier than they actually are.

Tackling the broad question that animated this study: does data suggest that the weathering hypothesis model can be extended to include fetal loss in addition to the more classical studies of low birth weight and infant mortality? Results indicate yes. Although the exact increase in risk varies by the dataset under analysis, it is reasonable to say that when accounting for various controls, the increased odds of fetal loss range between approximately ten and seventy percent between teenage pregnancy and young adult pregnancies for non-Hispanic black pregnancies in the United States in three large, robust, and reasonably nationally representative samples. In addition, there are implications in this study that the populations impacted by weathering likely include Hispanic-black, Hispanic-whites, and Multiracial individuals. In this context, the considerations to the safety of minority mothers and pregnancies in general as it relates to racial disparities should likely be broadened in this new context.

5.2 Policy Implications

Considering the results, it is reasonable to conclude relative risk of fetal loss by race is akin to other veins of maternal and infant outcomes of the weathering hypothesis (e.g. low birth weight, premature birth, etc.). The current results have several important implications for social policies.

First, the study concludes that there are four major racial groups that have the most dramatic differences when weathering is considered: non-Hispanic blacks, Hispanic-blacks, Hispanic-whites, and Multiracial mothers. Research into weathering has typically focused on either non-Hispanic black as a population or has made no consideration for additional Hispanic identity. In contrast, the effects shown in Figures 2 and 3 are the most dramatic among the Hispanic-black population of mothers. Recent research into the broader concept of the Hispanic paradox suggests that this may be less surprising than initially suggested, with the most benefits from Hispanic identity being found among typically white Mexican-born individuals (Borrell 2005). One possible reason looks at the conflicts of a Hispanic black identity causing an individual to not take opportunities for resources offered to either Hispanics or African Americans, since they do not feel like legitimate members of either group (Borrell 2005; Rockquemore et al. 2009). As a result, I propose that future healthcare policies and research needs to consider how Hispanic identity may intersect with black identity: Current prevention and intervention efforts should pay special attention to this group, which has likely been ignored due to a typical single-race focus in how the culture considers race.

Regarding those who identify as multiracial, a similar set of policies should be considered that target this group. Individuals who identify as multiracial are among the fastest growing group in the United States (Pew 2015), and considerations for future funding from entities such as federal and state health bureaus should consider if this group has unique health challenges. Related to the observation regarding Hispanic black individuals, multiracial individuals have been found to have multiple possible and complicated relationships with their racial identity. Some identify as only a combination of races (e.g. Asian-black) while others might merge the identity (e.g. both Asian and black) or only identify with one group primarily (Cheng and Lee

2009; Rockquemore et al. 2009). Research in this area suggests that distance (how separate the multiple identities feel) and conflict (are the identities in conflict) are both factors that influence how a multiracial individual experiences racial identity. Of particular note for the weathering hypothesis are findings that exposure to negative memories about the experience of being multiracial increases feelings of both distance and conflict (Cheng and Lee 2009). This effect that would not occur for non-multiracial individuals may explain part of the gap in outcomes. For this study, the 2016 NVSS was the only time an individual could explicitly choose multiracial as a category—this resulted in multiracial being the 5th largest racial category (2.58%), with easily the highest level of fetal loss in the sample at all age categories. This was particularly pronounced at ages 40 and above, with just above a 20% fetal loss rate. Future policy needs to consider multiracial individuals as being at a unique risk, especially at advanced ages. One proposal to consider would be an education campaign for hospitals: doctors would benefit from knowing to ask questions about patients that identify themselves as multiracial and consider them for extra attention as a form of high-risk population for fetal loss. In this effort, these policies should be informed by future research that examines which combinations of racial backgrounds are associated with particularly high rates of fetal loss risks among multiracial mothers.

In another, more bluntly focused approach to policy concerns, this research reinforces that healthcare advocates and related healthcare policy need to consider a more permissive approach and direct advocacy/support for minority women who have earlier pregnancies. Barring a sudden end to racism in the United States, research has consistently shown that the benefits of earlier pregnancy in black women has positive effects that not only effect the infants, but the long-term health of the mother (e.g. Geronimus 1987; Masho and Archer 2010; Spence and

Eberstein 2009). This research only extends these benefits, by adding fetal loss to the list, and provides more reason for making teenage pregnancy in certain groups a legitimate life choice instead of a purely negative outcome (assuming that racial inequality will likely persist). Such a decision should be supported by private institutions and government policy as a form of general health advocacy.

Serving as an example, though not targeted particularly at fetal loss, but designed with the weathering hypothesis in mind is found in New York City, called the By My Side Birth Support Program. This program specifically targets black women, uniting certified doulas with in-need pregnant women with three in home visits, medical care tracking, and assistance navigating the hospital system (Thomas et al. 2017). Although not an explicit aim, the average age of mothers being assisted is somewhat young at 27 and can include teenage pregnancies. Targeting 4 disproportionately high poverty and risk neighborhoods, a total of 489 births have occurred under the program thus far, of which 84% were to non-Hispanic black women. Overall, the program's success has caused a drop of nearly half in the rates of preterm birth (6.3 in-program vs 12.4% in the area) and low birth weight (6.5 vs 11.1% in the area) (Thomas et al. 2017). Overall, the success of this program suggests that commitment of funding and medical resources to community-based targeting combined with quality medical care can have strong effects on its own, and early enough efforts to expand this idea could be impactful for fetal loss outcomes as well.

Even though some level of success has been found in such advocacy, it is still the case that non-Hispanic blacks, Hispanic-blacks, Hispanic-whites, and multiracial mothers all have higher risks of fetal loss than their white-same-age counterparts (with one exception, teenage pregnancies in Add Health among non-Hispanics blacks are safer than non-Hispanic white

teenage pregnancies). This finding indicates that existing prevention programs for fetal loss should pay special attention to racial minorities in young and middle adulthood. In addition, because miscarriage and stillbirth rates are intrinsically higher among these groups, literature and medical policy suggestions proposed for women with multiple fetal losses may be particularly applicable for this group. For example, best practices for women with high risk and a multiple fetal loss background include additional preventative screenings such as consideration of family history, age, BMI, toxin exposure, early blood count screenings, etc. (Jauniaux et al. 2006). Adopting policies at the hospital or national level to directly inquire about fetal loss history with minority women (especially those in middle adulthood) and consider the more aggressive preventative schedule more often with the population would almost certainly impact fetal loss risks. Making this a policy instead of purely educational is particularly salient because of stereotypes about black women's strength and the false idea they feel less pain (Collins 2000) have been given as a possible explanation as to why into black women generally receive less in-depth care in the healthcare system (Institute of Medicine 2001).

The last policy angle to explore would be to not assume racism could not be attacked. Inevitably, the underlying cause of weathering is accumulated stress due to racism, with low-level racist events suggested as being the primary catalyst. A direct effort to reduce racist events nationally could slow or eliminate the effects of weathering by reducing allostatic load among certain minorities. The ability to successfully promote a reduction of this stress would reduce overall fetal loss disparity between groups such as black, non-Hispanics, Hispanic-blacks, and multiracial individuals. This would result in fetal loss rates staying low at teenage and young adulthood ages for these groups. Because fetal loss findings in this study are but one of multiple health factors influenced by weathering, this would be of multiple levels of benefit. Prior

weathering research has also established that reducing allostatic load would benefit mothers' future pregnancies and life expectancy, in addition to reducing the during and post-birth negative outcomes such as low birth weight, infant mortality, and premature birth.

5.3 Limitations

Overall, this study examined what appears to be among the most available of large, nationally representative, datasets that address the contentious topic of fetal loss. However, a focus on relatively large numbers, using datasets with occasionally problematic control variables, and only the capacity to control for individual effects in the Add Health dataset. In this section, we explore what these limitations are in more depth, and how future studies may address these problems.

5.3.1 Allostatic Load

Conceptually, allostatic load is a complicated thing to meaningfully measure. It is well observed that it has impacts, with research covering attempts to measure as diverse as medical based chronic inflammation diagnoses (Das 2013), chemicals in the brain and blood such as cortisol (Seeman et al. 2001) or glucocorticoids (Sapolsky et al. 2000), blood pressure (Seeman et al. 2001), and more sociological efforts such as the feeling of encountering daily discrimination (Hudson-Banks et al 2006; Schmitt et al. 2014), segregation in neighborhoods (Osypuk and Acevedo-Garcia 2008), and more.

The following issues were considered in the process of this study: Add Health has collected blood samples from a subset of respondents that includes cortisol; however, the data is restricted in access, would significantly lower the N of the Add Health data, and I lack the

training to understand how to meaningfully interpret the measurement. Another consideration was a question that asked in Wave IV: do you feel you have been treated with less respect or courtesy than other people. However, not only was this variable insignificant when added, the number of individuals who answered affirmatively only in total numbered in the hundreds across all races.

Attempts to resolve this issue could consider some of the following: 1) Looking at the cortisone levels of individuals in Add Health regardless, but with consideration that an already present issue in the data at times has been collinearity. Any variable that meaningfully lowers the number of participants would need to be alert for this issue. It is also possible that Wave V of Add Health could offer new possibilities when released. 2) Use a different dataset that can more directly address the question of allostatic load. Other datasets may exist that ask about the combination of pregnancy outcomes and either racism or stress hormone measurements. Because this study takes a broad view, a more focused study focused on this vein of the weathering hypothesis could bridge the gap of the issue.

5.3.2 Older Adult Pregnancies

Although this issue is discussed briefly in a footnote, it is difficult to ignore that Hypothesis 2 not being supported could be due to how younger versus older pregnancy is measured in this study. As the weathering hypothesis is typically conceived, it should be expected that if premature and cumulative physical aging is the cause of this increased risk of fetal loss, age should have an impact. Both the ages 35 and 40, consistent with some of the most cited prior research (e.g. Andersen et al. 2000; Cleary-Goldman et al. 2005) are generally viewed as reasonable cutoffs for when risks first begin to manifest (in the case of later 30's), and then

have begun to plateau (40 and older). 40 and older was chosen for this study because the effects tended to be more significant, although neither later age group definition tended towards any sort of meaningful interaction term with race and age. Because of the already broad scope of this project, and a lack of other age categories with broad support, this was used in the final product.

The most obvious solution to this issue that occurs to me is to conduct another study, reanalyzing the data (most likely from the NVSS) into a time series that looks if the point at which the risk of fetal loss begins to accelerate and/or plateau differs based on race. It is possible that the weathering effects are occurring, but if the effects are subtle (as a hypothetical example, the inflection point of risk occurs at age 36 for black mothers versus age 38 for white ones) that a logistic regression is a poor tool to find this effect. Another way to phrase this question would consider the following: Is the body of a 25-year-old black woman (from the perspective of allostatic load) the same as a 35-year-old white woman? Examination of biological markers or relative risks of fetal loss could both be considered to address this question. It is worth noting in any consideration of this for future research that mother's age is technically ordinal in NVSS which could complicate this effort, measuring 12 and younger, 13-49 as an interval variable, and then 50 and older.

5.3.3 Conceptual/Dataset Limitations

As discussed in both the literature and methods section, some issues in quantifying fetal loss and issues related to fetal loss come down to issues of conceptualization and datasets. Among the examples would be the discussion of color-blind racism, which has shifted the language and ideology of how race is both discussed and lived in American life (e.g. Bonilla-Silva. Another issue discussed is that it is well known that abortion is a particularly contentious

issue, and that literature readily admits that people lie about pregnancy outcomes in part because of the controversy (e.g. Ashcraft 2013; Guttmacher 2016). For example, it is known that miscarriage rates are correlated with neighborhood abortion rates (Fletcher and Wolfe 2009), at least in part because of this obfuscation. These issues are explicitly known to exist but have few readily available remedies that are not already addressed in what capacity they can. For example, Add Health's protocol already followed among the best practices for privacy suggested in the literature (not using an in-person interviewer). It is hard to imagine a readily available solution barring a dramatic shift in either racial or abortion politics in the future.

Although chosen for their relative quality, conceptually fetal loss has proven very difficult to study with any dataset. It is estimated that nearly forty percent of all fetal losses would only be detectable with early and consistent medical testing, and a fair number of fetal losses may occur so early it was unknown that the mother even became pregnant (Zinaman et al. 1996). Unlike birth weight and infant mortality, which have easily recordable outcomes that are nearly guaranteed to be handled in a medical environment, it is highly likely that a substantial amount of fetal losses was never even observed to be recorded. In a number of cases, especially for teenage pregnancies, even if the outcome was known, there would be intense social pressure to hide what happened due to fear.

The last broad discussion involves the datasets utilized, and the consistent issues control variables introduced. Especially in the case of the NVSS, it was evident in analysis that the birth records have data that is much better managed and more complete than fetal loss records. Because fetal loss is already a difficult to measure issue and a fairly rare event, this limits the capacity of research to properly analyze the cause and effect relationships between social variables and their resultant health outcomes in this study. As discussed in the policy section, one

of the major efforts to remedy this should consider making the issue more visible so that future collections have less of this problem. Especially since as this study indicates, fetal loss is one more on a list of issues far reaching with racial, health, and social-wellness implications.

As with many conceptual issues, it is nearly impossible to resolve any of these problems, even if there was time and resources immediately available. However, leaving these up for discussion opens opportunity for future research to build upon what has been done, with a hopefully better understanding of why decisions were made as is.

5.4 Conclusions

In closing, this study uses multiple national datasets and finds support for extending fetal loss into the broad umbrella of the weathering hypothesis: teenage pregnancy is less risky than adult pregnancy for certain minority groups in relation to the risk of fetal loss. This finding is consistent with prior literature on other negative pregnancy outcomes such as low birth weight and infant mortality, resulting in an additional area of concern, potential research, and avenues to explore about how to improve maternal and child healthcare outcomes. In the analyses of both The National Longitudinal Study of Adolescent to Adult Health (Add Health) and the National Vital Statistics Survey (NVSS), protective effects were found for teenage pregnancies relative to young adult pregnancies: This effect was consistently found for black mothers, but there was also evidence for a similar and even more dramatic effect for Hispanic-black mothers. As a result, the major hypothesis about weathering was supported. However, results were not entirely consistent with the idea of weathering causing premature aging and substantially high fetal loss risk among the oldest minority pregnancies. Suggestions for future research included a call for improved data collection about fetal loss, despite its complicated and controversial nature.

APPENDIX A

IRB APPROVAL LETTER

The Florida State University
Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673, FAX (850) 644-4392

EXEMPTION MEMORANDUM

Date: 2/1/2018

To: Andrew Latinsky

Address:
Dept.: SOCIOLOGY

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Weathering, Age, Stress, and its Impact on Fetal Loss and Mortality

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and one member of the Human Subjects Committee. The proposed research protocol is Exempt from human subjects regulations as described in 45 CFR Â§ 46.101(b)4.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This memorandum does not replace any departmental or other approvals, which may be required.

The Committee expects that all relevant subject protection measures and ethical standards will be followed, as outlined in your proposal. No continuing review is required unless the nature of the project changes and it would affect the project exemption status.

You are advised that any change in protocol for this project that would affect the exemption status must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is

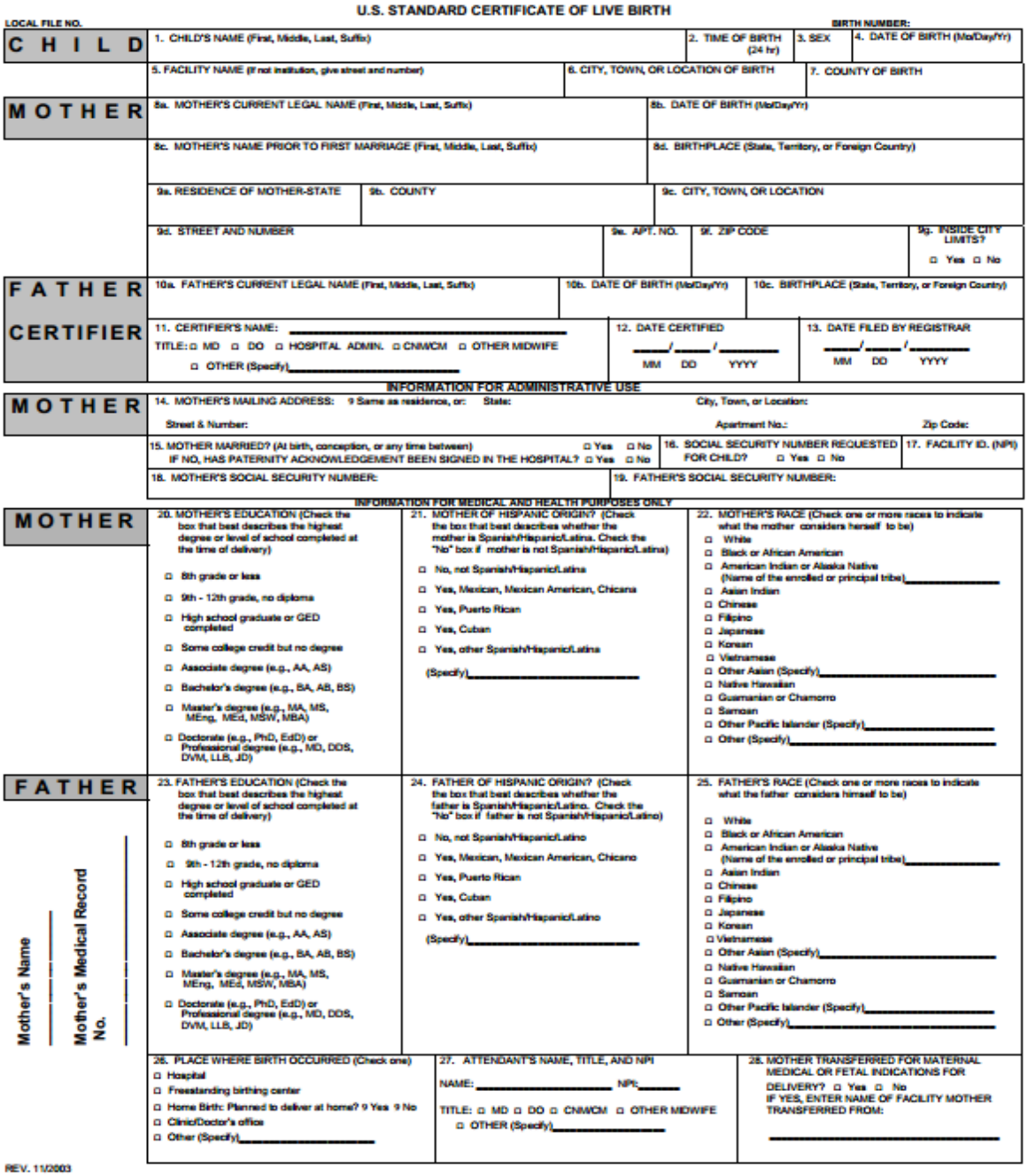
reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is FWA00000168/IRB number IRB00000446.

Cc: Koji Ueno, Advisor
HSC No. 2017.22725

APPENDIX B

CERTIFICATE OF LIVE BIRTH



U.S. STANDARD CERTIFICATE OF LIVE BIRTH

LOCAL FILE NO. BIRTH NUMBER:

CHILD

1. CHILD'S NAME (First, Middle, Last, Suffix)
2. TIME OF BIRTH (24 hr)
3. SEX
4. DATE OF BIRTH (Mo/Day/Yr)
5. FACILITY NAME (If not institution, give street and number)
6. CITY, TOWN, OR LOCATION OF BIRTH
7. COUNTY OF BIRTH

MOTHER

8a. MOTHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix)
8b. DATE OF BIRTH (Mo/Day/Yr)
8c. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last, Suffix)
8d. BIRTHPLACE (State, Territory, or Foreign Country)
9a. RESIDENCE OF MOTHER-STATE
9b. COUNTY
9c. CITY, TOWN, OR LOCATION
9d. STREET AND NUMBER
9e. APT. NO.
9f. ZIP CODE
9g. INSIDE CITY LIMITS? ☐ Yes ☐ No

FATHER

10a. FATHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix)
10b. DATE OF BIRTH (Mo/Day/Yr)
10c. BIRTHPLACE (State, Territory, or Foreign Country)

CERTIFIER

11. CERTIFIER'S NAME: _____
TITLE: ☐ MD ☐ DO ☐ HOSPITAL ADMIN. ☐ CNM/CM ☐ OTHER MIDWIFE
☐ OTHER (Specify)_____
12. DATE CERTIFIED ____/____/____ MM DD YYYY
13. DATE FILED BY REGISTRAR ____/____/____ MM DD YYYY

INFORMATION FOR ADMINISTRATIVE USE

MOTHER

14. MOTHER'S MAILING ADDRESS: ☐ Same as residence, or: State: City, Town, or Location:
Street & Number: Apartment No.: Zip Code:
15. MOTHER MARRIED? (At birth, conception, or any time between) ☐ Yes ☐ No
IF NO, HAS PATERNITY ACKNOWLEDGEMENT BEEN SIGNED IN THE HOSPITAL? ☐ Yes ☐ No
16. SOCIAL SECURITY NUMBER REQUESTED FOR CHILD? ☐ Yes ☐ No
17. FACILITY ID. (NPI)
18. MOTHER'S SOCIAL SECURITY NUMBER:
19. FATHER'S SOCIAL SECURITY NUMBER:

INFORMATION FOR MEDICAL AND HEALTH PURPOSES ONLY

MOTHER

20. MOTHER'S EDUCATION (Check the box that best describes the highest degree or level of school completed at the time of delivery)
☐ 8th grade or less
☐ 9th - 12th grade, no diploma
☐ High school graduate or GED completed
☐ Some college credit but no degree
☐ Associate degree (e.g., AA, AS)
☐ Bachelor's degree (e.g., BA, AB, BS)
☐ Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

21. MOTHER OF HISPANIC ORIGIN? (Check the box that best describes whether the mother is Spanish/Hispanic/Latina. Check the "No" box if mother is not Spanish/Hispanic/Latina)
☐ No, not Spanish/Hispanic/Latina
☐ Yes, Mexican, Mexican American, Chicana
☐ Yes, Puerto Rican
☐ Yes, Cuban
☐ Yes, other Spanish/Hispanic/Latina
(Specify)_____

22. MOTHER'S RACE (Check one or more races to indicate what the mother considers herself to be)
☐ White
☐ Black or African American
☐ American Indian or Alaska Native (Name of the enrolled or principal tribe)_____
☐ Asian Indian
☐ Chinese
☐ Filipino
☐ Japanese
☐ Korean
☐ Vietnamese
☐ Other Asian (Specify)_____
☐ Native Hawaiian
☐ Guamanian or Chamorro
☐ Samoan
☐ Other Pacific Islander (Specify)_____
☐ Other (Specify)_____

FATHER

23. FATHER'S EDUCATION (Check the box that best describes the highest degree or level of school completed at the time of delivery)
☐ 8th grade or less
☐ 9th - 12th grade, no diploma
☐ High school graduate or GED completed
☐ Some college credit but no degree
☐ Associate degree (e.g., AA, AS)
☐ Bachelor's degree (e.g., BA, AB, BS)
☐ Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

24. FATHER OF HISPANIC ORIGIN? (Check the box that best describes whether the father is Spanish/Hispanic/Latino. Check the "No" box if father is not Spanish/Hispanic/Latino)
☐ No, not Spanish/Hispanic/Latino
☐ Yes, Mexican, Mexican American, Chicano
☐ Yes, Puerto Rican
☐ Yes, Cuban
☐ Yes, other Spanish/Hispanic/Latino
(Specify)_____

25. FATHER'S RACE (Check one or more races to indicate what the father considers himself to be)
☐ White
☐ Black or African American
☐ American Indian or Alaska Native (Name of the enrolled or principal tribe)_____
☐ Asian Indian
☐ Chinese
☐ Filipino
☐ Japanese
☐ Korean
☐ Vietnamese
☐ Other Asian (Specify)_____
☐ Native Hawaiian
☐ Guamanian or Chamorro
☐ Samoan
☐ Other Pacific Islander (Specify)_____
☐ Other (Specify)_____

Mother's Name _____ Mother's Medical Record No. _____

26. PLACE WHERE BIRTH OCCURRED (Check one)
☐ Hospital
☐ Freestanding birthing center
☐ Home Birth: Planned to deliver at home? ☐ Yes ☐ No
☐ Clinic/Doctor's office
☐ Other (Specify)_____

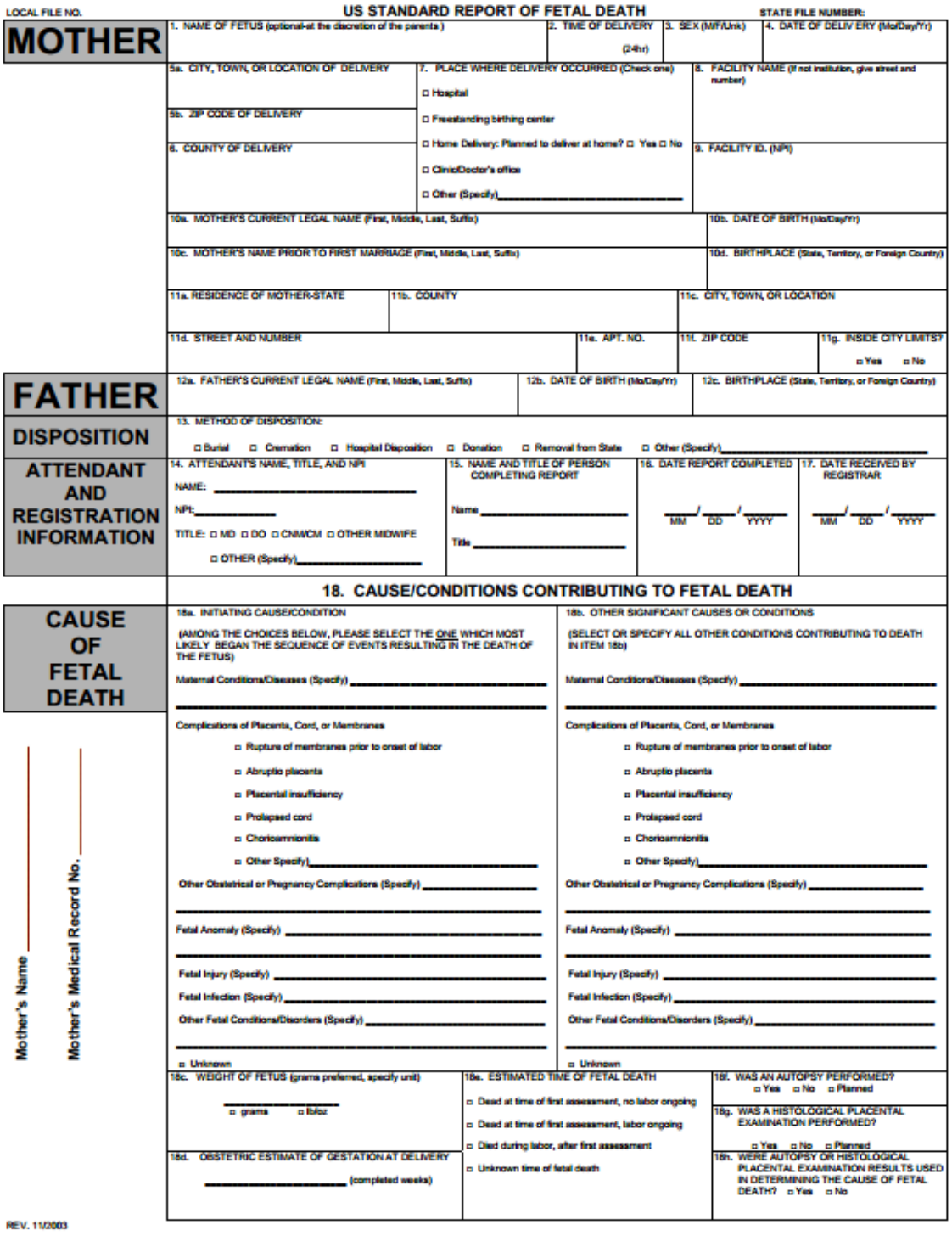
27. ATTENDANT'S NAME, TITLE, AND NPI
NAME: _____ NPI:_____
TITLE: ☐ MD ☐ DO ☐ CNM/CM ☐ OTHER MIDWIFE
☐ OTHER (Specify)_____

28. MOTHER TRANSFERRED FOR MATERNAL MEDICAL OR FETAL INDICATIONS FOR DELIVERY? ☐ Yes ☐ No
IF YES, ENTER NAME OF FACILITY MOTHER TRANSFERRED FROM:
_____

REV. 11/2003

APPENDIX C

CERTIFICATE OF FETAL DEATH



LOCAL FILE NO.

US STANDARD REPORT OF FETAL DEATH

STATE FILE NUMBER:

MOTHER

1. NAME OF FETUS (optional-at the discretion of the parents)
2. TIME OF DELIVERY (24hr)
3. SEX (M/F/Unk)
4. DATE OF DELIV ERY (Mo/Day/Yr)

5a. CITY, TOWN, OR LOCATION OF DELIVERY

5b. ZIP CODE OF DELIVERY

6. COUNTY OF DELIVERY

7. PLACE WHERE DELIVERY OCCURRED (Check one)
- ☐ Hospital
- ☐ Freestanding birthing center
- ☐ Home Delivery: Planned to deliver at home? ☐ Yes ☐ No
- ☐ Clinic/Doctor's office
- ☐ Other (Specify)_____

8. FACILITY NAME (If not institution, give street and number)

9. FACILITY ID. (NPI)

10a. MOTHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix)

10b. DATE OF BIRTH (Mo/Day/Yr)

10c. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last, Suffix)

10d. BIRTHPLACE (State, Territory, or Foreign Country)

11a. RESIDENCE OF MOTHER-STATE

11b. COUNTY

11c. CITY, TOWN, OR LOCATION

11d. STREET AND NUMBER

11e. APT. NO.

11f. ZIP CODE

11g. INSIDE CITY LIMITS? ☐ Yes ☐ No

FATHER

12a. FATHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix)

12b. DATE OF BIRTH (Mo/Day/Yr)

12c. BIRTHPLACE (State, Territory, or Foreign Country)

DISPOSITION

13. METHOD OF DISPOSITION:
☐ Burial ☐ Cremation ☐ Hospital Disposition ☐ Donation ☐ Removal from State ☐ Other (Specify)_____

ATTENDANT AND REGISTRATION INFORMATION

14. ATTENDANT'S NAME, TITLE, AND NPI
NAME: _____
NPI:_____
TITLE: ☐ MD ☐ DO ☐ CNM/CM ☐ OTHER MIDWIFE
☐ OTHER (Specify)_____

15. NAME AND TITLE OF PERSON COMPLETING REPORT
Name _____
Title _____

16. DATE REPORT COMPLETED
____/____/____
MM DD YYYY

17. DATE RECEIVED BY REGISTRAR
____/____/____
MM DD YYYY

18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH

CAUSE OF FETAL DEATH

18a. INITIATING CAUSE/CONDITION

(AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS)

Maternal Conditions/Diseases (Specify) _____

Complications of Placenta, Cord, or Membranes
- ☐ Rupture of membranes prior to onset of labor
- ☐ Abruptio placenta
- ☐ Placental insufficiency
- ☐ Prolapsed cord
- ☐ Chorioamnionitis
- ☐ Other Specify)_____

Other Obstetrical or Pregnancy Complications (Specify) _____

Fetal Anomaly (Specify) _____

Fetal Injury (Specify) _____

Fetal Infection (Specify) _____

Other Fetal Conditions/Disorders (Specify) _____

☐ Unknown

18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS

(SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18b)

Maternal Conditions/Diseases (Specify) _____

Complications of Placenta, Cord, or Membranes
- ☐ Rupture of membranes prior to onset of labor
- ☐ Abruptio placenta
- ☐ Placental insufficiency
- ☐ Prolapsed cord
- ☐ Chorioamnionitis
- ☐ Other Specify)_____

Other Obstetrical or Pregnancy Complications (Specify) _____

Fetal Anomaly (Specify) _____

Fetal Injury (Specify) _____

Fetal Infection (Specify) _____

Other Fetal Conditions/Disorders (Specify) _____

☐ Unknown

18c. WEIGHT OF FETUS (grams preferred, specify unit)
_____
☐ grams ☐ lb/oz

18e. ESTIMATED TIME OF FETAL DEATH
- ☐ Dead at time of first assessment, no labor ongoing
- ☐ Dead at time of first assessment, labor ongoing
- ☐ Died during labor, after first assessment
- ☐ Unknown time of fetal death

18f. WAS AN AUTOPSY PERFORMED? ☐ Yes ☐ No ☐ Planned

18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? ☐ Yes ☐ No ☐ Planned

18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY
_____ (completed weeks)

18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? ☐ Yes ☐ No

Mother's Name _____ Mother's Medical Record No. _____

REV. 11/2003

APPENDIX D

LOGISTIC REGRESSION RESULTS FOR ADD HEALTH

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Teenage Pregnancy	0.032	0.020	0.039	0.050	0.325***	0.315***
	(0.072)	(0.072)	(0.072)	(0.072)	(0.093)	(0.093)
High School Graduate			0.128	0.135	0.133	0.151*
			(0.071)	(0.072)	(0.072)	(0.072)
Parents High School			0.094	0.101	0.103*	0.109*
			(0.052)	(0.052)	(0.052)	(0.052)
Pregnancy Diabetic				0.696***	0.699***	0.674***
				(0.137)	(0.137)	(0.138)
Pregnancy Hypertension				0.018	0.009	0.006
				(0.098)	(0.098)	(0.098)
Mild Depression						0.169**
						(0.053)
Moderate Depression						0.196*
						(0.100)
Severe Depression						-0.019
						(0.220)
Black		0.098*	0.098*	0.102*	0.180***	0.166***
		(0.047)	(0.047)	(0.048)	(0.050)	(0.050)
Hispanic		0.018	0.050	0.054	0.030	0.034
		(0.084)	(0.085)	(0.085)	(0.091)	(0.091)
Asian		-0.176	-0.179	-0.177	-0.115	-0.116
		(0.116)	(0.116)	(0.116)	(0.118)	(0.118)
American Indian		-0.143	-0.129	-0.125	-0.033	-0.060
		(0.232)	(0.232)	(0.233)	(0.239)	(0.240)
Other		0.154	0.152	0.157	0.209	0.196
		(0.173)	(0.173)	(0.173)	(0.180)	(0.180)
Teenage*Black					-0.799***	-0.797***
					(0.167)	(0.167)
Teenage*Hispanic					0.178	0.187
					(0.265)	(0.266)
Teenage*Asian					-1.302	-1.293
					(0.744)	(0.744)
Teenage*American Indian					-1.214	-1.220
					(1.066)	(1.066)
Teenage*Other					-0.617	-0.616
					(0.658)	(0.658)
Constant	-1.606***	-1.628***	-1.820***	-1.849***	-1.873***	-1.927***
	(0.022)	(0.027)	(0.077)	(0.078)	(0.078)	(0.081)
Observations	16,835	16,835	16,835	16,830	16,830	16,823

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BIOGRAPHICAL SKETCH

Andrew T. Latinsky
Florida State University
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Tallahassee, FL 32306

EDUCATION

ABD Doctoral candidate. Sociology, Florida State University, Tallahassee, FL (present)

M.S., Sociology, Florida State University, Tallahassee, FL (2015)

M.A., Applied Sociology, University of Central Florida, Orlando, FL (2013)

B.A., Women Studies, University of Florida, Gainesville, FL (2010)

PUBLICATIONS – PEER REVIEWED

Rohlinger, Deana A. and Andrew Latinsky. 2015. "Privilege" in *Encyclopedia of Sociology (2nd Edition),* edited by G. Ritzer. Oxford: Blackwell Publishers.

Rohlinger, Deana A. and Andrew Latinsky. 2015. "Gender Socialization" in *Encyclopedia of Sociology (2nd Edition),* edited by G. Ritzer. Oxford: Blackwell Publishers.

Latinsky, Andrew. 2012. "Public Presentations of Gendered Bodies: A Look at Gay and Lesbian Online Dating Profiles" *Sociation Today* 10(2).

PUBLICATIONS [In Progress]

Latinsky, Andrew and Koji Ueno. "Leveling Up? Video Game Play in Adolescence and Impacts on the Transition into Adulthood." Revise and resubmit.

PROFESSIONAL RESEARCH EXPERIENCE

Research Analyst: Florida Department of Elder Affairs [February 2019-Present]

Researcher: Tallahassee Community College; Office of Institutional Excellence (Accreditation Division) [March 2018-February 2019]

PROFESSIONAL PRESENTATIONS

2018

Latinsky, Andrew. "Teenage Pregnancy, Race, and Fetal Loss: An Examination of Weathering Effects in National Data." Southern Sociological Society Conference. New Orleans, LA.

2017

Latinsky, Andrew. "Weathering the Storm: An Examination of the Interaction of Race and Teenage Pregnancy on Involuntary Fetal Loss." Southern Sociological Society Conference. Greenville, SC

Presider: The Health of Populations: A Focus on African Americans. Southern Sociological Society Conference Greenville, SC

2016

Latinsky, Andrew. "Leveling Up? Video Game Play in Adolescence and Impacts on the Transition into Adulthood." Southern Sociological Society Conference. Atlanta, GA.

Presider: Health Outcomes Over Time. Southern Sociological Society Conference. Atlanta, GA.

2015

Andrew Latinsky and Buyukozturk, Bertran. "Discriminating Tastes: How Gender, Race, and Sexuality Impact Online Dater's Self Descriptions and Date Preferences." Southern Sociological Society Conference. New Orleans, LA.

Presider: Intimacy and Romance: Framings and Practices. Southern Sociological Society Conference. New Orleans, LA.

2013

Latinsky, Andrew. "Signaling Self: How Gender, Race, and Sexuality Inform Online Dating." Southern Sociological Society Conference. Atlanta, GA.

Andrew Latinsky and Carter, Shannon. "Social Constructionism and Race: A Look at Online Comments regarding the Treyvon Martin Case." Southwestern Sociological Association, New Orleans, LA.

2012

Latinsky, Andrew. "A Comparison of Interracial Relationship Interests of Heterosexuals and Homosexuals on an Online Personal Dating Website." Southern Sociological Society Conference. New Orleans, LA.

INVITED PRESENTATIONS

2014

"Introduction to Regression Analysis." Florida State University. Social Statistics Class.

2013

"Racial Exclusion Patterns in Online Dating." University of Central Florida. Sociology of Race Class.

TEACHING EXPERIENCE

Florida State University

2016-2018

Adjunct Faculty

SYO 4402 Medical Sociology (Fall 2018)

Assistant: SYD 3020 Population and Society (Spring 2019)

Instructor

SYA 1000 Introduction to Sociology (Summer 2016)

SYG 2010 Social Problems (2016-Summer 2018)

Online Mentor

SYA 4010 – Social Theory

2015

Online Mentor

SYD 3020 – Population and Society

SYA 4010 – Social Theory

Class Construction: Dr. Daniel Tope; Social Theory Re-Wired.

2014

Teaching Assistant

SYA 4400 – Social Statistics

Online Mentor

SYO 4300 – Sociology of Politics

SYA 4010 – Social Theory

SYG 2010 – Social Problems

2013

Teaching Assistant

SYO 3100 – Family Problems and Social Change

Online Mentor

SYG 2430 – Sociology of Marriage and the Family

University of Central Florida

2013

SYP 3400 - Social Change

SYP 4000- Social Psychology

2012

SYP4000 - Sociological Social Psychology

SYG2000 - Introduction to Sociology

SYP3400 - Social Change

SYO4300 – Political Sociology

2011

SYA4450 - Data Analysis

CERTIFICATIONS, HONORS, AND TRAINING

*Advanced PIE Teaching Training Recognition; April 2016

*NIH "Protecting Human Research Participants" Certification #1356889; January 2014

*FSU Human Subjects Training Module Certification; January 2014

*FSU Program for Instructional Excellence Certification; August 2013

PROFESSIONAL SOCIETIES

Information Resources Committee Representative, FSU, Sociology Graduate Student Union (2015-2017)

Alpha Kappa Delta Honor Society, Sociology, FSU (2015-Present)

American Sociological Society (2014-2018)

Southern Sociological Society (2012-2018)

VOLUNTEER EXPERIENCE

August 2010 – August 2011

Halifax Behavioral Services, Auxiliary (Medical Clinic and Outpatient Department)

Acting in a volunteer capacity approximately eighteen hours a week. Responsibilities were primarily secretarial in nature but was called upon to aid in many different capacities and departments as needed, including work in outpatient and teaching centers.

Reference: Dr. Michael Reed (Outpatient Supervisor) (386-274-5333)

STATISTICAL AND COMPUTER EXPERIENCE

*Knowledge of SPSS and STATA statistical packages and programming.

*Beginner level programming with Visual Basic Plus and Java

OTHER SKILLS, SOCIETIES, AND HONORS

*Experience with WebCT, Blackboard, and Canvas online teaching platforms