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THE LONG-TERM HEALTH AND DEVELOPMENTAL IMPACTS OF CHILDREN
BORN AT LOW BIRTH WEIGHT

by
Kathryn Grace Kelly

A thesis submitted to the faculty of the University of Mississippi in partial fulfillment of
the requirements of the Sally McDonnell Barksdale Honors College.

Oxford
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Approved by

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Although this thesis marks the end of my time here at the University, one never graduates from Ole Miss. Hotty Toddy!

ABSTRACT

The state of Mississippi currently has the highest incidence of low birth weight (LBW) births in the United States. LBW is a negative birth outcome which can lead to suboptimal pediatric health and development. The primary goals of this thesis are to identify the long-term outcomes associated with LBW and to present potential interventions to address LBW. A combination of literature review and quantitative data analysis were used to inform the objective of this thesis. A variety of physical health, behavioral health, and other long-term issues were found associated with LBW. The consequences of LBW place LBW children at a disadvantage early in life, and some of these disadvantages can create challenges throughout the duration of their life. Prenatal maternal prevention strategies, postnatal interventions involving the LBW child, and educational interventions are all promising tools for reducing the rate and implications of LBW. Although there is ample room for further research into the long-term effects of LBW, it is evident that LBW is closely associated with lasting negative impacts which can reduce overall health and quality of life for children born at LBW. Due to the large economic and social impact LBW can have, the State of Mississippi should seek to ensure the presence and funding of adequate resources aimed at mitigating the effects of LBW.

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LIST OF ABBREVIATIONS

CHC	Community health center
CDC	Centers for Disease Control
DCD	Developmental coordination disorder
ELBW	Extremely low birth weight
LBW	Low birth weight
MSTAHRS	Mississippi Statistically Automated Health Resource System
NBW	Normal birth weight
SDOH	Social Determinants of Health
VLBW	Very low birth weight

INTRODUCTION

The term birth outcome is used to discuss both the gestational age and the birth weight of an infant (Chen, 1999). Birth outcomes are commonly used as an indicator of health for a variety of determinants including maternal health, labor and delivery, poverty, and nutrition (Cutland, 2017). In the United States, the Centers for Disease Control (CDC) and Prevention records data on a variety of birth outcomes including prematurity, infant deaths, low birthweight, and sex ratio (Centers for Disease Control and Prevention, 2020). These data are valuable because it may help to provide insight on the impacts of birth outcomes and facilitate improvements to maternal and child health (Centers for Disease Control and Prevention, 2020). The definition for adverse birth outcomes can vary slightly based on the specific scientific study of interest, but adverse birth outcomes typically encompass stillbirth, preterm birth, low birth weight, macrosomia, neonatal death, congenital anomaly, and small for gestational age (Weng, 2014). The course of this thesis will primarily focus on low birth weight (LBW) and its implications as an adverse birth outcome.

For an infant to be categorized as LBW, the newborn must weigh less than 2,500 grams (5lbs, 8oz) at the time of birth (Cutland, 2017). Symptoms of LBW normally include decreased composite weight at the time of birth, smaller physical appearance, reduced amount of body fat, and the infant's head may be proportionally larger than the rest of the body (Stanford Medicine, 2022). Specific concerns associated with LBW include low oxygen levels at birth, inability to maintain body temperature, difficult

feeding and gaining weight, infection, breathing problems, neurological problems and intraventricular hemorrhage, gastrointestinal problems, and sudden infant death syndrome (Stanford Medicine, 2022).

Beyond health concerns, there are also fiscal costs which accompany LBW. The cost for a LBW birth is remarkably higher than the cost for a normal birth weight (NBW) birth with the average hospital cost being \$27,200 and \$3,200 respectively (United Health Foundation, 2022). Within the spectrum of LBW, very low birth weight (VLBW) births incur more medical costs, and they make up roughly 30% of all newborn healthcare costs with a total of \$13.4 billion in neonatal intensive care unit costs (United Health Foundation, 2022). Immediate hospital treatments following a LBW birth (which include admittance to the neonatal intensive care unit, temperature-controlled beds, or specialized feedings services) all contribute to the increased cost inherent in a LBW birth (Stanford Medicine, 2022).

The primary cause of LBW is premature birth, which is defined as being born prior to 37-weeks gestation (The Children's Hospital of Philadelphia, 2014). Intrauterine growth restriction is another significant leading cause of LBW, and it refers to improper growth, in utero, during pregnancy (The Children's Hospital of Philadelphia, 2014). Other risk factors associated with a LBW birth are race, age, multiple birth, a prior LBW birth/maternal birth history, maternal health and pre-existing conditions, infection during pregnancy, insufficient maternal weight-gain during pregnancy, and substance use (The Children's Hospital of Philadelphia, 2014). Within the recent years of the coronavirus pandemic, it was also found that women who contracted COVID-19 were at an increased risk of delivering prematurely, and this subsequently puts these women at risk for

delivering a child at LBW (United Health Foundation, 2022). The social determinants of health (SDOH), defined as “conditions in the places where people live, learn, work, and play that affect a wide range of health and quality-of life-risks and outcomes” (WHO, 2008) are other factors which are closely tied to LBW and birth outcomes as a whole (Centers for Disease Control and Prevention, 2021). SDOH can be used to illustrate health disparities which are visible in the American healthcare system (Adler, 2016). Maternal factors including income, education level, marital status, healthcare access and quality, and race are examples of SDOH which are associated with adverse birth outcomes and LBW (Cutland, 2017 ; Gennuso, 2016; Zhang, 2009). Race is one of the most important SDOH and maternal indicators of LBW, as African American mothers are more than three times as likely to have adverse birth outcomes in comparison to white mothers (Gennuso, 2016). In response to these causes and risk factors for LBW, regular prenatal care, healthy diet, and no substance use (alcohol, drugs, smoking) during pregnancy have all been found to be the best strategies for preventing LBW, with regular prenatal care as the most effective (Stanford Medicine, 2022).

As of 2020, the national percentage rate for LBW birth was 8.24%, but the percentage rate of LBW births in Mississippi was 11.8% (Centers for Disease Control and Prevention, 2022). Not only is the percentage rate for LBW births in Mississippi higher than the national average, but the state of Mississippi ranked as #1 out of all 50 states with the highest percentage rate of LBW births in the country (Centers for Disease Control and Prevention, 2022). Within Mississippi, birth outcomes, including LBW, are worse in Delta counties compared to their non-delta county counterparts (Gennuso, 2016).

LBW births are problematic as they can lead to health complications and expensive healthcare costs. Based on these issues, and the exceptionally poor percentages of LBW births in the state of Mississippi, this thesis will further investigate the impact of LBW on pediatric health and development in order to provide potential solutions in an effort to reduce the challenges children born at LBW face.

METHODS

The course of this thesis sought to investigate:

1. The impact of low birth weight (LBW) on pediatric health and development.
2. Potential solutions to reduce the disadvantages that affect children born at LBW.

In order to complete this research, a combination of public health data was layered with a comprehensive literature review. Both the quantitative and qualitative data complemented one another and provided insight into the problem at hand while also supplying potential solutions.

Quantitative Public Data collection

To inform my study, while also giving a more holistic point of view, I implemented quantitative public health data into my research. In setting the framework for why LBW and its effects are relevant, I searched for data sources that gave background information on the prevalence of LBW in Mississippi. The Mississippi Department of Health provides a Mississippi Statistically Automated Health Resource System (MSTAHRs). Through the MSTAHRs I collected data regarding current (within the past 5 years) Mississippi LBW rates and its correlation with factors of age, race, education, and marital status. This data informed the background of which populations in Mississippi are most affected by the presence of LBW. Publicly available data provides information which is critical for giving later qualitative data significance and meaning.

Public Data Analysis

After collecting data from the MSTAHRS public database, I analyzed and organized the data. I looked for common themes within the data which allowed me to draw conclusions and further organize the data. I then conceptually organized the data into the visual form of a graph. The visualization data components further illustrate my research conclusions.

Literature Review

Through my literature review, I further investigated the following questions:

1. What is the specific impact of LBW on pediatric health and development?
2. What are potential solutions to reduce the disadvantages that affect children born at LBW?

As a whole, adverse birth outcomes can affect a variety of areas, and poor birth outcomes place children at a disadvantage early in life. The goal of this study was to address the problems brought on by LBW, provide potential solutions, and better understand and define the specific adverse health effects associated with being born at LBW.

CHAPTER I: ADVERSE EFFECTS OF LBW

LBW is associated with adverse long-term health outcomes. As birth weight decreases, the risk for long-term health complications increases (Hack, 1995). Birth weight has also been found to be related to a variety of developmental outcomes (Boardman, 2002). Upon review, the literature clearly illustrates that LBW is associated with:

1. Physical health abnormalities in pediatric patients
2. Behavioral and mental health disorders
3. Challenges which can be lasting into adulthood

Together, the literature presents a large breadth of complications which are associated with children born at LBW. A common theme of the examined literature is the disadvantage individuals born at LBW have in comparison to those born at NBW. These disadvantages can be seen as a life-long struggle as LBW not only poses issues at birth, but often lasts into their academic years and sometimes adulthood.

Physical Health Implications

LBW is associated with physical health abnormalities in pediatric patients. Being born at LBW or “being small for gestational age at birth was associated with suboptimal growth at least until age 5” (Mikkola, 2005). Motor skills are often impaired in children with adverse birth outcomes. Developmental Coordination Disorder (DCD), a motor functioning disorder, is positively correlated with being born at VLBW and exhibiting DCD at school age (Edwards, 2011). DCD in particular is more prevalent in children of

school age who are born at LBW than their NBW peers (Edwards, 2011). As a result, children born with adverse birth outcomes, specifically VLBW or very preterm children, perform more poorly on motor assessments than their NBW or full-term peers (Edwards, 2011, p. 6). This is important because motor skills have been linked to academic achievement, with decreased motor functioning decreasing levels of academic achievement (Edwards, 2011). Grip strength is a motor skill which was found to be significantly weaker in individuals who were born at extremely low birth weight (ELBW) (Saigal, 2007). LBW individuals have further been found to have limitations in visual and auditory processing, as well as decreased dexterity and an increase in clumsiness (Saigal, 2007). Besides motor skills, LBW is further associated with an increased risk for chronic medical conditions with asthma being one of the most common conditions (Mississippi, 2019; Currie, 2010). Overall, physical health abnormalities are associated with birth weight, and these outcomes place school aged children at a disadvantage to their NBW peers. Since motor skills and dexterity are essential components of elementary school education, LBW children can be hindered in their abilities to achieve academically.

Behavioral Health Implications

Mental health disorders are associated with children born at LBW. Autism spectrum disorders, including Asperger Syndrome, have been exhibited in LBW children (Currie, 2010). Attention-deficit hyperactivity disorder (ADHD) has likewise been found to be prevalent in children born at LBW (Hack, 2009). ADHD has been shown to have stronger association in LBW children living in urban areas than in comparison to suburban areas (Breslau, 1996). The association between ADHD in LBW children of urban areas is predominantly due to demographic factors of women sampled from this

area (Breslau, 1996). The urban sample of mothers featured more African American mothers, single mothers, and mothers without a high school diploma (Breslau, 1996). It is therefore likely that ADHD is associated with LBW children who come from poorer socioeconomic statuses, disadvantaged backgrounds, or are racial minorities; all of which is of greater prevalence in urban areas (Breslau, 1996). A relationship exists too between unfavorable birth weight and cognitive and developmental functioning (Brecht, 2012). Decreased composite IQ, general developmental delays, and cognitive dysfunction have all been shown to be associated with children born at LBW (Voss, 2012 ; Mikkola, 2005). There is a strong correlation between mental dysfunction in cases of extremely low birth weight (ELBW). In one study in particular, only 25 percent of ELBW infants obtained a classification of normal development by age 5, and only 26 percent of the total ELBW children were classified to have normal developmental outcomes excluding physical factors (Mikkola, 2005). High rates of cognitive dysfunction “suggests an increased risk for learning difficulties”, and specific skills including those related to “attention, language, sensorimotor, visuospatial, and verbal memory” were all seen as significantly poorer in children born at ELBW than in children born at NBW (Mikkola, 2005). Birth weight has been indicated to be an important component in the later mental functioning and capabilities of school aged children. Children who are born under the category of LBW are at increased risk for mental disorders which can place them behind their NBW peers in school.

Long-Term Impacts

LBW and poor birth outcomes present challenges which can be lasting into adulthood. While many of the health abnormalities associated with LBW present in early

childhood, some of these abnormalities can affect adulthood. Adverse birth outcomes and the mental and physical health abnormalities associated with it are correlated with poor long-term health outcomes (Currie, 2010). Young adults who were born at ELBW self-reported chronic health conditions at higher rates than in comparison to young adults born at NBW (Saigal, 2007). In a study that concentrated on the long-term follow up of VLBW children, adults born VLBW showed a greater presence of mental health problems in their 20s in comparison to NBW adults (Husby, 2016). Included in these mental health problems were attention and internalizing (Husby, 2016). Social issues such as decreased social and intellectual resilience, and personality traits linked to isolation from peers were also identified in association with adults born at LBW (Husby, 2016). In one 2020 study a 50-year follow-up was performed on adults who were born at LBW. When measuring the vitality (defined as a measure of energy and fatigue) of midlife adults who were born at LBW, they reported lower vitality than their NBW peers (Hegelund, 2020). In this same study LBW was also found to be associated with a risk of decreased life satisfaction and a low perception of quality of life during midlife (Hegelund, 2020).

Beyond just health, birth weight can affect life opportunities. Health problems in early childhood have been indicated to be “significant determinants of adult socioeconomic status” (Currie, 2010, p. 518). Since children with adverse birth outcomes are at a higher risk for early health problems, they can be further disadvantaged by socioeconomic status. Decreased composite IQ, ADHD, and reduced academic achievements are all associated with LBW and can influence the success of an individual into adulthood (Voss, 2012 ; Breslau, 1996 ; Edwards, 2011). While birth outcomes do

not directly determine adult health, LBW can put children at an increased risk for factors which later influence adult health and success.

CHAPTER II: INTERVENTION STRATEGIES

Based on the review of the available literature, it is evident that LBW is associated with negative health and developmental outcomes. In order to mitigate the impacts posed by LBW, it is important to propose feasible intervention strategies. Prenatal, postnatal, and education-based intervention strategies are available to potentially decrease the negative impacts faced by children born at LBW.

Prenatal Interventions

It can be reasonably concluded that the best way to mitigate the harmful impacts of LBW is to prevent the occurrence of LBW births. Prenatal interventions can be a key element in preventing LBW. Community health centers (CHC) and private medical practices both provide essential medical services to expectant mothers (Thorsen, 2019). As a whole, patients with earlier access to CHCs, and by association prenatal care, had reduced instances of LBW in comparison to patients with later access to CHCs (Thorsen, 2019). Despite this support for the prenatal care provided by CHCs, other confounding variables such as race, economic status, and demographic status can all impact birth outcomes (Thorsen, 2019). While prenatal care is undoubtedly an essential component of encouraging positive birth outcomes, the presence of other uncontrollable factors make it challenging to generalize the effectiveness of prenatal care alone in preventing LBW. Maternal anxiety, depression, and stress are all associated with negative birth outcomes (Feinberg, 2015). Specifically, high maternal cortisol levels during pregnancy have been shown to negatively impact amygdala volume and affect (Buss, 2012). Therapies aimed

at addressing maternal stress, such as psycho-educational programs that encourage co-parenting and healthy parental support, have been shown to diminish both maternal stress and the resulting negative birth outcomes (Feinberg, 2015). This type of therapy can be used as a prenatal preventative measure against negative birth outcomes which may include LBW (Feinberg, 2015). Nutrition during pregnancy is also important, and prenatal malnutrition increases the risk of LBW (Whitney, 2022). Based on this information, adequate maternal nutrition during pregnancy is an important prenatal tool that may be used to reduce the risk of LBW.

Postnatal Interventions

Postnatal interventions can be valuable in addressing LBW concerns after a child has already been born. The use of occupational and physical therapy has shown potential in reducing the risk of abnormal motor function in children born at LBW (Watkins, 2014). Early therapeutic interventions have the potential to improve complex motor planning, and these therapies may be especially beneficial in the case of high-risk children born at VLBW (Watkins, 2014).

Although LBW may appear to be an issue which solely impacts the child, LBW and birth-related issues can also negatively impact parents. Parents of LBW infants are often subject to distress (Mcmanus, 2014). Parental stress levels are of concern, because parental stress has been shown to be a risk factor in suboptimal child development (Schmitt, 2016). Therefore, intervention strategies aimed at addressing parental status, more specifically maternal psychological status, may lead to improvements in infant health outcomes (Brecht, 2012; Mcmanus, 2014). “Long-term therapeutic and behavioral interventions for parents”, “short-term parenting/coping”, and parental PTSD

interventions in conjunction with infant-based interventions have shown improvements to infant cognitive and behavioral development, with a large portion of the improvements being related to improvements in the parental mental health status (Brecht, 2012). Growth of both infant weight and social, emotional, and regulatory development has been seen in association with interventions addressing attachment and relationships of “parent-infant dyads” (Kim, 2022).

Nutrients play a valuable role in reducing infant mortality and morbidity, and breastmilk is the most beneficial nutritional option for infants (Natalia, 2021). LBW infants who are breastfed have been shown to increase significantly in both weight and length (Thakur, 2012). Despite the proven effectiveness of breastfeeding, breast milk production can be hindered for mothers who give birth to LBW children, in large part because they are often separated after birth when the infant is in the neonatal intensive care unit (NICU) (Natalia, 2012). Medical and educational resources that promote breastfeeding are therefore important interventions which can be implemented to assist in the optimal growth of LBW children (Natalia, 2021).

Education as an Intervention

Education may lend itself as an intervention strategy for LBW. In one retrospective study a strong association was drawn between generational maternal educational attainment and birth weight (Huang, 2015). This study looked over the course of three generations, and it found that the grandchild’s birth weight was associated with the grandmother’s education level at the time of the mother’s birth (Huang, 2015). This study emphasizes the importance of education, specifically maternal education, as a

determinant of birth weight from a generational perspective. As a result, maternal education and degree level should be viewed as valuable contributors to birth outcomes.

While mixed data exists regarding the risk that age singly has on birth outcomes, a 2007 study found evidence that a teenage pregnancy alone is a risk factor for adverse birth outcomes including LBW (Chen, 2007). In response to the issue of teenage pregnancy and teenage births in the United States, a study investigated and concluded that federally funded comprehensive sex education decreased the percentage of teenage births (Mark, 2022). Because teenage pregnancy puts the child at an increased risk for LBW, comprehensive sex education could function as a potential intervention tool against LBW for this specific subsection of LBW births. Prenatal education is also a valuable tool in mitigating LBW (Thielen, 2012). Group prenatal care education programs have shown promise in birth outcomes, as women participating in such programs experience longer gestation and increased infant birth weight (Thielen, 2012). While prenatal care and education are important, modern healthcare and societal obstacles can make it difficult for all pregnant women to receive adequate prenatal care and education (Thielen, 2012). Group prenatal care can accommodate multiple mothers at once and the complicated schedules of both mothers and physicians (Thielen, 2012). It is an affordable option for those of lower socioeconomic status, an accommodating option for those with untraditional daily schedules like teen mothers or working mothers, and an efficient solution for overworked healthcare providers (Thielen, 2012). Group prenatal care is a specific tool that can be used to address and maximize the prenatal education of mothers when one-on-one education is either unavailable, inaccessible, or unaffordable (Thielen,

2012). This education model is a promising option which may increase prenatal education for a variety of mothers (Thielen, 2012).

CHAPTER III: QUANTITATIVE RESULTS OF LBW IN MISSISSIPPI

Quantitative Data

The quantitative birth data from the state of Mississippi between 2016-2020 via the MSTAHRS platform shows certain trends associated with LBW. The quantitative data provides commentary on the factors which may lead to LBW births. Together, the quantitative data illustrates there are a variety of social, economic, and biological factors associated with an increased occurrence of LBW births. This information is valuable because it informs mothers, healthcare providers, and policy makers of the risk factors associated with LBW. This data also provides the potential for additional research to be conducted and for resources to be allocated in order to reduce LBW birth percentages.

Table 1

Table 1 illustrates a comparison between percent of LBW births and maternal race. This data shows that Black mothers are nearly twice as likely to give birth to a child of LBW in comparison to a White mother (13.3% vs. 6.9%). This finding is significant because it points to risk factors for LBW which are relatively complex.. While the genetic factors of race may explain the percentage increase in LBW, other prejudices and biases associated with race may also explain the association between LBW and race.

Table 2

Table 2 compares maternal marital status to the percentage of LBW births. In this table the data indicates that unmarried women are more likely to give birth to a child of LBW than a married woman (11.6% vs. 7.4%). This finding associates LBW with social

factors, and it could be hypothesized that the economic and social benefits provided by the institution of marriage likely contribute to such positive birth outcomes.

Table 3

Table 3 compares the maternal age group with the percentage of LBW births. This table shows a decreasing percentage of births to a child at LBW as maternal age increased from 10 to 34 years, however the risk then increased with increasing age from 35 to 40+ years. The findings of this data are likely supported by both social and biological factors. Optimal childbearing age, social resources, economic status, and maturity likely all influence birth outcomes.

Table 4

Table 4 compares the percentage of children born at LBW based on maternal education status. In this table the data indicated that the percentage of giving birth to a LBW child decreased with increasing educational status. This data can be explained by social factors rather than biological factors. The economic stability which comes with increasing educational status, as well as knowledge on pregnancy and prenatal care can be attributed to the decreasing percentages of LBW as education status increases.

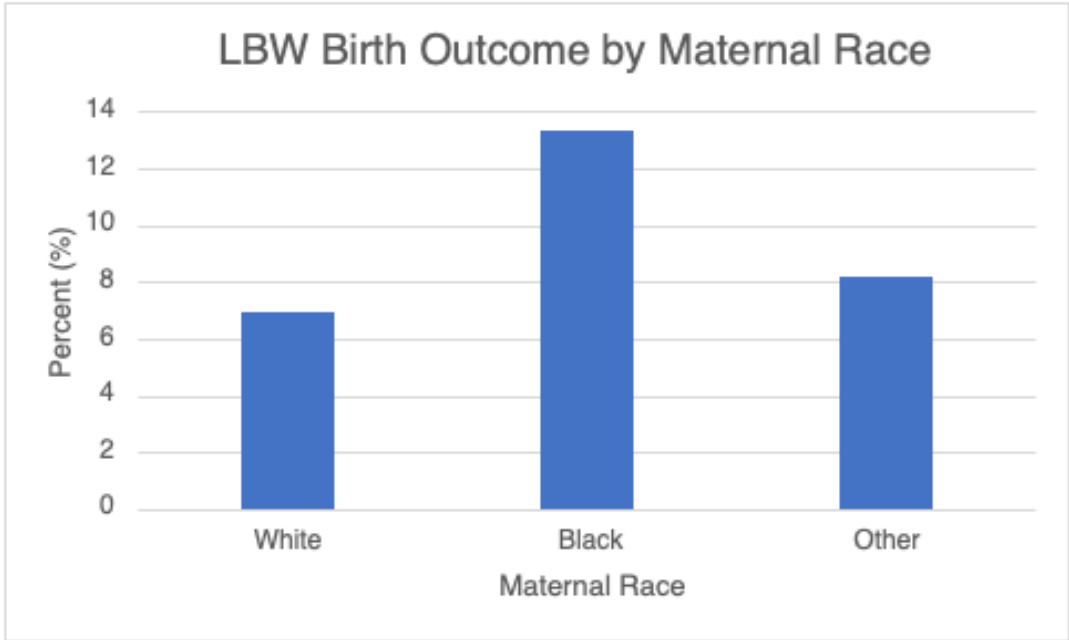


Table 1: A comparison of the percent of incidence of LBW births as a function of maternal race to include white, black, and other. Results are compiled from 2016-2020 in the state of Mississippi via the MSTAHRS.

Total births = 184,421

White births = 100,580

Black births = 78,754

Other births = 5,087

Total LBW births = 21,928

White LBW births = 8,424

Black LBW births = 13,034

Other LBW births = 470

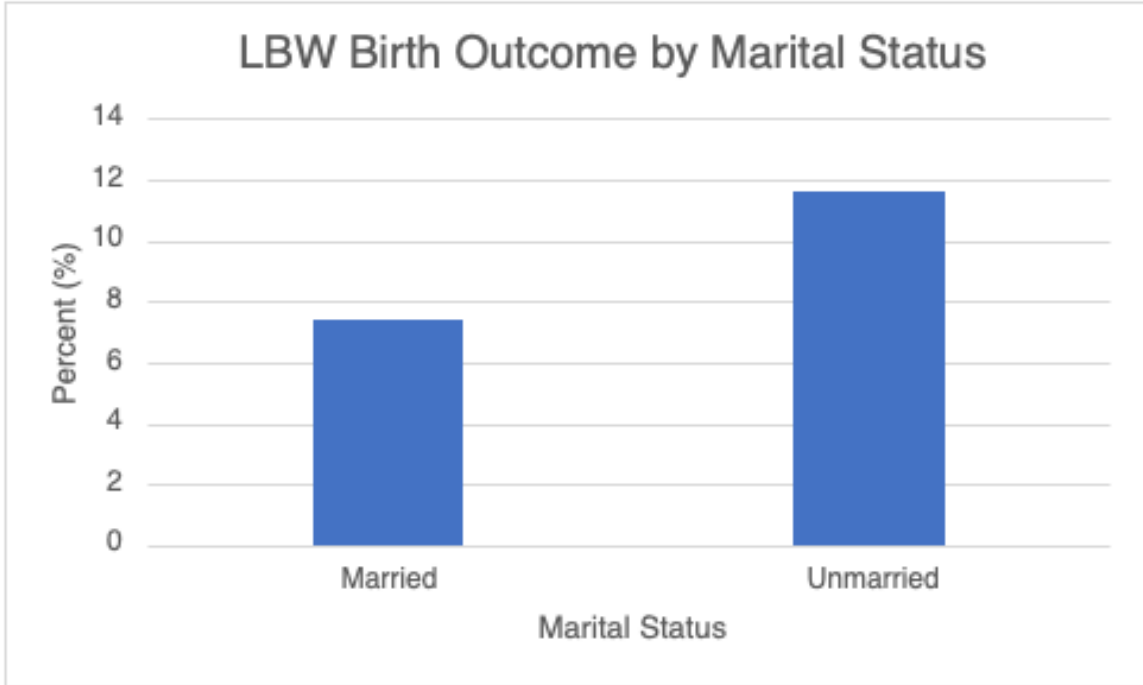


Table 2: A comparison of the percent of incidence of LBW births as a function of maternal marital status. Results are compiled from 2016-2020 in the state of Mississippi via the MSTAHRs.

Total births = 184,421

Married births = 84,324

Unmarried births = 100,097

Total LBW births = 21,928

Married LBW births = 7,416

Unmarried LBW births = 14,512

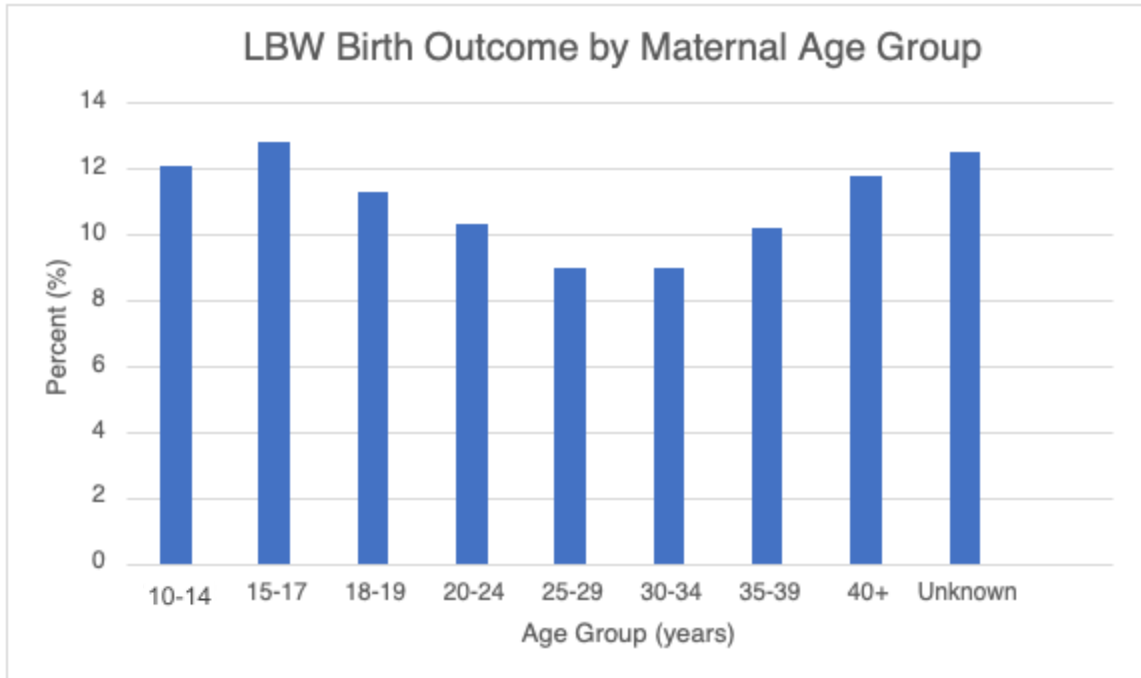


Table 3: A comparison of the percent of incidence of LBW births as a function of maternal age groups. Results are compiled from 2016-2020 in the state of Mississippi via the MSTAHRS.

Total births = 184,421

- 10-14 years = 226
- 15-17 years = 3,876
- 18-19 years = 10,976
- 20-24 years = 53,703
- 25-29 years = 58,538
- 30-34 years = 38,228
- 35-39 years = 15,947
- 40+ years = 2,820

Total LBW births = 21,928

- 10-14 years = 29
- 15-17 years = 529
- 18-19 years = 1,422
- 20-24 years = 6,564
- 25-29 years = 6,452
- 30-34 years = 4,324
- 35-39 years = 2,140
- 40+ years = 467
- Unknown years = 5 or fewer

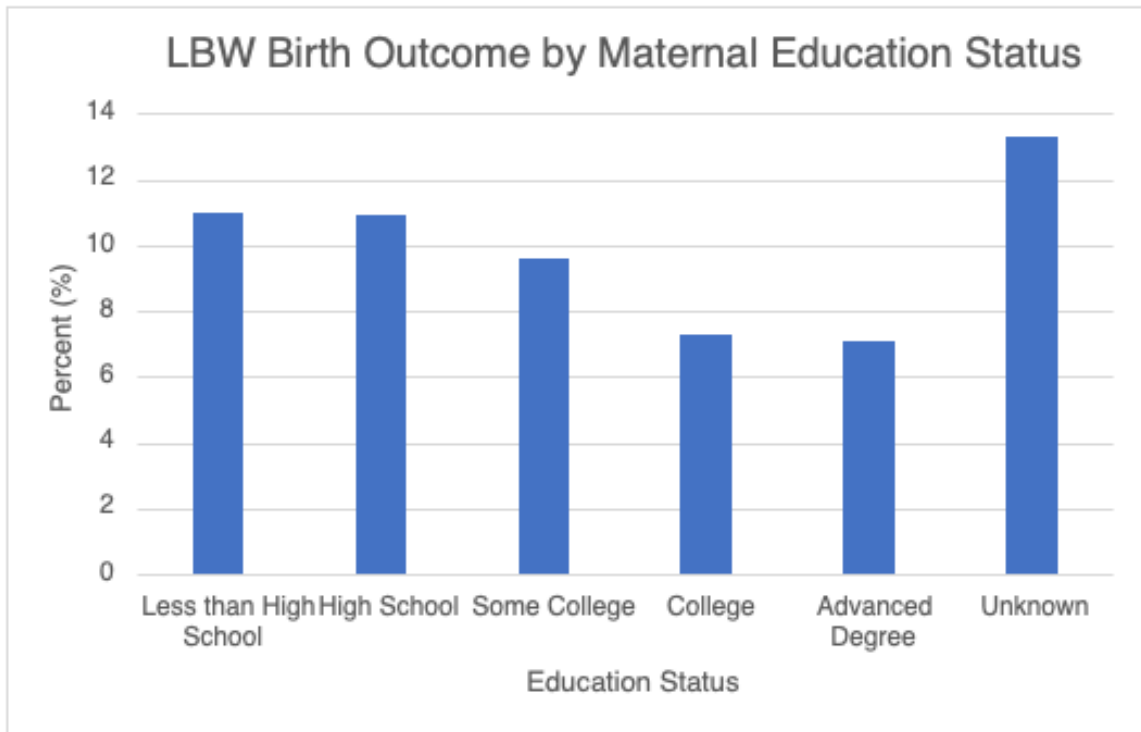


Table 4: A comparison of the percent of incidence of LBW births as a function of maternal education status. Results are compiled from 2016-2020 in the state of Mississippi via the MSTAHRs.

Total births = 184,421

Less than High School = 23,769

High School = 54,155

Some College = 67,096

College = 25,239

Advanced Degree = 13,750

Unknown = 412

Total LBW births = 21,928

Less than High School = 3,435

High School = 7,381

Some College = 7,779

College = 2,108

Advanced Degree = 1,131

Unknown = 94

DISCUSSION

Commentary & Recommendations

The issue of LBW is a concern for a variety of reasons, but it is especially important in the state of Mississippi. With some of the worst birth outcomes, including high rates of LBW birth, in the United States, Mississippi should seek to address LBW for the future of the State. Aiming to set the children of Mississippi up for success and prosperity can first begin with promoting positive birth outcomes. Based on the provided quantitative data and literature review, it is hard to ignore the negative impacts that LBW may have on children throughout the duration of their lives. Social, medical, and academic issues are at the forefront of problems posed by LBW. These issues are especially problematic because they not only affect children born at LBW, but they function to separate LBW children from their NBW peers. Inability or challenges to succeed socially and academically may create additional issues as LBW children compare themselves to their NBW peers. Inability of some LBW children to meet the standard of normalcy or success may further amplify issues. LBW also extends beyond the child to impact the family. Parental birth trauma and parental stress were previously reported in the literature and can influence the environment in which the LBW child is reared. Negative attachment and parenting styles as a result of parents' stress may lead to additional challenges for children born at LBW. Economic impacts are also an area of concern for children born at LBW. Hospital bills and life-long medical expenses can add

a burden to families of LBW children and LBW children themselves. Expenses may also add economic burden to hospitals, insurance companies, and the community. Overall, the economic, social, familial, and academic aspects of life may be more challenging for children born at LBW due to primary and secondary impacts.

After reviewing the quantitative data and literature in regards to LBW, there are some plausible responses which may be used to address the concerns associated with LBW. First, resource allocation should be viewed as an important and essential component in addressing the challenges of LBW. Although resources may be viewed as a costly response, providing adequate resources may eliminate or reduce costs associated with LBW later on. Resources should be allocated to address the following areas:

1. Prenatal care
2. Postnatal therapies
3. Education

While the data does not overtly state that prenatal care can completely prevent LBW from ever occurring, it is one of the most important components in reducing the chances of LBW and increasing the likelihood of positive birth outcomes. Resources should be readily available in CHCs in order to provide comprehensive prenatal care to as many women as possible. Comprehensive and accessible prenatal care will specifically help to address the issue of LBW for lower socioeconomic status women or in rural communities. Postnatal therapies are also effective and valuable in addressing the issues posed by LBW after it has already occurred. Physical therapy, occupational therapy, parental therapy services, and lactation consultation are all options which may promote the health and well-being of both the LBW child and respective parent. Furthermore,

these postnatal therapies provide the opportunity for partnership between healthcare professionals to develop comprehensive solutions and treatment plans for families.

Education is also a valuable tool in reducing the occurrence and issues of LBW. Promoting female education as a whole will lend itself to decrease the likelihood of a LBW birth for those females who go on to become pregnant. Comprehensive sex education is also an effective tool in reducing LBW. This is a tool that can be implemented in schools at a younger age to promote positive birth outcomes, and it can target the issue of teenage pregnancy which is a contributing factor for LBW births. Prenatal education is also valuable during pregnancy, and is an intervention that provides expectant mothers with direct medical counsel. Furthermore, educating the community, expectant mothers, and healthcare providers about the risk factors, long-term impacts, and responses to LBW may help to effect change in the awareness and amount of resources devoted to LBW.

The above solutions have been supported by research; however, they are not effective if not put into practice. Based on the physical, mental, and financial complications associated with children born at LBW, resources addressing LBW should be readily available. It is nearly impossible to implement effective interventions without the tools and resources necessary to do so. It is of my opinion that funding should be available for both public and private institutions that promote positive birth outcomes, specifically those addressing LBW. Although funding does increase front-end costs, preventing and reducing the rates of LBW will likely reduce back-end costs associated with treating and addressing LBW. It can be argued that interventions that decrease LBW

will decrease the financial burden faced by families, the healthcare system, and academic institutions.

Limitations

While the findings of this thesis have required much time, effort, and attention, they are not without some limitations. First, the issue of LBW can be stated to have many associations, but it is difficult to prove exact causation. A plethora of potential confounding variables including socioeconomic status, race, genetics, quality of medical care, geographical location, etc. may all impact LBW to some extent. These variables are not only confounding, they are also challenging to control for. It is therefore difficult to isolate LWB without taking into account the many other variables at play. Direct solutions may be difficult to present for factors which are uncontrollable or unfixable. Furthermore, LBW is a spectrum that can include LBW, VLBW, and ELBW, and this spectrum may stratify the negative effects of LBW. When addressing the appropriate responses for LBW, differing severities may require more or less extreme responses.

As for the methodology of this thesis, I originally proposed to conduct qualitative interviews of healthcare professionals with experience in the direct care of children born at LBW. The purpose of these interviews would have been to gather a more holistic view of the challenges associated with LBW and to determine potential solutions to reduce the disadvantages LBW children face. It was my intention to interview healthcare professionals, because they possess unique life and professional experiences with LBW that may not have been previously represented in the available literature. I would argue that the personal stories and opinions of healthcare professionals may add another dimension of depth and significance to the issue of LBW that may be lost in scientific

reports. The addition of personal stories has the potential to make the issue of LBW more important and relatable. Although these interviews would have likely benefited my research, I found that many healthcare professionals were hesitant to speak with me in regards to LBW. After facing rejection multiple times, I determined that many healthcare professionals felt ill-equipped to answer follow-up questions regarding children born at LBW. From this observation I concluded that there is a gap between the healthcare professionals involved in delivering LBW children and healthcare professionals who are involved in the direct follow-up care of LBW children. Based on my previous interest in obtaining qualitative interviews and the conclusion that there is a gap in knowledge regarding long-term LBW outcomes, I determined that further research could benefit from a more thorough investigation of healthcare provider roles in the follow-up care of children born at LBW. Furthermore, I question whether mothers of LBW children also face similar issues I did in finding health care professionals educated on LBW. Below are examples of proposed interview questions for such interviews of healthcare professionals.

1. What is your age and highest educational attainment?
2. Have you personally noticed any differences in the health or development of LBW children?
3. How have you seen the addition of prenatal care influence birth outcomes?
4. Have you personally seen negative birth outcomes due to the lack of prenatal care?
5. Do you have a memorable case of LBW you can speak on? What complications did this child have?
6. What specific follow-up services does your practice offer for LBW children?

7. (If yes) What type of services have you seen to be the most effective in practice?
8. Have you seen instances of LBW children facing any health problems following birth?
9. (If yes) What duration after birth?
10. Have you seen a presence of disability or behavioral abnormality in LBW children?
11. Do you see more complications in LBW children than NBW?
12. Are there certain things you see more in LBW children than NBW children?
13. Can you speak a little bit on how LBW children tend to grow following birth? Are there specific things you are worried about?
14. How do LBW children compare developmentally to peers their own age?
15. Could you explain any academic ability differences you have seen in LBW children?
16. Do you think children born at LBW are impacted by their birth weight, and if so to what extent?
17. What types of treatment (medicinal or alternative) are effective in addressing challenges children face as a result of LBW?
18. Could you elaborate/share any specific events that are related to your experience with LBW?

Despite the existence of some limitations, the literature and quantitative data indicate that LBW is an issue both at birth and beyond. The issue of LBW impacts children, families, and society as a whole. The issue of LBW is especially concerning for the state of Mississippi. Overall, LBW is not a favorable birth outcome, and it is one

which should be able to be addressed with the amount of knowledge and resources available today. The state of Mississippi should want to promote positive birth outcomes by reducing their jarring rates of LBW. Reducing the rates of LBW will serve Mississippi communities as a whole by potentially reducing the number of complications faced by children and some adults in this state.

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