Running Head: LOW BIRTH WEIGHT

Low Infant Birth Weight and Academic Achievement throughout Various Ages

Thesis

Submitted by Cristen Matthias

Table of Contents

CHAPTER 1: INTRODUCTION

Low birth weight is a major health problem in the United States. A significant number of infant deaths and childhood handicaps are related to low birth weight (LBW). Premature or early delivery is a major factor in LBW babies. A low birth weight (LBW) infant is one who is born weighing than 2500g. (5lbs. 8oz. or less), a very low birth weight infant (VLBW) weighs 1500g. (3lbs. 8oz. or less), and an extremely low birth weight (ELBW) infant weighs between 500 and 1000g. (1 1/2 to 2 1/2 lbs.) (Breslau, et. al 1988). In this study the term low birth weight (LBW) will include all three categories, LBW, VLBW and ELBW and will be treated in similar manner. Preterm or premature delivery is more common in the United States than in any other industrialized nation (Paneth 1995). It is also important to note that problems associated with LBW and the costs incurred in treating these problems can continue well into adulthood.

Background of the Problem

Although there have been many advances in the medical care of pregnant women, there has been very little change in the proportion of LBW deliveries in the United States. VLBW infants (3 lbs. 8oz. or less) are always born premature and their survival is a struggle, even with the use of modern technologies and intensive care (Hack, et. al 1995). According to studies of LBW students in primary and secondary schools, low birth weight has a negative impact on academic achievement. These problems require special educational and medical services that may be needed throughout a child's life. There are number of studies which presented that LBW children are experiencing either low achievement or had special needs in school compared to other children.

Statement of the Problem

There is not enough concrete information about the long- term effects of low birth weight in our country. Although long-term follow-up studies on LBW children have been explored in foreign countries, few have been done in the United States. Implementing long-term follow-up studies in countries that have national health care systems is easier because on- going medical records are more accessible, and because medical treatment is more available to individuals in lower socioeconomic groups (Shiono et. al 1995).

While there may not be a large body of information regarding the long-term effects of LBW in our country, there are studies showing that poor school performance and behavior disorders are more common in LBW children? These difficulties can often limit an individual's educational advancement and later career choices. Serious learning and behavior problems can also adversely impact the quality of family life. Given the increasing number of survivors of low birth weight, and the educational and health care costs involved in caring for these children, it is crucial that educators, health professionals and tax payers understand and appreciate the full extent of the adverse outcomes of low birth weight in children (Chomitz et. al 1995).

The devastating effects of LBW children should not be underestimated. Each member in our society bears the burden of these effects. Low birth weight babies and children require a greater amount of attention and services in order to survive and to compete with their normal birth weight peers. According to Lewit,Baker, Corman and Shiono 1995, about 31% of LBW children will repeat at least one grade by grade 10. In 1988, the average cost per pupil of repeating a grade has been estimated at more than $4,000. Since public schools operate on a fixed budget, monies used to assist these children are often taken from the school's general

budget funding. This constitutes a disproportionately large amount when compared to costs of services provided for the general population.

Purpose of the Study

The problem of long-term effects of LBW permeates our society. The purpose of this study is to provide information that explores the correlation between academic achievement at different ages, and low infant birth weight. This research project included the public school test scores of a large population of students of various ages in order to test the aforementioned correlation.

Research Questions

This study asks if there is a correlation between low birth weight and academic achievement during various ages. The research questions of this research study are given below:

1. What is the concept of Low Birth Weight and Stanford 9 test score?
2. How much Stanford 9 test score is effective to analyze the academic achievement of LBW children?
3. Does correlation between LBW and academic achievement is significant?
4. What can be done to ameliorate existing problems and prevent future ones?

Context of the Action Research Study

If a correlation between low infant birth weight and scholastic achievement can be solidly established then a greater amount of attention and support would be focused on this pervasive problem. In this study the use of data from a large population of students of different age groups

might afford the evidence needed to support further research aimed at minimizing current and preventing future effects of this debilitating condition.

Definitions

Low birth weight (LBW) refers to the birth weight of an infant weighing 2500g. (5lbs.8oz) or less.

Very low birth weight (VLBW) indicates the birth weight of an infant weighing 1500g. (3lbs.8oz.) or less.

Extremely low birth weight (ELBW) implies that the birth weight of an infant is between 500 and 1000 gr. (1 1/2 and 2 1/2 lbs.).

Normal birth weight (NBW) refers to the birth weight of infants born weighing more than 2500g (5 lbs. 8oz.). (Breslau, et. al 1988)

IEP refers to Individualized Education Program

*Note: As previously stated, the term LBW will include all three categories (LBW, VLBW and ELBW) in this study and will be treated in similar manner.

Summary

Due to the technological advances in our modern neo-natal care units, we can expect a greater number of LBW survivors. Given the information we already have on record regarding the difficulties associated with LBW, we can foresee even greater future difficulties if more serious attention is not paid to this problem. The hypothesis of this study, if shown to be correct, can increase the public's awareness, and hence, invite additional scientific research to combat this formidable problem.

Chapter 2: Literature Review

Introduction

The purpose of this Chapter is to provide a review of the literature on low birth weight and academic achievement. These studies include children that range from three months to twenty-six years of age and have utilized the clinical tests on specific test groups and control groups. Some of the tests used were: 1) The Wechsler Intelligence Scale for Children –Revised (WISC-R), 2) The Peabody Individual Achievement Test Revised, (PIAT-), 3) Kaufman Assessment Battery for Children (K-ABC), 4) Child Behavior Profile – Teacher's Version, (CBP) 5) Developmental Test of Visual Motor Integration (VMI), 6) Vineland Adaptive Behavior Scales 7), Berry, Developmental Test of Visual-Motor Integration, 8) Optic 2000 Vision Tester 9) Maico MA 25 Pure tone Screener, 10) The Woodcock Johnson Psycho-educational Battery

Relevant literature used in this study was located by the use of the "Netscape.com" database. The key search words used were "academic achievement and low birth weight" and "low birth weight and scholastic difficulties."

Synthesis of the Literature

In a study conducted by Strathis, O'Callaghan, Harvey & Rogers1999, in South Brisbane, Australia, head circumferences (HC) and head circumferences growth velocity (rate of growth)(HVG) were measured during (124) LBW infants' first year of life. A conclusion drawn from this work was that a small head circumference or a drop in the rate of head growth during the first two years of life is predictive of long-term disability. The conclusion was drawn from follow-up studies at ages 4, 8, and 12 months and 2,4, and 6 years. The study included academic

performances based on a teacher questionnaire dealing with aspects of reading, writing, mathematics and spelling. A child was considered to have a learning difficulty if academic problems were present in at least one of these four areas. Teachers reported a high prevalence of learning difficulty with LBW children. They were shown to be three times more likely to be academically delayed than the control group, resulting in the outcome, namely that small HC at 8 months of age and a reduced HGV between birth and 4 months in LBW infants, are associated with specific learning disorders in the school-aged child.

In another study by Schraeder 1992, an attempt was made to describe factors that influence school achievement in VLBW children at the completion of first grade. In this study 32 VLBW children were paired with 32 NBW children. VLBW children and their matches were made on the following variables: grade in school, gender, race, maternal education, birth order, and socioeconomic status. The comparison group was comprised of either classmates of the VLBW group or children who lived in, and attended school in that area. Instruments used included: the Developmental Test of Visual-Motor Integration (VMI), used to measure visual perception and motor behavior; the Kaufman Assessment Battery for Children (K-ABC), measuring cognition expressed in mental processing abilities and achievement; the Peabody Individual Achievement Test Revised (PIAT – R), which measures wide-range- achievement in mathematics, reading recognition, reading comprehension, spelling and general information, and Child Behavior Profile-Teacher's Version (CBP), which assesses the school performance, adaptive behavior and behavior problems.

The results of this study yielded some significant functional differences between the two groups of children. Examination of CBP data showed that teachers rated LBW students as having learned less, i.e. having lower academic achievement than their NBW peers. There were

also marked differences in visual motor integration and overall mental- processing- scores. The LBW group had difficulty on scales that required visual motor integration, spatial memory, localization and nonverbal concept formation that required visual motor communication.

Although birth weight status was not related to the children's overall scores on achievement testing, the results which indicated a need for special services, demonstrated that differences in information processing skills would suggest that LBW children do differ from NBW children in their cognitive processing strengths and these differences can definitely have an effect on their learning ability.

Klein, in 1988, conducted a study whereby she evaluated sixty-two VLBW children who were five years old. The study included all VLBW children who were enrolled in regular classrooms, which allowed the evaluators to compare the VLBW children's cognitive abilities along with their ability to function with their NBW classmates. The findings from this study revealed that the VLBW children had significantly more difficulty with visual perceptual and visual motor tasks than their NBW counterparts. Furthermore, VLBW children were rated by their teachers as having more classroom behavior problems than NBW classmates. The teachers also identified VLBW children as having more difficulty with expressing ideas verbally, attending to tasks, working independently and also following directions.

In a different type of research project, Farel, Hooper, Teplin, Henrey and Kaybell 1998, studied VLBW children who were born with Chronic Lung Disease (CLD), and compared their functioning to same age VLBW children who did not have Chronic Lung Disease (CLD). Both groups of children were assessed when they were seven years old. All the children were given standard physical and neurological examinations and screening tests for vision. Other tests used were the Weschler Intelligence Scale-Revised (WISC-R), the Woodcock-Johnson Test of

Academic Achievement-Revised and the Developmental Test of Visual-Motor Integration (VMI). At age seven, when compared with the non-CLD group of VLBW children, the group of VLBW children with CLD showed poorer performance on tests measuring language, memory and basic achievement in reading and math. These findings would seem to indicate that any additional physical insult to VLBW children adds further problems in other areas of development.

Hack, Breslau, Aram, Weissman, Klein &Borawski-Clark in 1992, as part of a longitudinal study, compared 249 VLBW children born in 1977 through 1979 with 363 NBW children of the same age. The hypothesis tested by these researchers was that VLBW children have significantly poorer neurocognitive abilities at school age than their NBW age mates. At the time of the testing, the children were between 8 and 9 years old. All the children came from the same county in Cleveland, Ohio and were randomly selected. Testers who were unaware of each child's birth weight administered the battery of tests. The tests used were the Wechler Intelligence Scale for Children-Revised (WISC-R), The Clinical Evaluation of Language Functions (CELF), The Bender Visual Motor Gestalt Test, The Purdue Pegboard Test, The Woodcock Reading Mastery Test, The Woodcock Johnson Psycho-educational Battery and The Wide-Range Achievement Test.

The results of the tests indicated that the total LBW population had significantly poorer scores on all measures with the exception of the speech domain. Despite similar IQ scores, VLBW children had significantly poorer scores on the CELF test of expressive language, memory, and fine motor function. This investigation confirmed the hypothesis that 8 and 9 year-old VLBW children have a poorer outcome at school age than do NBW controls. Ten percent of VLBW children demonstrated major neurologic abnormality, and an additional 21% who took a

Wechsler Intelligence Scale for Children Revised (WISC-R) had an IQ less than 85. In comparison, none of the children in the control group had any major neurologic abnormality, and only 16% had an IQ of less than 85. When the VLBW subgroup with a normal IQ and normal neurologic results was compared with the control group, significant deficits persisted in visual motor, memory function, expressive language, and hyperactive behavior (Hack et. al 1992).

Before the introduction of neonatal intensive care in the 1960's, the rates of major neurological and intelligence impairment among school age LBW children ranged from 54 to 68%. Since 1960 the rate of severe mental retardation and neurosensory deficit has decreased. However, the differences among relatively intact LBW and NBW children have persisted, as described in this study (Fried et. al 1992).

As the numbers of surviving LBW infants increase concerns about major neurological or developmental abnormalities persist. A number of centers have reported on the long-term outcome of LBW survivors supplying conflicting results. In a study conducted by Schmidt & Wedig 1990, a questionnaire was mailed to the homes of 49 families of surviving LBW children ages 6 to 10 years. Parents of 42 children completed the questionnaires and returned them. The purpose of the study was to obtain information from parents regarding their LBW school age children.

The information gleaned from this study revealed that all of the LBW children aged 6 to 10 were alive and in school in first to fifth grades. No child was blind or deaf. Only one child had a major health problem: cerebral palsy and epilepsy. Thirty-nine children were in regular classes and three were in special classes. Of the thirty-nine children in regular classes, thirteen were receiving special assistance such as remedial reading, remedial mathematics, speech therapy and attended part time learning disabilities classes. Seventeen, or 40%, of the 42

children had repeated a grade. The study found that 40% of the children did not repeat a grade or require special education, yet 40% did repeat a grade and six of those still needed special education. The overall rate (for all children) of repeating a grade in that school area was 12%.

A study conducted by Powls, Bsotting, Cooke, Stephenson & Marlow 1997, assessed the visual capabilities of 137 LBW children. Their aim was to compare the visual function of a cohort of LBW children in early adolescence with that of their normal peers. They also correlated visual impairment in this group with available perinatal data, and examined the relation between visual ability of LBW children and their cognitive motor skills.

The children in this study were between the ages of 11 and 13 years. Their eyes were examined for strabismus, movement disorders, visual acuity, stereopsis, contrast sensitivity, and for the use of visual correction for refractive errors. All of the children were given standardized tests of motor ability and cognitive skills. Their IQ's were measured by using a short form of the Wechsler Intelligence Scale for Children (WISC III). This provided subscale measures of the verbal and performance elements of IQ as well as an overall or full scale IQ. Perinatal data had been obtained from the children's medical records.

The population studied came from two hospital-based cohorts of LBW children treated at Mercy regional neonatal unit. None of the children had major neurodevelopment handicaps, and they were in mainstream schools at the time of the study. A normal birth weight control population was recruited from classmates having the same sex and similar age as the LBW children. This population also provided close matches in socioeconomic and educational variables.

The results revealed that LBW children had poorer vision than NBW controls. The examination showed that there were higher incidences of strabismus among the LBW children,

and visual acuity was poorer in the LBW group than in the control group. Stereopsis was reduced or absent in significantly greater numbers in LBW children, and the LBW children also displayed poorer contrast- sensitivity than their NBW counterparts. In general, abnormalities of visual function were detected more frequently among LBW children than among the control groups for all measures used. In the LBW group, 33% of the children had abnormalities that could be detected by standard visual screening measures compared to 15% of the controls. In addition LBW children in this cohort had a higher incidence of neurodevelopmental impairments, both in motor and cognitive areas. Researchers in this study concluded that they had demonstrated strong links between these abnormal outcomes and reduced visual function, particularly in relation to motor skills, IQ's, math and reading ability. These associations were strongest in children with strabismus and those with reduced contrast- sensitivity.

In June 2000, Dutch pediatricians collaborated on a national level, and collected data on 1,338 LBW infants. The research project called: "Looking back in time: outcome of a national cohort of very preterm infants born in The Netherlands in 1983," was conducted by Walther, Ouden, & Verloove-Vanhorick. The children involved in this project were assessed at 2, 5, 9, 10 - 11 and 14 years of age by their pediatricians, a team of investigators, and by parents, teachers, and the children themselves. The overall picture that emerged from this 14- year follow-up was that a low percentage of these LBW infants (10%) had a severe disability or handicaps at school age. Although 90% of the children were without severe disabilities at school age, many of them demonstrated serious difficulties in everyday life and were burdened with mild developmental abnormalities, and with behavioral and learning disorders that appeared to become more pronounced with age. It was concluded that in their adolescent period as many as 40% of the LBW survivors would probably not be able to become fully independent adults.

According to this study, abnormalities found during early-standardized clinical examinations are highly predictive for later problems.

Although information on later childhood educational outcomes of LBW children is sparse, several studies of LBW samples suggest that deficits in cognitive abilities and learning remain stable over time (Hunt, Bruce et al 1988). In 1998, a study conducted by Taylor, Klein, Minich & Hack, evaluated LBW children who were in middle school. The study was intended to explore the nature and extent of the children's cognitive, educational and psychosocial development as compared with their NBW counterparts. These researchers hypothesized that the LBW children would continue to display the same developmental difficulties as was indicated in a previous study (4 years earlier). In addition, it was also hypothesized that these developmental difficulties would not be limited to gross deficits in neurosensory status or cognitive functioning, but would also include problems in behavior, attention, and neuropsychological performance even among LBW children who were free of more obvious impairments. A third hypothesis was that the disparity in outcomes between the LBW group and control group would increase over a follow-up interval.

The participants in this study were 65 LBW children and 61 NBW children. The NBW control group was formed by random selection of classmates. For each LBW child, a NBW child matching the same race, gender and age within 3 months was recruited. An assessment of the sample groups at middle school age took place approximately 4 years after an earlier school-age assessment was given.

One research assistant assessed the children while a different research assistant interviewed parents, and supervised the completion of parent- rating scales. The instruments used provided data in the following categories: overall cognitive ability, language skills,

perceptual-motor skills, attention and executive function, memory academic achievement, academic performance, behavior problems, attention problems, self-perceived competence, self-ratings of depression, behavior competence and adaptive behavior.

This study was the first to follow a regional cohort of LBW children to middle school age using a comprehensive battery of neurobehavioral outcome- measures. The findings confirm the hypothesis that developmental and learning difficulties present in LBW children at earlier ages continue to be present at middle school age. The overall clinical implications of these findings are best validated in terms of relatively high rates of developmental, behavioral and learning problems in LBW children at middle-school age assessment. Impairment in one or more areas of functioning was observed in 63% of the LBW group compared to 18% of the NBW control group. These results also provided support for the hypothesis that developmental and learning problems in LBW children become increasingly pronounced over time. Changes in outcomes during the 4- year interval between early and middle school age assessments, measuring the children's academic performance, cognitive abilities, and word recognition were significantly less positive in the LBW group compared to their NBW counterparts.

Although recent reviews of the outcome of school age children who were LBW infants have raised concerns about their relatively high rates of learning problems and school difficulties, among children without severe handicapping conditions, both the prevalence and risk factors of these children remain uncertain. Since most studies have been based on small samples; a study by McCormick, Gortmaker and Sobol, 1989, with data from the 1981 National Health Interview Survey was utilized to remediate this problem. The 1981 Survey included a Child Health Supplement that collected data from one randomly selected child in each eligible household; a total of 11,699 children aged 4 to 17 were included in this survey.

The interview contained a series of questions concerning parent- reported behavior problems and chronic childhood conditions, along with socio-demographic material. All the information was derived from parental reports, and so no medical examinations of children were given nor were there any reviews of medical records. Children whose parents reported either mental disability (approximately 13 children) or autism were removed from the sample for this analysis. Questions about school difficulty were stated as two specific questions. The first was asked about children aged 5 to 17 who were attending special classes; "Does your child go to a special class or get special help in school because of a disability or health problem?" The second question was asked as to whether the child had ever "repeated any grades for any reasons." School difficulty was considered present if the response to either or both questions was in the affirmative.

Results of this survey indicated that LBW children were more likely to have experienced school difficulty, in terms of both repeating grades and requiring special education. A third of the LBW children had had either or both types of difficulty. Furthermore, LBW children received significantly higher scores on the hyperactivity sub-scale. Besides the relationship with hyperactive behavior, male gender, black race, a greater number of siblings, the absence of either biologic parent, a family income in the poverty range, and low maternal educational attainment remained strong independent risk factors for school difficulty. The associated risks of these indicators of socioeconomic disadvantage were strongest for repeating a grade. Secondary analysis results provided additional evidence of the risk of school difficulty among lower birth weight children in a large representative sample. These results also reinforced the well-established association between socioeconomic disadvantage and academic problems. Equally important, this analysis further associated LBW with hyperactive behavior and socioeconomic

disadvantage. Thus, the poor, tiny child who develops a behavior problem is at greatest risk of school difficulty.

The proportion of LBW children for whom one type or another of school difficulty is reported is similar to that reported in other samples. Likewise, the prevalence of underachievement in the overall sample is similar to that in other reports. Despite certain limitations, the results of this survey provided support for concern about the longer-term behavioral and academic status of LBW children, especially those born to disadvantaged mothers. As already indicated, the risk of LBW children having such difficulties is markedly higher than for NBW children. According to Hughes & Simpson, 1995, the extent to which the risk of school difficulty can be ameliorated for these children needs to be established. Further studies are needed which specifically explore the impact of income and other resource interventions on LBW. These researchers also point out that early results have suggested that intensive educational intervention in early childhood (up to 3 years of age) results in gains in cognitive assessment scores and fewer behavior problems.

In a longitudinal research program conducted by Lagerstrom, Bremme, Eneroth, and Janson 1994, in Stockholm, the medical and educational records of LBW and NBW children were studied. These records began at the time of the children's birth and continued until the children reached 18 years of age. Children who attended special schools for the mentally disabled or those needing special institutionalized care due to extreme physical or mental handicap, were not included in this study. However, the population did comprise a representative group of children attending normal schools in the metropolitan area in Sweden. The aim of the study was to confirm or reject earlier results concerning the relation between birth weight and long-term intellectual development as measured by school grades.

Results of this study indicated that LBW children scored significantly lower grades than NBW children did. At the time of the study, all boys in Sweden at the age of 18 years went through a military draft that included a medical and psychological (IQ) examination. The examinations showed that NBW boys were larger and performed better on IQ tests than LBW boys. Looking at the educational records of these children, a familiar picture emerged, namely that children born in adverse circumstances (LBW children) perform intellectually inferior as compared to NBW children who had been given a better start in life.

Another study, the purpose of which was to discover whether a correlation existed between children's birth weights and their scholastic achievement in school, was conducted by Brook, Shemesh & Heim in 1990. The project entitled "The Correlation Between Birth Weight and Learning Traits in Senior School Pupils – A retrospective Survey,"' studied the school records of 718 high school students. The purpose of the study was to establish whether a correlation existed between children's birth weights and their scholastic achievement in school.

The correlation between academic achievement and birth weight had been previously investigated, in elementary and middle schools, and those conducting this study wanted to ascertain whether additional schooling had changed the children's known educational status. The records of 718 high school students were reviewed. Among the 718 students, 45 were LBW children. The LBW students'achievements was analyzed and the NBW students' records were used as a control group. The results of the analysis showed a statistically significant disability for LBW children in the study of exact sciences and foreign languages. However, no significant differences were noted in the study of humanities.

According to this investigation, it appears that primary and middle school education does little to change the scholastic acumen (or lack thereof), of these LBW children. The contention

of the authors of this study was that a prospective study ought to be carried out in order to provide "at risk mathematicians" with additional assistance while at middle school.

In a study published in the International Family Planning Perspective Journal, June 2000, participants from birth to age 26 were studied. This study analyzed data on infants born in the United Kingdom during the period of April 5 through 11, 1970. There were also follow-up studies on these subjects at 5, 10, 16 and 26 years of age. Infants were excluded if they had congenital abnormalities that would influence developmental outcomes. The resulting sample consisted of 1,064 LBW infants, and 13,125 NBW infants who served as the comparison group. The following information was gleaned from this study. People who were born LBW are slightly less likely to perform well in school. Likewise, they are less likely to hold professional or managerial jobs and are more likely than NBW individuals to work as unskilled, semiskilled or manual laborers. They were also shown to have reported lower weekly incomes than people who were NBW.

There is mounting evidence that the effects of LBW can impede an individual's learning process as well as negatively impact the individual's self-image and general outlook on life. Although problems associated with LBW are complex and far- reaching it has been shown in various studies, (The Role of Social change in Preventing LBW, Hughes & Simpson 1995, LBW: Analysis and Recommendations, Shiono & Berhman 1995), that they can be confronted. There is no doubt that additional legislation supporting funding for research, treatment, and prevention of LBW deliveries needs to be implemented. The following are recommendations that can be helpful in preventing and ameliorating the effects of LBW deliveries: (Paneth 1986) 1) make family planning services more assessable to low-income teenage women; provide services in schools, churches, community organizations, and youth centers. 2) support funding

that makes health courses available in educational institutions (starting at middle school). These courses should provide students with in-depth information about the causes and effects of LBW deliveries (Shiono & Behrman 1995). 3) remove barriers for teenagers to get birth control by ensuring confidentiality 4) promote program evaluation and research to find effective and culturally sensitive family planning strategies for males and females 5) remove barriers for pregnant drug and alcohol abusers seeking help by eliminating risk of legal sanctions 6) offer adequate nutrition to pregnant women by expanding such programs as WIC, food stamps, and food shelves (Center for Early Education and Development 2000). 7) Provide early educational enrichment programs for very young LBW children who are at risk of compromised development. There is evidence to show that enrichment programs improve developmental outcomes for LBW students. Expanding enrichment programs at all levels of education has the potential to greatly reduce some of the adverse developmental and educational problems that afflict LBW children and adults (Hack et al 1995).

Conclusion

This study attempts to draw a correlation between LBW and academic achievement at different growth periods. The above studies have demonstrated that a significantly higher percentage of LBW children manifest learning problems which are rooted in difficulties with visual motor integration, spatial memory, nonverbal concept formation that requires visual motor communication and hyperactivity. Studies encompassed individuals from 3 years to 26 years of age. In almost all cases, the results of the research have confirmed the detrimental effects of LBW as related to academic achievement. These results remain relatively consistent across different age periods. Although the results have been unchanging, these studies present some

limitations that can hinder their validity. In most of the studies, the results found were based on somewhat small numbers of samples. Furthermore, the testing instruments used in some studies were explicitly designed for that specific research project. The problem with this methodology is that when an instrument is designed to elicit a specific result, the validity of the results is put into question. In other cases many of the instruments used were the same ones used to test children for special class placements. The problem with this method is that the population tested has already exhibited difficulties in school, and does not represent the general population. In contrast to the limitations noted in those studies, the proposed study will be using the entire school population of three public schools, incorporating children of many different ages, except for the children who are specifically excluded from taking the Stanford 9 test. In addition, the scores measured will be from tests that all public school children are required to take. The larger number of subjects used and the data taken from commonly used academic assessments may provide greater validity to this research project.

Summary

The aforementioned studies have shown that there is a correlation between LBW, learning problems and the effects of these problems. The problems associated with LBW infants affect all of us. As taxpayers, we shoulder the added costs of providing special treatments and services to assist LBW infants and children. Further down the road, if these problems are neglected, they will most likely result in learning disabilities, leading to higher absenteeism, and even higher school dropout rates. This eventuality should concern us all. In order to combat and prevent problems associated with LBW, information is needed. Only when the public is armed with accurate and valid information, can steps be taken to prevent and

ameliorate the problems associated with LBW. The purpose of this study is intended to provide additional valuable information regarding LBW and academic achievement.

Chapter 3: Research Methodology

"The purpose of Chapter III is to present the methodology used to answer the research questions presented in Chapter I." Does a correlation exist between Low Birth Weight and academic achievement during various ages? This study is an extension of other similar studies done primarily in elementary and middle schools and is aimed at investigating a possible correlation between students' achievement test scores and their birth weights. It further attempts to explore the consistency of the resulting correlation at different developmental stages. The age ranges of students participating in this study include students from 6 to 18 years of age. Using the scores from the Stanford 9, which is an academic achievement test given annually to public school students; a statistical correlation was investigated between achievement test scores and student's birth weight. Information was provided from a questionnaire filled out by parents. Three schools randomly selected one elementary, one middle and one high school, were participate. Research studies indicate that intellectual and academic functioning of low birth weight (LBW) children remain generally below that of normal birth weight (NBW) children. At present there is a paucity of solid information about the long-term follow-up of LBW children in the United States. It is important to ascertain whether problems related to academic achievement due to LBW persist throughout childhood, adolescence and into adulthood. If a correlation exists between LBW and academic achievement during various ages, what can be done to ameliorate or prevent these problems?

Sample of the research

Three schools from the Los Angeles Unified School District which were randomly chosen and agree to participate in this study were contribute the raw data (student's test scores

and birth weight information provided by parents) needed for this study. The sample size of this study was approximated at 4,303 students. The first school to be included is West Athens Elementary School. It is located in South Central Los Angeles, and its student body is presently comprised of 52% Latino and of 48% African American students. There are presently 1200 students in this school, 300 students are in Pre-Kindergarten and Kindergarten classes, and 60 students have IEP's (Individualized education program) that specifically exclude them from taking the Stanford 9 Achievement test. These 360 students were omitted from this study because they are exempt from taking the Stanford 9 Achievement tests. Students in this school are from 6 to 10 years of age.

The next school used in this study was Hollenbeck Middle School, located in East Los Angeles. The student body of this school is presently comprised of 98% Latino students and 2% African American and members of other ethnic groups. At present there are approximately 1,000 students in the school, and 17 students have IEP's that specifically state that they are excluded from taking the Stanford 9 Achievement test. These 17 students were being included in this study because they are exempt from taking the Stanford 9 Achievement tests. Students range from 11 to 13 years of age in this school.

The third school to be used in this study was Palisades High School, located in the Pacific Palisades. The ethnicity of the student body is presently comprised of 30% Latino, 36% Caucasian, 31%African American and a small portion, 3% Asian and other ethnicities. There are presently 2,500 members of the student body and 20 of these students have IEP's that state they are exempt them from taking the Stanford 9 Achievement test. This exemption prevents these 20 students from being included in this study. The age of students in this school range from 14 to 18 years. Participants in this study will include all the students that attend the three

schools with the exception of those students whose IEP's specifically exempt them from taking the Stanford 9 Achievement test.

Data Analysis

The materials used in this study included sample students' Stanford 9 test scores and a questionnaire. The single page questionnaire contained 8 questions, numbered 1 to 8 on the left margin. All answers to these questions were multiple choices, delineated with upper case letters, A, B, and C. Answer choices were horizontally placed 2 spaces below the question, beginning at the left margin. All questions and answers were written in 12- point Palatino font and lines will be double-spaced. Directions placed on the top of the questionnaire will state the following: "Please fill out the questionnaire by circling one answer for each question." Stanford 9 test scores were used in this project because they are the most commonly used and available test scores in the Los Angeles Public School System. They also provide a significant body of information concerning the students' ability in areas of mathematics, reading comprehension, and writing. The parent questionnaires were used because this is viewed as one of the most direct ways of obtaining information about students' birth weights. The information collected was analyzed using a correlational study in order to show the relation between 2 variables (birth weight and Stanford 9 test scores). If a significant correlation is found then it can call attention to the importance of future investigations in this area.

Ethical Consideration

Special permission was obtained in order to use students' Stanford 9 test scores for this research project. Precautions were taken to protect test score confidentiality and information

gleaned from the questionnaire. Teachers distributed the questionnaire to each student in the sample. The teachers then directed the students to print their names on the upper right hand corner of the questionnaire before they leave the class. Boys were given a green questionnaire and girls were given a yellow questionnaire. The different colored sheets provided additional gender information for possible future use. Questionnaires were one page in length and all questionnaires asked the same questions. There were questionnaires written in English and Spanish. Along with the questionnaire, the students will be given a stamped envelope with the researcher's name and address on it. Students were asked to have their parents or guardian to fill out the questionnaire and mail it back by a specified date. These instructions were typed on the back of the questionnaire. In order to motivate the parents to return the answered questionnaire, the students were told that a personalized certificate acknowledging their participation in the research project was given to them when the answered questionnaire is received by the researchers.

CHAPTER 4: DATA ANALYSIS

This chapter shows the outcomes of the interviews and survey, on the basis of which we can analyze if there is a correlation between LBW and academic achievement and what can be done to ameliorate existing problems and prevent future ones? The results and outcomes of questionnaire survey and Stanford 9 test score are presented in this part of the dissertation:

Survey Analysis

For the survey technique we used the questionnaire. The total number of respondents of this survey was around 4303. The respondents of this survey are LBW children of three different schools.

West Athens Elementary School

The first school of this research is West Athens Elementary School. It is located in South Central Los Angeles, and its student body is presently comprised of 52% Latino and of 48% African American students. There are presently 1200 students in this school, 300 students are in Pre Kindergarten and Kindergarten classes, and 360 students have IEP's (Individualized education program) that specifically exclude them from taking the Stanford 9 Achievement test. These 360 students were omitted from this study because they are exempt from taking the Stanford 9 Achievement tests. Students in this school are from 6 to 10 years of age.

Statistical Analysis

The mean of the questionnaire survey is given below:

Statistics

		1. Does this student have any brothers or sisters?	2. If there are other brothers and sisters in the family, in what order was the student born?	3. Did the student have a full-term or premature birth?	4. What was the student's birth weight?	5. Where was the student born?	6. Was the student born during the daytime or evening (AM or PM)?	7. Was the student bottle-fed?	8. What was the age of the mother at the time of the student's birth?
N	Valid	840	646	840	840	840	840	840	840
	Missing	0	194	0	0	0	0	0	0
Mean		1.98	2.30	1.38	1.42	1.82	1.37	1.42	1.75

1. Does this student have any brothers or sisters?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	194	23.1	23.1	23.1
	2	471	56.1	56.1	79.2
	3	175	20.8	20.8	100.0
	Total	840	100.0	100.0	

The above frequency table shows that majority of respondents have 1-3 brothers and sisters and some of them have no or 4 to 8 brothers and sisters. The data shows that 471 out of 840 participants from the West Athens Elementary School have 1-3 brothers and sisters; 194 out of 840 participants of the research have no brother or sister and 175 out of 840 participants of the research have 4-8 brothers and sisters.

2. If there are other brothers and sisters in the family, in what order was the student born?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	226	26.9	35.0	35.0
	3	420	50.0	65.0	100.0
	Total	646	76.9	100.0	
Missing	System	194	23.1		
Total		840	100.0		

The above frequency table shows that majority of respondents are youngest in their family and some of them have middle and oldest order in their families. The data shows that 420 out of 840 participants from the West Athens Elementary School are youngest in their families; 226 out of 840 participants of the research are oldest in their family and remaining of them has middle position in their families.

3. Did the student have a full-term or premature birth?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	521	62.0	62.0	62.0
	2	319	38.0	38.0	100.0
	Total	840	100.0	100.0	

The above frequency table shows that majority of respondents have full-term birth and some of them have premature birth. The data shows that 521 out of 840 participants from the West Athens Elementary School have full-term birth; and 319 out of 840 participants of the research have premature birth.

4. What was the student's birth weight?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	487	58.0	58.0	58.0
	2	353	42.0	42.0	100.0
	Total	840	100.0	100.0	

The above frequency table shows that majority of respondents have less than 5lbs. 8oz birth weight and the remaining of them have 5lbs. 8 oz. or higher birth weight. The data shows that 487 out of 840 participants from the West Athens Elementary School have less than 5lbs. 8oz; and 353 out of 840 participants of the research have 5lbs. 8 oz. or higher birth weight.

5. Where was the student born?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	150	17.9	17.9	17.9
	2	690	82.1	82.1	100.0
	Total	840	100.0	100.0	

The above frequency table shows that majority of respondents were born in a hospital and the remaining of them was born at home. The data shows that 690 out of 840 participants from the West Athens Elementary School were born in a hospital; and 150 out of 840 participants of the research were born at home.

6. Was the student born during the daytime or evening (AM or PM)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	530	63.1	63.1	63.1
	2	310	36.9	36.9	100.0
	Total	840	100.0	100.0	

The above frequency table shows that majority of respondents were born during the daytime and the remaining of them was born during evening. The data shows that 530 out of 840 participants from the West Athens Elementary School were during the daytime; and 310 out of 840 participants of the research were born during evening.

7. Was the student bottle-fed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	490	58.3	58.3	58.3
	2	350	41.7	41.7	100.0
	Total	840	100.0	100.0	

The above frequency table show that majority of respondents were bottle-fed and the remaining of them was not. The data shows that 490 out of 840 participants from the West Athens Elementary School were bottle fed; and 350 out of 840 participants of the research were not bottle-fed.

8. What was the age of the mother at the time of the student's birth?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	251	29.9	29.9	29.9
	2	545	64.9	64.9	94.8
	3	44	5.2	5.2	100.0
	Total	840	100.0	100.0	

The above frequency table show that the age of the majority of mothers of LBW children at the time of the student's birth were between 19 to 26 Years; remaining of them were between 12 to 18 Years and 27 years and up. The data shows that 545 mothers of the LBW children

were between 19 to 26 Years; 251 out of 850 mothers were 12 to 18 years and 44 out of 840 mothers were 27 years and up.

Hollenbeck Middle School

The next school used in this study was Hollenbeck Middle School, located in East Los Angeles. The student body of this school is presently comprised of 98% Latino students and 2% African American and members of other ethnic groups. At present there are approximately 1,000 students in the school, and 17 students have IEP's that specifically state that they are excluded from taking the Stanford 9 Achievement test. These 17 students were not included in this study because they are exempt from taking the Stanford 9 Achievement tests. Students range from 11 to 13 years of age in this school.

Statistical Analysis

The mean of the questionnaire survey is given below:

Statistics

		1. Does this student have any brothers or sisters?	2. If there are other brothers and sisters in the family, in what order was the student born?	3. Did the student have a full-term or premature birth?	4. What was the student's birth weight?	5. Where was the student born?	6. Was the student born during the daytime or evening (AM or PM)?	7. Was the student bottle-fed?	8. What was the age of the mother at the time of the student's birth?
N	Valid	983	556	983	983	983	983	983	983
	Missing	0	427	0	0	0	0	0	0
Mean		1.70	2.46	1.41	1.42	1.87	1.44	1.38	1.53

1. Does this student have any brothers or sisters?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	422	42.9	42.9	42.9
	2	432	43.9	43.9	86.9
	3	129	13.1	13.1	100.0
	Total	983	100.0	100.0	

The above frequency table shows that majority of respondents have 1-3 brothers and sisters and some of them have no or 4 to 8 brothers and sisters. The data shows that 432 out of 983 participants from the Hollenbeck Middle School have 1-3 brothers and sisters; 422 out of 983 participants of the research have no brother or sister and 129 out of 983 participants of the research have 4-8 brothers and sisters.

2. If there are other brothers and sisters in the family, in what order was the student born?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	255	30.6	54.1	54.1
	3	301	25.9	45.9	100.0
	Total	556	56.6	100.0	
Missing	System	427	43.4		
Total		983	100.0		

The above frequency table shows that majority of respondents are youngest in their family and some of them have middle and oldest order in their families. The data shows that 301out of 983 participants from the Hollenbeck Middle School are youngest in their families; 255 out of 983 participants of the research are oldest in their family and remaining of them has middle position in their families.

3. Did the student have a full-term or premature birth?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	578	58.8	58.8	58.8
	2	405	41.2	41.2	100.0
	Total	983	100.0	100.0	

The above frequency table shows that majority of respondents have full-term birth and some of them have premature birth. The data shows that 578 out of 983 participants from the Hollenbeck Middle School have full-term birth; and 405 out of 983 participants of the research have premature birth.

4. What was the student's birth weight?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	570	58.0	58.0	58.0
	2	413	42.0	42.0	100.0
	Total	983	100.0	100.0	

The above frequency table shows that majority of respondents have less than 5lbs. 8oz birth weight and the remaining of them have 5lbs. 8 oz. or higher birth weight. The data shows that 570out of 983 participants from the Hollenbeck Middle School have less than 5lbs. 8oz; and 413 out of 983 participants of the research have 5lbs. 8 oz. or higher birth weight.

5. Where was the student born?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	130	13.2	13.2	13.2
	2	853	86.8	86.8	100.0
	Total	983	100.0	100.0	

The above frequency table shows that majority of respondents were born in a hospital and the remaining of them was born at home. The data shows that 853 out of 983 participants from the Hollenbeck Middle School were born in a hospital; and 130 out of 983 participants of the research were born at home.

6. Was the student born during the daytime or evening (AM or PM)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	550	56.0	56.0	56.0
	2	433	44.0	44.0	100.0
	Total	983	100.0	100.0	

The above frequency table shows that majority of respondents were born during the daytime and the remaining of them was born during evening. The data shows that 550 out of 983 participants from the Hollenbeck Middle School were during the daytime; and 433 out of 983 participants of the research were born during evening.

7. Was the student bottle-fed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	608	61.9	61.9	61.9
	2	375	38.1	38.1	100.0
	Total	983	100.0	100.0	

The above frequency table show that majority of respondents were bottle-fed and the remaining of them was not. The data shows that 608 out of 983 participants from the Hollenbeck Middle School were bottle fed; and 375 out of 983 participants of the research were not bottle-fed.

8. What was the age of the mother at the time of the student's birth?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	460	46.8	46.8	46.8
	2	523	53.2	53.2	100.0
	Total	983	100.0	100.0	

The above frequency table show that the age of the majority of mothers of LBW children at the time of the student's birth were between 19 to 26 Years; remaining of them were between 12 to 18 Years and 27 years and up. The data shows that 545 mothers of the LBW children were between 19 to 26 Years; 251 out of 983 mothers were 12 to 18 years and 44 out of 983 mothers were 27 years and up.

Palisades High School

The third school to be used in this study was Palisades High School, located in the Pacific Palisades. The ethnicity of the student body is presently comprised of 30% Latino, 36% Caucasian, 31%African American and a small portion, 3% Asian and other ethnicities. There are presently 2,500 members of the student body and 20 of these students have IEP's that state they are exempt them from taking the Stanford 9 Achievement test. This exemption prevents these 20 students from being included in this study. The age of students in this school range from 14 to 18 years. Participants in this study included all the students that attend the three schools with the exception of those students whose IEP's specifically exempt them from taking the Stanford 9 Achievement test.

Statistical Analysis

The mean of the questionnaire survey is given below:

Statistics

		1. Does this student have any brothers or sisters?	2. If there are other brothers and sisters in the family, in what order was the student born?	3. Did the student have a full-term or premature birth?	4. What was the student's birth weight?	5. Where was the student born?	6. Was the student born during the daytime or evening (AM or PM)?	7. Was the student bottle-fed?	8. What was the age of the mother at the time of the student's birth?
N	Valid	2480	1662	2480	2480	2480	2480	2480	2480
	Missing	0	818	0	0	0	0	0	0
Mean		1.80	2.02	1.38	1.51	1.84	1.35	1.15	1.95

1. Does this student have any brothers or sisters?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	818	33.0	33.0	33.0
	2	1335	53.8	53.8	86.8
	3	327	13.2	13.2	100.0
	Total	2480	100.0	100.0	

The above frequency table shows that majority of respondents have 1-3 brothers and sisters and some of them have no or 4 to 8 brothers and sisters. The data shows that 1335 out of 2480 participants from the Palisades High School have 1-3 brothers and sisters; 818 out of 2480

participants of the research have no brother or sister and 327 out of 2480 participants of the research have 4-8 brothers and sisters.

2. If there are other brothers and sisters in the family, in what order was the student born?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	812	32.7	48.9	48.9
	3	850	34.3	51.1	100.0
	Total	1662	67.0	100.0	
Missing	System	818	33.0		
Total		2480	100.0		

The above frequency table shows that majority of respondents are youngest in their family and some of them have middle and oldest order in their families. The data shows that 850 out of 2480 participants from the Palisades High School are youngest in their families; 812 out of 2480 participants of the research are oldest in their family and remaining of them has middle position in their families.

3. Did the student have a full-term or premature birth?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1530	61.7	61.7	61.7
	2	950	38.3	38.3	100.0
	Total	2480	100.0	100.0	

The above frequency table shows that majority of respondents have full-term birth and some of them have premature birth. The data shows that 1530 out of 2480 participants from the Palisades High School have full-term birth; and 950 out of 2480 participants of the research have premature birth.

4. What was the student's birth weight?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1212	48.9	48.9	48.9
	2	1268	51.1	51.1	100.0
	Total	2480	100.0	100.0	

The above frequency table shows that majority of respondents have less than 5lbs. 8oz birth weight and the remaining of them have 5lbs. 8 oz. or higher birth weight. The data shows that 1212 out of 2480 participants from the Palisades High School have less than 5lbs. 8oz; and 1268 out of 2480 participants of the research have 5lbs. 8 oz. or higher birth weight.

5. Where was the student born?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	387	15.6	15.6	15.6
	2	2093	84.4	84.4	100.0
	Total	2480	100.0	100.0	

The above frequency table shows that majority of respondents were born in a hospital and the remaining of them was born at home. The data shows that 2093 out of 2480 participants from the Palisades High School were born in a hospital; and 387 out of 2480 participants of the research were born at home.

6. Was the student born during the daytime or evening (AM or PM)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1605	64.7	64.7	64.7
	2	875	35.3	35.3	100.0
	Total	2480	100.0	100.0	

The above frequency table shows that majority of respondents were born during the daytime and the remaining of them was born during evening. The data shows that 1605 out of 2480 participants from the Palisades High School were during the daytime; and 875 out of 2480 participants of the research were born during evening.

7. Was the student bottle-fed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2104	84.8	84.8	84.8
	2	376	15.2	15.2	100.0
	Total	2480	100.0	100.0	

The above frequency table show that majority of respondents were bottle-fed and the remaining of them was not. The data shows that 2104 out of 2480 participants from the Palisades High School were bottle fed; and 376 out of 2480 participants of the research were not bottle-fed.

8. What was the age of the mother at the time of the student's birth?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	721	29.1	29.1	29.1
	2	1163	46.9	46.9	76.0
	3	596	24.0	24.0	100.0
	Total	2480	100.0	100.0	

The above frequency table show that the age of the majority of mothers of LBW children at the time of the student's birth were between 19 to 26 Years; remaining of them were between 12 to 18 Years and 27 years and up. The data shows that 1163 mothers of the LBW children

were between 19 to 26 Years; 721 out of 2480 mothers were 12 to 18 years and 596 out of 2480 mothers were 27 years and up.

Stanford 9 test scores of three schools

The Stanford 9 test scores were also calculated by the three schools of the research for each participant. With the help of this score, researcher was able to reveal the academic achievements of the LBW children. The average Stanford 9 test score for West Athens Elementary School is 6.54; average Stanford 9 test score for Hollenbeck Middle School is 6.7; and the average Stanford 9 test scores of Palisades High School are 7.2. These scores were used to find out whether there is a significant correlation between LBW children and their academic achievement. Correlation table is given below, which is highlighting the correlation among two variables i.e., Low Birth Weight and Stanford 9 test scores.

Correlations

		Low Birth Weight	Stanford 9 Test Scores
Low Birth Weight	Pearson Correlation	1	.964**
	Sig. (2-tailed)		.000
	N	4303	4303
Stanford 9 Test Scores	Pearson Correlation	.964**	1
	Sig. (2-tailed)	.000	
	N	4303	4303

**. Correlation is significant at the 0.01 level (2-tailed).

The above given table mentioned that there is a significant correlation between low birth weight and Stanford 9 test scores. The outcomes and results, which were drawn from this research study, were that a significant and important correlation exists between low birth weight and academic achievement scores. It is also expected that the correlation remains constant during

the various age periods of the individual. The findings of the research have been answered in the affirmative.

CHAPTER 5: CONCLUSION

In the nut shell, this research deals with the problem of long-term effects of LBW permeates our society. The purpose of this study is to provide information that explores the correlation between academic achievement at different ages, and low infant birth weight. This research project included the public school test scores of a large population of students of various ages in order to test the aforementioned correlation. This study asked if there is a correlation between low birth weight and academic achievement during various ages. Another question which was asked if there is a correlation between LBW and academic achievement and what can be done to ameliorate existing problems and prevent future ones?. The findings of this research mentioned that there is a positive correlation between low birth weight and academic achievement. Researcher utilized the survey questionnaire and Stanford 9 test scores in order to reveal this significant correlation. Quantitative research methodology was used by the researcher. There is also number of studies of LBW students in primary and secondary schools which demonstrated that low birth weight has a negative impact on academic achievement. These problems require special educational and medical services that may be needed throughout a child's life. Even with this type of treatment the degree of long term health and developmental problems may limit an individual's opportunities to lead a full and productive life. The findings of the research also mentioned that adverse consequences of being born LBW include learning problems and lower levels of achievement in reading, spelling and mathematics. These adverse effects are still apparent in adolescence, and experts believe these abnormalities will be life-long and not improve as children enter adulthood.

This study is dependent upon parents and guardians of students providing survey data needed for this study and for the various schools providing the results of the students' tests.

Although this study includes a sizable number of students, it is limited to only one school for each grade level. A larger sampling of different schools from various regions of the country would give greater external validation to the study's results. In addition, the use of only one test (Stanford 9) in this study may narrow the impact of the study's findings. Therefore, it is recommended by the researcher that different tests can also be used in order to reveal the academic achievement scores of the low birth weight children. It is also recommended that further future research can also be done on the topic of effect of the demographic factors on the LBW children academic achievements and the influence of parental guidance on their achievement.

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Appendix

"Please fill out the questionnaire by circling one answer for each question."

1. Does this student have any brothers or sisters?

A) 0 B) 1-3 C) 4-8

2. If there are other brothers and sisters in the family, in what order was the student born? If there are no other children in the family leave this answer blank and go on to question #3.

A) Oldest B) Middle (if child is <u>not</u> the oldest or youngest) C) Youngest

3. Did the student have a full-term or premature birth?

A) Full-term B) Premature

4. What was the student's birth weight?

A) Under 5lbs. 8oz. B) 5lbs. 8 oz. or higher

5. Where was the student born?

A) At home B) In a hospital C) Other

6. Was the student born during the daytime or evening (AM or PM)?

A) Daytime B) Evening

7. Was the student bottle-fed?

A) YES B) NO

8. What was the age of the mother at the time of the student's birth?

A) 12 to 18 Years B) 19 to 26 Years C) 27 Years and up

NATIONAL UNIVERSITY INSTITUTIONAL REVIEW BOARD

RESEARCH APPLICATION FORM [RAF] and

RESEARCH EXEMPTION FORM [REF]

DATE OF SUBMISSION: _11_____/_20_____/_2005_____

MONTH DAY YEAR

TITLE OF PROJECT: _INVESTIGATING LOW INFANT BIRTH WEIGHT AND ACADEMIC ACHIEVEMENT_____

FUNDED: **[X] No** **[ ] Yes** _____

Funding agency(ies) ; type of funding; grant number

PROJECT DURATION: _7 weeks_____

INVESTIGATOR(S): *(List in order beginning with Principal Investigator)*

Allison Davis (graduate

student)_____

_____

NAME STATUS (Faculty, Staff, Grad Student, Undergrad Student) ACADEMIC

UNIT

CONTACT INFORMATION:

MAILING ADDRESS OF PRINCIPAL INVESTIGATOR: __17821 LASSEN ST. #216 NORTHRIDGE,

CA

91325_____

___

_____

TELEPHONE: 818-645-9225_____

E-MAIL:_____DAVISALLISON@EMAIL.COM_____

EXEMPTION REQUEST: □ YES **X** NO