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Morbidity, Growth and Development of Prematurely-Born Twins in Early Childhood

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MORBIDITY, GROWTH AND DEVELOPMENT OF PREMATURELY-BORN TWINS IN EARLY CHILDHOOD

by

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I certify that I have read this thesis and that in my opinion it is adequate, in scope and quality, as a thesis for the degree of Master of Science.

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CHAPTER I

INTRODUCTION TO THE STUDY

I. INTRODUCTION

From the time of Esau and Jacob, the first-recorded twins in sacred history, until the present time, the phenomenon of twins has attracted attention, curiosity, and sometimes awe. In some ancient cultures twins were worshipped as gods,[1] while in at least one culture they were thrown into a river immediately upon birth, because they were believed to be "evil spirits."[2]

In more modern times the spotlight of scientific research has been turned on twins, giving us factual answers to many of the age-old questions regarding multiple birth. Much of the research has been concerned with such topics as the genetics and biology of twinship, intra-uterine influences affecting twins, and maternal effects of multiple pregnancy. Still other topics with which researchers have concerned themselves are the determination of zygosity, neonatal mortality of twins, and incidence of malformation incompatible with life in twins. Furthermore, the use of twins for studies to determine the relative

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[1] Luigi Gedda, Twins in History and Science, (Springfield: C. C. Thomas, 1961), p. 3.

[2] Ibid., p. 7.

importance of genetic factors in disease conditions and in emotional and mental development has been recommended by many noted researchers, beginning with Galton in 1875.[3]

At present, even a casual review of current medical literature gives evidence of the widespread use of twins to facilitate research on various medical topics. However, the twins studied were usually adults, and the types of diseases investigated were generally chronic or degenerative diseases, such as diabetes or peptic ulcer. Thus close scrutiny of these studies revealed that research had been done chiefly in the following three areas: 1) investigations regarding the prenatal and neonatal twin; 2) studies of the genetic factors in common diseases using the twin-study method; 3) psychological studies regarding the importance of nature or nurture in the development of specific qualities.

From this survey, it appeared that there had been a lack of investigation concerning the type and amount of common acute medical conditions of childhood in twins as compared with singletons. The investigators' apparent lack of research regarding the childhood twin might seem to indicate that from the neonatal period on through childhood twins do not differ significantly from singletons in any medical factor. Although this conclusion may be correct, no study was found which dealt directly with this problem of physical and emotional morbidity and how these might influence the early childhood of twins.

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[3]F. Galton, "The History of Twins, As a Criterion of the Relative Importance of Nature and Nurture," Popular Science Monthly, 8: 345-375, March, 1875.

However, a study by Drillien incidentally contained a comparison between height and weight gains of twins and singletons at the end of the first two years of life.[4]

Numerically, the phenomenon of twins may be expected to increase. In the United States twins occur in approximately one out of eighty-six pregnancies,[5] so that in the year 1960 there were approximately 50,000 twins born in the United States.[6] Since the highest incidence of twins occurs among the Negro population, which is increasing at a rate greater than the Caucasian population in the United States, one may assume that the general incidence of twins will be increased in the United States in the future.[7] Consequently, it follows that medical studies of twins will become more expedient.

II. STATEMENT OF THE PROBLEM

It was the problem of this study to find out the effect of twinship on the prematurely-born twin's early childhood growth and development, and physical and emotional morbidity, excluding congenital and "inherited" conditions.

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[4]C. M. Drillien, "A Longitudinal Study of the Growth and Development of Prematurely and Maturely Born Children, part II," Archives of Diseases of Childhood, 34: p. 43, 1959.

[5]W. Nelson, editor, Textbook of Pediatrics (Philadelphia: Saunders, 1964), p. 347.

[6]U.S. Bureau of Vital Statistics (Washington: Government Press, 1961), p. 48.

[7]Nelson, loc. cit.

III. PURPOSE OF THE STUDY

It was the purpose of this study to compare a group of prematurely-born twins with a matched group of prematurely-born singletons at the end of the first eighteen months to two years of life for the following: 1) height; 2) weight; 3) age at which three specific developmental tasks were accomplished, a) sitting alone, b) walking unaided, c) speaking the first word; 4) types and amounts of physical and emotional morbidity. Incidental information, number of siblings born prior to and including the time of birth of the child under study and number of missed appointments, was also obtained which might influence the above factors.

The sources of data were: 1) the clinical medical records of the children in this study; 2) interviews with mothers of the children included in the study.

IV. HYPOTHESIS

Prematurely-born twins have slower growth and development and more physical and emotional morbidity than prematurely-born singletons during the first eighteen months or two years of life.

V. JUSTIFICATION OF NEED

Much study has been devoted to prenatal and neonatal factors influencing twins, and to genetic studies concerning mental or physical factors. Also there have been many case-studies of single incidence of various rare conditions affecting twins, in which a twin pair were reported to be either concordant or discordant for a certain disease or

syndrome. However no study was found which was devoted to the identification of types of morbidity in childhood or infant twins which differ from the morbidity in singletons. A group as large as that of the twin population is certainly of importance in any consideration of the health of the over-all child community.

Twins are reported to require one and a half the amount of time for care that a singleton requires.[8] Parents report three to four times the amount of emotional stress in rearing twins as compared to singletons.[9] Certain physicians and nurses working in an out-patient clinic for prematurely-born children expressed an opinion that, in general, twins cared for in that clinic had more morbidity and less parental attention to their physical and emotional needs than did singletons. No study was found to point out evidence of any such difference. Therefore, this study was purposed in order to identify such areas of difference, if any difference did exist.

VI. ASSUMPTIONS

The following assumptions were made for this study:

1. That the out-patient clinic medical records of the prematurely-born twins and singletons had been equally well-kept.
2. That gestation period and birth weight are important criteria of prematurity.

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[8]M. B. Thistle, "What Everybody Wants to Know About Twins," Parents Magazine, August, 1953, p. 78.

[9]Ibid.

3. That whatever was operating in one twin would affect both twins to some degree.
4. That impartiality could be assured in choosing the twin to be included in this study by tossing a coin.
5. That the socio-economic level of each child's family could be adequately ascertained from information in each child's clinic medical record.
6. That the mother of each child in the study would have a reliable memory of her child's development milestones and physical and emotional morbidity.
7. That a visit to each child's home would be beneficial in determining the socio-economic level of that child.

VII. CRITERIA FOR SELECTION OF THE GROUP FOR STUDY

The criteria of this study were as follows:

1. Only children who had attended the selected premature clinic until at least eighteen months or two years of age were included.
2. Only children who had attended the clinic at least three times were included.
3. Only children who had begun attending the clinic by the age of three months were included.
4. Only those twins were included whose co-twin had survived at least until the end of the research period.
5. Only those twins were included who could be matched with a singleton for: sex; race; birth weight; gestation period; and socio-economic level.

6. Only those children were included who had attended the clinic between the years of 1959 and 1964.

VIII. DEFINITION OF TERMS

For the purpose of this study the following definitions were used:

Emotional Morbidity. Any emotional or psychological abnormality or lack of well-being noted on the medical record by the physician or the nurse, or reported by the mother, e.g., "child appears to be afraid," or "temper tantrums."

Physical Morbidity. Any physical illness which was not congenital or inherited, and physical symptom, or lack of physical well-being noted on the chart, or reported by the mother during the interview.

Research Period. The time period from the birth of the child until eighteen months or two years of age.

IX. METHOD OF STUDY

The pertinent literature was reviewed concerning the following:

1. Previous related studies.
2. Criteria used in evaluation of infant morbidity and development.
3. Emotional and physical problems of twins.
4. Problems and characteristics of parents of twins.
5. Development and morbidity of prematurely-born twins.

An outpatient clinic for prematurely-born infants was chosen as

the agency from which to select children for the study. Since the majority of twins are prematurely-born,[10] it was assumed that this type of clinic would provide a sufficient number of twins and matched singletons for the study.

Permission to conduct the study was obtained from the physician in charge of the premature clinic and from the administrator of the medical center, of which the premature clinic was a part.

The descriptive survey method was used to conduct this study. Clinic medical records of children who met the criteria of the study were matched with prematurely-born singletons in the following factors: 1) race or culture; 2) sex; 3) socio-economic level; 4) birth weight (within twelve ounces); 5) gestation period (within two weeks).

The following additional data were then gathered from the medical records of all twins and singletons in the study: 1) weight and height at the end of the research period; 2) relation of the child's height and weight to the Iowa Height and Weight Scale; 3) amount and types of physical and emotional morbidity; 4) number of siblings born prior to and including the time of birth of the child under study; 5) amount of missed appointments.

All the mothers who could be located were interviewed during a home visit to obtain more complete information about the child's development, physical and emotional morbidity, and the mother's reasons for

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[10]L. Emmett Holt, Rustin McIntash and Henry L. Barnett, Textbook of Pediatrics, (New York: Appleton-Century-Croft, 1962), p. 488.

missing clinic appointments. All children who had met the criteria above were kept in the study of the medical records, even if their mother was not interviewed.

The data obtained were classified, statistical analyses were made and tables were prepared. Conclusions were drawn and recommendations were made.

CHAPTER II

REVIEW OF THE LITERATURE

I. INTRODUCTION

Infancy, even for our modern-day Spock-raised babies, is the most precarious period of life. A prematurely-born infant faces many more hazards than a full-term infant. Since the parinatal period of the prematurely-born twin has been shown to be more freighted with danger and complications, the question was asked, do prematurely-born twins, once past the neonatal period, have greater morbidity in infancy and the early toddler years than do prematurely-born singletons? Literature was searched in an attempt to find any previous studies which had explored the answer to the above question, but no study was found. Other related topics about which the literature was reviewed are reported below.

In the last century scientists have been fascinated by the phenomenon of twinning. Biologists have been interested in many facets as to why twinning occurs; geneticists, psychologists and social scientists have used twins for studying the importance of heredity or environment in the development of various aspects of human behaviour; physicians have been interested in the effects of similar diseases on twins and their similar or dissimilar responses. Despite all the interest in twins by scientists there has been very little written by professional people about the physical and psychological problems inherent in twinship.

II. PROBLEMS RELATIVE TO TWINSHIP

Determination of Zygosity

Most writing in scientific literature about twins refers to two different types of twins: monozygotic twins ("identical" or from one fertilized ovum); and dizygotic ("fraternal" or from two fertilized ova). However, in recent years some writers have pointed out the possibility of a third type of twin, a pair which is neither "fraternal" nor "identical". Osborne and DeGeorge theorized that the third type of twin comes about in the following way: a sperm, in coming in contact with the ovum, causes the ovum to divide, making two identical ova, and then two separate sperm fertilize the two identical ova.[11] Thus, according to this theory, the resulting twins would have identical maternal genes but different paternal genes.

Kallmann pointed out the importance of including the same proportion of monozygotic and dizygotic twins in any study of twinship as the proportion of these twins in the general population of twins.[12] However, much of the newer literature on determination of zygosity points out the difficulty in differentiating between dizygotic and monozygotic twins until they reach early or middle childhood.[13, 14]

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[11]R. H. Osborne, and F. V. DeGeorge, Genetic Basis of Morphological Variation (Cambridge: Harvard University Press, 1959), p. 6.

[12]F. J. Kallmann, "An Appraisal of Psychogenetic Twin Data", Diseases of the Nervous System, 19 (7), Part 2, p. 9, July, 1958.

[13]S. G. Driscoll, "Why Are Twins Dissimilar?," Pediatrics, 33:325, March, 1964.

[14]Luigi Gedda, Twins in History and Science (Springfield: C. C. Thomas Company, 1961), p. 26.

Pittman observed, following her study of a group of hospitalized twins and their illnesses, that it seems to be the tendency for the parents of twins and other laity to think of all twins as identical unless the opposite diagnosis is definitely made by the physician.[15]

Even genetically-identical twins can appear quite dissimilar due to several factors, such as disadvantages of circulation or position in utero, according to Pilot and Spiro.[16] Also, mothers of one-egg twins often report "differences which may be regarded as constitutional differences from the earliest months of life. These constitutional differences may be due to the influence of cytoplasm inheritance which does not involve genes, as distinguished from nuclear or chromosomal inheritance which is by identical genes in unovular twins."[17]

Psychological Characteristics and Problems of Twins

Sense of identity. Many professional observers of twins seem to agree that there is a so-called "twin psychology". There seems to be agreement that the central psychological problem in twinship is difficulty in developing a sense of identity or a self-image. Parents of singletons in our society seem to push a child towards independence and individuality, but this is not true of parents of twins. Instead, parents of twins,

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[15]F. Pittman, "Illness in Twins. V. Observation on Social Development," Medical Journal of Australia, 45: Vol. I (1), p. 7, January, 1958.

[16]M. Pilot and H. Spiro, "The Use of Monozygotic Twin Cases in the Study of Psychosomatic Concepts," Yale Journal of Biology and Medicine, 31 (2), p. 93, November, 1958.

[17]P. Lowinger et. al., "Personality Development in Identical Twins," Archives of General Psychology, 8: p. 515, May, 1953.

according to Pittman, indicate they expect twins to act as a unit, to enjoy the same activities, to have the same tastes and interests even if they are dizygotic twins.[18]

Realizing one's identity is generally held to be a developmental task of late childhood or adolescence, although the basis for a twin's specific difficulty in this developmental task is begun in infancy (identical dress, rhyming or similar names, being referred to as a unit). Therefore it was assumed that this problem would not have a direct bearing on the emotional or physical health of infant twins with which this study was concerned.

Dependence and closeness. Another problem common to twinship is the extraordinary closeness and attachment to each other. On the surface this closeness may appear to be a helpful thing, but it often happens that this intra-twin bond becomes too strong and thus tends to weaken the relationship to their parents, as Graham found in interviews and observations of twins and their parents.[19] Many authors agree that a close, trustful dependence on a mother figure is a known essential for the normal emotional development of a child. The singleton, as a rule, forms a very close dependence on his mother early in life. He has no other close affectional tie early in life besides the mother figure. The twin is noted to have first allegiance early in life to his co-twin. This close attachment continues through all his formative years and until

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[18]Pittman, loc. cit.

[19]P. Graham, The Care and Feeding of Twins (New York: Harper and Company, 1955), p. 7.

maturity and marriage. Very often the close ties continue all through life, making normal hetero-sexual affectional ties, including the marital relationship, very difficult. This attachment, most agree, is more pronounced and more consistently present in one-egg twins than in two-egg twins, but both Pittman and MacKay observed that this twin attachment was definitely strong in all types of twins.[20, 21]

Some reasons for this attachment of twins may be noted. A twin has close companionship with the same person from the moment of conception. Even in babyhood they discover one another and appear to be fascinated each by the other. At naptime they are noted to giggle and talk together happily. Due to the coincidence of their identical age they are together in playing, eating, sleeping, and all activites, especially in childhood. Because of their almost identical environment they naturally have many similar tastes and interests. Monozygotic twins, because of identical heredity, naturally have even a stronger tendency to the same tastes and interests. However, Joseph's study, in which he interviewed twins and their parents periodically over a period of years, showed that the environment of twins from birth tends to be so similar that it enhances their natural similarity.[22] Because of their close attachment, their unified interests and actions they appear to other

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[20]Pittman, loc. cit.

[21]J. MacKay, "Twins As Viewed By a Member of the 'In-Group'", Canadian Nurse, 59: p. 968, October, 1963.

[22]E. D. Joseph, "The Psychology of Twins," Journal of the American Psychoanalytic Association, 9: p. 164, January, 1961.

children to be a team, an exclusive society too formidable to attempt to break into. Thus it appears to be quite difficult for twins to have other close friends, which in turn increases their dependence on one another.

Dominant - submissive roles. Twins have been noted, by both Pittman and Pilot, to divide themselves early in life into a dominant member and a submissive member.[23, 24] Often this dominance or submission is noted in the same twin for the rest of his life. However, some twin pairs have been noted to interchange the dominant and submissive roles between themselves at numerous different times in their childhood and adolescence, according to Plank.[25]

Rivalry. Just as the co-twin bond is generally much stronger than the usual sibling bond, so the rivalry between the twin partners often is more acute. Graham theorized that this keen rivalry is most often due to the twin's desperate attempt to establish a self-image apart from his twinship.[26] In order to call attention to his individuality or his separate identity, each twin must struggle much harder than the single child to emphasize his abilities. Social forces, circumstances of environment and heredity all seem to work toward his submersion as simply a member of the twin team.

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[23]Pittman, op. cit., p. 7.

[24]Pilot and Spiro, op. cit., p. 94.

[25]E. N. Plank, "Reactions of Mothers of Twins in a Child Study Group," American Journal of Orthopsychiatry, 28 (1), p. 198, January, 1958.

[26]Graham, op. cit., p. 5.

Constant competition with a twin can be stifling to a child. Graham states further that if twins find they compete for family attention they may take longer to realize security.[27] Lowinger states, "the twin relationship itself tends to be a retarding factor."[28]

Lack of fame. In the human species, twins represent a biological rarity in that the mother gives birth to two specimens of her kind. Twinning occurs in the United States population in general at the rate of once in every eighty-six deliveries.[29] However, twins do not achieve fame or a place in history relative to their rate of occurrance in the population. Indeed, one must search dilligently to find any twin who has distinguished himself in history. Exceptions to the apparent rule have been Remus and Romulus, the supposed founders of Rome, and "Ann Landers" and"Abigail Van Buren", identical twins who write competing advice columns. Gedda has theorized that failure of parents and society to foster individuality in twins is greatly responsible for the lack of fame among the twin population.[30]

Intelligence. Although there seems to be a prejudice among the laity that twins have low intelligence, this has not been found to be the case by Gesell and Amatruda. An unspecified number of twins was

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[27]Graham, loc. cit.

[28]Lowinger, loc. cit.

[29]A. Seski and L. Miller, "Plural Pregnancies - The Cause of Plural Problems," Obstetrics and Gynecology, 21: p. 227, February, 1963.

[30]Gedda, op. cit., p. 21.

among the large group of children with whom Gesell and Amatruda conducted extensive research over a period of twenty years. Written and cinematic records were made of children under controlled situations performing various developmental fetes during periodic visits to the laboratory during their first five years. A finding of their investigation was that twins' performance on intelligence tests was comparable to the performance of the general population on those same tests.[31]

Speech development. Drillien's study of the growth and development of prematurely-born and maturely-born children (following each child at regular periods for up to five years of age) found that twins, both monozygotic and dizygotic, are slower than singletons in speech development.[32] "Twins persist in using infantilism for a longer period than most children and also tend to trail well behind other children in speech - both in articulation and in vocabulary.[33]

Twins usually are noted communicating with each other very early in life. Their form of communication is primitive and usually unintelligible to parents and other "outsiders." Graham reasoned that the co-twin closeness, the lack of contact with other children who speak well, and the lessened contact with adults all contribute to the phenomenon of speech development of twins and to the type of inventive communi-

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[31]A. Gesell, and C. Amatruda, Biographies of Child Development, (London: Hoeber, Incorporated, 1939), p. 227.

[32]C. Drillien, "A Longitudinal Study of the Growth and Development of Prematurely and Maturely Born Children, part III," Archives of Diseases of Childhood, 1959, p. 45.

[33]MacKay, loc. cit.

cation between twins.[34] Since twins have a constant companion in their co-twin and because of this do not experience loneliness, they feel little need for social effort, such as conventional speech, Graham hypothesized after interviews with a large number of twins and their parents.[35]

Extra-sensory perception. Contrary to popular belief, twins apparently do not possess intra-twin extra-sensory perception, according to the findings of a study conducted by Rhine.[36] Rhine studied a large, unspecified number of twins by means of interviews with them and their parents and set up planned situations in which he tested the twins' ability to communicate with each other through extra-sensory means.

Social Expectations and Prejudices Related to Twins

Types of expectations held toward twins. Apparently society in general has various expectations regarding twins. No doubt these expectations have much to do in shaping a twin's experience and in influencing a twin's behaviour. Pittman reported the following social expectations regarding twins: Twins are believed by society to be devoted to each other. They are expected to prefer each other's company to anyone else's company. They are thought to never quarrel but to be in total agreement with each other. There is believed to be some mysterious

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[34]Graham, op. cit., p. 7

[35]Graham, loc. cit.

[36]J. B. Rhine, as cited by P. Graham, in Care and Feeding of Twins, (New York: Harper and Company, 1955), p. 178.

affectional bond between them, because of which they are supposed to suffer extremely if separated for any period of time. They are expected to be always together in all activities until the time of their marriage.[37] Pittman and Joseph have both stated their belief that these social expectations serve as a definite influence in molding an individual twin's behaviour and thinking.[38, 39]

Legends and Myths Concerning Twins

Society's prejudices toward, and expectations of twins, in turn, have apparently been molded, formed, and influenced by age-old legend, old-wives' tales and myths. It was deemed beneficial to discuss briefly here some of the major legends and myths which seem to have had a definite influence on society's prejudices regarding twins.

So impressive is the birth of two children at once to the same mother "that it has left its mark on the imagination of men of every ethnic group in every epoch of history."[40] In mythology one finds a very large number of twin "divinities". Among the Mohave tribe twins were supposed to be of supernatural origin and were thought to possess powers of clairvoyance.[41] In other tribes, such as the Akwaala tribe in Southern California, while twins apparently were not thought of as divinities they

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[37] Pittman, loc. cit.

[38] Joseph, loc. cit.

[39] Joseph, loc. cit.

[40] Gedda, loc. cit.

[41] Ibid., p. 6.

were given very special priviledged status. As a mark of distinction for this status it was customary for all twins of that tribe to wear especially magnificant garb.[42]

There were some legends which hinted at mysterious circumstances surrounding the birth of twins. According to other legends the phenomenon of twinning was believed to be due to superfecundation. Thus there was a suspicion of immorality or infidelity on the part of the mother of twins.[43]

There were many instances in ancient times of twins being abandoned, apparently principally because they were twins. Several legends speak of twins who were abandoned and raised by wolves or shepherds.[44] Some North American Indian tribes were also hostile towards twins. In the Kato tribe both twins were put to death.[45] In the Northwest Maidus even the mother was killed.[46] The Pitt Rivers tribe killed one of the twins "because the burden of two children would be too great."[47] Another tribe believed that the second-born twin was not a real person.[48] In the Bagandu Society in Africa it was considered a great honor to be parents of twins; they were asked to perform ritual

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[42] Ibid.

[43] Gedda, op. cit., p. 7

[44] Ibid., p. 6.

[45] Ibid.

[46] Ibid.

[47] Ibid.

[48] Ibid.

dances in the gardens of favored friends to help promote fertility of the crops.[49]

Twins in Literature

There are many works of literature which have been devoted to stories concerning twins. These works no doubt have influenced thinking regarding twins. Shakespeare centered several plays and stories around situations in which twins played a prominent part. In one such play there were "fraternal" twins of opposite sex which were supposed to look so much alike that they could pass for each other when dressed in appropriate clothing.[50] George Sand in his novel, La Petite Fadette, wrote of identical twins whose mother was full of prejudices about twins. One of her main preconceptions was that one of the twins must die. The father also had fears, since he had heard that a twin's feeling for his brother is so great that they, if they were to be separated, would not know how to live. The midwife advised the parents not to dress the boys alike, not to punish them together, and to have them engage in separate activities. However, the parents did not heed this advice. As the boys grew older their devotion grew and they admitted that they could not enjoy playing with other boys if the other twin was absent. However, one of the twins, Landis, fell in love with a girl, Fadette. The other twin, Silvan, objected vehemently and became ill because of his jealousy and deep hurt. Fadette nursed Silvan back to health, however, and he complicated the situation by also falling in love with her.[51]

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[49]Graham, op. cit., p. 30.

[50]Gedda, op. cit., p. 10.

[51]Ibid.

Thornton Wilder's The Bridge of San Luis Rey includes an account of twins who were left, as infants, in a basket in front of a convent. They had a "curious shame in regard to their resemblance." Their similarity of appearance brought about continual commenting and joking, but it was never funny to them. They invented a secret language for themselves and others could not understand them. Wilder pictured them as having a "terrible need of one another." Intra-twin telepathy was common with them.[52]

Margaret Mitchell in Gone with the Wind includes a set of identical twin boys who were suitors of Scarlett O'Hara. The twins were described as both being in love with Scarlett but there was no jealousy between them because of Scarlett. One of them had earlier been in love with another girl but when his co-twin expressed dislike for this girl the first twin broke off his relationship with the girl.[53]

It is the opinion of several authors that legends and myths concerning twins, twins in history and twins in literature help form the preconceptions society today holds concerning twins.

Problems and Characteristics of Parents of Twins

The development, personality and well-being of a twin pair are most affected by the attitudes and feelings towards twins held by that part of society with which the twins are most closely in contact during

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[52] Ibid., p. 15.

[53] Ibid., p. 16.

their early life, namely their parents or parent-substitutes. It was assumed that it would be helpful to this study to review literature which had to do with describing the present-day characteristics and problems of parents of twins.

Size of families containing twins. It is of interest to note that twins, in general, belong to families which are larger than the average. Edwards found in a study of one-hundred and ninety-three families which contained twins that there was a mean of approximately five siblings (exclusive of the twins) per family.[54] According to the United States Census Bureau, the average number of children per family in this country is two and five tenths.[55] Gedda also noted this tendency of twins to be born to large families, and he further stated his opinion that the mother of twins has a greater degree of fertility than average.[56]

Age of mother at time of birth of twins. The age of the mother at the time of the birth of twins is significant. Studies done by both Millis and Gedda have shown that the frequency of twinning increases with increasing maternal age, up to a maximum age which varies with race.[57,58] In the United States the maximum twin frequency occurs

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[54]Edwards, op. cit., p. 311.

[55]U. S. Bureau of the Census, Statistical Abstract of the United States, 1964 (Washington, D. C.: 1964), p. 36.

[56]Gedda, op. cit., p. 73.

[57]J. Millis, "The Frequency of Twinning in Poor Chinese in the Maternity Hospital, Singapore," Annals of Human Genetics, 23 (2); p. 171-174, April, 1959.

[58]Gedda, loc. cit.

in the mother's thirty-seventh year, according to Gedda.[59]

Race and the incidence of twins. Nelson's Textbook of Pediatrics states that negroes have the highest proportion of twins of any racial or ethnic group.[60] A recent study by Seski and Miller also showed at least a slightly higher percentage of twins among negroes than among whites. In studying the population of one maternity hospital, Seski and Miller found that, although negro women made up twenty-nine percent of the population of the hospital, they had thirty-one percent of the twins.[61]

Ambivalent feelings of parents of twins. Among those who have written concerning problems facing parents of twins there seems to be considerable agreement as to the major problems of these parents. One of the common problems mentioned is the twin parent's ambivalent feeling concerning having twins: in one sense the parent is especially proud, but on the other hand he feels unusually victimized and desperate, wondering how he can ever manage.

Financial problems of parents of twins. The worry of parents of twins regarding "managing" is not groundless. Besides the very obvious considerations, such as two beds, double milk supply and double diaper supply, parents of twins have reported a decided financial drain in

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[59]Ibid., p. 81.

[60]Nelson, op. cit., p. 304.

[61]Seski and Miller, op. cit., p. 233.

general. To begin, the old cliche which states that parents of twins get "two for the price of one" is not true. Actually a multiple birth, such as a twin birth, is notorious for its complication, both to mother and to infants. With complications there usually ensues extra charges due to such things as special medications, surgical procedures, and extra medical consultants. The majority of twins are born with the complication of pre-maturity.[62] Prematurity in itself, besides being a physical disadvantage, is also a financial disadvantage since prematurely-born infants frequently must stay in incubators for a period of time, and often must remain in the hospital for a substantial period of time as "boarders".[63]

Work load of mothers of twins. After twins are taken home, the work of caring for "identical needs at the identical time," of feeding two babies who often have separate schedules, of doing double laundry, of preparing twelve to sixteen bottles of formula at once, of hearing two babies crying loudly at the same time, besides caring for the other children, the home and husband, has been cited by writers as being too great a burden for one mother. This great burden, Graham advises, necessitates outside help, such as: diaper service; part-time maid service; relatives or baby-sitters to "live-in" to help with the twins.[64] It must be pointed out that such outside help, although set forth as a definite necessity, would also be an additional financial drain. Many

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[62]L. Emmett Holt, Jr., Rostin McIntosh and Henry L. Barnett, Pediatrics (New York: Appleton-Century-Crofts, ind., 1962), p. 153.

[63]Nelson, op. cit., p. 312.

[64]Graham, op. cit., p. 22.

parents of twins even in middle-class or upper-middle-class families have found it necessary to borrow a sizeable amount of money in order to care for infant twins.[65] In Plank's study group of mothers of twins most of the mothers had some outside help, but many of these mothers still reported that the first six months after the twins' birth exhausted them completely.[66]

Emotional problems of parents of twins. Besides physical and financial problems, there is an additional element of stress peculiar to parents of twins in the realm of emotions. A concern of most mothers of twins is that they will be unable to provide enough love for two children at once. According to Graham, parents often reported a related fear that they may show favoritism to one twin and thus be unfair to both.[67] Plank reported that mothers of twins often expressed hostility regarding advice given them on child care since they feel the "ideal" is practically impossible with twins.[68] Some parents, however, deny any negative feelings in regard to their role as parents of twins. One can only speculate at the influence which society's expectations have on the parents' expressions of joy at having twins. Schauffler, a physician who writes a column in a popular woman's magazine actually advised, in essence, that all would go well if only the twins' mother would have the "proper spirit."[69] Just what the "proper spirit" is he does not disclose.

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[65] Ibid.

[66] Plank, op. cit., p. 198.

[67] Graham, op. cit., p. 2.

[68] Plank, loc. cit.

[69] G. C. Schauffler, "Tell Me Doctor," Ladies Home Journal, 78: p. 9, December, 1961.

Vaillant found that parents of twins seem to feel more pride in having "identical" twins than in having "fraternal" twins, and some even try to insist that fraternal twins are identical twins.[70]

Mentioned previously has been the tendency for twins to form a close co-twin tie so that they do not usually experience as close an early mother-child bond as singletons form. Parents of twins seem to feel hurt, disappointment, and even resentment at this lessened child-parent dependence, according to Graham's observations.[71] The separate "language" used in communication between twins, which is unintelligible to parents, tends to increase the parents' feelings of being "shut-out" from closeness with twins, and contributes to less warm relationships, MacKay reports.[73] MacKay, who was herself a twin as well as a professional nurse, writes, "the bewilderment of parents when confronted with two identical children which they can scarcely tell apart, often makes their attitude towards the twins less warm and spontaneous."[73] Plank reported that parents related to her a feeling of being "ganged-up" on because of the twins' tendency to stick together, such as in mischief and in discipline problems.[74]

Recommendations For Rearing Twins

A need apparently acutely felt by the population of parents of

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[70]G. E. Vaillant, "Twins Discordant for Early Infantile Autism," Archives of General Psychiatry 9: p. 163, August, 1963.

[71]Graham, op. cit., p. 7.

[72]MacKay, op. cit., p. 968.

[73]Ibid.

[74]Plank, op. cit., p. 200.

twins is for specific suggestions on child rearing problems peculiar to twins. Parmelee reports that many physicians have been inclined to advise parents that whatever is recommended for a singleton needs only be duplicated for twins, but the same author points out that in practice parents have found that this advice does not meet their needs.[75]

The major problems of rearing twins will be mentioned below with the current thinking on ways of dealing with these problems.

Identity. Psychologists and physicians seem to agree in recommending that parents attempt to foster each child's individual interests, talents and personality. The following recommendations have been most prominantly advanced in order to facilitate the child's ability to find his own identity: 1) allowing each twin to dress according to his own likes, not to dress the children alike; 2) avoiding rhyming or similar names for twins; 3) speaking of and treating twins as two separate children, not as a single unit; 4) giving each child frequent, separate, parental attention away from his co-twin; 5) not allowing the twins to become a sideshow or to gain excessive attention simply for their twinship.[76,77]

Reducing mother's work load. There seems to be agreement among authors, including Plank and Graham, that the work involved in care of twins, plus other household and family burdens, is too great for one person to carry without additional help. Frequent recommendations

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[75]A. H. Parmelee, M.D., in his preface to The Care and Feeding of Twins, Phyllis Graham, (New York: Harper and Company, 1955), p. vii.

[76]Graham, op. cit., p. 22.

[77]MacKay, loc. cit.

are the following: 1) a relative, friend, or employee to "live-in" to help care for twins for the first few weeks; 2) diaper service; 3) automatic washer and dryer; 4) husband and older children helping with care of house and children; 5) borrowing additional funds to put into practice the above recommendations.[78,79]

Relationship of twins to other siblings. Authors agree that twins seem to prove to be difficult competition in the attention-getting department, and the child who is just older than twin siblings may be especially resentful at his apparent loss of attention and status.[80] This resentment, Rouda points out, may result in overt or covert acts of hostility toward the twins, thus complicating the parents' task.[81] Rouda suggests that parents curb undue attention of visitors towards twins and call attention to the older children and their accomplishments.[82] It is further suggested by Rouda that parents let the older children know of the arrival of twins in advance, if possible, and let them participate in preparing for and caring for the twins.[83] MacKay recommends that it will be beneficial to family relations for the parents of twins to spend some time regularly alone with each older child.[84]

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[78]Plank, op. cit., p. 200.

[79]Graham, op. cit., p. 22.

[80]Graham, op. cit., p. 68.

[81]C. Rouda, M. C., "Are Twins Double Trouble," Parents' Magazine, 36: 38, January, 1961.

[82]Ibid., p. 39.

[83]Ibid.

[84]MacKay, op. cit., p. 969.

Feeding of twins. A major problem for the mother of twins during the early months of the twins' lives is how to feed two hungry babies at the same time. Perhaps even more perplexing and time-consuming is the situation in which each twin is on a different feeding schedule, i.e., one on an every-three-hour schedule and the other on an every-four-hour schedule. The latter combination of schedules can make it almost impossible for the parents to accomplish anything besides feeding the twins. Graham and Plank both strongly recommend that twins be placed on identical feeding schedules at the earliest possible time to facilitate their care.[85,86] There also seems to be concurrance of opinion as to the impossibility of holding twins while one feeds them, since the time used would be considerable. Therefore, Plank advises either "propping" the babies or feeding both at the same time, with the babies lying on a couch or in their cribs.[87]

III. DEVELOPMENT AND MORBIDITY OF PREMATURELY-BORN TWINS

Birth Hazards

Prematurely-born infants generally have a higher parinatal mortality rate than maturely-born infants, according to Nelson.[88] Klein found that mothers of twins are three times more apt to have toxemia

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[85]Graham, op. cit., p. 34.

[86]Plank, loc. cit.

[87]Ibid.

[88]Nelson, loc. cit.

than are mothers of singletons.[89] Klein stated further, "Birth weight is the most significant single factor influencing survival of the twin."[90]

Development

Gesell and Amatruda stated their opinion, after their research referred to previously, that in spite of the physiological parinatal hazards connected with twins' multiple birth "it is unjust to assume that twins as a rule have an inferior development outlook."[91] "It is essential to assume that twins and singletons are the same after birth," stated Kallmann.[92] However, Pittman and Doig challenged this assumption of twin studies that twins after birth develop similarly to singletons.[93]

A group of six hundred prematurely- and maturely-born children (including one-hundred pairs of twins) from six months to two years of age were studied by Drillien in regards to certain aspects of mental and physical development.[94] Although in her statistical analyses she does not always separate the twins from singletons and maturely-born from prematurely-born children, still there were some findings which seemed worthy of note in relation to this study. She found that twins

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[89]Klein, op. cit., p. 738.

[90]Ibid., p. 144.

[91]Gesell and Amatruda, op. cit., p. 237.

[92]Kallmann, cited by Doig and Pitmann in "Illness in Twins: I. A Study of Twins From a General Hospital Population," Medical Journal of Australia 45: (2), 616, 1957.

[93]Doig and Pittman, op. cit., p. 616.

[94]Drillien, op. cit., p. 37.

show consistently lower scores in their "Development Quotient" than single-born children.[95] Also of interest is her finding that prematurely-born twins with a birth weight of less than four-and-a-half pounds have consistently less weight gain than singletons with a similar birth weight, even when given the best environmental conditions, although this difference was not found to be statistically significant.[96]

A few other aspects of the development of twins were found in literature. These factors were mentioned as being characteristic of twins in general, not of prematurely-born twins specifically. Weaning was found to be a problem in twins, by Graham who conducted interviews with a large group of parents of twins.[97] Mothers of twins she interviewed reported that twins clung to the bottle longer than single-born children.

Graham also reported that toilet training was accomplished at a later age in twins.[98] A helpful comparison of social and emotional development of twins and singletons was compiled by Graham as follows:

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[95] Ibid., p. 45.

[96] Ibid., p. 426-428, 431.

[97] Graham, op. cit., p. 64-67.

[98] Ibid., p. 9.

Development of Singletons	Development of Twins
Infant and mother - baby gains security from mother.	Twin and mother - shares mother, gains security from co-twin as well.
Baby and family - sense of self as an individual - autonomy.	Twins and family - twins find unit response gets results.
Runabout and neighbors - socializing as an individual.	Twins and neighbors - meeting the world as a team.
Child, school, and gang - leadership and group activity.	Twins, school, and gang - only one can lead - twins form a clique.
Adolescent and world - relating self to world - search for soul-mate, pal.	Adolescent twins and world - relating unit to world - twins already have a soul-mate.
Youth and mate - choosing life-mate and job.	Twins, mates, and jobs - twins may check-mate each other.
Adulthood - career and family	Adult twins - may not wish to face life without each other - twinship may lead to celibacy.

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Morbidity in Twins

In 1875, Galton wrote an article in Popular Science Magazine advising the use of twins in studies to test the relative importance of nature and nurture in various diseases.[100] In that same era also he wrote a book concerning the use of twins to determine hereditary factors in illness.[101] His works have been considered classics and ever since he made the above recommendation, twins have been the objects of

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[99] Ibid., p. 7.

[100] F. Galton, cited by R. Osborne, et. al., Genetic Basis of Morphological Variation, (Cambridge: Harvard University Press, 1959), p. 3.

[101] Ibid.

science, used commonly to determine the relative importance of heredity or environment in causation of disease. Examples of studies in which twins have been thus used are as follows: studies concerning peptic ulcer; cholecystitis; appendicitis; inguinal hernia; chest infections; eczematous dermatitis; epilepsy; squint; varicose veins; tuberculosis; infectious hepatitis.

The "twin study" method has been used also to determine genetic components in Electrocardiogram findings, blood pressure and pulse.[102] In this manner also, adult twins were studied in regards to special abilities such as endurance, strength, and mechanical skill.[103] "Such studies are not designed to determine if any disease occurs more often in twins than in singletons, but simply to compare its incidence in both identical and fraternal twins."[104]

One study which actually dealt with problems related to twinship itself was conducted by Illingworth and Woods.[105] They set out to determine whether the high incidence of twins among children with Cerebral Palsy and with mental retardation without Cerebral Palsy is merely due to the high incidence of prematurity associated with twins.

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[102]J. A. Mather, et. al., "Studies of Blood Pressure and Electrocardiograph Findings in Adult Twins," American Heart Journal 62: p. 634, November, 1961.

[103]L. Wright, " A Study of Special Abilities in Identical Twins," Journal of Genetic Psychology, 99: p. 245, December, 1961.

[104]Marshall, et. al., op. cit., p. 1.

[105]R. S. Illingworth, and G. E. Woods, "The Incidence of Twins in Cerebral Palsy and Mental Retardation," Archives of Diseases of Childhood, 35: p. 333, August, 1960.

They found a significantly higher occurance of Cerebral Palsy in prematurely-born twins than in other prematurely-born children. However, it was found that mental retardation occurs in prematurely-born twins no more frequently than in other prematurely-born children.

Regarding the psychiatric problems of twins, Pittman's study showed that "Twins do not seek psychiatric treatment at a rate greater than their proportion in the community."[106] Karpman pointed out that even if it is granted that constitution or heredity determines the presence of neurotic illness, "It is inevitable that a co-twin will be involved in the neurosis of any twin, although not causally."[107]

There is occasional reference in literature to the presence of infantile autism in both fraternal and identical twins. However, the writer could find no study which specifically compared the incidence of autism in twins and singletons.

No study was found which compared the incidence of respiratory illness in childhood twins and singletons. Regarding etiology of major respiratory illness, Nelson states that a child is predisposed to Pneumonia by factors which lower resistance,[108] and that predisposing causes of Bronchitis or Bronchiolitis are: under-nutrition; chronic infection of the upper respiratory tract; and allergy.[109]

Holt, in a section of Pneumonia, states that factors governing resistance to major respiratory infection are not well understood.[111]

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[106]Pittman, op. cit., p. 7.

[107]Karpman, as quoted by Doig and Pittman, op. cit., p. 616.

[108]Nelson, op. cit., p. 788.

[109]Ibid., p. 785.

[110]Ibid.

[111]Holt, et. al., op. cit., p. 491.

Regarding Bronchitis and Bronchiolitis, Holt states that the etiology "remains conjectural."[112]

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[112] Ibid., p. 488.

CHAPTER III

METHODOLOGY OF THE STUDY

I. THE RESEARCH DESIGN

The descriptive survey method, using the study of medical records combined with the interview technique, was employed in this retrospective study. Meyer and Heidgerkin define the survey as "an examination of what is or has been,"[113] and also as "a planned sequence of discoveries."[114] According to Good, one of the purposes of the survey investigation is "to secure evidence concerning the existing situation or current condition."[115]

Pertinent literature was reviewed in regards to: 1) previous related studies; 2) criteria used in evaluation of infant morbidity and development; 3) emotional and physical problems of prematurely-born twins; 4) problems and characteristics of parents of twins. (See Chapter II).

II. RATIONALE FOR AGENCY SELECTION PROCEDURE

A premature clinic in a large metropolitan city was the agency from which medical records of premature twins and singletons were

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[113]B. Meyer and L. Heidgerken, Introduction to Research in Nursing (Philadelphia: Lippincott, 1962), p. 375.

[114]Ibid.

[115]C. V. Good, Introduction to Educational Research (New York: Appleton-Century-Crofts, 1959), p. 167.

selected for this study. This premature clinic was conducted by faculty and students of an accredited medical school.

Most of the patients in this clinic were children who had been born at one of the county hospitals in the metropolitan area, then had been referred to this clinic.

III. SOURCE AND COLLECTION OF THE DATA

A comparative survey was conducted retrospectively, using patients' clinic medical records as sources of data. This method was selected because it would be time-saving as well as effective. It was assumed that the patient's medical record would be reliable, objective, reasonably complete and cumulative. It was assumed that the patients' medical records were well-kept regarding essential information concerning the child's physical and emotional morbidity, weight, height, as well as growth and development milestones.

Data were also obtained through interviews with mothers of children in the study. All mothers who could be located were interviewed, using a check list to obtain information from the mother which would corroborate, explain, or add to the information obtained from the medical record.

IV. METHOD OF SECURING PATIENTS' CLINIC MEDICAL RECORDS

The premature clinic kept a roster of patients seen in the clinic. The roster contained the patient's clinic number, his full name and the year in which he registered. The medical records of twins were first

requested to be seen, before the writer requested to see the singletons' records.

The physician in charge of the premature clinic gave permission for this study to be carried out and also agreed to serve as an advisor to the writer. Permission for the study was also obtained from the administrator of the medical center of which the premature clinic was a part.

Permission for use of the children's medical records was obtained from the supervisor of the medical records department, and the records were received at that department. In addition, some of the medical records of both twins and singletons were still in the office of the premature clinic, and the writer was granted permission to use these records in that clinic.

V. PILOT STUDIES

Two pilot studies were carried out in connection with this study. The first was done on the medical records of ten twins for the purpose of evaluating the effectiveness of the medical record check list.

The second pilot study consisted of interviews with five mothers of singletons in order to evaluate the effectiveness of the check list to be used in the interview.

VI. SELECTION OF MEDICAL RECORDS FOR INCLUSION IN THE STUDY

Selecting the Twins

The twins to be studied were selected as follows: all medical

records of twins who attended the premature clinic between 1959 and 1964 were obtained; each of these records was checked and included in the study if it conformed to the following criteria.

1. Children who had begun to attend the premature clinic within the first three months of life. Thus clinic personnel had an opportunity to observe the child early in life and make pertinent notations on the record.
2. Children who attended the clinic at least until eighteen months of age. Thus there was opportunity for observations of development, height, and weight near the end of infancy for a comparison with comparable factors at birth, and to observe trends of morbidity in the child over a period of time.
3. Children who attended the clinic at least three different times during the first eighteen months of life, thus giving opportunity for observations of progress and change. It was felt that at least this much attendance would be needed for observation of trends of illness and emotional difficulties.
4. Twins whose twin-partner survived and was living all during the twin's research period, since the twin relationship would not exist after the death of one of the twins.
5. One twin of each twin pair was selected, since whatever was operating in one twin was assumed to be affecting both twins.[116]

When both members of a twin pair were eligible for study, the

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[116]John D. Rainer, "Discussion of Kallman's Paper on Twin Data," Diseases of the Nervous System, 19 (7) p. 16, July, 1958.

writer chose the one twin to be used simply by tossing a coin: Twin A, or the twin whose chart was placed on top, was chosen if the coin fell with "heads" up; Twin B, or the twin whose chart was on the bottom, was chosen if the coin fell with "tails" up. It was assumed that this procedure would assure impartiality in choosing the twin to be included in the study.

There were over one-hundred twins seen in the clinic during the period from 1959 through 1964. However, using the above criteria for selection the writer was able to use only twenty records of twins for this study. Of those one was omitted since the writer was unable to match this twin with a singleton.

Matching with Singletons

After records of the eligible twins were selected, each twin was matched with a singleton according to the following criteria:

1. Sex, since some diseases have been shown to vary in incidence in each sex, and since growth in height and weight is different for boys and girls.[117]
2. Race or cultural group, since race and culture affect attitudes towards illness, medical care of children, and incidence of illness.[118]

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[117] Nelson, op. cit., p. 52.

[118] Anna Amann and Allie Mae Williams, "A Study of Child Health Problems," Nursing Outlook, 4: p. 109, February, 1956.

3. Socio-economic level, since growth, development, and illness have been shown to be affected by socio-economic level, especially in small prematurely-born infants.[119]
4. Birth weight, within twelve ounces, since birth weight has been shown to influence morbidity of an infant, as well as his growth and development.[120]
5. Gestation period, within two weeks, since some researchers felt that gestation period was a better guide to the degree of prematurity of the child than was birth weight,[121] and this degree of prematurity would affect the child's growth, development, and morbidity.

Approximately three-hundred medical records of singletons who had attended the premature clinic were reviewed. Only forty-six met the criteria of this study and the criteria for matching with a twin. The unsystematic random sampling method was used in matching the twins with singletons, i.e., the twins were paired with the first singleton-record which matched the twins for the above mentioned criteria. Meyer and Heidgerken define a random sampling thus: "Random sampling implies that every subject in the universe has an equal chance of being selected for the study."[122] "In more practical circumstances, a known

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[119]Drillien, op. cit., p. 45.

[120]Ibid.

[121]Nelson, op. cit., p. 306, 307.

[122]Meyer and Heidgerken, op. cit., p. 314, 315.

portion of the universe is isolated, e.g., patients in general hospitals in five communities - and the researcher selects randomly from this segment."[123]

VII. COLLECTING THE DATA

The Study of Medical Records

A check sheet was designed on which to place the information to be used in the study of the medical records.

For purposes of identification and/or matching, the following information was placed on each child's check sheet: 1) medical record number; 2) child's name; 3) sex; 4) race or cultural group; 5) birth weight; 6) gestation period; 7) socio-economic level, using Warner's method of grading levels of socio-economic status. His gradations were as follows:

Levels

I. "Old families," mostly, with wealth and family position.

II. Less wealthy, but prominent, such as most lawyers, some doctors and businessmen.

III. Small shopkeepers, skilled workers, clerks; they are usually religious, and thought of as the "backbone of America."

IV. "Little people", poor but honest workers, live in small houses crowded together in less well-kept parts of town.

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[123] Ibid., p. 315.

V. "Trash" element, live in shacks, small bungalows, and are "dirty poor whites," hillbillies, often are on relief.[124]

For purposes of comparison between twins and singletons, the following information was gathered:

1. Weight and height at the end of the research period, for comparison between matched twins and singletons as a measure of relative growth.
2. Comparison of weight and height at the end of the research period to the Iowa Scale of Height and Weight, to compare each child's weight and height with an accepted standard of norms of height and weight at a given age.[125]
3. Age when the child sat alone, an important factor of infant development which was used to compare each infant's progress in growth and development with the norms for his age and to facilitate comparisons between twins and singletons in this factor.
4. Age when the child walked alone, as an additional important development milestone for comparison between twins and singletons.
5. Age when the child spoke the first word, since speech formation is an important aspect of child development, and is a different form of development from the above-mentioned

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[124]W. Warner, et. al., Democracy in Jonesville (New York: Harper, 1959), p. 22-28.

[125]Nelson, op. cit., p. 46.

developmental tasks, walking and sitting alone.

6. Physical morbidity (types and number of times each was noted), to give a more complete picture of the illnesses, symptoms, and physical signs of abnormality for each child in the study, and to provide a basis for comparison of physical morbidity between twins and singletons. Morbidity judged to be clearly caused by congenital or inherited factors was not included in the study.
7. Emotional morbidity (number of times each was noted), to report all of the recorded symptoms and diagnoses suggesting evidence of emotional conflict in the child, or between parent and child, or of emotional ill health in the child. Comparison of the type and amount of emotional morbidity could thus be made between twins and singletons.
8. Number of siblings, for comparison with previous studies which have stated that twins have a significantly higher number of siblings,[126] and for further evaluation of possible work load of the mothers of children in this study.
9. Number of missed clinic appointments (either "cancelled" or "failed" appointments) for comparison of this type of behavior on the part of parents of twins and that of parents of singletons in this study, since missed appointments might have influenced the above findings of the study.

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[126]Gedda, op. cit., p. 73.

The Interview With Mothers

It was assumed that a visit to each child's home, including an interview with each child's mother, would be helpful in the following ways: it would provide the writer with an opportunity to observe each home for the evaluation of socio-economic level, as well as questioning the mother concerning physical and emotional morbidity of the child to compare with and add to the information collected from the medical record. It was assumed that the mother would have reliable memory of the developmental milestones being noted in this study, and reasons for missed clinic appointments.

A check list was designed to use in interviewing mothers to insure uniformity of queries and easier recording of data. (See Appendix.)

Along with the child's name and clinic number, the writer, in preparation for the interviews filled out the following additional identifying information obtained from the medical record: 1) parent's name; 2) address; 3) telephone number. Physical and emotional diagnoses and number of times listed were also recorded from the medical record, so that the writer would have this information on hand during the interview so as to ask the parent for corroboration of this information.

When the above information had been placed on the check list, attempts were made to arrange via telephone for a visit with the mother of every child. The writer was able to make appointments with only four of the parents.

Many did not have telephones listed in the medical record, but the writer attempted to locate them at their listed home address and

interview the mother of each child in the study. However only fourteen interviews were made. The following are reasons the other interviews were not made: 1) family moved, no forwarding address; 2) family not known at this address or by neighbors; 3) no such address.

The procedure of the interview was as follows: The writer wore a nurse's white uniform, since it was assumed that a nurse, whose identity was clearly stated by her name pin and uniform would be accepted readily, and would be permitted to interview the mother. After introducing herself by name, the writer explained the purpose of her visit and gave assurance that all information provided would be kept confidential. The writer then questioned the mother, following the check list and asking the questions in order.

The first questions asked were to obtain the mother's verification and comments regarding the morbidity listed on the child's chart. The writer placed a 3 x 5 card over the left-hand column of the check list which contained the record of the illnesses as obtained from the chart, in an effort to prevent the writer from "leading" the mother, and to allow her to answer spontaneously.

The first question was put in this manner: "Would you try to remember back to (child's) first two years (or eighteen months) when you were taking him to the premature clinic. Can you recall the illnesses (child) had for which you took him to the clinic?" The writer recorded all the mother reported. After the mother reported spontaneously, the writer removed the 3 x 5 card and then referred to the information regarding morbidity which had been recorded on the child's clinic record.

If there were symptoms or diagnoses from the chart which the mother had not mentioned spontaneously, the writer asked her about these. In almost all instances, the mothers reported spontaneously all of the morbidity included on the child's clinic medical record.

The mother was then asked to recall at what age the child had first done the following: 1) sat alone; 2) walked unaided; 3) spoke the first word. These answers were recorded in the place provided. In every case except one the mothers answered the above questions with exclamations indicating that they did not remember the ages called for. Although they attempted to give some indication of the ages when the three developmental tasks were accomplished, the mothers all qualified their answers with, "I guess," "approximately," "it must have been around --." In the category of the first word spoken a large number declined even to venture a guess.

Next the writer, referring to the Interview Check Sheet, said almost verbatim, "Sometimes a child only has a 'little' illness or sometimes even when a child is sick, the parents can't take him to the clinic. Would you try to remember any illness which (the child) had for which you were not able to take him to the clinic. ?" The purpose of this section of the interview was to have a more complete picture of all the illnesses the child had during his first eighteen months, or two years, whether treated at the premature clinic or not.

The following series of questions were asked, to which the mother was to answer in one of the following ways: "frequently"; "seldom"; or "never". These questions were directed toward discovering more about

the child's emotional morbidity, or emotional well-being.

1. Did (child) have temper tantrums during his first two years (or first eighteen months)?
2. Did he have head-banging?
3. Did he have head-rocking? (explained the meaning).
4. Did he suck his thumb?
5. Did he eat well?
6. Did he sleep well?
7. Was he a cuddly baby? When picked up and held did he cuddle up or stiffen out?

After the appropriate answers were recorded, the writer proceeded to the final query, which again was stated almost verbatim to each mother as follows: "Most parents find that it is very hard to take a child to the clinic even when the child is ill. I was wondering if you have ever had any problems in trying to take (child) to the clinic." The writer found that most of the mothers had ready answers to the above question and spoke most spontaneously. The purpose of this question was to ascertain reasons for missed clinic appointments.

The interview was concluded with the writer expressing appreciation for the mother's cooperation and with reassurances that the statements given would be confidential.

As soon after the interview as possible the writer recorded in the provided space her evaluation of the family's socio-economic level, using Warner's scale, as outlined on page 43.

VII. CLASSIFYING AND ANALYZING THE DATA

Weighting Morbidity

A complete list was made of all the different forms of physical and emotional morbidity gathered from patients' records and mother interviews. The physical morbidity was temporarily grouped under system headings, e.g., respiratory, to facilitate evaluation of their relative importance in order to devise a fair weighting system.

The list of morbidity types was taken to the pediatrician in charge of the premature clinic. The pediatrician and the writer agreed that it was important to the evaluation of the findings of this study to place different weights or values on physical and emotional morbidity of differing severity. Thus a "cold" was given a different weight or value of importance than Bronchopneumonia.

Drillien's weighting of illness in children[127] was adapted to the needs of this study. While Drillien added all one child's illnesses together and then gave this total a value ranging from one (no illness) to seven (four or more major respiratory infections, plus three or more hospitalizations) the writer felt the findings of this study would be more easily evaluated if each type of illness was assigned a weight separately. In the case of a child who had more than one illness, the total of the values assigned to his various illnesses were added together and recorded. The resulting Illness Index was as follows: (the numbers before each entry are the numerical values assigned to the illnesses listed).

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[127]Drillien, op. cit., p. 220.

Physical Morbidity

1. Minor - respiratory infections (such as "colds"); gastro-intestinal complaints ("loose stools", and so forth); skin and conjunctival disorders (e.g., diaper rash, conjunctivitis); neurological complaints (e.g., tense fontanels); accidents (falls with no injury noted); lymphadenopathy; "childhood" illnesses (e.g., mumps).
2. Moderate - respiratory infections (e.g., Otitis Media); and skin disorders (e.g., ulcerations).
3. Major - respiratory infection (e.g., Pneumonia); gastro-intestinal complaints (e.g., Salmonella); and low Hemoglobin (10.5 grams or below after the sixth month of life); and accidents (e.g., fracture of femur after "fall from bed").
4. Hospitalizations - for any of the above type of diagnoses, but excluding elective surgery.

Emotional Morbidity, and Child-rearing Problems

1. "Eats poorly," "trouble sleeping."
2. "Trouble sleeping" with therapy for this complaint at the county clinic; "some colic - spits up;" "very active"; "sucks thumb"; "sucks blanket"; "is double-trouble"; occasional temper tantrum.
3. Frequent temper tantrums; "appeared afraid"; "irritable - cried a lot"; question of intelligence of child; frequent aggressive-combative behaviour; "very nervous"; "roughest child"; child didn't care to be held.

Analyzing Data

A statistician was consulted regarding proper type and form of statistical analyses suitable for analyzing factors involved in this study. The various factors were classified and statistical analyses done. Tables and figures were constructed and comparisons were made between the singleton and the twin data.

CHAPTER IV

PRESENTATION OF ANALYSIS OF DATA

I. INTRODUCTION

It was the purpose of this study to compare premature twins with matched singletons during the first eighteen months to two years of life, in specific factors of growth and development, and physical and emotional morbidity. Incidental information, number of siblings and number of missed clinic appointments, was also collected as they may have affected the findings concerning the above-named factors.

II. SETTING AND POPULATION OF THE STUDY

A retrospective study, using clinic records of a matched group of prematurely-born twins and singletons, was done using the descriptive survey method. Subsequently, each mother who could be located was interviewed during a home visit.

A premature clinic, which was staffed by faculty and students of a medical school, was selected for the study. The clinic was located in a large metropolitan city.

Using the criteria for selection of subjects for the study, which were discussed in Chapter III, there were selected nineteen prematurely-born twins and nineteen matched prematurely-born singletons.

Singletons were matched with twins in the following characteristics: sex, race, socio-economic level, birth weight, and gestation period. Tables I, II, and III identify the resulting study population.

There was no attempt made in this study to select an equal number of male and female children. However, there were twenty males and eighteen females.

There were no Mexican males or Anglo-Saxons, either male or female, in the study, as none were eligible. The figures below identify the study population by sex and race.

RACE	MALE	FEMALE	TOTALS
Negro	20	12	32
Mexican	0	6	6
TOTALS	20	18	38

The socio-economic level assigned each child was evaluated (using Warner's scale, as listed on page 43) from information on the medical record regarding father's occupation, location of residence, whether the child was born in a county or a private hospital, and whether the child or his family was on some form of government aid. From the information on the medical records, no child was evaluated to belong to Levels I, II, or III. Twenty children were evaluated to belong to Level IV, and eighteen children to Level V (see Table I). However, upon home visits to fourteen of the children, in order to interview the mothers, the writer categorized the socio-economic levels of the children as follows: Level III, three children; Level IV, eight children; Level V, three children. The majority of the families visited gave the impression of being in a higher socio-economic level than was evident from the child's medical record. Perhaps several had been moving upwards, socially and economically, since the time the clinic information was recorded.

TABLE I

COMPARISON OF THE STUDY POPULATION BY SOCIO-ECONOMIC LEVEL* AND RACE AND SEX

SEX AND/OR RACE	SOCIO-ECONOMIC LEVEL		TOTALS
SEX	LEVEL IV	LEVEL V	
Male	12	8	20
Female	8	10	18
TOTAL	20	18	38
RACE			
Negro	20	12	32
Mexican	0	6	6
TOTAL	20	18	38
SEX AND RACE			
Negro Male	12	8	20
Negro Female	8	4	12
Mexican Male	0	0	0
Mexican Female	0	6	6
TOTAL	20	18	38

The figures represent the number of children in each category. There are an equal number of twins and singletons in each category.

* By use of Warner's Scale.

The paired twins and singletons were matched in birth weight within twelve ounces. The birth weights ranged from two pounds, six ounces to four pounds, fifteen ounces. The overall mean for both twins and singletons was three pounds, thirteen ounces (see Table II).

Matched twins and singletons were within two weeks gestation of each other. The range of gestation periods was from thirty weeks to thirty-nine weeks. The twin mean was 34.13 weeks, and the singleton mean, 34.03 weeks (see Table III).

III. COMPARISON OF TWIN-SINGLETON BIRTH WEIGHTS WITH WEIGHTS AT THE END OF THE RESEARCH PERIOD

As previously noted, the mean birth weights of the twins and singletons were identical. At the end of the research period the mean weight of twins was 2.08 pounds less than the mean weight of the singletons. The t value for this total difference was 1.82 which was not statistically significant (see Table IV). In a study which involved both twins and singletons (prematurely-born versus maturely-born) Drillien noted a weight-gain difference in twins and singletons, although this difference was not statistically significant.[128] Perhaps the lessened amount of time and attention which a mother of twins has to devote to feeding each twin may be a factor in influencing weight gain. The higher incidence of physical and emotional morbidity in twins, noted below, may have been a factor in slower weight gain.

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[128]Drillien, op. cit., p. 426-428.

TABLE II

IDENTIFICATION OF THE STUDY POPULATION BY BIRTH WEIGHTS

BIRTH WEIGHT (Lbs. and Ozs.)	TWINS	SINGLETONS	TOTAL NUMBER OF CHILDREN IN GROUP
2-6 - 3-0	3	3	6
3-1 - 3-8	3	4	7
3-9 - 4-0	7	6	13
4-1 - 4-8	3	3	6
4-9 - 4-15	3	3	6
TOTALS	19	19	38
MEANS	3 lb., 13 oz.	3 lb., 13 oz.	3 lb., 13 oz.

TABLE III

IDENTIFICATION OF THE STUDY POPULATION BY GESTATION PERIOD

GESTATION PERIOD IN WEEKS	TWINS	SINGLETONS	TOTAL NUMBER OF CHILDREN IN EACH CATEGORY
30 - 32	7	5	12
33 - 36	8	10	18
37 - 39	4	4	8
TOTALS	19	19	38
MEANS	34.13 weeks	34.03 weeks	34.08 weeks

TABLE IV.

COMPARISON OF BIRTH WEIGHTS OF TWINS AND MATCHED SINGLETONS

WITH WEIGHTS AT THE END OF THE RESEARCH PERIOD

	MATCHED PAIR #	SINGLETONS B. WT. Lb. Oz.	SINGLETONS E. R. P. WT. Lb. Oz.	TWINS B. WT.	TWINS E. R. P. WT. Lb. Oz.	DIFFERENCE* Lb.
Two-Year Group	1	4-0	28-0	4-0	21-4	-6.75
	2	3-14	24-8	4-0	19-4	-5.25
	3.	3-11	33-0	3-11	27-8	-5.50
	4	4-13	27-0	4-9	29-0	+2.00
Eighteen-Month Group	5	3-7	23-0	3-13	19-0	-4.00
	6	4-0	27-0	4-12	19-0	-8.00
	7	4-8	25-0	4-8	23-0	-2.00
	8	3-0	28-0	2-7	17-8	-10.50
	9	4-4	20-0	3-12	18-8	-1.50
	10	3-10	23-8	3-8	26-0	+2.50
	11	3-0	24-0	3-8	23-0	-1.00
	12	4-10	24-0	4-4	31-0	+7.00
	13	4-8	24-8	4-4	22-0	-2.50
	14	3-9	24-0	4-0	21-0	-3.00
	15	4-15	24-8	4-11	15-8	-9.00
	16	3-5½	20-0	3-0	26-8	+6.50
	17	2-10	23-8	2-6	29-0	+5.50
	18	3-6	22-0	3-11	19-8	-2.50
	19	3-3	24-0	3-6	22-8	-1.15

t value of total group: 1.82, Significance level: 10%

* DIFFERENCE: A minus means the twin weight was less than the singleton weight; a plus means that the twin weight was more than the singleton.

SYMBOLS: B. WT. = Birth Weight
E. R. P. WT. = Weight at the end of the Research Period

IV. COMPARISON OF HEIGHT OF TWINS AND MATCHED SINGLETONS AT THE END OF THE RESEARCH PERIOD

Height of twins and singletons at the end of the research period was compared. Unfortunately birth heights (recorded on only two children) were not available for comparison.

As with the weight comparison, the twins' mean height was slightly less than the singletons', the mean difference being .66. The t value was 1.83 and was not significant. Since the twins and singletons were matched for race, sex, socio-economic level, birth weight and gestation period, these factors were ruled out as causative factors in the height and weight difference between twins and singletons shown in Tables IV and V. The twin group's greater incidence of illness, especially major respiratory illness, which was discussed below, was perhaps a factor in the lower weight and height of the twins. (See Table V).

V. RELATIONSHIP OF HEIGHT AND WEIGHT TO THE IOWA SCALE

The relationship of the twins' and singletons' heights and weights, at the end of the research period, to the levels of the Iowa Height and Weight Scale, e.g., Mean (see sample in Appendix), is demonstrated in Figure I.

While the placement of twin and singleton height values seemed quite similar, there appeared to be a concentration of twin weights well below most singleton weights. Placing the heights and weights on the levels of the Iowa Scale seemed to blur or nullify the differences noted

TABLE V.

COMPARISON OF HEIGHT OF MATCHED TWINS AND SINGLETONS AT THE END OF THE RESEARCH PERIOD

	MATCHED PAIR #	SINGLETONS	TWINS	DIFFERENCE*
Two-Year Group	1	31.5 Inches	30.5 Inches	-1 Inches
	2	31	29.5	-1.5
	3	35.5	33	-2.5
	4	34.5	34	-0.5
	5	31.5	28.5	-3
	6	33	32	-1
	7	30.5	31	±0.5
Eighteen-Month Group	8	30.5	29.5	-1
	9	29	29.5	±0.5
	10	31	31.5	±0.5
	11	31	32	-1
	12	31	33	±2
	13	33	31	-2
	14	31	29.5	-1.5
	15	32.5	30	-2.5
	16	29	31.5	±2.5
	17	30.5	31	±0.5
	18	32	30	-2.0
	19	31.5	30	-1.5

* DIFFERENCE: A minus means the twin was a given number of inches less in height than the singleton; a plus means the twin was a given number of inches taller than the singleton.

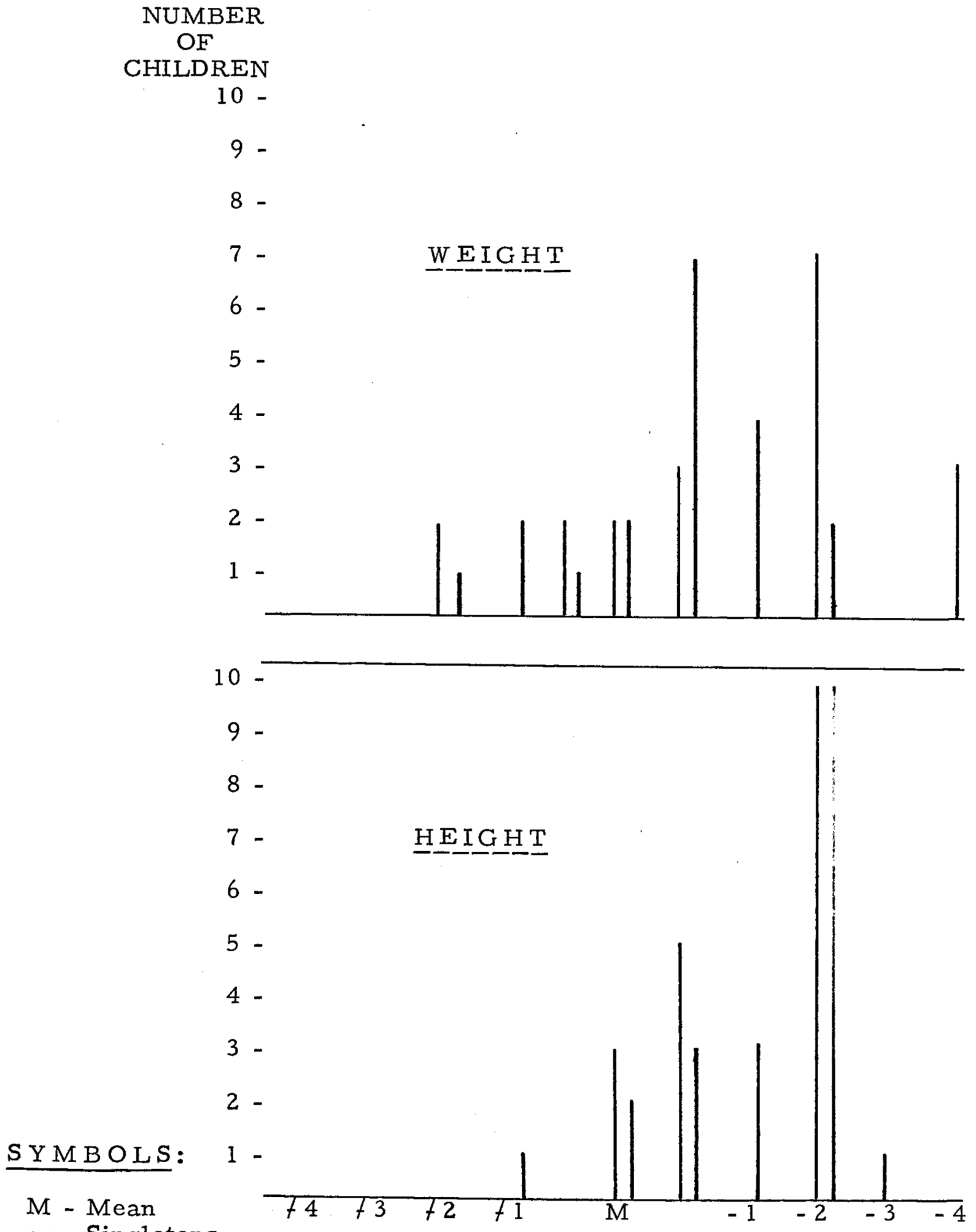

FIGURE 1.

NUMBER OF CHILDREN AT LEVELS OF IOWA HEIGHT AND WEIGHT SCALE

previously (Tables IV and V) when height and weight were compared using pounds and inches, respectively.

VI. COMPARISON BETWEEN TWINS AND SINGLETONS IN THREE DEVELOPMENTAL TASKS

Data Obtained From Clinic Medical Records

It was one of the original purposes of this study to compare the age of accomplishment of the following developmental tasks for twins and singletons: walking unaided; sitting alone; and speaking the first word. However, no such comparisons could be made since those factors did not appear on all of the medical records studied.

It was not one of the original purposes of this study to compare the frequency with which the above-named developmental tasks were recorded on medical records of twins and singletons. However, a difference was observed. Each of the three developmental tasks was recorded less frequently on the twins' medical histories than on the singletons', and this difference had a Chi^2 value of 4.25 with a significance level of five percent.

The physician in charge of the premature clinic reported that it was the practice before examination of twins in that clinic to bring both children, along with the parent, into the examining room at the same time. The same physician examined both children. It seemed reasonable that under such a situation, if both children should cry or demand maternal attention, that the mother and the physician might have been distracted, with a tendency to speed up the procedure of examination and history-taking. In this way some parts of the examination or inter-

view regarding the developmental milestones might easily have been overlooked.

Data Obtained From Interviews With Mothers

The interview data was incomplete, thus no statistical analysis was done. However, it became apparent from those interviews which were done that the majority of mothers did not have a clear or accurate memory regarding the age at which the child accomplished certain developmental tasks. Most mothers spontaneously declared that any answer they gave on this topic would be a guess only. This situation would seem to confirm the contentions of several writers, including Lowinger and colleagues,[129] who question the value of retrospective questioning of parents regarding their child's development.

VII. TYPES OF PHYSICAL MORBIDITY FOUND IN TWINS AND SINGLETONS

Data From Clinic Medical Records

Physical morbidity included in the study was limited to morbidity in which parental care could have been an influencing factor, such as in acute respiratory illness. In addition, all such morbidity as so-called "childhood" illnesses were included for comparison of twins and singletons. Illnesses such as "hernias" or "appendicitis" were excluded. See figure II for the total list of categories and findings of physical

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[129]Lowinger, et. al., op. cit., p. 517.

morbidity in twins and singletons. In two categories (Major Respiratory Illness, and Hospitalization) the difference between the incidence in twins and singletons was significant at the one percent level. It was noted in the above categories that the twins' incidence was nine and eight, respectively, but there was no recorded incidence in these two categories for singletons. The eight hospitalizations occurring in the twin group were all due to Major Respiratory Illness.

There was no clear-cut reason observed to account for the difference in the incidence of Major Respiratory Illness and Hospitalization in twins and singletons. However, factors related to twinship itself (as noted in Chapter II) seemed possible influences in etiology. The twin's mother's work load (similar, simultaneous demands of twins, plus a larger-than-average number of other children) could reduce her competency in caring for a child. In addition, the twins' average weight was lower at the end of the research period. However, the twin and singleton incidence of low Hemoglobin was the same, and Minor Respiratory Illness was no greater for twins than for singletons. Therefore these factors could be ruled out as being of importance in the higher incidence of Major Respiratory Illness among twins. The significantly higher incidence of missed clinic appointments in twins, discussed below, may have resulted in poorer preventive care for twins.

The incidence of Lymphadenopathy for twins was nine, and for singletons was one. This difference was significant at the five percent level. Lymphadenopathy is commonly found in connection with upper respiratory infections,[130] but the incidence of that type of infection

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[130]Nelson, op. cit., p. 990.

(see Minor and Moderate Respiratory Illness, Figure 2) was almost identical in twins and singletons. Thus there was no significant difference in incidence of upper respiratory infection to account for the increased incidence of Lymphadenopathy in twins. Only four of the observations of Lymphadenopathy in twins were made on the same children who, at other clinic visits or hospitalizations, had diagnoses of Major Respiratory Illness. Swelling and hyperplasia of lymphoid tissue "may last long after the primary infection which caused it has disappeared."[131] Perhaps the higher incidence of Lymphadenopathy in twins was due to infections, such as respiratory infections, in the twins which were not seen by or reported to the physicians in the premature clinic.

VIII. TOTAL AMOUNT OF PHYSICAL MORBIDITY

By Use of the Illness Index

The Illness Index described in Chapter III was used to assign numerical values to each symptom or diagnosis of physical morbidity. The numerical value of morbidity for each matched pair of twins and singletons was determined. Using the t test, the difference was not found to be statistically significant, although the total incidence of weighted physical morbidity for twins was 189 compared to 101 for the singletons (see Table VI). While no statistical analysis was possible (due to incomplete data) on the data from the interviews with mothers, weighting by use of the Illness Index was done on the available data.

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[131] Ibid.

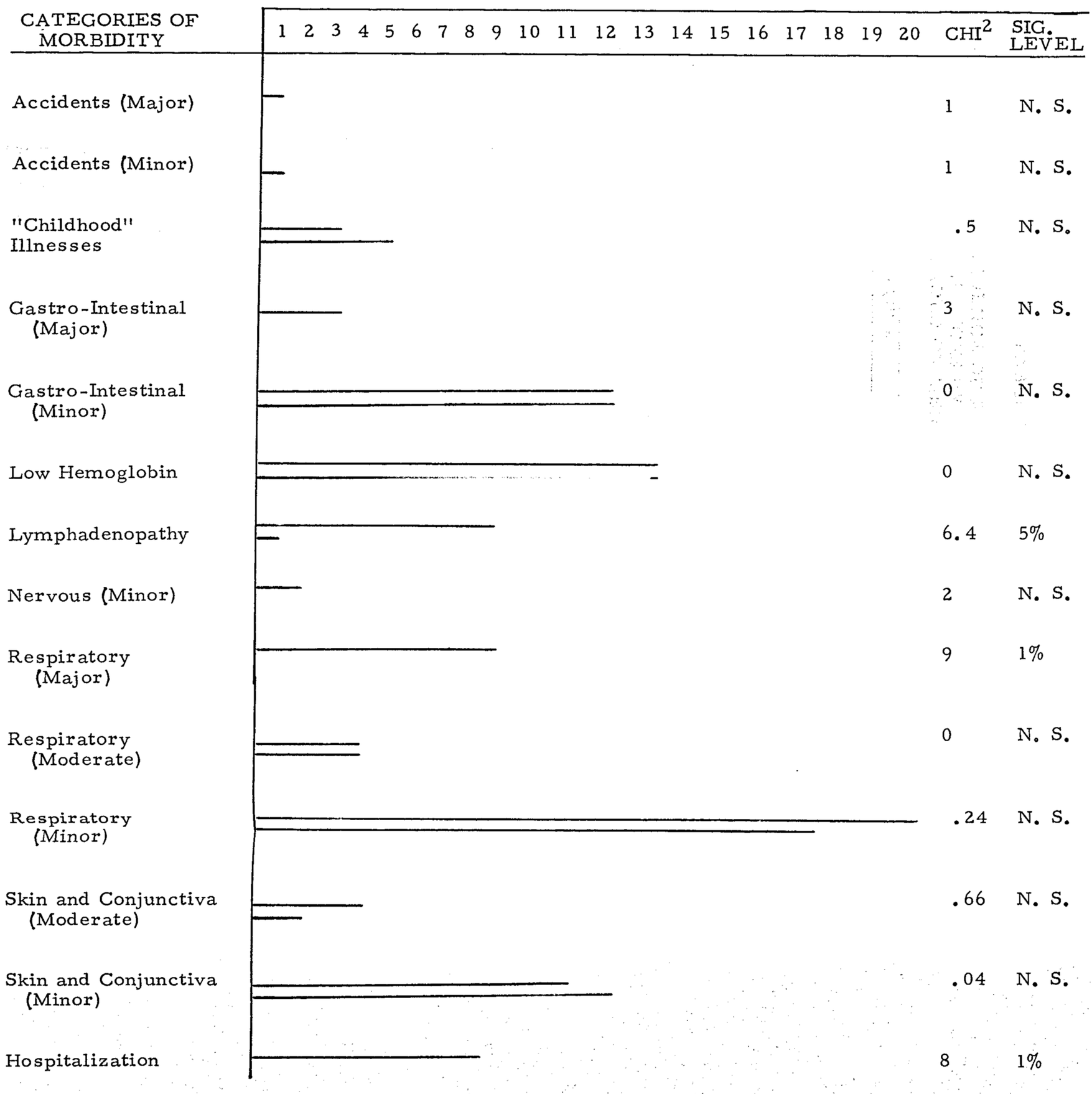

FIGURE 2.

COMPARISON OF TYPES OF PHYSICAL MORBIDITY FOR TWINS AND MATCHED SINGLETONS AS RECORDED ON MEDICAL RECORDS

SYMBOLS:
Sig. Level - Level of Significance
N. S. - Not significant
——— - Twins
——— - Singletons

TABLE VI.

COMPARISON OF INCIDENCE OF PHYSICAL MORBIDITY IN TWINS AND MATCHED SINGLETONS BY USE OF ILLNESS INDEX* AS RECORDED ON MEDICAL RECORDS

MATCHED PAIR #	TWINS	SINGLETONS
1	5	3
2	10	0
3	4	14
4	1	5
5	0	5
6	10	2
7	8	2
8	3	10
9	5	12
10	5	10
11	4	2
12	0	1
13	42	1
14	49	8
15	7	8
16	0	5
17	14	6
18	20	3
19	2	4
TOTALS	189	101

t value = 1.39, NOT SIGNIFICANT
Mean for Total = 7.63
Mean for Twins = 9.95
Mean for Singletons = 5.32

* See ILLNESS INDEX on pages 49-51.

The resulting twin mean was fifteen, while the singleton mean was 7.5, showing a higher percentage of illness in twins than in singletons.

By Number of Illnesses (Unweighted)

The total morbidity for twins was 103 versus 70 for singletons. Using Chi^2 the difference was significant at the five percent level. While no definite reason was noted for the observed difference, the general effect of the additional emotional and physical burdens attributed to the parent of twins could again have been influential in affecting the quality of child care given to twins. The total number of instances of physical morbidity obtained from the medical records of each twin and singleton was recorded on Table VII.

Since incomplete data was obtained from interviews of mothers, no statistical analysis was made of the findings thus obtained. However it was of interest to note that the mean of total twin physical morbidity reported by the mothers was 9.83, while the singleton mean was 7.00. Of particular interest were the findings under the classifications of Major Respiratory Illness and Hospitalization, since they showed findings comparable to the findings under the same categories from the study of the medical records. In Major Respiratory Illness the incidence for twins was seven, while the incidence for singletons was zero. The singleton incidence for Hospitalization was also zero, while the twin incidence was four. These findings are even more impressive when it is noted that there were eight singletons and only six twins in the interviews with mothers. The figures obtained do not, therefore, refer to matched pairs of twins and singletons (see Table VIII).

TABLE VII

COMPARISON OF PHYSICAL MORBIDITY BY TOTAL NUMBER OF ILLNESSES IN TWINS AND MATCHED SINGLETONS, AS RECORDED ON MEDICAL RECORDS

MATCHED PAIR #	TWINS	SINGLETONS
1	5	1
2	6	0
3	5	7
4	1	3
5	0	5
6	10	2
7	4	2
8	1	9
9	3	6
10	5	6
11	2	2
12	0	1
13	20	1
14	19	5
15	6	4
16	0	5
17	8	6
18	6	1
19	2	4
TOTAL NUMBER OF ILLNESSES	103	70

$Chi^2 = 6.30$
Significance Level = 5%

TABLE VIII.

COMPARISON OF PHYSICAL MORBIDITY BY NUMBER OF ILLNESSES IN TWINS AND UNMATCHED SINGLETONS AS OBTAINED FROM INTERVIEWS WITH MOTHERS

TYPE OF MORBIDITY	NUMBER OF INCIDENCE OF MORBIDITY		MEANS	
	Twins*	Singletons*	Twins	Singletons
Accidents (Major)	0	1	0	.13
Accidents (Minor)	0	1	0	.13
"Childhood" Illnesses	3	7	.50	.88
Gastro-intestinal (Major)	1	0	.17	0
Gastro-intestinal (Minor)	1	0	.17	0
Respiratory (Major)	7	0	1.17	0
Respiratory (Moderate)	6	2	1.00	.25
Respiratory (Minor)	37	45	6.17	5.63
Hospitalization	4	0	.67	0
TOTALS	59	56	9.83	7.00

* Note: There were six twins whose mothers were interviewed, and eight singletons whose mothers were interviewed.

IX. EMOTIONAL MORBIDITY

Data From Medical Records, Using Illness Index

Emotional morbidity was weighted as described in Chapter III. The total incidence of weighted emotional morbidity for twins was twenty-eight, and for singletons was seven. The t value of 1.73 was not significant (see Table IX). The literature review in Chapter II gave considerable evidence of the presence of emotional conflicts regarding their twin children in a high percentage of mothers of twins. The tensions produced by two children crying, hungry, wet, or soiled at the same time have been discussed as well as the frustrations of the emotional and physical demands on the mother. It was reasoned that such factors might produce tension in the mother, and that such tension might be transmitted verbally or nonverbally to the child, thus producing emotional tension in the child.

Since parents have only so much time for holding caressing, rocking and playing with their children, when this time must be divided between twins, conceivably the child could feel emotional deprivation.

Unweighted Data From Medical Records

Each notation of emotional morbidity, e.g. "temper tantrums", was recorded and again a comparison made between twins and singletons. The total of morbidity in the twin group was significantly higher than the singleton group total. The twin total was fourteen and the singleton total was four. Using Chi^2 the significance level was found to be five percent (see Table X).

TABLE IX.

COMPARISON OF TOTAL INCIDENCE OF EMOTIONAL MORBIDITY IN TWINS AND MATCHED SINGLETONS BY USE OF ILLNESS INDEX* AS RECORDED ON MEDICAL RECORDS

MATCHED PAIR #	TWINS	SINGLETONS
1	2	0
2	3	0
3	0	1
4	0	0
5	1	0
6	0	0
7	0	0
8	0	2
9	0	0
10	2	0
11	0	0
12	0	0
13	2	0
14	0	1
15	9	0
16	0	0
17	6	0
18	0	0
19	3	3
TOTAL NUMERICAL VALUE OF EMOTIONAL MORBIDITY	28	7

t - 1.73, SIGNIFICANCE LEVEL - 10%

*See ILLNESS INDEX on pages 49-51.

TABLE X.

NUMBER OF NOTATIONS OF EMOTIONAL MORBIDITY RECORDED ON MEDICAL RECORDS COMPARING TWINS WITH MATCHED SINGLETONS

MATCHED PAIR #	TWINS	SINGLETONS
1	2	0
2	3	0
3	0	1
4	0	0
5	1	0
6	0	0
7	0	0
8	0	1
9	0	0
10	1	0
11	0	0
12	0	0
13	1	0
14	0	1
15	3	0
16	0	0
17	2	0
18	0	0
19	1	1
NUMBER OF INCIDENCES OF EMOTIONAL MORBIDITY	14	4

Chi^2 - 5.56, SIGNIFICANT at 5% level.

Unweighted Data From Interviews with Mothers

The mean emotional morbidity of twins was of interest, since it was higher than the mean for singletons. The twin mean was 2.5; the singleton mean, 1.6. However, no statistical analysis was done, due to incomplete data from the interviews of mothers.

The following are types of emotional morbidity which were noted by the writer during home visits:

Aggressive - combative

Extremely active

Mother seemed unable to speak of twins as individuals, but always referred to the twins as "they"; she knew no factor in which the two differed.

The following are types of emotional morbidity reported by mothers during home visits made by the writer:

Sucks thumb

Sucks blanket

Did not care to be held

Head-banging

Temper tantrums

"Double-trouble"

"Over-spoiled"

"Very nervous"

"Roughest child, mean"

"Child gets away with murder, too hard to control."

X. COMPARISON BY NUMBER OF TWIN SIBLINGS AND SINGLETON SIBLINGS

The number of twins' siblings and singletons' siblings born prior to and including the birth of the child under study were compared. These figures did not include siblings born subsequent to the birth of the child under study, since complete data was unavailable.

A table was designed to give a view of the influences of race and sex on the number of siblings of twins and singletons. In each category twins had a significantly higher number of siblings. Chi^2 of the total difference was significant at the .1 percent level.

Of the racial categories, the Mexican group (all females) showed the greater difference between number of siblings of twins and singletons, with a significance level of one percent. The twin mean of the Mexican category was four siblings per twin, while the singleton mean was .33 per singleton.

Of the subgroups, the greatest difference in the number of siblings was found between female twins and female singletons; Chi^2 was twelve with a significance level of .1 percent. The total mean number of siblings for twins was 3.47, and for singletons, 1.47 (see Table XI). This showed approximately the same percentage of siblings of twins as Edwards' study, in which he found an average of approximately five siblings per twin, with two of these being born after the twin.[132] Gedda also reported that mothers of twins usually have "many"

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[132]Edwards, op. cit., p. 311.

TABLE XI.

COMPARISON OF TWINS AND SINGLETONS IN NUMBER OF SIBLINGS BY RACE AND SEX

SEX / RACE	MALE (20)	FEMALE (18)	TOTALS (38)	MEANS	CHI^2	LEVEL OF SIGNIFICANCE
NEGRO (32)	30 T 16 S	24 T 11 S	54 T 27 S 81	3.38 T 1.80 S	9	1%
MEXICAN (6)	T S	12 T 1 S	12 T 1 S 13	4 T 0.33 S	9.30	1%
TOTALS (38)	30 T 16 S 46	36 T 12 S 48	66 T 28 S 94	3.47 T 1.47 S	15.36	.1%
MEANS	3 T 1.6 S	4 T 1.33 S	3.47 T 1.47 S			
CHI^2	4.26	12	15.36			
LEVELS OF SIGNIFICANCE	5%	.1%	.1%			

SYMBOLS:

T = Twins
S = Singletons
Number of children in each major category - numbers in parenthesis - (10), (20), etc.

other children, which he attributed to greater fertility in women who have twins.[133] The quality of care given to twins could possibly be affected adversely by the presence of large numbers of siblings for whom the mother also has to care. Perhaps the larger number of siblings contributed to the higher incidence of physical and emotional morbidity noted in twins in this study.

XI. MISSED CLINIC APPOINTMENTS

The records of the premature clinic contained two types of "missed" appointments, i.e., "cancelled" (parent telephoned or wrote to cancel the appointment) or "failed" (parent did not cancel the appointment, but simply did not show up).

While "failed" appointments for twins were numerically greater, the twin total was forty-three and the singleton total was twenty-eight, this difference was not statistically significant. However, the difference in "cancelled" appointments, the twin total was twenty-two and the singleton total was six, was significant at the one percent level. The difference between the twins and singletons in total missed appointments was also significant at the one percent level, the twin total being sixty-five while the singleton total was thirty-four (see Figure 3).

The difference in number of missed appointments noted, which may have been a factor influencing higher incidence of morbidity and slower growth in twins, was interpreted as being a result of the difficulty in transportation and management in the clinic of twin infants (two together) by one adult. This interpretation was somewhat borne out by

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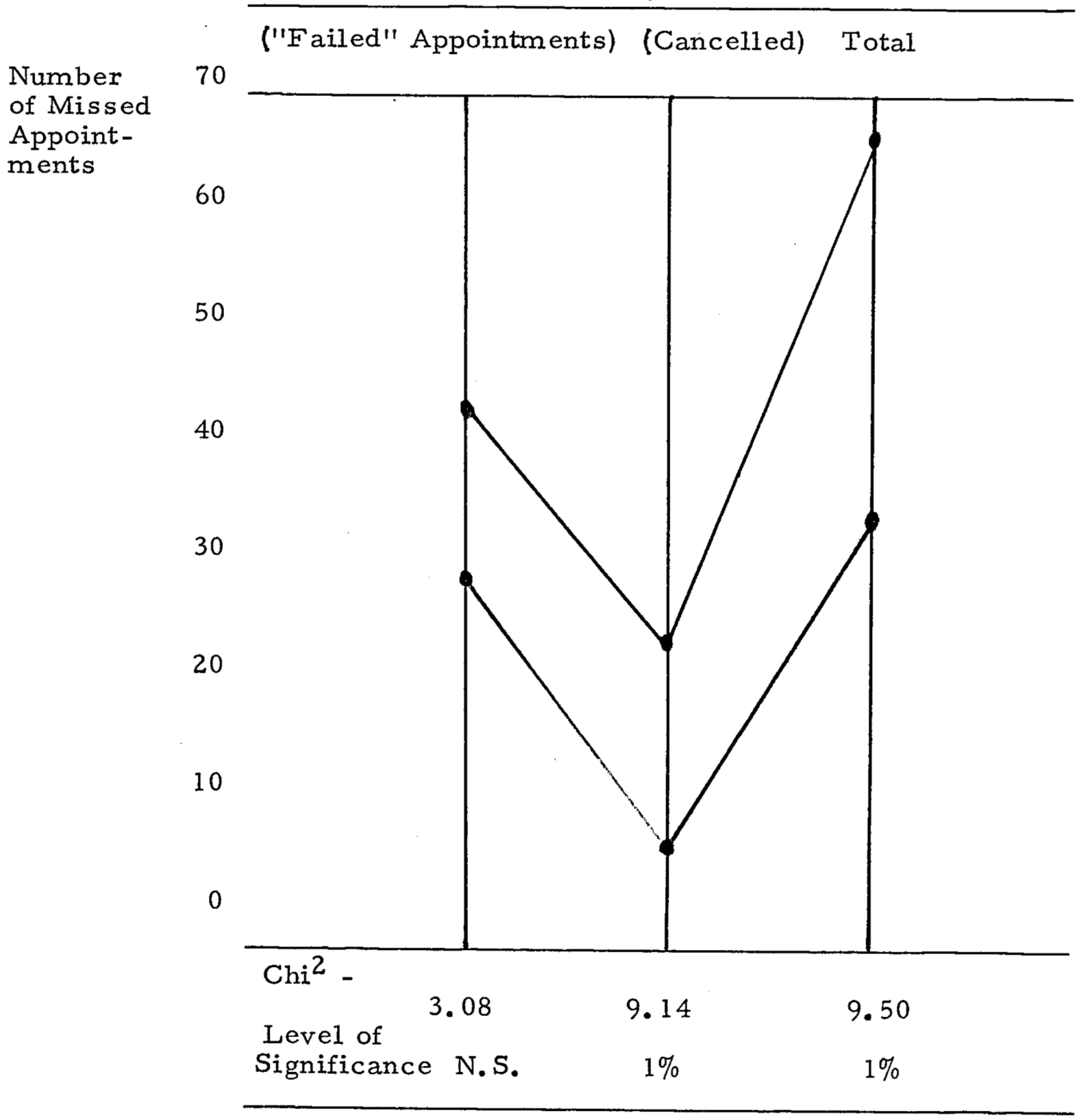
[133]Gedda, op. cit., p. 73.



SYMBOLS:

Twins ——
Singletons ——
Not Significant - N.S.

FIGURE 3.

COMPARISON OF MISSED CLINIC APPOINTMENTS FOR TWINS AND MATCHED SINGLETONS FROM MEDICAL RECORDS

reasons for missed appointments given by mothers in the interviews. The reasons given were stated as problems encountered in bringing the child to the clinic. The answers given by mothers of twins and mothers of singletons were as follows:

REASONS GIVEN	MOTHERS OF TWINS	MOTHERS OF SINGLETONS
Mother works	-	1
Difficulty in taking children on bus	3	2
Bus fare	-	1
Problem managing child in waiting room	4	-
Husband has to "lay off" work and lose wages	1	1
Lack of driver's license (mother)	-	1
Must get neighbor to care for school child	-	1
Must keep one child home from school to "babysit"	1	-
Child, other children, or mother ill	3	2
Bad weather, didn't wish to take child out	1	1
Conflicting appointments at other hospital or clinic	1	-
Long wait at clinic, "wastes time"	-	1
Rudeness of nurses and secretaries at the clinic	1	2
"No problem"	-	4

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

Much study has been devoted to prenatal and natal factors influencing mortality and morbidity of twins during the prenatal, natal, and neonatal periods. A few studies have been reported whose purpose it was to identify the "twin psychology." One study touched on a comparison of height and weight gain in infant twins versus infant singletons. However, no study was found which compared the type and amount of physical or emotional morbidity in premature twins and premature singletons.

Certain physicians and nurses working in an outpatient clinic for prematurely-born children expressed an opinion that, in general, twins cared for in that clinic had more physical and emotional morbidity and less parental faithfulness in keeping clinic appointments than singletons. Therefore it was planned that this study was to find if such differences did exist, and to serve as a necessary preliminary to the identification of the causes of these differences.

It was the problem of this study to find out the effect of twinship on the prematurely-born twin's early childhood growth and development, and on his physical and emotional morbidity.

The purposes of the study were to compare a group of prematurely-born twins with a matched group of prematurely-born singletons at the end of the first eighteen months or two years of life. The following

factors were recorded: 1) height; 2) weight; 3) age at which three specific developmental tasks were accomplished (sitting alone, walking unaided, speaking the first word); 4) types and amounts of physical and emotional morbidity. Incidental information, number of siblings born prior to and including the birth of the child under study and number of missed clinic appointments, were included since these factors may have influenced the findings above.

Literature was reviewed concerning the following: 1) previous related studies; 2) criteria used in evaluation of infant morbidity and development; 3) emotional and physical problems of twins; 4) problems and characteristics of parents of twins; 5) development and morbidity of prematurely-born twins.

The method chosen for the study was the descriptive survey. A review of the medical records of twins and matched singletons was conducted, using the clinic records in a selected premature clinic. It was assumed that the medical records reviewed were objective, dependable, and well-kept. It was assumed that an interview with parents of the children under study might also be beneficial in obtaining a more complete record of physical and emotional morbidity, age when the child accomplished designated developmental tasks (sitting alone, walking unaided, speaking the first word), and reasons for missed appointments. Therefore each mother who could be located was interviewed during a home visit, regarding the above factors.

Two separate check lists were used in this study: one for recording data from the review of medical records, and another for the interview of the mothers. Pilot studies were conducted to test the

effectiveness and adequacy of the two check lists used in the study.

All eligible twins from the selected premature clinic were included in the study, with the exception of one who could not be matched with a singleton. This excluded twin was Anglo-Saxon and could not be matched with an Anglo-Saxon singleton. Twins included in the study were limited to the following: 1) those who had begun to attend the clinic within three months of birth; 2) those who had attended the clinic at least three times; 3) those who had attended the clinic until at least eighteen months of age; 4) those whose co-twin had survived during the research period.

All eligible twins making up the study population were matched with singletons for: sex, race, socio-economic level, birth weight, gestation period. There were nineteen twins and nineteen singletons. No attempt was made to have an equal number of each sex and race. After classification there were eighteen females and twenty males; thirty-two Negroes and six Mexican children. Only fourteen mothers of the children in this study could be located for the interview.

The findings of this study were:

1. The mean weight at the end of the research period was 2.08 pounds less for twins than for singletons, but this difference was not statistically significant.
2. The mean height at the end of the research period was .66 inches less for twins than for singletons, but this difference was not statistically significant.
3. There were incomplete records of the age of accomplishment of the three developmental tasks, so that no statistical

analysis could be done.

4. There was a significant difference, at the five percent level, in the number of twin and singleton medical records on which the three developmental tasks were recorded, with the twin group being consistently lower in this respect.
5. There was a higher incidence of lymphadenopathy in twins, with this difference being significant at the five percent level.
6. The twin group had a significantly higher incidence of Major Respiratory Illness, with the significance level being one precent.
7. The twin group had a higher incidence of Hospitalization, and this difference was significant at the one percent level.
8. Types of morbidity in which there was no significant difference between the two groups included: Accidents, "Childhood" Illnesses, Gastro-intestinal Illness, Low Hemoglobin, Neurological Illness, Minor and Moderate Respiratory Illnesses, and Skin and Conjunctival Conditions.
9. When total physical morbidity and total emotional morbidity was weighted and the totals thus obtained were compared between twins and singletons there was no significant difference.
10. When physical morbidity and emotional morbidity was un-weighted the twin group had a significantly higher incidence, with the significance level being five percent in both instances.
11. The twin group had a higher incidence of total missed clinic appointments, and this difference was significant at the one

percent level.

12. There was a significantly higher number of siblings in the twin group than in the singleton group, with the significance level being one tenth of one percent.
13. Mothers, both of twins and of singletons, expressed many different types of difficulty experienced in taking their child to the clinic. These difficulties were mainly related to difficulty in transportation and difficulty in controlling a large group of children en route to the clinic and in the clinic waiting room.

II. CONCLUSIONS

On the basis of the data obtained from this study, the hypothesis was partially accepted. Prematurely-born twins had significantly more physical and emotional morbidity than prematurely-born singletons. On the basis of the data obtained from this study the hypothesis was partially rejected. Prematurely-born twins did not have significantly slower growth and development than prematurely-born singletons.

III. RECOMMENDATIONS

On the basis of the findings and conclusions of this study the following recommendations were made:

1. That professional and lay people involved in care of prematurely-born twins be made aware of the higher incidence of emotional and physical morbidity (particularly major respiratory illness) among prematurely-born twins, with a

view to greater care and attention being given to prevention.

2. That only one twin at a time be seen by a physician so that the mother and physician can give their full attention to each child.
3. That parent education classes be held in conjunction with any premature clinic to teach the parents the special needs and problems of twins and parents of twins, and how to meet these problems.
4. That a plan be devised to improve the regularity and amount of clinic attendance by premature twins, by such means as providing help with child care at the clinic and transportation to the clinic.

IV. RECOMMENDATIONS FOR FURTHER STUDY

On the basis of the findings and conclusions of this study, the following recommendations for further study were made:

1. That a study similar to this study be done comparing maturely-born twins and singletons.
2. That an on-going study be conducted, following and examining a large group of prematurely- and/or maturely-born twins and singletons at regular intervals over a period of years, to compare growth, development, physical and emotional morbidity.
3. That the total number of charts of twins and singletons of the selected premature clinic be studied, and the total data regarding twin and singleton averages be compared.

4. That further study be done on a larger group of twins and singletons to compare height and weight gain, physical and emotional morbidity.
5. That a study be conducted to see if baby-sitting services in the clinic would increase the amount and regularity of clinic attendance by mothers of twins, thereby decreasing the incidence of morbidity in twins.

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APPENDICES

APPENDIX A

STUDY OF MORBIDITY OF PREMATURELY-BORN TWINS

Data-Gathering Tool For Medical Records

TWIN
SINGLETON Clinic Number _____

* Race
*Socio-Economic Level
*Sex
Number of Sibs.
*Gest. period
*Birth weight
Weight at end of Research Period
Relation to Iowa Weight Scale
Sat Alone
Walked Alone
Spoke First Word

	Diagnosis	Number
Physical Morbidity Diagnosis and Number		
Emotional Morbidity Diagnosis and Number		
Failed Appointment (Number of times)		
Cancelled Appointment (Number of times)		

* Factors for Matching Twins and Singletons.

APPENDIX B

PARENT INTERVIEW

For Twin - Singleton Research Project

Lynelle King

Child _____ Clinic Number _____

Address _____ Socio-Economic Level _____
Phone Number _____

Introduction
- Introduce self
- Explain reason for project
- Enlist Parent's help
  - tell will be confidential
  - tell no names will be used

Data

	Illnesses noted on chart	Parent's verification and comments
	Sat alone	
	Walked alone	
	Spoke first word	

"Sometimes a child just has a 'little' illness, or sometimes even when they are fairly sick a parent can't always take the child to the clinic. Would you try to remember any illnesses which (the child) had for which you weren't able to take him to the clinic? Would you tell me what those illnesses were?

	FREQUENTLY	OCCASIONALLY	NEVER
Temper tantrum?			
Head-banging?			
Head-rocking?			
Sucked thumb?			
Eat well?			
Sleep well?			
Cuddly baby?			

"Most parents find that it is very hard, often, to take a child to the clinic, even when the child is ill. I was wondering if you have ever had any problems in trying to take your child to the clinic. It would help me if you could tell some of the problems which you have experienced in trying to take your child to the clinic."

_____

_____

_____

_____

_____

APPENDIX C

DEPARTMENT OF PEDIATRICS, STATE UNIVERSITY OF IOWA

BOYS

Weight – Age Values
Median, 16th and 84th percentile

Height – Age Values
Mean, Mean ± 1 SD

Age Years 0 1 2 3 4 5 6

Wt.- lbs. Wt.-kgs.

Ht.-inches Ht.-cms.

Name

No. Birth Date

Date	Age	Height	Weight

PREPARED FROM DATA COMPILED BY IOWA CHILD WELFARE RESEARCH STATION

LIT. NO. 251-B

DEPARTMENT OF PEDIATRICS, STATE UNIVERSITY OF IOWA

GIRLS

Weight – Age Values
Median, 16th and 84th percentile

Height -Age Values
Mean, Mean ± 1 S.D.

Name

No. Birth Date

Date	Age	Height	Weight

Age Years 0 1 2 3 4 5 6

Wt - lbs. Wt - kgs.

Ht - inches Ht - cms.

PREPARED FROM DATA COMPILED BY IOWA CHILD WELFARE RESEARCH STATION

NO. 251-G

LOMA LINDA UNIVERSITY

Graduate School

MORBIDITY OF PREMATURELY-BORN TWINS IN EARLY CHILDHOOD

by

Lynelle King

An Abstract of a Thesis

in Partial Fulfillment of the Requirements

for the Degree Master of Science

in the Field of Nursing

August, 1965

ABSTRACT

This study was concerned with the problem of determining the effect of twinship on the prematurely-born twin's growth and physical and emotional morbidity during early childhood. The immediate purposes of the study were to compare prematurely-born twins with prematurely-born singletons regarding their incidence and types of physical and emotional morbidity, and their growth during early childhood. It was hypothesized that prematurely-born twins have slower growth and more physical and emotional morbidity than prematurely-born singletons. The descriptive survey method was used. From children cared for at a selected premature clinic, nineteen twins were matched with nineteen singletons for: race, sex, socio-economic level, birth weight, and gestation period. The medical records of their first eighteen months were reviewed. Mothers of children in the study were interviewed, if possible. To secure uniformity, a guide was used for collecting the data from medical records and a second guide was used for the interviews. The findings of the study indicated that the twins had a significantly higher incidence of physical and emotional morbidity. Specific types of morbidity in which twins had significantly higher incidence were major respiratory illnesses and lymphadenopathy. There was also a significantly higher incidence of hospitalizations for twins. The twin group's incidence of major respiratory illness was nine, while the singletons had no illness in this category. The twins had eight instances of hospitalization and the singletons had none. Certain factors were noted which may have influenced morbidity, including a significantly

higher incidence of missed clinic appointments and number of siblings in the twin group. The twin group's slower growth was not statistically significant.