RISK FACTORS ASSOCIATED WITH THE [illegible] OF MENTAL RETARDATION AND DEVELOPMENTAL DISABILITY AMONG CHILDREN OF BANGLADESH

Ph.D.

SHAHIDUL ISLAM

DEPARTMENT OF PSYCHOLOGY

UNIVERSITY OF DHAKA

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SHAHEEN ISLAM

DEPARTMENT OF PSYCHOLOGY
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Shaheen Islam

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The University of Dhaka, Dhaka, Bangladesh.

DEPARTMENT OF PSYCHOLOGY
UNIVERSITY OF DHAKA

The undersigned certify that they have read the thesis entitled "Risk Factors Associated with the Occurrence of Mental Retardation and Developmental Disability among Children of Bangladesh", submitted by **Shaheen Islam** in partial fulfillment of the requirements for the degree of Doctor of Philosophy and recommend to the University of Dhaka for its acceptance

18th April, 1996.

Sultana S. Zaman
Supervisor

18th April, 1996

Sultana Bamu
Co-Supervisor

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ABSTRACT

Utilizing the social, demographic, and medical data collected during a nationwide epidemiological study of childhood disabilities in Bangladesh, the present study investigated the relationship between mental retardation and other developmental disabilities with various demographic, maternal, and medical risk factors. Specific focus was made on exploring the effect of difference in social class prevailing in the society as a potential factor that increased the risk of having children with mild mental retardation as opposed to serious mental retardation. Ensuingly, the study, at first, attempted to develop a single, reliable socioeconomic index, useful for both rural and urban Bangladesh, with the available data.

The epidemiological study that served as a base upon which the present study emerged followed a modified cluster sampling procedure involving a two stage design. In the first stage 10,299 children ranging in age from 2 to 9 years belonging to five areas, both rural and urban, of Bangladesh were administered three questionnaires: HF (household form), MC (mother-child form), and TQ (Ten questions on five types of disability) by the community

workers. In the second stage children who were found positive ie., having any kind of disability on TQ were examined by a team of professional consisting of peadiatricians and psychologists. A total of 1626 children were professionally evaluated in the base study.

For both the purpose of developing the socioeconomic index and identifying the risk factors, the present endeavor used the data collected on 1626 children who were professionally evaluated during the second stage. Each unit of the study sample was assigned proportionate weight according to TQ status group of the first stage they were representing.

By analyzing the data collected on HF and MC forms regarding occupation, education, housing conditions and possessions, a Socioeconomic Index of Family (SIF) was developed on the basis of internal consistency among the items and one factor loading on the index. Reliability coefficient of the final index was .79 for all area. Reliability coefficient for urban and rural areas were .83 and .71 respectively. Loading of the items included in the scale on one factor ranged from .43 to .79. Significant association with socioeconomic index score and death of at least one child in the family provided evidence of construct validity of the scale.

Results of potential social and demographic risk factors analysis indicated that lower socioeconomic class was significantly

associated with the occurrence of mild mental retardation but not with serious or other developmental disabilities. Consanguinity was established as a significant risk factor related to both serious mental retardation and other developmental disabilities. Urban habitation compared to rural area, was found to raise the risk of other developmental disabilities significantly.

Adverse medical factors seemed to impart notable repercussion on child mental development. Prenatal threat, low birth size, and postnatal hazards were found to be the significant risk factors determining the occurrence of serious mental retardation. None of the medical factors examined had any significant association with other developmental disabilities.

CHAPTER ONE

INTRODUCTION

Presence of a developmentally disabled, particularly mentally retarded child places tremendous psychological stress and substantial burden on the family as well as on the community and the nation at large. It produces wide range of emotional responses in the parents and greatly influences the coping mechanism of the child and the family. Shock, denial, sadness, and anger were the most common reactions of the parents that seriously threaten the stability and integrity of the family (Cummings, 1966; Demon, 1983; Leonard, 1985). The financial burden and social problems caused by these disabled children were increasingly large and overwhelming for the society. Mental retardation and developmental disabilities were not curable yet vast majority were preventable and pertinent timely effort in detection and early intervention in controlling the 'risks' could minimize the suffering and the detrimental effect it has on human welfare (Marfo, 1986). Great scientific advances have been made in preventive medicine, and the information need to be disseminated among researchers, professionals, non-professionals, and parents to identify risk factors among the children so that appropriate measures could be taken. Meeting this challenge require definite understanding of the nature of underlying etiological factors and identification of potential risk

factors associated with mental retardation and developmental disabilities, so that population most in need of such services might be reached. The present study was an endeavor to delineate the risk factors associated with mental retardation and developmental disabilities. The following paragraphs would offer a discussion on risk factors, mental retardation and developmental disabilities and its manifestation among children.

1.1: Risk Factor:

Developmental disability, including mental retardation was considered to be a long term consequence of disease or/and trauma that might originate from either genetic or environmental sources or from the interaction of both. Multifactorial and interrelated nature of etiological determinant of disability constraints generating a simple general explanation. Certain factors were more specific to certain types of disability, however all cases with impaired conditions did not develop disability at functional level. Still there were many cases where specific cause leading to disability was not identifiable. Particular factors appeared to be more functional than others to predispose a person by increasing the risk of developing the disorder. Whereas many cases arose as a consequence of complex interaction among the factors. Many distant biological and environmental conditions were found to be adversely related to the process of development of disability, and

thus the concept of **'risk factors'** generated that marked the likelihood of occurrence of disability.

The notion **'at risk'** implied that persons with certain identifiable characteristics have a significantly higher probability of experiencing a given disability than others without such characteristics (WHO, 1980). Attributes or conditions that were associated with an increased threat of a person developing a given disability or other outcomes was termed as 'risk factors'. It was the antecedent predisposable conditions that paved the path for a possible later development of disorder. A risk factor was not necessarily a cause or determinant, it only indicated an association between a raised frequency of disability and the factor.

Presumption underlying the conviction of risk factor was that removal of the factor in question could be expected to reduce the number of occurrence to a certain proportion. Hence information on risk factors, were not only functional in early detection programme to readily identify and focus on people with potential problems, but also crucial in generating preventive strategy that would save time and resources in providing health services.

Three major categories of risk factors were identified in current high-priority infants programme: (1) Established risk, (2)

Biological risk, and (3) Environmental risk (Tjossen, 1976; Cilent and Farel,1991; Kirby, Swanson, Kelleher, Bradley, Casey, 1993)

(1) **Established risk** refered to those diagnosed conditions known to project developmental disabilities in children. They included such conditions as Down's syndrome or other chromosomal abnormalities and structural or metabolic defects that lead to developmental delays.

(2) **Biological risk** factors were diseases, health conditions, or other indicative events in prenatal, perinatal, neonatal and early life that produce the likelihood of mental retardation, developmental disorders and delays. They included measures of perinatal outcome such as prematurity, extremely low birth, intraventricular hemorrhage, respiratory distress syndrome, etc., and maternal reproductive characteristics like drug abuse, infection.

(3) **Environmental risk** refered to sociocultural milieu in which the child lived. They included socioeconomic status, household composition, psychosocial characteristics of primary care giver, and level of social support. Environmental conditions in which such early life opportunities as family care, health care, and physical and social stimulation were provided at only a minimal level produced their share of mental retardation and developmental disability.

Psychophysiological problems comprising mental retardation and developmental disabilities originating before 18 years were mostly associated with some degree of brain dysfunction. The adverse genetic and environmental conditions accountable might arise or interact at any time during the early developmental period. Systematic representation of interception of and interactions among the multidimensional conditions has been offered in Figure 1.1.

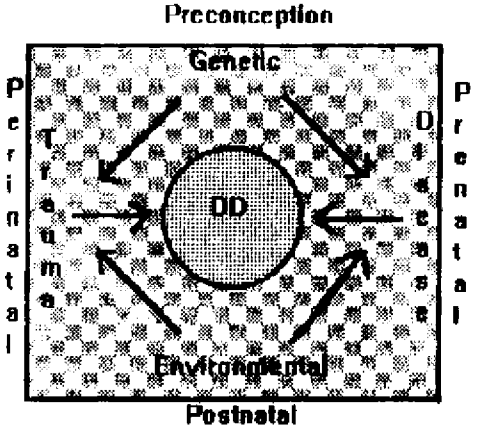


Figure I: Temporal Scheme of Etiology for Mental Retardation and Developmental Disability

Further elaborate discussions on the known etiology and potential risk factors associated with mental retardation and developmental disabilities would be furnished after extending the notion of mental retardation and developmental disability.

1.2: Concept of Mental Retardation:

Among the developmental disabilities, **mental retardation** received exclusive concern as a major psychological disorders enduring immense, lifelong behavioral implications, commonly found among the children of any country. About 2 to 3 percent of the population was estimated to be affected by this incapacitating condition (Brich, Richardson, Baird, Horobin, Illsley, 1970). Generally mental retardation implied to incompetence in intellectual tasks and inability to perform or adapt to social demand in appropriate fashion. It was not a disease but resulting in intellectual arrest of certain pathological conditions causing inability to cope with the immediate environment to the extent that required special assistance. Current definition of American Association of Mental Deficiency (AAMD) stated mental retardation as a condition which "refers to significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period" (Grossman, 1973, 1983). Though not free of criticism, AAMD definition was the most scientific and widely accepted definition with detail elaboration of its principal components.

Subaverage general intellectual functioning refered to an IQ score of 70 or below on an individual intelligence test. The person's test performance indicated that he was significantly less mentally able than the majority of the population, two or more standard

deviation below mean usually 100, and thus unable to benefit from the average school programme in comparison to his age peer. Pragmatic use of IQ as a sole criterion have been subjected to criticism and controversy (Kushlick and Blunden, 1974), therefore considerable amount of flexibility was permitted regarding the cutoff point (Patrick and Reschly, 1982). Reference to the extent of learning difficulties and problems in adaptive functioning compared to one's peer has been necessitated.

Deficits in adaptive behavior refered to lag in general maturation or major limitation in personal independence and social responsibility. If a person with significantly subaverage intelligence managed to master those skills necessary to get along satisfactorily in his social environment, could not legitimately be labeled as mentally retarded.

The phrase during the developmental period simply designated the chronological age of 18 as the upper limit of the developmental period. This ruled out classifying any deficits in intelligence and adaptive behavior from traumatic accidents or illness occurring later in life as mental retardation (Baroff,1986).

In defining different grades of mental retardation nevertheless all investigators unanimously valued the level of intellectual functioning, relying largely on measurement of IQ, as the paradigm. Table 1.1 presented the categorization of mental retardation based

on IQ range by DSM-III, 1980, showing their level of intellectual and educational functioning and ultimate academic achievement. The range of IQ used as criterion varied 1 to 2 points on different citation depending on the intelligence test employed.

Table 1.1: Categorization of Mental Retardation

IQ Range	Intellectual Deficiency	Functional Attainment	Academic Achievement
70-50	Mild	Educable	4-6 grade
49-35	Moderate	Trainable	0-2 grade
34-20	Severe	Dependent	-
below 20	Profound	Life Support	-

(Source: Robinson and Robinson, 1976)

Inspite the argument against using IQ as a sole criterion for defining 'mental retardation', all people with an IQ below 50, were considered as severely retarded in all societies and in all service (Fryers, 1987).

(i) Mild Mental Retardation: (IQ 50-70): Persons in this group were considered educable, and were able to attain intellectual level comparable to average 8 to 10 years old children. They could learn academic skills up to almost 6th grade and usually achieve social and vocational skills adequate to minimum self support, with early diagnosis, guidance and assistance. Ordinarily, they did not show signs of brain pathology or other physical irregularity. The largest number of mentally retarded fell within this group and often unable to distinguish from normal until school age.

(ii) Moderate Mental Retardation: (IQ 49-35): Individuals in this group were likely to appraise as trainable and were able to attain intellectual levels to those of average 4 to 7 years old children. They could profit from training in social and occupational skills but unlikely to progress beyond 2nd grade level. They usually appeared clumsy and inept, and suffered from physical deformities and poor motor coordination. Under sheltered condition with adequate opportunities and help they might achieve partial independence in daily self-care, and economic usefulness.

(iii) Severe Mental Retardation: (IQ 34-20): Persons included in this category were sometime referred to as dependent retarded. Among them motor development was poor and speech development was severely retarded. Sensory defects and motor handicaps were typical. They could learn to communicate, and be trained in elemental health habits and limited self-maintenance skills. In controlled environment might perform simple tedious vocational tasks but always remained dependent on others for care.

(iv) Profound Mental Retardation: (IQ under 20): The term life-support retarded was often used to refer to individuals in this category. Mostly involved minimal capacity for sensorimotor functioning and gross retardation in adaptive behavior. Some rudimentary level of useful speech might develop. Severe physical deformities, central nervous system pathology, retarded growth and other accompanying retardation were typical. They might achieve

very limited self-care but needed constant custodial care through out their lives.

Beside these categorization based on the severity, several distinct clinical patterns of mental retardation were recognized, such as: Down's syndrome, Phenylketonuria, Cretinism, Microcephaly, Hydrocephaly, Cultural-familial and many others. Most of them, except cultural-familial, stemed primarily from underlying biological causes (Carson, Butcher and Coleman, 1988). General deficit at least to some extent in communication, social, academic and sensorimotor skills were prevalent in retarded persons along with general cognitive defects which have assumed to be responsible for the observed deficits in adaptive behavior.

1.3: Developmental Disability:

The term disability has many usage. It was often used interchangeably with impairment and handicap, again as well as with general term covering all the three facets of inability ie., impairment, disability, and handicap. World Health Organization (1980) provided specific definition of these terminology in International Classification of Impairments, Disabilities and Handicaps (ICIDH).

(a) Impairment was defined as "any loss or pathology of physiological or anatomical structure or function at organic level".

(b) Disability refered to a "restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being at functional level".

(c) Handicap denoted to a "disadvantage for a given individual, resulting from an impairment or disability, that limit or prevent the fulfillment of a role that was normal for that individual at social level".

This implied to a process that started with impairment which created disturbance at organic level that might result in disabilities to function normally which in turn often lead to handicap condition that prevent from performing social and economic role adequately. However, there was no one to one relationship between these three components in manifestation of disorder. Presence of organic impairment did not necessarily lead to functional disability or handicapping condition. For instance, only one-third of cerebral palsy cases that definitely involved brain lesion suffered inability to function intellectually or was in disadvantage social position (Rutter et al.,1970; Nelson and Ellenberg, 1978). Conversely, it was not always possible to identify definite organic abnormality for all functional

disabilities. Even in case of many severe mental retardation it was difficult to make any specific clinical diagnosis. On the other hand, person suffering from mild form of disability often managed to overcome their social limitations (Stein and Susser, 1984). Various system of the body affected in disability were generated by a host of adverse conditions like diseases, accidents, genetic, nutritional and environmental factors.

When disability occured in childhood, it affected the normal and regular patterns of development. The term development embraced the concept of unfolding of normal language, cognitive, motor and social skills - all of which were relevant to the child's educational and social progress (Najma, Bor, Morrison, Andersen and Williams, 1992). Detrimental affliction directly involving age-appropriate structure and function of brain causing delay or failure to progress through the normal developmental milestones of childhood in acquiring motor, adaptive, communicative and social skills were termed as **developmental disability**. Body movement, coordination and balance necessary for such activities as rolling over, standing up, walking, and running were referred as motor skill. Problem solving abilities and manipulative skills essential to interact effectively with the environment were the adaptive skills. Communicative skills refered to the capacities to understand and express oneself. Social skills refered to the ability to interact with other individual (Johnston and Magrab, 1976).

Defined as such, developmental disabilities encompassed mental retardation, learning disability, autism, cerebral palsy, epilepsy, visual impairment, hearing impairment, hyperkinetic syndrome and also multiple handicaps since different disabilities were not always mutually exclusive rather in most cases found in combination. Such psychophysiological disorders might have differing etiology and symptoms but involve CNS dysfunction as a common, underlying factor, resulting in behavioural handicap (Demon, 1983). Developmental Disability Act of 1970 of USA defined developmental disability as " a disability attributable to mental retardation, cerebral palsy, epilepsy, or another neurological condition of an individual.... which originates before such individual attains age eighteen, which has continued or expected to continue indefinitely, and which constitutes a substantial handicap to such individual (Meier, 1976).

Regular developmental process of these basic skills proceeded through orderly, sequential stages as a function of progressive development and maturation of brain during the early years of life. Each subsequent milestone of development were dependent on successful attainment of the previous skill and at the same time was a prerequisite for the development of subsequent new and higher skills. Normal development towards independence and self-reliance has been an innate and natural inclination of human being. Although normal development of ability and skills has been culture specific, yet inability of the child to succeed or progress in

terms defined by the existing value system was concern to parents, and has both clinical and theoretical significance. It was also recognized that there was a major genetic component to development which set limit on what could be achieved, but it was also clear that, within these genetic constraints environmental factors had found to play a substantial part (Najma et.al., 1992). Any interference, internal, external or both, especially at an early stage could jeopardize the system affecting the one or more emerging abilities.

Developmental disorder, thus, allude to a group of deficits in neurological development as a consequence of diseases, accidents, genetic, nutritional, and environmental factors resulting in handicap in one or a combination of skill areas, such as intelligence, motor, language, personal and social originating during early developmental years.

Most definitions recognized upper limit of developmental years as 18 years by which a person was fully matured in every aspects of development. Any disability occurring after maturity would be considered as damage and there was qualitative difference in impairment occurring after 18 years and during developmental periods, thereby callforth different approach to encounter the dilemma.

Detrimental effect of the adverse conditions varied with type, time and location of insult leading to a wide range of impairment causing many different types of disabilities. DSM-III-R incorporated an extensive range of disorders first evident in infancy, childhood, or adolescence under developmental disorder, accounted for delay or arrest acquisition of cognitive, language, motor, social or academic skills (Carson, et.al., 1988). Based on the predominant area of disturbance, **developmental disabilities could be broadly grouped into three classes.**

I: **Neurosensory handicaps:** Problem of information input causing visual and hearing disability, impairment of pain perception.

II: **Neuromotor handicaps:** Obstacle in information output causing debilitation in speech and motor function as manifested in cerebral palsy, epilepsy.

III: **Neurocognitive disabilities:** Adversity in information processing inducing mental retardation, slow learner, learning disabilities, autism.

Beside these several mixed and specific type of developmental disorders were conceded and classified. About two-third of the developmentally disabled children had two or more handicaps (Accardo and Capute, 1979). To be retarded was to be at significant risk for other disabilities. Congenital or acquired

hearing loss might cause language retardation and 50% of cerebral palsy were accompanied by mental retardation (Demon, 1983). Cantwell and Baker (1987) reported higher rates of prevalence of psychiatric disorder and developmental disorders in six hundred children with communication disorder. After a follow up study for three to seven years of 133 children having epilepsy within first years of life Czochanski and his associates (1994) reported death of 15 children and out of 118 surviving 53 were severely mentally retarded.

1.4: Known Etiology and Potential Risk Factors:

Each child must pass through the normal developmental process. To comprehend the conditions that interfere with that process insight into the pattern of normal development was essential. It covered a vast and unlimited area which required exhaustive and sweeping knowledge into the depth of entire process of human development. Biological and psychosocial conditions for both the child and the family were involved in the process.

Such wider perspective was beyond the scope of present deliberation; the account on the yet known predicament would thus be considered according to the temporal scheme presented in Table 1.2.

Table 1.2: Etiological factors following temporal scheme .

I:	**Preconceptional period:**
	Genetic disorders
	Chromosomal anomalies
II:	**Prenatal Period:**
	Ingestion of teratogen
	Excessive radiation
	Consumption of alcohol
	Viral infections
	Maternal malnutrition
II:	**Perinatal:**
	Difficult labor
	Infant's condition
III:	**Postnatal period:**
	Infection
	Trauma
	Disease
	Undernutrition
	Inadequate stimulation

I: Preconceptional Period: Root of many disability could be traced back to the condition before birth to the time of conception or even far beyond to genetic endowment. Similar to normal traits, many of the birth defects were also determined by genetic code and its interaction with environment before conception. The common role the genetically transmitted disorders played in causing developmental disorders, particularly visual and hearing impairment and mental retardation have been delineated rentlessly during the past few years.

Genetic Disorder: In United state it has been estimated that 5 out of every 100 babies were born with congenital defects and about a

third of these were considered to be inherited (Wright, Schaefer, and Solomons, 1979). Autosomal recessive disorders, autosomal dominant disorders, sex-linked disorders involved severe physical, biochemical abnormalities or/and mental retardation (Batshaw and Perret, 1981; Rao, 1990). Largo and Schinzel (1985) observed developmental and behavioral disturbance in 13 boys from three families with fragile X syndrome. Moderate to severe retardation and gross delay in language development was found in all boys. Most of them had severe articulation problems and about 69% of the boys had autistic features.

Winter (1993) reported inheritance of either autosomal or X-linked dominant genes by a mother and two sons with a syndrome of microcephaly, short stature, a distinctive face, broad thumbs and wide toes, and mild developmental delay. Deafness and neurodevelopmental abnormality in a four-year-old boy was suggestive of probable inborn error of sex-linked condition since his mother had sensorineural deafness and similar biochemical abnormalities (Simmonds, Webster, Lingam, Wilson, 1985).

Dereyneker and his associates (1988) conducted a genetic-diagnostic survey on institutionalized severely mentally retarded patients and found constitutional cause in 45.5% of the cases which included chromosomal abnormalities, autosomal recessive disorder, autosomal dominant, and X-linked recessive disorder.

Chromosomal Anomalies: Chromosomal testing of developmentally delayed children without any clinically evident aetiology revealed an abnormality in 3.8% of the cases (Graham and Selikowitz, 1993). Similar results of much higher percentage (11 to 13%) were found in children with undifferentiated type of mental retardation and congenital malformations (Vorsanova, Iurov, Demidova and Vekhova, 1993; Koterazawa, Shimogaki, Miyata, Uetani, Nakamura, 1994). Down syndrome, trisomy 21, was the most leading specific cause of mental retardation (Korenberg, Chen, Schipper, Sun, Gonsky, Gerwehr, Carpenter, Daumer, Dignan, Disteche; et-al, 1994). Chromosome studies of male patients in an institution for mentally handicapped revealed that 21.5% had abnormal chromosome; 12.7 with Down syndrome, 5.9% with fragile X-syndrome, 2.5% with autosomal anomalies other than Down syndrome, and 0.4% with sex chromosome anomalies (English, Davidson, Bhate and Barrett, 1989). Abnormalities in sex-chromosome also involved physical and intellectual defects (Baranovskaia, Bedel'baeva, Zakharov, 1986). Next to Down's syndrome, probably the most common cause of moderate mental retardation in males was fragile X-syndrome (Gustavson, Blomquist, and Holmgren, 1986; Stromme, Skjeldal and Knudtzon, 1992; Turner G and Turner B, 1974; Turner G J, Optiz W T, Brown K E, Davis p A, Jacobs E C Jenkins M Millelsen M W Partington and Sutherland G R, 1986). Cammarata and his colleagues (1988) reported a prevalence of mental retardation due to chromosomal abnormality as 1.83 per 1000 and that due to fragile X-syndrome was 0.37 per 1000 in a small population of 2735 males aged between 5 to

20 years in Mediterranean area. The percentage of X-linked mental retardation in a group of 600 mentally retarded children was found to be 1.3% for total group, 2.2% for girls and 2.8% for boys with genetic forms of imbecility (Bliumina M G, 1989).

Severity of intellectual functioning may vary in case of chromosomal abnormalities (Hersh, Bloom, Yen, Topinka, and Weisskopf, 1988). Gustavson, Holmgren and Blomquist (1987) reported chromosomal aberrations in 11.9% of children with mild mental retardation as compared to 39.1% of children with severe mental retardation.

Consanguinity, age of the parents, and gender of the involved member often documented to have considerable influence in genetic disease and therefore needed to pay attention as potential risk factors (Bonthron, Barlow, Burt and Barr, 1993).

Consanguinity: Madhavan and Narayan (1991) addressed the much debated issue of consanguinity and mental retardation. Their result indicated that, when there was a history of mental retardation in the family and if the parents were consanguineously married, the risk of mental retardation in the offspring was significantly high. Among the consanguineously married families, the blood relationship of uncle-niece seems to have the highest risk of affecting the offsprings. High degree of intermarriage and a high frequency of retarded siblings indicated genetic basis of

mental retardation (Janson, Jayakoddy, Abulaban and Gustavson, 1990). Alfi, Chang, and Azen (1980) also observed an increased frequency of consanguineous parents among their Down syndrome patients. However these findings were not confirmed by many other studies (Cereijo and Martinez-Frias, 1993)

Parental Age: Regarding parental age, autosomal dominant spontaneous mutation were common with elderly fathers and chromosomal anomalies were common with elderly mothers. Compared to parental age group of under 25, there were significant increase of relative risk of age group 30-34 and 45 above (Zhang, 1992). Fortunately these disorders were rare and such children had very limited life span. Positive relationship between late maternal age (above 35) and the incidence of Down's syndrome was well documented in several studies (Abroms and Bennett, 1981; Mikkelsen, Fischer, Hansen, Pilgaard, Nielsen, 1983). Additional influence of paternal age has been evidenced recently. Men of 55 years or older may have a significantly increased risk for having children with trisomy-21 (Stene, Fischer, Stene, Mikkelsen, Petersen, 1977).

Gender: Male preponderance among mental retardation had been reported in several studies and surveys (Richardson, 1987; Satapaty, Ghosh, and Sarangi, 1985). Excess male prevalence among sporadic cases could be attributed to X-linked mental retardation. While opposite was found to be true for mild retardation (Pakrasi,

Basumallik, Choudhury, and Chakraborty, 1987). Social factors were more likely to contribute to such differences in sex distribution.

II: Prenatal Period: During early period of cell division and multiplication, numerous genetic and environmental influence could cause dysmorphic events (Lamont and Dennis, 1988; Rao, 1990; Rubin and Davis, 1986). Taylor, Nelson and Howie (1993) examined the antecedents of 294 children with neurodevelopmental disability and found significantly higher incidence of prenatal complications among the disabled children than among their matched normal developing siblings of nearest ordinal position.

Ingestion of Teratogen: Ingestion of teratogen such as Thalidomide, Dilantin (anti-convulsant drug), Therapeutic drugs like anti-cancer, antiepileptic drugs, sex-hormones have been found to be associated with malformation and mental retardation (McBride, 1961; Taussig, 1962; Hanson and Smith, 1975; Olegard, Laegreid, Wahlstrom, Conradi, 1987). Occurrence of high fever secondary to maternal infection or environmental temperature might be teratogenic to the development of central nervous system.

Excessive Radiation: In mid pregnancy, any excessive radiation, maternal viral infection, diabetes mellitus, maternal medication or alcoholism and such other environmental adversity could have a devastating effect on brain development of the fetus (Olegard, Laegreid, Wahlstrom, Conradi, 1987). Study on the survivors of

Hiroshima and Nagasaki revealed existence of a direct relationship between radiation and birth defects. Woman who were about one and quarter miles out of it had a very high incidence of microcephalic children (Wood, Johnson and Omori, 1967). Ikenoue, Ikeda, Ibara, Otake and Schull (1993) examining the elementary school performance of 929 children who were born from mothers exposed to the atomic bombing observed the most severe mental retardation in the group exposed between 8 and 15 weeks following fertilization, and the second most severely damaged was exposed between 16 and 25 weeks. Another clinical study of these researchers on those who survived intrauterine growth retardation revealed that neurotoxic events similar to ionizing radiation before 27 weeks of gestational period, affected the brain development of the fetuses. Cooper and Cooper (1966) in their study of pregnant woman receiving cobalt treatment for cancer found that 26.6% infants were born with central nervous system abnormalities.

Congestion of Alcohol/Smoking: In chronic alcoholics, the incidence of malformed children was at least 35% as found by Jones, Smith, and Ulleland (1973). Most of them were found to be moderately mentally retarded by childhood. Alcohol consumption and smoking by mothers before, during, and after pregnancy were studied by Roeleveld and his colleagues (1992) in an epidemiologic study. The study suggested that parental smoking and maternal alcohol consumption were risk factors for mental retardation in offsprings. For fathers who smoked a pipe or cigar, an odds ratio of 2.4 (95%

CI; 1.2-5.1) was observed. Maternal alcohol consumption was high among the mothers of mentally retarded children, with an odd ratio of 1.7 (95% CI:1.2-2.3) during preconception and 1.4 ((95% CI:1.0-2.0) during fetal period. In a prospective study 60 two year old children exposed to alcohol during the first trimester only, during the first and second trimesters in utero and those exposed throughout pregnancy were assessed for mental and language development by Autti and his associates (1992). A group of nonexposed children were also examined. No definite effect of alcohol exposure on mental and language development was found in children in group one. Children exposed throughout the pregnancy scored significantly lower than children in group one both on mental performance and verbal comprehension. Delay in language development was found to be more often in group two than in group one. Effort should be made to identify and find proper treatment for women who drink alcohol early in their pregnancies.

Viral Infection/Maternal Disease: Livanainen and Lahdevirta (1988) reported that infectious diseases alone caused mental retardation in 11.1% and other neurological sequelae in 1.5% of 1,000 children examined. Viral prenatal infection like rubella, syphilis, influenza in prenatal period could also lead to infants born blind, deaf, retarded, cerebral palsied, microcephalic and with congenital heart defects (Pass, Stagno, and Myers, 1980; Koterazawa, Shimogaki, Miyata, Uetani, Nakamura, 1994). Regarding viral infection and drug, the time of invasion was crucial. Infants of

mother with chronic disease, such as diabetes, hypertension, or thyroid disease also have more complications .

Maternal Malnutrition: Maternal malnutrition during pregnancy was also considered by the researchers to be an important factor that might stall the growth of the fetus and give birth to a high risk low birth weight baby (Naeye, Blanc and Paul, 1973). Crawford and his associates (1993) illustrated the relationship of maternal nutrition in pregnancy to birthweight and head circumference. In their study of 513 pregnancies found that nutrient intakes in mothers of low birth weight babies were well below those of mothers whose babies were in the 3.5-4.5 kg range at which morbidity was at its lowest. Their study also revealed that premature and intrauterine growth retarded babies were born with deficits of the types of essential fatty acids known to be required for brain development. Such deficits have been found experimentally to impair visual and cognitive development. Prenatal brain damage played a major role in the pathogenesis of cerebral palsy and severe mental and motor retardation (Suzuki and Kodama, 1991).

Iodine Deficiency: An insufficient dietary supply of iodine effecting thyroid functioning leading to a variety of developmental disorder in fetus and infants characterized by mental deficiency, deaf mutism, and spastic diplegia, was the result of iodine deficiency in the mother. Serious consequence of iodine-deficient mothers was high risk of having children with congenital cretinism

and deaf-mutism (UN,1979; Hetzel, 1983; Delange, 1990). If untreated within few weeks of birth, congenital hypothyroidism was found to cause severe physical and mental retardation (Sutan, 1990; Tambyah and Cheah, 1993). Iodine deficit disorders were particularly prevalent in developing countries (Delange, 1990).

III: Perinatal Period: Adverse perinatal factors were assertained to be associated with about one-third of the mental retardation and developmental disability.

Difficult Labour: Difficult labour as manifested by heomorrhage during labour, fetus distress, abnormal presentation, prolonged labour were well known to have impact on subsequent neurodevelopmental disability in children (Holst, Andersen, Philip, Henningsen, 1989; Jonas, Chan, Macharper, Roder, 1970; Rubin and Davis, 1986; Lamont and Dennis, 1988; Rao, 1990). Comparison of obstetric and neonatal antecedent factors in singleton children with neurodevelopmental disability and with children of normal development as control indicated strong association between all categories of disability, except cerebral palsy, and severe hypertension, unclassified antepartum hemorrhage, and preterm uterine activity. Cerebral palsy was found to be associated with fetal tachycardia during labour (Taylor, Howie, Davidson, Davidson, Drillien, 1985). Older studies had indicated considerable risk for vaginally born breech infant. But in contrast, recent studies showed no significant differences in outcome for full-term breech

delivery. Prospective follow-up studies and carefully matched controlled studies with sophisticated neurological evaluation indicated that breech infants, regardless of mode of delivery, scored slightly less favourable than infants born in vertex presentation which reflected prenatal factors rather than birth injuries (Westgren and Ingemarsson, 1988).

Infant's Condition: Condition of the infant at birth also have a determining influence in future neurological development. **Delayed respiration, infection, hypoxia, hypoglycemia, seizures, coma or birth injury** were found to be correlated with developmental disorders. Fielder, Russell, Dodd, and Mellor (1985) in their study of 53 children with delayed visual maturation (DVM) suggested that infants with DVM who experienced difficulties in the perinatal period had an increased risk of developing permanent neurological sequelae. Significant problem in neurodevelopmental, motor, psycholinguistic, cognitive and school progress were found in children with low birthweight, neonatal neurological symptoms or several neonatal disorders, when assessed at the age of nine years (Lindahl, Michelsson, Helenius, and Parre, 1988).

Preterm Baby: Forslund (1992) found no significant difference in physical growth between preterm and full term baby at 8 years of age. Mild motor problem observed in preterm baby was rather correlated to birth weight. A 4-year follow-up study of 137 children born preterm - after 26 to 35 weeks of gestation but free

of severe prenatal or neonatal illness and of major handicaps showed that infants who were light-for-gestation at birth were significantly smaller at 4 years than the appropriate for gestation as regard to height, weight, and head circumference. Their reduced cognitive and motor functioning were indicative of motor- perhaps cerebellar-- function to be particularly vulnerable to perinatal growth retardation (Greisen and Bloch, 1989).

In Philippines, a study examining the performance of children with histories of perinatal risk events established that the children performed significantly below Philippine norms in developmental screening test. Findings also suggested that developmental stimulation could significantly improve the developmental status of preterm infants (Williams, Williams, and Dial, 1986).

Extremely Low Birth Weight: A considerable number of studies conducted on very low birth weight (VLBW) infants revealed long-term adverse neurological outcome. Longitudinal neurodevelopmental assessments performed by Khadilkar and his associates (1993) in 107 VLBW infants diagnosed 18 infants as 'dystonic' at 4 months of age. Comparative follow up at 9 years of age, on 9 out of 18 dystonic with 54 of the 89 non-dystonic infants revealed lower mean general cognitive index and higher incidence of disability as measured by a developmental assessment scale and a disability grading scale. The study suggested that these VLBW infants constituted a high-risk group for subsequent neurodevelopmental

disabilities, even if the premature dystonic syndrome in VLBW infants abated by one year.

Brown and his colleagues (1993) also documented adverse neurological outcome at 3 years of 52 of 55 extremely low birthweight survivors. At 3 years, 12% children had severe neurological impairment like cerebral palsy, blindness, deafness or a General Quotient (GQ) below 70; 21% had mild to moderate impairment and 67% had no neurosensory impairment and normal development (GQ equal or above 85). The developmental profile of the 35 neurologically normal children also revealed significant weakness in eye and hand coordination skills and a relative strength in hearing and speech skills.

Prospective analysis of McDermott and his associates (1993) assessed the risk of mild mental retardation (MMR) associated with low birthweight (birthweights less than 2500 g). At the age of five, 13.8% of the 195 children with low birth weight were found to be MMR (Scores of 50-70 on the Raven Progressive Matrices), whilst 4.2% of the 2293 children with normal birth wieght were MMR. After adjusting for confounders (maternal age, race, education, prenatal alcohol use, maternal conditions and congenital anomalies), the relative risk of MMR for LBW was 3.4 (95% CI 1.2-5.4). For children aged 9-11, 7.7% of 194 LBW children were MMR, compared with 6.2% of the 2556 with normal birth weights; the adjusted relative risk for LBW was 1.2 (95% CI 0.7-2.0). The findings of

the study also suggested that race, a marker for environmental factors might influence the LBW and MMR relationship.

Similar high risk of neurological, auditory, motor, and intellectual impairments were documented in several other longitudinal studies on extremely low birthweight infants (Roussounis, Hubley, and Dear, 1993; Ross, Lipper and Auld, 1986; Marlow and Chiswick, 1988; Sugimoto, Fukushima, Yazaki, Nagata, Shimizu, Sugimoto, Tamaru, Tsukada, 1990; Jones, Chan, Macharper, Roder, 1990; Lefebvre, Bard, Veilleux, and Martel,1988). Retrospective review of 725 children in a neurodevelopmental clinic by Rubin and Davis (1986) in South Africa revealed that seventy-one per cent of the perinatal factors were a result of birth related problems in full-term infants; only 22 per cent of this group represented by premature and low birthweight infants. This finding sharply contrasted with data from industrialized centre.

Available data, therefore, suggested that developmental disabilities and mental retardation might, in many cases, originate during pregnancy and delivery.

IV: Postnatal period: Nervous system infection such as meningitis, encephalitis; trauma like child abuse, accidents, near drowning; diarrhoeal disease during postnatal period were found to be associated with infant's development (Lamont and Dennis, 1988; Rubin and Davis, 1986; Rao, 1990).

Infection: Livanainen and Lahdevirta (1988) accounted prenatal and perinatal infections for 82% of mental retardation, epilepsy and cerebral palsy. Janson, et.al., (1990) in a group of 203 severely mentally retarded children, found meningitis to be one of the main etiologically related factor leading to a combination of severe mental retardation and cerebral palsy. Clinical evaluation revealed that survivors of neonatal bacterial meningitis had poorer long-term outcome with lower IQ scores and more severe sequelae than matched controls (Franco, Cornelius, and Andrews, 1992). A retrospective review in South Africa revealed that almost a third of the postnatal causes were a result of acute intracranial infection. Another 13 percent were a result of metabolic consequences of acute gastroenteritis (Rubin and Davis, 1986).

Seizures: Febrile seizures in childhood was also considered to have some association with epilepsy and mental retardation (Wolf and Forsythe, 1989). The degree and type of central nervous system damage existing at the onset of epilepsy was decisive for the outcome of the child. However cessation of epileptic seizures also improved the child's developmental possibilities (Czochanski, et.al., 1994).

Lead Exposure: Prenatal and early postnatal exposure to lead also increase the risk of developmental disability. Study of possible undue neurobehavioral effects of low-level lead exposure was performed in a Danish first grade school children. Lead absorption

was found to be related to impaired psychological test performance and difficulties at school. However this relationship was confounded by medical risk factors for neurological deficit (Lyngbye, Hansen and Grandjean, 1988)

Malnutrition: Inadequate mothering and undernutrition were also found to be threatening to proper development of a child. According to WHO report (1976) about 10% of disability were result of infectious diseases and about 19% caused by malnutrition. Growth retardation was a particular manifestation of chronic undernutrition which was associated with delayed motor development (Gross, 1991). Poor mental and developmental test performance found in infants with iron deficiency anaemia were suggestive of unwarranted effect of malnutrition on infant's development (Lozoff, Wolf, Urrutia, and Viteri, 1985). Severely impaired somatic growth during early postnatal life was found to be associated with the subsequent impairment of mental abilities. The first few months of postnatal period appeared to constitute a "sensitive period" for the relationship between growth and mental functioning (Skuse, Pickles, Wolke, Reilly, 1994).

The growth and development of early-undernourished children were not irreversibly fixed by the acute illness, but were highly sensitive and modifiable by early and stable environmental improvement. A study assessed the physical and intellectual outcome of 35 school children who share a common history of early

undernutrition. 16 of whom were adopted after recovery, while of the rest, 11 were reared by their biological families and 8 in institutional care. The results showed that the adopted children had mean normal weight and height for age, and IQ was also within the normal range. In contrast the children from institution were significantly shorter. Both the groups significantly differed from the adopted group in IQ, mainly for verbal scale (Colombo M, Parra and Lopez, 1992). Therefore the study emphasized that the intellectual and physical outcome of children who were undernourished in early life was influenced by later environmental condition.

Unknown Factors: A number of research evidences identified a host of genetic and adverse pre- peri- and postnatal environmental factors considered to be detrimentally related to proper physical and mental development and were predictive of developmental disabilities and mental retardation but many were still unknown (Ohdo, Sonoda, Ohba, Hayakawa, 1992, Lamont and Dennis, 1988; Rubin and Davis, 1986; Rao, 1990). There were many cases for which no specific genetic or environmental causes could be identified. Wellesley and his associates (1991) assessed the level and aetiology of intellectual disability in all children born and/or living in Western Australia from the established register. Out of 1602 children aged between 6 to 16 years identified had IQs less than 70, 40% had a definite genetic basis, 20% an environmental cause and 40 % were of unknown aetiology. The insult was prenatal

in 61%, 10% had a possible perinatal cause, 8% were postnatal and for 21% the timing could not be assessed. A cross-cultural study on the cause of mental handicap in the Cape Town area noted acquired causes to be more prevalent among the black ethnic group (Molteno, Roux, Nelson, Arens, 1990).

In developing countries, birth asphyxia and brain trauma were found to be the leading causes of mental handicaps. The other responsible conditions were: infections such as tuberculous and pyogenic meningitis and encephalopathies associated with measles and whooping cough; severe malnutrition in infancy; hyperbilirubinemia in the newborn; iodine deficiency. and iron deficiency anaemia in infancy and early childhood (Shah, 1991). In Jamaica, 34 to 40% of disabilities identified among the children below 18 years were due to pre-natal and peri-natal causes (Thorburn,1981).

1.5: Relevant Research on Risk Factor :

It was indisputable that adverse family history, pregnancy, birth and many other biological and environmental factors often placed a large number of children in each year at an increased risk for mental retardation and developmental disability (Keele,1983; Allen, 1993). Fortunately, most did not go on to have major disabilities.

Ecologically, both health and disease or disability were resultant force of total interaction of man and his environment. Although some risk factors carried much higher risk of disabilities than others; there was much overlap among risk factors and a complex multifactorial process which operated underlying various disease and disabilities. The specific risk of a disability might be present but not all person inflicted develop the disability. The children who were constitutionally susceptible were more likely to develop or acquire the disability under detrimental environment. Social conditions such as poverty, overcrowding, malnutrition, as well as non human aspects such as season, geographic region, have been identified to have definite association with the occurrence of many disabilities. In actuality more than a single risk factor contributed to the occurrence of any disease or disability (Khan, 1989).

In a prospective longitudinal study, Laucht and his colleagues (1992) followed the developmental course of 362 children born at differing degrees of biological and psychosocial risk, from birth to school age. The study found both the risks had a marked negative effect on development but biological risks were more associated with impaired motor functioning, while psychosocial risks adversely affected cognitive and social-emotional competence. The relative weight of risk factors also appeared to change during the first two years with biological risks becoming less important and psychosocial risk factors gaining influence. Very low birth

weight and neonatal seizures were identified as single risk factors as being prognostically very unfavourable. Of the psychosocial risks a pattern of unfavourable family characteristics such as low educational level, history of broken home or mental health problems of parents and chronic difficulties were strongly related to poor outcome. Results rendered by Msall and his associates (1992) also akinly delineated the significance of biomedical and socio-demographic risk factors as predictors of major impairment and educational underachievement.

Screening of infant and children using various pre- and perinatal risk inventories, psychomotor developmental index, family history, were being used with significant results to predict long term consequence in child health and development programme (Kirby, et.al., 1993; Laucht, et.al., 1992; Abel, Korb, Mender, Lamme, Kodiz, 1992; Campbell and Wilhem, 1985).

Scheiner and Sexton (1991) found perinatal risk inventory to be the most robust predictor of developmental outcome of high risk infants. Their inventory included such characteristics as Apgar scores, the gestational age and the appropriateness of the weight of the infant, the presence or absence of congenital infection, the presence or absence of seizures, the infants's head growth, and other neurological signs and symptoms. The study demonstrated a sensitivity of 76% and a specificity of 79% with a positive

predictive value of 92.9% in identifying infants who were developmentally disabled.

Multiple Risk: Undoubtedly infants with multiple risk factors generally have a greater risk of disability than infants with just a single risk factor. Holst, et.al., (1989) found that the incidence of handicaps was 11 times higher for a combination of three or more maternal risk factors than in mothers with no risk factors. Of complications at delivery, intrapartum asphyxia, premature rupture of membranes were significantly associated with later handicaps. The perinatal complication most strongly associated with later handicaps was found to be extremely low birthweight.

Retarded Offspring: A study of normal nonconsanguineous parents and retarded offspring without specific diagnosis by Costeff and Weller (1978) revealed that severity of retardation and nature of medical history significantly affected the risk of having a second retarded child. Estimated recurrence risks in most simplex families was reported to drop sharply with each additional normal child. In majority of the families with more than one handicapped child, both the child had same disorder; however specific disorder was also observed (Wild and Rosenbloom, 1985).

Lower Social Class: Numerous studies have consistently confirmed the relationship between developmental delay and social adversity

(Johnston, 1980; Drillen and Drummond,1983; Eu and O'Neill, 1990; Jolly, 1990). Low social class was found to be the most significant **environmental predictor** of neurodevelopmental problems (Lindhal, et.al., 1988; Taylor, et.al., 1985). In Australia, the issue of socio-economic inequalities in adult and child health have become a national concern. A longitudinal study on child health indicated that mothers who had lowest socio-economic status (using any of the three index: chronic socio-economic disadvantage, mother's education, family income) had substantially higher rates of children manifesting developmental delays (Najman, et.al., 1992). Cass, Sonksen, and McConachie, (1994) found that 60% of visual impairment involving the nervous elements associated with developmental setbacks had major social adversity factors. A preliminary analysis of census data from Spain also tend to indicate that disability prevalence was higher among the lower socioeconomic strata, and among the person with limited formal education (Rodrigue, 1989). A distribution of such pattern was also observed in other countries (MacKenbach, 1987). Disability was also found to be more common among children of the lowest class families in a prevalence study of childhood disability in a Southern Indian city (Natale, Joseph, Bergen, Thulasiraj, and Rahamthullah, 1992).

General effect of parental education and socioeconomic status was found to be greater in the developmental outcome in infant with low birhtweight and perinatal complications (Ellison, Greisen, Foster,

Petersen, Friis, 1991). A study of familial factors as possible predictors of disabilities in adolescence indicated that parental traits (ie., maternal education) were more accurate predictors of adolescent status than the child' own behavior in early childhood (Kochanek, Kabacoff and Lipsitt, 1990).

Studies in developed countries have repeatedly demonstrated the significance of **adverse socioeconomic condition as an associated risk factor of mental retardation**. According to Co'eman (1976) three-fourths of the nation's mental retardates came from socially, economically, and culturally disadvantaged homes. A significant relationship between socioeconomic class and incidence of mental retardation was also reported in India (Pakrasi, et al., 1987). Consistent with the above pattern, social class differences were confirmed to be more pronounced in case of mild mental retardation as compared to severe mental retardation (Tarjan, Wright, Eyman, Keeran, 1973; Nelegan, Prudham, and Steiner, 1974, Stein and Susser, 1983; Martin, Ramey, and Ramey, 1990). In a study of socioeconomic traits in mildly retarded children of differential diagnosis, Broadhead (1973) found that brain-injured children came from homes characterized by parents who have tended to have completed and graduated from high schools and have occupations in the category of "skilled workers". On the other hand the parents of educable mentally retarded children tended to have only partially completed their high school studies and were employed as "semiskilled" workers. This further suggested the significance of

socio-cultural bearing on mild mental retardation which was not associated with minimal brain damage. Data from the British Child Health and Education Study pointed to the importance of parental social background influencing, in a complex manner, the intellectual development of a child. Groups in socio-economic disadvantage experienced over-crowding, poor household amenities and shorter tenure of residence. It was the combination of effects which was perceived to influence subsequent child development negatively (Osbon, Butler and Morris, 1984).

The socio-familial background and medical risk factors in 169 mildly retarded children were considered extensively by Lamont (1988). Strong relationship between social class and presence of different prenatal and perinatal risk factors were perceived. 56% children were from the two lowest level of social class. Medical risk factors were identified in 42% of the children overall; but the prevalence fell from 55% in social class II to 30% in social class V. About 49% of the reported perinatal and most of the postnatal events were detected in the second and third level of social class. Children in lower social classes did not appear to be at increased risk of retardation from environmental medical events. Prenatal factors were identified in 22 children of whom 14 were third or later born in their sibship reflecting risk associated with increased maternal age at birth. Importance of parental education in raising the risks was also reflected in their study. However, Taylor and his associates (1993), in their

sibling-control study observed that prenatal complications and delayed onset of regular respiration were predictive of neurodevelopmental disabilities, independent of social class and gestational age at birth.

Social class and regional differences in mental retardation were also studied by Rantakallio (1987). The incidence of severe mental retardation was found to be significantly high in farming families and in less developed areas which belong to the lower end of society. The obvious explanation for the higher incidence of severe mental retardation among farmers was an excess of older mother in this group. Mild retardation was significantly high in all class other than the upper socio-economic class. Other less favourable social conditions such as death of a father, parental unemployment, absence of mother were more frequent in the families of the mentally subnormal. Another comparative analysis of some familial and demographic characteristics by Portnov and Marincheva (1992) found differences in etiology that existed between mild and severe mental retardation. In a pilot survey of severe childhood disability in 8 less developed countries, although no definite consistent pattern emerged for mild mental retardation vs severe mental retardation regarding frequency, gender ratio, average age, or socio-economic status but MMR differed from SMR consistently regarding consanguinity. associated impairments, and positive symptoms (Stein, Belmont, Durkin, 1987).

Inconsistent with the popular view that mild retardation was predominantly cultural-familial and not pathological in nature, Al-Ansari (1993) found illiterate father, consanguinity, and a relative with mental retardation to be significantly more common among the sample with mild mental retardation.

Large scale studies tend to dilute the effect of severe biologic insult because high variability was the most striking characteristic of the larger normal group. Such surveys concluded that low intelligence was better predicted by the level of maternal education, socioeconomic status, and prenatal care than by biomedical and neurological variables (Broman, Nichols and Kennedy, 1975). Lamont and Dennis (1988) found that 51% of the families having children with mild mental retardation had a history of serious educational problems in both parents.

Kochanek, et.al., (1990) suggested that early identification models which focused upon developmental delay or adverse medical events at birth or early childhood were inadequate in fully identifying children eventually judged to be handicapped. Cohen and his colleagues (1982) stated that the developmental outcome of a biologically high-risk infant was dependent on the socioeconomic status of the infant. Numerous twin studies have shown that improved environment lessen if not reverse the adverse effect of predisposing biological factors. Study of Swedish families had shown that the detrimental effect of malnutrition on development

could be arrested if given opportunity to enhance (Hagberg, Hagberg, and Lewerth, 1981).

Habitat: Geographical differences in the prevalence of mental deficiency was found to exist to a certain amount. Significantly higher incidence was found in rural than in urban area in a study of six representative areas in England and Wales (Lewis, 1929). Diaz and Gestal (1987) conducted a survey on registered mentally handicapped people to study the influence of habitat on the prevalence of mental handicap in Galicia, Spain. Higher prevalence was observed in rural, inland, mountainous, isolated and socioeconomically and culturally depressed areas with low population density, high migration rates and a high degree of endogamy. Prevalence of severe mental retardation was also high in these areas due to CNS infections, cranial traumatism and goiter and to the infrequent use of birth control methods.

Certain amount of inconsistency that do exist in the study findings in the neurobehavioural field might be partly explained by different means of identification and statistical treatment used for assessment of biological and psychosocial risks.

Other Relevant Demographic factors: It has long been recognized that family size was negatively related to intellectual competence. Individual from large families achieved lower average intelligence test score than those from smaller families. Belmont, Stein, and

Wittes (1976, 1977) found that family size bore a direct relation to the rate of attendance at special schools for the mentally retarded. A large proportion of individuals from larger families than from small families attend such school. Pakrasi et al (1987) also reported higher incidence of retarded children in larger families. Children from smaller families had advantage over those from larger family in enjoying more share of family resources (Lindgren, 1980). Family size effects, however, differed by social class and birth order.

Crowding, household size, density (person per room), living conditions etc were also often been investigated to be associated with infant mortality and disease (Rahman, Rahman, Wojtyniak, and Aziz, 1985; Schoeman, Westawat, and Neethling, 1991). Literacy rate, especially of mothers, was invariably shown to be the most important factor having strong negative correlation with infant health, mortality and net reproduction (Chaudhuri, 1987). Impact of these demographic variables as risk on mental retardation and other developmental disabilities need to be examined.

Contemporary etiological pursuit addressed so far stressed the notion of **'risk factors'** to be an optimal concept in identification of mental retardation and developmental disability in early childhood. Etiological search must be multivariate focusing both

child and family and account for differential weights of biological and environmental risk factors over time. Significance of socioeconomic condition in stunting proper development or aggravating the afflicting condition was well documented. Information on risk factors, thus, appeared to be imperative in tracking and monitoring high-risk infants during infancy and childhood, eventually allowing early identification of mental retardation and developmental disabilities for appropriate referral for services and early intervention. Therefore the issue of developmental disability among children, along with its prevalence, in developed and developing countries, with exclusive focus on Bangladesh, needs to discussed.

1.6: Deliberation on Childhood Disability:

Persons of all ages have been affected by disability and require services and attention throughout the world. Deliberation on **childhood disabilities** received exclusive concentration because childhood suffice the foundation of future adult life. Childhood has been recognized as a distinct and crucial periods of human life. Potential effects of early experience on later development of human being has been substantially documented in various researches and theories of human behavior. Needs and problems of today's children eventually project the craving and distress of coming grown-ups. Intervention and services centred around early

childhood period, hence, were more liable to procure effective, long lasting, positive impact. Insight into situation affiliated with childhood disabilities would also speak for the issue concerning disability in adulthood. Moreover prospects of intervention were more favourable for younger children. Early intervention programme with high risk infants achieved great success in promoting or/and arresting the adverse effect.

The UNICEF estimated that about one out of ten of the world population were born with or acquire some sort of physical, mental, or sensory disabilities. Unless some special support and concern has provided, disability encroached their capacities for normal development. A current population projection by Rehabilitation International (1980) showed that in 1975, there were more than 6 million disabled children in North America, more than 11 million in Europe, 13 million in Latin America, 18 million in Africa, and 88 million in Asia. The global picture conceived by the study project was that by the year 2000 there would be about 190 million disabled children, of which 150 million would live in developing countries. It was deducted that about 25% of world's population have been suffering from the disastrous impact it has on the individual, family and community (Noble,1981). Data from various countries all over the world depicted a large number of disabling conditions commonly found among the children, among which locomotor problems, mental retardation, blindness, deafness were obtrusive. Variation in prevalence estimates in different studies were subjected to the

ways disability had been defined, the categories considered, the population included and the methodology followed. But despite of their limitations, all imperatively deliberated the growing necessity for urgent attention to the issue of mental retardation and childhood disability .

1.7: Prevalence Studies in Developed Countries:

United Nations Disability Statistics Data Base (DISTAT, 1988) provided a systematic documentation of data on disability in population census and various household surveys from several countries. In United States, population census of 1980 reported 8.5% disabled within the age group of 16-64 years. Health and disability survey (1983) in Canada gave an account of 11.2% disabled person. In United Kingdom, disability survey conducted during the year of 1985-86 reported 3.2% disabled among the people below 15 and 14.2% in the age group of 16 and over.

Numerous studies had been carried out in this connection in United States and Latin America with varying results. Boyle C A, Decoufle P and Yeargin A M (1994) examined the prevalence of developmental disabilities and its impact among children ages 0 through 17 from the data of 1988 National Health Interview Survey in United States. Following a structured in-person interview with a parent or other adult household member, to identify and examine a wide range of

developmental disabilities like deafness or hearing trouble, blindness, epilepsy or seizures, stammering and stuttering, other speech defects, cerebral palsy, delay in growth or development, learning disabilities, and emotional or behavioral problems. The result stated seventeen percent of children in US to have ever had a developmental disabilities. The study depicted substantial impact of these condition on the health and educational functioning of the affected children. Prevalence of specific disabilities were also agonizing according to the World Health Organization report as well as individual study results. A Pan American Health Organization study in Latin America cited 11.06 percentage of prevalence estimate for various forms of disability. Out of which three percentage experiencing locomotor problems, three percent mental retardation, 2% blindness, and other 2% deafness and speech problem. A survey of 75 million school-age children by United States Office of Education classified 10% handicapped as speech impairment 3.5%, mental retardation 2.3%, hearing impairment and deafness 1%, visual impairment 1%, locomotor and other problems 3% (Source:Rehabilitation International, 1980).

The overall prevalence rate of mental retardation has been estimated to be as high as 3 percent of the population. Shah (1991) reported that 5-15% of children aged 3 to 15 years in both developing and developed countries suffered from mental handicaps. Accordingly, there might be as many as 10-30 million severely and about 60-80 million mildly or moderately mentally retarded children

in the world. The incidence of mental retardation in the United States was estimated to be about 6.8 million person (Robinson and Robinson,1976). The prevalence rate at livebirth of Down syndrome found in their study ranged from 5.8 to 20.8 per 10,000. California Birth Defect monitoring Program (CBDMP) identified 1058 infants with Down's syndrome giving a crude prevalence of 1.03 per 1000 (Hahn J A and Shaw G M, 1993).

Large number of studies had also been carried out in Europe, Australia, and Japan. Empirical study of an unselected school population of 416 children aged 6-12 years by Sonnander (1990) yielded a prevalence of mental retardation of 1.3% in Sweden. Dolk.H and his associates (1990) covered a total population of 1,414,895 live and stillbirths by 19 registries in 11 countries in Europe during the study period of 1980-86. The administrative prevalence of mental handicap at the age of 10 years was ascertained for a group of children born in 1973 and 1974 in New Zealand by Joyce and his associates (1988). Birth cohort prevalence of 4.33 per 1,000 live births were found. A community based study of prevalence of intellectual handicap in Western Australia found the rate to be 8.9 per 1000 live male birth and 6.3 per 1000 female birth with an overall rate of 7.6 (Wellesley, Hockey, Montgomery and Stanley, 1992). In Gunma prefecture of Japan, out of 236,000 school going children between 6 to 15 years of age, 129 cases of severely mentally and physically disabled children were reported in the register of regional board of

education (Machida, Yano, Suzuki, Hirayama, Arai, 1993). In a study of suburban area of Tokyo, high incidence rate was found for severe motor and mental retardation ,1.0/1,000. Incidence rate for cerebral palsy and Down syndrome were 1.9 and 1.3 per 1,000, respectively (Suzuki and Kodama, 1991).

It was reasonably speculated that economic drawbacks affected the quality of life in developing countries. Below standard health status and social well-being were deftly pictured in their below average life expectancy at birth and high infant and maternal mortality rate. Malnutrition, infectious diseases, illiteracy, poor living standard, improper hygiene and above all disproportionate distribution of facilities and services have been more prevalent in developing countries than in technologically more advanced countries. Therefore children in developing countries have been extremely vulnerable to many biological and environmental factors which cause mental retardation and other developmental disability.

1.8: Prevalence Studies in Developing Countries:

A large number of the disabled population live in developing countries. In 1975, more than three-quarters of the world's disabled people lived in developing countries and by 2000, this rate would rise to four-fifth (Noble,1981). About one third of the

disabled population were children. Table 1.2 provided United Nations Disability Statistics Compendium (1990) report on population census data on percentage of disabled person by age group from selected Asian countries.

Table 1.3: Percentage of Disable Person by Age Group in Various Asian Country reported in Census Survey

Country	Census Year	Age Group (percentage)			
		0-14	15-24	25-59	60+
Bahrain	1981	14.2	15.5	36.7	33.7
Egypt	1976	17.2	17.5	47.1	18.1
Kuwait	1980	34.2	25.3	26.4	14.1
Pakistan	1981	19.8	12.8	32.7	34.7
Sri Lanka	1981	23.4	19.1	37.1	16.6

Source: United Nations Disability Statistics Compendium,1990

Percentage of disabled children (under 14 years) varied from 14 to 34% in these reports from Asian countries and also notably higher than the developed countries.

Tao (1988) reviewing the recent prevalence survey in urban and rural areas of China found prevalence rate similar to those in Western countries, but much higher rate was reported in minority regions. A national sampling survey of China in 1987 provided an estimate that one out of every five families had a member who was disabled. For children under 14 years of age, the overall prevalence rate of disability was 2.66%. The prevalence rate of

mental retardation was 1.8% which accounted for 66% of all disabled children (Chen and Simeonsson, 1993).

A report on deaf population in the third world considered 6 million children to be suffering from hearing impairment (Hammerman, 1981). Blindness survey of Nepal reported 0.84 per 100 to be blind people but fortunately childhood blindness reported in the study was low. Only eleven cases of blindness were detected in children under the age of 15, estimated population was 4033 (Billiant, Grasset, Lepkowski, Kolstad, Hawks, Pararajasegaram, Brilliant, Gillbert, Konyama, Shrestha and Kuo, 1984).

Preliminary studies in developing countries suggested that the prevalence rate of serious mental retardation in developing countries was also higher than developed countries. An international pilot study on childhood disability was carried on in 10 study sites in 9 developing countries. House to house survey of 1000 children of 3 to 9 year old children were screened at each study site by using simple questionnaire to identify children having disability, particularly severe mental retardation. The study gave an approximate prevalence estimation of severe mental retardation to be 5 to 16 per thousand (Belmont,1984). The population survey of mental retardation was conducted in 44 electorial units of Pakistan by Hasan and Hasan (1981). The study included 7,012 persons from 1,483 randomly selected households. 279 cases were diagnoses as mentally retarded by a team of

professionals, of which 70 cases were severely retarded. A rate of 10.3 per thousand was estimated for severe mental retardation while 30.7 per thousand for mild retardation. Narayanan (1981) gave an account of prevalence of mental retardation in southern India. Results of the epidemiological survey conducted in three villages in 1970 give an average prevalence rate of 3.4 per 1,000 of severe mental retardation. The prevalence rates of severe mental retardation in two villages surveyed in 1979-80 were found to be 6.4 per 1,000, somewhat higher than the earlier study. In another door to door household survey in Southern India, Satapathy, Ghosh and Sarangi (1985) reported a rate of 4.4 per 1000 in total population and 10.4 among children under 14 years of age, with male to female ratio of 5:3.

1.9: Prevalence of Disability in Bangladesh:

Beside some confined survey reports, prevalence estimate of disability was not adequately available in Bangladesh. A sample census conducted in 1982 provided an account of 0.77% disabled person, with greater percentage in rural area (0.79%) than urban area (0.57%). 24.11% of the disabled person were below 14 years of age (Source:Statistical Year book of Bangladesh 1984-85). A survey of 9,886 families in Dhaka city reported presence of a handicapped child in 2.5% of the families. About 88.4% of the disabled children identified were in the range of 2-16 years age. Major

types of disabilities found in the survey were physical (40.4%), hearing and speech (16.5%), and sight (15%). (Sobhan, Rahman and Farouk, 1962).

First attempt to provide any empirical data on the situation of handicapped children was undertaken by Mia and his associates (1981). A national survey covering 24,858 rural and 15,35 urban families was carried out to identify handicapped children and portrayed the magnitude of the problem. The study estimated that 252,850 families with a total of 14.24 million members were affected by the presence of handicapped children. The rate of handicapped children per thousand children was found to be 8.41 in rural area and 7.08 in urban area. A study of prevalence of nutritional blindness in rural and urban Bangladesh by Cohen and his associates (1985) found that out of 18,660 rural and 3,675 urban children examined 738 rural and 211 urban children had abnormal eye function. The International Pilot Study of Childhood Disability carried out on 1,000 children between 3 and 9 years of age from rural Bangladesh found 56.58% of the disabled children were mentally retarded (Zaman,1982).

Like most developing countries, the disabled children in Bangladesh have been typically subjected to extreme negligence. Their needs have been ignored by the policy planners of the country battling to render the rudimentary standards of proper growth and development of which majority of the children were deprived of. Data on

general health and educational situation of children in Bangladesh furnished in Table 1.3 reflected a pathetic and substandard scenario.

Table 1.4: General Health and Educational Feature of the Children of Bangladesh

Mortality Rate		Malnutrition (Percentage)		Primary Education (Percentage)	
Infant (per 1000 live birth)	Child (per 1000 in 1-5 yrs age)	Mild/ Moderate	Severe	Enrolment Rate	Completeing Rate
125	22	63	21	61	55

Source: Unicef: An analysis of the situation of children in Bangladesh,1987.

Percentage of child mortality rate and malnutrition were both high, whereas primary education rate among the children was strikingly low. Ensuring proper health and education to the majority of the children received priority in the national policies but the issue of disability was often suppressed. The welfare of these disabled children have been, therefore, to a large extent left to the hands of the immediate families yielding to charity and sympathy. Parents of mentally handicapped children have unrealistic attitude towards recognition and acceptance of the child. They either try to keep the presence of a handicapped child in the family a secret or place undue pressure on the child to perform normally (Zaman and Rahman, 1981; Hammerman, 1981). Parents feel emotional burden and blame themselves for the predestined condition. Social attitude

toward developmental incompetence also has a significant impact on the future of the disabled children.

From the above discussion on the situation of disabled children of the world it became explicit that the magnitude of the problem has becoming so alarming that no nation could avoid its responsibility any longer. Conditions were more deploring in the developing countries where services extended to the need of the disabled children were sparse. Understanding of the afflicting physical and social situation that were causing disability or predisposing high risk within an individual has been a pressing demand to generate and materialize any effective intervention strategy to promote the well-being of the disabled children. Epidemiological studies provide the information and knowledge necessary as a groundwork for such earnest effort. Such studies could identify high-risk population more specifically and could provide insight into the history of specific disabilities (Lin and Standley, 1962; Kramer, 1967). Subsequent paragraph would thus focus on the need for epidemiological study, along with a few citation.

1.10: Urgency of Epidemiological Study:

Epidemiology emerged as an independent discipline rendering an indispensable role in elucidating the nature of a host of human health and disease problems. Its primary concern was to determine

a comparative appraisal of factors essentially related to or influencing the occurrence and persistence of any disease by analyzing its distribution over different time, different place and different person. Subsequent derivation of biological inferences from these observation provided the basis for developing and evaluating preventive procedures and positive health policies. Consideration of a group of people as a whole unit has expanded the scope of epidemiologic study to reach the vast boundless phenomena of pathological and beneficial health conditions that have impediment bearing on human population, under natural setting (Lilienfeld and Lilienfeld, 1980). It was no longer confined to the quest of distributions and determinants of diseases, infectious or noninfectious, and epidemic situation only, but also acknowledge the issue of disabilities, mental illness, environmental hazards like accidents, trauma, occupational exposure and general health status including care and services.

Epidemiology addressed the questions such as whether relative mortality and/or morbidity experience from a given disability in different population groups were related to the existing differences in environmental, personal or genetic characteristic of the groups. Determined the presence of such association at the individual level by pursuing whether certain characteristic was more frequently observed in persons with the disability than those without disability. Conversely, did persons with certain characteristic were more likely to develop the disorder than those

who did not possess the characteristic. Amelioration of factors that often seem remote from the disorder essentially proved to have more positive result than the knowledge of specific etiological factor (Steinberg and Wilder, 1952). Epidemiologic search for the most important or most direct causal factor in the 'web of cause' has both psychological and practical benefit (Friedman, 1980). Data on high risk persons were useful in indicating the segment of population where primary preventive activities should urgently focus. Considerable attention on the use of demographic and social indicators to reflect the magnitude and location of "high-risk" and target population was also based on findings from variety of epidemiological studies (Redick, 1971). Sound epidemiologic study would furnish essential facts about mental retardation and other developmental disabilities that might more fully elucidate their social distribution and etiology that would provide useful basis for the rational to plan services for prevention at national as well as regional level.

Epidemiologic Studies on Mental Retardation and Childhood Disability: The first US population-based epidemiologic study of the prevalence of mental retardation, cerebral palsy, hearing impairment, and visual impairment among school age children was 'the Metropolitan Atlanta Developmental Disabilities Study' (Yeargin, Murphy, Oskley and Sikes, 1992). Using a multiple source method, the study included all 10 years old children residing in five Georgia countries. High prevalence rate of 10.3 per 1000 for

mental retardation was found. Prevalence rate for cerebral palsy, hearing impairment and visual impairment found were 2.0, 1.0 and 0.6, respectively. The study depicted that about 95% of children with one or more of these disabilities were identified by the school system.

Wellesley, et.al., (1991) in a community based study on intellectual disability (IQs less than 70) among all children born and living in Western Australia found that 40% had a definite genetic basis, 20% an environmental cause and 40% were of unknown etiology. The insult was prenatal in 61%, 10% had a possible perinatal cause, 8% were postnatal and for 21% the timing could not be assessed. A disparity was also found in prevalence between rural (9.9/1000) and urban areas (6.5/1000).

A population study of developmental disabilities among children between birth and 3 years estimated overall incidence of neurodevelpomental deficits to be 31 per 1000 in Haifa district (Tirosh, Shapira, Jaffe, Tamir and Zelnik (1993).

In India, a house-to-house epidemiologic survey was done in a rural population of 63,645 in South Kashmir in order to ascertain the prevalence and pattern of various neurological disease in 1986. The study yielded a prevalence ratio of 9.67/1000 and epilepsy, paralytic poliomyelitis, mental retardation, deaf mutism and

cerebral palsy constituted about 92% of all neurological cases (Razdan, Kaul, Motta, Kaul and Bhatt, 1994).

Multitudinous epidemiological studies cited on **mental retardation** have been undertaken to assess its prevalence, level and etiology. K. H. Gustavson, a prominent pediatrician in Sweden, conducted a number of epidemiological research on mental retardation. In 1976, he found higher prevalence rate of 3.5 per 1000 for five to sixteen years old children at an isolated rural area than a typical Swedish area (2.4 per 1000). In both the areas male excess ratio was evident. Five main groups of predominant etiological factors were identified and very similar distribution was found in both the areas. Known or unknown inherited or acquired prenatal pathogenic factors were found to be the commonest main cause of severe mental retardation. He also found a relationship between prevalence of Down's syndrome and maternal age (Gustavson, 1981).

An epidemiological study of mental deficiency was carried out in an area of the region of Valencia provided a prevalence estimate of 14-10/1000 in children between 0-14 years old, evidencing a gradual increase in the rate with age. The study found predominance of prenatal (29%) and postnatal origin (49%) but in 57% of the cases no identifiable cause had been found (Tomas V M, Parico T J M, Colomer R C, Andres C M, and Moratal A, 1991).

In Bologna, Italy, an epidemiologic study investigated prevalence, causal origin of and impairment associated with severe mental retardation among all school children (6-13 years). The prevalence of severe mental retardation was 4.2 per 1000 for males, 2.5 per 1000 for females and 3.4 per 1000 for both sexes. Causal origin reported in the study was prenatal for 33.3 percent, perinatal for 14.4 percent, combined pre- and perinatal for 5.6 percent and postnatal for 13.3 percent. Another 12.3 percent of the children with IQs less than or equal to 50 had autism or childhood psychosis. For remaining 21.1 percent there was no evident cause of mental retardation. 50 percent had at least one associated physical or neurological impairment other than mental retardation, with epilepsy and cerebral palsy predominating (Benassi G, Guarino M, Cammarata S, Cristoni P, Fantini M P, Ancona A, Manfredni M, D'Alessandro R. 1990).

In northwest Spain, a cross-sectional epidemiological study of mentally retarded persons registered in the diagnosis centres and the therapeutic guidance centres was carried over by the authority. The reported prevalence rates of 4.95 and 3.40 per 1000, corresponded to those found in other countries (Diaz, 1988).

In Canadian Maritime provinces a retrospective epidemiological survey was undertaken in 1980. Prevalence was estimated to be 36.5 per 10,000 children. The study ascertained predominance of prenatal cause (58%), followed by perinatal (10%) and postnatal

(4%). No specific cause could be determined for 27% of the children, but 41% of this group had epilepsy and/or cerebral palsy (McQueen, Spence, Winsor Garner and Pereira, 1986).

Epidemiologic studies also addressed the issue of taxonomy (Lester, Marchesi, Bagnasco and Bonelli 1991), gender differences (Richardson, Katz and Koller, 1986), urbanization (Grimsmo, 1990). The sex ratio generally was found to favour males. Most authors had reported a male to female ratio of about 1.6:1. Such gender difference found in epidemiological surveys were more consistently applicable to mild mental retardation, having a somewhat higher prevalence of boys than girls (Levinson, 1962; Laxova, Ridler, and Bowen-Bravery, 1997; Lindsey and Russell, 1981; Son Blomquist, Gustavson, and Holmgren, 1981, Richardson, 1987). Richardson, Koller, and Katz (1987) examining the number of boys and girls at different levels of retardation agreed with the findings found to be true in other studies. Age-specific variation of prevalence of mental retardation was also extensively manifested in these studies. Reported prevalence of mental retardation tend to increase with age until 20 years. Almost all studies asserted highest occurrence between the ages of 10 and 20 years, followed by a drop. However exceptional findings were also reported (Richardson, Koller, Katz, and Mclaren, 1984; Fishbach and Hull, 1982). In a review of four epidemiological studies from Sweden, Akesson (9174) reported more mental deficiency coming from rural than urban communities.

In Bangladesh the first systematic epidemiologic study on childhood disability was the '**Rapid Epidemiological Assessment of Childhood Disabilities in Bangladesh (REA)**' initiated by a collaborative effort as a aftermath of an International Pilot Study on Childhood Disabilities conducted in 8 less developed countries, including Bangladesh (Belmont, 1984). The present study diagnosed and selected cases from this REA survey, and therefore the study has been described in considerable detail in next section i.e. section 1.11, as the foundation work of the present study.

The study results from different countries were not instantly comparable due to dissimilar methodologies and various sized population. Precise definition of concepts and conditions were essential to generalize the findings. The beneficial outcome of these studies in unfolding the underlying etiological and associated risk factors enabled to understand the trend in childhood disability and has heightened the need for rigorous epidemiological data before planning any rational services for any particular geographic area. It has also been useful in educating the professionals and the general public about the extent of problems presented and experienced by the mentally retarded or disabled persons. These studies, although had authenticated the importance of organic and psychological factors, have extensively recognized the importance of social conditions specially for milder cases. Besides environmental factors have been viewed to be more responsible for severe mental retardation in developing countries

where health care facilities were minimal (Satapathy et.al.,1985). Hence a specific emphasis on the effect of socioeconomic status on the prevalence of mental retardation with varing severity was placed in the present study.

1.11: The Rapid Epidemiological Assessment of Childhood Disability (REA Project):

The REA project was an international collaborative effort carried out in three developing countries, Bangladesh, Jamaica and Pakistan. The study was supported by the Board of Science and Technology for International Development, National Academy of Science, Washington D.C., USA. An international study group at Gertrude Sergievsky Center of Columbia University in New York, U.S.A headed by Dr.Zena Stein and Dr.Mureen Durkin coordinated the study. The research team in Bangladesh was headed by Dr.Sultana S. Zaman, from the Department of Psychology of the University of Dhaka. The author, along with others, worked as a research assistant and was actively involved in data collection and analysis.

Background of the study: The REA study was an extension of the International Pilot Study of Severe Childhood Disability (IPSSCD), undertaken by a group of researchers in eight developing countries including Bangladesh, Brazil, India, Malaysia, Nepal, Pakistan,

Philippines, Sri Lanka, and Zambia, in 1981 (Stein 1981; Belmont 1981) as an initial attempt to gather information on childhood disability in these countries. In the Pilot study a two stage design was followed. In the first stage a door-to-door survey was completed in one community within each country. At this stage, all 3 to 9 year old children in each community (approximately 1000 per community) were screened for severe mental retardation and other disabilities. Two screening questionnaires were developed for and used in the pilot study: the 'Ten Questions (TQ)'and a slightly more elaborate questionnaire 'Childhood Disability Questionnaire (CDQ). To determine the usefulness of the TQ and CDQ in identifying severely disabled children in the community, the children screened positive on TQ or CDQ and a random sample of children with negative screening results were referred to stage two. In the second stage these children were examined by a team of professionals comprising of paediatrician and psychologist. The result indicated that the TQ was highly sensitive and at least as good as the longer CDQ for detecting severe mental retardation (Belmont,1984). Though the samples of the pilot study were too small to make any population based estimates of prevalence or to allow risk factor studies, this study provided the basis for the more elaborate REA study.

Study objectives: The REA study, as an extension of JPSSCD, was undertaken to overcome the limitations of the pilot study by expanding its scope to include larger samples, younger children

(2-9 years) and more detailed information on potential risk factors. The REA study also included probe questions on the TQ and followed more elaborate and standard professional assessment procedure. The objectives of REA study was to:

1: To standardize a modified version of Ten Question as a screening instrument for six types of disabilities i.e., motor, vision, hearing, speech, epilepsy and mental retardation.

2: To provide an estimation of prevalence of childhood disabilities.

3: To determine the potential **risk factors** associated with disabilities.

The two stage study design adopted in the REA study called for drawing a large sample of population in the first stage through initial screening using an inexpensive, simple technique, the TQP by community workers and only a sub-sample was selected for subsequent follow-up in the second stage involving thorough diagnostic evaluation by professionals. Detailed household and demographic data and medical history were gathered during the survey. About 10,000 children were initially screened and 1626 children, all those screened positive and a random number of screened negative, were professionally evaluated.

The data gathered during the study served as a base upon which the present study emerged. In the subsequent writings, the REA study would be referred as the **base study**. One of the major question of

the present study was to find out the influence of social inequality on the prevalence of different levels of mental retardation, specifically. This necessitated an effort to develop a scale to measure social status from the available REA household data. Therefore present writing took the liberty of advancing a brief review on the significance of appraising socioeconomic status along with reference to differnent indicators used to assess social class differences.

1.12: Significance of Appraising Socioeconomic Status:

Variation in socioeconomic status (SES) within a society as well as crossculturally have significant impact on health condition and disease incidence in the community. Epidemiological and public health researchers have repeatedly demonstrated distinct social class differences in infant mortality, disease rate, psychomotor development and other health behaviour (Peritz and Bialik,1968; Palti H.,et.al., 1977, Marmot, M. et.al.1987). Majority of the studies have portrayed adverse association with socioeconomic state and disease risk. Such findings have augmented the importance of studying social environment, an irrefutable aspect of human life, for better understanding of the various health needs and disease outcome in a community. Investigation of individuals social exposure contributed to the understanding of underlying etiological and associated risk factors of any disease or

disabilities and would reveal the way how health and disease were affected by the mode of social structure (Marmot, M. et.al.1987).

Meaning of socioeconomic status: Socioeconomic status of an individual reflected his rank in the hierarchy of social class or strata. Although analytically distinct, the terms social class, strata or status were basically interchangeable as synonymous to indicate social inequality generating from definite value judgement. Two rudimentary arenas were consensually recognized to adjudicate social status: biological distinctions such as age, sex, or race and acquired distinction like power, wealth and prestige. Issues of comparative importance of these dimensions underlying social stratification, specifically among the acquired, was subjected to great theoretical controversy far rooted into the legacies of Marx and Weber (Haug,1977).

Advocates of Marxism emphasized the economic dimension reflected on division between the owners and nonowners group based on relation to the means of production. According to them, social class categories were primarily devised by the few advantaged who were at the crest of the society, exploiting the majority. Weberian perspective, on the other hand, maintained the multidimensional aspect of social stratification. Three independent arenas were identified as accountable to divergent societal position. Class referred to the economic dimension as Marxist, ownership and control of production resources. Status reflected the prestige or

honour granted to the standing in a social position, having access to life privileges, while power dimension with political referent implied exercise of control over others (Muller and Parcel, 1981). Complying to these two perspective, Lenski (1966) defined social class as 'unequal access to possession of goods and services, with status and power variation as both causes and consequences.' Ann Daniel (1983) revealed the interwoven character of these dimensions in her definition of social class as 'the position of a person or group of persons occupies in society and it designates access to social and economic resources and to valued life experience'. Despite the disagreement as to the relative importance and existing interrelationship, social value of wealth, power, and prestige were quite obvious dimensions to serve as a basis for ranking individuals, family, or groups into different socioeconomic status.

Indicators Used to Assess Social Class: Education, occupation, and income were the properties commonly used as a determinants of social ranking. Besides these area based measure, household component, wealth, possession, room-person ratio, were currently been utilized as an index of SES (Otto, 1975; Morgan and Chinn, 1983; Pole and Ikeme, 1979; Abramson, Goffin, Habib, Pridan and Gofin, 1982). All these indicators were most valued in the society and their pertinence of estimating social status was well documented in psychosocial researches.

Appraisal of theories and practices argued for selection of occupation as the most reliable and feasible single indicator of person's relative standing with respect to the different life-style and power position. Since one's occupational option relied heavily on variation in schooling and earnings, occupations have been customarily ranked on the basis of educational requirements and monetary payoffs (Haug, 1977). Edward (1933, 1938) developed a ranking system for U.S Bureau of Census occupations which still serve as the basis for current Census classification scheme based on these strategy. He reasoned that education conveyed social status on the occupation and, in turn, in a similar manner income conveyed the economic status. Rationale behind such hierarchy has been questioned for not being mutually exclusive. Wide intracategory variation in income and education has been considered as a critical shortcoming of the scheme of occupational position as a single measure. Moreover, in majority of women no formal employment could be recorded, and the social esteem attached to it also vary over time and place. However its importance was never repudiated and several renowned scales of social position has employed occupation as one indicator in a composite index (Hollinshead, 1977; Siegel and Hodge, 1968; Duncan, 1961). Despite of its disadvantages, many researchers considered prestige of occupation as the only and powerful indicator satisfactorily consistent with the power dimension in advanced industrial societies (Daniel, 1984; Mueller and Parcel, 1981).

Income or earnings was seldom desirable as direct measurement of economic status; rather its relevance to the understanding of stratification of modern societies have been reserved (Haug,1977). The fact that income did not vary monotonically with either prestige or power, a considerable amount of income heterogeneity existed within an occupation, unstable over time as well as regional and cross-cultural comparisons, more likely to response error, overlay serious difficulties in appropriate utilization of this economic dimension.

The appropriateness of education as a measure of social class for use in health studies in developing countries had been advanced by Zurayk and his colleagues (1978). It has become a popular single indicator of social class because of its association with many lifestyle characteristics, simplicity in collecting and classifying data, and fair accuracy of obtainable data (Liberator, Bruce, Jennifer, 1988). Education has been found to be moderately correlated with income and occupation but unlike these later properties, education applied to every adult and was more or less stable over one's lifetime. The number of school years completed, assignment of scores to different educational levels starting from illiterate to university level, average educational scores of a family, were the most commonly used measure of education. The main advantage of education as a basis for social class ranking was that it not only reflected the variation in material conditions of living but also the level of social awareness and skills.

The feasibility and practicality of different indicators have not been fixed but change with variation in social and economic structure over time and space. Thus the conceptual issue whether social class was unitary with all indicators measuring the same concept, or the different indicators of social class were distinct but related components measuring multiple aspects of social class eventuated (Lipset, 1968). Analysis of covariance structure has recommended a multidimensional strategy to deal with the problem of measuring SES (Rossi, Simpson, Bose, Jasso, Passel, 1974). Green (1970) established a major strategy of obtaining a composite measure based on several indicators that correlated highly with normal health behaviour.

Several measures of social class have been frequently included in psychological researches either as an explanatory or a control variable (Muller and Parcel, 1981; Abramson, Goffin, Habib, Pridan and Gofin, 1982). But caution must be taken against loosely used index. Recognizing the importance of socioeconomic status one must take care for selection of indicator/indicators, and its measurements to refrain harm caused by its unthinking use.

Social Structure In Bangladesh:

Economic system, division of power, leadership according to renowned Sociologist, have been the basis of social stratification in a given society (Afsar,1990). Economy of agriculture reliant rural Bangladesh has been built upon land. Variations in social

relationship, power and prestige of agriculturists in rural Bangladesh centred around the ownership of land. Land-owners were more well-off than the sharecropper who bear ceaseless economic hardship in cultivating land on lease. In between these two groups evolved another class, who cultivated their own land, were somewhat more solvent economically.

In urban area of Bangladesh, education has a special role in creating differences in status and power structure, beside the amount of property owned. Higher academic degree holders occupied higher government or private jobs and profession and enjoyed more facilities and privilege than the less educated. The value of education has been also similarly potrayed in the business community too.

Importance of social index were duly recognized in social and psychological researches in Bangladesh but various measures of social index often used rely heavily on economic dimension, usually taking income as a key indicator. Measures of occupational and educational dimensions were also commonly considered, while some include household and property in their surveys. These properties were either used individually or collectively but no systematic attempts have been so far generated to develop a reliable scale of social index. Present dissertation also attempted to address to the need while searching for environmental risk factors.

Under this entire framework, the perspective and purpose of the present study, its significance, and objectives would now be specifically rendered in ensuing paragraphs.

1.13: The Present Endeavor:

Present endeavor as an offshoot of REA study attempted to provide an overall perspective on the situation that may be considered as potential risk factors associated with occurrence of mental retardation and other developmental disabilities among young children in Bangladesh. The present dissertation placed emphasis on early developmental years and focuses on 2 to 9 year old children. Children below two years of age were excluded, as disability was often difficult to identify before two years unless it accompanied gross physical defects.

For present purpose 'inability in psychophysiological functioning manifested during the early developmental years of life' were designated as developmental disability in the present dissertation. Defined as such, present study encompassed incapacitating conditions like visual, hearing, speech, motor, seizure, and intellectual disabilities. Among the developmental disabilities, mental retardation bore more psychological impact on the family and the community at large. Moreover, Bangladesh, being deficient in material resources, rely excessively on its potential man power.

Children have been regarded as an asset to our families and often served as a valuable source of income. Due to various reasons children of this country have been devoid of facilities for developing healthy personality. Under such circumstances, presence of a mentally retarded child outset tremendous burden to entire family. Therefore, assuming that low functioning ability of the mentally retarded children would have more distressing and handicapping effect than those of other developmental disabilities in children, conditions associated with the occurrence of **Mental Retardation (MR)** was considered exclusively. While the other categories of developmental disabilities considered in the study, ie., seizure, motor, visual, speech, and hearing, save mental retardation, have been addressed together as **Other Developmental Disabilities (ODD)**. This also allowed delineating the risk factors responsible for mental retardation and other developmental disabilities.

Regarding severity of developmental disabilities, present focus was on serious disabilities (moderate and severe), except for mental retardation comparative appraisal was performed between serious mental retardation and **Mild Mental Retardation (MMR)** in relation to social class variance. Research oration of the present deliberation therefore, portrayed: (i) Serious Mental Retardation (SMR), (ii) Mild Mental Retardation (MMR), and (iii) Other Developmental Disabilities (ODD).

Significance of Present Research: Ultimate aim of research in this field was at primary prevention to reduce the impact of these developmental disabilities on quality of life, for which comprehensive and strategic approach to cause and mechanisms were needed (Polani, 1993). Theoretically the present essay would ameliorate the existing knowledge about mental retardation and developmental disabilities in the field of developmental and clinical psychology. The courses offered in these fields could be enriched by introducing the portentous issue from the context of Bangladesh. The professionals striving to extend some assistance to these ill-fated children and their families to cope with their problems would also be benefitted immensely by the present findings.

From the perspective of the national interest, the research emerged out of practical necessity of expanding awareness and commitments to the new challenge of providing necessary services to the mentally retarded and developmentally disabled children. This calledforth a thorough research illuminating the nature and the prevailing situation of these children in Bangladesh. The present study, in essence, attempted to enhance the insight into the problems of mentally retarded and other developmentally disabled children and thereby, covered all conditions of disabled children in Bangladesh by focusing on the important medical and psychosocial risk factors, specially social conditions, associated with the prevalence of mental retardation and other developmental

disability. Awareness of such predicament was essential for providing conditions facilitating optimal development of the child's potential and ensuring happiness that would maximize his self esteem, and value in family, and society. 'Risk factors' associated with prenatal and perinatal conditions would be lessened by undertaking appropriate preventive measures. Early intervention and proper rehabilitation programme could help these children to overcome their limitation and become a productive and useful member of the society. The present study would be able to furnish necessary information, presently lacking but vital to the policy makers to conceptualize any intervention strategy to be undertaken for the well being of these unfortunate children with mental retardation and developmental disabilities for minimizing the burden on the family as well as on the nation and also to increase public awareness. Adequate provision of primary health care services could impede a significant portion of mental retardation and developmental disabilities through managing the conditions responsible, most of which are largely preventable. Knowledge about the risk factors would, thus, expedite undertaking of preventive measure wherefore reducing the incidence of disability which in turn would raise the quality of life of all children, disabled or normal.

Purpose of the Study: The present study, therefore, aimed at identifying the potential medical, social, and demographic factors associated with the prevalence of mental retardation and other

developmental disabilities (blindness, deafness, seizure, speech and motor disability). In order to investigate the relationship between degree of mental retardation and social class differences, the present study also attempted to develop an index for measuring socioeconomic status of the family which would be useful for both rural and urban areas of Bangladesh.

Objectives of the Present Research:

The objectives of the present study were to :

1) develop a reliable index useful for measuring socioeconomic status in both rural and urban areas of Bangladesh,

2) estimate the prevalence of mental retardation in Bangladesh taking into account the age, sex and rural urban distribution,

3) identify specific demographic and maternal factors associated with the prevalence of mental retardation and other developmental disabilities,

4) explore social class differences in the occurrence of mental retardation and other developmental disabilities,

5) investigate into some prenatal, perinatal, and postnatal medical factors associated with mental retardation and other developmental disabilities.

6) compare risk of serious and mild mental retardation in relation to social class differences.

To accomplish the said ends, present study strived to resolve the subsequent research questions. Research evidences suggested that

conditions prevailing in developing countries like Bangladesh were more viable to disabilities, disease, and health problems. However due to scarcity of adequate demographic and vital statistics, and information on the cause and risk factors associated with mental retardation and other developmental disabilities in Bangladesh certain questions were raised. Such as:-

Demographic Relationships:

1) Whether there was any significant gender and age difference in the occurrence of mental retardation and other developmental disabilities.

2) Whether mental retardation and other developmental disabilities were more prevalent in urban than rural areas.

3) Whether large family, density, and number of caretaker were related to the occurrence of mental retardation or other developmental disabilities.

Maternal Factors:

4) Whether younger or older mothers had high risk for mentally retarded children or children with other developmental disabilities.

5) Whether consanguineous marriage raised the risk of having children with mental retardation or other developmental disabilities.

6) Whether mothers who had given birth to dead children were more likely to have children with mental retardation or other developmental disabilities

7) Whether children born in hospitals which provide obstetric care or in other places (i.e., at home) had more risk of having mental retardation or other developmental disabilities.

Social Inequality:

8) Whether conditions prevailing in lower socioeconomic class raise the risk of mental retardation and other developmental disabilities than other sector of the society.

9) Relevance of social inequality has been projected in the higher rate of mild mental retardation in the lower socioeconomic class in developed countries (Tarjan et.al., 1973, Stein and Susser, 1983; Martin et.al., 1990). Lack of any systematic data in developing countries give rise to the question whether such pattern of serious mental retardation and mild mental retardation also exist in the developing countries like Bangladesh.

Medical Factors:

Since adverse prenatal, perinatal, and postnatal conditions have been documented to be positively associated with mental retardation and various other childhood disabilities, present dissertation also addressed certain prenatal, perinatal, and postnatal issues as a potential risk factor.

10) Pregnancy complications: Whether number of gravidity, parity, or miscarriage had any association with the occurrence of mental retardation or other childhood disabilities.

11) Prenatal threat: Whether manifestation of any adverse conditions such as high blood pressure, bleeding, infection/fever,

or other health problems during pregnancy raised the risk of mental retardation or other childhood disabilities.

12) Maternal goiter: Whether goiter of mother increased the probability of mental retardation more than the other serious disabilities.

13) Preterm birth: Whether preterm born children were more likely to develop mental retardation or other serious disabilities.

14) Perinatal threat: Whether perinatal complications such as longer labour, difficult birth, and adverse birth position had any effect on the occurrence of mental retardation and other serious disabilities.

15) Birth asphyxia: Whether birth asphyxia was related to the occurrence of mental retardation and other serious disabilities.

16) Low birth size: Whether low birth size increased the probability of mental retardation or other serious disabilities.

17) Postnatal hazards: Whether adverse postnatal conditions, such as seizures, infection, difficultly in feeding, yellow colour, tetany, diarrhea, and difficult breathing increased the risk of having mental retardation or other serious disabilities in children.

Such knowledge of associated risk factors was of vital importance for any health service personnel in order to undertake effective preventive and prompt intervention services for these ill-fated children. The subsequent chapters have narrated the framework and methodology involved in fulfilling these objectives in detail.

CHAPTER TWO

METHOD

This chapter of methodology described the scheme involved in utilizing the accessible data from the 'base study' - the 'Rapid Epidemiological Assessment of Childhood Disability Study (REA)' - for the present purpose to appraise the risk factors associated with mental retardation and developmental disability in childhood. Firstly, it would provide an elaborate account of study design and sample, sampling techniques, instruments utilized in the base study. Next it would focus predominately on the present study population, procedure involved to chose relevant variables as probable 'risk factors', formulate new variables, and necessary coding. At this point the criterion used to identify and label different types of disabilities in the study would be documented. Thirdly, it would elaborate the strategy applied to the development of a socioeconomic index utilizing the data at hand. Intent of the index, sample included, and approaches entertained would be discussed. Finally the **statistical analyses involved to develop socioeconomic index and to ascertain the risk factors** associated with mental retardation and other developmental disabilities would be addressed in this chapter.

2.1: Study Design and Sample (Base study):

The study design adopted in the Base Study included two groups of samples at two successive levels of the study. In **two stage design** a large sample of population was screened at the first stage in the community using an inexpensive, simple technique and only a sub-sample was selected for subsequent follow-up at the second stage involving thorough diagnostic evaluation (Durkin, Zaman, Thorburn, Hasan and Davidson, 1991). Figure 2.1 represents a flow chart showing the sample at two stage of the study.

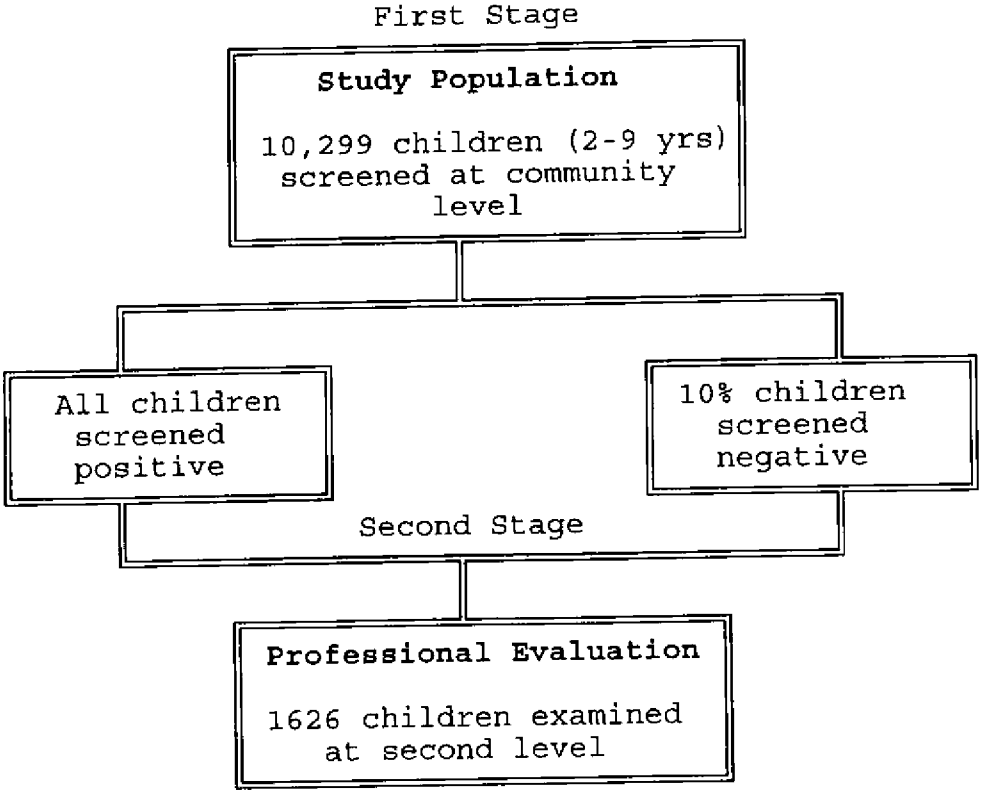


Figure 2.1: The Sample at Two Stage of the Study.

Study population: At the first level, a large sample of 10,299 children of 2 to 9 year old from five selected areas in four divisions of Bangladesh were screened using an inexpensive simple screening questionnaire, the "Ten Questions with Probes" (TQP), for five types of disabilities by the community workers. Among the total number of children screened from all the five areas, 26 percent were urban and 74% were from rural habitat. At this stage the community workers also collected demographic and other information about the household from the mother and the child using two other forms - the Household Form (HF) and the Mother-Child (MC) form. Age and gender distributions of the study population with percentage screened positive have been presented in Table 2.1. Table showed slight over representation of boys (53%) in the study population and 8.2 percent of the total were screened positive.

Table 2.1: Age and gender distribution of Study Population with percentage screened positive

Age	All	% Positive	Boys	%Positive	Girls	%Positive
2	1154	6.9	620	6.6	534	7.3
3	1186	7.5	622	7.7	564	7.3
4	1246	7.1	619	8.7	627	5.6
5	1361	8.1	728	8.1	633	8.1
6	1064	9.6	575	9.9	489	9.2
7	1587	9.5	808	12.3	779	6.7
8	1089	9.6	577	10.4	512	8.6
9	1612	7.3	864	7.4	748	7.2
Total	10299	8.2	5413 (53%)	8.9	4886 (47%)	7.4

Professional evaluation: Secondly, a sub-sample of 1626 children from the community level was selected for follow up at the second level which involved detailed and thorough professional evaluation by a team of psychologists and pediatricians to identify the presence of any disability. All children who appeared to have any problem at the community level i.e, at the first stage, were referred to the professional level i.e., at the second stage. In addition another 10% of those who seem to be free of problems were also included in the second level in order to evaluate the possible missing cases of disabled children. The professionals examined the children blindly, i.e,. without any knowledge of their screening results at the first level. Age, gender distribution and percentages of those who were screened positive of the study population as evaluated by the professional at the second stage has been presented in Table 2.2.

Table 2.2: Age, gender distribution and % screened positive of the study population as evaluated by the professionals

Age	All	% Positive	Boys	% Positive	Girls	% Positive
2	171	4.7	88	4.8	83	4.6
3	180	5.2	81	4.9	99	5.5
4	172	4.7	97	5.4	75	3.7
5	209	5.9	12	5.6	89	6.2
6	196	5.9	118	6.6	78	5.0
7	292	8.8	167	10.0	125	7.3
8	193	5.5	106	5.5	87	5.4
9	213	5.8	127	5.5	86	6.2
Total	1626 (100%)	46.5	904 (56%)	48.3	722 (44%)	44.2

46.5% of the children professionally evaluated were of positive screening results.

2.2: Study Area (Base study):

The study was carried out in five areas of four major divisions of Bangladesh. To ensure representation of the country's diversity, the following three factors were considered in selecting the study areas : a) rural and urban areas, b) geographical distribution, such as, plain, coastal and hilly area and 3) iodine deficient area. The selection criteria of five study areas from four major divisions of Bangladesh have been shown in Figure 2.2.

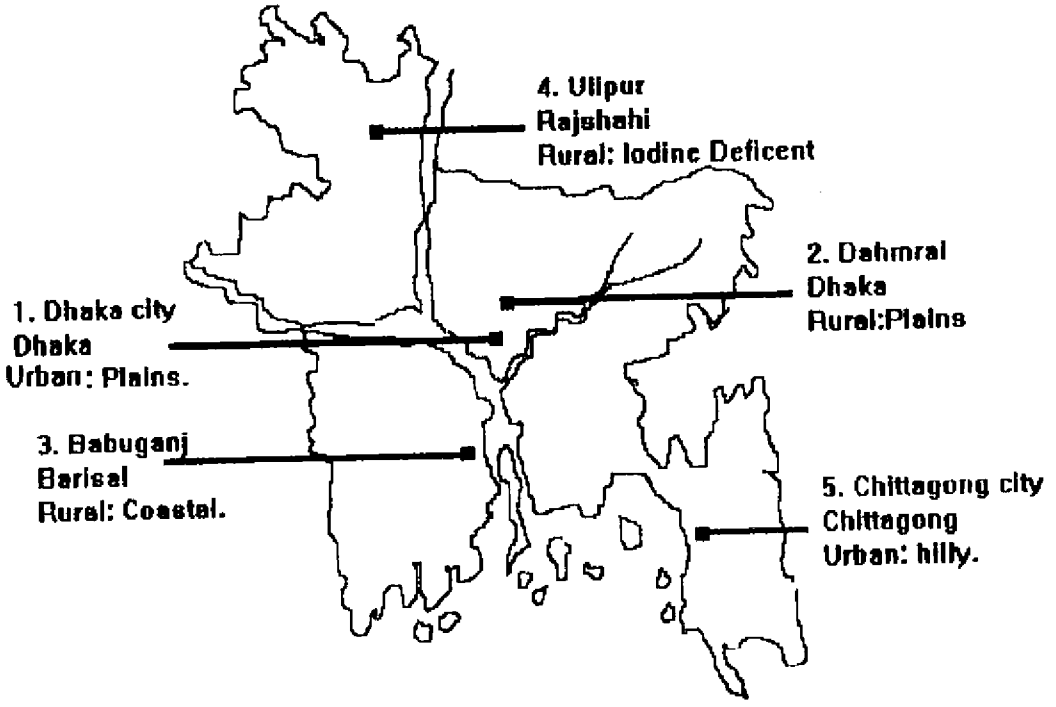


Figure 2.2: The Selected Study Areas of Bangladesh.

2.3: Sampling Method (Base study):

The study entailed door to door household survey to screen required number of children of 2-9 years of age group from five selected areas. Like most other population based household research, the study followed cluster sampling procedure to collect data more efficiently.

The cluster sampling method involved several techniques for choosing the ultimate sampling unit from various groups or clusters (m) within selected area in cluster sampling method. Most widely employed strategy among them consist of selecting the units with probabilities proportional to their sizes. In Probability Proportional to Size (PPS) cluster sampling, a detail frames for each 'm' selected clusters were developed and from each of these 'm' clusters random samples of 'n' were selected (Lemeshaw, 1987). For the present purpose to draw a probability sample of the desired number of children based on usual PPS cluster sampling method, it was essential to have a complete list of children corresponding to each household. Unavailability of such list of children necessitated to adopt a modified but novel form of PPS cluster sampling scheme.

According to this innovative sampling technique the sampling strategy of the present study involved two steps. This technique was developed and used in Expanded Programme of Immunization

(EPI) during World Health Organization programme on small pox eradication (Lemeshow and Stroh, 1988). EPI method was a rapid and widely used method for cluster sampling well suited to settings in which sampling frames were not readily available. The step followed in selecting the sample in each study area have been presented in Figure 2.3.

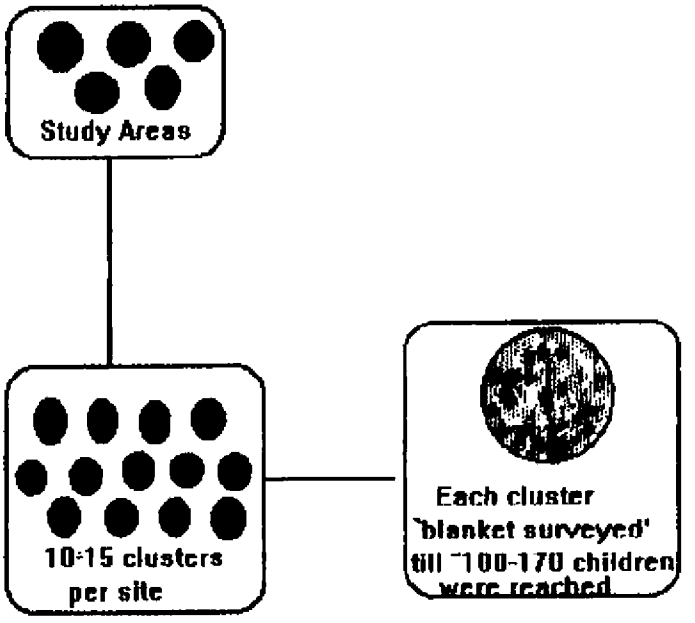


Figure 2.3: Steps Followed in Selecting the Sample from the Study Areas.

In the first step:

a) a list of the number of households in each moholla (census enumeration unit) within each of the five areas selected was prepared on the basis of 1981 Bangladesh census report. This was done by the teachers of Statistics Department from the University

of Dhaka on request. The mohollas referred to as 'clusters' of households, constituted the primary sampling unit (PSU).

b) within each study area a sample of 10 to 15 clusters were selected systematically from the total number of clusters with probability proportional to the cluster size i.e., number of households in each. Following procedure was adopted in selecting clusters:

Let Ni = Population size of ith cluster i = 1,2,.... M.

Cluster	Ni	Cumulative Ni
1	N1	N N
2	N2	(N + 1) + N
3	N3	(N + 1) + N
M	N	N + N + ... + N

A sample of preferred number of clusters, m = 15 or 10, was systematically drawn by picking a random number between 1 and K and subsequently every Kth number was included in the sample.

In the second step:

To select approximately 100 to 170 children per cluster 78 to 100 households were surveyed door to door in every cluster. The first sampling unit or household was selected at random. If a target child (a child between 2 and 9 years of age) was found to reside in that household, the necessary information of the household including the children were collected by the community

workers who then proceeded to the next closest unit. If no target children were present in the first unit then the community workers proceeded to the next closest unit until a household with at least one child belonging to the target age group was found. Blanket coverage of the households within each cluster continued until the required number of target children were reached. In Chittagong the sampling procedure at the second stage was slightly changed. Instead of the first sampling unit or the household, the first fifteen households in each cluster were randomly selected. Selected number of clusters of households and number of children per cluster in each study area has been presented in Table 2.3.

Table 2.3: Selected Number of Clusters of Households and Number of Children per Cluster in each Study Area.

Study Area	Actual Households	Clusters (PSU) Selected Randomly	Clusters Sampled (m)	Children per Cluster
Dhaka	334124	553	15	170
Dhamrai	43552	303	15	170
Barisal	20329	85	10	150
Barisal	49589	13	10	100
Chittagong	138007	93	15	170

2.4: Instruments Used:

Instruments used at the two stages of the study have been listed in Figure 2.4 followed by a brief description of the instruments.

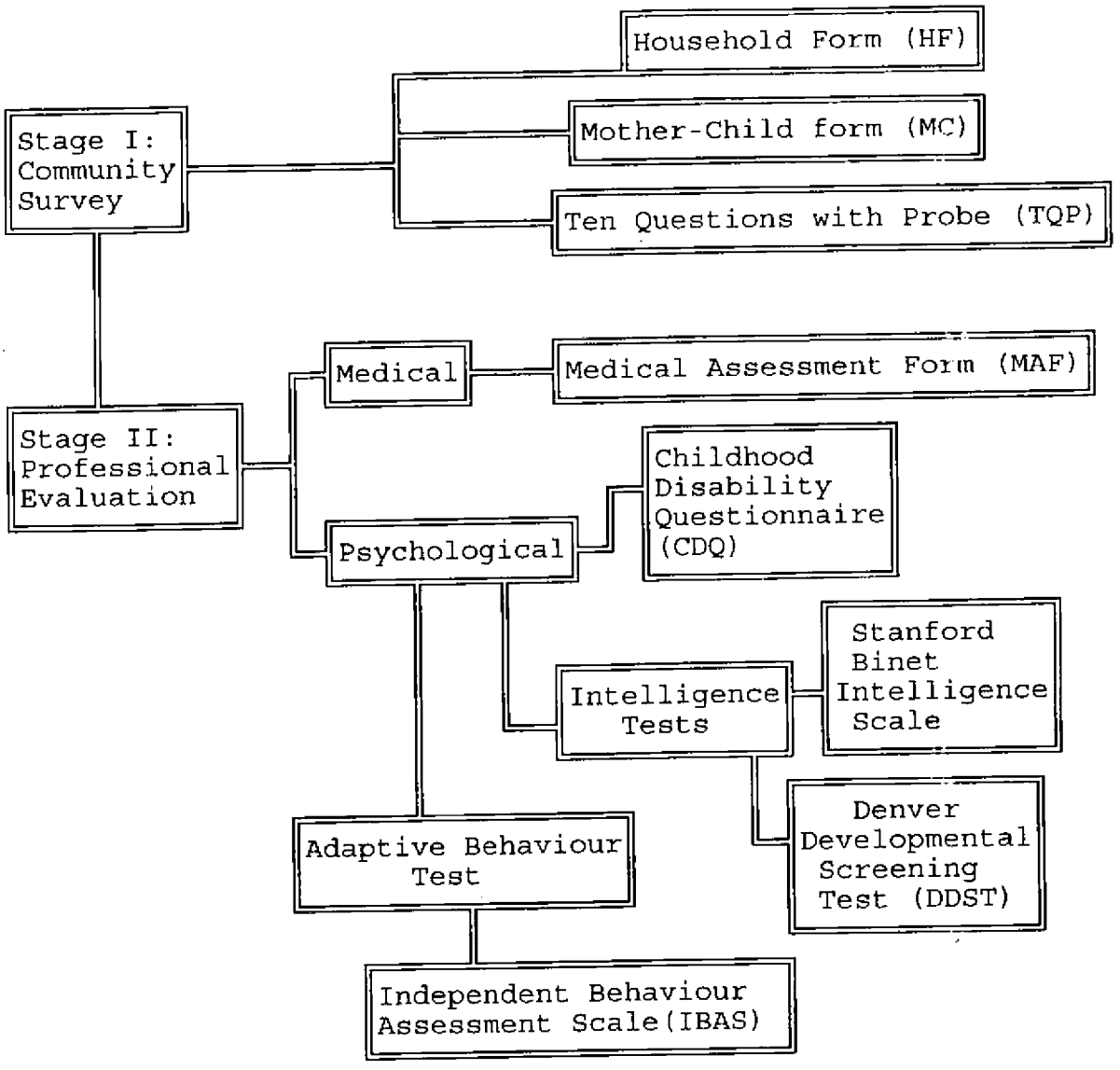


Figure 2.4: Instruments Used at Two Stage Levels

Stage I: Community Survey: Three questionnaires the Household Form (HF), the Mother-Child Form (MC), and the Ten Questions with Probes (TQP) were used by the community workers at stage I (Appendix-A).

1) The Household Form (HF) - This form was designed to collect the socio-demographic data on each household. It incorporated questions used in the World Fertility Survey (IRD,1986). The HF collected information on occupation and religion of the head of the family, land and possessions owned, whether the home was rented or owned by the occupants, types of floor and toilet, sources of drinking and other water, number of younger and older household members, and the number of mothers having 2-9 year old children in the household. It also included information on households who refused or for other reasons did not participate in the study.

2) Mother-Child Form (MC) - This form also incorporated some questions used in the World Fertility Survey (IRD,1986). It collected information on maternal risk factors such as age, education and occupation of the mother,consanguinity and birth history.

3) Ten Questions with Probes (TQP) - This was the screening instrument used to identify serious visual, hearing, motor, seizure and cognitive disabilities in the children surveyed. It contained the Ten Questions(TQ) used in the pilot study with the addition of 19 probe questions. The main questions were found to be sensitive for detecting mental retardation in the pilot study but also generated false positive (Belmont, 1984). Both the main ten questions and the probe questions were in yes-no format. Of

the ten questions, six intended to detect cognitive disabilities i.e., mental retardation. There was one question each on vision, hearing, movement and seizure. The probes were only asked if the child was found to be positive in the given main questions. For one question (question 9 on speech) an alternative version of the question was given for 2 year old children. The original TQ used in the pilot study was developed by Belmont, Clark and Narayana (1981).

Stage II: Professional Level Evaluation: Detailed medical and psychological assessments were done in stage- II by a professional team consisting of paediatricians and psychologists.

(1) Medical Assessment: (a) Medical Assessment Form (MAF) - (Appendix-B) developed by Davidson et.al.,(1986) was used for medical evaluation of the children. The MAF consisted of seven parts:

i) case history - contained detailed history of perceived problems, age of onset, associated events, treatment received, family history etc. Information regarding consanguinity, birth and pregnancy history, post and perinatal problems, nutrition, developmental rate, immunization status, past illness, trauma and general behaviour of the child.

ii) observation of functions - used to screen children who needed full neurological examination by observing the child performing certain tasks.

iii) general examination - it included physical examination to identify abnormalities in hair, skin, head, face,eyes, ears, mouth,chest, abdomen, genitalia, spine and extremities. It also included WHO classification of goiter and xerophthalmia.

iv) neurological examination - involved routine examination of child's mobility, manual dexterity and reflexes.

v) anthropometric measurements - involved measures of height, weight, mid-upper arm circumference, head circumference. A beam balance, a stadeometer, TALC tapes and normal measuring tapes were used.

vi) vision test and audiometry - visual acuity was measured by using Landhold chart and picture chart and hearing was measured by a field audiometer.

vii) final summary sheet - contained the final results of assessment of impairment and disability with severity ratings. It also recorded the needed treatment, use of medicine, and need for referral.

(2) Psychological Assessment: For psychological evaluation four scales were used. One disability questionnaire, two intelligence tests, and one adaptive behaviour scale. These tests were either developed or adapted for use in Bangladesh.

i) Childhood Disability Questionnaire (CDQ) - was developed by Belmont and Clark (1981). It was a long questionnaire covering the same areas as Ten Questions (TQ) but contained questions

regarding developmental milestones, toilet and feeding habits, language and the interviewer's observation of the child. CDQ also focused on mental retardation.

ii) Independent Behavior Assessment Scale (IBAS) - developed by Shirin Z. Munir (1986) was designed to measure the age appropriate adaptive behavior necessary to function independently in four areas of development: motor, social, communication and daily living. The scale was a four-point scale sequenced in order of difficulty.

iii) Stanford Binet Intelligence Scale - only 5 non-verbal sub scales of 1986 revised version of Stanford Binet Intelligence Scale (Throndike, Hagen and Sattler,1986) were used. The non-verbal sub scales - quantitative, pattern analyses, bead memory, copying and memory for digits, were selected because they were less culture bound and measured specific factors of quantitative reasoning, abstract/visual reasoning and short term memory. These five sub-scales of Stanford Binet Intelligence Scale were standardized for Bangladesh by Sharmin Huq (1991).

iv) Denver developmental Screening Test (DDST) - was used as an alternative to Binet for 2-year old children. The test was developed by Frankenberg and Dodds (1967) and was adapted for Bangladesh to detect developmental delays from birth to 6 years of age. It measured four major areas of behaviour: personal social, fine motor, adaptive, language and gross motor.

Reliability: The test-retest reliability for selected items of the three forms used at community level survey were estimated by repeated administration on 101 samples after two weeks . Kappa coefficients were computed as indicators of agreement for dichotomous responses. The point estimate ranged from .47 to .99 indicating acceptable reliability of the data (Zaman, Khan, Islam, Durkin, 1992). High reliability were also reported for MAF, IBAS and Stanford Binet scale (Khan, 1991; Munir, 1990; Huq, 1992).

The Present Study:

Subsequent section would delineate the variables chosen as relevant to risk factor analysis and development of the socioeconomic index to measure environmental risks utilizing the data collected during the REA study. The necessity of constructing new variables and the required recoding done would be pointed out. The strategy undertaken to generate an index of socioeconomic status would be discussed elaborately.

2.5: Sample for Risk Factor Analyses:

In both the levels of the study, the standard procedure was strictly followed in every cluster for all the areas. Blanket

coverage of the household within each cluster was done until required number of target children of two to nine year olds were reached. Every mother and every child of 2-9 years of age within the household were interviewed and screened respectively. Possibility of having more than one mother per household and more than one child per mother was ignored in the present study.

The number of households surveyed, mothers interviewed and children screened at the first level by the community workers and the number of children evaluated by the professionals at the second level in the five selected areas have been presented in Table 2.4.

Table 2.4 : Number of households, mothers and children surveyed in first stage and number of children evaluated in second stage from the five study areas.

Sites:	First Stage Community Worker Level			Second Stage Professional Level
	Households Surveyed	Mothers Interviewed	Children Screened (% tq +)	Children evaluated (% tq +)
Dhaka	1407	1454	2576 (6.9)	359 (46.3)
Dhamrai	1346	1394	2667 (9.3)	434 (48.8)
Barisal	798	798	1506 (9.8)	275 (50.2)
Kurigram	493	501	1023 (6.9)	163 (58.3)
Chittagong	1178	1210	2527 (7.8)	395 (56.7)
Total	5222	5357	10299 (8.2)	1626 (53.5)

Two stage design employed in the base study resulted in professional evaluation of only a portion of children surveyed by

the community workers. Complexity and high cost of assessing mental retardation and rare developmental disorders and scarcity of trained professionals to examine all children in the community had led to the adoptation of the two stage design as being more economical and efficient for the original study. Ethically to render intervention services to the disabled, virtually all children who appeared to have some problem among the total 10,299 children surveyed at the community level were referred to stage-II for professional evaluation. In order to select randomly a sample of normal children, every 8th child was included regardless whether the child was screened as having any disability or not.

Out of 10.299 children screened at the first stage, 1926 children were referred for professional evaluation at the second stage, of which 1626 (84.2%) were actually examined by the professionals. Children were examined for **Mental Retardation (MR)** and four major types of **Other Developmental Disabilities (ODD):** visual disability, hearing disability, motor disability, and seizure. At the end of the professional evaluation a joint meeting between paediatricians and psychologists was held every day in order to arrive at a **consensus** regarding decision for the presence and level of mental retardation (MR). For making joint agreement the ratings of Binet, IBAS and MAF were considered. The final diagnosis of MR was rated as 'at risk' or 'mild', 'moderate', severe' and 'none'.

The diagnostic data on the presence and absence of disability, nature, and level of disability was thus available for 1626 children evaluated in stage II. The total of 1626 children evaluated in the second stage of the base study was taken as the **study sample** for present study i.e., for the risk factor analysis and the development of an index for measuring socioeconomic status. Number and percentage of different levels of disabled children and normal children after professional evaluation in rural and urban areas have been presented in Table 2.5.

Table 2.5: Number of Disabled, Seriously Disabled and Normal Children in the Study.

Area	Any Disability	Serious Disability	Children Having No Disability
Rural	114	47	758
Urban	108	54	646

Number of mentally retarded children and children with other developmental disabilities in the present study have been presented in Table 2.6.

Table 2.6: Number of Children with Mental Retardation and Other Developmental Disability

Number of Children	Mental Retardation (MR)				Other Developmental Disability (ODD)*	
	Serious (SMR)		Mild (MMR)			
	Boy	Girl	Boy	Girl	Boy	Girl
Total	25	21	30	16	25	30
G.Total	46		46		55	

* Other Developmental Disability (ODD) include motor, visual, hearing, and seizure

In total 101 children were found to have serious disabilities, of which 46 children were suffering from serious mental retardation (SMR) and 55 from other developmental disabilities (ODD). Moreover 46 children were found to have mild mental retardation (MMR). Number of children with motor, visual, hearing, and seizure disabilities included in Other Developmental Disabilities (ODD) has been given in Appendix-C.

Due to ethical reason all children screened positive but only a sub sample of those screened negative were included and evaluated in the second stage. Therefore, 1626 children evaluated by the professionals were not a random representation of all children screened as having and not having disability in the total sample of 10,299 studied in the first stage of the base study. To allow for different probabilities of selection or different levels of non response, it was necessary to assign **a weight** to each sampling unit (children) by their screening results (whether screened as having or not having disability). It was the ratio of all the children screened within each category (positive vs negative) in the base study population the sampling unit was representing (Appendix-D). Consequently, subsequent analysis would represent the total number of 10,299 children included in the base study.

2.6: Data Utilized to Develop Socioeconomic Index and to Analyze Risk Factors:

The present study primarily utilized the demographic and socioeconomic data obtained from Household Forms and Mother-Child form to develop socioeconomic index and to investigate associated demographic and maternal risk factors. Selected data of Ten Questions (TQP) were also relevant to the present study. Information on medical risk factors were gathered from the detailed history accumulated in MAF. Moreover, information on father's education was obtained from IBAS.

2.7: Procedure:

The procedure of the present study involved selection of relevant variables from the data gathered during the base study for risk factor analyses and development of an index measuring socioeconomic status of family. Each variable along with the prospect of inclusion in the present study and necessary recoding have been addressed below. In Appendix-E all the possible variables along with their values have been documented.

Demographic and Social Variables: The Household Form (HF) form contained socioeconomic and demographic information of the household for 2 to 9 year old children. It contained information

on occupation and religion of the head of the household, own or rented house, amount of land and types of possessions owned, number of rooms, type of floor and toilet, sources of drinking and other water. Number of person 10 years and above and 9 years and less living in the household was also recorded in the form. The Mother-Child form (MC) form provided the information on mothers' age, education, occupation and consanguinity. It also contained the child birth history of the mother. The questions were either coded into two or more possible answers or in a "yes" -"no" format. Noticeable features of the variables have been presented through Table 2.7 to 2.12.

Occupation: The question regarding the occupation of the head of the household were coded into 9 categories: (i) agricultural, (ii) fishing, (iii) unskilled labour, (iv) business or sales, (v) clerical or service, (vi) skilled or professional work, (vii) mainly unemployed, (viii) other and (ix) no information. Similar coding was also used in MC for mothers' occupation, but it included further questions regarding whether the mother worked outside or not and whether the mother received any wage for the work. Table 2.7 presented the distribution of fathers' and mother' occupation by rural and urban residence. More rural people (55.2) were agriculturist than urban people. In urban area higher percentages were found for fourth, fifth and sixth categories, 22.2%, 25.9% and 33.2% respectively. But the wide variety of occupations included in these categories made it

difficult to judge their social status by these classification of occupation alone. For example the fourth category of 'business and sales' included both the elites and the vendor in the same

Table 2.7: Distribution of Fathers' and Mothers' Occupation by Rural and Urban Residence(%).

Occupation	Father		Mother	
	Rural	Urban	Rural	Urban
Housewife	-	-	98.3	92.1
Agriculture	55.2	0.9	-	-
Fishing	0.6	0.2	-	-
Unskilled	16.6	22.2	1.4	3.9
Business	10.9	25.9	-	-
Clerk/Service	11.1	33.2	0.2	2.1
Skilled/Profession	4.1	14.1	-	1.4
Unemployed	1.0	2.8	-	0.5
Other/No Information	0.5	0.6	-	-
Total	5313	4986	5313	4986

class. Similarly the next category of 'clerical and service' included both the low paid clerk and also the high paid government and private service holders. The skilled labourer like truck drivers, craftsmen or technicians were included in the same class like professionals as doctors or engineers. This variation i,e., low and high education within the same class was evident when they were further classified by education (Table 2.8). The occupational variables, per se, was thus not included in the risk factor analyses. More than 90% of the mothers did not work outside, i.e., they were housewives, in both rural and

urban areas. Since it was difficult to judge the status of these housewives, mothers' occupation was excluded from the analysis.

Education: Information on fathers' education was not included in HF form but was included in IBAS form, one of the psychological evaluation scales (See Appendix-F). Table 2.8 showed that only 7.6% had higher education. 44.5% had no education at all and majority were in rural area. There were two questions regrading mothers' education - whether she could read and to what level she had taken formal education in Mother-Child form (MC).

Table 2.8: Distribution of Fathers Occupation by Education(%)

Occupation	Education					
	None	Primary	Secondary	Higher Secondary	Above (Graduate)	Total
Agriculture	62.4	19.3	17.1	0.8	0.4	28.9
Fishing	51.3	-	48.7	-	-	0.4
Unskilled	65.3	21.2	12.9	0.6	-	19.3
Business	29.5	26.3	27.0	7.2	10.1	18.2
Clerk/Service	18.6	10.6	36.8	12.5	21.4	21.8
Skilled/Profession	36.3	23.4	22.8	7.4	10.0	8.9
Unempolyed	45.7	75.3	47.1	3.4	27.7	0.4
Other/No Information	100.0	-	-	-	-	0.1
Total	44.5	19.4	23.4	5.1	7.6	10299

Table 2.12 showed that 73% of rural mother and 52.6% of urban mothers' could not read at all. Low percentage of mother had passed secondary level. Compared to 21.7% mothers' in urban area

only 9.7% mothers' in rural area had secondary or above level education. Over all 63% had primary education and only about 3% had higher secondary or above. Education was thus used both as a probable risk factor and as an index of social status.

Religion: Religious variable showed little variation among the groups in the population (Table 2.9). Majority were muslims in both urban (89.2%) and rural (93.6%) areas. This variable was also not included in the analysis due to lack of enough variation within the groups.

Table 2.9: Selected Household Characteristics by Area (%).

Area	Muslim	Land > half acre	Rented house	Room < three	Electricity	Cement floor
Rural	93.6	31.4	97.3	77.3	10.7	2.5
Urban	89.2	8.5	59.0	74.4	79.6	60.5

Land: Amount of land owned was classified into three categories i.e., none, less than half acre, more than half acre. Though about equal percentage of people owned land in both rural and urban area, but greater percentage (31%) of people in rural area owned more than half acre compared to only 8% of urban people. Land therefore was used as a criteria for discriminating variation within the occupational groups.

Rented/Own House: The question regarding whether the head of the household owned this house or rented it, showed that 97.3% of the

rural people lived in their own house while 59% of the urban people did not own the house that they were living in (Table 2.9). While considering the types of floor, sources of drinking water and number of possessions of rented or own house , it was found that rented house had better floor condition (63.2% cement floor), better source of drinking water (72.5% used tap water) and toilet facilities (63.3% flush toilet) and also possessed more than four commodities (21.8%) as compared to the own house (16.7% cement floor, 40.8% tap water, 13.7% flush toilet and 14.7% more possession (Table 2.10). Thus this question as such did not indicate that the person who lived in his own house were in better condition than those who lived in a rented house. Therefore this item was also excluded from the analysis.

Table 2.10: Household Characteristics of Rented vs Own House(%)

House	Cement Floor	Tap Water	Flush Toilet	> four Possession
Rented	63.2	72.5	63.3	21.8
Own	16.7	40.8	13.7	14.1

Number of Rooms in the House: The Table 2.9 showed the percentage of room in the house in rural and urban areas. Most people had one or two rooms in both rural and urban areas. The variable was included as an index of housing condition.

Possession: Two questions identified the number of possessions in the house or owned by anyone of the household in a "yes" and

"no" format. Only 10.7% of the people in rural area had electricity as compared to 79.6% in the urban area (table 2.9). Percentage of other possessions like TV, VCR, bicycle, car etc., were very low or zero in rural area. However, percentage of such possessions were also not very high in urban area. "Yes" or "no" answers to each possessions were recoded to 1 and 0 respectively and included in the present study to indicate prosperity of the household.

Types of Floor: The types of floor included four categories, but as none had wood/bamboo or other type of floor in the sample, only two categories were used - mud or sand and cement. Percentage in rural and urban area showed that 60% of the urban people had cement floor while 97.5% of the rural people had mud or sand floor (Table 2.9). This item was included in the analysis as an index of housing condition.

Source of Water: Major sources of water for both drinking or other uses were included in the questionnaire. Since rain water was not commonly used in Bangladesh it was grouped with river water and vendor ie., water supplied from truck or tanker were grouped with tap in the yard because it was a better source than public tap or river or well. Both the source of drinking and other water was recoded reversely giving highest value to home tap. Sources of drinking and other uses of water in rural and urban areas have been given in Table 2.11, which showed that 51%

of rural people used river water for other uses and 51.5% used public tap for drinking water. In urban area 40 to 42% used tap

Table 2.11: Toilet and Water Source in Rural and Urban Household (%)

Area	Toilet Facilities			Water Source					
				Drinking			Other Uses		
	No Toilet /Bucket	Pit	Flush	River	Well/ Public	Tap	River	Well	Tap
Rural	20	78	2	7	64	29	51	29	20
Urban	6	37	57	6	21	73	9	20	70

in the yard or water supplied by the vendor for both drinking or other uses and only 29.2 to 30.2% used home tap. This variable was included as an index of housing condition.

Toilet Facilities: Regarding toilet facilities, 78.2% in rural area used pit toilet while 57.3% of the urban people had flush toilet (Table 2.11). The variable was also included as an index of housing condition in the present study.

Members of Household: The HF included four questions regarding the number of people living in the household. Two questions were: what was the number of people 10 years and above, and 9 years and below who lived in the household? Similar questions were again repeated to count any other persons living in the household but not included before. These questions were considered in the present study to indicate number of household members living within limited space in the room.

Age of Mother: In MC form, the mother's age on her last birthday was noted, code of 98 was given for 'not known' and 77 for mother who died. Only 0.4% of the mother in rural sample were dead. To determine the age of the mother at the time of birth of the child, child's age was subtracted from the mother's age and then classified into three groups -i) 18 years and less, ii) 19 to 34 years, and iii) 35 years and above. 12.5% of rural mothers were above 35 years of age at the time of child birth in comparison to 6.1% of urban mothers (table 2.12). Mother's age at the time of child birth was included in the risk factor analysis.

Table 2.12: Selected Maternal Characteristics by Area (%)

Area	Cannot Read at all	Secondary or higher education	35 yrs & more at child birth	Consanguous Marriage	5 or more dead children	Home Birth	Mother Dead
Rural	73.0	9.7	12.5	7.1	4.1	99.3	0.4
Urban	52.6	21.7	6.1	9.9	1.6	87.6	0.0

Consanguinity: The question regarding consanguinity asked whether the parents were cousins before marriage in simple yes and no format. Table 2.12 showed that in urban (9.9%) area the percentage of consanguineous marriage was higher than rural area (7.1%), however the over all percentage was low. Since there was a similar question with somewhat different coding regrading consanguineous marriage in the MAF form, the answers to HF and MAF items were compared and certain amount of discrepancies were noted (appendix-G). Therefore, consanguinity could be defined in

three ways (i) those who said 'yes' in the HF form as first cousin (5.3%), (ii) those who said 'yes' in the MAF form as first cousin (8.5%) and (iii) those who said yes to MAF and HF both as first cousin (1.8%). Responses in the MAF forms were recorded by the doctors, while HF forms were filled in by the community workers. Since people have more confidence in a doctor than a community worker who were mostly considered as an outsider, responses to MAF thus could be taken as more reliable data. Consanguinity was investigated as a potential risk factor.

Death of a Child: The birth history of the mothers showed that 4.1% rural and 1.6% urban mothers had history of more than four dead children (Table 2.12). This item - having at least a history of one dead child - was included in the analyses as a probable risk factor as well as an evidence of construct validity of socioeconomic index developed in the present study.

Place of Birth: Infromation of child's birth place on TQP was considered. Coded eight categories were recoded for home birth vs hospital birth and included in the analyses of risk factor. Table 2.12 showed higher percentage of home birth in both rural(99.3%) and urban area(87.6%).

Gender: Gender of the child was also investigated as a probable risk factor for developing mental retardation and other types of disability.

Age of the Child: Two age groups were considered (i younger group comprising of 2 - 4 year old children and (ii) older group of 5 - 9 year old children.

Medical Risk Factors: Medical Assessment Form (MAF) was designed to cover various aspects of child's prenatal, perinatal, and postnatal history which were considered as probable medical risk factors. The pregnancy and birth history utilized in this dissertation have been documented in the Appendix-H and discussed below.

Pregnancy complication: Pregnancy history covering the issue of number of gravidity, parity, stillbirths, and spontaneous abortions the mother had, whether the mother had high blood pressure, bleeding, infection/fever or any other health problems in 1st trimester, did she ever had a goiter, reported by the mother were recorded in MAF. Table 2.13 and 2.14 gave the rural/urban distribution of pregnancy history (one or more incidence) and complication in first trimester.

Table 2.13: Pattern of Pregnancy History by Area (%)

Area	Gravidity (3 or more)	Parity (3 or more)	Stillbirth (atleast one)	Abortion (atleast one)
Rural	63.0	61.9	0.6	0.4
Urban	58.6	55.2	0.0	0.2

Table 2.14: Various Pregnancy Complication by Area (%)

Area	Blood Pressure	Bleeding	Infection/ Fever	Other Problems	Goiter
Rural	0.4	0.5	0.3	10.6	0.9
Urban	1.8	0.3	0.6	5.2	1.6

Table 2.13 showed that percentage of gravidity and parity, both were high in rural area (48.2% and 47.3%, respectively). Gravity was defined as the total number of pregnancies before this child and counting this child, while Parity was defined as the total number of live birth before this child and counting this child. Though overall percentage of stillbirth and abortion were low in the study population, these conditions were also more typical of rural population. Due to little variability, stillbirth and abortion were considered together in the present analyses. **Gravidity and parity** were investigated separately as indicative of complication during pregnancy.

As expected high blood pressure was high in urban area (1.8%), while bleeding in the 1st trimester (0.5%) and other health problems (10.6%), saving infection/fever were high in rural area. Mother having goiter was also high in urban area (1.6%). Occurrence of any such problem during the pregnancy or 1st trimester was considered as **postnatal threat**. Goiter of mother was included in the analysis.

Birth problems: Information regarding birth problems such as, was the child a single born, was the baby full-term, was the labour difficult, or were there any problem at the time of birth, did the baby cry immediately or needed assistance, birth weight and size, were included in birth history. Presence of such birth problems by area have been reported in Table 2.15 and Table 2.16.

Table 2.15: Selected Birth Problems by Area (%)

Area	Multiple Birth	Preterm Birth	Longer Labour	Difficult Birth	Abnormal Position
Rural	-	2.1	11.3	5.5	0.2
Urban	0.2	2.3	7.6	5.6	0.7

Only 0.2% of the urban children were twin or multiple birth and the no such incidence was recorded in rural area. Since none of the twin or multiple birth had any sort of disability, it was not investigated as a risk factor. No noticeable difference in percentage of preterm birth was present between rural and urban area but longer labour was noticeably high in rural area (11.3). Preterm birth was defined as baby born 'more than one month earlier' and longer labour was defined as 'labour for or longer than 24 hours'. Percentage of difficult birth was also similar in both the areas. Abnormal birth position, i.e., bottom or foot came out first, was high in urban area. **Preterm birth** was investigated separately as a risk factor while longer labour, difficult birth, and abnormal position were considered together as **perinatal complication.**

Table 2.16: Birth Asphyxia, Birth Weight and Size by Area (%)

Area	Cried After >5 min.	Assisted to Breath	Less than 2500 gm	Birth Size < Average
Rural	2.3	1.9	-	5.6
Urban	2.6	3.3	0.7	12.2

Percentage of babies cried after five minutes or later were about equal in both the areas but greater percentage of infants in urban area (3.3%) received some assistance from the attendant than the rural area (1.9%). Only 0.7% of urban infants were reported to be born having low birth weight, however, for majority (96.7%) of the cases actual birth weight was unknown. So present analysis had to exclude low birth weight per se as a risk factor. However in 8.7% cases birth size smaller than average babies were reported by the mothers. Percentage of smaller birth size was high in urban area (12.2%). **Birth asphyxia** (breathing after >5 minutes) and **low birth size** (less than average size) were included in risk factor analysis. Since the percentage of response 'unknown' to the query regarding goiter, preterm, birth asphyxia , ranged from 10% to 24% and were bearing fifty percent chances of being high risk or not, it was valued as medium risk.

Postnatal health hazards: Whether the child had any difficulties like seizures, infection, feeding difficulty, tetany, diarrhoea, difficult breathing in the first four weeks were questioned and

recorded. Distribution of such postnatal health hazards has been included in Table 2.17.

Table 2.17: Postnatal Health Hazards by Area (%)

Health Hazard	Rural	Urban
Seizures	0.8	0.9
Infections	8.0	7.4
Trouble Feeding	2.5	1.2
Yellow Colour	0.0	2.1
Tetany	0.3	0.0
Diarrhoea	1.1	3.3
Difficult Breathing	1.8	2.3

Table 2.17 showed that infection was more common among postnatal hazards in both rural and urban area. Diarrhoea (3.3) and breathing problem (2.3) were more common in urban area than rural area. Occurrence of any such health problems were counted and included in the investigation.

New Variables Created for Social and Demographic Data:

Manipulating the data at hand certain new variables were formulated for investigation in the present study. Figure 2.5 portrayed the derivation of new variables from the available data. Description of these variables were as follows.

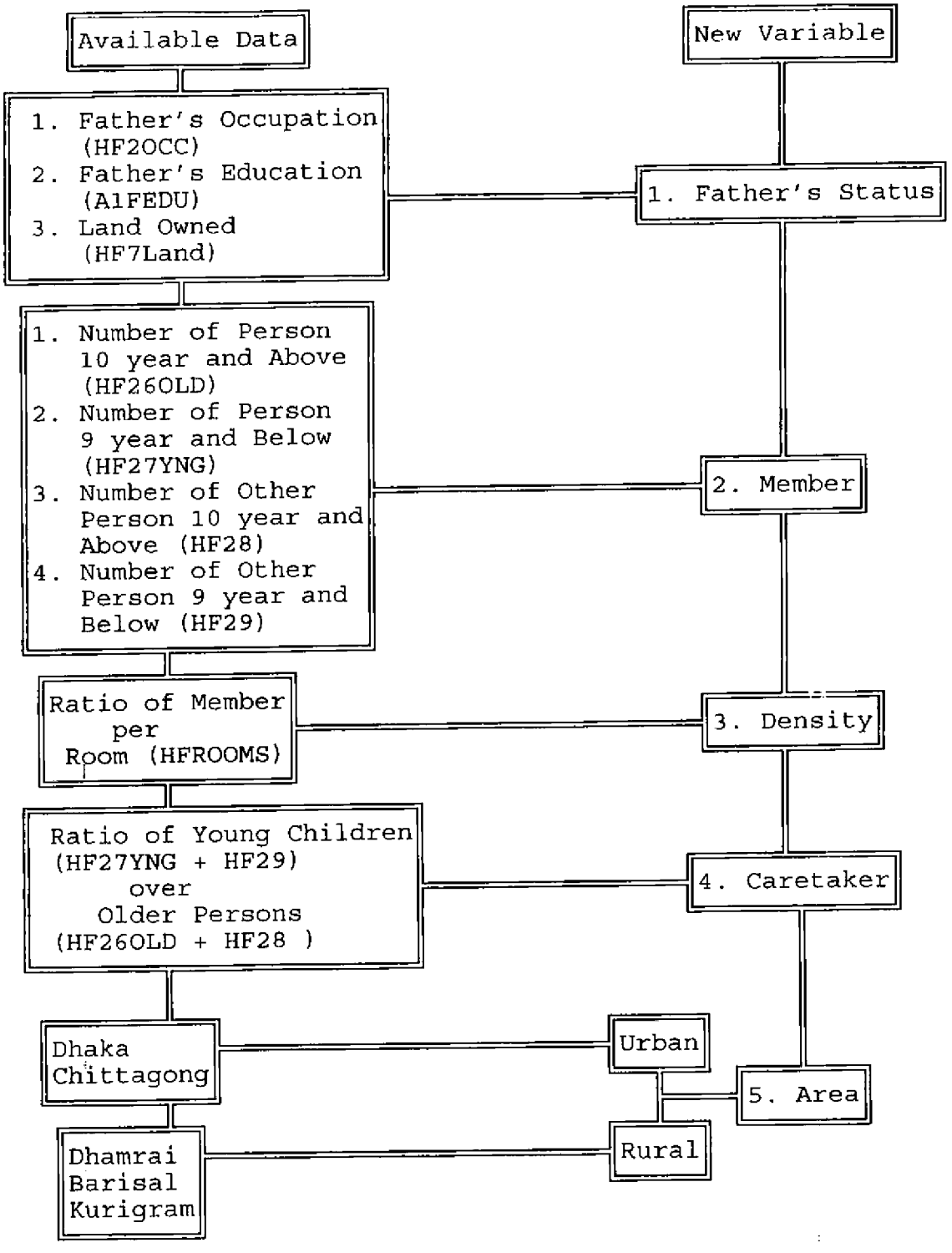


Figure 2.5: New Variables Derived from Available HF Data.

Status of Father: Occupation has been a significant indicator of social status but since the categorization of the item occupation of the head of the household' included in the HF was not satisfactory, for the present purpose of evaluating the socioeconomic condition of the family, a new item "father's status" was created by classifying father's occupation further into different groups according to the amount of land owned by the family and the education of the father (appendex-I). Since more land were owned by the rural people majority of whom also were agricultural, amount of land owned was taken as criteria for classifying agricultural into (i) landless agricultural, (ii) agricultural with less than half acre of land, and (iii) agricultural with more than half acres of land. Similar classification was made for fishing and unskilled labourer according to the amount of land they owned. For classifying the fourth, fifth and sixth categories of occupation (i.e., bussiness, clerk/service, and skilled/profession), education of the father was taken as a criteria. Any of these three occupational groups with (i) no education, (ii) with primary and secondary education, (iii) with higher secondary education and (iv) with higher education (graduate and above) were grouped into separate class. The unemployed and the others were also classified accordingly by the level of education. These new groupings of occupation were ranked into six categories of "father's status', in order of status having the landless

agricultural, fishing and unemployed at the bottom and business, service and professionals with high education at the top.

Table 2.18: Selected Characteristics of Different Level of Father's Status(%)

Level of Status	Urban Dweller	More than Three Possession	Cement Floor
1 and 2	33.1	2.3	11.3
3 and 4	52.3	17.0	33.3
5 and 6	81.3	58.8	81.1

Table 2.18 showed that 81.7% of the higher status (level 5 and 6) holder dwelt in urban area, 58.8% had more than three possessions, and 81.1% had cement floor as contrast to the lowest status holders (33.1%, 2.3%, and 11.3%, respectively). The observed differences in the selected characteristics provided some basis that justified determination of father's status. This new variable was included as an index of socioeconomic status of the household.

Member: Four questions regarding members of the household were added to compute a new variable 'member' reflecting the total number of people living in the household. Table 2.19 showed higher percentage of household members consisting of more than four in urban area.

Density Another new variable 'density' was created to give the ratio of household member per room living in the household.

Table 2.19 showed that households of urban area were more densely populated than rural area.

Since a number of studies have revealed that a large number of family members and crowding created health hazards (p.44), both member and density were considered in risk factor analysis to investigate whether crowding in the family was related to mental retardation or other childhood disability.

Table 2.19: Characteristics of New Variables by Area (%):

Area	More than four member	More than two person per room	Less than three care taker
Rural	79.7	66.0	49.2
Urban	82.9	68.6	48.9

Caretaker: The number of caretaker as defined by the ratio of younger children (2-9 years) over older member (above 10 years) in the family was also considered. Table 2.14 showed that about equal percentage of household in both the areas had two or less caretaker per child aged 2 - 9 years.

Area: The total sample was divided into urban and rural area. Dhaka and Chittagong were considered as urban area and Dhamrai, Kurigram and Barisal constituted the rural area. 50.6% of the study population were from rural area (Table 2.4).

New Variables Created for Medical Risk Factor:

Number of gravidity, parity, maternal goiter, preterm birth, birth asphyxia, and low birth size were investigated individually as a probable risk factor. Besides these certain new medical variables were created for the present analysis which has been presented in Figure 2.6.

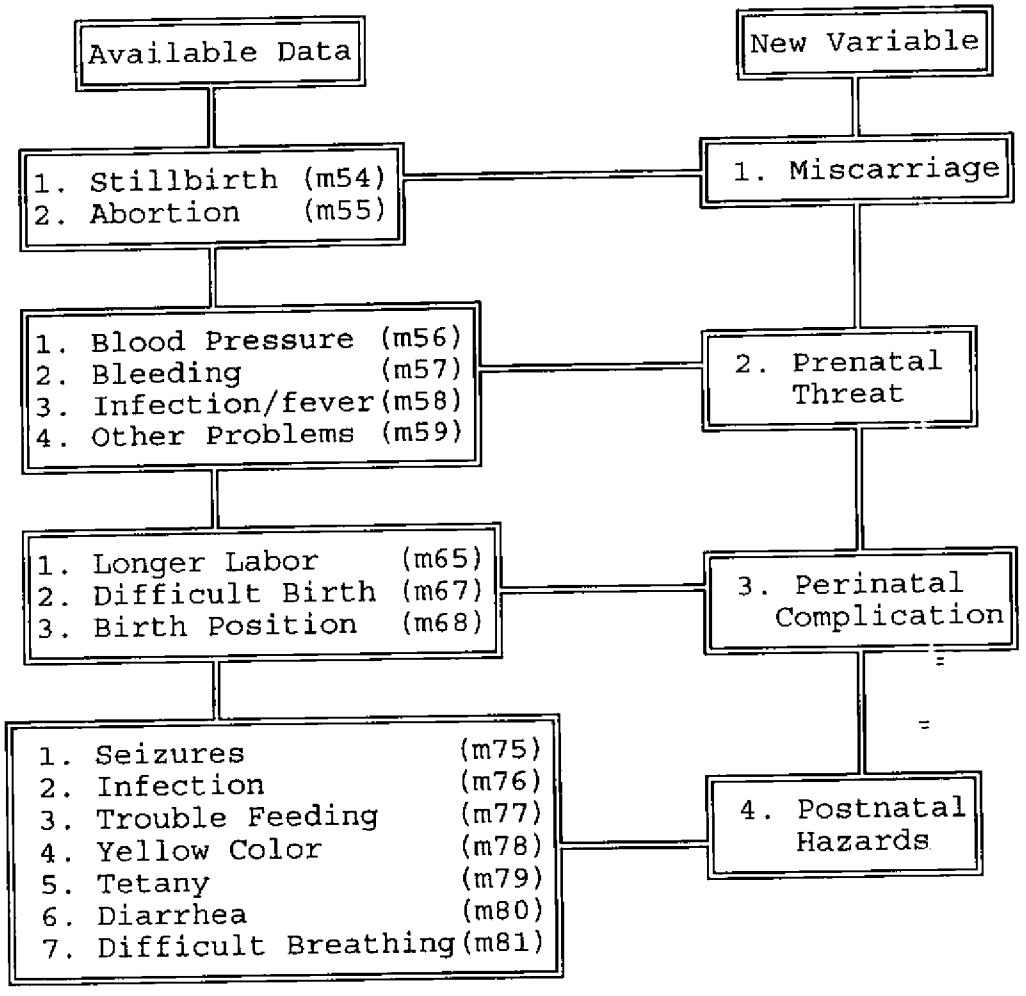


Figure 2.6: New Medical Variables Created for Risk Factor Analysis from MAF data.

Table 2.20 presented the percentage of miscarriage, prenatal threats, perinatal complications, and postnatal hazards by area.

Table 2.20: Distribution of New Medical Variables (%)

Area	Miscarriage	Prenatal Threat	Perinatal Complication	Postnatal Hazard
Rural	6.4	11.7	16.6	11.2
Urban	8.5	6.9	11.8	11.5

Miscarriage: Any number of stillbirth and abortion were summated to obtain number of miscarriage to be counted as a risk factor. percentage of miscarriage seemed to be higher in urban area (6.4) than rural area (8.5).

Prenatal Threat: Incidence of any threat like high blood pressure, bleeding, infection/fever, or other health problem during the pregnancy were counted as prenatal threat. Percentage of any one such threat was high in rural area (11.7) than urban area (6.9).

Perinatal Complication: Occurrence of any complication during delivery such as longer labour, difficult birth, and abnormal birth position, were regarded as indicative of perinatal complication. Percentage of any such perinatal complication was also high in rural area (16.6) than in urban area (11.8).

Postnatal Hazard: Advent of any physical ailment or difficulties within the first four weeks of birth were considered as postnatal hazards. Infants in both the rural and urban area seemed to be equally vulnerable to such postnatal hazards.

2.8: Determination of Mental Retardation and Developmental Disabilities:

In the second stage of the base study a standard medical assessment procedure was thoroughly followed for every child and a corresponding structured medical assessment form (MAF) was filled in by the professionals i.e., the paediatricians and psychologists. At the end of medical assessment of each child a consensual diagnosis was made regarding the presence of any disability among children and was enumerated in a summary sheet of the Medical Assessment Form (MAF), using ICD-9 codes (WHO, 1980). This summary sheet of MAF was used to identify type and severity of disability. The psychological assessment was also pertinent to the present study because consensual diagnosis on mental retardation was based on the information obtained in Binet or DDST, ABS and CDQ as well as physician's assessment.
The summary sheet of MAF completed for every child undergoing professional evaluation indicated the presence or absence of any disability i.e., cognition, motor, hearing, vision, speech, epilepsy, following the procedureal manual of MAF for criteria.

Disability the child was suffering was recorded using assessment of functional level or degree such as: none, mild, moderate, severe, or uncertain. Other than the physician's assessment of the child's cognitive ability, the joint decision of the physician and the psychologists was also indicated in the summary sheet. Children who were diagnosed as having moderate and severe level of cognitive disability in the joint decision were considered as **serious mental retardation (SMR)** while those who had mild level of cognitive disability were taken as **mild mental retardation (MMR)**. All the children suffering from any disabilities at moderate or severe level, other than cognitive, were considered as **other developmental disabilities (ODD)** in the present study.

2.9: Development of Socioeconomic Index of Family (SIF):

To ascertain the plausibility of socioeconomic discrimination within the society as a potential environmental risk factors for mental retardation and developmental disabilities, the present dissertation foremostly intended to develop a measure for determining socioeconomic status of the family. Following section provided the account of the items considered, aims and approaches undertaken in order to develop a socioeconomic index utilizing the data at hand.

Items for Socioeconomic Index:

The information regarding parental occupation, education, housing condition and possessions were included as items for determining the socioeconomic status of the family. The new variable '**father's status**' was selected as an indicator of father's occupational and educational status. Both the questions indicating **educational level of the mother** i.e., level of formal educational attainment and reading capacity, were selected. The **housing condition** included the number of rooms, type of floor and toilet, sources of drinking and other uses of water, and electricity. **Possession** included the various items such as radio, TV, car, cow etc., owned by the household. All the items considered in socioeconomic index were scored giving lowest to highest value depending on number of alternative answers to the items. Table 2.21 documented the items considered for the index with their values.

The father's status was scored on a 6 - point scale having lowest value of 1 and highest value of 6. Different forms of answers were included for the items on housing condition and thus were scored differently. For example, the item 'the number of room' included the total count, and a score of one was given for every room the household had. The items regarding the type of toilet, floor and sources of water were scored giving 1 to the lowest level and subsequent higher value of 4 to 6 for the higher level depending on the number of alternative answers to the item. The

Table 2.21: Variables Considered in Socioeconomic Index

Variable Name	Value Label	Value
Father Status	Lowest to Highest	1-6
Mother Work/ Mother Paid	No	1
	Yes	2
Mother Education	None	1
	Primary	2
	Secondary	3
	Higher Secondary	4
	Above	5
Mother Read	Not At All	1
	With Difficulty	2
	Easily	3
Ownership of House	Own	1
	Rented	2
Number of Rooms	(number)	#
Possession (Electricity to Tube well)	No	0
	Yes	1
Types of Floor	Mud	1
	Cement/Wood	2
Drinking Water/ Other Water Source	Other	1
	River	2
	Well	3
	Public Tap	4
	Yard Tap	5
	Home Tap	6
Types of Toilet	None	1
	Bucket/Other	2
	Pit	3
	Flush	4

questions on possession (electricity to tube well) were simply in yes-no format and thus scored on a 2 - point scale, ascribing 1 or 0 value for the answers.

Approaches Used to Develop the Present Socioeconomic Index of Family (SIF): In generating the socioeconomic Index the primary endeavour was to construct an index **suitable for both rural and urban area** with sound reliability coefficient measuring internal consistency and factor loading in one factor solution utilizing as many of the available social indicators. To attain the goal, **the construction of socioeconomic index involved three perspectives.** First to include as many as possible items of social indicators available, secondly to develop three separate indexes measuring three different aspects of socioeconomic conditions i.e., education and occupation of the parent, housing condition, and possessions; thirdly, to use composite score for the housing condition and the possession. Each approach ended into tryouts of different versions of socioeconomic index which were judged by their alpha coefficient for all area, urban and rural area, and five different study areas, and the loading of the individual items on one factor. The ventures to develop the socioeconomic index from three subsequent approaches have been discussed in the result section.

2.10: Statistical Analyses Involved:

Available REA data were stored in several Database files. Before analyzing the potential risk factors, it was essential to check all the data thoroughly, necessary corrections and recodings were made. Several descriptive and inferential statistical procedure were involved in the present study.

1: Frequencies and percentages were calculated to furnish description of the sample and the variables under investigation.

2: Alpha coefficient and factor analysis using SPSS/PC data analysis package were done to develop the socioeconomic index. The reliability estimate was based on the observed correlations of items within the index using Cronbach'alpha coefficient for testing internal consistency of a test. Internal consistency refers to the degree of interrelatedness among the items. The number of common factors needed to describe the index adequately was determined by eigen method of factor extraction based on eigen values and percentage of the total variance accounted for by different numbers of factors (SPSS manual).

3: Logistic regression analysis was done using SPSS/PC program for calculating odd ratios to identify factors - social and other demographic factors, associated with disabilities. Odd ratio greater than one indicated that persons with the characteristics

have more risk of having mental retardation or other developmental disabilities. The logistic model described the relationship between a response variable and one or more explanatory variables following the general principles used in linear regression model but the dependent variable or covariates in logistic regression model was binary or dichotomous (Hosmer and Lemeshow, 1982). The odd ratio generated by the programme indicated whether the presence of a factor was more common among children with disabilities than other children in the population. However, SPSS/PC provided only the point estimate of the odd ratio with the level of significance. But to procure the standard error to calculate the 95% confidence intervals for the population, an advance programme, PCCARP, was used to compute the regression equations for the factors which were found to be significant in SPSS. PCCARP was a computer programme developed for analysis of data from multi-phase studies (Fuller, Kennedy, Schnell, et.al.,1989).

CHAPTER THREE

RESULT

The chapter offers the results of the study in two sections. The first section would (a) illustrate and compare the different try outs of Socioeconomic Index of the Family (SIF) intended to develop utilizing the base study data, and (b) deliberate the final selection and distribution of the index. Next section would predominately focus on the fulfillment of the leading study quest of identifying the associated risk factors. This section would encompass: (a) descriptive appraisal of present study population (b) prevalence of mental retardation and also of other developmental disabilities (c) determination of potential risk factors for mental retardation and other childhood disabilities, (d) comparison between serious mental retardation and mild mental retardation for social class as possible risk factor.

I: DEVELOPMENT OF SOCIOECONOMIC INDEX OF FAMILY (SIF):

3.1: Tryouts of Socioeonomic Index (SIF):

Objective of the present attempt was to develop a socioeeconomic index which would be a single unidimensional index workable for both rural and urban area, appraising the items that were sampled from a predefined domain (data from base study). Estimate of reliability depended on particular error factors that one considers to be relevant. Since error factor associated with the use of different items were of interest, evidence of internal consistency as measured by coefficient alpha were considered to be appropriate. Alpha was said to be a measure of first factor saturation -i.e., the extent to which a certain factor was present in all items (Cortina, 1993). Alpha coefficients in the range of 0.60 to 0.80 indicated good reliability of a scale (Flesis, 1981). However, high alpha did not necessarily imply presence of a strong common factor. Therefore, factor structure of each measures had been directly examined by using factor analysis model. Eigen value method which counted all factors with eigen values greater than one was utilized. An eigen value was the total variance of a scale explained by a given factor when the items in the scale have been standardized. The number of common factor measured by the items in each scales was taken into account.

Factor loading of each item on a single factor in the scales were also judged as a evidence of unidimentionality. A factor loading

was the correlation between each item with a common factor. Higher correlations indicated that the item was both reliable and correlated with the common factor. Lower correlations indicated either unreliability or that the item measured something other than the factor common to the other items. Selection of items for inclusion in the index was based on whether an individual item contribute to or detract from an index alpha coefficient.

Table- 3.1 provided the alpha coefficient of the first tryout of Socioeconomic Index of Family (SIF- 1) for all, rural, urban and different study areas showing the items that detracted the alpha for more than .01. This first approach included all items on parental occupation, education, housing condition (i.e., number of room, floor type, water source etc.) and possession (i.e., had radio, Tv, VCR, car, etc.) as separate entity. The alpha value for all area was .79. Compared to urban area (.82) alpha value was low for rural area (.56). Across the different rural areas relatively low alpha (.53 and .65) were found for Dhamrai and Barisal. In Kurigram (.75) the alpha value was comparatively high. For urban area Dhaka, the alpha coefficient was the highest (.83) while for the other urban area Chittagong the value was moderate (.78). A notable number of items were found to detract the alpha for .01 to .10 points. Among the housing conditions, other water and toilet detracted the alpha most in the rural areas. Most of the items for possessions, except radio and TV detracted the alpha in both rural

and urban area. Refrigerator, VCR, car, motor bicycle and bullock cart had zero variance in many area.

Table 3.1: Alpha Coefficient for Reliability with Items Detracting Alpha for SIF 1 including item as Separate Unit

Area		All	Rural	Urban	Dhaka	Dhamrai	Barisal	Kurigram	Chittagoan
Alpha		.79	.56	.82	.83	.53	.65	.75	.78
Mother	Educational Level								
	Reading Ability								
Father's Status									
Housing	Room								
	Floor					x			
	Drinking Water		.				x		
	Other Water		xx			x	x		
	Toilet		x			x			
	Electricity								
Posses	Radio								
	TV								
	Refrigerator		o			o	o	o	
	VCR	x	o	x		o	o	o	x
	Bicycle	x		x	x			-	x
	Motor Bike	x		x		x	o	x	x
	Car	x	x	x	x	o	x	x	o
	Boat	x	x	x	x		x		o
	Bullock Cart	x	x	o	o	x	x	x	o
	Cow	xx		x	x				o
	Tube Well	x		x	x	x			x

(o=zero variance, x=item detracted)

Table 3.2: Alpha Coefficient for Reliability with Items Detracting Alpha for SIF 2, the Parental Prestige Index

Area		All	Rural	Urban	Dhaka	Dhamrai	Barisal	Kurigram	Chittagong.
Alpha		.82	.73	.84	.85	.54	.81	.78	.81
Mother	Education Level								
	Reading Ability								
Father	Status	x	x	x	x	x	x	x	x

(o=zero variance, x=item detracted)

Table 3.2 showed the alpha coefficient for the parental prestige index (SIF 2), as estimated by educational level and occupational status of the parents, for all, rural, urban and different study areas showing the items that detracted the alpha for more than .01. The first index of the second approach had high alpha coefficient (.73 to .85) across all the rural and urban areas as well as in all areas taken together (.82), except Dhamrai area which had alpha value of .54 only. However the item father status detracted the alpha in all the areas.

Table 3.3 presented the alpha coefficient for the index including only the items of housing conditions (SIF-3) for all, rural, urban and different study areas showing the items that detracted the alpha for more than .01. The index had very low range (.03 -.51) of alpha value for different study areas. The value was also poor for urban area and all area together. A considerable number of items specially the 'other water' detracted the alpha coefficient for .01 to .10 points.

Table 3.3: Alpha Coefficient for Reliability with Items Detracting Alpha for SIF 3 containing Housing Items

Area		All	Rural	Urban	Dhaka	Dhamrai	Barisal	Kurigram	Chittagong
Alpha		.51	.03	.49	.47	.14	.29	.11	.45
Housing	Room	x	x					x	
	Floor								
	Drinking Water					x			x
	Electricity								
	Other Water		xx			x	x	x	
	Toilet		x			x	x		

(o=zero variance, x=item detracted)

Table 3.4 presented the alpha coefficient for the index containing only the possession items (SIF-4) for all, rural, urban and different study areas showing the items that detracted the alpha for more than .01. The alpha value for this possession index was poor for 'all areas'(.49) and also for 'rural areas' (.31 -.36), except Kurigram where the alpha was relatively high (.52). In urban areas the value were comparatively high (.63 - 67). The number of items that had detracted the alpha values were also high.

Table 3.4: Alpha Coefficient for Reliability with Items Detracting Alpha for SIF 4 including Possessions

Area		All	Rural	Urban	Dhaka	Dhamrai	Barisal	Kurigram	Chittagong
Alpha		.49	.36	.67	.67	.31	.33	.52	.63
Possession	Radio								
	TV								
	Refrigerator		o			o	o	o	
	VCR		o			o	o	o	
	Bicycle								
	Motor Bike		x			x	o	x	
	Car		x			o	x	x	o
	Boat	x	x			x	x	x	o
	Bullock Cart	x	x			x	x		o
	Cow					x			o
	Tube Well								

(o=zero variance, x=item detracted)

Table 3.5 and 3.6 showed the alpha coefficient values for the index using composite scores for housing and possession (SIF-5 and SIF-6) for all, rural, urban and different study areas showing the items that detracted the alpha for .01 point. Two separate composite scores, one the **composite housing condition** (I) score which include items such as number of rooms, floor condition, electricity, water for drinking and other uses, and toilet facilities as an additive units; and the other the **composite possession** score - the sum of the number of items possessed by the household were computed. For example if the household had radio, TV, and VCR; composite score would be '3'. The results demonstrated decline of alpha

Table 3.5: Alpha Coefficient for Reliability with Items Detracting Alpha for SIF 5 using Composite Housing and Possession Score

Area		All	Rural	Urban	Dhaka	Dhamrai	Barisal	Kurigram	Chittagong
Alpha		.74	.63	.81	.84	.56	.72	.54	.75
Mother	Education Level								
	Reading Ability								
Father's Status									
Housing Condition 1		x	x	x	x	x	x	x	x
Possession									

(o = zero variance, x = detracted)

coefficient for 'all area' (.74) compared to that of SIF-1 (table-3.1). Relative increase of alpha values were found for 'rural area', 'Dhamrai', and 'Barisal', but the value seemed to decline in 'Kurigram'. The composite housing condition (1) appeared to detract the alpha value in all the area band considered.

Probe into SIF-1 and SIF-3 established that the variables toilet facilities and water for other uses detracted the alpha value in most areas. The tryout of the index SIF-6 was thus, undertaken abandoning these two items from the composite housing condition score (II) . Alpha coefficient for SIF-6 demonstrated elevation for rural areas (Table 3.6). The alpha value were at acceptable range (.63 to .84) for all areas, both rural and urban areas, and for individual areas. Composite possession score detracted the alpha in 'all', 'Dhaka', 'Kurigram' and 'Chittagong' areas.

Table 3.6: Alpha Coefficient for Reliability with Items Detracting Alpha for SIF 6, the Last Tryout

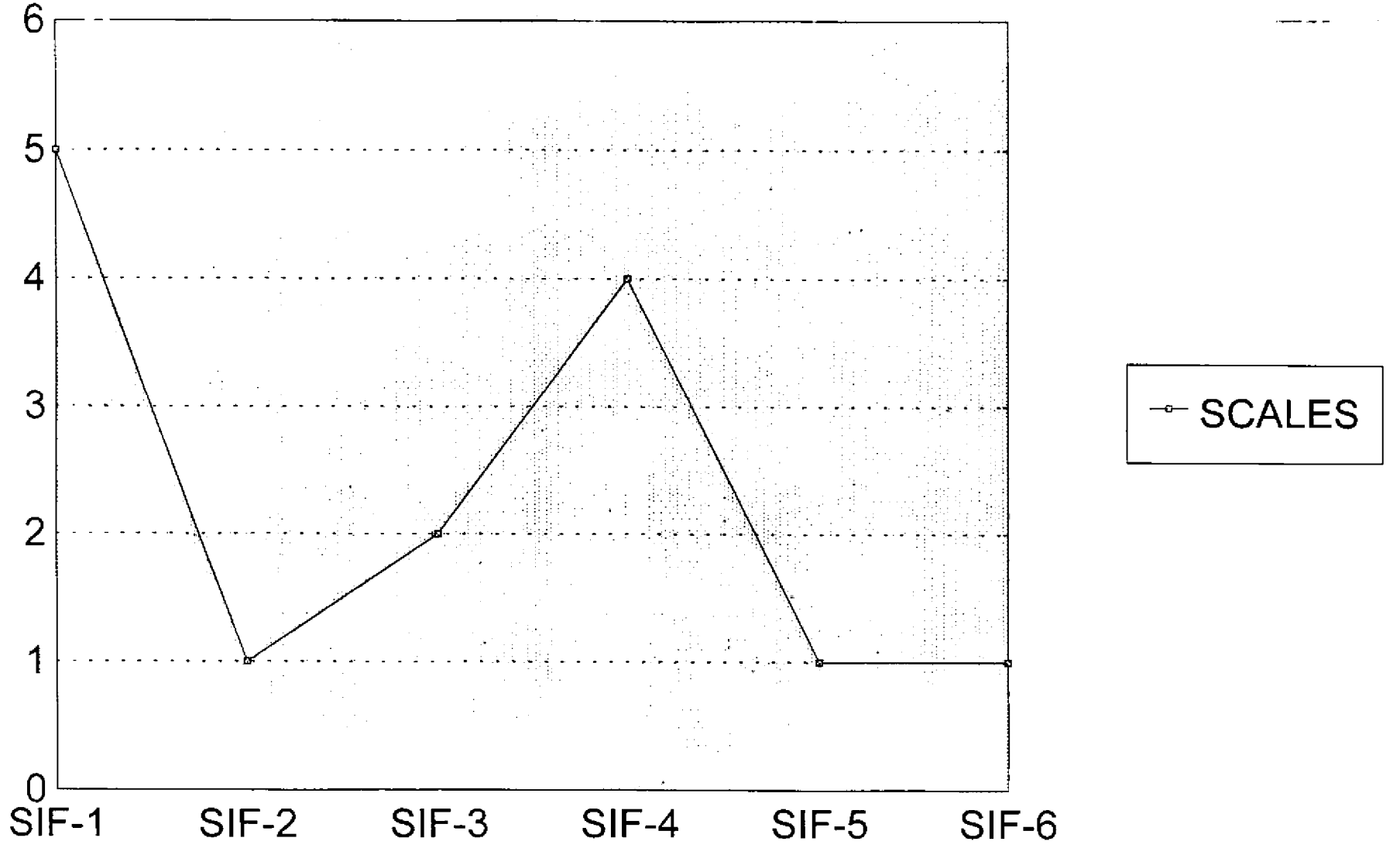
Area		All	Rural	Urban	Dhaka	Dhamrai	Barisal	Kurigram	Chittagong
Alpha		.79	.71	.83	.84	.63	.73	.75	.76
Mother	Education Level								
	Reading Ability								
Father's Status									
Housing Condition 2									
Possession		x		x				x	x

(o=zero variance, x=detracted)

Figure 3.1 shows the number of factors having eigen value greater than one in each tryout of the Socioeconomic Index of Family (SIF). Eigen value greater than one indicated the common factors extracted to explain the total variance. The results of factor analysis showed that SIF-1 extracted five factors with eigen value more than one, suggesting that the items loaded for more than a single common factor needed for the index. The tryout SIF-2 had factor loading on one factor, indicating that the items of the index measured a common factor. The factor analysis of the items of the indexes SIF-3 and SIF-4, also indicated loading on more than one factor. Factor loading of both SIF-5 and SIF-6 indicated one factor solution with eigen value greater than one for the items of the indexes.

Figure 3.1: Number of Common Factor Extracted

Eigen Value Greater than One



3.2: Final Socioeconomic Index of Family (SIF):

Table 3.7 provided the comparative alpha value of six tryouts of SIF for separate study areas indicating the items encompassed in individual tryouts. Item loading on one factor for the different tryouts of the socioeconomic index has been displayed in Table 3.8. Comparative appraisal of alpha coefficient values of different try outs manifested a vast range of alpha values (.53 to .78) of the first tryout (SIF-1) encompassing all the available socioeconomic indicators as individual entity, in different study areas. Specially in 'rural area' and particularly in 'Dhamrai' the value was below the acceptable range.

The tryouts of three separate indexes (SIF-2, SIF-3 and SIF-4) resulted in awfully low reliability coefficient across the areas for SIF-3 and SIF-4. Comparatively, SIF-2 was found to have highest alpha values across the area considered. SIF-5 achieved improved alpha in rural area as total but for Dhamrai and Kurigram it was still unsatisfactory. The reliability coefficients of SIF-6 altogether were elevated (.83 - .63) compare to other tryouts of the indexes, particularly from SIF-5 implicating high internal consistency of the index. Results of factor analysis (table 3.8) exhibited coarse loading of numerous items on one factor extraction for SIF-1. In SIF-2, both the items for mother's educational levels had higher item loading than father's status. Factor analysis of both the SIF-3 and SIF-4 manifested wide range of item

Table 3.7: Comparative Weigh of Socioeconomic Index of Family (SIF)

Socioeconomic Index (SIF)		SIF 1	SIF 2	SIF 3	SIF 4	SIF 5	SIF 6
Alpha	All	.79	.87	.51	.54	.74	.79
	Rural	.56	.73	.03	.37	.63	.71
	Urban	.82	.84	.49	.67	.81	.83
	Dhaka	.83	.85	.47	.67	.84	.85
	Dhamrai	.53	.54	.14	.31	.56	.63
	Barisal	.65	.81	.29	.33	.72	.73
	Kurigram	.75	.78	.11	.52	.54	.75
	Chittagoan	.78	.81	.45	.63	.75	.76
Mother	Education Level	*	*			*	*
	Reading Ability	*	*			*	*
Father's	Status	*	*			*	*
House	Room	*		*		*	*
	Floor	*		*		*	*
	Drinking Water	*		*		*	*
	Electricity	*		*		*	*
	Other Water	*		*		*	
	Toilet	*		*		*	
Possession	Radio	*			*	*	*
	TV	*			*	*	*
	Bicycle	*			*	*	*
	Refrigerator	*			*	*	*
	VCR	*			*	*	*
	Motor Bike	*			*	*	*
	Car	*			*	*	*
	Boat	*			*	*	*
	Bullock Cart	*			*	*	*
	Cow	*			*	*	*
	Tube Well	*			*	*	*

* Items included in the indexes

Table 3.8: Item Loading on Common Factor for Socioeconomic Index of Family (SIF)

Items		SIF 1	SIF 2	SIF 3	SIF 4	SIF 5	SIF 6
Mother	Education Level	.58	.88			.82	.79
	Reading Ability	.49	.86			.76	.74
Father's Status		.53	.65			.62	.65
H	Room	.18		.12		*	*
o	Floor	.58		.74		*	*
u	Drinking Water	.34		.50		*	*
s	Electricity	.47		.68		*	*
e	Other Water	.38		.28		*	
	Toilet	.32		.22		*	
Composite Housing						.21	.55
P	Radio	.34			.39	*	*
o	TV	.60			.56	*	*
s	Bicycle	.01			.02	*	*
s	Refrigerator	.38			.61	*	*
e	VCR	.11			.38	*	*
s	Motor Bike	.09			.25	*	*
i	Car	.04			.22	*	*
o	Boat	.00			.00	*	*
n	Bullock Cart	.00			.00	*	*
	Cow	.07			.02	*	*
	Tube	.00			.01	*	*
Composite Possession						.45	.43

Note: * indicate items included in composite scores

loading on a single factor extraction. The outcome of factor analysis for SIF-5 showed low loading (.21) for composite housing score on single factor extraction. Compared to other tryout

(except SIF-2) the items of SIF-6 loaded notably for one factor exclusion (.79 -.43).

Tables 3.9a-h present the correlation matrix of items of SIF-6 for all and different study areas. Tables indicated highly significant

Table 3.9a: Correlation Matrix of Items of SIF 6 for All Area.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.87**	1.00			
Father Status	.62**	.59**	1.00		
Housing (2)	.52**	.48**	.55**	1.00	
Possession	.46**	.39**	.43**	.45**	1.00

N = 10299 Significance: * .01 ** .001

Table 3.9b: Correlation Matrix of Items of SIF 6 for Rural Area.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.92**	1.00			
Father Status	.45**	.44**	1.00		
Housing (2)	.29**	.29**	.35**	1.00	
Possession	.27**	.27**	.34**	.36**	1.00

N = 5313 Significance ** .001

Table 3.9c: Correlation Matrix of Items of SIF 6 for Urban Area.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.85**	1.00			
Father Status	.65**	.62**	1.00		
Housing (2)	.52**	.49**	.53**	1.00	
Possession	.57**	.47**	.52**	.58**	1.00

N = 4986 Significance ** .001

Table 3.9d: Correlation Matrix of Items of SIF 6 for Dhaka.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.82**	1.00			
Father Status	.68**	.63**	1.00		
Housing (2)	.53**	.44**	.55**	1.00	
Possession	.59**	.49**	.55**	.67**	1.00

N = 2361 Significance ** .001

Table 3.9e: Correlation Matrix of Items of SIF 6 for Dhamrai.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.94**	1.00			
Father Status	.30**	.32**	1.00		
Housing (2)	.26**	.22**	.33**	1.00	
Possession	.23**	.24**	.32**	.25**	1.00

N = 2552 Significance ** .001

Table 3.9f: Correlation Matrix of Items of SIF 6 for Barisal.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.90**	1.00			
Father Status	.57**	.54**	1.00		
Housing (2)	.28**	.32**	.26**	1.00	
Possession	.24**	.22**	.18**	.49**	1.00

N = 1653 Significance ** .001

Table 3.9g: Correlation Matrix of Items of SIF 6 for Kurigram.

Item	Mother Education	Mother Reading	Father Status	Housing (2)	Possession
Mother Education	1.00				
Mother Reading	.90**	1.00			
Father Status	.59**	.58**	1.00		
Housing (2)	.28**	.25**	.47**	1.00	
Possession	.45**	.45**	.56**	.38**	1.00

N = 1108 Significance ** .001

Table 3.9h: Correlation Matrix of Items of SIF 6 for Chittagong.

Item	Mother's Education	Mother Read	Father Status	Housing Condition	Possession
Mother's Education	1.00				
Mother Read	.86**	1.00			
Father Status	.58**	.55**	1.00		
Housing Condition	.44**	.44**	.46**	1.00	
Possession	.43**	.37**	.41**	.43**	1.00

N = 2625 Significance ** .001

correlation among the items of SIF-6. The range of correlation value for all area was .39 to .89. For different study areas the range varied from .22 to .94. The highest correlation was found between father's status and mothers education (.82 -.94).

Factor loading of the final index for rural and urban area has been provided in Table 3.10. Results showed that housing condition and

Table 3.10: Factor Loading on One Factor for Rural and Urban Area

Variables	Rural	Urban
Mother's Education	.75	.79
Mother Read	.75	.72
Father Status	.49	.66
Housing Condition	.33	.57
Possession	.31	.58

possession had poor loading for rural area. Loadings of items in the SIF_6 for urban area reflected one factor model.

Evidence of Construct Validity of Socioeconomic Index of Family (SIF)

Table: 3.11 presented the odd ratio indicating association between loss of at least one child in the family and socioeonomic index with 95% confidence interval. The obtained odd ratio of 1.06 suggested a significant relationship between the social class and

loss of child in the family. The lower social class had significantly higher rate of a loss of a child. The index score was also correlated with the gross family income reported by the respondents. For 96% of the cases information on income was reported and obtained significant correlation value of r=.48 was

Table 3.11: Odd Ratio Indicating Association between Loss of At Least One Child in Family and Socioeconomic Index Score (confidence interval)

	Loss of At least One Child in the Family
Socioeconomic Index (SIF) Score	1.06 (1.03 - 1.10)

indicative of positive correlation between social class and income. The higher the social class as measured by the index, the greater the family income also suggested some evidence of construct validity.

Outcome of Socioeconomic Index of Family (SIF):

Table 3.12 showed the mean and SD of socioeconomic index scores by different study areas. The results showed that mean scores for rural areas was lower than that of the urban areas. Mean scores for Dhamrai, Barisal, and Kurigram areas were also less than Dhaka and Chittagong. The score of Dhaka was comparatively higher than that of Chittagong.

Table 3.12: Mean and SD of Socioeconomic Index of Family (SIF) Score by Areas.

Areas	Mean	SD	Total
Dhaka	18.53	5.6	359
Dhamrai	12.04	2.7	434
Barisal	13.92	3.5	275
Kurigram	13.89	4.0	163
Chittagoan	15.06	404	395
Rural	12.98	3.3	872
Urban	16.71	5.3	754
All Areas	14.71	4.7	1626

Figure 3.2 provided the distribution of socioeconomic index score in all the areas considered under the present study. The positive skewness of the figure depicted the fact that the study population were massed at the low end of the index and were spread out gradually toward the high or right end. The lowest 15% was arbitrarily chosen to be defined as the lower social class for the present purpose.

Table 3.13 manifested comparative picture of lower 15% and upper 85% of socioeconimic index on certain selected characteristics. Table demonstrated that 79.7% fathers and 99.2% mothers of lower class had no education at all, compared to 38.2% fathers and 56.6% mothers of upper 85% of the social class. Higher percentage of fathers in lower class were agriculturist (42%) or unskilled labour (51.4%). Higher percentage of lower class families also had no

Figure 3.2: Distribution of Social Class

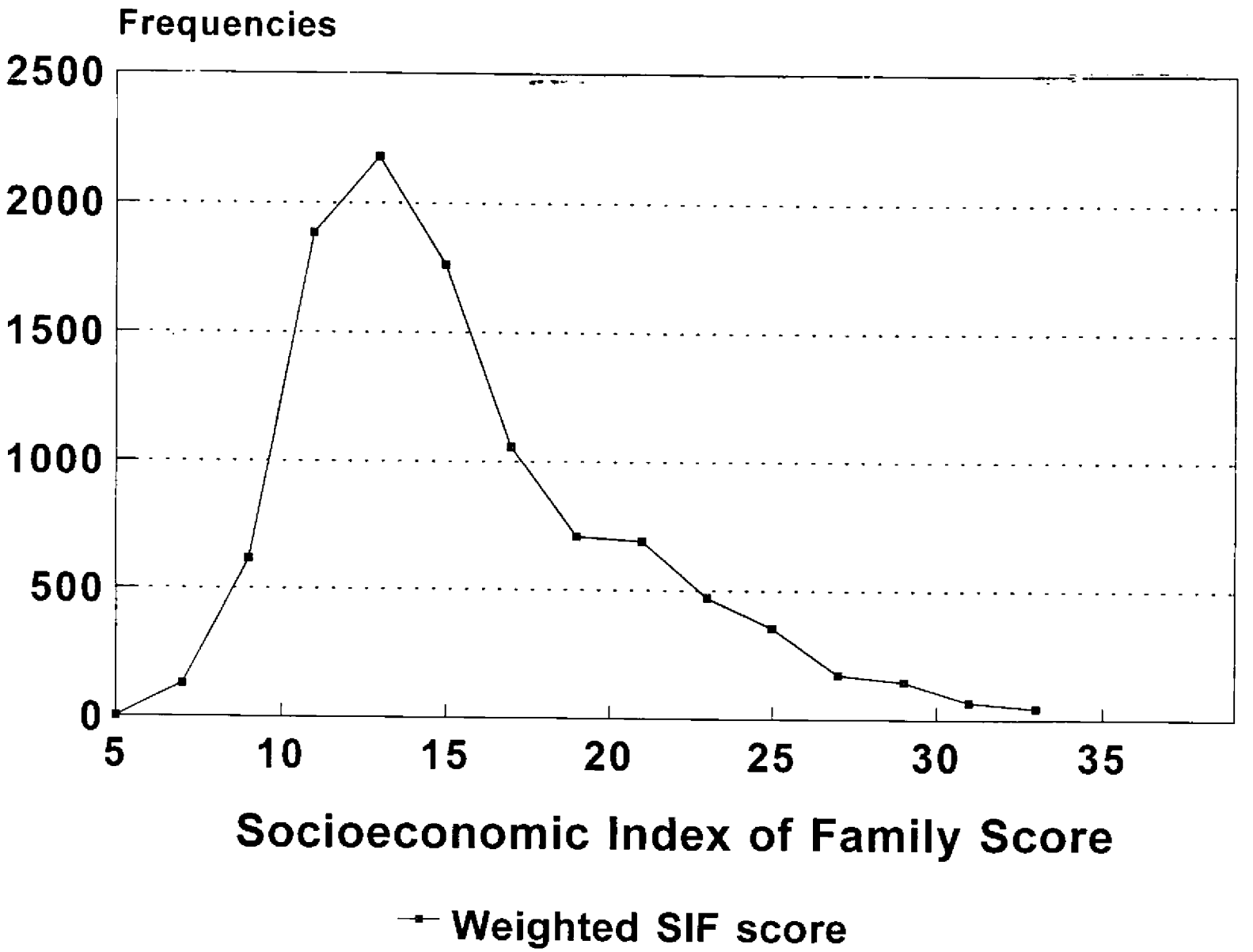


Table: 3.13: Selected Characteristics of Lower 15% and Upper 85% of Socioeconomic Index of Family - SIF (percentage)

Socioeconomic Index Score	No Education		Father Occupation		At least one Dead Children	No Land	No Electricity	No Possession
	Father	Mother	Agriculture	Unskilled				
Lower 15%	79.7	99.2	42.0	51.4	33.4	77.4	94.9	75.6
Upper 85%	38.2	56.6	26.5	13.5	29.3	25.3	48.9	47.2

land, no electricity, and no possession, compared to upper 85%. Comparative picture certainly demarcated the lowest 15% as the most disadvantageous group. Nevertheless analysis was also carried on both with the lowest 25% and 33%, meeting with similar results.

II: IDENTIFYING POTENTIAL RISK FACTORS FOR MENTAL RETARDATION AND OTHER DEVELOPMENTAL DISABILITY

3.3: Description of the Study Population:

The demographic features of Serious Mental Retardation (SMR), Other Developmental Disabilities (ODD) which included motor disability, vision impairment, hearing impairment, and seizure, and Mild Mental Retardation (MMR) have been presented in Table 3.14.

The table, showed that the percentage of boys was greater for Mild Mental Retardation (MMR) while the percentage of boys with Other Developmental Disabilities (ODD) was less than in the children

Table 3.14: Distribution of Demographic Features for SMR, ODD, MMR and Children with No Disability

Group	Boys (%)	6-9 year (%)	Urban (%)	Member (X)	Density >4 (%)	Caretaker (X)
SMR (N=46)	54.3	50.0	58.7	6.1	80.1	2.5
ODD (N=55)	45.5	60.0	49.1	6.0	84.8	2.4
MMR (N=46)	65.2	58.7	58.7	6.0	84.8	2.3
Children with No Disability	55.3	54.9	46.0	6.3	81.5	2.4

*ODD include motor,vision, hearing and seizure.

with no disability. Higer percentage of ODD and MMR were of older age group (6-9 year), whereas 50% of Serious Mental Retardation (SMR) was below 6 years. Percentages of SMR and MMR were greater in urban area. The mean number of members in the family and number of caretaker per child were similar for all the groups. More than 80% of all the groups had members per room ratio (density) greater than fpur. The maternal charecteristics of Serious Mental Retardation, Other Developmental Disabilities, and Mild Mental Retardation have been presented in Table 3.15.

Table 3.15: Distribution of Maternal Charecteristics for SMR, ODD, MMR, and children with No Disability (percentage)

Group	Age <19	Age >35	Consanguinity	Hospital Birth	Dead Children	Education > Secondary
SMR (N=46)	13.0	10.9	13.0	8.7	39.1	19.5
ODD (N=55)	16.4	7.3	12.7	9.1	36.4	5.4
MMR (N=46)	19.6	4.3	10.9	4.3	43.5	6.5
Children with No Disability	14.6	9.0	8.7	5.9	32.5	11.5

*ODD include motor,vision, hearing and seizure.

The data in the table showed that age of 19.6% mothers of the MMR was below 19 year at the time of birth of the child, compared to other groups higher percentage of mother with SMR had maternal age above 35 years at the time of birth of the child. Percentage of consanguineous marriage was higher for SMR than the children with no disability; such percentage was also found to be high for ODD and MMR. Compared to children with no disability higher percentage of SMR and ODD were born in the hospitals. Percentage of mother having at least one dead child was high for SMR and ODD; it was still higher for MMR compared to children with no disability. Higher percentage of mothers (19.5%) of SMR had passed their secondary level of education. Mothers of ODD and MMR had relatively lower education.

Table 3.16 presented the percentage of children with serious mental retardation (SMR), mild mental retardation (MMR), and other developmental disabilities (ODD) at the low socioeconomic level (lower 15% of the Socioeconomic Index score).

Table 3.16: Serious Mental Retardation (SMR), Mild Mental Retardation (MMR), and Other Developmental Disabilities (ODD) at the Lowest Socioeconomic Level

Lower Social Class (Lowest 15%)	Percentage of Children
SMR (N=46)	17.4
MMR (N=46)	23.9
ODD* (N=55)	16.4
Children with No Disability	16.5

*ODD include motor,vision, hearing and seizure.

Relatively higher percentage of MMR (23.9) were found in the lower level of the social class. Such percentage for SMR and ODD were about equal to children with no disability.

The distribution of medical risk factors for Serious Mental Retardation (SMR), Other Developmental Disabilities (ODD), and Mild Mental Retardation (MMR) have been presented in Table 3.17 and Table 3.18, respectively. Table 3.17 showed no notable difference among the mean number of gravidity and parity for all the groups. Incidence of miscarriage was relatively higher for MMR (16.9) than SMR or ODD. Similarly, incidence of prenatal threat and maternal goiter were also comparatively high for both SMR and MMR than

Table 3.17: Pregnancy Complication and Prenatal Risk Factors for SMR, ODD, MMR, and Children with No Disability (%)

Group	Gravidity (X)	Parity (X)	Miscarriage (%)	Prenatal Threat (%)	Maternal Goiter (%)
SMR (N=46)	3.8	3.6	9.7	15.2	6.5
ODD (N=55)	3.4	3.2	7.3	9.1	1.8
MMR (N=46)	3.3	3.3	16.9	13.0	9.3
General Children	3.6	3.5	7.6	10.0	1.5

*ODD include motor,vision, hearing and seizure.

children with no disability. The data on table 3.19 showed that percentage of preterm birth was high for SMR and ODD. Incidence of perinatal threats and postnatal hazards, both were relatively high for SMR, followed by MMR, whereas such factors were less in ODD, compared to children with no disability. Compared to children with no disability percentage of birth asphyxia and low birth size were

Table 3.18: Perinatal and Postnatal Risk Factors for SMR, ODD, MMR, and Children with No Disability (percentage)

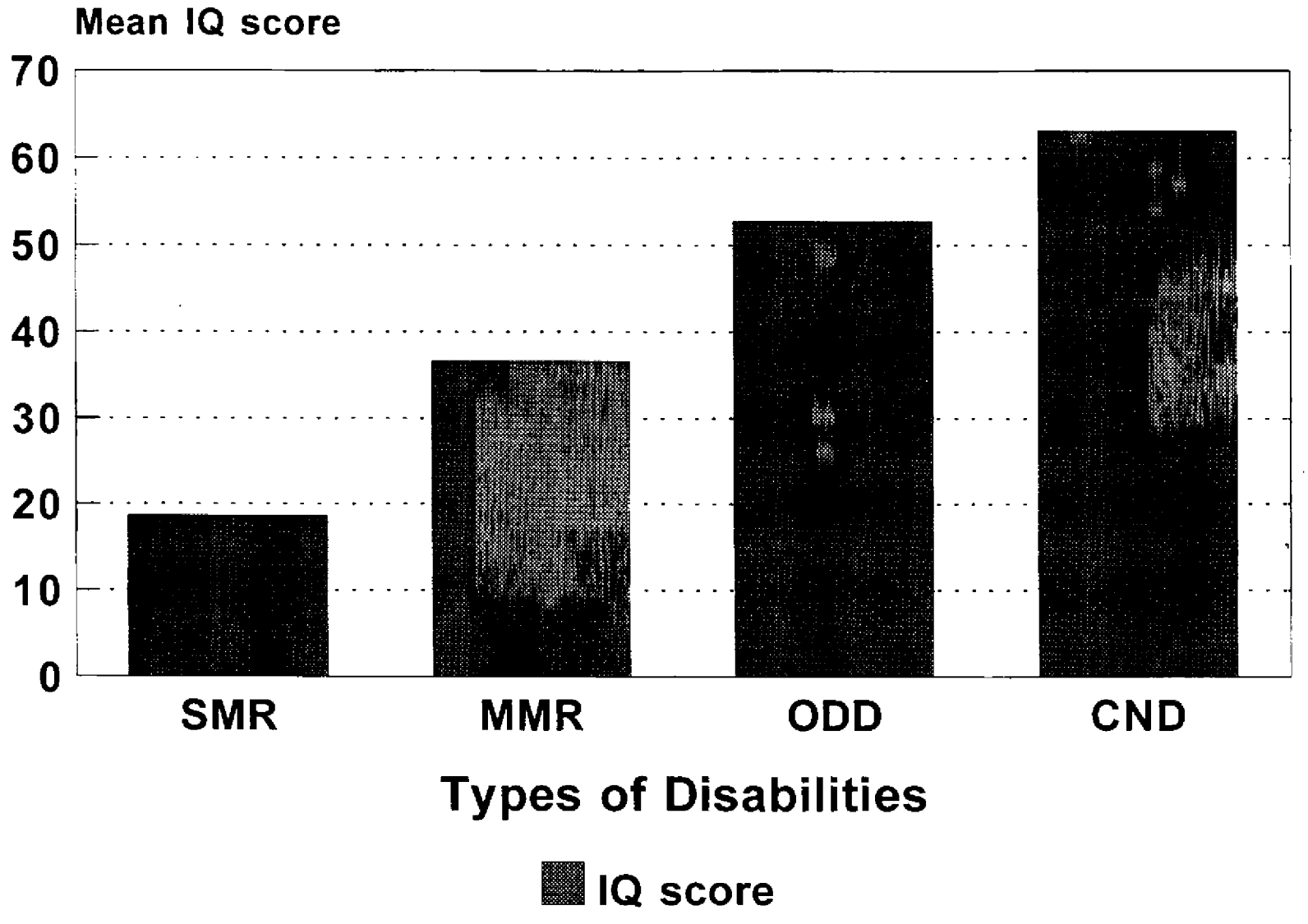
Group	Preterm Birth	Perinatal Threat	Birth Asphyxia	Low Birth Size	Postnatal Hazard
SMR (N=46)	4.3	23.9	8.7	21.7	21.7
ODD* (N=55)	7.3	10.9	9.1	12.7	9.1
MMR (N=46)	2.2	19.6	6.3	23.9	19.6
General Children	2.5	14.1	3.2	8.3	11.4

*ODD include motor,vision, hearing and seizure.

high in all the disabilities considered. Percentage of low birth size was highest for MMR and than for SMR.

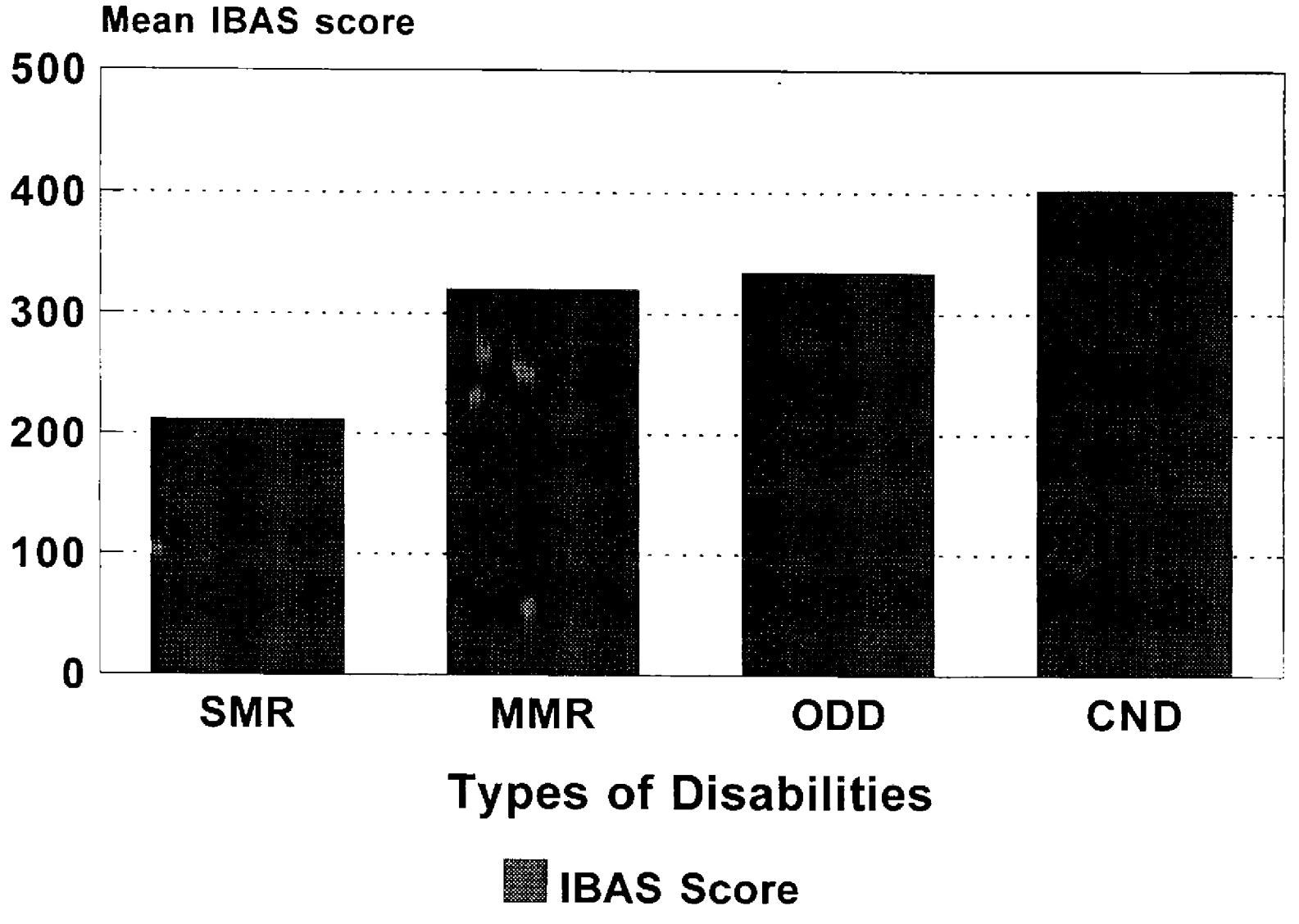
The Figure 3.3 and 3.4 portrayed the mean intelligence score (Binet) and score for Independent Behaviour Assessment Scale (IBAS), an adaptive behaviour scale score for SMR, MMR, ODD, and children with no disability. Both the mean IQ and adaptive behaviour scale score were low for SMR. Comparatively higher mean IQ and independent behaviour score was found for MMR. Children with ODD had higher IQ and independent behaviour score than mentally retarded children but scored lower than the children with no disability. Figure 3.5 provided a comparative picture of associated disabilities with SMR and MMR. As expected greater percentage of SMR had more associated disabilities than MMR. Percentage of motor disability was highest for SMR, while hearing disability was more commonly found in MMR.

Figure 3.3: Mean Q Score



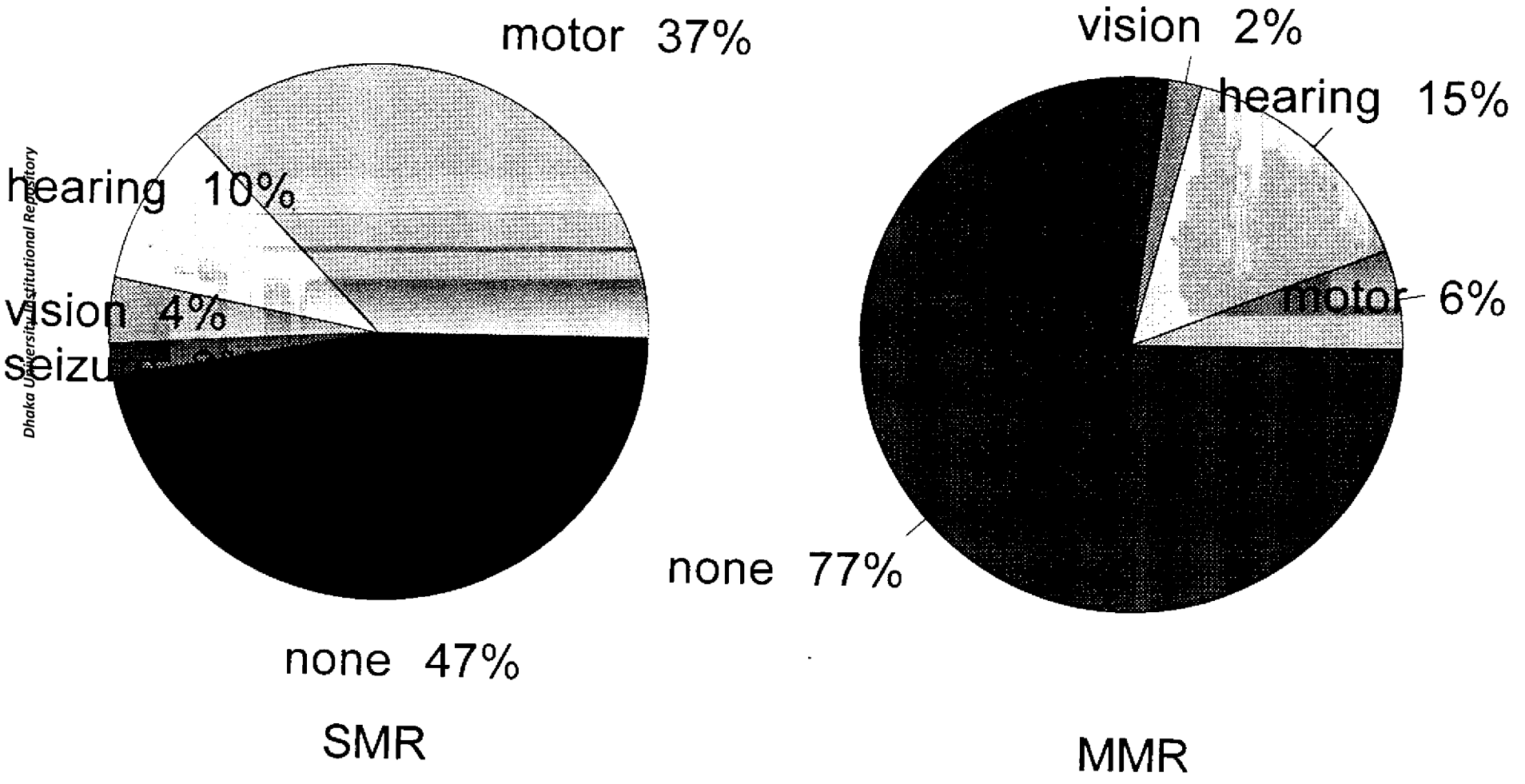
CND:Children with No Disability

Figure 3.4: Mean IBAS Score



CND:Children with No Disability

Figure 3.5: Associated Disabilities With SMR and MMR



3.4: Prevalence of Mental Retardation (MR) and Other Developmental Disabilities (ODD):

Table 3.19 provided the prevalence rate per 1000 of mental retardation and other childhood disabilities by age group, gender and rural and urban residence, with the 95% confidence interval for Bangladesh. Reported prevalence estimates and confidence intervals were obtained using formulas described by Shrout and Newman (1989) that took the two stage study design into account (Zaman et al.,1992). The estimated prevalence for serious mental retardation (SMR), mild mental retardation (MMR) and other developmental disabilities (ODD) were 5.93, 14.45, and 9.74, respectively.

Table 3.19: Prevalence of Mental Retardation and Other Developmental Disability by Age Groups, Gender and Rural/Urban Residence (95% confidence interval).

Groups	Serious Mental Retardation	Mild Mental Retardation	Other Developmental Disabilities*
Total	5.93 (3.42-8.43)	14.45 (7.83-21.07)	9.74 (5.35-14.13)
Boys	5.08 (3.10-7.06)	18.33 (8.12-28.84)	8.58 (2.86-14.30)
Girls	6.94 (2.01-11.88)	9.91 (1.97-17.86)	11.10 (4.32-17.89)
2-5 years	5.12 (3.04-7.20)	14.57 (4.65-24.50)	7.15 (2.30-11.99)
6-9 years	6.62 (2.27-10.96)	14.36 (5.49-23.24)	12.07 (4.99-19.15)
Rural	5.84 (1.47-10.21)	13.18 (4.14-22.22)	5.91 (3.73-8.08)
Urban	6.03 (3.77-8.29)	15.81 (6.10-25.53)	13.86 (5.10-22.61)

*ODD include motor,vision, hearing and seizure.

Prevalence rate for SMR was high for girls than boys; similar result was also noted for ODD. But for MMR greater prevalence rate for boys were found than the girls. Both SMR and ODD were more

prevalent in older age group (6 - 9 years). All three types of disabilities considered were more prevalent in urban area compared to rural area.

3.5: Associated Risk Factors for Mental Retardation and Other Developmental Disabilities:

In retrospective study basic comparison was made between cases and controls with regard to the presence of the relevant variables already occurred in their past experience. Since the incidence in exposed and non exposed population was not known in retrospective case-control studies, an estimate of relative risk could be readily obtained by calculating the Odd Ratios (OR), provided the following assumptions were met: (a) the incidence of disability was low and (b) cases and controls were representative of person with and without disabilities in the underlying population. Odd Ratio was the cross product obtained by multiplying diagonally in a 2x2 table of cases vs controls and exposed vs not-exposed. If cases showed a high proportion of an attribute than do the controls (i.e., OR greater than 1), then an observed association between the attribute and the disability might be inferred (Friedman,1980; Khan,1989). 95% confidence interval was calculated; if the confidence interval did include one, then an OR greater than one for any factor would be considered to have a significant effect.

Table 3.20 presented the point estimate of the odd ratios for selected demographic factors indicating possible association with serious mental retardation or other serious childhood disabilities. Odd ratios for some factors such as 'density', 'less caretaker', 'hospital birth', 'older children', 'less educated father', were found to be greater than one. Nevertheless, none of the factors were found to be significantly associated with neither serious mental retardation (SMR) nor other developmental disabilities (ODD). Odd ratio for gender showed that girls were

Table 3.20: Point Estimates of Crude Odd Ratios Indicating Possible Associations between Demographic Factors with Mental Retardation and Other Developmental Disabilities.

Demographic Risk Factors	Serious Mental Retardation (SMR)	Other Developmental Disabilities (ODD)*
Urban	1.04 (0.44 - 2.42)	2.38 (1.12 - 5.07)
Boys	0.71 (0.62 - 3.17)	0.76 (0.52 - 3.31)
More Family Member	0.90 (0.77 - 1.06)	0.92 (0.82 - 1.12)
Density	1.05 (0.92 - 1.91)	0.99 (0.84 - 1.20)
Less Caretaker	1.46 (0.72 - 2.99)	1.28 (0.62 - 2.61)
Hospital Birth	1.17 (0.38 - 3.53)	0.87 (0.31 - 2.43)
Older Age (6-9 yrs)	1.17 (0.53 - 2.58)	1.64 (0.37 - 4.07)
Less Educated Father	0.96 (0.69 - 1.32)	1.36 (0.99 - 1.88)

*ODD include motor,vision, hearing and seizure.

more likely to suffer from serious mental retardation and other developmental disabilities. However, compared to serious mental retardation, occurrence of other serious disabilities was found to be significantly related to urban area. Lower bound confidence

interval of 0.99 suggest a possibility of less educated father to have more children with other developmental disabilities.

Table 3.21 presented the point estimate of crude odd ratios for selected maternal factors indicating possible association with serious mental retardation or other serious childhood disabilities with 95% confidence interval. Odd ratios for 'number of dead children' and 'any dead children' though were greater than one but did not have any significant positive relationship with neither SMR nor ODD. Consanguinity was found to be significantly associated with both serious mental retardation and other serious disabilities. Education of the mother was not found to have any significant relationship with neither SMR nor ODD.

Table 3.21 : Point Estimate of Crude Odd Ratio indicating Association between Maternal Risk Factors and Mental Retardation and Other Developmental Disabilities with 95% Confidence Interval

Risk Factors	Serious Mental Retardation (SMR)	Other Developmental Disabilities (ODD)*
Young Mother (less than 18)	0.79 (0.31 - 2.04)	0.72 (0.31 - 1.66)
Older Mother (more than 35)	0.97 (0.35 - 2.66)	0.44 (0.15 - 1.35)
No.of Dead Children	1.15 (0.86 - 1.52)	0.91 (0.64 - 1.28)
Any Dead Children	1.15 (0.54 - 2.45)	1.10 (0.43 - 2.83)
Less Educated Mother	1.01 (0.63 - 1.64)	1.25 (0.79 - 1.97)
Consanguinity	4.04 (1.02 - 16.12)	6.57 (2.17 - 19.12)

*ODD include motor,vision, hearing and seizure.

Table 3.22 presented the point estimate of the odd ratios for selected medical factors indicating association with serious mental retardation or other serious childhood disabilities. Among the

Table 3.22: Point Estimates of Crude Odd Ratios Indicating Possible Associations between Selected Medical Factors with Mental Retardation and Other Developmental Disabilities.

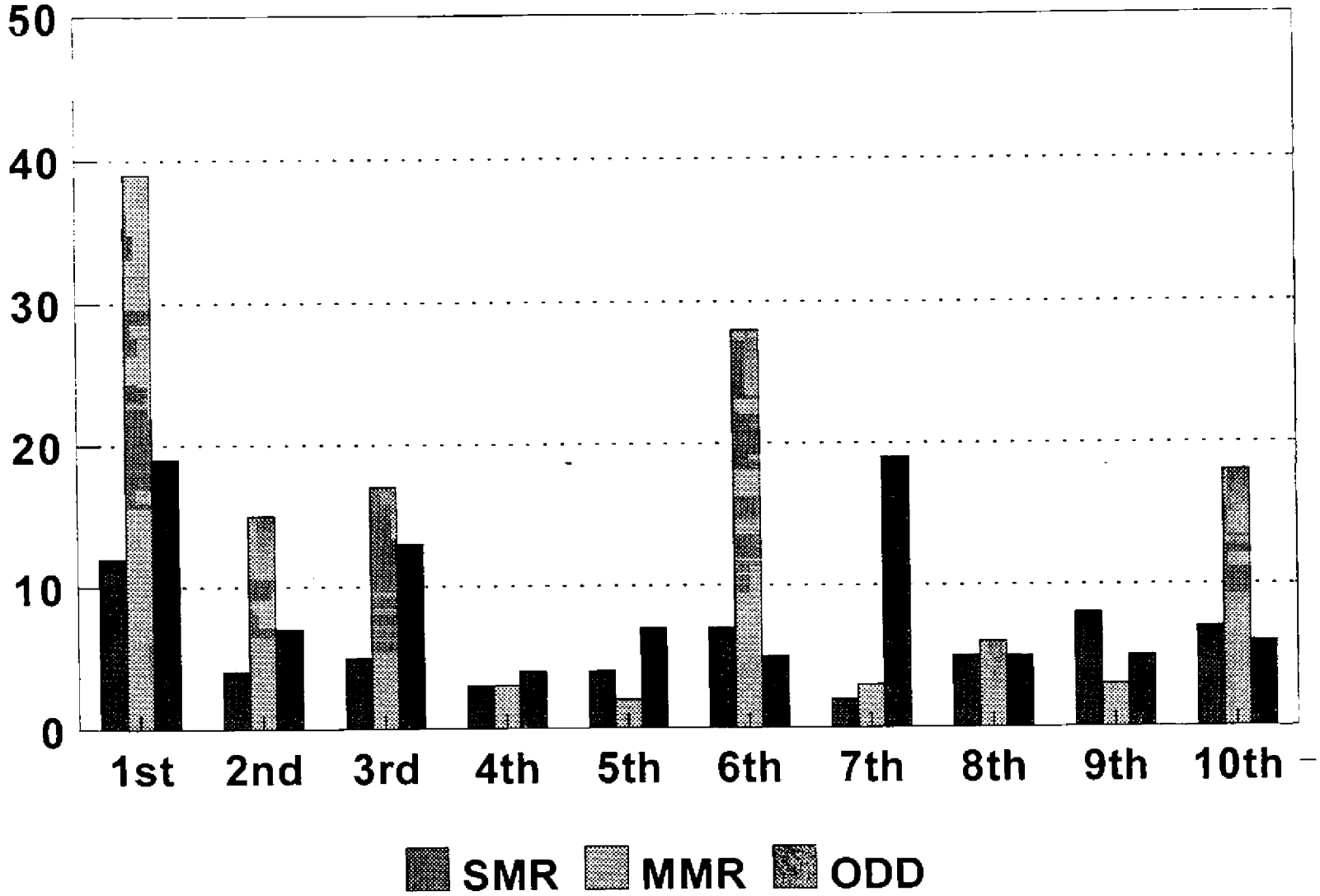
Medical Risk Factors	Serious Mental Retardation (SMR)	Other Developmental Disabilities (ODD)*
Gravidity	1.19 (0.93-1.53)	0.94 (0.86-1.02)
Parity	1.19 (0.91-1.55)	0.87 (0.86-1.02)
Miscarriage	0.89 (0.55-1.45)	0.58 (0.27-1.26)
Prenatal Threat	2.73 (1.18-6.29)	0.68 (0.25-1.67)
Maternal Goiter	1.33 (0.62-2.85)	1.27 (0.47-3.39)
Preterm Birth	1.72 (0.38-7.83)	2.12 (0.66-6.85)
Birth Asphyxia	1.12 (0.55-2.26)	1.46 (0.74-2.89)
Perinatal Complication	1.61 (0.91-2.85)	0.48 (0.22-1.05)
Low Birth Size	2.47 (1.08-5.65)	0.93 (0.37-0.84)
Postnatal Hazards	1.61 (1.06-2.14)	0.54 (0.25-1.17)

*ODD include motor,vision, hearing and seizure.

various medical risk factors prenatal threat, low birth size, and postnatal hazards were found to be significantly associated with SMR. No significant positive relationship with ODD were observed for any of the factors.

Social Inequality: Figure 3.6 potrayed the prevalence of SMR, MMR, and ODD by decile points of SIF scores. MMR was more prevalent at the lowest end of the index than SMR and ODD. Table 3.23 presented the crude odd ratio indicating possible association between lower social class and two levels of mental retardation, and also with

Figure 3.6: Prevalence of SMR, MMR, and ODD
by Socioeconomic Index of Family Scores(weighted)



other serious disabilities with 95% confidence intervals. The obtained results showed that of the two levels of mental retardation, not serious mental retardation, but mild retardation was significantly related to lower social class. Children from

Table 3.23 : Point Estimate of Crude Odd Ratio indicating Association between Lower Social Class and Two Levels of Mental Retardation and Other Developmental Disabilities with 95% Confidence Interval

VARIABLES	Serious Mental Retardation (SMR)	Mild Mental Retardation (MMR)	Other Developmental Disabilities (ODD)*
Lower Social Class (Lowest 15% of SIF Score)	2.46 (0.71 - 8.44)	3.96 (1.49 - 10.56)	2.33 (0.73 - 7.41)

*ODD include motor,vision, hearing and seizure.

lower social class had 3.96 probability of having MMR than the other segment of social class. Other serious disabilities was also not found to be significantly related to lower social class.

Table 3.24 presented the odd ratios for lower social class and serious mental retardation, mild mental retardation, and other

Table 3.24: Adjusted Odd Ratios indicating Association between Lower Social Class and Mental Retardation and Other Developmental Disabilities, adjusted for Rural/Urban area, with 95% Confidence Intervals

Adjusted Factors	Serious Mental Retardation (SMR)	Mild Mental Retardation (MMR)	Other Developmental Disabilities (ODD)*
Lower Social Class	2.62 (0.83 - 8.25)	4.65 (1.83 - 2.96)	3.25 (0.85 - 12.39)
Urban	1.26 (0.62 - 2.53)	1.70 (0.71 - 4.14)	3.05 (1.14 - 8.16)

*ODD include motor,vision, hearing and seizure.

developmental disabilities, adjusted for rural/urban areas. Results showed that MMR was still more prevalent in lower social class even when adjusted for urban/rural areas. For both SMR and ODD no significant association with lower social class were found as before. Relationship between ODD and urban area was still significant, irrespective of social class.

Analysis was extended further to include factors that had significant relationship with serious mental retardation (SMR) and other developmental disabilities (ODD). Adjusted odd ratios with the significant demographic and social factors for serious mental retardation and other developmental disabilities have been presented in Table 3.25 and Table 3.26, respectively.

Table 3.25: Point estimate of Adjusted Odd Ratios for Serious Mental Retardation with 95% Confidence Interval

Adjusted Factors	Serious Mental Retardation (SMR)
Lower Social Class	2.48 (0.72 - 8.66)
Consanguinity	4.08 (1.02 - 16.29)

Table 3.26: Point estimate of Adjusted Odd Ratios for Other Developmental Disabilities with 95% Confidence Intervals'

Adjusted Factors	Other Developmental Disabilities (ODD)*
Lower Social Class	3.18 (0.85 - 11.92)
Consanguinity	6.12 (2.08 - 17.98)
Urban	2.75 (1.08 - 7.11)

*ODD include motor,vision, hearing and seizure.

The obtained results in table 3.25 showed that consanguinity was significantly related to SMR, irrespective of social class difference. The table 3.26 indicated that consanguinity and urban area, both were significantly related to ODD, even when adjusted for social class difference.

To summarize the obtained results, firstly the present attempt to develop a socioeconomic index (SIF) from the data collected during the base study, revealed that the information regarding parental education, status, housing conditions and possessions could be reliabily utilized as a measure of variation in social class in both rural and urban areas of Bangladesh, and in any health related study. Secondly the estimated prevalence of serious and mild mental retardation and other developmental disabilities portrayed an alarming situation which necessarily calledforth prompt action to abate the burden on the families and the nation as a whole. Finally the analysis of risk factors associated with mental retardation and other developmental disabilities emphasized the importance of identifying the associated factors which increased the probability of occurrence of such disabilities. For serious disabilities, mental or other, importance of medical risk factors was heightened. Consanguinity was also found to be associated with serious mental retardation and also other developmental disabilities. Lower socioeconomic class was significantly related to mild mental retardation to be considered as a potential risk factor for its occurrence.

CHAPTER FOUR

DISCUSSION

Information on various psychosocial and biosocial characteristics associated with mental retardation, as well as other developmental disabilities has been essential for a proper understanding of the problem that have lifelong behavioural impact on one's social and economic life, as well as family, and extensively on the nation at large. Recognizing the massive importance of the solemn issue, the present dissertation attempted to explore the demographic, maternal and medical risk factors associated with the prevalence of these much neglected disabilities in children in Bangladesh. Results of the present investigation indicated the significance of prenatal threat, low birth size, and postnatal hazards as potential medical risk factors for serious mental retardation. Consanguinity was also established as a significant factor by the result raising the risk of serious mental retardation. Investigation on the presumable aftermath of social inequality found greater risk of mild mental retardation rather than serious mental retardation within lower social class. Results of the present study regarding other developmental disability (which include motor, vision, and hearing disability, and also seizure) consanguinity

and urban residence were found to increase the risk of having other developmental disability. None of the medical factors and other demographic and social factors were found to be significantly associated with the risk of other developmental disability. Since emphasis was more on the adverse social class as risk of developing mental retardation, the question of measuring variation in social status was considered and would be addressed before referring to the main risk factor inquest.

I: Measurement of Social Class:

Relevance of social class analysis as a probable risk factor insinuate the problem of measuring social class differences, the dilemma has been addressed in the succeeding paragraphs.

4.1: Development of Socioeconomic Index of Family (SIF):

Health studies had repeatedly demonstrated the importance of socioeconomic status as having significant relationship with health conditions (Zurayk, Halabi, and Deeb, 1987; Syme and Berkman, 1976, Masuy-Stoobant, 1989; Jachandrar, 1986; Marmot, Kogevinas, Elson, 1987). Nonetheless, social scientists had declined to reach a general consensus regarding the valid or rightful index of social class distinction. Considerable debate had evolved around the issue of unitary or multidimensional nature of social pattern. Possibility of composite feature of social class indexes have also been apprehended by some researchers (Lipset, 1968; Rossi, et.al.,

1974; Green 1970). Occupation, education, and income were the social and economic properties that had been extensively employed as key indicators of social class in various psychological, health, and social researches abroad and also in Bangladesh, either individually or in combination. Housing, residence, and various other indices had also been used (Morgan, 1983; Otto, 1975; Miller, 1983; Morgan and Chinn, 1983, Huq, 1992). In developing countries a number of scales have been developed as an index of social status (Hollinshead, 1977; Siegel and Hodge, 1968; Duncan, 1961), but seldom any attempt was undertaken to develop a reliable index to measure socioeconomic status in Bangladesh. Since a vast disparity exist between the economic structure of rural and urban Bangladesh, the creditability of a common measure for both the areas have been subjected to apprehension.

The present search for probable association between socioeconomic factors and prevalence of mental retardation as well as other developmental disabilities necessitated the development of a single reliable index of socioeconomic status of family, by utilizing the data of different social indicators accumulated during the nationwide epidemiological survey on childhood disability (REA-the base study). Referring to chapter two and three, present effort addressed the issue from three approaches, ie., unitary, multidimensional, and composite, that steered several tryouts of the index in order to fulfill the intent of forming a reliable, unidimensional index of social class workable for both rural and

urban areas of Bangladesh. Brief Account of rationale behind and resolution reached after each tryout follows. The final selection was conceived on the basis of comparative judgement of the reliability coefficient and single factor loading of various version of the index.

Development of Final Socioeconomic Index of Family (SIF): The **first approach** (SIF_1) to include as many as possible items of socioeconomic indicators as separate entity resulted in relatively low and diverse alpha value for rural areas and housing items such as 'other water' and 'toilet' notably detracted the alpha value (table 3.1). This might be due to the reason that about 80% of rural people use river or well water for other uses and 20% of the rural population did not have any toilet facilities (table 2.11). Moreover even wealthy people in rural area did not care for having proper sanitary facilities. Possessions like refrigerator, VCR, car, etc were possessed by very few or none in many areas under consideration, inclusion of such items also affected the alpha coefficient in both urban and rural area. Furthermore results of factor analysis also exhibited lack of unidimensionality (figure 3.1). The unitary approach, SIF 1, thus did not ascertain the aims for developing the present socioeconomic index.

This approach, however led to the **second** thought to assess three distinct indexes, (1) parental prestige as estimated by educational level and occupational status of the parents (SIF_2),

(2) housing conditions (SIF_3) and (3) possessions (SIF_4). Rather than leaving out the items that affected the alpha values, these separate indexes surmised to be indicative of the three facet of socioeconomic condition of the family. This multidimensional approach also proved to be unsatisfactory in meeting the present purpose. Saving SIF-2 (table 3.2), the remainder two indexes (table 3.3 and 3.4) failed to prove as a reliable measure of a common factor.

The third and finally the possibility of using composite score for (a) housing condition and (b) possessions rather than excluding the items from the index was considered to ensure maximum utilization of the information on the household composition accumulated from the survey. Composite score was used with the anticipation that if it did not have much affect on the overall alpha value but would influence the pattern whether the items in the index add or detract the alpha. Comparative appraisal of SIF-5 (table 3.5) - that included all the items under housing condition as a composite score; and SIF_6 (table 3.6) - that excluded the items vastly influenced the alpha value ie., toilet and other water, from the composite score; established preference for SIF_6 due to elevation of alpha for rural areas. Alpha values across all the areas considered were indicative of good reliability of the index. Detraction of alpha by the composite possession score in some areas might be accounted to the non existence of certain items in some areas. The SIF-6 also ensured the requirement of single common

factor solution for the index. The final tryout, hence voted for employing composite approach to measure social class variation and was thus selected to be used as a measure of socioeconomic condition of the family, since it was more consistent with the aims of developing Socioeconomic Index workable for both rural and urban area. Preference for the use of composite score revealed the independence and interdependence among the indicators which were distinct but related components measuring social class (table 3.7 and 3.8).

Validity of the Index: Satisfactory evidence of construct validity of the index was also established in the present study by examining the discriminatory power of the measure for a family health variable, i.e., death of atleast one child in the family. This scheme had been used by many researchers to evaluate the relative effectiveness or predictive validity of different indicators of social class in relation to health variables (Zurayk et.al., 1987; Abramson, Gofin, Habib, 1982). Numerous studies on child mortality rate had reported higher incidence of child death in lower social class. Carvajal and Burgess (1978) analyzing the data from urban fertility survey in Latin America found that fetal mortality and child death were more prevalent in lower income groups than it was in higher income groups. The obtained result from the present study that lower social class was significantly related to the death of atleast one child in the family (table 3.11) undoubtedly acknowledged the fact. Besides significant correlation with social

status as measured by the index with the income of the family (page 144), also rendered evidence of validity, since income had often been considered as a sole indicator of social class differences in several studies. However the low correlational value (.48) between income and socioeconomic index score might be explained by the fact that many considered income as sensitive topic and thus people seldom were sincere in exposing their genuine income; as a result the income reported by the family could not be considered with authenticity. Undoubtedly strong evidence of content validity of the index could be accorded, on the ground that the items included in the index bear significant effect on the prestige and power of a person and had been extensively conveyed in manifold studies to denote social status.

It could be mentioned, here, that although occupation had been the highly favoured single index of social status (Ott,1975; Miller, 1983; Morgan, 1983) the present study as put forward in chapter two, faced inconvenience in manipulating occupation as an individual entity in the index due to the existing vast variation in respect to income and prestige within the same major occupational categories. This necessitated construction of a new variable 'father status' based upon educational level, since kind of occupation one's hold generally count on educational level. Such occupational prestige ranking based on education or/and income had been accounted in various widely used indexes of social class (Daniel, 1983; Elley and Irving, 1966). Present assumption that

mother's occupation would be irrelevant had also been supported by researchers. Great majority of the mothers were housewives which conveyed no status at all (table 2.7). However, because families share the same status in society, the status of the head of the family, the main breadwinner, could be considered as a valid indicator of its member's social advantage and/or disadvantage (Daniel,1979). Nevertheless, relative apprehension about the effectiveness of various social indices employed in the present index, in relation to health variables needed careful exploration. Readers have been referred to the paper of Durkin, Islam, Hasan and Zaman (1994) for further insight into the issue.

Rural/ Urban variation: Review of the alpha values across the areas in different tryouts seemed to render the point that the present index of social class were more viable for the urban areas rather than the rural areas (table 3.7). Review of the factor loading of the index for rural and urban areas (table 3.10) portrayed the enduring heterogeneity between the infrastructure of rural and urban area of Bangladesh. Low loadings of the items i.e., 'housing condition' and 'possession' in rural area have put forward the actuality that the variables included in these items do not carry similar weight for both the areas. The present study furnished mean scores and SD for both rural and urban area as well as for separate areas under survey (table 3.12). The mean score for rural areas were found to be lower than that of the urban

areas. These figures could be taken as reference for comparative interpretation.

The positive skewness of the index scores (figure 3.2) corresponded to the World Bank (1994) report on the existing economic infrastructure of Bangladesh. According to the report, the lowest 20% of the population had share of only 9.5% of the national income distribution; in contrast to the fact that 38.6% of the national income were consumed by the upper 20% in the year of 1988-89. Corresponding figure was also reported by Asian Development Bank (1992). Only 17.53% of national income distribution was reported to accrue to the bottom 40% of the population against the figure of 20.51% to the top 5% of the population. Choosing daily calorie intake per person as an indicator of poverty incidence, the report stated that 47% of the population intake below 2122 calories, an average minimum per capita energy needed. The picture was marked as even more deplorable in rural areas (Nutrition Survey of Rural Bangladesh, 1983).

Keeping in view that feasibility and practicality of different measures tended to vary over time and space, it might be conclude at this point that the present attempt to develop an unidimensional socioeconomic index from the household data collected during the base study, undoubtedly imparted the strength of household information collected during epidemiological studies or any large scale health or social surveys as indicative of variance in social

status of the population. Subsequent paragraph would now discuss the leading problems of identifying the associated risk factors determining the prevalence of serious mental retardation and other developmental disabilities.

II: Determination of Associated Risk Factors:

4.2: Prevalence of Mental Retardation and Other Developmental Disabilities:

Since the country lack systematic account on childhood disability situation, the prevalence rate of mental retardation and other developmental disabilities, estimated in the present study could be considered as a basic data that provide first hand insight and knowledge into the situation of disabled children in Bangladesh. Since the formula used (Zaman et al, 1992) to estimate prevalence in the present study were modified to take the study design into consideration, the reported prevalence rates could be considered as tenable. Though the prevalence rate reported across the various countries were not simply comparable due to methodological constraints and criterion used for case definition, the rate of serious mental retardation (3.19 per 1000) as indicated by the present study was considerably higher compared to the range of prevalence rate (1.69 - 6.1) found in various surveys in developed countries reported by Dupont (1981), for average age of 0 to 14 years. Such relatively piercing estimate were consistent with the

findings of other developing countries in the region (Hasan and Hasan, 1981; Narayanan, 1981). Percentage of disabled children under 14 was also observed to be notably high in various Asian countries (UN Disability Statistics Compendium,1990). Stein, Durkin and Belmont (1986) reported prevalence rate of SMR for eight different Asian countries ranging from 5 to 16 per thousand in children from three to nine years of age. Marfo (1986) argued that the observed differences in prevalence rate of developmental disabilities between less developed and technologically advanced countries could be explained by the existing dissimilarity in the quality of life between the two. Developing countries were more poverty stricken and economically in disadvantageous position, which harshly affected the social and health life of the society. Basic essentials were frequently completely lacking in developing countries. Malnutrition, disease, illiteracy, inequitable distribution of social services, poor housing, inadequate and non availability of drinking water, improper hygiene, etc were vehemently projected in developing countries compared to developed countries. Higher rate of childhood mortality and disabilities were considered as an inevitable consequence of such substandard life style. As contemplated, the prevalence rate of mild mental retardation was found by the present study to be much higher in Bangladesh than that of serious mental retardation. This agreed with the findings reported by Hasan and Hasan (1981), in Pakistan. Report on the international epidemiological pilot study in Bangladesh, also substantiated the result (Zaman, 1982). Wider

difference between prevalence of SMR and MMR (table 3.19) might be accounted to variation in cutoff point of IQ used. Moreover it was difficult to identify severe developmental disabilities, especially mental retardation, at younger age unless it involved gross retardation. Variation of prevalence over time and place, specially in less developed countries, might also have raised the intriguing issue of increased survival and association with social class related characteristics (Fryers, 1987).

Corresponding rate of other developmental disabilities (table 3.19) which included vision, hearing, motor, and seizure, was found to be low in the present study, compared to mental retardation. Detailed account of prevalence rate of various disabilities included as other developmental disabilities in the present study were provided in the final report of the base study (Zaman et.al.,1992). Relatively higher rate of mental retardation to other forms of disabilities were also reported in United Nation studies (UNICEF,1980). Similar higher incidence was also reported in a study of mentally retarded children in Eastern India (Pakrasi, at.al., 1987). Present result was also in consistence with the findings of international pilot study on rural Bangladesh. The study reported that more than half of the identified disabled children were mentally retarded (Zaman,1982). It might be contended that the comparative higher rate of SMR, MMR and ODD in developing countries like Bangladesh, where about 47% of the population lies below the poverty line, was an anticipated outcome

of the prevailing low income economy that affects the infrastructure of the nation.

Gender differences: Contrary to the generally established male preponderance in the prevalence of serious mental retardation, prevalence of SMR, as well as other serious developmental disabilities were high for girls as indicated by the present study (table 3.19). Corresponding to the present findings, Mulcahy and Reynolds (1985) had failed to find any clear evidence of such positive sex ratio of male patients that often considered characteristic of Down's syndrome. Similar results was also evident in the study of Pakrasi et.al., (1987). Examination of the obtained odd ratio indicated that being a boy appeared to be a protective factor for serious developmental disabilities (table 3.20). Higher rate of male for mild mental retardation as found in the present study (table 3.19) was consistent with earlier findings (Blomquist, Gustavson and Holmgren, 1981; Richardson, et.al., 1986). Both the results could be accounted to socio-cultural perspective of the people of Bangladesh. Since male child happened to be more preferred in our society, parents had more favourable and protective outlook for them regarding health matters (Zaman and Rahman, 1980). Therefore, antecedent conditions were less threatening for boys than girls to predispose them for any serious disabilities. Boys in such cultural setting, in general, lavished more family care, while female chid survived amidst varying degree of deprivation and neglect. It seemed possible that various stress

factors had tended to increase the risk of mental retardation in female children (Pakrasi, et.al.,). On the opposite, due to social stigma attached to mental retardation, parents tended to be evasive regarding female child suffering from mild mental retardation. Sincere response to screening questionnaire in this regard was skeptical, many of these female children might have been left out while screened at the community level.

Age variation: Results of the present study also indicated substantial evidence of age variation in the prevalence of mental retardation, favouring older age (table 3.19). Such differences were usually more visible for MMR. Greater prevalence at older age group had often been regarded as a function of high but decreasing mortality rate at all ages (McLaren and Bryson,1987). Following the usual trend, in the present study both SMR and ODD were more prevalent in older age group. But not surprisingly enough, no such pattern was evident in case of mild mental retardation. Several reason for such findings might be extended. In contrast to serious mental retardation, it was difficult to determine the time of onset of impairment and disability for mild mental retardation. Besides such mild retardation might not persist throughout the life. The propensity of many mildly retarded children to be gradually integrated into the society of less developed countries due to simplicity of its life, with advancing age was more presumable. Such likelihood of person suffering from mild form of disability to manage and overcome their social limitations and to become

indistinguishable from the general population was also suggested by Stein and Susser (1984). However examining the odd ratios older age was not evident to be a significant risk for the occurrence of neither serious mental retardation nor other developmental disabilities (table 3.20).

Rural-Urban discrepancies: Present findings revealed higher prevalence of both mental retardation and other developmental disabilities in urban areas than that in rural areas (table 3.19). This disagreed with the previous findings of Akesson (1974), Welleshley et.al.,(1991) and Diaz and Gestal (1987) that retardation, specially intellectual, were more prevalent in rural area than in urban area. Such results were expected in developed countries because rural areas were considered to be emotionally and culturally more depressed areas. Illiteracy, lack of knowledge about basic health care, improper family planning, poor obstetric care make rural children more viable for infection, birth trauma, and other negative conditions that have detrimental effect on child development. Children of rural areas were more deprived of stimulation, which was more a consequence of lack of knowledge and poverty than deliberate neglect (Brown, 1983). Though such adverse features were also characteristics of rural areas of Bangladesh, argument for present disputable results might be that urban area of Bangladesh were more densely populated and majority dwell in the slum areas, where conditions detrimental to health were perhaps more prevalent than rural areas of Bangladesh. This feature also

signified the trend of migration of poorest from the rural to urban areas. As opposed to O'Connor and Tizad (1956) contention, urban rather than rural setting of Bangladesh demand initiative and independence as an important trait. Social support was possibly less in urban than rural area. Moreover, children residing in urban area were more exposed to environmental menace, such as road accidents, industrial polution and mishaps. Accordingly, the present finding was not an unanticipated outcome of the typical disparate social demand of rural and urban community of the country. Support for present reasoning could be sought from the study results of Finnstam, Gunnar, and Rashid (1989) in Pakistan having comparable social formation. In their study impairments were somewhat more common in the urban slum than in the villages.

Associated Disabilities: Comparative figure of associated disabilities with serious and mild mental retardation (figure 3.5) represented in the present study conformed the results of the previous studies that number of associated disorders increased with severity of retardation (Baird and Sadovnick, 1985; Fishbach and Hull, 1982). Motor disability as found by the present research was the most common among the SMR, while greater percentage of MMR had hearing disability. Cerebral palsy and other motor impairments had been found to be common disorder associated with mental retardation. Though epilepsy had consistently been shown to be the most common single disorder, the percentage of seizure in mentally

retarded children were low for SMR and nil for MMR. Hearing and visual problem were found to be associated with both SMR and MMR in the present study. This finding was in compliance with the study of Gillberg, Persson, Grufman, and Themner (1986), who had reported sensory impairments in 10 to 20% of the cases.

The present findings on the prevalence of mental retardation and other developmental disability indeed portrayed the enduring condition of children suffering from developmental disabilities in Bangladesh, and duly depicted the necessity of uncovering the underlying factors that raise the risk of mental retardation and other developmental disabilities. Accordingly, the utmost quest of the present study was to delineate impact of various demographic, maternal, medical and social factors on risk of developing mental retardation and other developmental disabilities, which would now be addressed.

4.3: Potential Risk Factors Associated with Serious Mental Retardation and Other Developmental Disabilities:

(i) Risk Factors for Serious Mental Retardation:

Demographic factors: Present study attempted to explore the role of demographic variables as predictors of serious mental retardation and developmental disabilities. Variables investigated were 'more family member', 'density' and 'less caretaker' as

indicative of poor housing situation as well as urban habitation and illiteracy. Apprehension of gender and age difference as a probable risk had already been regarded beforehand along with the issue of prevalence in previous section.

Poor housing situation: Poor and over crowded housing conditions have, with few exceptions, consistently been associated with poor mental and physical health conditions (Rahman, Rahman, Wojtyniak, and Aziz, 1985; Schoeman, Westawat, and Neethling, 1991). Negative relation with family size and intellectual competence have also been documented (Belmont, Stein, and Wittes, 1976, 1977; Pakrasi et.al 1987). None of the housing conditions examined under the present study was found to have significant bearing on serious mental retardation (table 3.20). One possible reason might be that since the study was confined only to serious type of disabilities (with exception for social class effect) impact of poor and over crowded housing conditions as indicated by 'more family member', 'density' and 'less caretaker' were not apparently manifested. As imparted by the odd ratio greater than one for the variable 'density' with a narrow range of 95% confidence interval quite closer to one was suggestive of some unfavorable consequences of overcrowding. Inspite of the fact that the children from larger families were in disadvantageous position compared to those from smaller homes in terms of 'share of family resources' and 'privacy'; the traditional bond that do still exist within the family members of joint family attributed to more solidarity and

integration than nuclear family in our country. Therefore, children of larger families in our country might experience less mental strain and feelings of competition than those from developed countries. As World Health Organization had pointed out that children brought up in nuclear families with many children were more likely to show problems in psychological development (WHO, 1977). However, previous studies had revealed dependency of family size effects on social class and birth order, the factors were not taken into consideration in the present study.

Illiteracy: Literacy rate was invariably shown to be the most important factor having strong negative correlation with infant mortality and net reproduction (Chaudhuri, 1987; Dellaportas, 1971). Education was expected to generate greater awareness about judicious child bearing and efficient childrearing practice. Present pursuit, however failed to find any significant relationship with neither father's or mother's educational level with serious mental retardation (table 3.20 and 3.21). Pakrasi (1987) though found proportionately more children with mental retardation among illiterate mothers but consistent with present findings (table 3.21) the difference among more educated and smallest educational group was not significant.

Urban habitation: Though the prevalence of serious mental retardation was high for urban area, as mentioned earlier in the previous section, the obtained odd ratios and 95% confidence

interval (table 3.20) indicated no inclination for urban habitation to be a significant factor raising the risk of having children with serious mental retardation.

Maternal Factors:

Maternal age: It was often advised that late pregnancies, of mothers aged 30 years or more, should be avoided to prevent the birth of retarded children, especially those with Down's syndrome (Stern, 1968; Abroms and Bennett, 1991; Mikkelsen, et al., 1983). On the other hand, children reared by very young mothers were also thought to be more likely to show developmental problems since they have more risk of having reproductive casualties (Penrose, 1949; Begab, 1976). In the present study mother's age whether young (<18) or older (>35) was not found to be related to serious mental retardation (table 3.21). One ground might be offered that mothers age reported in the study endure extreme doubt because majority of the mothers, especially from rural and less educated background could not report their exact age; as a result in many cases interviewer had to rely on guessing through relating to any memorable events like time of independence war, year of flood, famine, epidemic or other natural calamities. Other possibility might be that mothers age had repeatedly been reported to be related specifically to Down's syndrome. Since the study included all categories of serious mental retardation and the number of Down's syndrome baby was not presently known, the effect of mothers age might be subdued.

Consanguinity: Present findings positively supported the conviction that consanguineous marriage increased the risk of children with developmental problem. Consistent with the previous studies (Madhavan and Narayan, 1991; Janson et al., 1990), consanguinity was found to be significantly associated to serious mental retardation (table 3.21). Obtained odd ratio indicated that risk of serious mental retardation was about four times greater when parents were consanguineously married.

Medical Factors: Considerable document on the impact of detrimental pre-, peri-, and postnatal conditions in increasing the risk of such disabilities had been offered earlier. The importance of the role played by the medical dimension in explaining and predicting mental retardation and other developmental disability would now be considered.

Prenatal Threat: The importance of mother's health during pregnancy as having influence on the growth and development of the child had been an usual conviction. Present study reported that mothers who experienced greater threat like 'high blood pressure', 'bleeding' in the 1st trimester, 'infection' or any other problem during the prenatal period had 2.73 time more probability of having mentally retarded children than those without any such threat (table 3.22). To a certain extent pregnancy complication was also found to be important factor in severe mental retardation in the studies of Drillien (1978) and Hagberg (1978). Taylor and his associates

(1985) found strong association between severe mental retardation and severe hypertension, however they failed to find any significant association between disability and vaginal bleeding before 12 weeks' gestation.

Reproductive loss: No significant association between reproductive loss as indicated by gravidity, parity, and miscarriage, and severe mental retardation was established by the present results (table 3.22). Since it had been shown in various studies that there was a tendency for a repetition of some forms of reproductive casualties in the mother (Lilienfeld and Pasamanick, 1955), no ready explanation could be offered for absence of similar association. However the lower bound confidence interval above 0.90 for gravidity and parity implied remote possibility of some association with severe mental retardation suggesting more rigorous study in this respect.

Goiter: Widespread prevalence of goiter or iodine deficiency in South-East Asia (Ramalingaswami,1973) had led to the speculation of high risk of mental retardation and other developmental disability in mothers with goiter. Because iodine deficiency of the fetus which in its most common form characterized by mental deficiency, deaf mutism, and spastic diplegia, was the result of iodine deficiency in the mother (Hetzel, 1983). Nonetheless, present result declined to find any association between maternal goiter and severe mental retardation (table 3.22) which might be due to

current awareness building programme on goiter prevention and readily available of supplementation with iodized salt and iodized oil.

Preterm birth, birth asphyxia, and perinatal complication: Retrospective nature of the data that relied heavily on recall method could be extended as a reason for present contradictory findings of no positive association with preterm birth, birth asphyxia or other perinatal complications (table 3.22). In addition, close examination of the connection between these perinatal factors and neurodevelopmental disorders had indicated that the particular risk due to these perinatal factors would arise depended largely on whether frank neurological damage had supervened or not (Stembera etal., 1985, Fryns, Kleczkowsk, Dereymaker, etal., 1986). Frequency of such neurological damage was not ascertained in the present study. Yet examination of the lower bound confidence interval of above 0.90 for perinatal complication suggested the far-off possibility of some association with severe mental retardation.

Low birth size: Infants born having below average birth size were found in the present study to be 2.47 times more likely to develop severe mental retardation (table 3.22). Multiple reasons for small size at birth had been indicated that might have made the infant vulnerable to disease and infection (Allen, 1984). Since another logical postulate might be that low birth size babies would also be

of low birth weight, abundant support for the present finding could be accumulated from the earlier studies on extremely low birth weight infants evidencing long term adverse neurological outcome (Khadilkar et al., 1993; Brown et al., 1993).

Postnatal hazards: Examination of the present data revealed that infant who suffered from different types of ailment like, seizure, diarrhoea, difficult breathing etc., during the postnatal period had relatively higher risk (1.61 times more likely) of mental retardation than those not experiencing such threat (table 3.22). Infection, diarrheal disease, seizures, respiratory problem during postnatal period were consistently reported to be associated with infant development and mental retardation (Rubin and Davis, 1986; Rao, 1990; Wolf and Forsythe, 1989).

(ii) Risk factors for Other Developmental Disabilities (ODD) (include motor, visual, and hearing disabilities and seizure)

Demographic factors:

Poor housing and illiteracy: None of the housing conditions examined under the present study was found to have significant bearing on other developmental disabilities (table 3.20). Present pursuit, though failed to find any significant relationship with neither father's nor mother's educational level, with other developmental disabilities (table 3.20 and 3.21), but the presently

observed lower bound 95% confidence interval for other developmental disabilities did indicate a probable association with less educated father and other developmental disabilities (table 3.20).

Urban habitation: Though the prevalence of both serious mental retardation and other developmental disabilities were high for urban area, as mentioned earlier in the previous section, the obtained odd ratios and 95% confidence interval (table 3.20) indicated urban habitation to be of significant risk factor for other developmental disabilities. Misfortune of urbanization might bear more leverage on ensuing disabilities which involved visual, hearing, motor problem, or seizure.

Maternal factors:

Mothers Age and Consanguinity: In the present study mother's age whether young (<18) or older (>35) was not found to be related to other developmental disabilities (table 3.21). However, the risk of other developmental disabilities were also found to be much greater (6.57 times more likely) among consanguineously married couples, suggesting importance of genetic basis for various developmental disabilities. However, the present study recognized the necessity of assessing the relative risk of consanguinity for specific types of developmental disabilities.

Medical factors:

Role of pregnancy complication in the aetiology of other forms of neurodevelopmental disabilities has been less well studied, however, data of Taylor et al., (1985, 1993) suggest that pregnancy and delivery complication may in many cases lead to neurodevelopmental disabilities. Contradicting the former notion, other developmental disabilities was not found to have any significant positive association with any reproductive loss or prenatal threat (table 3.22). Similarly other adverse medical conditions regarded in the present study such as goiter, preterm birth, birth asphyxia, low birth size, perinatal complication and postnatal hazards were also not found to have any significant association with the other developmental disabilities. This might imply that such adverse conditions were more effective in raising the risk for serious mental retardation rather than other developmental disabilities. Another conjecture might be that specific causes were often more responsible for specific type of disability, but since all other forms of developmental disabilities ie., motor, visual, hearing, and seizure, were embraced into single category in the present study, the effect, if any, might have either been nullified or not been revealed. Absence of any indication on the frequency of damage in central nervous system due to prenatal and perinatal condition might as well be a rationale for the apparent low risk found for other developmental disabilities.

(iii) Social Inequality and Mental Retardation: It could be stated irrefutably that the present findings (table 3.23) was in accordance with the recount of high rate of MMR compared to SMR in lower socioeconomic class established in developing countries signifying the relevance of social inequality as a potential risk factor for MMR (Broadhead, 1973; Tarjan, et.al., 1973; Stein and Susser, 1983). Current deduction would be that though there exist a wide difference in the prevalence rate between developing and developed countries, the pattern of the disabling situation was still alike. This difference in the prevalence of mental retardation by social class suggested to the importance of social environment, possibly implying that when retardation was not organically caused was determined by individual exposure. This study, however, had not distinguished social factors from biological factors. Nevertheless, conforming the previous studies, it indicated that social environment in which the child was reared, as reflected by educational background, residential circumstances, occupational status as an entity, were important in the genesis of child developmental delay and intellectual deficits (table 3.24). Besides as Cohen et.al., (1982) had pointed out developmental outcome of a biologically high risk infant could also be dependent on the socioeconomic status of the infant. Lower social class were socially and economically disadvantaged in relation to upper class and consequently their chances for survival appeared to be poorer. Such unanimity was also substantiated by other studies on health and disease (Potter, 1991; Marmot, et.al., 1987; Marmot, 1989;

Smith, Leon, Shipley, and Rose, 1991). Life style and exposure difference between social class lead to such disparity in health status. It should be noted that the relationship of poverty and deprivation to retardation was, however, associative and not causal (Begrab, 1976).

The socioeconomic status thus deemed to have appreciable influence on the prevalence of mild mental retardation. Socioeconomic effects was felt to be exhibited at all stages of birth - prenatal, perinatal, and postnatal. Pregnant women at low socioeconomic levels were less likely than others to receive prenatal care and might be less knowledgeable about risks concerning mental retardation. As an aftermath they tended to experience a higher risk of prematurity, low birth babies, infection, malnutrition and other detrimental conditions that increased the risk of mild mental retardation. Lack of stimulation and proper life chances also shared its toll for such disproportionately higher rate of prevalence of mild mental retardation. Various studies had also identified various family characteristics, such as greater number of children, crowdedness, low level of parental education, poor household amenities, ethnic segregation, family disorganization etc., associated with lower social class to be related to identification of children as mentally retarded (Osborn et.al., 1984; Nazman, et.al. 1992).

Selection of lower 15% as the lower level of social class though was arbitrary, it might be argued that about 15% of the study population scored one SD below the total mean score for all areas. Further, prevalence of MMR seemed to be higher in the 1st decile than the SMR or ODD (figure 3.6). Regardless, supporting analysis at higher level, lower 25% and 33% of the index also conformed the reported findings and the assumption that MMR rather than SMR or ODD were more prevalent in under privileged class.

(iv) Independent Effect: Adjusted odd ratio for lower social class and rural/urban area (table 3.24) indicated that influence of adverse social class on the prevalence of mild mental retardation was independent of rural/urban discrepancy, while the outcome that other developmental disabilities were more prevalent in urban area was also independent of social class influence (table 3.24). Similarly, effect of consanguinity on the prevalence of serious mental retardation and other developmental disabilities was also independent of lower social class influence (table 3.25).

Results of the present study indicated the significance of prenatal threat, low birth size, and postnatal hazards in augmenting the risk of having children suffering from serious mental retardation. Consanguinity was found to be a portentous risk factor for both serious mental retardation and other developmental disabilities. Urban habitation asserted to bear higher risk for other developmental disability. No such inclination was found for

serious mental retardation. Adverse social condition was contended to be associated with mild mental retardation but neither with serious mental retardation nor other developmental disabilities.

Conclusion and Recommendation:

The study emphasized the presence of certain association between detrimental pre-, peri, and postnatal factors, and increased risk of having serious mental retardation. Eminence of consanguinity as a significant factor that raised the risk of serious mental retardation and other developmental disabilities focused on the benefits of genetic counselling, improved maternal health, proper obstetric and postnatal care in reducing the risk of serious mental retardation. It also maintained the favour of having medical risk inventories to facilitate early identification of high risk infants that would expedite effective early intervention programme. Insufficient evidence of any relationship between various demographic or maternal factors were more symptomatic of inter-relatedness and dependency among them, suggesting more careful and intensive probe into the problem.

It could be viewed that present social class analysis hold the potential for examining the way that the organization of society produced substantial effects (increament or decreament) in intellectual development, broadly speaking on health and disease. In circumstances, where a great many people lived in sub-standard

life condition in Bangladesh, the study result offered a good argument for raising awareness and concern about the adverse impact of such social disparity on the nation's children who were the victim of poverty and deprivation.

Social class was a complex construct, which provided the basis for distinguishing differences in behavioural, cultural, and economic characteristics. Its measurement should be targetted to the specific circumstances of various subgroups within a culture (Natale, et.al.,). The present study recognized that much remained to be learnt about interaction effects among various characteristics of social and physical environment in families living in poverty as put forward by Weber et.al.,1981. Need to establish which were the relevant social factors rather than considering social factors as an entity was also acknowledged. Further studies in this domain should take these issues into account.

Present effort to extend a Socioeconomic Index of Family featured the significance of living conditions and education in Bangladesh as suggestive of health awareness rather than economic standing solely based on occupation or income. An important characteristic of some socioeconomic variable was that they could be manipulated by public effort. This was true of education and employment for example. Accordingly data on household conditions served as additional support benefiting the ranking of social position in

health related survey. No effort was beyond limitation. Author acknowledged the limitations of the amount of information collected as noted by the discrepancy in comparative factor loading for rural and urban area (table 3.10). None of the socioeconomic variables could be defined without reference to the specific setting. Moreover some data on household structure such as 'occupational category', 'ownership of a house' had not proved especially valuable because of the narrow definition. Difficulty in obtaining accurate data on income and reqirement of more detail information for satisfactory occupational ratings, placed heavy reliance on easily obtainable and acceptable data on education. Additional caution in data collection could have ascertained their use in the analysis.

Moreover, a number of other limitation do also exist. It was important to be aware of some problems implicit in the sampling and collection of the data. Caution should be taken in interpreting the data for general commitment. Choice of measures depended on the availability and validity of information. In addition, as referred before, the associated indicators do not reflect causal relationships.

Based on the present findings the study extended few recommendation related to further research on potential risk factors for mental retardation and other developmental disabilities.

(a) Future studies should center around pronouncing any cause and effect relationship, if exist between the proclaimed risk factors and the developmental disabilities concerned through launching cohort studies.

(b) Probe into the inter-relatedness and inter-dependency of the factors should be an integral component of any further exploration in this area.

(c) Since presence of acquired lesion of the central nervous system in the incidence of pre-, peri, and postnatal affliction was pivotal to the amount of risk sustained, determination of the frequency and extent of neurological damage should be considered in asserting the proportion of relative risk.

(d) On such basis, attempts on developing and evaluating developmental risk inventories for easy and early detection of high risk mother and children for developmental disabilities should be undertaken.

(e) Commencing search for identifying risk factors for different developmental disabilities more specifically like mental retardation might prove more helpful for the policy makers.

(f) Consideration of socioeconomic status in considering the developmental outcome of biologically high risk infant would also be encouraging.

(g) Since no single environmental factor appears to be responsible for developmental outcome, cumulative effects of multiple risk factors in increasing the risk of developmental disability must be contemplated further.

(h) Because of wide dissimilarity between national and local circumstances, etiology or risk of developmental disability vary in importance from region to region. Development of regional data concerning prevalence and associated risk factors would be cost-effective and beneficial in adapting health care programme and policies to reduce disability.

(i) Constancy and pattern of influence expended by various risk factors over time might also be a pertinent issue to be contemplated in further studies in this area.

Few propositions regarding refinement of the Socioeconomic Index (SIF) had also been offered.

(a) It was suggested that use of average education of the family would have been more informative rather than that of only the head of the family.

(b) Rather than computing composite score for 'possession', assignment of weight according to the value of various items or using ranking order would have been more practical and authentic.

(c) Use of a single index but separate scoring scheme for rural and urban area would have reflected the heterogeneity that exist between the two region in our country.

(d) Consideration of the proportion of current distribution of rural/urban population would have generated more pragmatic measure of social status for Bangladesh.

In conclusion, despite the few drawbacks of the study, it would not be an exaggeration to pronounce it to be the best available data at present and that the facts and findings of the study would positively facilitate development of a 'frame of reference', helpful to understand the intensity of the situation in our country and locate the high risk population that ultimately would be valuable for generating any practical and worthwhile timely intervention and preventive services and awareness development programme. The present study highlighted the increasingly large domain of mental retardation and other developmental disabilities as one of the important public arenas in which psychologists and health personnel could make notable contributions by suggesting some direction to eliminate the barriers these children experience in achieving their life goals so that they may more adequately fulfill their roles and responsibilities with human dignity and prove themselves as prospectous citizen of Bangladesh.

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APPENDIX

A: Survey Questionnaires
   (1) Household Form (HF)
   (2) Mother-Child form (MC)
   (3) Ten Questions with Probes (TQP)

B: Medical Assessment Form (MAF)

C: Number of Children with Serious Motor, Visual, Hearing, and Seizure Disability

D: Table of Weights

E: Documentation of Demographic and Social Variables

F: IBAS Response Sheet

G: Discrepancy in Response to Consanguinity between MAF and HF Forms

H: Documentation of Medical Variables

I: Index of Father's Status.

 File; BBHAF

Household Form (HF) (April 1987 Revision)

Interviewer: Complete one HF for every household in the area with at least one 2 to 9 year-old child.

Household Number: |__|__| |__|__|__|__| HF1
Area Site House Number

Head of Household's Full Name: _____

Address or Village: _____

What kind of work does (or did, if retired) the head of the household mainly do? |__| HF2

Use locally relevant categories, for example:

1. agricultural 2. fishing 3. unskilled labor
4. business/sales 5. clerical/service 6. skilled/professional work
7. mainly unemployed 8. other, specify _____ 9. no information

---

Interviewer Visits

	1	2	3	Final Visit	
Date(day/month/year):	__/__/__	__/__/__	__/__/__	__ __ __ __ __ __	HF3
Interviewer's Number:	__ __	__ __	__ __	__ __	HF4
Result 1. completed	__	__	__	__	HF5

2. not home
3. postponed
4. refused
5. partly completed
6. other (explain)

Interviewer: If the interview is refused or not completed for another reason, please complete the Refusal Information on page 4(reverse side of page 3) of this form.

	Field Edited By.	Office Edited By.	Keyed By
Name	_____	_____	_____
Date	_____	_____	_____

Household Number:___/___/__ __ __
Area Site House Number

Interviewer: Codes "9" and "99" generally indicate"no information".
Use this codes only after probing to try to get the correct information.

Which category best describes the ethnicity and/or religion of members of the household? |__| HF6

(Codes to devised for locally relevant categories)

How much land is owned by members of the household? |__| HF7
. none less than half acres Half acre
or more

Does the owner of the household own this house or rent it? |__| HF8
1. owns the house 2. rents the house

How many rooms are there in your house? |__|__| HF9

Does your house have: Electricity?	YES |__| NO |__|	HF10
A Radio	YES |__| NO |__|	HF11
A Television	YES |__| NO |__|	HF12
A Refrigerator	YES |__| NO |__|	HF13
V.C.R.	YES |__| NO |__|	HF14

Does any member of your household own:

A Bicycle	YES |__| NO |__|	HF15
A Motor cycle	YES |__| NO |__|	HF16
A Car or Jeep	YES |__| NO |__|	HF17
A Boat	YES |__| NO |__|	HF18
Bullock cart	YES |__| NO |__|	HF19
Ploughing or milking cow	YES |__| NO |__|	HF20
Shallow tubewell	YES |__| NO |__|	HF21

What is the main material of the floor of your house? |__| HF22
1. Earth/sand 2. Cement
3. Wood 4. Other(specify)

File: REAMIC

Mother-Child Form (MCF)

(May 1987 Version, Bangladesh)

ONE FORM TO BE FILLED OUT FOR EACH SET OF CHILDREN IN THE HOUSEHOLD WHO HAVE THE SAME MOTHER.

Household Number: ☐ | ☐ | ☐ ☐ ☐ ☐ MC1

Area Site House

Mother Number: ☐ MC1

Interviewer's Number: ☐☐ MC2

Head of Household's Full Name: _____

Relationship of mother to head of the household: ☐ MC3

1. self 2. wife 3. mother
4. daughter or granddaughter 5. daughter-in-law 6. other relative
7. servant 8. other nonrelative

Relationship of informant to mother: ☐ MC4

1. self 2. father of the child/children
3. parent of the mother (grandparent of the child/children)
4. other relative of the mother 5. other (specify)

In what month and year were you (the mother) born? ☐☐/☐☐ MC5

(don't know=98/98) Month Year

How old were you (the mother) at your last birthday? (don't know=98) ☐☐ MC6

What was the highest level of school you (the mother) attended? ☐ MC7

1. never attended school 2. primary 3. secondary 4. higher

Can you (the mother) read a letter or newspaper easily, with difficulty, or not at all? ☐ MC8

1. easily, 2. with difficulty, 3. not at all

Do you (the mother) now work outside the home? YES ☐ NO ☐ MC9

If yes, ask:

What kind of work do you (the mother) mainly do? ☐ MC10

Use locally relevant categories, for example:

1. agricultural 2. fishing 3. unskilled labor
4. business/sales 5. clerical/service 6. skilled/professional work
7. other 8. not applicable 9. no information

Do you (the mother) earn wages for your work? YES ☐ NO ☐ MC11

Were you and your husband (the child's mother and father) related to each other (for example, as cousins or as uncle and niece) before marriage? YES ☐ NO ☐ MC12

Area ___ Site ___ House ___ ___ Mother ___

BIRTH HISTORY:

Note: The questions below concern live births only.
Do not record miscarriages, abortions or stillbirths.

How many times have you (the mother) given birth to a live baby? ☐☐ MC13

Have any of your (the mother's) babies or children died? YES ☐ NO ☐ MC14

If yes, enter number ☐☐ MC15

How many of your children are now living? ☐☐ MC16

Note: MC16 should equal MC13 minus MC15. If not, ask again and make corrections.

Interviewer: Say to the respondent: "Now I would like to talk to you about your (the mother's) births, starting with the first one you (the mother) had, and including all, whether still alive or not." First complete column 1 by asking her to list the name of each child, beginning with the first born and ending with the last born. Then go back and ask the sex, birthday and other information for each child, and record the information.

What name was given to your (first, next) baby?	Is (NAME) a boy or girl? (circle one)	In what month & year was NAME born?	Is (NAME) still alive? (circle one)	If dead, how old was (NAME) when he/she died? RECORD DAYS IF <1 mo., MONTHS IF <2 YEARS, OR YEARS	If alive, how old was (NAME) at his/her last birthday? RECORD AGE IN COMPLETED YEARS	If alive, is he/she living in this house? (circle one)	Child Number
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	01
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	02
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	03
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	04
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	05

Area ___ Site ___ House ___ ___ Mother ___

_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	06
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	07
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	08
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	09
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	10
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	11
_____	boy girl	__ __/__ __ mo. yr.	yes no	days: ☐☐ months: ☐☐ years: ☐☐	age: __ __	yes no	12

Interviewer: Circle the child number of each 2 to 9 year-old child listed above who is still living and lives in this house. Then complete one Ten Questions with Probes Form (TQ) for each child whose number is circled. Use the child numbers assigned above on the child's TQ form.

Use additional sheets if one mother had more than 12 live births.

Enter the number of TQ forms to be completed for children listed on this form ☐ MC17

File: REATQ

TEN QUESTIONS WITH PROBES (TQP)

May 1987 Revision (Bangladesh)

Household Number: ☐.☐.☐☐☐☐ HF1

Mother Number:..... ☐ MC1

Child Number:..... ☐☐ TQ1

Interviewer Number:..... ☐☐ TQ2

Date of Interview (day/month/year): ☐☐/☐☐/☐☐ TQ3

Child's Name: _____

Head of Household's Name: _____

Child's Month and Year of Birth (month/year):..... ☐☐/☐☐ TQ4
(98/98=not known)

Child's Age (in completed years):..... ☐ TQ5

Child's Sex:.....BOY ☐ GIRL ☐ TQ6

Child's Place of Birth:..... ☐ TQ7
(*Provide codes for up to 7 locally relevant categories,* 9=not known.)

Does the child attend school regularly?.....YES ☐ NO ☐ TQ8

Who will answer the questions about the child?..... ☐ TQ9

1. the child's mother
2. the child's father
3. the child's grandmother
4. the child's sibling
5. another relative
6. other

Is the informant one who mainly takes care of the child?.....YES ☐ NO ☐ TQ10

	Field Edited By	Office Edited By	Keyed By
Name	_____	_____	_____
Date	_____	_____	_____

CHILD'S ID NUMBER: __|__|__ __ __ __|__|__ __
Area Site House Mother Child

Ten Questions with Probes

stion 1. COMPARED WITH OTHER CHILDREN, DID THE CHILD HAVE ANY SERIOUS DELAY IN SITTING, STANDING OR WALKING? YES ☐* NO ☐ to11

If no, skip to Question 2.
If yes, probe: "Did the child walk by the age of 2 years?" YES ☐ NO ☐ to12

---

stion 2. COMPARED WITH OTHER CHILDREN DOES THE CHILD HAVE DIFFICULTY SEEING, EITHER IN THE DAYTIME OR AT NIGHT? YES ☐* NO ☐ to13

If no, skip to Question 3.
If yes, probe: "Is the difficulty only at night?". YES ☐ NO ☐ to14
"Can he/she see that?" (point to a small object in the home). YES ☐ NO ☐ to15
"Does he/she have some other eye problem?" YES ☐ NO ☐ to16
If yes to this probe, write down what the parent says:

---

stion 3. DOES THE CHILD APPEAR TO HAVE DIFFICULTY HEARING? YES ☐* NO ☐ to17

If no, skip to Question 4.
If yes, probe: "Can the child hear at all?" YES ☐ NO ☐ to18
"Does he/she have some other problem with his/her ears?" YES ☐ NO ☐ to19
If yes, write down what the parent says:

---

tion 4. WHEN YOU TELL THE CHILD TO DO SOMETHING, DOES HE/SHE SEEM TO UNDERSTAND WHAT YOU ARE SAYING? YES ☐ NO ☐* to20

If yes, skip to Question 5.
If no, probe: "If you ask him/her to bring you a cup (but you don't point), is he/she able to do it?" YES ☐ NO ☐ to21

---

stion 5. DOES THE CHILD HAVE DIFFICULTY IN WALKING OR MOVING HIS/HER ARMS OR DOES HE/SHE HAVE WEAKNESS AND / OR STIFFNESS IN THE ARMS OR LEGS? YES ☐* NO☐ to22

If no, skip to Question 6.
If yes, ask all of these questions:
"Does he/she need help in walking?" YES ☐ NO ☐ to23
"Can he/she use his/her hands to pick things up?" YES ☐ NO ☐ to24
"Does he/she have stiffness?" YES ☐ NO ☐ to28
"Does he/she have weakness?" YES ☐ NO ☐ to26

CHILD'S ID NUMBER: __|__|__ __ __ __|__|__ __
Dhaka University Institutional Repository — Area Site House Mother Child

stion 6. DOES THE CHILD SOMETIMES HAVE FITS, BECOME RIGID, OR LOSE CONSCIOUSNESS? YES ☐* NO☐ TQ27

If no, skip to Question 7.
If yes, probe: "Has he/she had a fit in the last year?" YES ☐ NO ☐ TQ28
"Do the fits interfere with his/her usual activities (like doing chores or going to school, if old enough)?" YES ☐ NO ☐ TQ29

---

stion 7. DOES THE CHILD LEARN TO DO THINGS LIKE OTHER CHILDREN HIS/HER AGE? YES ☐ NO ☐* TQ30

If yes, skip to Question 8.
If no, probe: "Can you tell me about something he/she seemed to have difficulty learning?" YES ☐ NO ☐ TQ31
"Does the informant give an example?" YES ☐ NO ☐ TQ32
If yes, write down her example:

---

estion 8. DOES THE CHILD SPEAK AT ALL (CAN HE/SHE MAKE HIMSELF/HERSELF UNDERSTOOD IN WORDS; CAN HE/SHE SAY ANY RECOGNIZABLE WORDS)? YES ☐ NO ☐* TQ33

---

estion 9. **FOR 3 TO 9 YEAR-OLD CHILDREN ASK:**
IS THE CHILD'S SPEECH IN ANY WAY DIFFERENT FROM NORMAL (NOT CLEAR ENOUGH TO BE UNDERSTOOD BY PEOPLE OTHER THAN HIS/HER IMMEDIATE FAMILY)? YES ☐* NO ☐ TQ34

If the parent responds "yes" check yes. If the parent cannot respond "yes" or "no" because the child cannot speak at all, leave Question 9 blank and skip to Question 10.
If no, skip to Question 10.
If yes, probe: "Does he/she stammer or stutter?" YES ☐ NO ☐ TQ35
"Does he/she have some other problem with his/her speech?" YES ☐ NO ☐ TQ36
If yes to this probe, write down what the parent says:

---

estion 9. **FOR 2 YEAR-OLD CHILDREN ASK:**
CAN HE/SHE NAME AT LEAST ONE OBJECT (FOR EXAMPLE, AN ANIMAL, A TOY, A CUP, A SPOON)? YES ☐ NO ☐* TQ37

If yes, skip to Question 10.
If no, probe: "Does he/she use his/her own words for things, like bow-wow for dog?" YES ☐ NO ☐ TQ38

CHILD'S ID NUMBER: __ | __ | __ __ __ __ | __ | __ __
Area Site House Mother Child

stion 10. COMPARED WITH OTHER CHILDREN OF HIS/HER AGE, DOES THE CHILD APPEAR IN ANY WAY MENTALLY BACKWARD, DULL OR SLOW? YES ☐* NO ☐ T039

If yes, probe: "Would you say that he/she is much behind other children his/her age, that he/she acts like a much younger child?" YES ☐ NO ☐ T040

ES THE CHILD HAVE ANY SERIOUS HEALTH PROBLEM IOT YET MENTIONED? YES ☐ NO ☐ T041

If yes, write down what kind of problem it is:

---

arviewer: Answer the question below by circling one of the three options. The questionnaire result positive if the response to any one or more of the Ten Questions has an esterisk (*) next to it. If no sponse has * next to it, then the result is negative.

yes No

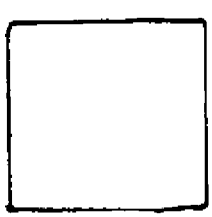
SHOULD THIS CHILD BE REFERRED FOR PROFESSIONAL EVALUATION? ☐ ☐ T042

1. No, because the questionnaire result is negative and there is no X in the box below.

2. Yes, because, although the questionnaire relult is negative, there is an X in the box below.

3. Yes, because the questionnaire result is positive.

For data entry only:
Does box the below contain an X ? YES ☐ NO ☐ T043



File: REAMAF1

MEDICAL ASSESSMENT Form (MAF)

(August 1987 Revision)

Household Number: ___ | ___ | ___ ___ ___ ___ HF1
Area Site House

Mother Number: ___ MC1

Child Number: ___ ___ TO1

Examiner Number: ___ ___ M1

Child's Name: _____

Head of Household's Name: _____

Child's Month and Year of Birth (month/year; if not known do not estimate, enter 98/98): ___ ___ ___ ___ M2

Child's Age (in completed years estimate if not known): ..... ___ M3

Child's Sex: Boy =1 Girl=2 ..... ___ M4

Who will answer the questions about the child? ..... ___ M5

the child's mother =1 the child's grandmother=3 another relative =5
the child's father =2 the child's sibling =4 other =6

Contents of the Medical Assessment Form — Pages

Instructions:

Part I. **History**. Administer as a semi-structured interview. Ask all the questions specified in this form. Use local terminology if necessary to insure that the informant understands the questions. After each question you may probe for additional information and use your clinical judgement to arrive at the answer. (For example, if a mother reports fits, but on questioning it appears the child fainted without ever actually having a seizure, do not code epilepsy.) Be sure to answer all questions. Most should be answered by writing the code in the space provided. Some of the questions require a brief answer in words.

Parts II, III, and IV, The **Examination**. Note special instructions on page 9 for the functional observation of the child. You may vary the order in which you carry out the various parts of the examination, except that the observation of function **must** come before the neurological (because only the children with problems noticed on the observation of function, are given the full neurological, page 13). All children receive all the other parts of the examination.

Part V The **physical measurements** and **hearing and vision screening** may be performed by either a doctor or by another health worker.

Part VI. The **Summary Sheet** must be filled out by the doctor after completing the assessment.

See Medical Assessment Procedure Manual for further instructions.

Prepared by: Leslie Davidson (USA) and Naila Khan (Bangladesh), Marigold Thorburn (Jamaica), Zaki Hasan (Pakistan), and Maureen Durkin (USA), with help from Zena Stein, Lillian Belmont and other colleagues in the Sergievsky Center and Judy Gravel, Victoria Sheffield and Karin Nelson.

For the projects: Rapid Epidemiologic Assessment of Childhood Disabilities in Bangladesh, Jamaica and Pakistan.

I. History

A. PERCEIVED PROBLEMS (ask the parent)

IS THERE ANYTHING ABOUT YOUR CHILD THAT WORRIES YOU?

Examiner: If yes, inquire about the problems and complete the table below. After recording the information for one problem area, ask about all other problem areas and complete the table. When no problem is perceived in an area, circle **No** and leave the remaining boxes blank for that area.

If no to the first inquiry, still ask specifically about each problem area and complete the table.

When more than one option in the table seems to apply, enter the main one in the box and write the codes for others in [ ] to the right of the box. In the box for family history, enter the smallest number that applies.

PROBLEM AREA	Does the parent perceive a problem? (circle No or Yes)	APPROXIMATE AGE AT ONSET IN MONTHS: at birth =888, d/k =998, (eg, at 1 mo=001) (estimate if exact age of onset is not known)	EVENT ASSOCIATED: none =1, prenatal =2, birth trauma =3, fever,infection =4, injury =5, malnutrition =6, other(specify) =7	TREATMENT RECEIVED: none =1, modern only =2, folk only =3, both =4, d/k =8	FAMILY HISTORY: none =1, parent =2, sibling =3, grandparent =4, 1st cousin,aunt,uncle =5, other blood relative =6, d/k =8
Walking: If yes, describe: _____	No Yes m6	m14	m21	m28	m35
Using Hands: If yes, describe: _____	No Yes m7	m15	m22	m29	m36
Hearing: If yes, describe: _____	No Yes m8	m16	m23	m30	m37
Vision: If yes, describe: _____	No Yes m9	m17	m24	m31	m38
Speech: If yes, describe: _____	No Yes m10	m18	m25	m32	m39
Seizures: If yes, describe: _____	No Yes m11	m19	m26	m33	m40
Learning: If yes, describe: _____	No Yes m12	m20	m27	m34	m41
Other: If yes, describe: _____	No Yes m13				

Additional Comments:

Child's ID: __ | __ | __ __ __ __ | __ | __ __

B. FAMILY: Are the parents of the child related to each other? ..... ___ m42
no =1 yes, as first cousins=3 yes, as distant cousins=5
yes, as uncle and niece=2 yes, as second cousins=4 unknown=8

C. SEIZURES: Ask these questions whether or not the mother said her child has seizures on page 1. Probe to find out the frequency of seizures, if these are associated conditions and find out the setting in which they occurred. Codes for questions 1 through 4 below: no=1 yes =2 unknown=8

1. Did (does) the child have febrile fits (fits with fever)? ..... ___ m43
2. Did the child have other provoked fits (fits with dehydration, shigella, meningitis, toxins, trauma (within 24 hours of trauma))? ..... ___ m44
3. Did the child have breath holding spells (loss of consciousness, in setting of anger, pain frustration, or crying)? ..... ___ m45
4. Has the child ever had unprovoked afebrile seizures? ..... ___ m46

If yes, please describe _____
If no, skip to section D.

5. If the child has had unprovoked afebrile seizures, how frequent and how current are they? never =1 >1 total but none in past 12 mos =3 unknown=8 ..... ___ m47
only 1 ever=2 >1 total & ≥1 in past 12 mos=4

6. Does the child get medication for seizures?

Code medications: no=1 yes=2 unknown=8

If yes to any, explain _____

Phenobarbital ___ m48
Dilantin ___ m49
Other Western ___ m50
Traditional / Herbal ___ m51

D. PREGNANCY (for birth of this child): Enter the correct numbers for gravidity, parity, stillbirths and spontaneous abortions that applied at the time of this child's birth. Gravity is defined as the total number of pregnancies before this child (and counting this child). Parity is defined as the total number of actual births before this child (and counting this child).

Gravidity ___ ___ m52
Parity ___ ___ m53
Stillbirths ___ m54
Spontaneous Abortions ___ m55

When the mother was pregnant with this child did she have:
Code: no=1 yes =2 unknown=8

High Blood Pressure? ___ m56
Bleeding 1st trimester? ___ m57
Infection/Fever 1st trimenster? ___ m58
*Other Health Problems? ___ m59
Did she have antenatal care? ___ m60
Has she ever had a goiter? ___ m61

*Do not include here problems with veins, pyelonephritis, moderate vomiting or mild conditions.

E. BIRTH:

Where was the child born? Home=1 Hospital =2 Clinic/Birthing Center=3 Other=4 Unknown=8 m62

Was it a single birth? Single birth=1 Twins =2 Triplets or more=3 Unknown=8 .... m63

Was the baby born at 9 months? Yes=1 No, >1 mo.early=2 No, >2 weeks late=3 Unknown=8 ..... m64

Child's ID ___ ___ ___ ___ ___ ___

BIRTH continued:

How long was the labor? <24 hours=1 >24 hours=2 Unknown=8 ___ m65

Who assisted in delivering the baby? Trained midwife/TBA=1 Doctor=3 Other=5 ___ m66
Untrained TBA/dai=2 Family member=4 Unknown=8

Were there any difficulties at birth? No=1 Yes=2 Unknown=8 ___ m67
If yes, explain: _____

In what position did the baby come out? Head first=1 Feet first=3 Unknown=8 ___ m68
Bottom first=2 Cesarian=4

Did the baby cry immediately? Yes=1 No, after >5 minutes=3 ..... ___ m69
No, but in ≤5 min.=2 Unknown=8

Did the birth attendant have to do anything to the baby to make it breathe? ..... ___ m70
If yes, why _____ No=1 Yes=2 Unknown=8

Was the baby taken away from the mother? No=1 Yes=2 Unknown=8 ..... ___ m71
If yes, why _____

If the baby was kept in a hospital, for how many days was it kept there? ..... ___ ___ m72

What was the birthweight in grams? 9999=Unknown ___ ___ ___ m73
(If given in pounds, write ____lbs. and ____oz. here _____, then convert to grams.)

How big was the baby at birth? About the size of most babies=1 Bigger than most babies=3 ___ m74
Smaller than most babies=2 Unknown=8

Did the child have any difficulties in the first four weeks?
Code: No =1
Yes =2
Unknown =8

Seizures ___ m75
Infection ___ m76
Trouble Feeding ___ m77
Yellow Color ___ m78
Tetany ___ m79
Diarrhea ___ m80
Difficulty Breathing ___ ...81

F. NUTRITIONAL HISTORY:

Was the child breast-fed & for how long? No, never=1 Yes, 7 - 12 mo.=4 Yes, >24 mo.=7 ___ m82
Yes, <1 mo.=2 Yes, 13 - 18 mo.=5 Unknown=8
Yes, 1 - 6 mo.=3 Yes, 19 - 24 mo.=6

When did the child start bottle feeding? Never=1 7- 12 mo.=4 After 24 mo.=7 ___ m83
Within 1st mo.=2 13 - 18 mo.=5 Unknown=8
1 - 6 mo. =3 19 - 24 mo.=6

At what age was solid food introduced? 3 - 6 mo.=1 After 12 mo.=3 Unknown=8 ___ m84
7 - 12 mo.=2 Not yet=4

Can the child feed himself or herself? (assess in accordance with local cultural norms). ___ m85
Yes, skillfully (with spoon/fork or fingers)=1 Yes, but unskilled (i.e., like a baby)=2 No, must be fed=3

Child's ID: __|__ ___ ___ ___|__|__

G. DEVELOPMENTAL HISTORY:

At what age did the child walk without help or holding on? ____ m9
(Note: Codes 4 and 5 do not apply to children under 3 years.)
By 18 mo.=1 | By 2 years=2 | Btw 2 &3 years =3 | By 3 years=4 | Later than 3 years=5 | Not yet=6 | Unknown=8

At what age did the child first use single words with meaning (other than names, hello or bye-bye)? ____ m10
(Note: Codes 4 and 5 do not apply to children under 3 years.)
By 18 mo.=1 | By 2 years=2 | Btw 2 &3 years=3 | By 3 years=4 | Later than 3 years=5 | Not yet=6 | Unknown=8

At what age did the child first put two or three words together? ____ m11
(Note: Codes 3 and 4 do not apply to children under 3 years.)
By 2 years=1 | Btw 2 &3 years=2 | By 3 years=3 | Later than 3 years=4 | Not yet=5 | Unknown=8

H. MEDICAL HISTORY:

Note. Use local expressions when discussing with the informant the diseases and medical problems mentioned in this form.

IMMUNIZATIONS: Refer to the child's immunization record if the mother brings is with her.

Has the child ever been immunized for:.....

Code: yes, complete=1; yes, but incomplete=2; no=3; unknown=8

- Polio ____ m12
- Whooping Cough, Diphtheria (DPT) ____ m13
- Tetanus Toxoid ____ m14
- TB (BCG) ____ m15

Ask the following question even if information on specific immunizations is recorded above.

Has the child had any immunizations? Yes=1 No=2 Unknown=8 ____ m16

Explain _____

Note: If the mother answers yes to any of the medical problems mentioned in the next few pages, inquire specifically if the event was the cause of any of the problems described by the mother in the beginning of the interview. If so, write it in this section and also on page 2 in the column called "Event Associated."

Note: For the remaining questions on medical history: If the answer is yes, enter the approximate age of the child in months when the event occurred. If the event occurred in the perinatal period, enter 001 for age. If approximate age is not known enter 998 for age. If the answer to the question is not yes, leave the spaces for age blank. AGE IN MO

Has the child ever had a bad infection in the brain, meningitis or encephalitis? ____ m94 ____ ____ m95
No=1 Yes=2 Unknown=8
If yes, describe: _____ « mm1brain

Has the child ever had a major injury, such as the following? (read all choices):
If no, enter 1 and leave age blank
If yes, indicate type of treatment and age.

Codes: No=1; In hospital=2; Outpatient=3; Home care=4; Unknown=8

- Motor Vehicle Accident ____ m96 ____ ____ m97
- Other Vehicle Accident ____ m98 ____ ____ m99
- Near Drowning ____ m100 ____ ____ m101
- Fall (1 level to another) ____ m102 ____ ____ m103
- Burns (not minor) ____ m104 ____ ____ m105
- Other ____ m106 ____ ____ m107

If yes to any, describe: _____ « mm2injur

Child's ID: ☐☐ ☐☐☐☐☐ ☐ ☐☐ (HF1 MC1 TO1)

H. MEDICAL HISTORY continued:

Has the child ever lost consciousness after an injury to the head? m108 m109
No, never=1 Yes, <1 week=3 Yes, >1 month =5
Yes, <10 minutes=2 Yes, <1 month=4 Unknown=8

If yes, describe _____ « mm3head

Has the child ever been poisoned by chemicals or cleaners or medicine? m110 m111
No, never=1 Yes, hospitalized=3
Yes, not hospitalized=2 Unknown=8

If yes, describe: _____ « mm4pois

Has this child had tuberculosis? No=1 Yes =2 Unknown=8 m112 m113

If yes, has he/she received treatment for tuberculosis? No=1 Yes=2 Unknown=8 m114 m115

Has this child had the measles? No=1 Yes mild=2 Yes severe=3 Unknown=8 m116 m117

If yes, describe _____

Has this child had whooping cough? No=1 Yes mild=2 Yes severe=3 Unknown=8 m118 m119

If yes, describe _____

Has the child ever been hospitalized? (at least overnight, other than at birth) m120 m121
No=1 Yes, once=2 Yes, >once=3 Unknown=8

If yes, enter age last hospitalized and describe _____

Has your child ever been very ill with diarrhea, vomiting and dehydration? m122 m123
No=1 Yes=2 Unknown=8

If yes, describe treatment _____

Has the child ever had any other major illness not mentioned so far? m124 m125
No=1 Yes=2 Unknown=8

If yes, describe _____

I. BEHAVIOR:

Does your child have any problems with behavior?

Code: No=1, Yes=2, Unknown=8

Does he/she:

Act very aggressively toward other people? ___ m126

Act extremely withdrawn and shy? ___ m127

Show odd repetitive movements? ___ m128

Other? ___ m129

If other, list problems: _____

_____

_____

_____

Physician: In your opinion, was the informant able to give an accurate history of the child? ___ m130
Yes=1 No, did not know child well=2 No, appeared muddled=3 Interviewer unsure=8

Additional Comments on History:

Child's ID: __ | | _ _ _ _ _ _ | _ | _ _ _

II. **OBSERVATION OF FUNCTION:** COMPLETE FOR ALL CHILDREN.

Instructions: **Observe** the child carry out the 7 tasks listed below.

As the child and informant come into the room:

1. Observe the child walking at least 5 steps into room. Watch carefully, looking for limp asymmetry of gait, toe walking, ataxia, involuntary movements, and atrophy of contractures.

2. Welcome the child and observe the response; does he or she hear, make an appropriate social response, smile, act shy, speak?

3. Invite the child to squat and to pick up a tiny object, such as a bead, coin or raisin (defined size), using each hand in turn. Observe carefully for fisting, asymmetry in grasp, absence of pincer grasp, or difficulty in seeing the object

4. Observe the child as he/she stands up: Does he/she need to use hands to get to an upright position? (proximal muscle weakness).

5. Elicit speech by asking the child questions such as: "What did you pick up?" "What is that?" (point to a raisin, chair, etc.) "What is this called?" (point to nose, ear, foot, etc.). "What is your name?" Watch for problems in hearing, speech and comprehension.

6. Ask the child to point to body parts (eyes, mouth, etc.). Observe for problems in hearing and comprehension

7. Give the child paper and a pencil and ask him/her to draw something. Scribble (for 2 year old) or draw shapes: circle (for 3 year old), square (for 4 through 6 year old), diamond (for 7 through 9 year old). Observe fine motor function and comprehension.

Rate the child in the following areas after observing the above 7 tasks:

Code: **Pass=1**
Fail=2
Uncertain=3
No response=9

Gross Motor

Fine Motor

Hearing

Vision

Speech (Motor)

Speech (Language)

Comprehension

Then have the child undress for the rest of the examination.
Complete the physical examination (pages 10 - 13) for all children.
Some children must have the neurological examination in addition to the physical.
Use the criteria outlined below to determine whether or not to complete the neurological exam for this child.

CRITERIA FOR DETERMINING WHICH CHILDREN MUST HAVE THE NEUROLOGICAL EXAM:

Give the neurological exam if:

1. The child fails or scores "uncertain" in any of the 7 areas rated above, or
2. Any of the following are true:
   a. the informant mentions that the child has had any neurological, sensory or cognitive problems.
   b. the physician notes microcephaly, macrocephaly or any atrophy on the physical exam.
   c. the physician suspects hearing or vision impairment.

Physician: Do you think, based on the interview with the informant and this brief observation that the child has a neuromuscular, vision, hearing or cognitive impairment?

No=1 Yes=2 Uncertain=8

PLEASE DO NOT CHANGE YOUR ANSWER TO THIS LAST QUESTION AFTER COMPLETING THE REST OF THE EXAMINATION.

Additional Comments on the Observation of Function:

Appendix-E: Documentation of Demographic and Social Variables

Code	Variable Name	Value Lable	Value
HF2OCC MC10TYPE	Father Occupation Mother Work Type	Agriculture	1
		Fishing	2
		Unskilled	3
		Business	4
		Clerical/Service	5
		Skill/Profession	6
		Unemployed	7
		Other	8
		No Information	9
MC9WORK MC10WAGE	Mother Work Mother Paid	No	1
		Yes	2
A1FEDU MC7LEVEL	Father Education Mother Education	None	1
		Primary	2
		Secondary	3
		Higher Secondary	4
		Above	5
MC8READ	Mother Read	Not At All	1
		With Difficulty	2
		Easily	3
HF8ETH	Religion	Islam	1
		Hindu	2
		Christian	3
		Buddist	4
HF7LAND	Amount of Land	None	1
		Less than 1/2 acre	2
		More than 1/2 acre	3
HF8OWN	Ownership of House	Own	1
		Rented	2
HF9ROOMS	Number of Rooms	(number)	#

Code	Variable Name	Value Lable	Value
HF10ELEC to HF21TUBE	Possession	No	0
		Yes	1
HF23FLR	Type of Floor	Mud	1
		Cement/Wood	2
HF23DW HF24OTHW	Drinking Water Other Water Source	Other	1
		River	2
		Well	3
		Public Tap	4
		Yard Tap	5
		Home Tap	6
HF25TOIL	Type of Toilet	None	1
		Bucket/Other	2
		Pit	3
		Flush	4
HF26OLD to HF29	Member	(number)	#
MC6AGE	Mother's Age	(number)	#
MC12CON and M42CON	Consanguinity	No	0
		Yes	1
MC15NO	Any Dead Child	(number)	#
TQ7BIRPL	Birth Place	Own House	1
		Mother's House	2
		Inlaws' House	3
		Relatives' House	4
		Maternity Center	5
		Hospital	6
		Private Clinic	7
M4SEX	Gender	Male	1
		Female	2
M3AGE	Child's Age	(number)	#

CHILD'S ID NUMBER: ___ ___ ___ ___ ___ ___
Area Site House Mother Child

ADAPTIVE BEHAVIOUR SCALE
RESPONSE BOOKLET

CLIENT

NAME: _____ SEX : _____

DATE OF BIRTH _____ D ___ M ___ YR AGE ___ YR ___ M ___ D CLASS

FATHER	MOTHER
NAME : _____	NAME : _____
AGE : _____	AGE : _____
EDUCATION : _____	EDUCATION : _____
OCCUPATION : _____	OCCUPATION : _____

ADDRESS : _____

_____

_____

TOTAL MONTHLY FAMILY INCOME : _____

RESPONDENT OTHER THAN MOTHER

NAME : _____

RELATION TO THE CHILD : _____

HOUSE HOLD NUMBER ___/___/___ ___ ___

MOTHER NUMBER ___

CHILD NUMBER ___ ___

EXAMINER NUMBER ___ ___

DATE OF EXAMINATION ___ ___/___ ___/___ ___

CHILD'S GRADE ___ FATHER'S AGE ___ ___ FATHER'S EDUCATION ___

Note: HF refers to Household Form
MC refers to Mother Child Form
TQ refers to Ten Questions
A refers to Independent Behaviour Assessment Scale
M refers to Medical Assessment Form

Appendix-G: Discrepancy in Response to Consanguinity betweem Medical (MAF) and Household (HF) Forms.

Forms		Household Form (HF)		
M A F	First Cousin Marriage	No Consanguinity	Consanguineous Marriage	Total
		685 (6.7%)	185 (1.8%)	871 (8.5%)
Total		9754 (95%)	545 (5.3%)	10299

Child's ID: __ | __ | ____ | __ | __

VI. Summary Sheet. COMPLETE FOR ALL CHILDREN. Examiner: For each type of problem listed below, indicate whether you think impairment is present or not. If impairment is present, indicate the diagnosis and ICD9 codes, the degree of disability (see MAF Procedure Manual for criteria), and whether or not the child has an unfulfilled need for treatment (including rehabilitation, medication, or referral for further professional evaluation and/or therapy)

TYPE OF IMPAIRMENT	DIAGNOSIS	ICD-9 CODE	DISABILITY	TREATMENT NEEDS
Is there impairment? (circle No for no or probably no, circle Yes for yes or probably yes.	see MAF Procedure Manual	see MAF Procedure Manual	1=none 2=mild 3=moderate 4=severe 8=uncertain	1=none 2=CBR 3=professional eval. 4=medication 5=2 & 3; 6=2 & 4 7=2, 3 & 4; 8=other
Gross Motor, No Yes m 248	m259	m270	m281	m292
Fine Motor, No Yes m 249	m260	m271	m282	m293
Hearing, No Yes m250	m261	m272	m283	m294
Vision, No Yes m251	m262	m273	m284	m295
Speech, No Yes m252	m263	m274	m285	m296
Seizures, No Yes m253	m264	m275	m286	m397
Cognition, (physician only) No Yes m254	m265	m276	m287	m298
Psychiatric, No Yes m255	m266	m277	m288	m299
Nutritional, No Yes m256	m267	m278	m289	m300
Other, No Yes m257	m268	m279	m290	m301
***Cognition,** (joint decision) No Yes m258	m269	m280	m291	m302

* Joint decision regarding cognition refers to the rating given by the physician and psychologist jointly. after discussion. If this differs from the physician's earlier rating do not change the earlier one.

Summary Comments:

Apendix-C: Number of Children with Serious Motor, Visual, Hearing, and Seizure Disability included within Other Developmental Disabilities (ODD) by Age and Gender Distribution

AGE	Motor		Visual		Hearing		Seizure	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
2	10	8	2	-	-	1	-	-
3	4	4	-	-	-	1	1	-
4	-	1	-	-	1	-	-	-
5	1	2	1	-	-	2	1	-
6	2	1	1	1	2	1	1	-
7	-	-	1	1	3	2	-	-
8	-	1	-	-	3	6	-	-
9	1	-	2	5	2	4	-	-
Tot	18	17	7	7	11	17	3	-

Appendix-D: Table of Weights

Status	All Kids
TQ+	1.1151
TQ-	10.8690

File: REA

Child's ID: ☐☐ ☐☐☐☐☐ ☐ ☐☐ (HF1 MC1 TQ1)

V. Anthropometry, Vision & Hearing: COMPLETE FOR ALL CHILDREN

Examiner Number: ___ ___ m230

A. PHYSICAL MEASUREMENTS:

Required for All Children.

*Optional for Mothers
Omit mother's if informant is not the mother.

Child's Height (cm.):	___ ___ ___	m231
Child's Weight (kg.):	___ ___.___	m232
Child's Head Circumference (cm.):	___ ___.___	m233
Child's Mid Upper Arm Circumference (cm.):	___ ___.___	m234
*Mother's Height (cm.):	___ ___ ___	m235
*Mother's Weight (kg.):	___ ___.___	m236
*Mother's Head Circumference(cm.):	___ ___.___	m237
*Mother's Mid Upper Arm Circumference (cm.):	___ ___.___	m238

Does the child's mother appear healthy? yes = 1 No, not quite healthy = 2 No, appears ill = 3 Uncertain = 8 d/k, mother not present=9 ___ m239

B. VISION & HEARING EVALUATION: ALL CHILDREN

VISION ACUITY: For 3-9 year-olds who can follow C or E chart instructions, use Landholt C chart if possible. Otherwise use E chart.

Code:
- 6/6 or better (20/20 or better) =1
- 6/9 or better (20/30 or better) =2
- 6/18 or better (20/70 or better) =3
- 6/60 or better (20/200 or better) =4
- 6/61 - light perception (20/20l thru light perception) =5
- No light perception =6
- Untestable =8

Right Eye ___ m240
Left Eye ___ m241

VISION ACUITY: For 2 year-olds and older children who cannot follow C or E chart instructions, use "fix and follow" test.

Code:
- 1/32 k =1
- 1/8 k =2
- 1/2 k =3
- 6 k =4
- Failed All =5
- N/A, used C or E=7
- Untestable =8

Right Eye ___ m242
Left Eye ___ m243

HEARING: Code: 1=Pass 2=Fail
For 2 year-old children use Downs test.
For 3-9 year-old children use audiometer.

Right Ear ___ m244
Left Ear ___ m245
Overall ___ m246

Was the audiometer used to screen this child's hearing? No=N Yes=Y ..... ___ m247

If yes, indicate the screening cutoff in dB for the particular site/day and whether the child passed or failed at each Hertz level given in the table below (enter 1 for pass and 2 for fail).

Screening Cutoff		Hertz 500	1000	2000	4000
___ dB	Right ear	___	___	___	___
	Left ear	___	___	___	___

Comments:

Child's ID: __ | __ | __ __ __ __ | __ | __ __

PHYSICAL EXAMINATION continued:

Codes: No=1, Yes=2, Uncertain=8

CHEST:	Rales	___	m178
	Wheezy	___	m179
COR:	Murmur	___	m180
ABDOMEN:	Distended	___	m181
	Hepatomegaly	___	m182
	Splenomegaly	___	m183
GENITALIA: (Code 1 for girls)	Large Testes	___	m184
	Undescended Testicles	___	m185
SPINE:	Kyphosis	___	m186
	Scoliosis	___	m187
	Spina bifida	___	m188

EXTREMITIES: (Arms, Legs and Feet)

Code: **All Normal=1**, Right Arm=2, Left Arm=3, Both Arms=4, Right Leg/Foot=5, Left Leg/Foot=6, Both Legs/Feet=7, One Arm & One Leg/Foot=8, Both Arms & Legs/Feet=9

Wasting	___	m189
Abnormal Angulation	___	m190
Contractures	___	m191
Absent	___	m192
Atrophy	___	m193

HANDS:

Code: **Both Normal=1**, Right Hand=2, Left Hand=3, Both Hands=4

Absent	___	m194
Partial Absence	___	m195
Digits Extra (Abnormal)	___	m196
Short Fingers	___	m197
Fisting	___	m198

Physician: In your opinion, did this constitute an adequate physical exam of the child? ___ m199

Yes=1 No, child uncooperative=2 3=No, not enough time=3 Not sure=8

Does this child get a full neurological examination based on results from Observation of Function, Physican Examination, or History? ___ m200

No=1 Yes=2

Additional Comments on the Physical Exam:

Child's ID: __|__|__ __ __ __|__|__ __

IV. NEUROLOGICAL EXAM: FOR ALL CHILDREN WHO FAIL OR SCORE UNCERTAIN ON THE OBSERVATION OF FUNCTION.

MOTOR EXAM:

Mobility:

Normal Gait = 1
Not normal, but ambulant, no aids, independent = 2
Ambulant with aids, independent = 3
Ambulant with aids, limited = 4
Not ambulant, wheelchair only, but independent = 5
Not ambulant, wheelchair only, limited = 6
Not ambulant, bed ridden or wheelchair = 7
Uncertain = 8

___ m201

Manual Dexterity: (Observed during the Observation of Function)

Normal = 1
Slight Impairment = 2
Moderate Impairment = 3
Marked Impairment = 4
No useful function = 5
Unknown = 8

Right Hand: ___ m202

Left Hand: ___ m203

Use codes No = 1 Yes = 2 Uncertain=8 for the remaining questions in Part IV (unless otherwise indicated):

Is the child in a frogged position when lying down? ..... ___ m204

When you pick the child up under the arms do his/her legs scissor? ..... ___ m205

Code = 7 if child is too heavy to lift.

Move each of the four limbs around the major joints (shoulders, elbows, wrists, hips, knees and ankles)

Is any limb hypotonic?

Right Arm ___ m206
Left Arm ___ m207
Right Leg ___ m208
Left Leg ___ m209

Is any limb hypertonic?

Right Arm ___ m210
Left Arm ___ m211
Right Leg ___ m212
Left Leg ___ m213

Do you notice any involuntary movements? ..... ___ m214

Does the child seem unstable, ataxic or show titubation? ..... ___ m215

Can the child sit unaided? ..... ___ m216

Tap out reflexes at biceps, knees and ankles. Are reflexes completely absent in:

Right Arm? ___ m217
Left Arm? ___ m218
Right Leg? ___ m219
Left Leg? ___ m220

Do the reflexes seem exaggerated in:

Right Arm? ___ m221
Left Arm? ___ m222
Right Leg? ___ m223
Left Leg? ___ m224

You have observed the child walk, stoop and stand up. Is there any evidence of: proximal muscle weakness? ___ m225
distal muscle weakness? ___ m226

SENSORY EXAM:

Test sensory functions only if indicated by the nature of the motor exam; i.e., only if there are motor deficits in the distribution of a peripheral neuropathy, or a spinal level such as meningomyelocele.

Is there sensory loss? ___ m227

If there is sensory loss, describe: _____

Physician: In your opinion, was this an adequate neurological exam to assess this child? ___ m228

Code: Yes = 1 No, Child Uncooperative = 2 No, Time Too Short = 3 Uncertain = 8

If Cerebral Palsy is disagnosed, enter the ICD--10 code here: ..... G ___ ___ ___ m229

(See MAF Procedure Manual, Appendix B for coding).

Additional Comments on the Neurological Exam:

Child's ID: __ | __ | __ __ __ __ | __ | __ __

III. PHYSICAL EXAMINATION: COMPLETE FOR ALL CHILDREN

A. Rate the child's general appearance as: ..... ___ m139

Overnourished =1 | No subcutaneous fat =3 | No fat and edematous=5
Well-nourished=2 | Diminished muscle mass 4 | Uncertain=8

B. Rate the presence of the following conditions:

Codes No=1 Yes=2 Uncertain=8

HAIR:	Brittle/Discolored	___	m140
	Sparse	___	m141
SKIN:	Scars (Burns)	___	m142
	Weeping Sores	___	m143
	Ulcers	___	m144
	Cheilosis	___	m145
HEAD:	Microcephaly	___	m146
	Macrocephaly	___	m147
FACE:	Hypertelorism	___	m148
	Epicanthal folds	___	m149
	Flat Midface	___	m150
	Micrognathus	___	m151
	Facial Weakness	___	m152
EYES:	Ptosis	___	m153
	Brushfield Spots	___	m154
	Cataract	___	m155
	Retinitis	___	m156
	Trachoma	___	m157
	Squint	___	m158
	Conjunctivitis	___	m159
	Onchocerciasis	___	m160
	Nystagmus	___	m161
	Discs Pale/atrophic	___	m162
Xerophthalmia (see codes at left)	Right Eye	___	m163
	Left Eye	___	m164
EARS: Pneumatoscopy Code: Normal=1, Abnormal=2, Not Seen=8	Right Ear	___	m165
	Left Ear	___	m166
Otoscopy Codes: No=1, Yes=2, Uncertain=8	Suppurative (Draining)	___	m167
	Perforated	___	m168
	Inflamed : Acute Otitis	___	m169
	Fluid : Serous Otitis	___	m170
	Low Set or Deformed	___	m171
MOUTH:	Cleft Palate	___	m172
	Diminishing Gag	___	m173
	Missing Many Teeth	___	m174
	Many Carious Teeth	___	m175
	Drooling	___	m176
THYROID: « Enter WHO Goitre Classification		___	m177

Xerophthalmia Codes (ICD-9 and WHO) **Normal=1**
Night Blindness=2
Conjunctival Xerosis=3
Bitot's Spot=4
Corneal Xerosis=5
Keratomalacia,1/3 corn.surf.=6
Keratomalacia/Corneal Ulcer>1/3 corn.surf.=7
Corneal Scars=8
N/A or missing data=9

THYROID: WHO Goitre Classification Codes:

- Thyroid not palpable or, if palable, not larger than normal. ..... =1
- Thyroid distinctly palpable and definitely larger than normal but usually not visible when head is in normal or extended position. =2
- Thyroid easily palpable and visible when head is in extended position. Presence of a discrete nodule also qualifies one for inclusion in this grade. ..... =3
- Thyroid easily visible with the head in a normal position. ..... =4
- Goiter visible at a distance..... =5
- Monstrous goiter. ..... =6
- Unknown. ..... =8

Appendix-H: Documentation of Medical Variables

Code	Variable Name	Value Label	Value
(D:Pregnancy: for birth of this child)			
M52	Gravidity	(number)	#
M53	Parity	(number)	#
M54	Stillbirths	(number)	#
M55	Spontaneous abortion	(number)	#
(During pregnency with this child)			
M56 M57 M58 M59 M60 M61	High Blood Pressure Bleeding 1st trimester Infecation/Fever 1st tri. *Other Health Problem Antenatal Care Maternal Goiter	No	1
		Unknown	2
		Yes	3
(E:Birth)			
M62	Place of Birth	Home	1
		Hospital	2
		Clinic/Center	3
		Other	4
M63	Single/Multiple Birth	Single Birth	1
		Twin	2
		Triplets or more	3
		Other	4
M64	Born at 9 months	Yes	
		No,>1 mo.early	2
		No,>2 weeks late	3
		Unknown	8
M65	Duration of Labor	<24 hours	1
		≥24 hours	2
		Unknown	8
M67	Birth Difficulties	No	1
		Yes	2
		Unknown	8

Code	Variable Name	Value Label	Value
M68	Birth Position	Head first	1
		Bottom first	2
		Foot first	3
		Cesarian	4
		Unknown	8
M69	Cry Immediately	Yes	1
		No, but in ≥5 min.	2
		No, after >5 min.	3
		Unknown	8
M73	Birth Weight	Gram/lbs	#
		Unknown	9999
M74	Birth Size	About size of most babies	1
		Smaller than most babies	2
		Bigger than most babies	3
		Unknown	8
(Any difficulties of the child in first four weeks)			
M75 M76 M77 M78 M79 M80 M81	Seizures Infection Trouble Feeding Yellow Color Tetany Diarrhea Difficult Breathing	No	1
		Yes	2
		Unknown	3

Note: M refers to Medical Assessment Form

Appendix-I: Index of Father's Status.

Prof-esion	Land (acre)			Education				
	No	<1/2	<1/2	None	Prmry	Secdy	H Sec	Abv
Agriculture	1	2	3					
Fishing	1	2	3					
Unskill	1	2	3					
Business				3	4	4	5	6
Clerical /service				3	4	4	5	6
Skill/ profess.				3	4	4	5	6
Unemploy				2	2	2	3	3
Other				2	2	2	3	3
No Infor				2	2	2	3	3

Appendix J: Items for Social Economic Index.

Socio Economic Scale Items	
Mother's Education Level	
Mother's Reading Ability	
Father's Status (education & occupation)	
House Cond	* No. of Room
	* Type of Floor
	* Source of Drinking Water
	* Electricity
	* Source of Other Water
	* Type of Toilet
**	Composite Housing Condition
Possession	* Radio
	* TV
	* Bicycle
	* Refrigerator
	* VCR
	* Motorbike
	* Car
	* Boat
	* Bullock Cart
	* Cow
	* Tube
**	Composite Possession

Note: (*) indicate items included in composite scores (**)