

**EMOTIONAL CONSEQUENCES  
OF  
COMMUNICATION DISORDERS IN CHILDHOOD**

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## **ABSTRACT**

To target health services aimed at the impact of maladjustment secondary to a chronic disorder, it is necessary to identify specific disorders that increase the risk of maladjustment. This thesis examines whether children with communication disorders are more likely to have emotional and behavioral problems than those who are healthy or those with other chronic disorders. It also studies whether children with communication disorders are more likely than the comparison groups to develop mental health problems or to persist in having these problems as young adults. To answer these questions, cross-sectional and cohort analyses were conducted on 2,638 children from the Ontario Child Health Survey and 11,744 children from the British National Child Development Study.

Children with communication disorders from both studies were found to have more emotional and behavioral problems than those who were healthy or those with chronic physical disorders. In neither sample, however, was there evidence to conclude that these psychological problems increase or persist in early adulthood.

The implications of these findings for public health and clinical practice are discussed.



## **Abrégé**

Pour orienter les services de santé qui s'occupent de l'impact de l'inadaptation due à une maladie chronique, il est nécessaire d'identifier les maladies spécifiques qui augmentent le risque d'inadaptation. Cette thèse examine si les enfants avec des troubles de communication ont plus tendances à avoir des troubles de comportement ou des problèmes affectifs que les enfants en santé ou ceux ayant d'autres maladies chroniques. Cette thèse se penchera sur le fait que les enfants ayant des troubles de communication ont plus de chance, que le groupe témoin, de développer des problèmes de santé mentale qui pourraient persister comme jeune adulte. Afin de répondre à ces questions des études transversale et de cohorte ont été menées sur 2,638 enfants du Ontario Child Health Survey et 11,744 enfants du British National Development Study.

Les enfants des deux études, ayant des troubles de communication, ont démontré plus de problèmes affectifs et de comportement que les enfants en santé ou ceux ayant des troubles physiques chroniques. Toutefois, aucun des échantillon n'a pu amener à conclure que ces troubles psychologiques augmentaient ou persistaient jusqu'à l'âge adulte.

Les implications de ces résultats pour la santé publique et la pratique clinique sont présentées.

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## **INTRODUCTION**

## INTRODUCTION

### I. Rationale for Study

It is well established that children with chronic physical disorders are at an increased risk for emotional and behavioral problems relative to the general population of children (Nolan and Pless 1986). In a recent review of studies in this field published over the last ten to fifteen years, Nolan and Pless conclude that children with chronic physical disorders experience at least twice as many emotional and behavioral problems than do healthy children. Because the estimated prevalence of chronic disorders varies from ten to twenty percent depending on the definitions used, the methods of study, and the populations under investigation (Newacheck, Halfon and Budetti 1986), the costs of providing either preventive or curative psychosocial therapy for such a large group may be prohibitive. Consequently, one of the research priorities for pediatric chronic disease epidemiology is to identify specific chronic disorders that may place children at even greater risk in order to target the services necessary to prevent or diminish the impact of emotional or behavioral problems secondary to a chronic disorder. If this were possible, limited resources could be used more efficiently than if a universal approach was adopted.

Three distinct stages are implicit in this research task. Each stage is conditional on the findings from the

preceding stage. The first is to determine the existence of the high-risk chronic disorder and the magnitude of the association between such a disorder and emotional and behavioral problems. Inherent in this task is the determination of the natural history of the condition - is it self-limiting or is it an enduring problem for a child and his or her family. If a high-risk chronic disorder exists, the second research task is to empirically assess, using randomized controlled trials whenever possible, strategies to prevent or diminish the emotional or behavioral problems secondary to the disorder. If sufficient evidence has accumulated from the first two stages that suggests that there is a high-risk group for which effective interventions strategies exist, then the relative merits of screening for such a problem need to be assessed.

The present study addresses the first stage of the research task. Building on current literature, an attempt will be made to determine the long-term emotional and behavioral consequences of communication disorders occurring in childhood.

Children with communication disorders, that is children with speech, language, and hearing impairments, may be one subgroup of those with chronic conditions who are at an especially high risk for emotional and behavioral problems. If we define communication "as the transmission and exchange of information through coded symbols which form language" (Van Riper and Emerick 1984),

speech and hearing are the foundation and primary medium of this act. Disordered communication may interfere with normal social interactions, academic achievements, or both (Howlin and Rutter 1987). It may be important to determine if communication disordered children are at increased risk relative to children with other chronic disorders<sup>1</sup>.

The prevalence of communication disorders is high compared to many of the other chronic disorders, and accordingly information about this subgroup may have extensive clinical implications. Further, communication disorders are distinct from other chronic disorders in a variety of ways, and thus may be expected to result in a different pattern or magnitude of maladjustment <sup>2</sup>.

The sections of the introduction that follow will provide an overview of the definitions and etiological hypotheses of pediatric communication disorders. Also, the prevalence of communication disorders and the differences between these conditions and other chronic

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<sup>1</sup>The term "other chronic disorders" will be used synonymously with "chronic physical disorders." Both terms will exclude children with mental handicaps.

<sup>2</sup>Although in clinical psychiatry, the terms "emotional problems," "behavioral problems," and "maladjustment" may have unique meanings, in pediatric epidemiology these terms have been used interchangeably (Nolan and Pless 1986). For the most part, when investigators seek to establish the presence or extent of emotional or behavioral correlates of chronic disorders, they use these terms as a shorthand to refer to the results of a variety of measures intended to assess a wide range of behaviors similar to those seen in children with clinically distinct psychiatric disorders of varying degrees of severity. The terms are operationally defined by the test used to assess the outcome (Nolan and Pless 1986). One of the outcome measures used in the present study was designed to assess "maladjustment" in school while another was used to assess "emotional and behavioral problems" at home and at school. For the purposes of this study, therefore, the term "maladjustment" will be used synonymously with "emotional and behavioral problems."

disorders will be discussed.

## II. Definitions of Communication Disorders

At the most basic level, a communication disorder is a deviation in the oral production or auditory reception of spoken language. Although hearing disorders are clearly defined, there has been a lack of consensus on the definitions and classification systems for pediatric speech and language disorders (Cantwell and Baker 1987b). Many classification systems exist: some emphasize the area of development affected - articulation or fluency - while others classify the disorders according to their presumed cause - cleft palate or cerebral palsy (Cantwell and Baker 1987b; Bloodstein 1984). For the purposes of this study, the term "speech disorders" will be used to include difficulties in articulation or phonology, fluency and language<sup>1</sup> (Bloodstein 1984).

Many factors including mental handicap, hearing impairment, and physical disorders such as cerebral palsy or cleft palate may disturb the normal development of communication skills. When speech disorders are accompanied by these conditions, it is generally accepted that the structural or neurological deficit is at least partially responsible for the speech disorder. The presence of these other conditions may also increase the likelihood of maladjustment. One of the objectives of this study is to compare the magnitude of the association

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<sup>1</sup>Voice disorders are excluded from this study.

between other chronic disorders and maladjustment to that of communication disorders and maladjustment. This study, therefore, will only include communication disordered children who are free of any other chronic disorder.

The classification scheme of the *Diagnostic and Statistical Manual of Mental Disorders*, 3rd edition revised (American Psychiatric Association 1987) complements that of Bloodstein (1984). It distinguishes between speech disorders that may be explained by general mental retardation, hearing impairment, neurological impairments, or physical abnormalities from those that are not explained by these factors. Childhood stuttering, articulation and language disorders without associated factors are classified on Axis II of a five-axis scheme, under the heading "developmental disorders." The DSM-III-R distinction between developmental communication disorders and those resulting from other causes is helpful and pertinent to the present study.

**Developmental Articulation Disorders:** Developmental articulation disorders may be characterized by deviations in the way speech sounds are produced. For example, a lateral lisp is an articulation disorder which results from the substitution of a /θ/ phoneme<sup>1</sup> for a /s/ phoneme.

Several terms have been used to designate these problems: "dyslalia," "functional speech disorders,"

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<sup>1</sup> /θ/ is the symbol used in the International Phonetic Alphabet for an unvoiced interdental fricative, "th," as in bath or teeth.

"developmental articulation disorders," "infantile articulation," "immature articulation," and most recently "phonological disorders" (Cantwell and Baker 1987b; Bloodstein 1984; Shames and Wiig 1990). Controversy as to whether developmental articulation disorders involve essentially "delayed" or "deviant" articulation exists (Shames and Wiig 1990; Cantwell and Baker 1987b). Simplifications of adult forms of speech are found in the speech of children with developmental articulation disorders, and thus are suggestive of delay. However, unique speech patterns not found in the speech of normal children or adults also exist and may be considered deviant.

Several models have been proposed to explain the etiology of developmental articulation disorders. In general, it has been found that peripheral anatomical structures (such as lips, teeth, palate, and tongue) need to be obviously and severely impaired before they are associated with articulation problems (Shames and Wiig 1990). Some suggest that although there is no clear association between neurological disorders and developmental articulation disorders, children with such disorders show slightly elevated prevalences of neurological "soft signs," especially clumsiness and mixed cerebral dominance (Cantwell and Baker 1987b). Other factors that have been postulated as playing a role in the etiology of the disorder include cognitive



deficits, deficits in general motor skills or oral motor skills, social or environmental limitations, and general developmental lags (Shames and Wiig 1990; Cantwell and Baker 1987b).

It has also been suggested that developmental articulation disorders are due to faulty phonological processes<sup>1</sup> and as such may be thought of as a language disorder (Aram and Kamhi 1982; Panagos 1982; Shelton and McReynolds 1979; Shriberg 1982). Articulation errors, particularly in children with multiple errors, frequently fall into patterns: a child may show a pattern of omitting most final consonants in words, or always substituting one class of phonemes, such as stops (/b/, /p/, /d/, /t/, /g/, /k/), for another class such as fricatives (/z/, /s/, /v/, /f/, /d<sub>ʒ</sub>/, /ʃ/). It is suggested that these error patterns reflect phonological process that may represent the way children simplify production of sounds that they may be unable to produce correctly (Edwards and Shriberg 1983; Hodson 1986). In this context, articulation is synonymous with phonology, and phonology is one component of language. Thus, articulation disorders are phonological disorders. It follows that a phonological disorder must be a language disorder (Shames and Wiig 1990).

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<sup>1</sup>Phonology is that aspect of language concerned with the rules governing the structure, distribution, and sequence of speech sounds in a language (Shames and Wiig 1990).

Although the above explanation may seem like an exercise in semantics, it has both interesting clinical and research implications. For the clinician, evaluation of a child with a possible articulation disorder is no longer limited to the identification of single phonemes that may be in error but expanded to explaining the child's phonological processes. Traditional articulation tests (Goldman-Fristoe Test of Articulation, Goldman-Fristoe 1972) are being replaced by or supplemented with tests of phonological processes (Phonological Process Analysis, Weiner 1979). The research implications are that developmental articulation disorders may not simply be regarded as problems of "output" and developmental language disorders as "central processing problems" but these two problems are thought to overlap considerably. Empirical studies demonstrating that many children have both articulation and language disorders, and thus suggesting a common etiological factor will be presented in the following sections.

**Stuttering:** Disorders of communication which are characterized by abnormalities in the rate or phrasing of speech are disorders of fluency. Stuttering consists of brief periods of interruptions in speech that have abnormal duration or frequency. These interruptions may be accompanied by facial, vocal, or other mannerisms, often known as associated or secondary symptoms.

It is not atypical that as a child begins to develop

longer and more complicated utterances normal dysfluency is observed. This usually occurs between the ages of two and a half and three and a half years, and it is characterized by an increase in effortless repetitions of words (and syllables). How long normal dysfluency continues varies from child to child - sometimes weeks, months and then disappears (Shames and Wiig 1990). In one study, approximately 85% of young children who "stuttered" during the early preschool years recovered spontaneously in a few months' time without intervention (Homzie and Lindsay 1984). Some authors believe that stuttering develops out of normal dysfluencies (Van Riper 1954; Bloodstein 1960 a,b) while others consider stuttering to be distinct from normal dysfluencies (Adams 1978).

Etiological hypotheses for stuttering have included neurophysiological, biochemical or genetic factors; others have suggested developmental, behavioral, and psychoanalytic theories (Shames and Wiig 1990; Bloodstein 1984).

**Developmental Language Disorders:** Pediatric language disorders are defined as language abilities that are below those expected for the child's age and level of functioning (Shames and Wiig 1990). As with developmental articulation disorders, there have also been a variety of terms to describe developmental language disorders, and a variety of etiological

hypotheses. These terms include "language delayed," "language deviance," "dysphasia", "developmental aphasia," "developmental word deafness," and "developmental language disorders" (Shames and Wiig 1990; Cantwell and Baker 1987b).

Developmental language disorders are further subdivided by DSM-III-R into developmental expressive language disorders and developmental receptive language disorders. Other recent approaches have ignored these subclassifications, and have attempted to use linguistic terms to delineate the areas of language that are affected (Bloom and Lahey 1978; Wiig and Semel 1980; Shames and Wiig 1990). As with developmental articulation disorders, there is controversy as to whether the child has essentially "delayed" or "deviant" language skills (Cantwell and Baker 1987b).

The etiologic factors most frequently studied in relation to developmental language disorders include impaired cognitive, perceptual, and symbolic abilities, deficits in interpersonal interaction, social deprivation, and cortical damage (Shames and Wiig 1990). It has been proposed that the difficulties experienced by children with developmental language impairment is a consequence of cerebral hemisphere damage (Bloodstein 1984; Cantwell and Baker 1987b). Children for whom there is the most conclusive evidence of brain damage are those whose problems have associated motor and sensory deficits

(Shames and Wiig 1990; Bloodstein 1984). For children whose difficulties seem to rest principally in language, however, the evidence for neurological hard signs is not convincing (Cantwell and Baker 1987b; Shames and Wiig 1990; DSM-III-R 1987; Bloodstein 1984). Perhaps more sophisticated neurological imaging procedures, such as the PET (positron emission tomography) scan, will provide additional information to aid in excluding or including some of the existing hypotheses.

**Hearing Disorders:** Hearing disorders result from deficits in perceiving or processing auditory signals. The difficulty may be at the level of the middle ear, resulting in conductive hearing loss, at the inner ear, resulting in sensorineural hearing loss, or somewhere along the eighth cranial nerve, or at the cortex resulting in central auditory processing problems. The inability to detect pure tones greater than 25 decibels (that is, an average threshold across pure tones between 500 and 2000 Hz greater than 25 dB) is considered to be a hearing loss according to the American National Standards Institute (1970). Hearing loss may be associated with or result in speech and language disorders.

**Summary:** Except for hearing disorders, the underlying pathologies of the developmental communication disorders discussed above remain elusive. The cause of pediatric hearing disorders may be established through conventional pediatric audiometry or, when this is not successful, brain stem evoked response audiometry. However, the etiologies

of developmental articulation disorders, developmental language disorders, and stuttering remain uncertain. Even within these distinct subgroups, there may be several different conditions with heterogeneous etiologies.

### III. The Prevalence of Communication Disorders

In population based surveys designed to assess the prevalence of all chronic conditions in childhood, communication disorders have been found to account for between 13 and 19% of these conditions (Richardson, Higgins and Hanes 1965; Rutter, Graham and Yule 1970; Pless and Satterwhite 1975).

The prevalence estimates of speech disorders in children under 17 years of age vary from a low of 1.2% (Rutter, Tizard and Whitmore 1970) to a high of 33.6% (Hull et al. 1971). Because the criteria for defining hearing loss are widely accepted (Yantis 1985), there are fewer variations in prevalence rates of hearing loss compared to speech disorders.

The National Speech and Hearing Survey (Hull et al. 1976), conducted by Colorado State University during the 1968-69 school year, measured pure tone air-conduction thresholds on a nationwide sample of 35,568 children in grades 1 to 12. Hearing impairment was defined as a pure tone average exceeding 25 dB. The survey revealed that 2.6% of school-age children exhibited hearing impairment. The National Center for Health Statistics (1982)

estimated a prevalence of hearing loss of 0.6% among children less than 5 years of age, and 1.6% among children 5-14 years. From similar studies conducted among school children in Denmark (Parving 1983) and Saudi Arabia (Ashoor 1983), estimated prevalences of hearing impairment are 1.4% and 1.8%, respectively.

Possible factors that may account for the discrepancies in reported prevalences of speech disorders include factors likely to give a spurious estimate, such as variations in case definition, variations in the manner in which cases are identified, and variations in the sampling frame. As well, factors likely to represent a real difference such as age-specific trends may contribute to reported discrepancies.

**Variations in Case Definition:** Speech disorders are distributed on a continuum of severity and are, therefore, difficult to separate into distinct classes. When a condition such as a speech disorder is defined in quantitative terms, such as the number of errors on an articulation test, arbitrary distinctions are made to define abnormality. The prevalence rates between studies will therefore vary if there are differences in the cut-off points used to define abnormality.

For example, Fundudis, Kolvin and Garside (1979) reported that 4.0% of 3-year-olds were "speech retarded" defined as a "failure to use three or more words strung together to make some sort of sense." On the other hand,

based on a psychometrist's assessment, Silva (1980) claimed that 8.4% of children age 3 were language delayed defined as "significant delay in either verbal comprehension or expressive language."

**Variations in Case Identification:** In some studies, trained listeners are asked to identify children with speech disorders. In other studies untrained listeners are employed. The trained listener may report accurately many minor deviations which would seldom attract the attention of others. The untrained examiner may not identify many deviations, but for the most part those that are identified will either be severe or will have some particular quality that is disturbing (Elliott 1978).

For example, in the 1977 National Health Interview Survey involving a random sample of 41,000 households throughout the United States, respondents (adult females) were asked if anyone in their family presently stuttered, stammered or had any other speech defect. The prevalence rate of speech disorders estimated from this survey was 1.98% of males and 1.05% of females averaged across all ages (National Center for Health Statistics 1981).

When trained listeners are used, however, estimates are usually much higher. In 1982, Beitchman and colleagues employed honors level university psychology students and professional speech pathologists in a two-stage screening of speech problems among children



attending kindergarten in the Ottawa-Carleton region. They reported a prevalence of articulation or language impairments of 19.0% (Beitchman et al. 1986).

Hull and colleagues (1971) also used trained listeners in a national survey in nine census divisions across the United States. A total of 38,802 school-aged children in grades kindergarten through 12 were sampled. They reported the prevalence of moderate or severe speech disorders to be 33.6%. However, "extreme" speech defects were identified in 2.0% of these children. This estimate closely corresponds to that provided by the National Health Interview Survey. The comparability of these two estimates supports the claim that untrained listeners are more likely to recognize the most severe disorders.

**Variations in Sampling Frame:** Large scale surveys encounter sampling difficulties when estimating the prevalence of communication disorders. Individuals who live in institutions or special schools for the mentally handicapped are often excluded from the sampling frame. A large proportion of these individuals also have speech disorders (Elliott 1978).

**Age effect:** Because the prevalence of speech disorders decreases with age (Hull et al. 1971), overall prevalence rates in the pediatric population may mask age-specific differences.

**The Prevalence of Individual Speech Disorders:** In addition to the prevalence surveys discussed above,

Cantwell and Baker (1987a) and Beitchman and colleagues (1989a) reported relative frequencies of distinct subgroups of speech disorders. Cantwell and Baker (1987a) selected subjects from incoming patients to a large community speech and hearing clinic in the greater Los Angeles area. Over a three year period, 600 children were evaluated and included in the study. The mean age of the group was 5 years 7 months. All children were given a comprehensive speech and language evaluation that included standardized testing and the analysis of a spontaneous speech sample. Based on these results, the children were divided into three groups: (1) those with "pure speech disorders" (2) those with "speech and language disorders" (3) and, those with "pure language disorders." The children with "pure speech disorders" had abnormal fluency, rate, or articulation but normal language comprehension, expression and usage. Those with "speech and language disorders" had difficulties in both fluency, rate, or articulation, and language (comprehension, expression or usage). Those with "pure language disorders" had abnormal development in language but normal fluency, rate and articulation. The relative frequencies of these groups were as follows: 33.8% of the sample had "pure speech disorders"; 58.7% had "speech and language disorders"; and only 7.5% had "pure language disorders."

In Beitchman and coworkers' study (1989a), a cluster

analysis was employed to classify speech disorders in a randomly chosen sample of kindergarten-aged children from the school population of Ottawa-Carleton. Based on scores of a variety of standardized speech and language tests, three groups of children with communication disorders were identified. Approximately 54.9% had low scores on articulation tests only; 24.4% had low scores on both articulation and language tests; and 17.7% had low scores on auditory comprehension (receptive language) only.

Beitchman et al. suggested that their group of children with poor articulation (54.9%) corresponded to Cantwell and Baker's group of "pure speech disorders" (33.8%), and that their group of children with low overall scores (27.4%) corresponded to Cantwell and Baker's group of "speech and language disorders" (58.7%). If these groups from the two studies are the same, it is not clear why the relative proportions of children differed so remarkably. Variations in the age distribution of the subjects, in the methods used to measure communication disorders, or in the sample selection procedures may explain these discrepancies. In both studies, the majority of children had articulation disorders with or without language disorders; the percentages were 83.2% and 92.5% for Beitchman et al. (1989a) and Cantwell and Baker (1987a), respectively.

#### IV. Differences Between Communication Disorders and Other Chronic Disorders

Empirical studies have established that all chronic disorders have common elements, and thus a generic or non-categorical approach to the investigation of the psychosocial adjustment of these children is encouraged (Pless and Perrin 1985). However, sensory disorders, that is those involving speech, hearing or vision, may result in psychological maladjustment that is greater than that of chronic disorders without sensory impairment (Pless and Perrin 1985). This increased maladjustment for children with speech or hearing problems may be better understood by comparing communication disorders with other chronic disorders along a variety of dimensions. Two such dimensions are the severity and nature of the disorder.

**Severity of Disorder:** The clinical severity of disorders varies between and within diagnostic categories. Stein and colleagues recommend that for comparisons across diagnostic categories, measures of functional severity or impact of illness are most appropriate (Stein et al. 1987).

Functional severity is the impact of the disorder on an individual's ability to perform age-appropriate activities under a broad range of circumstances. In children, it is often assessed by items such as days missed from school, or inability to engage in physical activities such as team sports. Unlike disorders such as

cerebral palsy that typically have a significant impact on mobility, however, communication disorders do not restrict a child's physical activities. Although communication disorders may not lead to restrictions in physical activity, they may render the child virtually unintelligible. As a consequence they may have a more serious impact on social or interpersonal activities than conditions such as diabetes mellitus or arthritis.

Severity may also vary by the impact of the disease on society or on the family. A disorder that leads to high service utilization or large medical care costs may be considered more severe than one that does not. Given that most communication disorders, when treated, are treated on an out-patient basis and frequent hospitalizations are rarely required, it may be safe to assume that the medical-care costs incurred are modest.

On the other hand, the severity of communication disorders assessed in terms of their impact on the family may be great. This may be the case, for instance, when a child has a communication disorder that impedes normal family verbal interaction. Such a child is unable to easily make his or her needs or wants known, or the parents are unable to have their instructions and comments heard and understood. Additionally, treatment for most communication disorders requires that frequent, usually daily, exercises be carried out under the supervision of a parent or an older sibling. In extreme

cases, when the prognosis for the child acquiring adequate verbal communication skills is bleak, it may be recommended that the child use an alternative mode of communication, such as sign language. This places yet another burden on the family because they, too, must learn to "sign" in order to communicate effectively with the child.

**Nature of the Disorder:** The primary symptom of any communication disorder is an impairment in the ability to communicate feelings, thoughts, and emotions. Thus, such disorders may have a greater impact on psychosocial adjustment than a chronic condition for which the primary symptom is dyspnea or joint pain.

The intent of this study is to take a noncategorical approach to communication disorders. Children with various diagnoses of communication disorders will comprise the study group. The assumption of such an approach is that children face common life experiences and problems based on generic dimensions of their condition rather than on idiosyncratic characteristics of any specific disorder (Stein and Jessop 1982; Pless and Perrin 1985; Pless and Pinkerton 1975). The similarities between the distinct diagnostic categories of this disorder will be emphasized to permit an examination of the long-term consequences of these disorders on maladjustment. This approach differs from the perspective taken by speech pathologists, audiologists

and other professionals working with children with communication disorders who are trained to identify the unique characteristics of each disorder to provide a differential diagnosis. This is important for specialized treatment and prognosis, but it may be considerably less important when considering the impact the communication disorder has on family functioning, and the psychological and social adjustment of the child.

#### **V. Development of the Present Research Questions**

Two parallel concerns have led to the present research questions. First, the need to identify subgroups of children with chronic disorders who may be at especially high risk for emotional and behavioral problems has been emphasized by researchers of pediatric chronic diseases (Jessop and Stein 1985; Lewis and Khaw 1982; Steinhausen, Schindler and Stephan 1983; Nolan and Pless 1986).

Second, most speech-language pathologists, myself included, who have worked with children and adolescents are aware of the frustrations faced by some of their clients who are unable to communicate effectively. These frustrations are seen in the child's unwillingness or inability to follow verbal instructions, extreme stubbornness, withdrawn behavior, inability to separate from parents, and tendencies to "act out" through physical aggression. In a study completed in 1981, I found that speech disordered children were slower to

process language, including verbal instructions, and thus may be perceived as being less compliant at home and at school (Hobbs 1981). Sometimes the parents' or the speech pathologist's concern regarding the child's behavior results in referrals to other professionals more skilled in dealing with emotional and behavioral problems. Although this may not be the case for the majority with communication disorders, enough do appear maladjusted to justify a study of the association between communication disorders and maladjustment during childhood and early adulthood.



## LITERATURE REVIEW

The interest in the relationship between communication disorders and psychopathology is not new. In one of the earliest textbooks on speech problems, Orton (1937) stated that difficulties in social behavior could occur as secondary consequences of handicaps in communication. In recent years, there has been a renewed interest and reemphasis on relationships between communication disorders and emotional and behavioral problems, resulting in an emerging body of research and clinical literature (Prizant et al. 1990).

In a review of studies published since 1966, several were found that provide evidence to support the hypothesis that children with communication disorders are at increased risk for emotional or behavioral disorders. These studies vary in their objectives, research design, outcome measures, analysis, and hence the degree of certainty with which conclusions can be drawn. The nature and severity of the communication disorder varies across and sometimes within studies. However, distinct diagnostic categories, such as stuttering or hearing impairment, usually are examined separately.

Studies included in this review were identified through a MEDLINE search of English language literature<sup>1</sup>.

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<sup>1</sup>The key words used in the search were as follows: communicative disorders by (child development; affective disorders; affective symptoms; anxiety; emotion; or any mental disorder). The search was restricted to English publications.

Additionally, references that were not retrieved during this search but were found in key publications (Silva 1987; Rutter and Lord 1987; Howlin and Rutter 1987; Beitchman 1986) were included. This review is not intended to exhaust the existing literature but rather to make clear the current state of the art - both methodological and substantive - and to demonstrate how the current study will contribute to a further understanding of the issues.

Critical appraisal of the literature began by reading the title or abstract, or both. This thesis excludes communication disordered children who are part of a special subgroup such as the mentally handicapped, autistic or chronically physically disabled. If the title or abstract indicated that the study was primarily concerned with such a subgroup it was omitted from the review.

Review of literature can take several possible forms from a chronological narrative of ideas through a summary of studies grouped by similarity of research design to a formal meta-analysis (Spitzer 1991). In assessing the contribution of each study to the determination of increased risk of emotional and behavioral problems in communication disordered children, design is of central importance. Hence, the studies are evaluated in this context. Cross-sectional and cohort studies will be reviewed. For both these designs, studies with a control

group are separated from those without a control group.

### **I. Cross-Sectional Studies**

Most of the studies reviewed used cross-sectional or prevalence designs and are restricted to clinical populations. These studies are characterized by the fact that information regarding the communication skills of the child is ascertained at the same time as that regarding his or her emotional or behavioral status. Although these studies vary in the ways in which they define and identify communication disorders, and in the ways in which emotional and behavioral problems are evaluated, three different approaches are found within this category.

In the first, the case-series design, children representative of those seen at speech or hearing clinics are evaluated to determine the prevalence of emotional or behavioral problems without reference to any comparison group. In the second, children are also chosen from clinic populations but a second group, free of communication disorders, is selected for comparison or reference. The third is the traditional epidemiologic survey. In it a sample of children is drawn from the general population and the prevalence of communication disorders and emotional and behavioral problems are determined simultaneously.

#### **A. Case-series**

Summaries of the cross-sectional studies are found

I in Tables 1.1 and 1.2. Table 1.1 includes all the case-series. Of the 10 studies listed, the four reported by Baker and Cantwell involve children from the same clinic. As the sample enlarged, Cantwell et al. published periodic reports describing this population, and the methodology and findings remained relatively consistent. Thus in the discussion of these findings, the four separate reports are counted as one, making a total of nine case-series reports. These include only children with speech, language, or hearing disorders. Five reports focus on children with hearing impairment, while the remainder are concerned with children with speech or language disorders. Six studies have sample sizes of 100 or more, while three include fewer than 50 subjects.

The assessment of emotional and behavioral adjustment in case-series studies is usually based on assessments made by clinicians, or paper and pencil measures administered to the child, parent, or teacher, or some combination of these. No single outcome measure predominates, and it is difficult, therefore, to compare results between studies.

Cantwell and Baker (1987a) reported on 600 children with communication disorders who presented to a community speech and hearing clinic. The children fell into three subgroups (as described in the introduction of this thesis on pages 15 and 16): those with "pure speech disorders" ; those with "speech and language disorders"; and, those

**Table 1.1 Case Series, Uncontrolled**

Reference	Disorder	Sample Size	Age (yr)	Outcome Measures	Findings
Williams	Hearing impairment	51	5 - 14 (X = 10)	Psychiatric assessment	33% had mild behavioural (1970) disturbance, 66% had more severe behavioural disturbance
Bowyer and Gilles (1972)	Hearing impairment a. moderate to severe b. profound	140	School-aged	Lowenfeld's Mosaics and teacher's ratings for "ability to get on with other children"	No significant differences
Goldberg, Lobb and Kroll (1975)	Profound hearing impairment	172	18	Psychiatric assessment	73% emotionally maladjusted
Cantwell et al. (1980)	Speech and language disorders	100	2 - 10 (X = 5.6)	Psychiatric assessment Modified Conners Parent symptoms questionnaire, Rutter parent questionnaire	53% had at least one psychiatric diagnosis

**Table 1.1 Case Series, Uncontrolled (continued)**

Reference	Disorder	Sample Size	Age (yr)	Outcome Measures	Findings
Cantwell et al. (1981)	Speech and language disorders	200	2 - 14 (x = 4.4)	Same as Cantwell et al. (1980)	53% had at least one psychiatric diagnosis
Baker and Cantwell (1982)	Speech and language disorders	291	1.1-15.1 (X = 5.6)	Same as Cantwell et al. (1980)	29% of pure speech-disordered, 45% of speech and language disordered, and 95% of pure language disordered had psychiatric diagnoses.
Scherer (1983)	Hearing impairment	40	2.5-3.7	Social and emotional development rated from observation and parent interview	75% had abnormal social and emotional development
Shriberg et al. (1986)	Developmental speech disorder	39	1.1-9.7 (X=5.0)	Psychosocial behaviour rated from videotaped interaction	15% had at least one behaviour problem
Davis et al. (1986)	Sensorineural hearing impairment	45	5-18 (X=8.5)	Child Behaviour Checklist (Achenbach)	50% expressed concern about being accepted by peers compared with 15.5% of normally hearing children, hearing impaired had significantly higher scores than norms on scales of aggression and somatization

**Table 1.1 Case Series, Uncontrolled (continued)**

Reference	Disorder	Sample Size	Age (yr)	Outcome Measures	Findings
Cantwell and Baker (1987a)	Speech and language disorders	600	(X=5.7)	Same as Cantwell et al. (1980)	31% of pure speech disordered had at least one psychiatric disorder, 58% of speech and language disordered had at least one psychiatric disorder. 73% of pure language disordered had at least psychiatric disorder

with "pure language disorders." The two subgroups with language involvements had higher rates of psychiatric and developmental disorders than those with "pure speech" involvement. There were some differences between the three groups on certain measures of social class with the "pure speech disordered" group tending towards higher socioeconomic status on all measures.

Cantwell and Baker suggest three reasons why children with language involvement may be at greater risk than children with only speech involvement. Firstly, children with language involvement are more likely to develop learning problems and learning problems are themselves a risk factor for psychiatric disorders. Secondly, the authors postulate that one could hypothesize that children with language disorders are more likely than children with "pure speech disorders" to have subtle defects in central nervous system functioning that are associated with psychiatric disorders in general. Thirdly, children with language disorders may have poorer peer relations than children with "pure speech disorders," and this may lead to psychopathology. Cantwell and Baker (1987a) state that these three hypotheses "require rigorous testing before they can be considered to be established."

In summary, the evidence from the case-series allows only modest inferences about the relationship between communication disorders and emotional and behavioral problems. No internal reference group exists in the



studies making it difficult to establish that children with communication disorders have more problems than children who are free of such disorders. For the majority of the studies, the prevalences of maladjustment are much higher than what may be expected in the general population. However, communication disordered children seen at a clinic or enrolled in a special school may have other risk factors for maladjustment that may partially account for the increased rates of maladjustment.

Without a control group that is similar in all other respects, it is not possible to determine what proportion of maladjustment is due to the communication disorder and what proportion is due to other risk factors.

Additionally, case-series do not permit statements about causality; this design precludes concluding that the emotional or behavioral problem is a consequence of the communication disorder. It may be that the causal direction is reversed. The communication disorder may have been caused by the emotional or behavioral problem. Or, both may have a common cause. Reverse causality is not plausible for some communication disorders, such as sensorineural hearing loss, but reverse and common causality are possible for some speech disorders.

#### **B. Comparison studies**

Two types of studies include comparison groups: matched and unmatched designs. In both, an attempt is made to compare the frequency of emotional and behavioral

problems between those with a communication disorder and a referent, or control group. Table 1.2 summarizes 14 observational studies in which a control group is included and assessed in the same manner as that of the communication disordered group. Eight reports focus on disorders of hearing only, while the remainder include disorders of articulation or language.

Control selection and the extent of matching varies between studies. Age, sex, and socio-economic status are most frequently used for matching but this was done in less than half of the studies. In comparison studies, the measures used to assess emotional disturbances again vary widely. Most use paper and pencil tests, usually comprising behavioral inventories (such as the Achenbach Child Behavior Checklist; Achenbach and Edelbrock 1983).

Evidence from twelve of these studies supports the general hypothesis that children with communication disorders have more emotional and behavioral problems than healthy children, and four of these stand out. These provide the most convincing evidence that children with communication disorders are at increased risk of emotional and behavioral problems. The first is that of Meadow and Schlesinger (1971) involving a group of 516 hearing-impaired children from a community clinic compared with children from the general population included in a Mental Health Survey of Los Angeles County. A behavior questionnaire completed by a teacher and

**Table 1.2 Case-Series with comparison groups**

Reference	Disorder	Cases	Controls	Age (yr)	Control Selection	Outcome Measures	Findings
McHale (1967)	Stutter enuresis, school- phobia	98	48	7.6-15.0 (X=11.8)	Random sample from two junior and three senior schools	Vineland Social Maturity Scale	Stuttering boys had lower score on dominance and harm compared with controls, but higher scores on abasement, acquisition and exposition
Meadow and Schlesinger (1971)	Hearing Impairment	516	532,567	School- aged	Children included in Mental Health Survey of Los Angeles County	Behaviour questionnaire (teacher, counsellor)	30% of cases had behavioral problems compared with 10% of control
Okasha et al. (1974)	Stutter	79	80	6-12	Matched on age, sex	Junior EPI test	Cases were more introverted than controls, no difference on neuroticism scale
Freeman et al. (1975)	Hearing Impaired	120	120	5-15	Matched on age, sex and residen- tial area	Modified Rutter Parent and Tea- cher Scales	On combined scores: 22.6% of cases had behavioral problems. No data are present- ed on controls.
Simonds and Heimbürger (1978)	Cleft lip or palate	40	40	6-18 (X=11.7)	Matched on occu- pational and econ- omic status of parents	Psychiatric assessment, Behavioral - emotional check- list	No significant differences in number of psychiatric diagnoses

Table 1.2 Case-Series with comparison groups (continued)

Reference	Disorder	Cases	Controls	Age (yr)	Control Selection	Outcome Measures	Findings
Lindholm and Touliatos (1979)	Speech disorders	106	2991	5-14	Not documented	Quay's Behaviour Problem Checklist	Controls had fewer behavioral disturbances in areas of personality problems, inadequacy, immaturity, and psychotic signs, no differences on conduct problems and delinquency
Fundudis et al. (1979)	Hearing impaired	59	102	7-10 (8.3)	Matched on age, sex and postal district	Behaviour Scale (parents), Rutter Teacher Scale	Cases less deviant than controls based on parents reports; 54% of profoundly deaf, 28% of partially hearing and 18% of controls had deviant behaviour based on teachers' reports.
Cantwell and Baker (1980)	Speech and language disorders	250 referrals to a psychiatric clinic	250	X=6.1	Randomly chosen from children without language delay referred for psychiatric evaluation	Psychiatric assessment, Behavior rating scale (parent, teacher)	No differences except language delayed had more autistic-like symptoms
Shorkey and Saski (1981)	Blind or deaf	41 27	160	School-aged	Stratified sample controlling for grade and school program	Rational behaviour inventory (Shorkey and Whitman)	No significant differences

**Table 1.2 Case-Series with comparison groups (continued)**

Reference	Disorder	Cases	Controls	Age (yr)	Control Selection	Outcome Measures	Findings
Silva et al. (1982)	Bilateral otitis media	47	355	5 (X=5.0)	Normals from Dunedin study matched on age	Modified Rutter Parent scale, Behavior rated by psychometrist	Significantly more behavioral problems in cases compared with controls
Silva et al. (1984)	Speech disorders	55	815	7.0	Normals from Dunedin study matched on IQ	Modified Rutter Parent and Teacher Scale	Cases with low IQ had more problems than cases with normal IQ and controls
Klansek-Kyllo and Rose (1985)	Hearing impairment	25	25	4.5-16.0 (X=10.0)	Not documented	Scales of Independent Behavior (Brunininks)	No significant differences except that cases scored lower on social and communication skills
Culbertson and Gilbert (1986)	Unilateral sensorineural hearing loss	25	25	6-13	Matched on sex, age, socio-economic status	Behavior rating scale (teachers)	Cases had more behavioral problems than controls
Beitchman et al. (1986) controls	Speech and language disorders	142	142	5	Matched for age, sex, classroom or school	Child Behavior Checklist Achenback), teacher rating scale (Conners), psychiatric assessment	48.7% had at least one psychiatric diagnosis compared with 11.9% of rating scale
Prior et al. (1988)	Hearing impaired	26	26	2.8-5.4	Matched on age, sex and socio-economics	Preschool Behavior Questionnaire (teacher and parents)	No significant difference between cases and controls based on mothers' reports; cases greater problems than controls based on teachers' reports

counselor was used to establish the presence of a behavioral problem. Thirty percent of the cases compared with 10% of the controls had behavioral problems.

The second is that by Beitchman and colleagues (1986). This study involved 142 kindergarten-aged children with speech and language disorders matched on age and sex with 142 children from the same classroom or school. In addition to the Child Behavior Checklist (Achenbach and Edelbrock 1983) completed by parents, a teacher rating scale (Conners 1969), and a psychiatric evaluation, were also used. According to parents, 32.1% of speech impaired children had behavioral problems compared to 22.1% of controls; teachers reported that 54.8% of speech impaired children had behavioral problems compared to 37.2% of controls. Almost 49.0% of the cases had at least one psychiatric diagnosis based on a psychiatric evaluation compared with 11.9% of the controls.

The prevalence of maladjustment in the Meadow and Schlesinger study, including children from a wider age range, is less than that in the Beitchman study, including only kindergarten children. The results from the remaining 13 studies reported in Table 1.2, however, do not provide sufficient evidence to conclude that the prevalence of maladjustment in children with communication disorders is age dependent. Inferences based on specific ages may not be derived from the studies presented in Table 1.2 because, with the

exception of the study by Silva et. al (1982) and Beitchman et al. (1986), data are collapsed across age strata.

Additional reports by Beitchman and colleagues (1989a; 1989b) suggest that there is an association between the type of communication disorder and the prevalence of psychiatric disorders. From the results of the study reported in Table 1.2, Beitchman et al. found distinct diagnostic categories of children; they are described in the introduction of this thesis on pages 16 and 17. Approximately 77% of children with articulation and language problems had DSM-III diagnoses compared to 33% of children with articulation problems only, and 38% of children with auditory comprehension problems only. Ten percent of controls had a similar diagnosis. Attention deficit disorder with hyperactivity was the most frequent psychiatric diagnosis in those with articulation and language problems, and in those with auditory comprehension problems only. For those with articulation problems only, the most frequent diagnosis was an emotional disorder.

In addition to psychiatrists' diagnoses, parents and teachers also assessed behavior. Parental and teachers' reports consistently identified children with problems in articulation and language as being more maladjusted than controls. This same consistency was not observed for either of the other two communication disordered groups.

The third noteworthy study was that by Silva and colleagues (1984). They reported on the cohort of children included in the Dunedin Multidisciplinary Child Development Study. This cohort consisted of 1,037 children drawn from all surviving metropolitan infants who were born at the only maternity hospital in Dunedin, New Zealand, between the 1st of April 1972 and the 31st of March 1973. Cross-sectional data when the children were age 7 years were available on 872 of the original cohort. On the basis of an articulation checklist of 6 isolated phonemes and 14 groups of sounds completed at age 7, 55 children were identified as having delayed or deviant speech. This disordered group was stratified according to IQ scores derived from the Wechsler Intelligence Scale for Children (Wechsler 1974). According to scores from the Rutter Parent's Scale (Rutter, Tizard and Whitmore 1970) completed by parents, children with delayed speech and low IQ had significantly higher mean scores, indicating more behavior problems, than either those with delayed speech and normal IQs or controls. The mean for children with delayed speech and normal IQs was not significantly different from that of controls. However, based on teachers' scores, children with delayed speech with either low IQs or normal IQs had significantly higher scores than controls. Thus, speech delay with a normal IQ was not associated with a significant increase in parent reported problems but was



associated with a significant increase in teacher identified reports (Silva et al. 1984).

In the fourth study, Fundudis and co-workers (1979) reported on 59 hearing impaired children who were ascertained from medical and educational services in Newcastle, England, and included in a cross-sectional study. The control group was the same as that used for the "residually speech retarded." As with the previous study, diagnostic assessments were undertaken, and five children were identified who could be considered "pathologically deviant." They were excluded from the analysis. The remainder of the group included 33 children who were profoundly deaf and 21 who were partially hearing impaired.

Based on the scores from the Rutter Teacher's Scale (Rutter, Tizard and Whitmore 1970), 28% of the partially hearing impaired and 54% of the profoundly deaf had behavioral problems compared to 18% of the controls. From interviews with the mothers, the hearing impaired children received lower scores, indicating less deviant behavior, than the controls. This difference was significantly lower only for the profoundly deaf children. The authors suggest three explanations to account for the disparity between parents' and teachers' reports. First, the behavior may be situation specific and reveal itself only in school; second, the parents may be unaware that the behavior is deviant; third, it may

reflect the lack of contact these parents have with their children who, for the most part, are in residential schools.

In summary, the studies presented in Table 1.2 provide some evidence of an increased prevalence of emotional and behavioral problems in children with communication disorders when compared to children who do not have a communication disorder if it is assumed that these groups are similar in all other respects. The existence and magnitude of the association is dependent on the nature and severity of the disorder, and the informant assessing the behavior. As with the studies presented in Table 1.1, the cross-sectional design does not permit statements regarding causality to be made with any confidence.

## **II. Cohort Studies**

Tables 1.3 and 1.4 summarize the results of 16 prospective studies. These studies are similar to concurrent cohort studies in that information is sought from the same study subjects at multiple intervals of time. However, unlike conventional cohort studies, the study subjects did not need to be free of disease at the outset of the study making it sometimes difficult to interpret the nature of the causal relationship between communication disorders and emotional and behavioral problems. The size of the samples in the studies included in Table 1.3 and 1.4 vary from 11 in the case-

Table 1.3 Case-series with follow-up

Reference	Disorder	Sample Size	Age(yr)	Length of Follow-up	Outcome Measure	Findings
Griffiths (1969)	Speech disorders	49	Initial: * Final: 7.5-16.8	1.1-7.1 yrs.	Teacher and parent behavior rating scale	39% of cases with normal intelligence were maladjusted; 52.4% of cases with "sub-normal intelligence were maladjusted
Garvey and Gordon (1973)	Speech disorders	53	Initial: * Final: 4-14		School reports School reports	Persistent behavior problems noted - no quantitative details
Petrie (1975)	Language disorders	11	Initial: 4-6 Final: 18 mos older than initial	18 months	Bristol Social Adjustment Guide	Initially: 7 cases were maladjusted; 18 months later no cases were maladjusted
King et al. (1982)	Speech disorders	50	Initial: 3.0-5.11 Final: 13.0-20.5	15 years	Mail questionnaire (parents)	Problems in social and interpersonal relationships reported by families of 4 cases
Aram et al. (1984)	Language disorder	14	Initial: 3.5-6.11 Final: 13.3-16.1	10 years	Child Behavior Checklist (Achenbach; parent)	Cases had more problems in internalizing and externalizing traits
Paul and Cohen (1984)	Language disorder	18	Initial: 2.3-19.0 Final: 7.1-22.4	Varied X = 6.9 years	Conners Parent Questionnaire	55% of cases were hyperactive; 0% had conduct problems; 10% had psychosomatic complaints; 20% were anxious

Table 1.3 Case-series with follow-up (continued)

Reference	Disorder	Sample Size	Age(yr)	Length of Follow-up	Outcome Measure	Findings
Baker and Cantwell (1987)	Speech or language disorders	Sample from community speech and hearing clinic (no controls)	300	Time 1: 2-15.9 Time 2: 6-20.0	Behavior rating scale (Rutter; teacher and parent), Psychiatric assessment	Prevalence of psychiatric diagnoses Time 1 - 44% Time 2 - 60%

\* Not documented in article

series follow-up study of Petrie (1975), to more than 14,000 in the British National Child Development Study. As with the other study designs, most outcome measures involve parent and teacher rating scales.

#### **A. Case-series with longitudinal information**

The studies presented in Table 1.3 are case-series with follow-up information. These studies were difficult to classify. They are similar to the case-series studies reported in Table 1.1 in that no comparison group was included but because they provided longitudinal information they are classified as cohort studies. Two studies from Table 1.3 will be discussed in detail.

In an important study conducted by Baker and Cantwell (1987), 300 "speech/language" disordered children were examined four to five years after their initial presentation at a community speech and hearing clinic. The subjects were drawn from a cohort of 600 children seen at the clinic. Initially, the mean age of the children was 5.7 years with a range of 2.0 to 15.9 years. Letters were sent to the first 500 cases. Information from the first 300 respondents was reported on by Baker and Cantwell in 1987. The cases that were followed differed in terms of family structure and psychosocial factors when compared to those who were not followed (there were more broken homes, lower social class status, more changes in residence, and more parental mental illness in the "not followed" group).

Linguistic and psychiatric assessments, and academic

achievement and intellectual testing, were completed. The linguistic assessment used both spontaneous speech samples and standardized tests. As previously mentioned in the discussion of the cross-sectional results, three groups of children were identified: those with "pure speech disorders"; those with "speech and language disorders"; and, those with "language disorders."

The majority of the children in the sample, approximately 85%, had received at least 4 months of speech or language therapy. At follow-up, the percentage of children with problems in articulation, rate or fluency had decreased from 93% to 66%. There was no change in the percentage of children with language comprehension difficulties. The percentage of children with expressive language disorders had decreased from 57% to 54% (a nonsignificant difference). The percentage of children with auditory processing problems had increased from 30% to 60%; the percentage of children with language usage problems had increased from 6% to 22%. (The authors suggest that this is not a "real" increase but rather an increase in the ability to detect these disorders in older children).

The psychiatric assessment at follow-up included interviews with the parents and the children as well as parent and teacher rating scales. At baseline, 44% of the children were found to have some DSM-III (American Psychiatric Association 1980) axis I psychiatric disorder

compared with 60% five years later. The authors note, however, that some of this increase in prevalence of psychiatric disorders is probably a result of the increased age of the children.

Of the children who developed a psychiatric "illness," 60% had "speech and language disorders," 39% had "pure speech disorders" and 1% had a "pure language disorder." These prevalences are similar to the prevalences of the communication disorders in the entire sample.

A multivariate logistic regression analysis of the initially "well" group using presence or absence of psychiatric "illness" at follow-up as the outcome was used to determine variables that were predictive of this outcome. The variables that were significant determinants of the development of psychiatric "illness" were the presence of a learning disorder at follow-up, the presence of psychosocial stressors at follow-up, and the presence of an initial language disorder.

The work by Cantwell and Baker is a major contribution to the study of the association between speech disorders and emotional and behavioral problems. Their precise measurements of both communication disorders and psychiatric disorders is exemplary. As noted by Beitchman et al. (1986), however, a major limitation of their work is that that their sample is taken from a speech and hearing clinic. As such, the

results of their studies cannot be generalized to the population at large. A second limitation, as noted by Cantwell and Baker themselves (1987b p. 550), is their lack of a control group. Because of this, it is not possible to compare the relative effects of individual risk factors separately from the communication disorder. For example, the increase in the prevalence of psychiatric problems may be due to the communication disorder but it also may be due to psychosocial stressors. Without a comparison group, however, it is not possible to determine how much of the increase is the result of psychosocial stressors versus that due to the communication disorder per se.

Griffiths reported on 49 children who had attended a special school for children with defective speech for an average of 20 months. All the children were initially referred to the school because of "severely delayed or defective speech development." Based on their speech and language abilities, the subjects were placed in 1 of 6 strata. The two strata containing the largest numbers were the one for children with delayed or abnormal language development and defective articulation (n=22), and the one for those with severely defective articulation with normal or near normal language development (n=10; including 7 with motor difficulties). In children with normal intelligence, 6 of the 8 children with severely defective articulation but normal or near



normal language development were considered by parents or teachers to be emotionally maladjusted compared to 3 of the 11 in the group with delayed or abnormal language development and defective articulation.

The first group may be compared to Cantwell and Baker's "pure speech disordered" group. If so the two studies are somewhat contradictory. It may be that the articulation group in Griffiths' study had more problems due to concomitant motor disorders. The numbers for Griffiths' study are small and caution must be exercised when comparing these results to those of other studies.

In this study, evidence was found to indicate that speech or language disordered children who also were mentally handicapped were more likely to have emotional or behavioral problems than speech or language disordered children of normal intelligence. Specifically, 52.4% of the former group had problems in emotional adjustment compared to 39.0% of the latter group.

#### **B. Cohort studies with control groups**

The studies in Table 1.4 include control groups. The prevalence of maladjustment in the communication disordered group at follow-up was compared to that of the control group. However, most of these studies did not control for maladjustment at baseline making it impossible to distinguish between new problems that developed and previous problems that persisted. Thus, the temporal relationship between communication

**Table 1.4: Cohort Studies**

Reference	Disorder	Cohort	Sample Size Cohort	Sample Size Disorder	Age (yr.)	Outcome Measure	Findings
Sheridan (1973)	Speech disorder	National Child Development Study (1958)	14,778	204	7	Bristol Social Adjustment Guide (teachers)	47.5% of speech disorder- ed were maladjusted com- pared with 13.5% of healthy
Peckham et al. (1972)	Hearing impairment	National Child Development Study (1958)	14,775	213	7	Bristol Social Adjustment Guide (teachers)	30.2% of severe unilat- eral group were malad- justed compared with 13.0% of healthy. 30% of severe bilateral group were maladjusted compared with 13.0% of healthy
Sheridan and Peckham (1975)	Speech disorders	National Child Develop- ment Study (1958)	14,778	124	11	Bristol Social Adjustment Guide (teachers)	30% of speech disorders were maladjusted compared to 10% of controls

Table 1.4: Cohort Studies (continued)

Reference	Disorder	Cohort	Sample Size Cohort	Sample Size Disorder	Age (yr.)	Outcome Measure	Findings
Fundudis et al. (1979)	Speech disorders	Newcastle, England birth cohort	3,300	102	7	Behavior rating scales (Rutter; teacher and	Based on mothers' reports speech disordered children were not more maladjusted than the healthy; based on teachers' reports 54.0% of "pathologically speech retarded" were maladjusted compared to 36.1% of "residually speech retarded" and 24.0% of healthy
Klackenberg (1980)	Speech disorder	Children recruited randomly at birth	55	49	3 - 20	Structured annual interviews (parents)	No clear findings
Richman et al. (1982)	Language disorder	Waltham Forest, England, random sample of 3 yr. olds	828	22	8	Behavior rating scales (Rutter, teacher and parent)	Based on mothers' reports 48% of language disordered were maladjusted compared to 24% of health based on teachers' reports; 45% of cases were maladjusted compared to 48% of the healthy

Table 1.4: Cohort Studies (continued)

Reference	Disorder	Cohort	Sample Size Cohort	Sample Size Disorder	Age (yr.)	Outcome Measure	Findings
Heller et al. (1985)	Cleft lip or palate, heart disease, hearing impairment	Clinical population	140		4 - 13	Child Behavior Checklist (Achen- bach), Children's self-report, Psychiatric rat- ing scale	Persistence or development of maladjustment over one year: 12.2% cleft palate, 24.0% heart disease, 28.6% hearing impairment
Lerner et al. (1985)	Speech or language disorder	Children from U. of Washing- ton pre-school 1965-1975	88	Not given	3 - 16	Psychiatric assessment	Those with speech or language problems had at least twice the risk of developing psychiatric disorders than healthy
Silva et al. (1986)	Bilateral otitis media with effusion	Sample of children born in Dunedin during one week in 1973	323	44	3, 5, 7, 9, 11	Behavior rating scales (Rutter; teacher and parent)	Children with bilateral otitis media had more teacher-reported behav- ioral problems at all ages compared with healthy; those with bilateral otitis media had more parent-reported behavioral problems at age 5 and 7 compared with healthy

disorders and maladjustment is blurred, and causal inferences remain tentative.

Sheridan's (1973) report shows that 47.5% of children with speech disorders were maladjusted compared with 13.5% of controls. A study by Peckham and colleagues (1972) reports on a sample of children with severe bilateral or unilateral hearing impairments. About 30% of these children were maladjusted compared to 13% of the controls. Perhaps the most important finding from the National Child Development Study cohort is that as the degree of hearing impairment increases, the risk of emotional and behavioral problems rises. While children with moderate bilateral hearing impairment were not at significantly greater risk for social maladjustment, those with severe unilateral or bilateral hearing impairment had a prevalence of maladjustment more than twice that of the children with normal hearing.

Sheridan and Peckham (1975) described 124 11-year-old children included in the National Child Development Study who were reported to show marked speech defects but normal hearing at age 7. At age 11, 69 of the 124 children had residual speech problems and the 55 remaining children had achieved satisfactory speech. Based on the results of the Bristol Social Adjustment Guide at age 11, four times as many children with residual speech problems at age 11 were considered to be maladjusted compared to controls. Similarly, three times

as many children with satisfactory speech by age 11 were maladjusted. The authors note, but do not provide quantitative information, that in "several instances" the children with residual speech problems had associated pediatric disorders such as diabetes and congenital heart defects. No attempt was made to control for behavior problems at age 7, and thus no distinction may be made between the development and persistence of behavioral problems. Also, only crude prevalence rates were provided making it impossible to assess confounding or effect modification.

Unfortunately, the 1958 British Cohort Study failed to analyze the data so as to control for potential confounders or to make optimal use of the longitudinal nature of the data.

Fundudis, Kolvin and Garside (1979) studied 3,300 children included in a birth cohort from Newcastle upon Tyne, England. Information was obtained at age 3 and again at about age 7. Initially, 102 (4%) children were "speech retarded" in that they were not using "three or more words strung together to make some sort of sense by the age of 36 months" (p.3). The "speech retarded group" was classified as "pathologically deviant" or "residually speech retarded" based on information obtained at age 7. Of the 18 children who were "pathologically deviant," seven were intellectually handicapped alone; five had cerebral palsy; two were autistic; two were electively

mute<sup>1</sup>; one was severely dysphasic; and, one was dysarthric and had a cleft palate.

At follow-up, parents, teachers and psychologists reported on the behavior of the children. According to parents' assessments, there were no differences between groups on global measures of behavioral deviance. From scores derived from the Rutter Teacher's Scale, 54% of the "pathologically speech retarded" group were behaviorally deviant compared to 36.1% of those with "residual speech retardation," and 24% of the controls. About 94% of the "pathologically speech retarded" were reported by a psychologist to have a psychiatric disorder compared to 29% of those with "residual speech retardation" and 24% of the controls.

The Newcastle study has made a valuable contribution in several ways. It provides longitudinal information on children with speech disorders from the general population. Assessment of behavior at follow-up was sought from three sources increasing the concurrent validity of the findings. Children with concomitant physical or cognitive defects were analyzed separately or excluded from the analysis, reducing the likelihood of confounding due to these factors and providing evidence

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<sup>1</sup> Elective mutism is defined in DSM-III-R as the continuous refusal to talk in one or more major social situations, including at school, with the ability to comprehend spoken language and to speak, and not due to another mental or physical disorder. Also sometimes called "selective mutism" (DSM-III-R American Psychiatric Association 1987).

that children with concomitant physical disorders were most at risk. One limitation of the study is that the controls were matched for gender, age and locality, but were not individually matched for the full range of social factors that may confound or modify the association between communication disorders and maladjustment. It is for this reason that the authors caution, "our attempts to control for social class factors were only partially successful; such factors, therefore, cannot be totally discounted when interpreting our various findings" (p. 39 Fundudis, Kolvin and Garside 1979). Additionally, no effort was made either in the design or the analysis to control for maladjustment at age 3. Thus, it is impossible to distinguish the proportion of children in either the index or control group who developed new problems in behavior from those who had persistent problems.

During a twelve month period in 1969-1970, a randomly chosen cohort of 828 3-year-old children living in an Outer London borough, Waltham Forest, was assembled. The initial study objective was to determine the prevalence of behavioral problems during the preschool years, and to determine if these problems were predictive of similar difficulties at 8 years (Richman, Stevenson and Graham 1982). The association between behavior problems at age 3 and other factors such as the language development of the child, material deprivation,



disturbed family relationships, and maternal depression was also assessed.

The mothers of all the children were interviewed at home within 1 month of the child's third birthday. At this time, three measures of language development were used corresponding to passive or receptive vocabulary (single word recognition task), expressive vocabulary (single word naming task), and language structure (syntactic complexity). Behavior problems were measured using a semi-structured interview (Behavior Screening Questionnaire) and a behavior checklist consisting of 12 items of behavior rated on the basis of mothers' reports.

Children of immigrant status were excluded from the analysis. At age 3, 101 (14.3%) of the 705 non-immigrant children in the cohort were identified as showing a significant behavior disturbance using reports from the Behavior Screening Questionnaire (Richman and Graham 1971). Of these 101 children, 14% used only single word utterances, 19.8% were not speaking in four syllable sentences, and 37.6% had articulation problems. The corresponding percentages in the group without behavior problems were 5.1%, 10.3% and 21.5%, respectively.

Language disorders were also studied. Defining language delay as expressive language six months behind chronological age, 22 children were identified. When the child's mental age was taken into account, only four children had language delay with "general retardation"

(Richman, Stevenson and Graham 1982). Of the 22 children with expressive language delay, 13 (59.1%) had behavior problems compared to 14.3% in the general population. Of the four children with expressive language delay not associated with "general retardation," three had behavior problems. The numbers here are small, and thus caution has to be used when interpreting the results.

Five years later, 535 of the initial sample were traced. The attrition rate between age 3 and age 8 in the total sample was about 35%. However, the authors state that the representativeness of those who were traced was satisfactory (Richman, Stevenson and Graham 1982). Some subgroups from the original cohort, including those with expressive language delay at age 3, were studied more intensively at follow-up than others.

The Rutter Teacher's and Parent's Scales were completed at age 7. A control group of 22 children from the same cohort was matched with the language delayed group on measures of behavioral problems at age 3. At age 7, approximately 36% of the children in the language delayed group had full-scale IQs below 85 compared to 4% of the control. (Approximately, 27% had a performance IQ below 85 compared to 4% of the controls). At age 7, based on the parents' assessments, 48% of language delayed children had behavioral problems compared to 24% of the controls. In contrast, based on the teachers' assessments of maladjustment, 45% of children with

language delay had behavioral problems compared to 48% of the controls (Stevenson 1984).

The study by Richman, Stevenson and Graham (1982) is one of the few studies to control for maladjustment at baseline. The children are randomly chosen from the general population and extensive assessments of communication skills are made at baseline.

Unfortunately, from the aggregate presentation of their data, it is not possible to distinguish the proportion of children who developed new behavioral problems between ages 3 and 8 from those who persisted in having existing problems. Thus, causal inferences are ambiguous at best.

### **III. Summary of Literature**

#### **A. Prevalence**

Of the 40 studies cited, 23 included a control group; of these, 9 studies provided the proportions of children maladjusted and thus prevalence rate ratios could be computed. The prevalence rate ratios for each of these studies are shown in Table 1.5. They ranged from 0.9 to 7.7. Caution must be used when interpreting these results because 13 studies that used measures of effect other than proportions or that had inadequate information to compute prevalence rate ratios were excluded. For example, the study by Lindholm and Touliatos (1979) reported differences in means and was excluded. In order to compare studies using different effect indicators, a formal meta-analysis would be required (Rosenthal 1984).

**TABLE 1.5: Prevalence rate ratios (PRR) from studies cited in Tables 1.2 and 1.4 according to communication disorder and informant assessing emotional and behavioral status**

Reference	Disorder	Informant	PRR
Meadow and Schlesinger (1971)	Hearing impaired	Teacher	3.0
Peckham et al. (1972)	Hearing impaired	Teachers	2.3
Sheridan (1973)	Speech disorders	Teachers	3.5
Sheridan, and Peckham (1975)	Speech disorders	Teachers	3.0
Fundudis, Kolvin and Garside (1979)	Partially hearing	Parents	0.9
	Profoundly deaf	Parents	0.9
	Partially hearing	Teachers	1.6
	Profoundly deaf	Teachers	3.0
Fundudis, Kolvin and Garside (1979)	Pathologically speech retarded	Teachers	2.3
	Residually speech retarded	Teachers	1.5
	Pathologically speech retarded	Parents	3.9
	Residually speech retarded	Parents	1.2
Richman, Stevenson and Graham (1982)	Language disorders	Parents	2.0
		Teachers	0.9*
		Teachers	2.0
Beitchman et al. (1986)	Speech disorders	Parent	1.5
		Teacher	1.5
		Psychiatrist	4.1

Table 1.5 is continued

TABLE 1.5: - continued

Reference	Disorder	Informant	PRR
Beitchman et al. (1989b)	Articulation and language disorders	Psychiatrist	7.7
	Articulation disorders	Psychiatrist	3.3
	Auditory comprehension problem	Psychiatrist	3.8

\*This study had two reference groups for the teachers' assessments of maladjustment. The first PRR is calculated using the control group matched on baseline maladjustment as the reference group; the second PRR is calculated using the total sample free of language disorders as the reference group.

This procedure, although very valuable, is beyond the scope of this thesis.

It may be concluded that of the 23 studies reported in Tables 1.2 and 1.4, children with communication disorders were more maladjusted than controls in 11 studies. In the remaining 12 studies, the increased prevalence was only evident for particular behaviors, or was only reported by some of the informants. Thus there is some evidence to conclude that children with communication disorders have more emotional and behavioral problems during early and middle childhood than children without such problems.

Variations in the magnitude of the effect across and within studies has been attributed to the severity of the problem (Fundudis, Kolvin and Garside 1979; Peckham, Sheridan and Butler 1972); the existence of associated physical or cognitive problems (Griffiths 1969; Sheridan and Peckham 1975; Fundudis, Kolvin and Garside 1979; Silva et al. 1984); the nature of the communication disorder (Cantwell and Baker 1987a; Beitchman 1989b); and the informant assessing the behavior (Prior et al. 1988; Richman, Stevenson and Graham 1982; Griffiths 1969; Beitchman et al. 1986; Fundudis, Kolvin and Garside 1979).

The only published study that compared children with communication disorders to children with other chronic disorders was that of Heller et al. (1985). In this

study, children with hearing impairment were more likely to have emotional and behavioral problems than either those with cleft palate or those with heart disease (28.6%, 12.2% and 24.0%, respectively). From an extensive review of the literature, the prevalence rate ratios of maladjustment in children with chronic physical disorders using healthy groups as a reference have ranged from less than or equal to 1 to 10.9 (Nolan and Pless 1986). Because of differences in sample selection, design and analysis, it is difficult to compare prevalence rates of maladjustment among communication disordered children to those among children with other chronic disorders. A study that compares children from the same population using similar measures of health status and behavior is required to determine if those with communication disorders are at a greater risk than those with other chronic disorders.

#### **B. Causal mechanisms**

Unfortunately, due to the limited number of prospective studies that controlled for baseline measures of maladjustment and the inherent weaknesses in other study designs, the temporal direction of the relationship is not clear.

The relationship may take different forms. Rutter and Lord (1987) summarized four of the varied patterns of association between psychiatric disorders and speech disorders. First, a psychiatric disorder may "cause" a

communication problem. Elective mutism and some cases of stuttering in early childhood are examples of this. The electively mute child has the ability to communicate, but for social or emotional reasons does not use this ability normally.

Second, a primary communication disorder may "cause" a secondary psychiatric disorder. This pattern is most pertinent to the purposes of this thesis, and will be discussed in greater detail below. Third, the association between the communication disorder and the psychiatric disorder may not be causal. Rather, both may result from the same underlying problem through a similar causal pathway. For example, an autistic child may have problems in both communication and behavior, and although the precise nature of the underlying problem is not known, it is assumed to involve a cognitive-developmental deficit (Rutter 1983). Beitchman (1985) suggests that neurodevelopmental immaturity is an important risk factor for problems in a variety of areas of functioning, including communication, cognition, visual-motor skills, and behavior.

The fourth pattern is one in which the communication disorder, especially a speech or language impairment, and a psychiatric disorder arise from different causal processes that both stem from the same factor. The distinction Rutter and Lord make between the third and the fourth pattern is important but rather subtle.



Unlike the former pattern, in the latter, although the communication disorder and the emotional and behavioral pattern occur together, they are not the result of the same underlying process. For example, a communication disorder and a psychiatric disorder may both be the result of parental neglect or severe environmental deprivation (Rutter and Lord 1987). In this example, the communication disorder may result from a lack of necessary learning experiences, while the emotional and behavioral problem may derive from the lack of a significant, consistent and meaningful relationship with adults (Rutter and Lord 1987). Finally, a fifth pattern proposed is one involving multiple interconnected causal processes, exemplified by mental retardation.

There are several ways in which communication disorders may lead to psychiatric problems though few are completely understood. First, the failure to develop normal communication skills may have a detrimental effect on parent-child interactions. In this case, difficulties in communication evoke disturbed patterns of parent-child interaction and in turn these contribute to the child's emotional difficulties (Howlin and Rutter 1987).

Second, problems in communication are likely to lead to problems in developing friendships. Difficulties in early social relationships tend to be one of the most powerful predictors of later emotional disturbances. Rejection by peers is likely to reduce self-confidence

even more, and although this may be most marked in children with severe communication impairments, even children with mild disorders may be affected in this way (Howlin and Rutter 1987).

Third, the communication disordered child may develop problems in symbolic play that reduce his or her ability to join in group games and impede opportunities for forming relationships with peers. Symbolic thinking and make-believe play serve several important functions - among them exploring feelings, lessening fears, and the rehearsing and developing of social skills (Rosenblatt 1980). The child in whom these functions are impaired may be at increased risk for the development of emotional problems (Howlin and Rutter 1987).

Fourth, empirical studies of the association between language and behavior suggest that speech and language are important in inhibiting inappropriate actions and promoting adaptive ones (Luria 1961; Tinsley and Waters 1982; Balamore and Wozniak 1984). Because most of the children with communication disorders have some speech and language problems, the impairment in their ability to use speech and language to mediate actions may make them more prone to develop emotional and behavioral problems.

### **C. Directions for future research**

From the recommendations of previous authors, the existing knowledge regarding the association between

communication disorders and emotional and behavioral problems may be improved in four ways. Firstly, many studies included children from speech and hearing clinics, or special educational facilities. Although these samples may provide essential knowledge regarding treatment effectiveness, they are limited in their ability to determine the prevalence of communication disorders and associated emotional and behavioral problems.

A prevalence rate is defined as "the total number of all individuals who have an attribute or disease at a particular time (or during a particular period) divided by the population at risk of having the attribute or disease at this point in time" (p.82 Last 1983). Errors in either the numerator or denominator will result in inaccurate estimates.

There are numerous examples demonstrating that studies based only on clinical populations will result in errors in determining the numerator. For example, it is known that patients with essential hypertension who are attending medical clinics have more symptoms of psychological distress than individuals newly discovered to have hypertension in the community (Davies 1970; Cochrane 1973). Irritable bowel syndrome was also thought to be closely associated with psychological distress. However, two studies (Whitehead et al. 1988; Drossman et al. 1988) have demonstrated that even after controlling for severity of symptoms and other important

confounders, psychological distress was primarily noticed among irritable bowel sufferers who had sought treatment for the condition and not among those who had not been treated. These two examples illustrate a selection bias inherent in clinic based samples. This bias occurs when the co-morbidity of the exposure (hypertension and irritable bowel syndrome) and the disease (psychological distress) lead to a higher prevalence of the disease than that found in the community.

Beitchman and colleagues (1986) provide another illustration of this point. In this example, Kallman (1953) originally proposed that the concordance rates for schizophrenia among monozygotic twins was approximately 80-90%. This led to the conclusion that inheritance was the major determinant of disease. Kallman's data were based on mental hospital cases. Subsequent studies have shown that the concordance rate for monozygotic twins is closer to 40%. The earlier data led to theories of etiology that are now believed to be incorrect (Beitchman et al. 1986).

It is not known whether children attending a speech and hearing clinic or other agency are representative of a randomly selected nonclinical group of communication disordered children from the general population. From experiences within other areas of epidemiology, it is reasonable to expect that those who do reach treatment may be different from those who do not. They may differ

on such variables as the severity of the disorder, the presence of other problems, and social and demographic characteristics that determine the utilization of health services and may simultaneously influence psychological adjustment. Further, the presence of psychological maladjustment may increase the likelihood that children with communication disorders will come to the attention of the clinic.

Errors in the denominator may be due to incomplete ascertainment of all the individuals who are at risk for having the attribute. Theoretically, even if the numerator is correct but the denominator is underestimated a higher prevalence rate will result. For example, if all communication disordered children who were maladjusted were ascertained but only half of those who were communication disordered but not maladjusted were ascertained, the prevalence rate would be doubled. Access to speech and hearing clinics varies by many factors including health insurance coverage, geographical region - rural or urban, and country of residence. In Canada, where training positions for physicians are being reduced, positions for speech pathologists and audiologists are being increased (Durieux-Smith 1991). Even in large urban centers like Montreal, it is typical that children are placed on waiting lists and required to wait for four months or longer for an initial assessment; the waiting list for treatment is even longer (McNutt

1990; Durieux-Smith 1991). In Northern regions of even the wealthiest provinces, there are often no speech pathologists to treat children with speech disorders. Many existing positions are left vacant for several years due to the scarcity of individuals with the appropriate professional training (Paulsen 1990).

Peckham (1973) claims that in England, Scotland and Wales there is a considerable regional variation in the accessibility to speech therapy services. At the time of her writing there was a recognized shortage of speech therapists in many areas of Britain. The areas where the need appeared to be the greatest were frequently the areas where the smallest proportion of children were receiving speech therapy. More children with communication disorders came from socially disadvantaged families, and yet there was no difference in the utilization of speech therapy in different social classes (Peckham 1973).

Thus, although it may be argued that complete ascertainment may be approached in some countries in large urban speech and hearing clinics, this does not imply that all children with communication disorders in Canada and Britain are receiving treatment. Population surveys are important for two reasons. Firstly, they define the extent of the problem and the extent to which health, educational and related services may be needed. Second, and of equal importance, they permit theory

building free of the biases inherent in data collected from clinics (Beitchman et al. 1986). Corrections can be made to theories derived from clinic-based samples, or, alternatively, certain of the hypotheses based on clinical studies may be confirmed.

Secondly, future studies could also be improved by the inclusion of control groups. The prevalence of maladjustment varies greatly across control groups. In part, this may be attributed to variations in measures of maladjustment, study designs, and methods of analysis. With such differing values it would be difficult to know which value to choose as a baseline for studies without internal reference groups. Using control group data that are based on existing literature opens the possibility for a variety of biases (Mausner and Kramer 1985).

Future studies could be improved by a greater use of and appreciation for multivariate analysis. This term is being used to describe the technique of controlling for extraneous variables and identifying interaction terms (effect modifiers) when examining the association between the exposure variable and the outcome variable. If provision is not made to control for confounding variables either during the design or the analysis of a study, estimates of effect may be biased (Rothman 1986). For example, it is known that social class is associated with both communication disorders (Beitchman, Peterson and Clegg 1988) and emotional and behavioral problems

(Gortmaker et al. 1990; Offord, Boyle and Jones 1987).

If social class is not controlled, then the estimate of association between communication disorders and emotional and behavioral problems may be increased, decreased, masked or reversed. For example, Fundudis, Kolvin and Garside (1979), aware that they have not adequately controlled for social factors, request that their readers exercise caution when interpreting the results of their study.

Effect modification refers to a change in the magnitude of an effect measure according to the value of some third variable which is called an effect modifier. For example, the association between communication disorders and emotional and behavioral problems may be modified by characteristics of the home environment. The work of Baker and Cantwell (1987a) and Beitchman, Peterson and Clegg (1988) has begun to identify such variables. Further work is needed in this area to help delineate, for example, the specific type of psychosocial stressors and other risk factors that may be significant determinants of emotional and behavioral outcome in communication disordered children (Prizant et al. 1990).

In 1987, Silva (1987) and Cantwell and Baker (1987b) reviewed the existing literature regarding the epidemiology of speech disorders. Both reports stated that further research is needed to determine the long-term consequences of communication disorders for behavior



problems and mental health. Of the 16 cohort studies that were reviewed in Tables 1.3 and 1.4, most were restricted to primary school age children (Petrie 1975; Peckham, Sheridan and Butler 1972; Sheridan 1973; Fundudis, Kolvin and Garside 1979; Richman, Stevenson and Graham 1982) or middle childhood (Garvey and Gordon 1973; Sheridan and Peckham 1975; Heller et al. 1985; Silva, Chalmers and Stewart 1986). The remaining seven studies had information on children age 16 or older. Of these, five were clinic-based samples. Two cohort studies with control groups included children 16 years of age and over (Klackenberg 1980; Lerner et al. 1985). The only clear finding from the study by Klackenberg was a suggestion that speech disordered children had more minor offenses than normal children; in the Lerner et al. study only five children had language problems initially.

In summary, many studies suggest that communication disordered children have an increased risk of emotional and behavioral problems, and a number of mechanisms have been proposed to explain this relationship. Most studies, however, have failed to examine communication disorders in the general population, and have failed to use multivariate statistical techniques to control for confounding variables and to identify effect modifiers. None have compared the extent of maladjustment in communication disordered children with that in children having a variety of other chronic disorders; neither have any examined the longitudinal pattern of this comparison.

## **METHODS**

## METHODS

### I. Hypotheses

Two principal questions are addressed in this study. First, are children with communication disorders more likely to be maladjusted than those with other chronic disorders and those who are healthy? Second, are children with communication disorders more likely than those with other chronic disorders and the healthy to develop emotional or behavioral problems or to persist in having these problems?

The first question can be answered using cross-sectional data in which the association between communication disorders and emotional or behavioral problems is measured by the prevalence rate ratio (PRR)<sup>1</sup>. To answer the second question a cohort design is necessary. In this, communication disordered children are followed over a period of time, and prevalence rate ratios for the development of new problems, and the persistence of existing problems are determined.

Using these two study designs, the following hypotheses were formulated prior to the analyses:

a) At the time of initial contact the prevalence rate of emotional or behavioral problems among the communication disordered will be greater than in a reference group of

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<sup>1</sup>In cross-sectional studies, a crude measure of association between exposure and disease is the prevalence rate ratio. Specifically, when groups are selected by exposure, and outcomes are prevalent rather than incident, the relative risk derived from a cross-sectional study is often referred to as a prevalence rate ratio (Kramer 1988).

children who are healthy. This prevalence rate will also be greater than that of those with chronic physical disorders.

b) The prevalence rates for the development and persistence of emotional or behavioral problems among communication disordered children will be greater than that of children who are healthy. These prevalence rates will also be greater than those of children with chronic physical disorders.

## II. Methods

To test these hypotheses in the general population two options were available. A prospective cohort study could have been conducted collecting original data from a sample of children and reassessing the same subjects several years later. This would have required substantial funds and research personnel. The second option was to test the hypotheses using existing data sets.

As with most research strategies, secondary analysis<sup>1</sup> has both advantages and limitations. It allows researchers access to data from large samples - data that would be difficult for a lone researcher to gather (Keicolt and Nathan 1985). Solving a problem by the analysis of existing survey data, rather than by collecting data in a new survey, economizes on money,

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<sup>1</sup>Herbert H. Hyman, a pioneer of secondary analysis methods, defines secondary analysis as "the extraction of knowledge on topics other than those which were the focus of the original surveys (Hyman p.1, 1972)."

time and personnel.

In addition to these pragmatic benefits, secondary analysis of multiple data sources can determine empirically whether the results are consistent across data sets from different countries at different points in time (Hyman 1972). Numerous authors across many scientific disciplines have recommended replication to increase confidence in research findings. Sir Austin Bradford Hill suggests that consistency of findings across places, circumstances and times decreases the likelihood that the findings were due to chance (Hill 1965).

#### **A. Data sets**

The hypotheses will be tested using two samples. The first sample is derived from the Ontario Child Health Survey (OCHS), a study of children from the general population of Ontario in 1983 and recontacted in 1987. The second sample is taken from the National Child Development Study (NCDS), a British cohort followed from birth to age 23.

The OCHS sample provides information on children 4 to 16 years old who were followed up four years later. In the NCDS, data are available on the cohort from ages 7 through 23, thus providing data on young adults. Although the NCDS has a longer follow-up period and two contacts with the sample during the 16 year follow-up period, the OCHS is advantageous in that it was completed

more recently and included Canadian children. These studies offer an exceptional opportunity to test and confirm the specified hypotheses across data collection procedures, methods of measurement and populations.

In the following sections, the methods used in each survey will be presented.

## **B. The Ontario Child Health Survey**

In 1980, the Child Epidemiology Unit of the Department of Psychiatry, McMaster University, undertook to design and execute a province-wide child health survey commissioned by the Ontario Ministry of Community and Social Services. Of special interest to the Ministry was the prevalence of emotional and behavioral disorders among children 4 to 16 years of age.

### **1. Population**

The target population included all children born from January 1, 1966 through January 1, 1979 whose usual place of residence was in a household in Ontario. The sampling unit consisted of all household dwellings listed in the 1981 Census of Canada. The selections were done by stratified, clustered, and random sampling by Statistics Canada in 1982. The survey excluded three groups: those living on Indian Reserves, those in collective dwellings, such as institutions, and those residing in dwellings constructed after June 1, 1981 (Census Day). Excluded groups represented 3.3% of the population aged 4 to 16 years. A total of 2,623

households was selected. These were evenly distributed among the four geographic regions of the Ontario Ministry of Community and Social Services: North, East, Central, and Southwest (Cadman et al. 1986).

Each of the four regions was subdivided into three strata based on the 1981 population: large urban areas with more than 25,000; small urban areas ranging in population from 3,000 to 25,000; and rural areas of less than 3,000. In the urban areas a simple random sampling of households was completed within each region. In the small urban and rural areas a two-stage sampling procedure was used: in the first census agglomeration areas<sup>1</sup> were selected; in the second, households were selected. Ninety-one percent of all eligible households participated (Cadman et al. 1986).

The field work was done by Statistics Canada interviewers between January 27 to February 18, 1983, with one week in March allowed for callbacks. The interviewers first visited all sampled households to screen for eligibility using a household record card. This was followed by a home interview with the female head of all eligible households (or male head of the household if he was a single parent). Teachers were approached after the home interview and asked to complete

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<sup>1</sup>The small urban areas consisted of census agglomeration areas with populations less than 25,000 and of smaller towns and villages with populations over 3000. The rural strata consisted of nonurban areas with population densities generally less than 400 persons per square kilometer and fringe areas of both census metropolitan areas and census agglomeration areas (Boyle et al. 1987).

behavior checklists similar to those administered to the head of households with additional questions concerning academic performance (Cadman et al. 1986; Boyle et al. 1987).

In March and April of 1987 a follow-up study was completed. It was expected by the investigators that approximately 90% of the households included in the original sample would be traced.

The principal investigator, Dr. David R. Offord, and his co-investigators have published several reports of the OCHS. The initial publications described the methodology of the study (Boyle et al. 1987; Offord et al. 1987; Byles et al. 1988). As previously mentioned, the primary purpose of the OCHS was to determine the prevalence and distribution of mental health problems in Ontario children. Several articles reflected this purpose and reported on the correlates of psychiatric disorder in the OCHS population (Offord, Boyle and Jones 1987; Blum, Boyle and Offord 1988; Szatmari, Offord and Boyle 1989; Links, Offord and Boyle 1990).

The OCHS also allowed an estimate of other medical conditions, such as hearing deficits and heart problems. The association between these other conditions and mental health problems was the focus of several publications (Cadman et al. 1986; Cadman et al. 1987; Cadman, Boyle and Offord 1988). For these secondary analyses, children with chronic health problems, identified by parental



reporting, were compared to children free of chronic health problems on several dimensions. For example, children with chronic illnesses were at a greater risk for psychiatric disorders than children reported to be healthy (Cadman et al. 1987). No subgroup analyses were performed to determine if communication disordered children were at greater risk for psychiatric disorders than those with other chronic disorders. Children with chronic health problems were found to be more likely to use physician, special education, social and mental health services (Cadman et al. 1986). However, several children with chronic disabilities who might benefit from specialized mental health services failed to use them (Cadman et al. 1987). The investigators also examined the type and amount of psychosocial maladjustment among the siblings of children with chronic physical health problems (Cadman, Boyle and Offord 1988).

## **2. Inclusion and exclusion criteria**

The cohort studied by the OCHS in 1983 is the base population for the present study. All children identified by their parents as having a speech or hearing problem, or both, of six months' duration or longer as of the winter of 1983, are included. These children are compared with those having other chronic disorders and the healthy (i.e., those free of any chronic disorders; see Appendix 1 for questionnaires). The inclusion and exclusion criteria for each of the three groups are

described below.

**a) Criteria common to all diagnostic groups**

**Normal intelligence:** Eligibility was restricted to children of "normal intelligence." If the respondent reported either that the child was mentally retarded or had ever received special education for the mentally handicapped they were excluded.

**Linguistic group:** Due to the possibility of confusing a communication disorders with second language learning, only those from homes where the predominant language was English or French were included. This will restrict the generalizability of the results to children who are English or French, but will increase the internal validity of the study.

**b) Communication disordered group**

For the purposes of this study, a child was considered to have a speech disorder if the parent or guardian reported that the child was unable to communicate at all using words or speech and that this problem had persisted for six months or longer; or if the child was reported by the respondent to have difficulty speaking or using words because of stammering, stuttering, lisping or being hard to understand, for six months or longer.

A child was considered to have a hearing loss if the respondent reported that the child was deaf or unable to hear at all in one or both ears and that this problem had

persisted for six months or longer; or that the child had difficulty hearing what was said in a normal conversation with another person (even with a hearing aid), and that this problem had persisted for six months or longer.

All children in the OCHS who were identified as having speech or hearing problems, or both according to the criteria above, constitute the group with "communication disorders."

Children who had both a communication disorder, as defined above, and another chronic disorder were excluded. This exclusion allowed the association between chronic disorders and maladjustment to be determined without confounding by a coexisting communication disorder.

**c) Other chronic disorders group**

Those with chronic disorders other than communication disorders, were children whose parent or guardian reported that the child had any other chronic condition of six months duration or longer. The chronic disorders included are listed in Table 2.1.

**d) Healthy group**

The healthy group consists of all remaining children, i.e. those presumed to be free of communication and chronic physical disorders. This group also excluded those reported to be blind or unable to see in one or both eyes, or who had difficulty seeing clearly. These were excluded because previous studies suggest that those

**TABLE 2.1: Chronic illnesses and disorders included in  
interview schedule - OCHS, 1983**

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Asthma

Kidney disease

Heart problems

Epilepsy

Arthritis

Cerebral palsy

Muscular dystrophy

Spina bifida

Diabetes

Cancer

Cystic fibrosis

Paralysis

Weakness of any kind

A condition present since birth, such as club foot or  
cleft palate

Any stiffness or deformity of the foot, legs, fingers,  
arms, or back

Missing fingers, hands, arms, toes, feet, or legs

Any unspecified chronic conditions

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with poor vision may also be more likely to be maladjusted (Pless and Satterwhite 1975; Pless 1984).

### 3. Validation of health status variables

The items used to ascertain health status, communication disorders and other chronic disorders were adapted from the National Health Interview Survey (National Center for Health Statistics 1977) of the United States. There was no validation of parental reporting of health status. Validation would have required extensive examinations by audiologists to diagnose hearing impairment, by speech pathologists to diagnose speech or language disorders, and by physicians to diagnose other chronic disorders. Given that this information was not available, errors in classification of health status need to be considered. For example, a parent could fail to report a communication disorder - a false negative - or a parent could report a communication disorder that did not exist - a false positive.

During the early conception and planning stages of the current study, the possible impact of these errors on the measure of association between health status and emotional and behavioral problems was reviewed. If the reporting errors were independent of the outcome variable (the prevalence of emotional and behavioral problems), nondifferential misclassification would exist (Rothman 1986). The impact of this type of misclassification on the prevalence rate ratio or prevalence odds ratio would

be to attenuate it towards the null. Thus, if there was no association found between health status and emotional and behavioral problems, the possibility of nondifferential misclassification would have to be accounted for in the interpretation of the results.

On the other hand, differential misclassification would occur if the magnitude of the reporting errors of health status varied according to the child's actual emotional or behavioral status. For example, if a parent of a child with an emotional or behavioral problem was more likely to falsely report a communication disorder than a parent of a child with no emotional or behavioral problem, then the measurement error would be differential with respect to health status. Depending on the nature of the association between reporting errors of health status and the true emotional and behavioral status of the child, the direction of the measured effect between health status and emotional and behavioral problems could be increased, decreased, reversed or masked. A priori there was no evidence to suggest that differential misclassification should occur. However, when interpreting the results, the possibility of this type of misclassification would have to be considered.

#### **4. Outcome measures**

The following description of the standardized instruments used includes a general outline of the measure, its origin, the construct it addresses, the

structure and content of the questionnaire, scoring procedures and psychometric properties. Validity, specifically content validity, criterion-referenced properties and convergent aspects of construct validity, are presented when available. Reliability, when assessed, includes measures of internal consistency, reproducibility and observer variability.

The primary outcome is the child's emotional and behavioral adjustment as reported in a self-administered questionnaire by the parent and teacher, or if the child was 12 years of age or older, as reported by the child and the parent. For those age 17 or older in 1987, their own report of psychosocial adjustment was the only outcome measure used; the instrument used for this, the Diagnostic Interview Schedule, will be described briefly in a following section. The choice of paper and pencil measures was based on the need for standardization, convenience, acceptability to respondents, and economic considerations (Boyle et al. 1987).

#### **a) Survey Diagnostic Instrument**

The Survey Diagnostic Instrument is a measure developed for the purposes of the OCHS and is the principal measure of mental health. It consists of two parts: items to measure behavioral status and others to assess social adjustment. Most of the items on this instrument were extracted from the Child Behavior Checklist (Achenbach and Edelbrock 1983).

Five separate checklists were employed: a) parental report for 4 to 11 year olds, b) teacher report for 4 to 11 years olds c) parental report for 12 to 16 year olds, d) teacher report for 12 to 16 year olds, e) youth self-report for 12 to 16 year olds.

For each of these five parallel checklists, four scales were constructed to measure the following behavioral problems: conduct disorder, hyperactivity (more specifically attention-deficit disorder with hyperactivity), emotional disorder, and somatization. These were selected because of the investigators' knowledge of their frequency, adverse effect on quality of life, and cost to society for diagnosis and treatment (Boyle et al. 1987).

A total of 40 items in the four scales are from the Child Behavior Checklist. Six additional items were developed by the OCHS investigators to improve the assessment of hyperactivity and somatization. (Items included in the scales are listed in Appendix 2.) Each has three possible responses to which corresponding numeric values were assigned: 0, for never or not true, 1, for sometimes or somewhat true, and 2, for often or very true. The respondents were asked to think of the items in terms of current behavior or behavior that had occurred within the past six months. The responses to all items within a scale were summed to form a score. Each scale was dichotomized at a specific threshold to



allow for the designation of a disorder as "present" or "absent."

The content validity of the Survey Diagnostic Instrument - the extent to which it reflects the domain it intends to measure - was maximized by having three physicians choose items from the Child Behavior Checklist which they believed best operationalize the criteria for specific disorders from the *Diagnostic and Statistical Manual of Mental Disorders*, 3rd edition (DSM-III) (American Psychiatric Association 1980; Boyle et al. 1987).

The investigators report that the DSM-III criteria for attention deficit disorder with hyperactivity - inattention, impulsivity, and hyperactive behavior - guided the selection of items for the hyperactivity scale. For conduct disorder, DSM-III criteria for a persistent pattern of physical violence against persons or property, severe violation of social norms, or both, were used.

The development of the somatization scale focused on the major DSM-III criteria for current somatic symptoms without organic cause. In this case, the criteria were divided into two components - distressing recurrent symptoms and perception of oneself as "sickly." Somatization was included only for 12 to 16 year olds because it was believed to occur too rarely to be reliably measured among younger children (Boyle et al.

1987). The items that were included in the emotional disorder scale were chosen to reflect elements of the DSM-III categories of anxiety disorder, major depression, and obsessive-compulsive disorder (Boyle et al. 1987).

Criterion-related validity - correspondence between the Survey Diagnostic Instrument and some criteria external to the instrument - a "gold standard," was assessed by correlating psychiatrists' diagnoses of a subset of the study sample with the checklists. One hundred ninety-four children took part in this validation study. Checklist information was collected approximately two weeks before a clinical assessment was done by a child psychiatrist blind to the scores. To evaluate all of the criteria for each of the four disorders listed above, psychiatrists judged whether or not a criterion was met for a particular disorder based only on the number, duration, and severity of symptoms identified during their clinical assessment. On this basis a clinical diagnosis was made for each of the four disorders (Boyle et al. 1987).

Using the child psychiatrists' diagnoses as the basis for threshold scores, quantitative checklist scores provided by parents, teachers and youths, were then converted to binary ratings. Separate thresholds were determined for each scale (conduct disorder, hyperactivity, emotional disorder, and somatization) and for each source of information (parent and teacher in the

4- to 11-year-old age group, parent and youth in the 12- to 16-year-old age group). In this manner, quantitative checklist scores could be used for the rest of the sample to approximate clinical diagnosis of a disorder.

To validate the selection of thresholds, the strength of agreement between the psychiatrists' diagnoses and the checklist ratings was assessed using sensitivity, specificity, kappa statistic, and the Y statistic. The kappa statistic is a measure of the amount of agreement between two raters corrected for chance agreement. One of the difficulties in using the kappa is that its value varies with sensitivity, specificity, and prevalence simultaneously. The Y statistic also quantifies agreement after taking chance agreement into account, but it does not confound prevalence with sensitivity and specificity. Theoretically, its value ranges from minus one to plus one although in practice this rarely occurs (Spitznagel and Helzer 1985). The Y statistic is recommended for use when the base rates for disorder are low (Spitznagel and Helzer 1985), and thus is the statistic reported in the following tables.

Table 2.2 illustrates the agreement between the psychiatrists' diagnoses and the checklist results. Agreement between the psychiatrists' diagnoses and the checklists for conduct disorder and hyperactivity is high for all indexes. Agreement for somatization is

adequate and for emotional disorder agreement is no better than chance. Due to the infrequent diagnosis of somatization in the 4- to 11-year-old age group, no threshold was set for this disorder.

**TABLE 2.2: Agreement between psychiatric diagnoses and checklist assessments of disorders by age of child - OCHS, 1983**

Age	Disorder (no. of cases) <sup>a</sup>	Sensitivity	Specificity	$\chi^2$
4-11 (n=78)	Conduct (10)	0.62	0.99	0.88
	Hyperactivity (14)	0.75	0.99	0.90
	Emotional (11)	0.06	0.89	-0.16
12-16 (n=97)	Conduct (13)	0.45	0.96	0.64
	Hyperactivity (7)	0.83	0.99	0.92
	Emotional (14)	0.15	0.92	0.19
	Somatization (8)	0.36	0.96	0.59

<sup>a</sup>Number of cases diagnosed by psychiatrists.

Derived from Boyle M et al. 1987.

Because there was poor agreement between the psychiatrists' diagnoses of emotional disorder and the checklist scores, Boyle and colleagues completed a further assessment of the usefulness of the threshold. They examined its relationship in the survey to the respondents' general perceptions of the child's mental health problems and ability to get along with others. To measure the former perception, respondents were asked the following three questions: "During the past six months ... do you think that the child has had any emotional or behavior problems?" For those answering yes, two additional questions were asked: "During that time, did

he or she tend to have more emotional or behavioral problems than other boys or girls of his or her age? Do you think that he or she needs or needed any professional help with these problems?" To measure the latter perception, respondents were asked to rate three items pertaining to the child's ability to get along with peers, teachers, and other family members.

Among those children identified by the checklist ratings as having emotional disorder alone, 42.5% were perceived as having more emotional and behavioral problems than other children the same age, 25.8% were perceived as needing professional help, and 22.9% were perceived as having problems getting along with others. The three estimates for children not scoring above any of the thresholds were 6.5%, 2.4%, and 6.3%, respectively. These findings are used to support the validity of the checklist threshold for emotional disorder.

Test-retest reliability of the checklist ratings of disorder was based on comparisons between responses collected two weeks before the psychiatrists' clinical assessments and those obtained during the original survey (OCHS) six to nine months earlier. Table 2.3 shows that overall agreement is 87% or better for all disorders. The Y statistic (a quantification of the agreement beyond chance corrected for prevalence) is greater than 0.40 for conduct disorder, hyperactivity, and emotional disorder across both age groups. Somatization in the 12- to 16-

year-old age group is the least stable of the checklist ratings. The Y statistic for somatization is 0.33 (Boyle et al. 1987). Internal consistency coefficients for each disorder ranged from 0.7 to 0.9 (Cadman, Boyle and Offord 1988).

**TABLE 2.3: Test-retest reliability of checklist assessments of disorders over six- to nine-month interval by age of child - OCHS, 1983**

Age	Disorder (no. of cases) <sup>a</sup>	Test-Retest Reliability	
		% Agreement	Y
4-11 (n=78)	Conduct (10)	93	0.69
	Hyperactivity (14)	94	0.66
	Emotional (11)	89	0.74
12-16 (n=97)	Conduct (13)	94	0.80
	Hyperactivity (7)	92	0.57
	Emotional (14)	87	0.44
	Somatization (8)	83	0.33

<sup>a</sup>Number of cases from psychiatrists' diagnoses

Derived from Boyle M et al. 1987.

#### **b) Diagnostic Interview Schedule**

For 17 - 21 year olds in 1987, the Survey Diagnostic Instrument was not an appropriate measure of maladjustment. Instead, a modified version of the United States' National Institute of Mental Health Diagnostic Interview Schedule (Robins et al. 1981) was employed. This schedule is a structured psychiatric interview administered by trained lay interviewers. When matched with a companion computer program, the Diagnostic

Interview Schedule can be used to generate DSM-III diagnoses. It has been used in over 20,000 interviews of community residents as part of the United States' National Institute of Mental Health Epidemiologic Catchment Area Studies (Regier et al. 1984). As used in the latter study, the instrument proposes five distinct DSM-III diagnoses: mania, personality disorder, major depression, dysthymia, and panic disorder. Those with one or more of these diagnoses are considered maladjusted.

**5. Comment regarding the reliability and validity of the Survey Diagnostic Instrument**

From the information displayed in Table 2.3, the test-retest reliability is quite high. This is an important feature of an instrument that is measuring phenomena that are assumed to be persisting characteristics that may not be assessable during a limited time interval (Achenbach 1985).

However, the criterion-related validity of the Survey Diagnostic Instrument may appear less than optimal. The Y statistic for emotional problems is disappointingly low. This may be due to the inherent limitations of the Survey Diagnostic Instrument or to the "gold-standard" chosen to determine sensitivity and specificity. In detailed reviews of child behavior rating scales and checklists, Barkley (1988) and Achenbach (1988) postulate that direct observations of

specific behaviors, as done by the child psychiatrists in the OCHS, may not be completely comparable to the information derived from behavior rating scales. Behavioral observations often focus upon behavior in very specific situations and over short time intervals. In contrast, the Survey Diagnostic Instrument required the rater to collapse observations across longer time intervals (6 months) and numerous situations (in the home, in the community, at school, etc.) resulting in substantial methodological differences in the two measures of the same construct.

Thus, although the information derived from the Survey Diagnostic Instrument and the psychiatrists' diagnoses certainly overlap to some extent, each also offers unique sources of information not obtained by the other (Barkley 1988). This limits the degree to which the criterion-related validity of the Survey Diagnostic Instrument can be established by such comparisons.

Barkley (1988) notes that despite the problems inherent in the use and interpretation of rating scales they will be used increasingly in research in child psychopathology. Compared to other forms of assessment, such as direct observations, behavior checklists have the following advantages for population-based epidemiological research: (1) they gather information from informants (parents, teachers, and youth) with extended time of experience with the child across diverse settings and circumstances; (2) they permit the collection of data on



behaviors that occur extremely infrequently and thus may be missed in a clinical assessment; (3) they allow quantitative distinctions to be made concerning qualitative aspects of the child's behavior that may be difficult to obtain through direct observational methods; (4) they allow for the gathering of information on a large community sample while minimizing costs.

#### **6. Other determinants**

In observational studies where randomization cannot be used to control for confounding, control of potential confounders must be considered during the design of the study or during the analysis. In this study, control was exercised in the analysis.

Given the scope of the objectives of the OCHS as initially defined, a wide spectrum of data were collected. During both the first and second data collection periods, information about the health, social, and behavioral status of the child and family was obtained. The variables chosen for this thesis were selected from the OCHS data set because of their theoretical and empirical relevance. Table 2.4 lists these independent variables classified according to their major determinant domains.

##### **a) Sociodemographic and parental variables**

Sociodemographic and parental variables were chosen based on the possibility that they may confound or modify the effect of communication status on maladjustment.

**TABLE 2.4: Independent variables by major determinant categories - OCHS, 1983**

<b>Category</b>	<b>Variable</b>	<b>Measurement</b>
<b>Demographic</b>	Gender	Dichotomous
	Age	Interval
	Number of sibs	Interval
<b>Socioeconomic</b>	Subsidized rent	Dichotomous
	Overcrowded	Dichotomous
	Welfare	Dichotomous
	Annual income	Interval
	Poverty	Dichotomous
<b>Parental</b>	Marital status	Dichotomous
	Maternal age	Interval
	Paternal age	Interval
	Maternal education	Polychotomous
	Paternal education	Polychotomous
<b>Medical</b>	Functional limitations	Dichotomous
	Health status	Polychotomous
<b>Home environment</b>	Alcohol abuse	Dichotomous
	Emotional disorder of mother	Dichotomous
	Emotional disorder of father	Dichotomous
	Health status of mother	Dichotomous
	Health status of father	Dichotomous
	Marital disharmony	Interval
	Family dysfunction	Dichotomous
	Parental separation	Dichotomous
	Spouse abuse	Dichotomous

The sociodemographic variables examined include:

- i) age
- ii) gender
- iii) number of siblings
- iv) type of dwelling - subsidized or other (i.e. currently living in a dwelling where the rent is subsidized by the government)
- v) overcrowded - no or yes (i.e. the same number or fewer rooms than there are household members)
- vi) welfare status - if any portion of the family income in the prior year was in the form of public assistance, such as welfare or mother's allowance
- viii) annual income - an ordered variable expressed in intervals of \$5000.00
- ix) poverty - no or yes (i.e. family earnings less than \$10,000 annually)

Information on parents was ascertained using the following items:

- i) marital status of the parents
- ii) maternal and paternal age
- iii) maternal and paternal education

The sociodemographic and parental items were obtained from Statistics Canada and have been used repeatedly in surveys conducted by them (Racine 1990). No reliability or validity data are available for these items.

#### **b) Home environment**

Several home environment variables were also included. Robins (1979) reports that the family's home environment may be a more important factor than sociodemographic variables in the development of child

psychiatric disorders. In a study of the effect of broken homes in predicting an adult diagnosis of antisocial personality among children, parental quarrelling was a more important predictor of behavior problems in children than was social class or parental marital status (Robins 1966 as cited in Robins 1979). Information regarding these family variables was obtained through a self-report completed by the mother, or the female head of the household. The variables collected were the following:

- i) alcohol abuse - an "agree" response to the statement that "alcohol is a source of tension or disagreement in the family."
- ii) emotional disorder of parent - a "yes" response to questions about whether respondent or spouse were ever hospitalized or treated for "nerves."
- iii) health status of parent - a "yes" response to questions about whether respondent or spouse suffers from a chronic medical condition or functional limitation.
- iv) marital disharmony - three questions relating to the frequency of mutually enjoyable activities, expressive caring, and quarrelling, and one question on overall relationship, which yields a scale ranging from 4 to 21.
- v) family dysfunction - a score above 27 on the 12-item General Functioning Scale derived from the McMaster Family Assessment Device (Miller et al. 1986). This instrument assesses family functioning on six dimensions: problem solving, communication, roles, affective responsiveness, affective involvement and behavior control. The range of scores on this score is 12 to 48; a score above 27 indicates family dysfunction.
- vi) parental separation - a "yes" response to a question about whether respondent and spouse were ever separated for one or more consecutive months for other than job-related reasons.

- vii) spouse abuse - a "yes" response from respondent to the question, "Do you ever hit each other when you quarrel?"

The OCHS was not designed to test reliability or validity of the home environment variables. However, the internal reliability and construct validity of the 12-item General Functioning subscale of the McMaster Family Assessment Device was evaluated using the 1983 OCHS data (Byles et al. 1988).

The correlation between the General Functioning subscale and other home environment variables was determined (Byles et al. 1988). Specifically, construct validity was assessed by postulating that deterioration of family functioning would be significantly associated with alcohol abuse, emotional disorder of either parent, marital disharmony, parental separation, or spouse abuse. Conversely, it was hypothesized that the General Functioning scale would not be correlated with socioeconomic status, geographic location, or physical health of either parent. The results indicated that the General Functioning subscale was associated in the expected direction with other home environment variables. Further, it was not associated with the physical health or either parent or the sociodemographic variables.

Reliability of the General Functioning subscale was consistent with previous findings (Miller et al. 1986); internal consistency was 0.86 (Cronbach's alpha) and the split-half coefficient (Guttman) was 0.83 (Byles et al.

1988).

## 7. Sample size and power

The calculation of sample size requirements for the cross-sectional component of the study is based on the assumption that the point prevalence of emotional and behavioral problems, as defined by the Survey Diagnostic Instrument at Time 1 is the major outcome of interest. Also, a 10% difference between health status groups in the proportion of children maladjusted was considered the smallest clinically relevant difference. Previous experience with the Child Behavior Checklist indicates that the best estimates of the prevalence of emotional or behavioral problems in healthy children, children with chronic physical disorders, and children with communication disorders are 10% (Achenbach and Edelbrock 1983), 20% (Nolan and Pless 1986), and 30% (Beitchman et al. 1986), respectively. Given the size of the cohort available in 1983, that is 90 children with communication disorders and 307 children with other chronic disorders, power estimates were calculated using a two-tailed test for proportions. Thus with alpha set at 0.05 and using the equation provided by Kelsey and colleagues (1986), if  $p_1$  is 20% and  $p_2$  is 30%, the power to detect this or a greater difference is 66.3%.

When comparing the children with communication disorders to those who are healthy, power estimates were calculated using a one-tailed test for proportions,

because it was not considered plausible to expect differences in the reverse direction (i.e. the communication disordered group would not be expected to have less emotional or behavioral problems than the healthy controls). Thus with alpha set at 0.05, if  $p_1$  is 10% and  $p_2$  is 30%, 90 children in the communication disordered group and 2,241 children in the healthy group provide power greater than 99% to detect a difference of this magnitude or more.

Given fixed values of  $n$ , alpha, and the proportion of children with other chronic disorders ( $p_0$ ) and those with communication disorders ( $p_1$ ) who were expected to be maladjusted at the time of follow-up, power estimates were calculated. Using two-sided tests with  $\alpha=0.05$ , power was estimated for several values of  $p_0$  and  $p_1$  and are shown in Table 2.5. The calculations are based on the assumption that at Time 1, 63 of the children in the communication disordered group (100% - 30%), 245 children in the group with chronic physical disorders (100% - 20%), and 2,017 children in the healthy group (100% - 10%) would be at risk for developing emotional or behavioral problems. From Table 2.5 it is evident that adequate power to detect statistically significant differences between communication disorders and those with other chronic disorders can only be attained for differences greater than 15%. Similar calculations of power were carried out for comparisons between the

communication disordered group and the healthy controls.

Table 2.6 indicates that even for differences of only 10%, power of at least 80% is available.

**TABLE 2.5: Power based on percentage maladjusted in communication disordered group and other chronic disordered group,  $\alpha=.05$  (2-tailed) - OCHS, 1987**

Percentage Maladjusted		Power
Communication disorders	Other chronic disorders	
30.0%	20.0%	39.7%
35.0%	20.0%	70.9%
40.0%	20.0%	91.0%

**TABLE 2.6: Power based on percentage maladjusted in communication disordered and healthy group,  $\alpha=.05$  (1-tailed) - OCHS, 1987**

Percentage Maladjusted		Power
Communication disorders	Healthy	
20.0%	10.0%	89.3%
25.0%	10.0%	99.4%
30.0%	10.0%	99.4%

## 8. Analytic strategy

Two approaches to the analysis were employed. First, cross-sectional analyses were conducted using the data collected in 1983 to determine if communication disordered children were more maladjusted than those who



had other chronic disorders or those who were healthy. Univariate and bivariate methods were used to provide descriptive statistics and measures of association. The point prevalences, crude (or unadjusted) prevalence odds ratios, and corresponding 95% confidence intervals describing the association between health status and maladjustment were computed.<sup>1</sup> The crude prevalence odds ratio rather than the prevalence rate ratio was reported because it allowed easier comparison between the results of the univariate analysis and those of the multivariate logistic regression. From the regression coefficients of the logistic regression models computed in the multivariate analysis, adjusted prevalence odds ratios are derived. Thus by reporting both the crude prevalence odds ratios and the adjusted prevalence odds ratios the effect of controlling for confounders was easily estimated.

When the outcome is rare, less than 10%, the prevalence odds ratio for maladjustment will approximate the prevalence rate ratio of maladjustment (Kleinbaum, Kupper and Morgenstern 1982). However, because the prevalence of emotional and behavioral problems is greater than 10% in all health status groups, the prevalence rate ratios were also computed.

#### Contingency tables and multiple logistic regression

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<sup>1</sup>Confidence intervals were constructed using Taylor series (Kleinbaum, Kupper and Morgenstern 1982; SAS 1988)

models were then used to test the association between health status groups<sup>1</sup> and maladjustment controlling for potential confounders. The same approach was used to test for the interaction between health status groups and other predictors of maladjustment. In the stratified analysis, Mantel-Haenszel odds ratios of the association between health status and maladjustment were estimated for each level of each predictor variable, as well as a summary odds ratio for each predictor variable as a whole.

Based on information from previous studies and the results of the bivariate analyses, variables were selected for entry into a forward stepwise logistic regression model to estimate the relationship between health status and maladjustment while simultaneously controlling for potential confounders. Interaction terms were also assessed.

Several options existed for computing logistic regression models. One model could have been computed for the entire sample and each health status could have been represented by a dummy variable. Interaction terms could then have been tested between each health status and each covariate. If there were six covariates, this would have entailed twelve interaction terms. The advantage of this strategy would have been that all

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<sup>1</sup>The term health status will be used to indicate the diagnostic grouping of the child: communication disorders, other chronic disorders, or healthy.

subjects would have been available when estimating regression coefficients for covariates. The main disadvantage would have been the number of interaction terms potentially required in each model.

Another strategy and the one chosen for this study was to compute two models. In the first, children with communication disorders were compared to healthy children. In the second, children with other chronic disorders were compared to the healthy. The advantage of this strategy was that there would be fewer interaction terms to be considered in each model. The disadvantage of this strategy was that for each model one of the health status groups, either communication disorders or other chronic disorders would be omitted and thus not be available to estimate more precisely model parameters. However, the communication disordered group and other chronic disordered group comprised only from 2.7% to 12.0% of the samples, respectively. Their absence, therefore, would not have strongly affected the estimates of coefficients for the covariates. Preliminary analyses demonstrated this to be true; estimates of regression coefficients and their corresponding standard errors for covariates were similar across the models comparing communication disorders with the healthy and those comparing other chronic disorders with the healthy.

In the second stage, a multivariate longitudinal analysis was conducted. Using the information collected

in 1983 to determine maladjustment in 1987, children who were not maladjusted in 1983 were separated from those who were maladjusted in 1983. For each of these groups, the association between health status in 1983 and emotional and behavioral problems four years later was to be determined using bivariate statistics and logistic regression models.

Although multiple comparisons were made between health status, other determinant variables and emotional and behavioral problems, no adjustment was made to make the p-values more stringent. This decision followed from Rothman's (1986) recommendation. He suggests that the best course for the epidemiologist to take when making multiple comparisons is to ignore advice to make adjustments for multiple comparisons. Otherwise it is difficult to determine what comparisons should be accounted for when adjusting the p-value. For example, adjusting the p-value taking into account only the comparisons made in one publication has no more credence than accounting for all the comparisons made in an investigator's career (Rothman 1986). Thus, Rothman recommends that each finding should be reported as if it were the only focus of the study, making clear the number of comparisons that have been made.

Statistical software on the McGill University MVS mainframe computer was used, including SPSSX (1988) for the descriptive analysis and SAS (1988) and BMDP (1988)

for the stratified and logistic regression analyses, respectively.

### **C. The National Child Development Study**

The National Child Development Study is a continuing longitudinal study which takes as its subjects all those living in Great Britain who were born between 3 and 9 March 1958. Major surveys involving this cohort were carried out in 1965 (NCDS1), 1969 (NCDS2), 1974 (NCDS3) and 1981 (NCDS4) when the subjects were age 7, 11, 16 and 23 years, respectively. Data were collected systematically using educational tests, teacher questionnaires, medical examinations, and interviews with parents.

#### **1. Population**

The cohort included in the NCDS target population has its origins in the Perinatal Mortality Survey which included every singleton live birth in England, Scotland, and Wales during the week March third to March ninth, 1958. The objective of this survey was to evaluate the provision of maternity services in Great Britain and to find social and obstetric factors associated with perinatal mortality and handicapping conditions. The response rate was exceptional; an estimated 98% of parents of all babies born during the designated week participated (Davie, Butler and Goldstein 1972).

NCDS1 when the children were age 7 years, was designed to include the surviving children of the 1958

birth cohort still living in England and Scotland. Additionally, the population included immigrants and some children who were born in Britain between the third and the ninth of March, 1958 but who, for various reasons, were not included in the initial survey (Pringle, Butler and Davie 1966).

The cohort was again contacted at ages 11, 16, and 23. The proportion successfully traced varied at each age: 91.3% at age 7; 90.9% at age 11; 87.3% at age 16; and 76% at age 23 (Goldstein 1983).

In 1985, the NCDS User Support Group was established to promote and facilitate the widest possible use of the NCDS data (Social Statistics Research Unit 1990). A great deal of analysis of all four waves<sup>1</sup> of NCDS has been carried out by researchers from a range of disciplines. To name but a few examples, publications have described the natural history of childhood asthma (Anderson et al. 1986); the correlates of childhood myopia (McMamus 1987); the relationship between breastfeeding and diabetes (Golding and Haslam 1987); and the prevalence of obesity (Peckham et al. 1982). Others have used the NCDS data to illustrate methodological advances in longitudinal data analysis (Fogelman 1985; Goldstein 1979).

## **2. Inclusion and exclusion criteria**

As in the OCHS, three groups of children were

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<sup>1</sup>Work is now underway on a fifth follow-up of the NCDS cohort.

included in the study sample. In the following sections, the inclusion and exclusion criteria that were similar to all groups, as well as those that were unique to each group are described.

**a) Criteria common to all diagnostic groups**

**Normal intelligence:** Only children who were attending regular schools and who were not known to be mentally retarded were included.

**Linguistic group:** Only children whose maternal language was known to be English were eligible.

**b) Communication disordered group**

A child was considered to have a speech disorder if, during the medical examination, the physician judged the child to produce many, all, or almost all, words unintelligibly. Children who the physician reported to have impaired understanding of speech based on current audiometric results and clinical judgement, or children whose mothers reported a past or current hearing problem were considered to have a hearing disorder. All children who were identified as having either speech or hearing problems, or both, according to these criteria comprise the communication disordered group.

Children who also had another chronic disorder in addition to the communication disorder were excluded.

**c) Other chronic disorders group**

The second group were those with other chronic disorders alone. These were defined using a set of

algorithms derived from the parental interviews and medical examinations (see Appendix 3). The disorders included are listed in Table 2.7.

**d) Healthy group**

The healthy group consisted of all remaining children, i.e. those free of any chronic disorder. The visually impaired were excluded, as in the Ontario Child Health Survey sample.

**e) Longitudinal measures of health status**

Information regarding health status and other key determinants was available at ages 7, 11 and 16. These longitudinal data were used in the cohort analysis of the NCDS sample presented in this thesis.

**3. Validation of health status measures**

To determine health status, in addition to parental reporting, the NCDS relied on physicians' judgements based on physical examinations and investigative procedures (such as laboratory results for hematology values and audiometric testing for hearing acuity). There was no validation of parental or physician reporting of health status in the NCDS, and thus the impact of reporting errors on the measures of association between communication disorders and emotional and behavioral problems would have to be considered when interpreting the results.

**4. Outcome measures**

The primary outcome measures were different for the



**TABLE 2.7: Chronic illnesses and disorders included in  
interview schedule - NCDS, age 7**

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Neurological

Cardiac

Musculoskeletal

Endocrine

Hematological

Gastrointestinal

Kidney

Respiratory

Cancer

Other

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cross-sectional and cohort analyses. In the cross-sectional analysis at age 7, a modified version of the Rutter Parent's Scale (Rutter, Tizard and Whitmore 1970), and the Bristol Social Adjustment Guide (Stott 1966) were used. For the cohort study, the Malaise Inventory (Rutter, Tizard and Whitmore 1970) was employed to assess maladjustment at age 23.

**a) Rutter Parent's Scale**

A modified version of the Rutter Parent's Scale (Rutter, Tizard and Whitmore 1970) was completed by a parent (usually the mother) or a guardian during a home interview when the children were aged 7 and 11. At 16 a slightly different version was used. This scale produces a total score that has been shown to discriminate children likely to have an emotional or behavioral disorder from normal children. The mother is asked to rate the child at ages 7, 11, and 16 on 31 behavioral descriptions. These items are divided into three response categories. In section 1, the mother is asked to indicate the frequency with which the child demonstrated eight problems from "never in the last year," given a weight of 0, through "at least once per week," given a weight of 2. Intermediate frequencies were given a weight of 1. Problems in this section include complaints such as headaches and truancy from school.

In the second section, the mother is asked to rate

the severity of five childhood difficulties, including eating and sleeping problems, from "no" difficulty, scored 0, "yes-mild," scored 1, to "yes-severe," scored 2. The final section consists of 18 descriptions of problem behavior in childhood. Parents were instructed to check whether each description "certainly applies," "applies somewhat," or "doesn't apply" to the child. These responses are given weights of 2, 1, and 0, respectively.

Scores for items in all three sections are summed to produce a total score with a range of 0 to 62. These scores are then transformed to a logarithmic scale to improve the linearity of the relationship with other variables. The higher the score, the more deviant the behavior (Ghodsian et al. 1980).

To validate the scale, 198 children ages 9 to 13, randomly chosen, were compared with a clinic sample of 120 children newly referred to the Maudsley Hospital. The best discrimination between clinic and non-clinic samples was obtained using a total cutoff score of 13 or more. Slightly more than 15.0% of boys and 8.1% of girls in the general population obtained such scores compared with 70.8% of the boys and 66.6% of the girls in the clinic sample (Rutter, Tizard and Whitmore 1970).

In a further test of the criterion-related validity, the case notes of those in the clinic-based sample were examined by a rater blinded to the mental health status

and a diagnosis of neurotic disorder, antisocial disorder, or other psychiatric condition was made. The diagnoses based on the scale subscores were then compared with the clinical diagnoses. The two were in agreement in about 80% of the cases (Rutter, Tizard and Whitmore 1970).

Test-retest reliability after a two month interval resulted in a product-moment correlation between the total scores of 0.74. Inter-rater reliability was examined by having fathers and mothers of 35 nine to 13-year-olds rate them simultaneously, but independently, during an interview. The product-moment correlation between their total scores was 0.64, indicating a moderate to good correlation (Colton 1974).

**b) Bristol Social Adjustment Guide (Stott 1966)**

The Bristol Social Adjustment Guide was completed by the child's teacher at both the 7 and 11 year follow-up. This scale is intended to detect and diagnose "maladjustment, unsettledness or other emotional handicap in children of school age" (Stott 1966).

The Bristol Social Adjustment Guide consists of 146 statements of childhood behaviors or attitudes. Each is designated as belonging to one of 12 separate "syndromes." The teacher underlines the items that he or she thinks "describe the child's behavior or attitudes." Each underlined item contributes a score of 1. Twenty-nine additional items representing "normal" behavior are

included but not scored. Hence any child may have as many as twelve "syndrome" scores and a total score, produced by addition of all "syndrome" scores. Stott suggested that a total score of 0-9 was compatible with normal adjustment; 10-19 indicated "unsettled" behavior; and 20 or more, "maladjustment."

Several studies evaluating the criterion-related validity of the Bristol Social Adjustment Guide have been completed (Stott 1966). Two studies are especially informative because they included large samples and randomly chosen comparison groups. The index group for both studies was "delinquent" boys. Stott states that "as a form of abnormal behavior delinquency may be used as a criterion of validity on the assumption that it is more likely to occur in conjunction with other forms of disturbed behavior." Seidel used the Bristol Social Adjustment Guide on 64 boys who had previously been in correctional schools, and a comparison group of randomly selected non-delinquent boys attending the same day schools. Almost 91% of the delinquent boys had a Bristol Social Adjustment Guide score indicating unsettled or maladjusted behavior while about 60% of the non-delinquent boys had a Bristol Social Adjustment Guide score indicating stable or normal adjustment (Seidel as cited in Stott 1966). In a similar validation study, Stott compared the Bristol Social Adjustment Guide scores of 403 boys aged 9 to 14 years who were put on probation

with the scores of 391 boys matched for age and school placement. Of the 403 boys on probation, 307 (76.2%) had a Bristol Social Adjustment Guide score indicating unsettled or maladjusted behavior; and, of the 391 matched controls, 280 (71.6%) had scores indicating normal adjustment (Stott 1960).

Inter-rater reliability was measured by pairs of teachers completing the Bristol Social Adjustment Guide independently for each of 88 secondary school children. The product-moment correlation between the scores was about 0.77 (Stott 1966). In a larger, more refined study, pairs of teachers independently completed the Bristol Social Adjustment Guide on 202 secondary school children. Based on the scores they made a diagnosis giving those who were maladjusted one or more of the twelve "syndrome" scores. Teachers agreed on 84.9% of the diagnoses (Stott 1966).

### **c) Malaise Inventory**

The Malaise Inventory was used to measure maladjustment at age 23. This inventory is a self-administered questionnaire designed to assess psychological distress (Rutter, Tizard and Whitmore 1970). The 24-item scale includes symptoms of depression, symptoms of anxiety and somatic symptoms thought to have a psychological component. Fourteen of the 24 items overlap with the psychiatric subscale of the Cornell Medical Index (Brodman et al. 1949).

When administered three times to a sample of almost 1,000 mothers in New Zealand, the Malaise Inventory demonstrated reasonably high stability over two years ( $r=0.63$ ) and over four years ( $r=0.58$ ) (McGee, Williams and Silva 1986). The value of coefficient alpha for the scale (0.80) suggests that the items are internally consistent. The Malaise Inventory is associated with factors that might be expected to be correlated with psychological distress: lower socioeconomic status, younger age at first birth, separated from partner, received marriage counselling, and treatment for depression. This scale has been described as measuring "the different types of emotional disturbance commonly seen in adults" (Rutter, Tizard and Whitmore 1970).

#### **5. Other determinants**

Other variables in the NCDS sample, listed in Table 2.8 and described below, were included for the present research because prior publications suggested that they were associated with communication disorders, maladjustment, or both.

##### **a) Sociodemographic variables**

These variables were obtained from interviews with the parents.

- i) Gender of the child
- ii) Social class at age 7: Social class was determined by the occupation of the child's father. In Britain at the time of the initial study, the most frequently used classification of occupations was that adopted by the Registrar General for census purposes. The basic framework is of five

occupational groups, termed social classes I to V, and categorized as follows:

**Social Class**

I	Higher Professional
II	Other Professional and Technical
III	Other non-manual occupations
III	Skilled Manual
IV	Semiskilled Manual
V	Unskilled Manual
	No male head of household

For the purposes of this study, the social class variable was divided into the following three categories:

- 1 - I, II, III (non-manual)
- 2 - III (skilled manual)
- 3 - IV (semiskilled manual)
- V (unskilled manual) or no male head of household

**b) Home environment**

During the interview with the parent, an assessment was made of family difficulties due to the following: housing problems, financial problems, physical illness, divorce, separation, death of the child's father, death of the child's mother, domestic tension, or alcoholism. This was done by the trained health visitor without specifically asking about these problems. It was judged that these were all difficulties which, if present, could contribute to a stressful home environment. No information regarding the reliability or validity of these items is available.

**6. Sample size and power**

The calculation of sample size requirements for the cross-sectional component of the NCDS is based on the



**TABLE 2.8: Independent variables by major determinant categories - NCDS, age 7**

Category	Variable	Measurement
Demographic	Gender	Dichotomous
Socioeconomic	Social class	Polychotomous
Medical	Health status	Polychotomous
Home environment	Housing problems	Dichotomous
	Financial problems	Dichotomous
	Divorce, separation	Dichotomous
	Mother deceased	Dichotomous
	Father deceased	Dichotomous
	Domestic tension	Dichotomous
	Alcoholism	Dichotomous

assumption that the point prevalence of emotional and behavioral problems, as defined by the Bristol Social Adjustment Guide and the Rutter Parent's Scale, are the major outcomes of interest. Previous experience with the Rutter Parent's Scale indicates that the prevalence of emotional or behavioral problems among healthy children, and among those with chronic physical disorders is 10% and 15%, respectively (Rutter, Tizard and Whitmore 1970). There is no comparable information for children with communication disorders. However, it is assumed, based on experience with the Child Behavior Checklist, that at least twice as many communication disordered children as children with other chronic disorders may have psychiatric problems as defined by the Rutter Parent's Scale, i.e. 30%. Given the size of the cohort when the children were 7, which includes 792 with other chronic disorders and 317 with communication disorders, power estimates have been calculated using a two-tailed test for proportions. If  $p_1$  is 15% and  $p_2$  is 30% and alpha is set at 0.05, a power of greater than 99% is available.

As in the OCHS, when comparing children with communication disorders with the group of children who are healthy, power estimates may be calculated using a one-tailed test for proportions. With alpha set at 0.05, if  $p_1$  is 10% and  $p_2$  is 30%, 10,635 children in the healthy group and 317 children in the communication disordered group will provide power greater than 99% to

detect a difference of this magnitude or more.

To estimate the power to test hypotheses when the sample was 23 years old, a procedure similar to that used for the OCHS sample was employed. Specifically, levels of power corresponding to different proportions of maladjustment among the communication disordered and the other two groups were determined. These calculations were based on the assumption that at age 7, 254 of the communication disordered group (100% - 30%), 673 (100% - 15%) of those with other chronic disorders, and 9,572 (100% - 10%) of those who are healthy would be at risk for developing emotional or behavioral problems. Using a two-sided test with  $\alpha=0.05$ , a power of 89.3% is available to detect a difference in proportions of 10% or more between the communication disordered and those with other chronic disorders. For differences of 20% or more, power of 99.4% is available.

Due to the large sample size of the NCDS, differences between the communication disordered and the healthy of 10% or greater can be detected with a power of 99.4% (one-sided test;  $\alpha=0.05$ ).

## **7. Analytic strategy**

An analytic strategy similar to that used with the OCHS sample was adopted for the NCDS data with a few important exceptions. Because there were two outcomes of interest at age 7, parent and teacher measures of maladjustment, the analyses proceeded in parallel.

To determine if maladjustment at age 23 was related to health status at age 7 a cohort analysis was conducted. Children who were reported by either their parent or teacher as being maladjusted at age 7 were analyzed separately from those who were not identified as such. In this way, it was possible to distinguish persistent problems of maladjustment from problems which developed after age 7.

The longitudinal analysis of the NCDS sample used information regarding communication disorders and other chronic disorders from all three time points (7, 11, and 16 years) to estimate the adjusted relative risks for maladjustment at 23. The strategy for using data from multiple time points is presented when the complete predictive model is discussed, and again in Appendix 4.

### III. Summary of OCHS and NCDS Samples

The salient characteristics of the OCHS and NCDS samples are presented in Table 2.9. Both studies have sampled children from the general population. The NCDS has a much longer follow-up period than the OCHS - 16 years compared to four years. Physician reports of health status were available for the NCDS while the OCHS relied exclusively on parental reporting of these conditions. The OCHS measured emotional and behavioral problems combining information from parents, teachers and youth; the survey instrument was based on DSM-III diagnoses. In the NCDS sample, no attempt was made to

**TABLE 2.9: Summary of OCHS and NCDS data sets**

<b>Characteristics of Data Sets</b>	<b>OCHS</b>	<b>NCDS</b>
<b>Age of sample (years)</b>		
Initially	4 to 16	7
At Follow-up	8 to 20	23
<b>Source of Information on Health Status</b>		
Speech	Parent	Physician
Hearing	Parent	Parent and Physician
Other chronic disorders	Parent	Parent and Physician
<b>Source of Information on Maladjustment</b>		
Initial	*SDI	Rutter Parent's Scale (parents) Bristol Social Adjustment Guide (teachers)
Follow-up	*SDI **DIS	Malaise Inventory

\*Survey Diagnostic Instrument was completed by parents and teachers for children age 4 to 11 and by parents and youth for children age 12 to 16.

\*\*Diagnostic Interview Schedule was completed by youth age 17 to 21.

combine information from parents and teachers regarding emotional and behavioral problems; two distinct measurement instruments were used at age 7. At age 23, information regarding maladjustment was obtained from the reports of children within the original cohort. Maladjustment in the NCDS does not rely on DSM-III diagnoses.

Both data sets were used to test our study hypotheses. If the indicators are valid and reliable measures of the same underlying phenomenon, then the direction and approximate magnitude of the effect should be similar across data sets providing it is possible to control for the same confounding variables. However, some differences may be expected due to the differences in ages of the children at follow-up. For example, if the association between communication disorders and maladjustment decreases with increasing age, then it would be expected that such an association would be lower in the NCDS follow-up when the children are age 23 than in the OCHS follow-up when the children range in age from 8 to 20.

## **RESULTS**

## RESULTS

The two study hypotheses were tested analyzing samples from the OCHS and the NCDS<sup>1</sup>. This chapter presents the results of these analyses. The chapter is divided into four main sections and one summary section. Each of the main sections presents results from one of the samples and one of the study hypotheses. Part A reports the findings from the cross-sectional analysis of the OCHS sample. This section includes descriptive statistics for this sample in 1983 and the data used to test the first study hypothesis. Specifically, do children with communication disorders in 1983 have a higher prevalence of emotional and behavioral problems than those who are healthy or those with other chronic disorders? Part B presents the findings from the OCHS sample used to test the second study hypothesis: In 1987, do children who had communication disorders in 1983 have a higher prevalence of emotional and behavioral problems than those who had other chronic disorders or who were healthy?

Part C presents the descriptive statistics of the NCDS when the sample was age 7 and the data used to test the first study hypothesis. Specifically, are communication disordered children at age 7 more likely to

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<sup>1</sup>Study hypotheses refer to a theoretical population, and thus are deliberately phrased in general terms. Operationally, in the context of each data set, the hypotheses are made more specific depending on the unique characteristics of the sample.



have emotional and behavioral problems than those with other chronic disorders or those who are healthy? Part D includes the results of the cohort analysis of the NCDS sample when the subjects were 23 years old, and thus addresses the second study hypothesis: At age 23, do children who had communication disorders at age 7 have a higher prevalence of maladjustment than those who had other chronic disorders or who were healthy? Part E presents a summary of the findings.

#### **Part A:**

##### **AI. OCHS - Descriptive Information in 1983**

Of the 3294 children in the original OCHS sample, 135 children had a communication disorder, 365 had a chronic disorder of another kind, and 2795 were free of any medical disorder. Not all of these children fulfilled the inclusion criteria; the number of communication disordered children excluded and the reasons for exclusion are shown in Table 3.1.

After applying these exclusion criteria, 90 children remained in the communication disorder group, 307 in the chronic disorder group, and 2241 in the healthy group (Table 3.2).

Table 3.3 provides a descriptive analysis of the entire sample in 1983 who met inclusion criteria. The mean age of the sample was 10.2 years and one half were males. About 7% of children were from families who were living below the poverty line, and about 11% came from single parent homes.

**TABLE 3.1: Communication disordered children excluded  
from study - OCHS, 1983**

<b>Reason for Exclusion</b>	<b>Number</b>
Co-existing other chronic disorder	29
Visually Impaired	4
Mentally Handicapped	2
Maternal language other than English or French	3
Missing information on exclusion criteria	7
<b>Total</b>	<b>45</b>

**TABLE 3.2: Distribution of subjects by diagnostic  
grouping - OCHS, 1983**

<b>Health Status</b>	<b>N</b>	<b>Percent of Total</b>
Communication disorders	90	3.4
Other chronic disorders	307	11.5
Healthy	2241	84.3
<b>Total</b>	<b>2638</b>	<b>100.0</b>

**TABLE 3.3: Social and demographic characteristics (mean, standard deviation (SD), and percentage) - OCHS, 1983**

Characteristic	Mean (SD)	Percentage
<b>Demographic factors</b>		
Age (years)	10.2 (3.7)	
Male		50.5
Number of siblings (% of subjects with more than 4 sibs)	2.4	13.5
<b>Socioeconomic status</b>		
Subsidized rent		4.2
Overcrowded		13.8
Welfare		6.4
Below poverty <sup>a</sup>		6.8
Annual income <sup>b</sup> (scale range 1-13)	6.9 (3.0)	
<b>Parental factors</b>		
Single parent		10.7
Maternal age (years)	37.6 (6.5)	
Paternal age (years)	40.4 (7.1)	
Maternal education (less than grade 8)		9.7
Paternal education (less than grade 8)		12.7
<b>Disability status<sup>c</sup></b>		
Functional limitations		5.7

Table 3.3 continues on next page.

TABLE 3.3 - continued

Characteristic	Mean (SD)	Percentage
<b>Home environment</b>		
Alcohol abuse		10.2
Emotional disorder of mother		19.6
Emotional disorder of father		5.5
Health problem of mother		18.2
Health problem of father		16.8
Marital disharmony <sup>d</sup> (scale range 4-23)	9.4 (3.0)	
Family dysfunction <sup>e</sup>	20.7 (5.3)	9.8
Parental separation		4.8
Spouse abuse		2.7

<sup>a</sup>Family earnings less than \$10,000.00 annually.

<sup>b</sup>Annual income was measured on a scale of \$5,000.00 intervals beginning with 1=\$5,000.00 or less through 13=\$60,000.00 or more. A mean of 6.9 represents an annual income of about \$29,500.00.

<sup>c</sup>Disability status pertains to all subjects in the sample and was determined independently health status.

<sup>d</sup>On this scale there are three questions relating to the frequency of mutually enjoyable activities, expressive caring, and quarrelling, plus one question on overall relationship, which yields a scale ranging from 4 to 23. A higher score indicates more disharmony (Byles et al. 1998).

<sup>e</sup>This scale, with scores ranging from 12-48, is from a 12-item General Functioning Scale derived from the McMaster Family Assessment Device (Miller et al. 1985). A score greater than 27 has been used to indicate family dysfunction (Offord et al. 1987).

Almost one in five had mothers who reported having had an emotional disorder, and about 10% came from families that were "dysfunctional" as indicated by criteria on the General Functioning Scale derived from the McMaster Family Assessment Device.

### **AII. OCHS - Crude Measures of Association**

The point prevalence, crude prevalence odds ratios, and corresponding 95% confidence intervals describing the association between health status and psychosocial maladjustment are shown in Table 3.4. The crude prevalence odds ratio for the communication disordered group, using the healthy as the comparison group, is 3.49 compared to 1.72 for the chronic group. These are, however, only crude estimates; potentially confounding variables and effect modifiers are not considered.

**TABLE 3.4: Health status related to emotional and behavioral problems (Prevalence, crude prevalence odds ratio [POR], and 95% confidence interval) - OCHS, 1983**

<b>Health Status</b>	<b>Prevalence (%)</b>	<b>POR<sup>a</sup></b>	<b>95% CI on POR</b>
Communication disorders	33.3	3.49	2.10, 5.80
Other chronic disorders	19.9	1.72	1.24, 2.40
Healthy	12.6	1.00	Reference

<sup>a</sup>The POR was computed using the healthy children as the reference group (POR=1.00).

The crude prevalence rate ratio for the communication disordered group is 2.64; this is the prevalence of emotional and behavioral problems among the communication disordered group divided by the prevalence of emotional and behavioral problems among the healthy group. The prevalence rate ratio for those with other chronic disorders using the healthy group as the reference was 1.58.

#### **AIII. OCHS - Bivariate Analyses**

Determinants of maladjustment have been proposed that may distort the estimation of the effect of communication disorders on the outcome. In order to identify these potential confounders, bivariate analyses of the association of these factors with health status and maladjustment were conducted. In these analyses, there were two criteria for confounding: (1) a variable had to be significantly associated with the exposure, i.e. health status, and (2) a variable had to be significantly associated with the outcome in the absence of exposure, i.e. maladjustment in the healthy group. In the event that a variable did not fulfill both of the above criteria, but results from previous studies suggested that it should be considered a confounder, it too was retained for further analyses (Rothman 1986).

The association between a potential confounder and the exposure, health status, was tested as follows. If the p-value, obtained from a chi-square test statistic

for a categorical variable or from a one-way analysis of variance for an interval variable, was less than 0.10 or the magnitude of the difference in proportions between groups was greater than 10%, the variable was retained.

To test the association between a potential confounder and maladjustment in the absence of the "exposure," i.e. in the healthy group, the measure of association differed from the above for the dichotomous variables. To determine if a dichotomous variable was associated with maladjustment in the absence of exposure, prevalence odds ratios were determined from a chi-square analysis measuring the association between maladjustment and the potential confounder. If in the healthy group the 95% confidence interval around the prevalence odds ratio excluded one, or if the prevalence odds ratio was greater than two, the variable was kept for further consideration. Because prevalence odds ratios were chosen to measure the association between health status and maladjustment, this measure of association was also used to test for other potential covariates. For an interval level variable, a one-way analysis of variance was computed between the potential confounder and maladjustment for the healthy group. If the p-value was less than 0.10, the variable was considered for further analyses.

The bivariate analyses of the association between the potential confounders and health status are provided in Table 3.5. These analyses were conducted to determine

**TABLE 3.5: Social and demographic characteristics of health status groups (means [standard deviations] or percentages) - OCHS, 1983**

Characteristic	Exposure		
	Healthy	Chronic Disorders	Communication Disorders
<b>Demographic factors</b>			
Age (years)	10.1 (3.6)	10.9 (3.6)	9.1 (3.8) *
Male (%)	49.5	54.1	62.9 *
Sibs > 4 (%)	13.6	11.1	18.9
<b>Socioeconomic status</b>			
Subsidized rent (%)	4.0	4.6	7.8
Overcrowded (%)	14.0	11.1	15.6
Welfare (%)	5.9	7.8	15.6 *
Below poverty (%)	10.4	12.4	13.3 *
Annual income <sup>a</sup>	6.9 (2.9)	6.8 (3.1)	5.5 (2.7) *
<b>Parental Factors</b>			
Maternal education - less than grade 8 (%)	12.7	13.1	12.8
Paternal education - less than grade 8 (%)	9.3	11.2	14.4
Single parent (%)	10.4	12.4	13.3
Maternal age (years)	37.6 (6.4)	38.0 (6.6)	36.0 (6.5) *
Paternal age (years)	40.5 (7.1)	40.3 (7.0)	38.2 (7.7) *
<b>Disability status</b>			
Functional limitations (%)	3.0	22.8	14.3 *

Table 3.5 continues on next page.



TABLE 3.5 - continued

Characteristic	Health Status		
	Healthy	Chronic Disorders	Communication Disorders
<b>Home environment</b>			
Alcohol abuse (%)	10.4	19.7	13.7
Emotional disorder of mother (%)	17.9	29.3	30.3*
Emotional disorder of father (%)	5.1	5.9	14.9*
Health problem of mother (%)	16.1	31.0	27.0*
Health problem of father (%)	15.7	22.3	26.3*
Marital disharmony <sup>b</sup> (scale range 4-23)	9.4 (3.0)	9.5 (3.1)	10.4 (3.1)*
Family dysfunction (%) <sup>b</sup>	9.9	9.3	12.5
Parental separation (%)	4.7	4.8	5.2
Spouse abuse (%)	2.6	3.4	4.3

\*Test statistic, chi-square or F-value, significant at  $p < 0.10$ .

<sup>a</sup>Refer to Table 3.2 for description. A mean of 6.9 represents an annual income of about \$29,500.00; a mean of 6.8 represents an annual income of about \$29,000.00; a mean of 5.5 represents an annual income of about \$22,500.00.

<sup>b</sup>Refer to Table 3.2 for a description of this variable.

which variables fulfilled the first criterion for confounders, association with the exposure, health status. The mean age of the children in the communication disordered group was less than the mean age in the other two groups. As would be expected from other studies, there were more boys with communication disorders than girls. The mean annual income of families of children with communication disorders was lower than that of either of the other two groups as was the mean age of both parents. About 23% of children with other chronic disorders had functional limitations compared to only 14% of those with communication disorders, and 3% of the healthy.

Among the variables describing the home environment in which a significant association was found, the risk factor was usually higher for those with communication disorders. The one exception was that the mothers of children with other chronic disorders were more likely to have a chronic health problem themselves than mothers of children with communication disorders.

Table 3.6 presents the findings of the bivariate analyses testing the association between the covariates and maladjustment in the healthy. These analyses were conducted to test the second criterion for confounding variables, association with emotional and behavioral problems among healthy children. The following variables were retained for further analyses because the confidence

**TABLE 3.6: Potentially confounding variables related to maladjustment in healthy children (prevalence odds ratio, 95% confidence interval, or t-test p-value) - OCHS, 1983**

	Prevalence odds ratio (95% confidence interval)	t-test p-value
<b>Demographic factors</b>		
Age		p<0.001
Gender (males) <sup>a</sup>	1.15 (0.89, 1.50)	
Number of sibs		p=0.823
<b>Socioeconomic status</b>		
Subsidized rent <sup>b</sup>	2.22 (1.32, 3.74)	
Overcrowded	1.27 (0.88, 1.82)	
Welfare	2.47 (1.62, 3.75)	
Poverty	3.04 (2.04, 4.55)	
Annual income		p=0.003
<b>Parental factors</b>		
Single parent	1.48 (1.01, 2.18)	
Maternal age		p=0.855
Paternal age		p=0.923
Maternal education		p=0.085
Paternal education		p=0.002
<b>Disability status</b>		
Functional limitations	3.22 (1.92, 5.41)	

Table 3.6 continues on next page.

TABLE 3.6 - continued

	Prevalence odds ratio (95% confidence interval)	t-test p-value
<b>Home environment</b>		
Alcohol abuse	1.97 (1.37, 2.84)	
Emotional disorder of mother	1.59 (1.16, 2.16)	
Emotional disorder of father	1.43 (0.81, 2.53)	
Health problem of mother	1.20 (0.86, 1.68)	
Health problem of father	1.46 (1.02, 2.07)	
Marital disharmony		p<0.001
Family dysfunction	3.10 (2.18, 4.41)	
Parental separation	1.55 (0.86, 2.81)	
Spouse abuse	1.26 (0.48, 3.30)	

<sup>a</sup>The POR is computed using females as the reference group.

<sup>b</sup>POR for the remainder of the dichotomous variables in the table are computed relative to those without the risk factor. For interval variables, such as age and annual income, the t-test is computed by comparing the mean of the interval variable in healthy children who are maladjusted to the mean of the same variable in healthy children who are not maladjusted.

intervals around the prevalence odds ratio excluded one, the prevalence odds ratio was greater than two, or the p-value was less than 0.10: age, subsidized rent, welfare, poverty, annual income, maternal education, paternal education, single parent, functional limitations, alcohol abuse, emotional disorder of mother, health problem of father, marital disharmony, and family dysfunction.

Table 3.7 lists the 24 variables included in the bivariate analyses and summarizes the results. Ten variables fulfilled both criteria for confounders. Twelve variables did not because they were not associated with health status, and with maladjustment in the absence of exposure. For example, subsidized rent and family dysfunction were associated with maladjustment in healthy children (Table 3.6) but not with health status (Table 3.5). Thus, they were omitted from further analyses. In addition, even though gender was not associated with maladjustment in the healthy, it was retained because Beitchman et al. (1986) found that girls with communication disorders were consistently at greater risk for psychiatric disorders than were boys with similar disorders.

A stratified analysis was then conducted to determine possible effect modifiers and to aid in the interpretation of the results of the subsequent logistic regression model (Rothman 1986). Several of the stratum specific estimates were imprecise due to small numbers.

**TABLE 3.7: Summary of bivariate analyses of potentially confounding variables - OCHS, 1983**

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**Variables associated with both group status and maladjustment and kept for further analyses**

Age  
Welfare  
Poverty  
Annual Income  
Maternal education  
Paternal education  
Functional limitations  
Emotional disorder of mother  
Health problem of father  
Marital disharmony

**Variables not associated with group status and maladjustment and omitted from further analyses**

Number of siblings  
Subsidized rent  
Overcrowded  
Maternal age  
Paternal age  
Single parent  
Alcohol abuse  
Health problem of mother  
Emotional disorder of father  
Family dysfunction  
Parental separation  
Spouse abuse

**Variables kept in the model based on information from previous literature**

Gender

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This imprecision resulted in large confidence intervals and point estimates that were often unreliable and contrary to what was found in previous studies. The results of the stratified analysis are included in Appendix 5. The most reliable findings from this analysis suggest that the effect of communication disorders on maladjustment may be greater for children whose mothers have experienced an emotional disorder than for those who have not. Also, those with other chronic disorders may have a greater likelihood of maladjustment if they do not have functional limitations than if they do.

#### **AIV. OCHS - Multivariate Analyses**

The multivariate analyses of the OCHS sample in 1983 determines if children with communication disorders have more emotional and behavioral problems than children with other disorders or those who are healthy, after controlling for confounding variables.

The following four steps were taken to determine the most appropriate logistic regression model. First, 12 variables were chosen to enter the model based on the results of the bivariate analyses, as summarized in Table 3.7.

Second, missing values were imputed to prevent loss of information, loss of statistical power, and loss of precision in estimating regression coefficients (Cohen and Cohen 1983). Missing values were imputed for those variables that had more than 4% missing information.

Table 3.8 lists the 11 variables with their corresponding percentage of missing values. The method of imputing missing values differed for each variable. For marital discord, these values were replaced by the mean value of the health status group to which the case belonged. Maternal education was regressed against paternal education, and the resulting equation was used to estimate father's education for missing values.

For functional limitations and other dichotomous variables, missing values were assigned either 0 or 1 by a random process using SAS (1988). Starting with those who had complete information, the proportion of subjects within each health status category with the factor present was determined. Then a value of one was distributed to the same proportion of randomly selected subjects who had missing values. The remaining subjects with missing values were assigned a zero <sup>1</sup>.

Third, to check for collinearity between the exposure and control variables, Pearson product moment correlations were computed. Welfare and poverty were highly correlated with annual income, and thus were eliminated from the model to avoid problems of

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<sup>1</sup>To check that the imputed values represented those of the original data, the parameters for the final model were re-estimated based on the original data and compared to those of the models using imputed data. These results may be found in Appendix 6.



**TABLE 3.8: Frequency of missing values for the variables selected for logistic regression model - OCHS, 1983**

Variable	Percentage
<b>Sociodemographic factors</b>	
Age	0.0
Gender	0.2
Welfare	0.0
Poverty	3.2
Annual income	3.2
<b>Parental factors</b>	
Maternal education	1.1
Paternal education	9.2
<b>Disability status</b>	
Functional limitations	8.7
<b>Home environment</b>	
Emotional disorder of mother	0.6
Health problem of father	11.1
Marital disharmony	11.7

multicollinearity<sup>1</sup>. Annual income was retained because it is a more accurate measure of socioeconomic status than either welfare or poverty, and thus would result in more precise estimates of regression coefficients. Paternal and maternal education, also measures of socioeconomic status, were correlated with annual income and were therefore omitted from further analyses.

Fourth, after step three, 9 variables remained and were entered into a stepwise logistic regression model using BMDP (1988). Tolerance levels for entry were 0.100, and for removal, 0.150. Controversy exists regarding the most judicious strategy used for the inclusion of the exposure of interest<sup>2</sup>. In one strategy, potentially relevant covariates are forced into the model first and the exposure of interest is allowed to enter only after all other covariates have entered. The advantage of this method is that it ensures that all potentially relevant covariates will be chosen including those that are highly correlated with the exposure of interest. It also determines if the exposure of interest contributes uniquely to the prediction of the outcome (i.e. unexplained by other covariates). A second approach recommended by Greenland (1989) and Kleinbaum,

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<sup>1</sup>Consequences of multicollinearity include inaccurate computation of (1) estimates of regression coefficients, (2) estimates of standard errors, and (3) hypothesis test statistics (Kleinbaum, Kupper and Muller 1988).

<sup>2</sup>In an analysis of a complex epidemiologic data set, it is not an uncommon dilemma to have to choose between two more statistically plausible models (Kleinbaum, Kupper and Morgenstern 1982 p. 480).

Kupper and Morgenstern (1982), and adopted for this study is to force the exposure of interest into all models initially. This allows observation of changes in the effects of the exposure on the outcome when controlling for each potential confounder (Greenland 1989).

Two separate models were determined to test main effects. The first was intended to select variables and estimate parameters for the relationship between communication disorders and maladjustment using the healthy group as the reference. The second was to determine the relationship between chronic disorders and maladjustment, also using the healthy group as the reference. The parameter estimates, standard errors, adjusted odds ratios, and corresponding confidence intervals derived from these models are presented in Table 3.9.

In addition to health status, variables that met entry criteria in the first model were functional limitations, age, annual income, marital discord, and emotional disorder of the mother. With the exception of emotional disorder of the mother, these same variables met entry criteria in the second model. Emotional disorder of the father, health problem of the father and gender failed to meet entry criteria for either model. In the first model, the adjusted prevalence odds ratio for maladjustment was 2.86 among the communication disordered children compared to those who were healthy.

**TABLE 3.9: Logistic regression of main effects relating health status and other predictor variables to maladjustment (regression coefficient, standard error [SE], adjusted odds ratio, and 95% confidence interval [CI]) - OCHS, 1983**

	Communication Disorders vs. Healthy		Other Chronic Disorders vs. Healthy	
	Regression Coefficient (SE)	Odds Ratio (95% CI)	Regression Coefficient (SE)	Odds Ratio (95% CI)
Health status	1.05 (0.29)	2.86 (1.61, 5.05)	0.41 (0.19)	1.50 (1.03, 2.18)
Functional limitations	1.04 (0.30)	2.83 (1.59, 5.09)	0.54 (0.26)	1.72 (1.03, 2.87)
Age <sup>a</sup>	0.07 (0.02)	1.83 (1.76, 1.91)	0.06 (0.02)	1.92 (1.85, 2.00)
Annual income <sup>b</sup>	-0.07 (0.03)	0.68 (0.64, 0.72)	-0.08 (0.02)	0.62 (0.59, 0.66)
Marital discord <sup>c</sup>	0.05 (0.02)	1.69 (1.64, 1.73)	0.05 (0.02)	1.62 (1.55, 1.69)
Emotional disorder of mother	0.35 (0.17)	1.42 (1.07, 1.98)	d	
Intercept	-2.85 (0.39)		-2.61 (0.36)	

<sup>a</sup>Odds ratio computed for mean age of communication disordered group, 10.9 years, and chronic group, 9.1 years.

<sup>b</sup>Odds ratio computed for mean annual income of communication disordered group, \$22,500.00, and for those with other chronic disorders, \$29,000.00.

<sup>c</sup>Odds ratio computed for mean score on Marital Discord scale, i.e. 10.4 for group with communication disorders, and 9.5 for those with other disorders.

<sup>d</sup>This variable did not enter the model.

Log likelihood=-667.31 for communication disorders; for other chronic disorders=-751.42  
Goodness of fit chi-square=0.64, d.f.=2, p=0.73 for communication disorders; for other chronic disorders goodness of fit chi-square=3.66, d.f.=5, p=0.16.

For those with other chronic disorders, the adjusted prevalence odds ratio for maladjustment was 1.50 compared to the healthy.

Interaction terms between health status and each of the significant main effects were then entered into the models. The p-value for entry of these product terms was 0.10 as recommended by several authors (Kleinbaum, Kupper and Morgenstern 1982; Kelsey, Thompson and Evans 1986; Greenland 1989). The estimates of the coefficients and the corresponding standard errors including those for the interaction terms that remained in the model are presented in Table 3.10. These results suggest that maladjustment is more prevalent among communication disordered children whose mothers had a history of an emotional disorder. Specifically, as shown in Table 3.11, among children with communication disorders, those whose mothers had experienced an emotional problem have an adjusted prevalence odds ratio of 5.79 (95% CI: 2.22, 15.12). In contrast, the point estimate for maladjustment in communication disordered children whose mothers have not had an emotional disorder is 1.93 with a 95% confidence interval between 0.91 and 4.10.

Further explanation regarding the interaction term between health status and a maternal history of an emotional disorder is required. This interaction term had a p-value of 0.08; thus, it reached the p-value for entry into the model but did not reach statistical

**TABLE 3.10: Logistic regression with interaction terms relating health status to maladjustment (regression coefficient and standard error [SE]) - OCHS, 1983**

Variable	Communication Disorders vs. Healthy	Other Chronic Disorders vs. Healthy
	Regression Coefficient (SE)	Regression Coefficient (SE)
Health status	0.66 (0.38)	0.60 (0.20)
Age	0.07 (0.02)	0.06 (0.02)
Functional limitations	1.04 (0.30)	1.08 (0.32)
Emotional disorder of mother	0.25 (0.18)	#
Annual income	-0.07 (0.03)	-0.08 (0.02)
Marital discord	0.05 (0.02)	0.05 (0.02)
HS*EDM <sup>a</sup>	1.10 (0.62)	#
HS*FL <sup>b</sup>	#	-1.26 (0.52)
Intercept	-2.86 (0.39)	-2.86 (0.36)

# This variable or interaction term did not enter the model for this group.

<sup>a</sup>This is the interaction term for Health status and Emotional disorder of mother.

<sup>b</sup>This is the interaction term for Health status and Functional limitations.

Log likelihood=-665.73 for communication disorders; for other chronic disorders log likelihood=-748.47.

Goodness of fit chi-square=1.54, d.f.=2, p=0.46 for communication disorders; for other chronic disorders goodness of fit chi-square=2.39, d.f.=2, p=0.30.

significance at the 0.05 level. At least two options exist when faced with such an interaction term. The interaction term could be omitted and the average effect of the exposure, health status, could be reported as in Table 3.9. The second option, as advocated by Greenland (1989) and followed in this thesis, is to set the significance of interaction terms much higher than 0.05<sup>1</sup>. This choice recognizes that the failure for an interaction term to reach significance may have more to do with a lack of power than a lack of effect modification. In this way, variations of the measure of effect across different levels of a covariate will not be missed. However, it must be recognized that the possibility for a sampling error, such as a Type I error, is greater when the alpha-value is increased to 0.10, and thus caution must be exercised when interpreting the results.

For the analysis comparing the chronic disordered group to the healthy, the estimates of the parameters and standard errors for the model including the interaction term are shown in Table 3.10 and the corresponding odds ratios and 95% confidence intervals are shown in Table 3.12. Among children with other chronic disorders, those who do not have a functional limitation have an odds ratio (OR) of 1.82 (95% CI:1.23, 2.69) while the odds

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<sup>1</sup>For the purposes of this thesis, the p-value for keeping interaction terms in the model was 0.10.

**TABLE 3.11: Communication disorders related to maladjustment with and without emotional disorder of mother (adjusted odds ratio and 95% confidence interval) - OCHS, 1983**

Health Status	Odds Ratio <sup>a</sup>	95% Confidence Interval on Odds Ratio
Communication disorder		
- without emotional disorder of mother	1.93	0.91, 4.10
- with emotional disorder of mother	5.79	2.22, 15.12

<sup>a</sup>Computed from coefficients and standard errors in Table 3.9 and adjusted for all variables included in the model for communication disorders shown in Table 3.9.

**TABLE 3.12: Other chronic disorders related to maladjustment with and without functional limitations (adjusted odds ratio and 95% confidence interval) - OCHS, 1983**

Health Status	Odds Ratio <sup>a</sup>	95% Confidence Interval on Odds Ratio
Other chronic disorders		
- without functional limitations	1.82	1.23, 2.69
- with functional limitations	0.52	0.20, 1.34

<sup>a</sup>Computed from coefficients and standard errors in Table 3.9 and adjusted for all variables included in the model for other chronic disorders shown in Table 3.9.



ratio for those with a functional limitations is 0.52 (95% CI:0.20, 1.34).

**Summary:** The results from the OCHS 1983 sample provided some support for the first study hypothesis. Children with communication disorders had a higher prevalence rate of emotional and behavioral problems than those who were healthy or those who had other chronic disorders. The association between communication disorders and emotional and behavioral problems may be modified by a maternal history of an emotional disorder. Specifically, communication disordered children whose mothers had a history of an emotional disorder may have the highest prevalence rate of emotional and behavioral problems.

## **Part B**

### **BI. OCHS - Descriptive Information in 1987**

Attrition was much greater than the 10% originally predicted by the primary investigators of the OHCS. Included in the 1810 children contacted in 1987, were 48 or 53.3% of the communication disordered group, 167 or 54.4% of the other chronic disorders group, and 1288 or 57.5% of the healthy group.

Children who were included in the 1983 survey only were compared to those included in both the 1983 and 1987 surveys. Children who were recontacted in 1987 were younger than those who were not, mean=9.8 years (SD=3.5) and mean=11.1 years (SD=3.8), respectively. Also, the mean annual income for families of children in the 1983

survey only was approximately \$28,000 (SD=\$14,250) while that for those recontacted in 1987 was \$30,000 (SD=\$15,100). Children in the 1983 survey only were also more likely to have functional limitations than those who were recontacted, 6.6% and 4.4%, respectively. No differences in gender, emotional disorder of mother, or marital disharmony were observed between those recontacted in 1987 and those not included in the 1987 survey.

## **BII. OCHS (1987) - Bivariate Analyses**

Children who had emotional and behavioral problems in 1983 were analyzed separately from children who were free of emotional and behavioral problems in 1983. In this manner, prevalence rates for the persistence of emotional and behavioral problems could be distinguished from the prevalences for the development of emotional and behavioral problems.

The results shown in Table 3.13 indicate that children diagnosed as having communication disorders and emotional and behavioral problems in 1983 had a prevalence odds ratio of maladjustment in 1987 of 0.97 (95% CI:0.31, 3.05). Thus, communication disordered children were no more likely to have persistent problems of maladjustment than the healthy. Similarly, the prevalence odds ratio for children with other chronic disorders and who were maladjusted in 1983 was 0.97 (95% CI:0.42, 2.26).

**TABLE 3.13: Health status in 1983 related to emotional and behavioral problems in 1987 for those who had emotional and behavioral problems in 1983 (number, prevalence, crude prevalence odds ratio [POR], and 95% confidence interval) - OCHS, 1987**

Health Status	N	Prevalence (%)	POR <sup>a</sup>	95% confidence interval on POR
Communication disorders	14	35.7	0.97	0.31, 3.05
Other chronic disorders	28	35.7	0.97	0.42, 2.26
Healthy	140	36.4	1.00	Reference

<sup>a</sup>The POR was computed using the healthy children as the reference group (POR=1.00).

**TABLE 3.14: Health status in 1983 related to emotional and behavioral problems in 1987 for children free of emotional and behavioral problems in 1983 (number, prevalence, crude prevalence odds ratio [POR], and 95% confidence interval) - OCHS, 1987**

Health Status	N	Prevalence (%)	POR <sup>a</sup>	95% confidence interval on POR
Communication disorders	34	8.8	0.68	0.21, 2.25
Other chronic disorders	139	15.8	1.21	0.73, 2.00
Healthy	1148	13.1	1.00	Reference

<sup>a</sup>The POR was computed using the healthy children as the reference group (POR=1.00).

When the analysis was restricted to children who were free of maladjustment in 1983, 34 children remained in the communication disordered group, 129 in the other chronic disorders group, and 1,148 in the healthy group. Again, as shown in Table 3.14, there were no statistically significant differences in the prevalence of new cases of maladjustment between either the communication disordered group and the healthy (POR=0.68; 95% CI:0.21, 2.25), or between those with other chronic disorders and the healthy (POR=1.21; 95% CI:0.73, 2.00).

#### **BIII. OCHS (1987) - Multivariate Analyses**

To determine the extent of the association between health status, as identified in 1983, and maladjustment as measured in 1987, while controlling for potential confounders and identifying effect modifiers, logistic regression models were used. The variables chosen to enter the models were the same as those that were entered into the models for the 1983 data. Similar tolerance levels for entry and exit were employed. None of the variables, including health status, were predictive of either persistent or developing maladjustment, and are therefore not presented in tabular form.

**Summary:** The results from the cohort analysis of the OCHS data did not support the second study hypothesis.

Children with communication disorders in 1983 were not found to have more persistent emotional and behavioral problems than those who were healthy or those with other

chronic disorders. Neither did communication disordered children develop more problems between 1983 and 1987 than those who were healthy or those who had other chronic disorders. These conclusions should be considered tentative due to low power because of an unexpectedly high attrition rate in the OCHS in 1987<sup>1</sup>.

### Part C

#### CI. NCDS - Descriptive Information at Age 7

In 1965, 2.7% of the NCDS sample at age 7 were reported to have communication disorders, and 6.7% were identified as having another chronic disorder as shown below in Table 3.15.

**TABLE 3.15: Distribution of subjects by diagnostic grouping total) - NCDS, age 7**

	N	Percent of Total
Communication disorders	317	2.7
Other chronic disorders	792	6.7
Healthy	10635	90.6
Total	11744	100.0

<sup>1</sup>When the thesis protocol was approved in 1986, the principal investigators of the OCHS predicted that in 1987 they would be able to recontact 90% of the subjects included in the 1983 survey.

In Table 3.16 the social and demographic features of the 11,744 children meeting the inclusion criteria who were included in the 1965 survey are summarized. Although the variables are not equivalent, comparisons with similar information from the OCHS sample may be of interest. Housing problems were experienced by 7.3% of the NCDS sample while 4.2% and 13.8% of the OCHS sample had subsidized rent or overcrowded conditions, respectively. Financial problems were reported by 8.0% of the NCDS households compared with 6.8% of the OCHS sample who were below the poverty line. Although no one variable identified a single parent family in the NCDS sample, the percentage of parents who were divorced or separated was 3.8% whereas the percentage of single parent households in the OCHS was 10.7%. Even when the percentage of households in which the mother or father were deceased was added to those of the divorced or separated, the proportion was still less than half that of the OCHS. This may be because the NCDS was completed 18 years earlier than the OCHS when divorce was less common or because divorce rates differ between Canada and Great Britain.

#### **CII. NCDS (age 7) - Crude Measures of Association**

At age 7, parents and teachers completed a questionnaire regarding the child's behavior. Table 3.17 displays the point prevalence, prevalence odds ratio and corresponding 95% confidence intervals summarizing the

**TABLE 3.16: Social and demographic characteristics -  
NCDS, age 7**

<b>Characteristic</b>	<b>Percentage</b>
<b>Demographic factors</b>	
Gender (male)	51.2
<b>Socioeconomic status</b>	
Social class	
I	29.4
II	44.2
III	26.4
<b>Home environment</b>	
Housing problems	7.3
Financial problems	8.0
Divorce, separation	3.8
Father deceased	1.1
Mother deceased	0.4
Domestic tension	5.8
Alcoholism	1.0

**TABLE 3.17: Health status related to parents' assessments of maladjustment (prevalence, crude prevalence odds ratio [POR], and 95% confidence interval) - NCDS, age 7**

Health Status <sup>a</sup>	Prevalence (%)	POR <sup>b</sup>	95% confidence interval on POR
Communication disorders	6.9	1.47	0.91, 2.35
Other chronic disorders	5.3	1.12	0.80, 1.57
Healthy	4.8	1.00	Reference

<sup>a</sup>n=277 for communication disorders; n=731 for other chronic disorders; n=9,987 for the healthy. These values differ from those of Table 3.15 because of missing values on parents' assessments of maladjustment.

<sup>b</sup>The POR was computed using the healthy children as the reference group (POR=1.00).

**TABLE 3.18: Health status related to teachers' assessment of maladjustment (prevalence, crude prevalence odds ratio [POR], and 95% confidence interval) - NCDS, age 7**

Health Status <sup>a</sup>	Prevalence (%)	POR <sup>b</sup>	95% confidence interval on POR
Communication disorders	23.2	2.22	1.70, 2.89
Other chronic disorders	15.6	1.36	1.11, 1.67
Healthy	12.0	1.00	Reference

<sup>a</sup>n=306 for communication disorders; n=768 for other chronic disorders; n=10,349 for healthy. These values differ from those of Table 3.15 because of missing values on teachers' assessments of maladjustment.

<sup>b</sup>The POR was computed using the healthy children as the reference group (POR=1.00).



association between the parents' assessments of the child's adjustment and the child's diagnostic grouping. The point estimate of the prevalence odds ratio for the communication disordered group was 1.47 and the confidence interval included 1. The prevalence odds ratio for those with other chronic disorders was only slightly elevated, and again the confidence interval included 1. Because the prevalence of maladjustment is less than 10% for all health status groups, the prevalence odds ratio in this case closely approximates the prevalence rate ratio.

According to the teachers' assessments of maladjustment, however, communication disordered children as a group were about twice as likely as healthy children (POR 2.22; 95% CI: 1.70, 2.89) to experience problems, and those with chronic disorders were about 1.3 times as likely (95% CI: 1.11, 1.67). The corresponding prevalence rate ratios are 1.93 for those with communication disorders, and 1.30 for those with other chronic disorders (Table 3.18).

### **CIII. NCDS (age 7) - Bivariate Analyses**

The criteria for confounding that were used for the OCHS sample were followed for the bivariate analyses of the NCDS sample. The results of the bivariate analyses of the association between potentially confounding variables and health status are included in Table 3.19. As in the OCHS sample, gender was significantly

**TABLE 3.19: Potentially confounding variables related to health status - NCDS, age 7**

Characteristic	Health Status		
	Healthy	Chronic Disorders	Communication Disorders
<b>Demographic factors</b>			
Males (%)	50.7	55.3	59.6*
<b>Socioeconomic status</b>			
Social class			
I (%)	29.9	27.8	20.7
II (%)	44.0	44.8	46.8
III (%)	26.1	27.5	32.5*
<b>Home environment<sup>a</sup></b>			
Housing problems (%)	7.3	6.6	10.3
Financial problems (%)	7.7	9.4	11.8*
Divorce, separation (%)	4.1	2.6	4.3
Father deceased (%)	1.2	1.1	1.0
Mother deceased (%)	0.5	0.0	0.7
Domestic tension (%)	5.7	5.8	7.7
Alcoholism (%)	1.0	0.7	2.3

\* Chi-square significant at  $p < 0.10$ .

<sup>a</sup> Values for home environment values are expressed in terms of percent with risk factor present.

associated with health status. There were more males in the communication disordered group than in either of the other groups.

Similarly, a significant association between health status and social class was found; the percentage of children in the lowest social class was higher in the communication disordered than in either the healthy or other chronic disordered group. In contrast to the OCHS sample, only one variable describing the home environment was related to health status - financial problems.

The results of the bivariate analyses of the relationship between the covariates and teachers' assessments of maladjustment in the healthy at age 7 are shown in Table 3.20. All of the covariates, with the exception of the death of either parent, were significantly associated with maladjustment. The largest statistically significant point estimate was domestic tension, and the smallest was alcoholism.

A summary of the results of the bivariate analyses is given in Tables 3.21. The variables found to fulfill the criteria for confounding were gender, social class, financial problems and domestic tension<sup>1</sup>. Other variables were found to fulfill only one or none of the criteria. For example, alcoholism was associated with the teachers' assessment of maladjustment in the healthy children, but it was not associated with health status.

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<sup>1</sup>These same variables also fulfilled the criteria for confounding when parents' assessment of maladjustment was used as the outcome variable.

**TABLE 3.20: Potentially confounding variables related to teachers' assessment of maladjustment in healthy children (prevalence odds ratio and 95% confidence interval) NCDS, age 7**

Characteristic	Prevalence Odds Ratio (95% confidence interval)
<b>Demographic factors</b>	
Gender (male) <sup>a</sup>	1.96 (1.73, 2.21)
<b>Socioeconomic status</b>	
Social class <sup>b</sup>	
II	1.85 (1.58, 2.16)
III	2.53 (2.15, 2.98)
<b>Home environment<sup>c</sup></b>	
Housing problems	2.02 (1.67, 2.44)
Financial problems	1.92 (1.44, 2.57)
Divorce, separation	2.15 (1.69, 2.74)
Father deceased	1.32 (0.79, 2.22)
Mother deceased	0.90 (0.36, 2.29)
Domestic tension	2.62 (2.13, 3.23)
Alcoholism	1.78 (1.05, 3.00)

<sup>a</sup>POR is computed using females as the reference group.

<sup>b</sup>POR is computed using Social class I as the reference group.

<sup>c</sup>For the home environment variables, POR is computed relative to the absence of the risk factor.

**TABLE 3.21: Summary of bivariate analyses of potentially confounding variables - NCDS, age 7**

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**Variables associated with both group status and maladjustment and kept for further analyses**

Gender  
Social class  
Financial problems

**Variables not associated with group status and maladjustment omitted from further analyses**

Housing problems  
Divorce, separation  
Father deceased  
Mother deceased  
Alcoholism

**Variables kept in the model based on results from the Ontario Child Health Survey and previous literature**

Domestic tension

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Although domestic tension was not statistically associated with both health status and maladjustment in the absence of exposure, it was kept in the model. Past studies have found that children living in disharmonious homes are more likely to show behavioral and emotional problems than children living in harmonious homes (Richman, Stevenson and Graham 1982; Rutter 1979). For this reason and to compare the effect of domestic tension in the NCDS model with that of a similar construct, marital discord in the OCHS sample, domestic tension was kept in the model.

As in the OCHS, a stratified analysis was conducted to identify possible effect modifiers and to aid in the interpretation of the results of the logistic regression model. The results are included in Appendix 7.

A further analysis revealed that the type of communication disorder may modify the effect between health status and maladjustment. Although both speech and hearing impairments may influence maladjustment through a common pathway of failure in communication, the neurological origins of these deficits are distinct. Because each disorder may thus pose different risks, groups were examined separately in an additional analysis. This distinction was not the focus of this study and is only briefly summarized here<sup>1</sup>.

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<sup>1</sup>This was not done in the OCHS sample due to the small numbers with each communication disorder, and the consequent lack of statistical power.

When speech and hearing disorders were examined separately, the nature of the disorder modified the effect: those with speech disorders had a prevalence odds ratio of maladjustment according to the teachers' assessments of 4.1 (95% CI:2.89, 5.94) while the hearing impaired had a prevalence odds ratio of 1.2 (95% CI: 0.82, 1.9); and those with speech disorders had a prevalence odds ratio of maladjustment according to the parents' assessments of 1.3 (95% CI:0.55, 2.88) while the hearing impaired had a prevalence odds ratio of 1.66 (95% CI: 0.93, 2.94). (Further information on these analyses is found in Appendix 8.)

#### **CIV. NCDS (age 7) - Multivariate Analyses**

Multivariate analyses of the cross-sectional study of the NCDS children at age 7 was similar to that of the OCHS sample in 1983. A brief description of each of the steps involved in this analysis is presented below.

Step one: Based on the bivariate analyses, the four variables listed in Table 3.21 were chosen to enter the model to test the association between communication disorders and maladjustment, and between other chronic disorders and maladjustment.

Step two: Procedures similar to those used in the OCHS sample were employed to test for collinearity between the exposure and control variables. Because there was little correlation between independent variables, none were dropped from the analysis at this

stage.

Step three: Four variables were entered into a stepwise logistic regression model. The following criteria were used: (a) health status was forced into all models, and (b) tolerance levels for entry of other variables were 0.100, and for removal were 0.150.

Table 3.22 includes the results of the multivariate analyses at age 7 using the parents' assessment of maladjustment. The adjusted prevalence odds ratio indicates that children with communication disorders are not significantly more likely to be maladjusted than healthy children (POR 1.5; 95% CI: 0.86, 2.46). Neither are children with other chronic disorders more likely to be maladjusted than healthy children (POR 1.2; 95% CI: 0.77, 1.62).

The results of the multivariate analyses at age 7 using the teachers' assessment of maladjustment are displayed in two models in Tables 3.23. The odds ratio for maladjustment adjusted for gender, financial problems, social class and domestic tension is about 1.9 when children with communication disorders are compared to healthy children, and approximately 1.5 when compared to those with other chronic disorders.

The strongest determinant of maladjustment was gender. In both models, boys had an adjusted prevalence odds ratio of about 4.0 when compared to girls. Other relationships were also very similar across the



**TABLE 3.22: Logistic regression of main effects relating health status and other predictor variables to parents' assessment of maladjustment (regression coefficient, standard error [SE], adjusted odds ratio and 95% confidence interval) - NCDS, age 7**

	Communication Disorders vs. Healthy		Other Chronic Disorders vs. Healthy	
	Regression coefficient (SE)	Odds Ratio (95% CI)	Regression coefficient (SE)	Odds Ratio (95% CI)
Health status	0.38 (0.27)	1.46 (0.86, 2.46)	0.11 (0.19)	1.12 (0.77, 1.62)
Gender (male)	0.20 (0.10)	1.23 (0.73, 2.07)	0.20 (0.10)	1.22 (1.00, 1.49)
Social class (I)	0.36 (0.14)	1.43 (0.71, 2.91)	0.33 (0.13)	1.39 (1.07, 1.81)
(II)	0.71 (0.14)	2.03 (1.55, 2.68)	0.71 (0.14)	2.03 (1.54, 2.66)
Domestic tension	0.97 (0.16)	2.64 (1.92, 3.62)	0.94 (0.16)	2.57 (1.88, 3.51)
Intercept	-3.58 (0.13)		-3.58 (0.12)	

Log likelihood=-1580.12 for CD; for other chronic disorders=-1647.07.

Goodness of fit chi-square=1.37, d.f.=2, p=0.63 for communication disorders; for other chronic disorders, goodness of fit chi-square=2.52, d.f.=2, p=0.33.

models for the two exposure categories, communication disorder and other chronic disorders. Children from families with financial problems had a prevalence odds ratio for maladjustment of about twice that of those from families without financial worries. Also, children from families with domestic tension were between 1.7 and 1.8 times as likely to have emotional or behavioral problems as children from homes without domestic tension.

**Summary:** The data from the NCDS sample at age 7 only partially support the first study hypothesis. At age 7, according to the teachers' assessments, communication disordered children were more maladjusted than those with other chronic disorders or those who were healthy. In contrast, however, according to the parents' assessments, communication disordered children were not significantly more maladjusted than those with other chronic disorders or those who were healthy.

#### **Part D**

##### **DI. NCDS (age 23) - Crude Measures of Association**

To predict maladjustment at age 23 from health status at age 7, the cohort was divided into two groups. The first group comprised those who were judged by either their parent or teacher to be maladjusted at age 7; the second group was made up of the remaining children, those who were not reported to be maladjusted at age 7. Children who had missing values for either parent or teacher assessments were excluded because it was not

**TABLE 3.23: Logistic regression of main effects relating health status and other predictor variables to teachers' assessment of maladjustment (regression coefficient, standard error [SE], adjusted odds ratio and 95% confidence interval) - NCDS, age 7**

	Communication Disorders vs. Healthy		Other Chronic Disorders vs. Healthy	
	Regression coefficient (SE)	Odds Ratio (95% CI)	Regression coefficient (SE)	Odds Ratio (95% CI)
Health status	0.63 (0.17)	1.89 (1.37, 2.61)	0.25 (0.12)	1.28 (1.01, 1.62)
Gender (male)	1.43 (0.07)	4.17 (3.64, 4.79)	1.38 (0.07)	3.98 (3.47, 4.56)
Financial problems	0.67 (0.11)	1.96 (1.57, 2.44)	0.72 (0.11)	2.06 (1.66, 2.55)
Social class (I)	0.61 (0.09)	1.84 (1.53, 2.21)	0.57 (0.09)	1.76 (1.48, 2.10)
(II)	0.79 (0.10)	2.21 (1.82, 2.69)	0.76 (0.10)	2.13 (1.76, 2.58)
Domestic tension	0.59 (0.13)	1.80 (1.39, 2.32)	0.52 (0.13)	1.69 (1.31, 2.17)
Intercept	-2.39 (0.08)		-2.35 (0.08)	

Log likelihood=-2982.24 for communication disorders; for other chronic disorders=-3113.34.  
 Goodness of fit chi-square=1.14, d.f.=2, p=0.57 for communication disorders; for other chronic disorders, goodness of fit chi-square=2.84, d.f.=2, p=0.24.

possible to determine if these children were maladjusted at age 7. Of the 10,812 children with complete information on parents' and teachers' assessments of maladjustment at age 7, 8,156 or 75.4% were recontacted at age 23. This latter group consisted of 198 children with communication disorders, 540 children with other chronic disorders, and 7,418 children who were healthy. Children who were recontacted at age 23 were less likely to be males, 49.7% compared to about 55.9% of those who were not recontacted; they were less likely to have come from families that were experiencing domestic tension when they were age 7, 4.9% compared to 7.6%; they were less likely to have come from families who were in the lowest socioeconomic class when they were age 7, 25.7% compared to 28.1%; and, they were less likely to be maladjusted at age 7, 15.3% compared to 19.0%.

Maladjustment at age 23 was determined by a cut-off on the Malaise Inventory. The prevalence of maladjustment at age 23 among those who were maladjusted at age 7 for each health status group is presented in Table 3.24.

These data indicate that communication disordered children had a crude prevalence odds ratio for maladjustment of about 2.5 (95% CI: 1.3, 4.8) when compared to those who were healthy at age 7.

The prevalence of maladjustment at age 23 among those who were not maladjusted at age 7 is presented in Table 3.25. The 95% confidence interval around the

**TABLE 3.24: Health status at age 7 related to maladjustment at age 23 among those who were maladjusted at age 7 (prevalence, crude prevalence odds ratio [POR] and 95% confidence interval) - NCDS, age 23**

Health Status at age 7 <sup>a</sup>	Prevalence (%)	POR <sup>b</sup>	95% CI on POR
Communication disorders	25.0	2.51	1.31, 4.83
Other chronic disorders	8.8	0.73	0.36, 1.47
Healthy	11.5	1.00	Reference

<sup>a</sup> n=52 for communication disorders; n=102 for other chronic disorders; n=1,153 for healthy.

<sup>b</sup> The POR was computed using those who were healthy at age 7 as the reference group (POR=1.00).

**TABLE 3.25: Health status at age 7 related to maladjustment at age 23 among those who were not maladjusted at age 7 (prevalence, crude prevalence odds ratio [POR] and 95% confidence interval) - NCDS, age 23**

Health Status at age 7 <sup>a</sup>	Prevalence (%)	POR <sup>b</sup>	95% CI on POR
Communication disorders	7.5	1.28	0.69, 2.38
Other chronic disorders	6.2	1.03	0.69, 1.54
Healthy	6.0	1.00	Reference

<sup>a</sup> n=146 for communication disorders; n=438 for other chronic disorders; n=6,265 for healthy.

<sup>b</sup> The POR was computed using those who were healthy at age 7 as the reference group (POR=1.00).

prevalence odds ratios for communication disordered children and for those with other chronic disorders includes 1.

Thus, from these unadjusted estimates it would appear that children with communication disorders are no more likely to develop emotional and behavioral problems between ages 7 and 23 than those who are healthy or those with other chronic disorders.

#### **DII. NCDS (age 23) - Multivariate Analyses**

The goal of the multivariate analysis of the NCDS cohort was to determine the magnitude of the association between health status at age 7 and maladjustment at age 23 while controlling for possible confounders, and identifying effect modifiers. Logistic regression models were created to predict maladjustment at age 23.

Models included variables measuring changes in health status between ages 11 and 16 and changes in socioeconomic status between ages 7 and 16 in addition to baseline variables. In analyzing longitudinal data with observations at more than two time points, it is rarely appropriate to consider only the correlations of baseline predictor variables with outcomes. As Rutter (1988) notes, to specify correctly the effect of baseline variables it is necessary to include information on changes that may have occurred during the interval between baseline measurement and outcome measurement. For example, to determine the effect of communication

disorders at age 7 on maladjustment at age 23, it is necessary to first account for important events that may have happened to the child in the intervening years.

This can be done in two ways. First, measures of important characteristics such as the presence or absence of communication disorders at ages 11 and 16 could be included in a regression model. These measures, however, are likely to be highly associated. If predictor variables are collinear, parameter estimates will likely have large standard errors, and thereby be unreliable (Kleinbaum, Kupper and Muller 1988). An alternative method, advocated by Goldstein (1979), is to construct variables indicating change in relevant characteristics over time.

Such pattern variables have been used by Goldstein (1979) in prior analyses of NCDS data to adjust baseline predictors for longitudinal variations. Magnusson and Bergman (1988) in analyzing data from their Stockholm longitudinal study have also based their analyses on patterns of behavior. In their method, individuals who experience similar behavioral changes over time are identified and grouped together. Variables are then constructed to represent patterns of behavior.

In this thesis, combinations of patterns for socioeconomic status, a trichotomous variable, were adapted directly from Goldstein (1979). He used changes in socioeconomic status between ages 7 and 16, using

socioeconomic status at age 11 as a reference point, to predict reading scores at age 16. In Goldstein's analysis of the NCDS, the 27 possible combinations of socioeconomic status were grouped into 5, those appearing in Table 3.26 plus a reference category of no change.

To exhaust the changes that may have occurred in communication disorders over the two ages (11 and 16) would require 4 combinations or patterns (2 X 2) of changes. Thus to simplify the model only two change patterns are used: one reflecting a resolving pattern of communication disorders, another reflecting a more persistent pattern. In the resolving pattern the child was rated as communication disordered at age 11 but was no longer considered disordered by age 16. In the persistent pattern, the child was disordered at ages 11 and 16, or age 16 only.

Further details regarding the manner in which patterns were constructed for changes in health status and socioeconomic status, and the methods used for imputed missing values for these pattern variables are available in Appendix 4.

An interaction term between health status at age 7 and maladjustment at age 7 was forced into the model. This made it possible to distinguish those who were reported as being maladjusted at both ages 7 and 23 from those who were reported to be maladjusted at age 23 only. The former group will be regarded as those who



"persisted" in having emotional and behavioral problems and the latter as those who "developed" emotional and behavioral problems. Other two-way interactions between health status and the other variables were permitted to enter the model if they met the tolerance levels; none did.

The estimates of the parameters and standard errors for the model including the interaction term between health status and maladjustment at age 7 are shown in Table 3.26. The corresponding adjusted odds ratios and 95% confidence intervals are shown in Tables 3.27 and 3.28 for the communication disordered children and those with other chronic disorders, respectively. The odds ratios are adjusted for gender, change in health status between ages 11 and 16, and changes in socioeconomic status between age 7 and 16 using socioeconomic status at age 11 as a reference.

The adjusted prevalence odds ratio for communication disordered children who were maladjusted at age 7 was 1.82 (95% CI:0.75, 4.45), and that for those who were not maladjusted at age 7 was 1.50 (95% CI:0.76, 3.00).

Although the point estimates of these odds ratios are elevated, the corresponding 95% confidence intervals include 1. Thus, it cannot be concluded that communication disorders at age 7 are significantly associated with the persistence or development of maladjustment by age 23.

**TABLE 3.26: Logistic regression with interaction terms relating health status at age 7 and other predictor variables to maladjustment at age 23 (regression coefficient and standard error [SE]) - NCDS, age 23**

Variable	Communication Disorders vs. Healthy	Other Chronic Disorders vs. Healthy
	Regression coefficient (SE)	Regression coefficient (SE)
Health status	0.41 (0.35)	0.08 (0.24)
Health status history <sup>a</sup>		
resolving	0.46 (0.23)	-0.07 (0.36)
persisting	-0.08 (0.25)	0.12 (0.18)
Gender (female)	1.15 (0.12)	1.22 (0.12)
Maladjustment at age 7 <sup>a</sup>	0.80 (0.13)	0.82 (0.13)
Maladjustment at age 7*health status	0.19 (0.57)	-0.20 (0.51)
Socioeconomic status using age 11 as a reference point		
social class II	0.44 (0.15)	0.40 (0.14)
social class III	0.81 (0.17)	0.73 (0.17)

Table 3.26 continues on the next page.

TABLE 3.26 - continued

Variable	Communication Disorders vs. Healthy	Other Chronic Disorders vs. Healthy
	Regression coefficient (SE)	Regression coefficient (SE)
Socioeconomic longitudinal patterns <sup>a</sup>		
III to I or II	-0.11 (0.18)	-0.12 (0.21)
II to I	-0.06 (0.29)	0.21 (0.26)
I or II to III	0.39 (0.21)	0.34 (0.21)
I to II	0.52 (0.31)	0.57 (0.30)
Intercept	-4.02 (0.15)	-4.03 (0.15)

<sup>a</sup> See text and Appendix 4 for details of variable.

Log likelihood=-1398.97 for communication disorders; for other chronic disorders log likelihood=-1430.98

Goodness of fit chi-square=3.27, d.f.=2, p=0.20 for communication disorders; goodness of fit chi-square=3.29, d.f.=2, p=0.19 for other chronic disorders.

**TABLE 3.27: Maladjustment at age 23 in children with communication disorders at age 7 (adjusted prevalence odds ratio and 95% confidence interval) - NCDS, age 23**

Health Status	Odds Ratio <sup>a</sup>	95% Confidence Interval on Odds Ratio
Communication disorder		
- maladjusted at age 7	1.82	0.75, 4.45
- not maladjusted at age 7	1.50	0.76, 3.00

<sup>a</sup>Computed from coefficients and standard errors in Table 3.26 and adjusted for all variables included in model for communication disorders shown in Table 3.26.

The crude analysis indicated that communication disordered children were significantly more likely to persist in being maladjusted than healthy children. However, after controlling for confounders in the multivariate model, this association no longer existed. The variables that resulted in the greatest change in the prevalence odds ratio were gender and socioeconomic status. Both these variables were associated with the exposure, health status, and the outcome, maladjustment at age 23. However, there was no significant interaction term between gender and health status, nor between socioeconomic class and health status.

There were more males in the communication disordered group than females, 58.1% compared to 41.9%, respectively. However, healthy females were more likely to be maladjusted at age 23 than healthy males, 10.0% compared to 3.6%. To determine the impact of gender on the measure of the effect of health status on

maladjustment at age 23, gender was entered into a model including health status, maladjustment at age 7, and the interaction between health status and maladjustment at age 7. When gender entered the model, the prevalence odds ratio increased from 2.5 to 2.8 for the persistence of maladjustment. This is a small increase but it is consistent with the observation that the communication disordered individuals were more likely to be males. Whereas among the healthy, maladjustment at age 23 was more common in females.

The impact of socioeconomic status on the prevalence odds ratio measuring the effect of health status at age 7 on maladjustment at age 23 is straightforward. Socioeconomic status is associated with health status. Specifically, the families of communication disordered children were more likely to be from the lowest socioeconomic class than were families of healthy children. Among those who were healthy at age 7, maladjustment at age 23 was more common for those in the lowest socioeconomic class than for those in the middle or highest socioeconomic class; 9.3% compared to 7.0% and 4.4%, respectively. Controlling for socioeconomic status attenuates the effect of health status on the persistence of maladjustment. Thus, in the crude analysis, the association between communication disorders and the persistence of maladjustment is at least partially due to confounding by social class.

As shown in Table 3.28, after controlling for gender, socioeconomic status and changes in health status and socioeconomic status, children with other chronic disorders who were maladjusted at age 7 did not have more persistent maladjustment than healthy children (POR=0.76; 95% confidence interval 0.18, 3.11). Also, children with other chronic disorders at age 7 who were not maladjusted at age 7 were no more likely than healthy children to become maladjusted by age 23 (POR=1.18; 95% confidence interval 0.73, 1.90).

**TABLE 3.28: Maladjustment at age 23 in children with other chronic disorders at age 7 (adjusted prevalence odds ratio and 95% confidence interval) - NCDS, age 23**

Health Status	Odds Ratio <sup>a</sup>	95% Confidence Interval on Odds Ratio
Other chronic disorders		
- maladjusted at age 7	0.89	0.37, 2.14
- not maladjusted at age 7	1.09	0.68, 1.74

<sup>a</sup> Computed from coefficients and standard errors in Table 3.26 and adjusted for all variables included in model for other chronic disorders shown in Table 3.26.

**Summary:** The results from the NCDS sample at age 23 do not support the second study hypothesis. It cannot be concluded that children with communication disorders at age 7 are more likely to persist in being maladjusted at age 23 than those with other chronic disorders or those who are healthy after controlling for gender, socioeconomic status, and changes in health status and

socioeconomic status. Neither are communication disordered children at age 7 more likely to develop problems of maladjustment by age 23 than those with other chronic disorders or those who are healthy.

**PART E:****EI. Summary of Findings**

With respect to the study hypotheses, the following conclusions can be drawn:

1. According to the results from the cross-sectional analyses of the OCHS sample, children with communication disorders had an adjusted odds ratio for maladjustment of 2.86 (95% CI:1.61, 5.05) using the healthy as a reference. These odd ratios are adjusted for age, functional limitations, annual income and marital disharmony. This finding may be modified by a maternal history of emotional disorder. Specifically, children with communication disorders whose mothers had a history of an emotional disorder may have a higher prevalence rate of emotional and behavioral problems than communication disordered children whose mothers did not have a history of an emotional disorder.

2. According to the results from the cross-sectional analysis of the NCDS sample, children with communication disorders at age 7 are more likely to be judged by their teachers to be maladjusted than those who are healthy or those with other chronic disorders. The adjusted odds ratio, using the healthy group as the reference is 1.89 (95% CI:1.37, 2.61) controlling for gender, financial problems, social class and domestic tension.

When judged by their parents, seven-year old children with communication disorders are not significantly more likely to be maladjusted than those



with other chronic disorders or those who are healthy.

3. According to the results from the cohort analysis of the OCHS sample, communication disorders are not significantly associated with the persistence or development of psychiatric disorders four years later. This conclusion is tentative due to the high attrition rate and corresponding low power between the time of the initial contact of the OCHS sample in 1983 and the second contact in 1987.

4. According to the results of the NCDS sample, children who had communication disorders at age 7 and were maladjusted at age 7 had an adjusted odds ratio for maladjustment at age 23 of 1.82 (95% CI: 0.75, 4.45) compared with those who were healthy at age 7.

Children who had communication disorders at age 7 and were not maladjusted at age 7 had an adjusted odds ratio for maladjustment at age 23 of 1.51 (95% CI: 0.76, 3.00).

Children with other chronic disorders and who were maladjusted at age 7 had an adjusted odds ratio for maladjustment at age 23 of 0.89 (95% CI: 0.37, 2.14); those who were not maladjusted at age 7 had an adjusted odds ratio of 1.09 (95% CI: 0.68, 1.74). These odds ratio were adjusted for gender, socioeconomic status, and changes in health status, and in socioeconomic status between the ages of 7 and 16.

## **DISCUSSION**

## DISCUSSION

In this chapter the conclusions to be drawn from this study are summarized in the context of other studies. The methodological strengths and limitations of this study are examined. Two theoretical models are proposed to account for the findings, and clinical and research implications are discussed.

### I. Summary of Results

The first objective was to determine whether children with communication disorders from the general population had an increased prevalence rate of maladjustment when compared with children with chronic physical disorders and with healthy children. Children with communication disorders from the OCHS had an adjusted prevalence odds ratio of maladjustment of 2.86 (95% CI:1.61, 5.05) using the healthy group as a reference. The magnitude of the relationship parallels that of the studies reviewed in the Introduction. There was some evidence that this finding may be modified by a maternal history of emotional disorder. Children with communication disorders in the OCHS whose mothers had a history of an emotional disorder were more likely to be maladjusted than healthy children (adjusted POR=5.79; 95% CI:2.22, 15.12). In contrast, communication disordered children whose mothers did not have a history of an emotional disorder were not significantly more maladjusted than healthy children (adjusted POR=1.93; 95% CI:0.91, 4.1).

Although the modifying effect of maternal emotional disorder was statistically significant only at the 0.10 level, evidence from other studies supports the complex relationship between maternal distress, childhood disorder, and childhood emotional and behavioral problems. It has been shown elsewhere that having a communication disordered child may increase maternal stress and maternal emotional problems. In a cross-sectional study of 26 hearing impaired children, Prior and colleagues (1988) reported that mothers showed elevated levels of anxiety, depression, and total scores on the General Health Questionnaire (GHQ) (Goldberg and Hillier 1979) when compared to mothers of a control group of children matched on social class, age and sex. (The GHQ is a 28-item scale designed to identify short term manifestations of anxiety, depression, insomnia, somatic symptoms and social dysfunction.) They suggest that mothers are likely to take most of the responsibility for the hearing impaired child's medical and educational management and for family communication needs, and that these added responsibilities account for reduced maternal mental health.

It is also possible that mothers who are less effective in their interaction with their child because of their own psychological problems may increase the adjustment problems encountered by their communication disordered children. Baker and Cantwell (1987), in a

five year longitudinal study of 300 speech impaired children from a southern California speech and hearing clinic, found that development of a psychiatric diagnosis appeared to be correlated with the presence of a mental illness in one or more parent. In the Prior et al. study described above, the best predictor of behavior problems among the hearing impaired children was the mother's psychological distress. More work is needed to unravel the exact process by which maternal mental health modifies the relationship between communication disorders and maladjustment.

In the NCDS sample, the prevalence rate of psychological maladjustment among communication disordered children differed somewhat depending on whether parents or teachers assessed the child's behavior. When information was obtained from the parents, children with communication disorders were not significantly more likely to be maladjusted than those who were healthy (adjusted POR=1.47; 95% CI:0.91, 2.35). In contrast, when teachers provided the ratings, communication disordered children were significantly more likely to be maladjusted than those who were healthy (adjusted POR=1.89; 95% CI:1.37, 2.61).

Other recent studies have also shown that teachers may be more likely than parents to report behavioral problems in communication disordered children. In the Dunedin Multidisciplinary Health and Development Study, the behavioral status of 47 children who had bilateral

otitis media with effusion (and hence some degree of hearing impairment) at age 5 was assessed at ages 5, 7, 9 and 11 by means of the Rutter Parent's Scale (Rutter, Tizard and Whitmore 1970) and the Rutter Teacher's Scale (Rutter 1967). Teachers, but not parents, reported significantly more behavior problems in the children with bilateral otitis media over the period studied than in a healthy age-matched control group (Silva, Chalmers and Stewart 1986). Similarly, in a study of 26 hearing impaired children, Prior and co-workers (1988) reported that teachers rated hearing impaired children as less well adjusted than a control group of normally hearing children, while mothers of the hearing impaired reported no greater level of behavior problems.

Agreement between different types of observers rating children in different situations, such as parents and teachers, are generally low to moderate (Achenbach and McConaughy 1987). This is not surprising in view of differences not only in teachers' and parents' expectations, but also in their influences on the child and the different constraints of the situation in which they see the children (Achenbach and McConaughy 1987; Archibald 1974). For instance, parents may have fewer rules about acceptable noise levels and about the need to request permission for various activities, such as using the washroom and leaving the room. Additionally, parents and teachers have different reference groups of children

with which they compare the behavior of a child.

An additional finding of the NCDS was that for the communication disordered children the prevalence rates of maladjustment when based on teachers' assessments varied by the type of communication disorder. When parents reported maladjustment at age 7, neither children with speech disorders nor those with hearing disorders were significantly more likely to be maladjusted than healthy children. However, teachers reported that those with speech disorders were significantly more likely to be maladjusted than healthy children (adjusted POR=3.40; 95% CI:2.10, 5.51), while those with hearing disorders were only marginally more likely to be maladjusted than healthy children (adjusted POR=1.28; 95% CI:1.01, 1.62).

The low rate of maladjustment among hearing impaired children differs from previous research in several respects. Of the 16 studies involving hearing impaired children reviewed in the Introduction (Tables 1.1-1.4), 6 reported that hearing impaired children had elevated rates of maladjustment compared to normative values or to control groups of normally hearing children. A closer examination of these studies may explain why they differ from the current study. Hearing impaired children included in previous samples are unlikely to be representative of hearing impaired children from the general population. Specifically, they were from institutions specializing in the care of children with

psychiatric problems (Williams 1970; Goldberg, Lobb and Kroll 1975); or they were selected from speech and hearing clinics (Davis et al. 1986; Meadow and Schlesinger 1971); or they were restricted to severely or profoundly hearing impaired preschoolers (Scherer 1983). Thus, in the current study, hearing impaired children may be less likely to be maladjusted than those in some previous studies because they may represent a wider range of hearing impairment, and be less likely to be receiving psychiatric treatment.

In addition to comparing the prevalence of maladjustment in the communication disordered children with that of the healthy, the prevalence of maladjustment in those with chronic physical disorders was compared with that of the healthy. This permitted comparisons of the magnitude of the effect in the communication disordered children with that of the chronic physically disordered while using the same reference group. Children with chronic physical disorders in the OCHS sample had an adjusted prevalence odds ratio of 1.50 (95% CI:1.03, 2.18) compared to healthy children. In the NCDS sample, those with chronic physical disorders had an adjusted prevalence odds ratio of about 1.1 to 1.3 using the healthy children as the reference group. The direction and magnitude of this relationship is consistent with the studies reviewed by Nolan and Pless (1986) and with the recent report by Gortmaker et al.



(1990).

In the OCHS sample, this association of chronic disorders and maladjustment was modified by the presence of functional limitations in the disordered child. Children with chronic physical disorders who did not have functional limitations had an adjusted prevalence odds ratio of 1.82 (95% CI:1.23, 2.69) compared to the healthy, while those with functional limitations were no more likely to be maladjusted than the healthy (adjusted POR=0.52; 95% CI:0.20, 1.34).

The manner in which functional limitations modifies the relationship between chronic disorders and maladjustment is unclear. Recent studies are inconsistent about this association. Some large-scale epidemiologic studies such as those summarized by Pless and Roghmann (1971) document an increased prevalence of psychological problems among children with chronic conditions and suggest that increased functional limitations are associated with a greater risk of psychological maladjustment. In contrast, in the Monroe County Survey, Pless and Satterwhite (1975) found that parental reports of interference with daily activities were directly related to only about one half of their measures of maladjustment. In most of the other measures the relationship was "curvilinear"; maladjustment being more frequent in the severely disabled and nondisabled groups, and less in those with intermediate levels of disability (Pless and Satterwhite 1975; p.88).

Similarly, Harper (1983) found no evidence of a linear relationship between scores on the Minnesota Multiphasic Personality Inventory and the degree of impairment in adolescents with muscular dystrophy and other orthopedic problems.

Other studies have found a negligible relationship between functional limitations and maladjustment. Stein and Jessop (1984) noted a "low positive" correlation between functional status and psychological adjustment among 81 chronically ill children. In a cross-sectional study of 50 6- to 11-year old children with cerebral palsy and spina bifida, Wallander and co-workers (1989) concluded that functional limitations were not associated with emotional adjustment.

In contrast to the current results based on the OCHS sample, Cadman and colleagues' (1987) analysis of the OCHS discovered that children who had both a chronic illness and an associated disability had a greater than threefold risk for psychiatric disorders. Children with chronic medical conditions but no disability had only a twofold increase in psychiatric disorders. The reason for the disparity between Cadman et al.'s results and the results of the present study are unclear but two explanations are possible.

First, of the 442 children with chronic conditions in Cadman et al.'s grouping, 135 were excluded from the current sample. Those who were visually impaired, blind,

or complained of chronic pain alone were excluded. Those with speech and hearing problems were excluded from those with chronic physical disorders and comprised a separate group of communication disorders.

Second, Cadman et al. only adjusted odds ratios for age and sex whereas the multivariate logistic regression, performed in the current study, adjusted simultaneously for all confounding variables. Although these explanations may account for the differences between the findings of Cadman and colleagues and those of the present study, more detailed analysis would be required to fully understand the interaction between functional limitations and chronic physical disorders.

The second objective of the present study was to determine if communication disordered children were more likely to persist in having emotional and behavioral problems or to develop more emotional and behavioral problems during follow-up periods of four and sixteen years. The OCHS sample suggests that communication disordered children are no more likely to persist in having adjustment problems, or to develop new problems when followed for 4 years, than either those with chronic physical disorders or those who are healthy. This is at best a tentative conclusion because loss to follow-up, greater than anticipated at the beginning of the current study, severely limited the number of children assessed in both 1983 and 1987. Complete information was available on only 48 children with communication

disorders, and only 3 of these developed new problems.

The NCDS sample was larger than that of the OCHS, suffered from less serious attrition, and had a longer follow-up period. Based on the scores from the Malaise Inventory at age 23, it was found that children with communication disorders at age 7 who were maladjusted at age 7 were not significantly more likely to persist in being maladjusted at age 23 than those who were healthy after controlling for confounding factors. Neither were communication disordered children at age 7 significantly more likely to develop problems of maladjustment by age 23 than those who were healthy. These results were controlled for gender, changes in health status between ages 11 and 16, and changes in socioeconomic status between age 7 and 11, using age 11 as a reference. These results also remain tentative due to the possibility that measurement error attenuated the effect towards the null and the possibility of bias due to attrition. Definitive conclusions require further research to confirm this result.

## **II. Contributions: Methodological and Substantive**

This study contributes to the existing literature on maladjustment among communication disordered children in a number of ways. These include generalizability of the conclusions, the strength of the design, and the analysis of the influence of family and demographic variables.

### A. Generalizability

The results of the cross-sectional analyses summarized above are in agreement with those of clinic-based samples reviewed in the Introduction. The size of the effect varies, but the conclusion is consistent. Clinic-based studies, however, are sometimes limited in their generalizability. Children who are brought to a clinic may not be representative of communication disordered children from the general population. As a result, risk factors for maladjustment and communication disorders, such as socioeconomic status, may be more restricted. These reductions in generalizability of clinic-based conclusions are avoided in the present study. Further, factors such as pre-existing psychological problems that may increase the likelihood of clinic attendance and thus threaten the validity of the results are avoided.

In contrast to the present study, clinic-based studies may employ standards of measurement impossible to achieve in large scale studies of the general population. For example, Cantwell and Baker (1987a) employed sophisticated diagnostic procedures to detect and characterize communication disorders. The present study has relied only on parental responses to a few questionnaire items in the OCHS sample, and parents' reports and physicians' judgements in the NCDS sample to identify communication disorders. Thus, the greater

likelihood of misclassification error must be recognized when acknowledging the increased generalizability of the current study. Further issues of measurement error will be included when the limitations of the present study are discussed.

## **B. Design**

The present study is the first cohort study of communication disordered children to control for multiple risk factors when estimating the effect of communication disorders on maladjustment into early adulthood. By distinguishing those at "risk" for the development of emotional and behavioral problems from those who were maladjusted at baseline, the prevalence of both the persistence and development of maladjustment could be determined. Furthermore, inferences regarding the etiology of maladjustment could be made with greater certainty than is possible from most of the studies reviewed in the Introduction. In the NCDS sample, children who had communication disorders at age 7 were no more likely to develop maladjustment problems than those who were healthy. This finding provides no evidence that communication disorders are likely to cause maladjustment in a child who is not already maladjusted by age 7.

A second important feature of the design is the parallel comparison of communication disordered children with those with chronic physical disorders. Although further research is required, this study identifies a

subgroup of children within the group of children with chronic conditions who may be even more likely to experience problems during childhood.

By including two samples, the emotional and behavioral consequences of communication disorders have been explored in two societal contexts. Not only are the NCDS and OCHS samples from two different countries, but they are also from two different decades. The data included in the cross-sectional analysis of the NCDS sample were collected in 1965 whereas that of the OCHS were collected in 1983. Period differences in the relationship between communication disorders and maladjustment could thus have been identified if such differences had existed.

Use of two data sets also allowed for confirmation of results across samples using different study strategies. If the same variable measured in different ways is shown to have an association with the specified outcome in populations that differ markedly in their characteristics, it is much more likely that the association is a true one and not subject to the idiosyncrasies of measurement error or bias of subject selection (Rutter 1988). Communication disordered children in both the NCDS and the OCHS samples were found to have more emotional and behavioral problems than the healthy and those with chronic physical disorders. In neither sample was there definitive evidence to conclude that these problems persist.

### C. Family and demographic variables

The current study contributes to the understanding of the relationship between communication disorders and maladjustment by including several characteristics of the home environment as well as socioeconomic and demographic variables. Baker, Cantwell and Mattison (1980), and Beitchman et al. (1988) have attempted to identify family and demographic variables that may increase the risk of maladjustment in communication disordered children. Beitchman et al. (1988) acknowledged the contribution of Baker, Cantwell and Mattison (1980), and identified two major limitations in their reports. The first is that Baker, Cantwell and Mattison only used clinic cases, and thus their results are generalizable only to other similar clinics. It is not known whether the relationships among the variables studied would be the same in an unselected random sample of the general population (Cantwell and Baker 1981). Second, Baker and co-workers did not include a control group, thus making it difficult to interpret nonsignificant differences and to determine if the presence of additional risk factors, such as economic disadvantage, place communication disordered children at an even greater risk than healthy children. Beitchman and colleagues avoided the latter two limitations. Using a communication disordered sample and a normal control group, they determined whether marital status, socioeconomic status, parental education,



and family size modified the relationship between communication disorders and psychiatric problems. They concluded that none of these sociodemographic variables was an effect modifier. These authors recommended that future research should examine the role other variables play in modifying the relationship between speech disorders and psychiatric problems (Beitchman et al. 1988).

The current study contributes to the exchange between Baker, Cantwell and Mattison (1980) and Beitchman et al. (1988). Home environment variables, such as marital discord, family dysfunction, and parental mental health were included for a general population sample. Findings from the OCHS sample regarding social class and parental education were similar to those reported by Beitchman and co-workers (1988). A greater proportion of communication disordered children than healthy children came from the lowest social class and had parents with less education. Additionally, a greater proportion of children with communication disorders than healthy children had parents who reported marital discord and emotional disorders. In the multivariate logistic regression of the OCHS sample, the only variables found to independently predict maladjustment were health status, annual income, age, functional limitations, emotional disorder of the mother, and marital discord. In a similar analysis of the NCDS, the variables found to

independently predict maladjustment were health status, gender, social class, and financial problems. These covariates have previously been identified as placing individuals at increased risk for emotional and behavioral problems (Gortmaker et al. 1990; Kessler and Cleary 1980; Emery 1982; Rutter 1979).

The interaction between health status and each of these additional risk factors was also examined. Only maternal history of an emotional disorder was found to modify the effect of communication disorders on maladjustment. This interaction and the caution necessary to interpret it accurately has been discussed above.

There was no evidence that the prevalence of maladjustment for children with communication disorders was modified by other variables. This means, for example, that the prevalence of maladjustment for communication disordered children who are also poor is no greater than the prevalences predicted based on these two independent factors alone. There is no synergistic relationship between communication disorders and poverty. However, all logistic regression models are multiplicative in their odds and thus indicate substantially greater likelihood of being maladjusted for children who have communication disorders and are economically or socially disadvantaged. For example, based on the results of the logistic regression of the NCDS sample at age 7 using teachers' assessments, the adjusted prevalence odds

ratios in Table 3.21 indicate that a communication disordered child who is a male from the lowest social class is up to 17 times more likely to be maladjusted than a healthy female from the highest social class.

### **III. Methodological Limitations**

Despite the strengths of this study, a number of insoluble methodological and design issues may have influenced the findings and conclusions. In this section, concerns regarding measurement, selection bias, confounding, and the direction of effects are addressed.

#### **A. Problems of measurement**

Some amount of measurement error is intrinsic to any epidemiological study. Although this error can seldom be eliminated, an appreciation of its impact on study results can contribute to the appropriateness of the conclusions drawn from studies (Kelsey, Thompson and Evans 1986).

**Misclassification:** The first issue to consider is whether measurement error has distorted the true association between the exposure, health status, and the outcome, maladjustment. The distinction between nondifferential and differential misclassification is important when discussing the possibility and impact of such bias. Nondifferential random misclassification of either the exposure or the outcome, or both, is a form of information bias that has been shown to distort the measure of effect towards the null, that is to a relative

1 risk of one (Kelsey, Thompson and Evans 1986; Kleinbaum, Kupper, and Morgenstern 1982). In contrast, differential misclassification (i.e. if the magnitude of the error for one variable differs according to the value of another variable) may distort the measure of association in any direction, and thus the apparent effect may be increased, reduced or reversed (Rothman 1986; Kelsey, Thompson and Evans 1986).

To provide a definitive assessment of the nature of the misclassification in this study (i.e. differential or non-differential) would involve an extensive exercise in cross-validation of both health status and maladjustment. Specifically, to validate health status in the OCHS sample, children identified by their parents as having a communication disorder would need to be examined by a speech pathologist or audiologist or both. Children with chronic disorders, such as diabetes and cardiac disease, would require medical examinations and the appropriate laboratory or radiological investigations. Additionally, a sample of children who were reported to be healthy would need to be subjected to the same investigations to confirm the absence of communication disorders and other chronic disorders.

Although perhaps less necessary, similar procedures would have been required to validate parents' reports and physicians' judgements of health status in the NCDS sample. The degree of misclassification of health status

would have to be correlated with the degree of misclassification of maladjustment to determine whether the magnitude of error in maladjustment varied according to health status. For example, if differential misclassification existed communication disordered children would be more likely to be wrongly classified as maladjusted than would healthy children.

In the absence of such cross-validation, or evidence of differential misclassification, it is assumed that most errors in the classification of health status are random and not correlated with the classification of maladjustment <sup>1</sup>.

**Exposure misclassification:** Exposure misclassification, that is errors in specifying health status, may have arisen from parental reporting in the OCHS sample. Parents may have failed to report a diagnosed disorder, or failed to detect an undiagnosed disorder. Conversely, they may have reported a communication disorder that did not exist. Thus, some children with communication disorders in the OCHS sample may not have been identified while other children may have been incorrectly considered communication disordered. Errors may also have occurred when classifying other chronic disorders and healthy children.

In the NCDS sample, classification of speech

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<sup>1</sup>This assumption was discussed extensively prior to the initiation of the current study and accepted as valid.

I disorders was based solely on medical reports, while hearing impairment was based on both parental and medical reports. The inexperience of some physicians relative to speech pathologists in identifying speech disorders may have introduced misclassification. More accuracy may be expected in physicians' diagnoses of hearing disorders because firm audiometric criteria were available. Having identified the likely sources of error in classifying health status, it is necessary to estimate the degree of misclassification and the extent to which the measure of association between communication disorders and emotional and behavioral problems may have been attenuated towards the null.

An indirect indication of the degree of misclassification can be obtained by comparing the prevalence of health status found in this study with that of others. Previous investigators have determined that the period prevalence of all chronic physical disorders for ages 0-20 years, including multiple handicaps, is approximately 10 to 12% (Pless and Douglas, 1971; Gortmaker and Sappenfield 1984; Gortmaker 1985; Gortmaker et al. 1990). This compares favorably with the OCHS value of 11.8%. The NCDS value of 6.7% is, however, considerably lower. This value is most likely due to the younger age of the sample at the time of initial ascertainment. It may also be due to the fact that the prevalence and actual numbers of chronic

disorders have increased in the two decades between the NCDS and the OCHS studies due to a combination of increased survival for several conditions and a cohort effect resulting from the "baby boom" of the 1950's (Gortmaker and Sappenfield 1984).

As noted in the Introduction, reported prevalences of communication disorders vary from a low of 1.2% (Rutter, Graham and Yule 1970) to a high of 33.6% (Hull et al. 1971). In the NCDS and OCHS samples prevalences were 2.7% and 3.6%, respectively. These lower values suggest that only the more severe cases have been ascertained.

If severity is related to maladjustment, the findings reported here may not pertain to less severe disorders. In the present study, no measure of severity of disorder was available in the NCDS sample. The only measure of severity available in the OCHS sample was a functional limitations scale. Unfortunately, the small number of children who were reported to have limitations in the communication disordered group precluded detailed analyses. Furthermore, parent reporting of functional limitations may not be the best measure of severity for this disorder.

Comparing the magnitude of the effect found in the present study to those of the studies summarized in Table 1.5 allows a rough estimate of the degree of attenuation of the measure of association between communication disorders and emotional and behavioral problems. From

the studies presented in Table 1.5, unadjusted prevalence rate ratios were reported or if not available computed from the presented data. The unadjusted prevalence rate ratios in the cross-sectional analysis of the OCHS 1983 sample of 2.6 is higher than 12 of the 21 prevalence rate ratios presented in Table 1.5. In the NCDS sample at age 7, using both parent and physician reports of communication disorders, the unadjusted prevalence rate ratios according to the teachers' assessments was 1.9. This value is higher than of the prevalence rate ratios in Table 1.5. Thus the measure of association between communication disorders and emotional and behavioral problems is firmly within the range of values reported in earlier studies.

**Outcome misclassification:** The effect of nondifferential misclassification of the outcome in follow-up studies depends on whether the risk ratio or risk difference is being estimated, and in which direction the misclassification occurs (Rothman 1986). If only a proportion of children who were maladjusted were identified, but this proportion was equal for children with communication disorders and those who were healthy, and there were no false positives, the relative risk would be unaffected. With overascertainment, that is when the specificity of the test is less than 100% and consequently the cases of interest are diluted with additional children who are not maladjusted, the relative



risk will be biased towards the null (Rothman 1986). In both the OCHS and NCDS samples no long-term effects of maladjustment were found. It is possible that this lack of effect was due to the inaccuracy of the outcome measures. Information regarding the outcome measure of the OCHS sample, the Survey Diagnostic Instrument, is available and has been reviewed in the Methods. However, the lack of power due to the high attrition rate during the follow-up period makes this a more likely cause of a null effect than any inherent limitation of the instrument.

Limited details are available regarding the sensitivity and specificity of the Malaise Inventory. A review of the absolute rates of maladjustment in the NCDS at age 23, 7.0% of the healthy and 10.7% of the communication disordered children, compares favorably with those found in other general population studies. For example, in the large National Institute of Mental Health Epidemiologic Catchment Area Studies of 20,000 individuals from the general population of the United States, 11.0% of those age 18 to 24 were found to have at least one of the following DSM-III disorders: affective disorders, anxiety disorders, somatization disorder, or schizophrenia (Regier et al. 1984). This tends to argue against low specificity being responsible for the null effect.

The instruments used in the OCHS and NCDS are only one component of the diagnostic process in child

psychopathology. Other possible measures include interviews with the parent and child conducted by a child psychiatrist, physical examinations, neurological examinations, and laboratory studies (Cantwell 1988). The inclusion of all components of the diagnostic process, but especially that of reliable and valid psychiatric evaluations would have improved the internal validity of the current study and increased confidence in the conclusions.

**Appropriate construct:** The final measurement issue to consider is whether the same construct was measured in the NCDS sample at ages 7 and 23. At age 7 the main outcome was the score on the Bristol Social Adjustment Guide. This purports to measure emotional and behavioral maladjustment at school. At age 23 the main outcome was the score on the Malaise Inventory. As described in the Methods, the Malaise Inventory identifies emotional disorders commonly seen in adults. It has been claimed that this measure is moderately successful in differentiating adults with and without psychiatric disorders (Rutter, Tizard and Whitmore 1970). There are no studies examining the equivalence of the Bristol Social Adjustment Guide and the Malaise Inventory. To the extent that the Bristol Social Adjustment Guide and the Malaise Inventory measure different constructs, rates of maladjustment in children cannot be compared to emotional disorders in adults. However, given that no

measures of maladjustment that are appropriate for all ages was available in the surveys selected, there is no alternative but to proceed with caution in the interpretation of the results.

#### **B. Selection bias**

The main source of selection bias in this study is the use of prevalent, as opposed to incident cases. A series of prevalent cases will have a higher proportion of cases with disease of long duration than a series of incident cases (Kleinbaum, Kupper and Morgenstern 1982).

Children who recover from problems of adjustment quickly have less chance of being identified as maladjusted in prevalence studies. If the health status risk factors of these children differ from those who have problems of longer duration, then the association between communication disorders and maladjustment may be misrepresented. For example, if children with communication disorders are no more likely than other children to have brief periods of maladjustment but much more likely to have adjustment problems of long duration, prevalence studies such as the current one will identify only the second relationship while missing the first.

However, the inherent bias of this design may also be an advantage when studying outcomes such as maladjustment that are likely to have a slow onset and longer duration than many other conditions such as infectious diseases. Incident cases of maladjustment

would, for the most part, be impractical or difficult to interpret because it is usually impossible to specify an exact date of onset of childhood maladjustment.

### **C. Residual confounding**

Multiple logistic regression was used to control for the effects of potential confounders when they were available in the existing data. The possibility exists, however, that some factors placing children at risk for the development of emotional and behavioral problems were not identified or measured in the study samples. One specific residual confounder may have been the treatment experience of the subjects that occurred between the initial and final contacts.

In the OCHS 1987 sample, binary variables were available that indicated whether children had ever received treatment for speech and language problems, or for emotional and behavioral problems, from a variety of professional sources. Unfortunately, the information from these variables was difficult to apply. A positive response may have had several interpretations, ranging from intensive therapy for a specific deficit to a single diagnostic session with minimal follow-up. Due to these limitations, it was decided to omit an assessment of the effect of the treatment from the analysis of the OCHS sample in 1987. A decision based on similar rationale was made for the sample from the NCDS at age 23.

### **D. Temporal sequence (directionality)**

One of the main limitations of cross-sectional

studies is their inability to determine the temporal relationship between the exposure and the disease, and thus to infer causality. In both the OCHS and NCDS samples, communication disordered children were more likely to be maladjusted at the initial time point than either the healthy or those with other chronic physical disorders. For those cases with both communication disorders and emotional or behavioral problems, however, it is impossible to determine the direction of the effect.

As was stated in the Introduction, some theories suggest that certain communication disorders, such as stuttering, may be caused by, rather than result in maladjustment. There are, however, other communication disorders, such as congenitally acquired sensorineural hearing loss, where it is biologically implausible to posit emotional or behavioral problems as causative factors. Nonetheless, for most speech and language problems, it is impossible to draw firm conclusions regarding the direction of the effect based on cross-sectional analyses. Three possibilities remain plausible: (a) the speech disorder could cause maladjustment, (b) maladjustment could cause the speech disorder or, (c) both the speech disorder and the adjustment problem could be caused by a third underlying factor that was not identified.

#### IV. Theoretical Models to Explain Findings

In this section two theoretical models to account for the association between communication disorders and maladjustment are proposed. The first focuses on neurological dysfunction as proposed by Beitchman (1985) and Cantwell and Baker (1987a); the second model relates to social immaturity also proposed by Cantwell and Baker (1987a) and expanded here. Although the data did not convincingly support or refute either model, it may be useful to conceptualize the nature of the relationship between communication disorders and emotional and behavioral problems to provide direction for future research.

Beitchman postulates that a gene or group of genes exists that influences or controls neurodevelopmental maturation. This genetic factor is initially manifested by delays in speech and language development. Parallel delays in visual-motor function, emotional development, and more general cognitive development may exist; the more parallel symptoms that are present the more severe the underlying neurodevelopmental immaturity. Using this model, it is postulated that the risk of psychiatric disorder among those with speech disorders will increase as a function of the underlying severity of the disorder. Additionally, factors that are not directly due to neurodevelopmental immaturity, such as maternal psychiatric status, will increase this risk.

Cantwell and Baker (1987a) make no assertion regarding the genetic inheritance of a common antecedent. They do suggest, however, that communication disordered children, especially those with language disorders, may have a subtle central nervous system dysfunction that predisposes them to both communication disorders and psychiatric disturbances.

If an underlying neurological abnormality is responsible for the speech disorder, this may explain why, in the OCHS and NCDS samples, communication disordered children were at a greater risk for psychiatric disorders than those who were healthy or those with other chronic disorders. It may also explain why, in the NCDS sample, speech impaired children were more likely to be maladjusted than those who were hearing impaired. Hearing impairment in children is most often due to peripheral dysfunction either in the middle ear, conductive hearing loss, or in the inner ear due to sensorineural hearing loss. Less often a hearing deficit may be due to a central auditory processing disorder (Grundfast 1990). Although the current study could not distinguish between children with articulation disorders and language disorders, Cantwell and Baker (1987b) have found that children with language problems are more likely to have persistent behavioral problems than children with pure speech disorders.

Furthermore, children with language disorders are

known to be more likely to develop learning problems than children with pure articulation problems (Cantwell and Baker 1987a). Because children with learning disorders are themselves at risk for psychiatric disorders (Rutter, Tizard and Whitmore 1970), this may be one reason why children with language impairment have higher rates of psychopathology (Cantwell and Baker 1987a).

A second theoretical model that is consistent with the pattern of findings in this study rests on the possibility that communication disorders may delay the psychological and social maturity of some children. This hypothesis suggests that many of the behaviors of communication disordered children that are identified as "maladjustment" are better understood as delays in maturation.

Children with communication disorders might be expected to mature less rapidly than other children because of their delayed ability to develop and express symbolic representations of the concepts, beliefs, and social norms necessary to function appropriately in society. If these children are slower to learn the symbolic representations shared by their peers, their immaturity may appear as emotional or behavioral maladjustment on the measures used. Further, these problems are likely to be associated with poor peer relationships, one of the strong correlates of psychiatric disorder in children (Cantwell and Baker



1987a).

This hypothesis can be used to explain why children with communication disorders were more likely to be assessed as maladjusted than were healthy children; why communication disordered children had a greater risk of maladjustment at younger ages than did children with other chronic diseases; why communication disorders were more strongly associated with maladjustment when ratings were made by teachers than when they were made by parents; and why maladjustment was not found to persist into early adulthood.

If a communication disorder results in impaired ability to develop shared representations necessary for normal social interactions, children with these disorders may be seen as more maladjusted than either those who are healthy or those with other chronic disorders. Chronic diseases may result in severe functional limitations but are probably less likely than communication disorders to affect the child's ability to learn a common set of meanings and norms. In both the Bristol Social Adjustment Guide and the Rutter Parent's Scale, many items can be interpreted as measures of age inappropriate behaviors. For example the Bristol Social Adjustment Guide includes such items as "in informal play, plays childish games for his age," or "plays only or mainly with younger children." Similarly, the Rutter scale includes such items as "does the child have difficulty in

settling to anything for less than a few moments?", or "does the child suck thumb or finger during the day?". Because children with communication disorders in this study were rated as maladjusted primarily on these measures, the results may be confirming the slower trajectory of social maturity of these children.

If social immaturity is being measured by the Bristol Social Adjustment Guide and the Rutter, this may explain why communication disordered children were often rated as maladjusted by teachers but not as consistently by parents. Judgements of maturity are relative to the behaviors and emotional expressions expected of a child of a given age. Teachers, more often than parents, have ready access to age appropriate behaviors. Teachers are in contact daily with children of the same age and come to appreciate standards of their conduct. Parents may have no other child with whom they can easily compare their child. If other children are in the home, they are not likely to be of the same age as the target child. Thus, as reflected in the findings of this study, teachers would be more likely to recognize age inappropriate behavior among children with communication disorders than would parents.

In previous studies, social isolation in childhood tended to subside with the passage of time (Robins 1979). If communication disordered children are able to find accepting peer groups as they mature, this may at least partially explain why as a group they were not more

likely to have persistent problems of maladjustment or to develop problems by age 23 than healthy children from similar socioeconomic backgrounds. It may be that despite their communication disorders, these children learn effective modes of social interaction that enhance their acceptance into a peer group. This may be particularly true for those children who have few other risk factors for psychiatric problems, such as co-existing learning disorders or impoverished family background.

All of these hypotheses require rigorous testing before they can be considered to be established.

#### **V. Further Research and Clinical Implications**

The findings of this study underline the importance of determining the direction of the relationship between communication disorders and maladjustment in childhood. At what age do these problems become evident? Are there critical periods in development in which children with communication disorders experience heightened psychosocial stress that may lead to the development of emotional or behavioral disorders? What is the nature of the interaction between communication disordered children and their mothers' emotional health that may result in, or preclude the development of emotional and behavioral disorders? Does an underlying factor exist that may cause both the communication disorder and the emotional and behavioral problem?

Prospective research is needed to address such questions. Albeit highly impractical, the design of choice to answer many of these questions would be a cohort study of children from the general population enrolled at birth. Frequent contacts with the child and parents during the subsequent preschool years to assess both communication skills and emotional and behavioral adjustment would be necessary. In this manner, incident cases of communication disorders and emotional and behavioral problems could be ascertained and the temporal relationship between them could be discovered.

In addition to discovering the temporal relationship between communication disorders and emotional and behavioral problems, further investigations are needed to determine the existence of an antecedent factor common to communication disorders and emotional and behavioral problems. For example, to detect the presence of a neurodevelopmental genetic factor as proposed by Beitchman (1985) evidence from studies of patterns of familial transmission would be important.

The clinical implications of this study are complex. An increased prevalence of emotional or behavioral problems in communication disordered children has been demonstrated during childhood. In contrast, it appears that children who are communication disordered at age 7 are not significantly more likely to have persistent maladjustment problems or to develop

maladjustment problems by age 23. The limitation and tentativeness of these findings have been emphasized. Yet, while awaiting the results of further studies to confirm or refute the present conclusions, decisions regarding the appropriate management of communication disordered children must be made. Dismissing the distress of children as less serious because it is not found to persist into adulthood reflects an adult-centered bias (Browne and Finkelhor 1986). Traumatic events in adulthood are not judged in terms of their impact on old age. Childhood maladjustment should be recognized as a serious problem for the immediate individual and family pain and disruption it may bring. Thus even with the tentative conclusions of this study, there is insufficient justification to withhold psychological or counselling services that may lessen the distress of communication disordered children.

What public health and clinical recommendations for prevention and management may be made regarding the increased prevalence of adjustment problems in communication disordered children during childhood? Is it reasonable to recommend general population screening for communication disorders for the primary and secondary prevention of emotional and behavioral problems? Conversely, once a communication disordered child comes to the attention of educational or health professionals, what is the appropriate course of action?

One has only to review general criteria for screening programs (Mausner and Kramer 1985) to conclude that general population screening of communication disorders for the primary or secondary prevention of emotional or behavioral problems is unwarranted. Chief among these criteria is that screening is appropriate only when a proven treatment is available. The effectiveness of routine treatment for the prevention of psychosocial disorders remains controversial (Nolan, Zvagulis and Pless 1987). Without proven effectiveness, primary prevention of psychosocial disorders involves both the danger of doing harm and the parallel danger of spending time and energies in well-meant activities that have no benefit (Rutter 1982).

Given existing knowledge and the professional resources available, it is only reasonable to suggest that once a child with communication disorders presents to the health care or educational system he or she be provided with appropriate treatment directed towards the communication disorder. Additionally, however, professionals responsible for communication disordered children - speech pathologists, audiologists, pediatricians, teachers, and others - should be aware of the increased psychological vulnerability of these children at younger ages (Prizant et al. 1990). This seems especially so for those who have other risk factors, such as male gender, low socioeconomic status,

mothers with a history of emotional problems, and parents who are in conflict.

The development of skills appropriate for serving emotionally and behaviorally disordered children and adolescents is typically limited in communication disorders training program (Gallagher 1990; Prizant et al. 1990). This information is lacking at a theoretical and practical level. Neither undergraduate nor graduate students are exposed to the extensive literature available (Prizant et al. 1990). For example, students and professionals are rarely trained in the use of DSM-III-R. Awareness of the conceptual framework of DSM-III-R for understanding emotional and behavioral problems would facilitate working with other mental health professionals around specific cases (Prizant et al. 1990). This information could be made available at training levels to professionals in speech pathology and audiology. To do so, however, would require consultation with other professionals. Very few professors in human communication disorders have the expertise to incorporate information concerning emotional and behavioral disorders into course curricula (Prizant et al. 1990). Thus, the expertise of faculty from other university departments including child and adolescent psychiatry and psychology who can provide information regarding indications for referral of communication disordered children with emotional and behavioral disorders could be utilized.

When communication disordered children with emotional and behavioral problems are identified, proper and prompt referral should be made to the most effective existing service in the community to ameliorate the problems, or, if this is not possible, to provide both the parent and child with useful coping strategies. A multi-disciplinary model of intervention with co-ordinated planning between speech pathologist and audiologists, and mental health professionals may result in the most effective treatment (Prizant et al. 1990; Gallagher 1990).

Although these recommendations for referral and multidisciplinary treatment seem justified, no randomized controlled clinical trials have been published to provide evidence of their effectiveness. Thus, there is a need for trials that test the effectiveness of different modes of intervention for preventing or reducing the impact of emotional and behavioral problems in communication disordered children.



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**APPENDIX 1: OCHS QUESTIONNAIRES**

**Appendix 1A: Selected items from OCHS Child Health  
Questionnaire - parent or guardian's report of communication  
disorders and other chronic disorders.**

<b>Speech</b>	↓
31 Is _____ unable to communicate at all using words or speech?	1 <input type="radio"/> Yes 2 <input type="radio"/> No → Go to Q 33
32 How long has _____ been unable to communicate?	3 <input type="radio"/> 6 months or less 4 <input type="radio"/> More than 6 months 5 <input type="radio"/> Don't know <div style="display: inline-block; vertical-align: middle; font-size: 3em; margin-left: 10px;">}</div> Go to Q 36
33 Does _____ have any speaking difficulties such as stammering, stuttering, lisping or being hard to understand?	6 <input type="radio"/> Yes 7 <input type="radio"/> No → Go to Q 35
34 How long has _____ had this problem?	1 <input type="radio"/> 6 months or less 2 <input type="radio"/> More than 6 months 3 <input type="radio"/> Don't know
35 Compared to other children (his/her) age, how well does _____ speak or use words? Would you say (he/she) is better, the same or worse?	4 <input type="radio"/> Better 5 <input type="radio"/> Same 6 <input type="radio"/> Worse

## Appendix 1A - continued

<b>Hearing</b>	↓
25 Does _____ presently use a hearing aid?	1 <input type="radio"/> Yes 2 <input type="radio"/> No
26 Is _____ deaf or unable to hear at all in one or both ears?	3 <input type="radio"/> Yes, one ear only 4 <input type="radio"/> Yes, both ears 5 <input type="radio"/> No → Go to Q 29
27 How long has _____ been deaf or unable to hear at all?	6 <input type="radio"/> 6 months or less 7 <input type="radio"/> More than 6 months 8 <input type="radio"/> Don't know
28 <b>INTERVIEWER CHECK ITEM:</b> • If "Yes, both ears" in Q 26 → • Otherwise →	1 <input type="radio"/> Go to Q 31 2 <input type="radio"/> Go to Q 29
29 Does _____ have any difficulty hearing what is said in a normal conversation with one other person (even with a hearing aid)?	3 <input type="radio"/> Yes 4 <input type="radio"/> No → Go to Q 31
30 How long has _____ had this problem?	5 <input type="radio"/> 6 months or less 6 <input type="radio"/> More than 6 months 7 <input type="radio"/> Don't know

## Appendix 1A - continued

**PART C:**

I am now going to read you a list of health problems or conditions that some children have. For each one could you tell me whether or not \_\_\_\_\_ presently has it

36 Does \_\_\_\_\_ presently have.

Yes No Don't know

- |   |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|
| (a) asthma? .....   | 01 <input type="radio"/> | 02 <input type="radio"/> | 03 <input type="radio"/> |
| (b) hay fever or some other allergy? .....                                    | 04 <input type="radio"/> | 05 <input type="radio"/> | 06 <input type="radio"/> |
| (c) a heart problem? .....  | 07 <input type="radio"/> | 08 <input type="radio"/> | 09 <input type="radio"/> |
| (d) epilepsy or convulsions without fever? .....                              | 10 <input type="radio"/> | 11 <input type="radio"/> | 12 <input type="radio"/> |
| (e) kidney disease? .....   | 13 <input type="radio"/> | 14 <input type="radio"/> | 15 <input type="radio"/> |
| (f) arthritis or rheumatism? .....  | 16 <input type="radio"/> | 17 <input type="radio"/> | 18 <input type="radio"/> |
| (g) cerebral palsy? .....   | 19 <input type="radio"/> | 20 <input type="radio"/> | 21 <input type="radio"/> |
| (h) diabetes? .....   | 22 <input type="radio"/> | 23 <input type="radio"/> | 24 <input type="radio"/> |
| (i) cancer? .....   | 25 <input type="radio"/> | 26 <input type="radio"/> | 27 <input type="radio"/> |
| (j) spina bifida? .....   | 28 <input type="radio"/> | 29 <input type="radio"/> | 30 <input type="radio"/> |
| (k) muscular dystrophy or other muscle disease? .....                         | 31 <input type="radio"/> | 32 <input type="radio"/> | 33 <input type="radio"/> |
| (l) mental retardation? .....   | 34 <input type="radio"/> | 35 <input type="radio"/> | 36 <input type="radio"/> |
| (m) developmental delay or lag? .....   | 37 <input type="radio"/> | 38 <input type="radio"/> | 39 <input type="radio"/> |
| (n) cystic fibrosis? .....  | 40 <input type="radio"/> | 41 <input type="radio"/> | 42 <input type="radio"/> |
| (o) missing fingers, hands, arms, toes, feet or legs? .....                   | 43 <input type="radio"/> | 44 <input type="radio"/> | 45 <input type="radio"/> |
| (p) any stiffness or deformity of the foot, leg, fingers, arms or back? ..... | 46 <input type="radio"/> | 47 <input type="radio"/> | 48 <input type="radio"/> |
| (q) a condition present since birth such as club foot or cleft palate? .....  | 49 <input type="radio"/> | 50 <input type="radio"/> | 51 <input type="radio"/> |
| (r) paralysis or weakness of any kind? .....                                  | 52 <input type="radio"/> | 53 <input type="radio"/> | 54 <input type="radio"/> |
| (s) any difficulty with coordination or clumsiness? .....                     | 55 <input type="radio"/> | 56 <input type="radio"/> | 57 <input type="radio"/> |

**Appendix 1B: Selected items from OCHS Child Behavior Checklist - parent or guardian's report.**

**PART A:**

Below is a list of statements that describe some of the feelings and behaviour of children. For each statement, please mark the circle that best describes \_\_\_\_\_ now or within the past 6 months. Please mark only one of the three circles for each statement. Mark your answers like this ⊗.

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Acts too young for his/her age . . . . .	001 <input type="radio"/>	002 <input type="radio"/>	003 <input type="radio"/>	Eats or drinks things that are not food (eg crayons, dirt, etc) . . . . .	076 <input type="radio"/>	077 <input type="radio"/>	078 <input type="radio"/>
Allergy . . . . .	004 <input type="radio"/>	005 <input type="radio"/>	006 <input type="radio"/>	Fears certain animals, situations, or places other than school	079 <input type="radio"/>	080 <input type="radio"/>	081 <input type="radio"/>
Argues a lot . . . . .	007 <input type="radio"/>	008 <input type="radio"/>	009 <input type="radio"/>	Fears going to school . . . . .	082 <input type="radio"/>	083 <input type="radio"/>	084 <input type="radio"/>
Asthma . . . . .	010 <input type="radio"/>	011 <input type="radio"/>	012 <input type="radio"/>	Fears he/she might think or do something bad . . . . .	085 <input type="radio"/>	086 <input type="radio"/>	087 <input type="radio"/>
Bragging, boasting . . . . .	013 <input type="radio"/>	014 <input type="radio"/>	015 <input type="radio"/>	Feels he/she has to be perfect . . . . .	088 <input type="radio"/>	089 <input type="radio"/>	090 <input type="radio"/>
Can't concentrate, can't pay attention for long . . . . .	016 <input type="radio"/>	017 <input type="radio"/>	018 <input type="radio"/>	Feels or complains that no one loves him/her . . . . .	091 <input type="radio"/>	092 <input type="radio"/>	093 <input type="radio"/>
Can't get his/her mind off certain thoughts, obsessions . . . . .	019 <input type="radio"/>	020 <input type="radio"/>	021 <input type="radio"/>	Feels others are out to get him/her	094 <input type="radio"/>	095 <input type="radio"/>	096 <input type="radio"/>
Can't sit still, restless or hyperactive . . . . .	022 <input type="radio"/>	023 <input type="radio"/>	024 <input type="radio"/>	Feels worthless or inferior . . . . .	097 <input type="radio"/>	098 <input type="radio"/>	099 <input type="radio"/>
Clinging to adults or too dependent	025 <input type="radio"/>	026 <input type="radio"/>	027 <input type="radio"/>	Gets hurt a lot, accident-prone . . . . .	100 <input type="radio"/>	101 <input type="radio"/>	102 <input type="radio"/>
Complains of loneliness . . . . .	028 <input type="radio"/>	029 <input type="radio"/>	030 <input type="radio"/>	Gets in many fights . . . . .	103 <input type="radio"/>	104 <input type="radio"/>	105 <input type="radio"/>
Confused or seems to be in a fog . . . . .	031 <input type="radio"/>	032 <input type="radio"/>	033 <input type="radio"/>	Gets teased a lot . . . . .	106 <input type="radio"/>	107 <input type="radio"/>	108 <input type="radio"/>
Cries a lot . . . . .	034 <input type="radio"/>	035 <input type="radio"/>	036 <input type="radio"/>	Hangs around with children who get in trouble . . . . .	109 <input type="radio"/>	110 <input type="radio"/>	111 <input type="radio"/>
Cruel to animals . . . . .	037 <input type="radio"/>	038 <input type="radio"/>	039 <input type="radio"/>	Hears things that aren't there	112 <input type="radio"/>	113 <input type="radio"/>	114 <input type="radio"/>
Cruelty, bullying, or meanness to others . . . . .	040 <input type="radio"/>	041 <input type="radio"/>	042 <input type="radio"/>	Impulsive or acts without thinking . . . . .	115 <input type="radio"/>	116 <input type="radio"/>	117 <input type="radio"/>
Daydreams or gets lost in his/her thoughts . . . . .	043 <input type="radio"/>	044 <input type="radio"/>	045 <input type="radio"/>	Likes to be alone . . . . .	118 <input type="radio"/>	119 <input type="radio"/>	120 <input type="radio"/>
Deliberately harms self or attempts suicide . . . . .	046 <input type="radio"/>	047 <input type="radio"/>	048 <input type="radio"/>	Lying or cheating . . . . .	121 <input type="radio"/>	122 <input type="radio"/>	123 <input type="radio"/>
Demands a lot of attention . . . . .	049 <input type="radio"/>	050 <input type="radio"/>	051 <input type="radio"/>	Bites fingernails . . . . .	124 <input type="radio"/>	125 <input type="radio"/>	126 <input type="radio"/>
Destroys his/her own things	052 <input type="radio"/>	053 <input type="radio"/>	054 <input type="radio"/>	Nervous, highstrung, or tense . . . . .	127 <input type="radio"/>	128 <input type="radio"/>	129 <input type="radio"/>
Destroys things belonging to his/her family or other children	056 <input type="radio"/>	056 <input type="radio"/>	057 <input type="radio"/>	Nervous movements or twitching . . . . .	130 <input type="radio"/>	131 <input type="radio"/>	132 <input type="radio"/>
Disobedient at home . . . . .	058 <input type="radio"/>	059 <input type="radio"/>	060 <input type="radio"/>	Nightmares . . . . .	133 <input type="radio"/>	134 <input type="radio"/>	135 <input type="radio"/>
Disobedient at school . . . . .	061 <input type="radio"/>	062 <input type="radio"/>	063 <input type="radio"/>	Not liked by other children . . . . .	136 <input type="radio"/>	137 <input type="radio"/>	138 <input type="radio"/>
Doesn't eat well . . . . .	064 <input type="radio"/>	065 <input type="radio"/>	066 <input type="radio"/>	Constipated, doesn't move bowels . . . . .	139 <input type="radio"/>	140 <input type="radio"/>	141 <input type="radio"/>
Doesn't get along with other children . . . . .	067 <input type="radio"/>	068 <input type="radio"/>	069 <input type="radio"/>	Too fearful or anxious . . . . .	142 <input type="radio"/>	143 <input type="radio"/>	144 <input type="radio"/>
Doesn't seem to feel guilty after misbehaving . . . . .	070 <input type="radio"/>	071 <input type="radio"/>	072 <input type="radio"/>	Feels dizzy . . . . .	146 <input type="radio"/>	146 <input type="radio"/>	147 <input type="radio"/>
Easily jealous . . . . .	073 <input type="radio"/>	074 <input type="radio"/>	075 <input type="radio"/>	Feels too guilty . . . . .	148 <input type="radio"/>	148 <input type="radio"/>	149 <input type="radio"/>

## Appendix 1B - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Overeating . . . . .	151 <input type="radio"/>	152 <input type="radio"/>	153 <input type="radio"/>	See things that aren't there	217 <input type="radio"/>	218 <input type="radio"/>	219 <input type="radio"/>
Overtired . . . . .	154 <input type="radio"/>	155 <input type="radio"/>	156 <input type="radio"/>	Self-conscious or easily embarrassed . . .	220 <input type="radio"/>	221 <input type="radio"/>	222 <input type="radio"/>
Overweight . . . . .	157 <input type="radio"/>	158 <input type="radio"/>	159 <input type="radio"/>	Sets fires	223 <input type="radio"/>	224 <input type="radio"/>	225 <input type="radio"/>
Physically attacks people . . .	160 <input type="radio"/>	161 <input type="radio"/>	162 <input type="radio"/>	Shy or timid . . . . .	226 <input type="radio"/>	227 <input type="radio"/>	228 <input type="radio"/>
Physical problems without known medical cause				Sleeps less than most children	229 <input type="radio"/>	230 <input type="radio"/>	231 <input type="radio"/>
a Aches or pains . . . . .	163 <input type="radio"/>	164 <input type="radio"/>	165 <input type="radio"/>	Showing off or clowning	232 <input type="radio"/>	233 <input type="radio"/>	234 <input type="radio"/>
b Headaches . . . . .	166 <input type="radio"/>	167 <input type="radio"/>	168 <input type="radio"/>	Sleeps more than most children during day and/or night	235 <input type="radio"/>	236 <input type="radio"/>	237 <input type="radio"/>
c Nausea, feels sick . . . . .	169 <input type="radio"/>	170 <input type="radio"/>	171 <input type="radio"/>	Speech problem	238 <input type="radio"/>	239 <input type="radio"/>	240 <input type="radio"/>
d Problems with eyes . . . . .	172 <input type="radio"/>	173 <input type="radio"/>	174 <input type="radio"/>	Stares blankly	241 <input type="radio"/>	242 <input type="radio"/>	243 <input type="radio"/>
e Rashes or other skin problems . . . . .	175 <input type="radio"/>	176 <input type="radio"/>	177 <input type="radio"/>	Steals at home	244 <input type="radio"/>	245 <input type="radio"/>	246 <input type="radio"/>
f Stomachaches or cramps . . .	178 <input type="radio"/>	179 <input type="radio"/>	180 <input type="radio"/>	Steals outside the home	247 <input type="radio"/>	248 <input type="radio"/>	249 <input type="radio"/>
g Vomiting, throwing up . . .	181 <input type="radio"/>	182 <input type="radio"/>	183 <input type="radio"/>	Stores up things he/she doesn't need . . . . .	250 <input type="radio"/>	251 <input type="radio"/>	252 <input type="radio"/>
h Other	184 <input type="radio"/>	185 <input type="radio"/>	186 <input type="radio"/>	Strange behaviour . . . . .	253 <input type="radio"/>	254 <input type="radio"/>	255 <input type="radio"/>
(describe) _____				Strange ideas . . . . .	256 <input type="radio"/>	257 <input type="radio"/>	258 <input type="radio"/>
_____				Stubborn, sullen, or irritable . .	259 <input type="radio"/>	260 <input type="radio"/>	261 <input type="radio"/>
_____				Sudden changes in mood or feelings . . . . .	262 <input type="radio"/>	263 <input type="radio"/>	264 <input type="radio"/>
✓ Picks nose, skin, or other parts of body . . . . .	187 <input type="radio"/>	188 <input type="radio"/>	189 <input type="radio"/>	Sulks a lot	265 <input type="radio"/>	266 <input type="radio"/>	267 <input type="radio"/>
Poor school work . . . . .	190 <input type="radio"/>	191 <input type="radio"/>	192 <input type="radio"/>	Suspicious . . . . .	268 <input type="radio"/>	269 <input type="radio"/>	270 <input type="radio"/>
Poorly coordinated or clumsy . . .	193 <input type="radio"/>	194 <input type="radio"/>	195 <input type="radio"/>	Swearing or obscene language	271 <input type="radio"/>	272 <input type="radio"/>	273 <input type="radio"/>
Prefers playing with older children .	196 <input type="radio"/>	197 <input type="radio"/>	198 <input type="radio"/>	Talks about killing self . . . . .	274 <input type="radio"/>	275 <input type="radio"/>	276 <input type="radio"/>
Prefers playing with younger children . . . . .	199 <input type="radio"/>	200 <input type="radio"/>	201 <input type="radio"/>	Talks or walks in sleep	277 <input type="radio"/>	278 <input type="radio"/>	279 <input type="radio"/>
Refuses to talk . . . . .	202 <input type="radio"/>	203 <input type="radio"/>	204 <input type="radio"/>	Talks too much . . . . .	280 <input type="radio"/>	281 <input type="radio"/>	282 <input type="radio"/>
Repeats certain acts over and over; compulsions . . . . .	205 <input type="radio"/>	206 <input type="radio"/>	207 <input type="radio"/>	Teases a lot . . . . .	283 <input type="radio"/>	284 <input type="radio"/>	285 <input type="radio"/>
Runs away from home . . . . .	208 <input type="radio"/>	209 <input type="radio"/>	210 <input type="radio"/>	Temper tantrums or hot temper	286 <input type="radio"/>	287 <input type="radio"/>	288 <input type="radio"/>
Screams a lot . . . . .	211 <input type="radio"/>	212 <input type="radio"/>	213 <input type="radio"/>	Threatens people . . . . .	289 <input type="radio"/>	290 <input type="radio"/>	291 <input type="radio"/>
Secretive, keeps things to self . . .	214 <input type="radio"/>	215 <input type="radio"/>	216 <input type="radio"/>				

## Appendix 1B - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Thumb-sucking . . . . .	292 <input type="radio"/>	293 <input type="radio"/>	294 <input type="radio"/>	Without physical cause suddenly loses.			
Too concerned with neatness or cleanliness . . . . .	295 <input type="radio"/>	296 <input type="radio"/>	297 <input type="radio"/>	a. sight . . . . .	358 <input type="radio"/>	359 <input type="radio"/>	360 <input type="radio"/>
Trouble sleeping . . . . .	298 <input type="radio"/>	299 <input type="radio"/>	300 <input type="radio"/>	b. ability to move arms or legs . . . . .	361 <input type="radio"/>	362 <input type="radio"/>	363 <input type="radio"/>
Truancy; skips school . . . . .	301 <input type="radio"/>	302 <input type="radio"/>	303 <input type="radio"/>	c. hearing . . . . .	364 <input type="radio"/>	365 <input type="radio"/>	366 <input type="radio"/>
Underactive, slow moving, or lacks energy . . . . .	304 <input type="radio"/>	305 <input type="radio"/>	306 <input type="radio"/>	d. voice . . . . .	367 <input type="radio"/>	368 <input type="radio"/>	369 <input type="radio"/>
Unhappy, sad or depressed . . . . .	307 <input type="radio"/>	308 <input type="radio"/>	309 <input type="radio"/>	e. ability to swallow . . . . .	370 <input type="radio"/>	371 <input type="radio"/>	372 <input type="radio"/>
Uses alcohol or drugs . . . . .	310 <input type="radio"/>	311 <input type="radio"/>	312 <input type="radio"/>	f. consciousness . . . . .	373 <input type="radio"/>	374 <input type="radio"/>	375 <input type="radio"/>
Unusually loud . . . . .	313 <input type="radio"/>	314 <input type="radio"/>	315 <input type="radio"/>	g. feeling on skin . . . . .	376 <input type="radio"/>	377 <input type="radio"/>	378 <input type="radio"/>
Vandalism . . . . .	316 <input type="radio"/>	317 <input type="radio"/>	318 <input type="radio"/>	h. other . . . . .	379 <input type="radio"/>	380 <input type="radio"/>	381 <input type="radio"/>
Wets self during the day . . . . .	319 <input type="radio"/>	320 <input type="radio"/>	321 <input type="radio"/>	(describe) _____			
Wets the bed . . . . .	322 <input type="radio"/>	323 <input type="radio"/>	324 <input type="radio"/>	_____			
Whining . . . . .	325 <input type="radio"/>	326 <input type="radio"/>	327 <input type="radio"/>	_____			
Withdrawn, doesn't get involved with others . . . . .	328 <input type="radio"/>	329 <input type="radio"/>	330 <input type="radio"/>	_____			
Worrying . . . . .	331 <input type="radio"/>	332 <input type="radio"/>	333 <input checked="" type="radio"/>	_____			
Overly upset when leaving someone he/she is close to . . . . .	334 <input type="radio"/>	335 <input type="radio"/>	336 <input type="radio"/>	Worries that something bad will hap- pen to people he/she is close to . . . . .	382 <input type="radio"/>	383 <input type="radio"/>	384 <input type="radio"/>
Overly upset while away from someone he/she is close to . . . . .	337 <input type="radio"/>	338 <input type="radio"/>	339 <input type="radio"/>	Cranky . . . . .	385 <input type="radio"/>	386 <input type="radio"/>	387 <input type="radio"/>
Sees self as more unwell or sickly than really is . . . . .	340 <input type="radio"/>	341 <input type="radio"/>	342 <input type="radio"/>	Has trouble enjoying self . . . . .	388 <input type="radio"/>	389 <input type="radio"/>	390 <input type="radio"/>
Worries that terrible things might happen . . . . .	343 <input type="radio"/>	344 <input type="radio"/>	345 <input type="radio"/>	Worries a lot about health . . . . .	391 <input type="radio"/>	392 <input type="radio"/>	393 <input type="radio"/>
Not as happy as other children . . . . .	346 <input type="radio"/>	347 <input type="radio"/>	348 <input type="radio"/>	Has difficulty awaiting turn in games or groups . . . . .	394 <input type="radio"/>	395 <input type="radio"/>	396 <input type="radio"/>
Distractable, has trouble sticking to any activity . . . . .	349 <input type="radio"/>	350 <input type="radio"/>	351 <input type="radio"/>	Worries about doing the wrong thing . . . . .	397 <input type="radio"/>	398 <input type="radio"/>	399 <input type="radio"/>
Poor appetite, not hungry . . . . .	352 <input type="radio"/>	353 <input type="radio"/>	354 <input type="radio"/>	Cannot keep friends . . . . .	400 <input type="radio"/>	401 <input type="radio"/>	402 <input type="radio"/>
Feels his/her health should be better . . . . .	356 <input type="radio"/>	358 <input type="radio"/>	357 <input type="radio"/>	Fidgets . . . . .	403 <input type="radio"/>	404 <input type="radio"/>	405 <input type="radio"/>

## Appendix 1C: Selected items from OCHS Child Behavior

## Checklist - teacher's report.

**PART A:** Answer each item as completely as possible, even if you feel you lack complete information. Mark your answer in the appropriate circle with a (X) or fill in the boxes provided. If you are unable to answer a question leave it blank.

<p>01. Child's grade <span style="border: 1px solid black; display: inline-block; width: 30px; height: 15px; vertical-align: middle;"></span></p> <p>(If ungraded or special class, describe.)</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>04 How would you describe this child's current school performance in the following categories?</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Reading English</th> <th style="text-align: center;">Spelling</th> <th style="text-align: center;">Arithmetic or Math</th> <th style="text-align: center;">Overall</th> </tr> </thead> <tbody> <tr> <td>Far below grade</td> <td style="text-align: center;">01 <input type="radio"/></td> <td style="text-align: center;">02 <input type="radio"/></td> <td style="text-align: center;">03 <input type="radio"/></td> <td style="text-align: center;">04 <input type="radio"/></td> </tr> <tr> <td>Somewhat below grade</td> <td style="text-align: center;">05 <input type="radio"/></td> <td style="text-align: center;">06 <input type="radio"/></td> <td style="text-align: center;">07 <input type="radio"/></td> <td style="text-align: center;">08 <input type="radio"/></td> </tr> <tr> <td>At grade level</td> <td style="text-align: center;">09 <input type="radio"/></td> <td style="text-align: center;">10 <input type="radio"/></td> <td style="text-align: center;">11 <input type="radio"/></td> <td style="text-align: center;">12 <input type="radio"/></td> </tr> <tr> <td>Somewhat above grade</td> <td style="text-align: center;">13 <input type="radio"/></td> <td style="text-align: center;">14 <input type="radio"/></td> <td style="text-align: center;">15 <input type="radio"/></td> <td style="text-align: center;">16 <input type="radio"/></td> </tr> <tr> <td>Far above grade</td> <td style="text-align: center;">17 <input type="radio"/></td> <td style="text-align: center;">18 <input type="radio"/></td> <td style="text-align: center;">19 <input type="radio"/></td> <td style="text-align: center;">20 <input type="radio"/></td> </tr> <tr> <td>Don't know</td> <td style="text-align: center;">21 <input type="radio"/></td> <td style="text-align: center;">22 <input type="radio"/></td> <td style="text-align: center;">23 <input type="radio"/></td> <td style="text-align: center;">24 <input type="radio"/></td> </tr> </tbody> </table>		Reading English	Spelling	Arithmetic or Math	Overall	Far below grade	01 <input type="radio"/>	02 <input type="radio"/>	03 <input type="radio"/>	04 <input type="radio"/>	Somewhat below grade	05 <input type="radio"/>	06 <input type="radio"/>	07 <input type="radio"/>	08 <input type="radio"/>	At grade level	09 <input type="radio"/>	10 <input type="radio"/>	11 <input type="radio"/>	12 <input type="radio"/>	Somewhat above grade	13 <input type="radio"/>	14 <input type="radio"/>	15 <input type="radio"/>	16 <input type="radio"/>	Far above grade	17 <input type="radio"/>	18 <input type="radio"/>	19 <input type="radio"/>	20 <input type="radio"/>	Don't know	21 <input type="radio"/>	22 <input type="radio"/>	23 <input type="radio"/>	24 <input type="radio"/>
	Reading English	Spelling	Arithmetic or Math	Overall																																
Far below grade	01 <input type="radio"/>	02 <input type="radio"/>	03 <input type="radio"/>	04 <input type="radio"/>																																
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Don't know	21 <input type="radio"/>	22 <input type="radio"/>	23 <input type="radio"/>	24 <input type="radio"/>																																
<p>02 This form was completed by a ...</p> <p>1 <input type="radio"/> Teacher</p> <p>2 <input type="radio"/> Counsellor</p> <p>3 <input type="radio"/> Other (specify)</p> <p>_____</p>	<p>05. Has this child ever repeated or failed a grade?</p> <p>1 <input type="radio"/> Yes</p> <p>2 <input type="radio"/> No</p> <p>3 <input type="radio"/> First year in school</p> <p>4 <input type="radio"/> Don't know</p>																																			
<p>03 How well do you know this child?</p> <p>1 <input type="radio"/> Very well</p> <p>2 <input type="radio"/> Moderately well</p> <p>3 <input type="radio"/> Not well</p>																																				

**PART B:** Below is a list of statements that describe some of the feelings and behaviour of children. For each statement, please mark the circle that best describes this child now or within the past 6 months. Please mark only one of the three circles for each statement.

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Acts too young for his/her age . . . .	001 <input type="radio"/>	002 <input type="radio"/>	003 <input type="radio"/>	Confused or seems to be in a fog	031 <input type="radio"/>	032 <input type="radio"/>	033 <input type="radio"/>
Hums or makes other odd noises in class . . . . .	004 <input type="radio"/>	005 <input type="radio"/>	006 <input type="radio"/>	Cries a lot . . . . .	034 <input type="radio"/>	035 <input type="radio"/>	036 <input type="radio"/>
Argues a lot . . . . .	007 <input type="radio"/>	008 <input type="radio"/>	009 <input type="radio"/>	Cruel to animals . . . . .	037 <input type="radio"/>	038 <input type="radio"/>	039 <input type="radio"/>
Fails to finish things he/she starts . .	010 <input type="radio"/>	011 <input type="radio"/>	012 <input type="radio"/>	Cruelty, bullying, or meanness to others . . . . .	040 <input type="radio"/>	041 <input type="radio"/>	042 <input type="radio"/>
Bragging, boasting . . . . .	013 <input type="radio"/>	014 <input type="radio"/>	015 <input type="radio"/>	Daydreams or gets lost in his/her thoughts . . . . .	043 <input type="radio"/>	044 <input type="radio"/>	045 <input type="radio"/>
Can't concentrate, can't pay attention for long . . . . .	016 <input type="radio"/>	017 <input type="radio"/>	018 <input type="radio"/>	Deliberately harms self or attempts suicide . . . . .	046 <input type="radio"/>	047 <input type="radio"/>	048 <input type="radio"/>
Difficulty following directions . .	019 <input type="radio"/>	020 <input type="radio"/>	021 <input type="radio"/>	Demands a lot of attention . . . . .	049 <input type="radio"/>	050 <input type="radio"/>	051 <input type="radio"/>
Can't sit still, restless or hyperactive . . . . .	022 <input type="radio"/>	023 <input type="radio"/>	024 <input type="radio"/>	Destroys his/her own things . . . . .	052 <input type="radio"/>	053 <input type="radio"/>	054 <input type="radio"/>
Clings to adults or too dependent. . .	025 <input type="radio"/>	026 <input type="radio"/>	027 <input type="radio"/>	Destroys things belonging to others . . . . .	055 <input type="radio"/>	056 <input type="radio"/>	057 <input type="radio"/>
Complains of loneliness . . . . .	028 <input type="radio"/>	029 <input type="radio"/>	030 <input type="radio"/>	Disobedient at home . . . . .	058 <input type="radio"/>	059 <input type="radio"/>	060 <input type="radio"/>



## Appendix 1C - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Disobedient at school . . . . .	061 <input type="radio"/>	062 <input type="radio"/>	063 <input type="radio"/>	Talks out of turn . . . . .	151 <input type="radio"/>	152 <input type="radio"/>	153 <input type="radio"/>
Disturbs other pupils . . . . .	064 <input type="radio"/>	065 <input type="radio"/>	066 <input type="radio"/>	Overtired . . . . .	154 <input type="radio"/>	155 <input type="radio"/>	156 <input type="radio"/>
Doesn't get along with other pupils . . . . .	067 <input type="radio"/>	068 <input type="radio"/>	069 <input type="radio"/>	Overweight. . . . .	157 <input type="radio"/>	158 <input type="radio"/>	159 <input type="radio"/>
Doesn't seem to feel guilty after misbehaving . . . . .	070 <input type="radio"/>	071 <input type="radio"/>	072 <input type="radio"/>	Physically attacks people . . . . .	160 <input type="radio"/>	161 <input type="radio"/>	162 <input type="radio"/>
Easily jealous . . . . .	073 <input type="radio"/>	074 <input type="radio"/>	075 <input type="radio"/>				
Eats or drinks things that are not food (e.g. crayons, dirt, etc.) . . . . .	076 <input type="radio"/>	077 <input type="radio"/>	078 <input type="radio"/>	Physical problems without known medical cause.			
Fears certain animals, situations, or places other than school . . . . .	079 <input type="radio"/>	080 <input type="radio"/>	081 <input type="radio"/>	a. Aches or pains . . . . .	163 <input type="radio"/>	164 <input type="radio"/>	165 <input type="radio"/>
Fears going to school . . . . .	082 <input type="radio"/>	083 <input type="radio"/>	084 <input type="radio"/>	b. Headaches . . . . .	166 <input type="radio"/>	167 <input type="radio"/>	168 <input type="radio"/>
Fears he/she might think or do something bad . . . . .	085 <input type="radio"/>	086 <input type="radio"/>	087 <input type="radio"/>	c. Nausea, feels sick . . . . .	169 <input type="radio"/>	170 <input type="radio"/>	171 <input type="radio"/>
Fears he/she has to be perfect . . . . .	088 <input type="radio"/>	089 <input type="radio"/>	090 <input type="radio"/>	d. Problems with eyes . . . . .	172 <input type="radio"/>	173 <input type="radio"/>	174 <input type="radio"/>
				e. Rashes or other skin problems . . . . .	175 <input type="radio"/>	176 <input type="radio"/>	177 <input type="radio"/>
Feels or complains that no one loves him/her. . . . .	091 <input type="radio"/>	092 <input type="radio"/>	093 <input type="radio"/>	f. Stomachaches or cramps . . . . .	178 <input type="radio"/>	179 <input type="radio"/>	180 <input type="radio"/>
Feels others are out to get him/her . . . . .	094 <input type="radio"/>	095 <input type="radio"/>	096 <input type="radio"/>	g. Vomiting, throwing up . . . . .	181 <input type="radio"/>	182 <input type="radio"/>	183 <input type="radio"/>
Feels worthless or inferior . . . . .	097 <input type="radio"/>	098 <input type="radio"/>	099 <input type="radio"/>	h. Other . . . . .	184 <input type="radio"/>	185 <input type="radio"/>	186 <input type="radio"/>
Gets hurt a lot, accident-prone . . . . .	100 <input type="radio"/>	101 <input type="radio"/>	102 <input type="radio"/>	(describe) _____			
Gets in many fights . . . . .	103 <input type="radio"/>	104 <input type="radio"/>	105 <input type="radio"/>	_____			
Gets teased a lot . . . . .	106 <input type="radio"/>	107 <input type="radio"/>	108 <input type="radio"/>	_____			
Hangs around with others who get in trouble . . . . .	109 <input type="radio"/>	110 <input type="radio"/>	111 <input type="radio"/>				
Hears things that aren't there . . . . .	112 <input type="radio"/>	113 <input type="radio"/>	114 <input type="radio"/>	Picks nose, skin, or other parts of body. . . . .	187 <input type="radio"/>	188 <input type="radio"/>	189 <input type="radio"/>
Impulsive or acts without thinking . . . . .	115 <input type="radio"/>	116 <input type="radio"/>	117 <input type="radio"/>	Poor school work . . . . .	190 <input type="radio"/>	191 <input type="radio"/>	192 <input type="radio"/>
Likes to be alone . . . . .	118 <input type="radio"/>	119 <input type="radio"/>	120 <input type="radio"/>	Poorly coordinated or clumsy. . . . .	193 <input type="radio"/>	194 <input type="radio"/>	195 <input type="radio"/>
Lying or cheating . . . . .	121 <input type="radio"/>	122 <input type="radio"/>	123 <input type="radio"/>	Prefers playing with older children . . . . .	196 <input type="radio"/>	197 <input type="radio"/>	198 <input type="radio"/>
Bites fingernails . . . . .	124 <input type="radio"/>	125 <input type="radio"/>	126 <input type="radio"/>	Prefers playing with younger children . . . . .	199 <input type="radio"/>	200 <input type="radio"/>	201 <input type="radio"/>
Nervous, highstrung, or tense . . . . .	127 <input type="radio"/>	128 <input type="radio"/>	129 <input type="radio"/>				
Nervous movements or twitching . . . . .	130 <input type="radio"/>	131 <input type="radio"/>	132 <input type="radio"/>	Refuses to talk . . . . .	202 <input type="radio"/>	203 <input type="radio"/>	204 <input type="radio"/>
Over conforms to rules . . . . .	133 <input type="radio"/>	134 <input type="radio"/>	135 <input type="radio"/>	Repeats certain acts over and over, compulsions . . . . .	205 <input type="radio"/>	206 <input type="radio"/>	207 <input type="radio"/>
Not liked by other pupils . . . . .	136 <input type="radio"/>	137 <input type="radio"/>	138 <input type="radio"/>	Runs away from home . . . . .	208 <input type="radio"/>	209 <input type="radio"/>	210 <input type="radio"/>
Constipated, doesn't move bowels . . . . .	139 <input type="radio"/>	140 <input type="radio"/>	141 <input type="radio"/>	Screams a lot . . . . .	211 <input type="radio"/>	212 <input type="radio"/>	213 <input type="radio"/>
Too fearful or anxious . . . . .	142 <input type="radio"/>	143 <input type="radio"/>	144 <input type="radio"/>	Secretive, keeps things to self . . . . .	214 <input type="radio"/>	215 <input type="radio"/>	216 <input type="radio"/>
Feels dizzy . . . . .	145 <input type="radio"/>	146 <input type="radio"/>	147 <input type="radio"/>				
Feels too guilty . . . . .	148 <input type="radio"/>	149 <input type="radio"/>	150 <input type="radio"/>				

## Appendix 1C - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Sees things that aren't there . . .	217 <input type="radio"/>	218 <input type="radio"/>	219 <input type="radio"/>	Tardy to school or class . . . . .	292 <input type="radio"/>	293 <input type="radio"/>	294 <input type="radio"/>
Self-conscious or easily embarrassed . . . . .	220 <input type="radio"/>	221 <input type="radio"/>	222 <input type="radio"/>	Too concerned with neatness or cleanliness . . . . .	295 <input type="radio"/>	296 <input type="radio"/>	297 <input type="radio"/>
Sets fires . . . . .	223 <input type="radio"/>	224 <input type="radio"/>	225 <input type="radio"/>	Trouble sleeping . . . . .	298 <input type="radio"/>	299 <input type="radio"/>	300 <input type="radio"/>
Shy or timid . . . . .	226 <input type="radio"/>	227 <input type="radio"/>	228 <input type="radio"/>	Truancy or unexplained absences . . . . .	301 <input type="radio"/>	302 <input type="radio"/>	303 <input type="radio"/>
Sleeps less than most children . . . . .	229 <input type="radio"/>	230 <input type="radio"/>	231 <input type="radio"/>	Underactive, slow moving, or lacks energy . . . . .	304 <input type="radio"/>	305 <input type="radio"/>	306 <input type="radio"/>
Showing off or clowning . . . . .	232 <input type="radio"/>	233 <input type="radio"/>	234 <input type="radio"/>	Unhappy, sad or depressed . . . . .	307 <input type="radio"/>	308 <input type="radio"/>	309 <input type="radio"/>
Explosive and unpredictable behaviour . . . . .	235 <input type="radio"/>	236 <input type="radio"/>	237 <input type="radio"/>	Uses alcohol or drugs . . . . .	310 <input type="radio"/>	311 <input type="radio"/>	312 <input type="radio"/>
Speech problem . . . . .	238 <input type="radio"/>	239 <input type="radio"/>	240 <input type="radio"/>	Unusually loud . . . . .	313 <input type="radio"/>	314 <input type="radio"/>	315 <input type="radio"/>
Stares blankly . . . . .	241 <input type="radio"/>	242 <input type="radio"/>	243 <input type="radio"/>	Vandalism . . . . .	316 <input type="radio"/>	317 <input type="radio"/>	318 <input type="radio"/>
Stores up things he/she doesn't need . . . . .	250 <input type="radio"/>	251 <input type="radio"/>	252 <input type="radio"/>	Fails to carry out assigned tasks . . . . .	319 <input type="radio"/>	320 <input type="radio"/>	321 <input type="radio"/>
Strange behaviour . . . . .	253 <input type="radio"/>	254 <input type="radio"/>	255 <input type="radio"/>	Overly anxious to please . . . . .	322 <input type="radio"/>	323 <input type="radio"/>	324 <input type="radio"/>
Strange ideas . . . . .	256 <input type="radio"/>	257 <input type="radio"/>	258 <input type="radio"/>	Whining . . . . .	325 <input type="radio"/>	326 <input type="radio"/>	327 <input type="radio"/>
Stubborn, sullen, or irritable . . . . .	259 <input type="radio"/>	260 <input type="radio"/>	261 <input type="radio"/>	Withdraws, doesn't get involved with others . . . . .	328 <input type="radio"/>	329 <input type="radio"/>	330 <input type="radio"/>
Sudden changes in mood or feelings . . . . .	262 <input type="radio"/>	263 <input type="radio"/>	264 <input type="radio"/>	Worrying . . . . .	331 <input type="radio"/>	332 <input type="radio"/>	333 <input type="radio"/>
Sulks a lot . . . . .	265 <input type="radio"/>	266 <input type="radio"/>	267 <input type="radio"/>	Overly upset when leaving someone he/she is close to . . . . .	334 <input type="radio"/>	335 <input type="radio"/>	336 <input type="radio"/>
Suspicious . . . . .	268 <input type="radio"/>	269 <input type="radio"/>	270 <input type="radio"/>	Overly upset while away from someone he/she is close to . . . . .	337 <input type="radio"/>	338 <input type="radio"/>	339 <input type="radio"/>
Swearing or obscene language . . . . .	271 <input type="radio"/>	272 <input type="radio"/>	273 <input type="radio"/>	Sees self as more unwell or sickly than really is . . . . .	340 <input type="radio"/>	341 <input type="radio"/>	342 <input type="radio"/>
Talks about killing self . . . . .	274 <input type="radio"/>	275 <input type="radio"/>	276 <input type="radio"/>	Worries that terrible things might happen . . . . .	343 <input type="radio"/>	344 <input type="radio"/>	345 <input type="radio"/>
Underachieving, not working up to potential . . . . .	277 <input type="radio"/>	278 <input type="radio"/>	279 <input type="radio"/>	Not as happy as other children . . . . .	346 <input type="radio"/>	347 <input type="radio"/>	348 <input type="radio"/>
Talks too much . . . . .	280 <input type="radio"/>	281 <input type="radio"/>	282 <input type="radio"/>	Distractable, has trouble sticking to any activity . . . . .	349 <input type="radio"/>	350 <input type="radio"/>	351 <input type="radio"/>
Teases a lot . . . . .	283 <input type="radio"/>	284 <input type="radio"/>	285 <input type="radio"/>	Poor appetite, not hungry . . . . .	352 <input type="radio"/>	353 <input type="radio"/>	354 <input type="radio"/>
Temper tantrums or hot temper . . . . .	286 <input type="radio"/>	287 <input type="radio"/>	288 <input type="radio"/>	Feels his/her health should be better . . . . .	355 <input type="radio"/>	356 <input type="radio"/>	357 <input type="radio"/>
Threatens people . . . . .	289 <input type="radio"/>	290 <input type="radio"/>	291 <input type="radio"/>				

## Appendix 1C - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
Without physical cause suddenly loses				Worries about doing the wrong thing	397 <input type="radio"/>	398 <input type="radio"/>	399 <input type="radio"/>
a sight	358 <input type="radio"/>	359 <input type="radio"/>	360 <input type="radio"/>	Cannot keep friends . . . . .	400 <input type="radio"/>	401 <input type="radio"/>	402 <input type="radio"/>
b ability to move arms or legs	361 <input type="radio"/>	362 <input type="radio"/>	363 <input type="radio"/>	Fidgets . . . . .	403 <input type="radio"/>	404 <input type="radio"/>	405 <input type="radio"/>
c hearing	364 <input type="radio"/>	365 <input type="radio"/>	366 <input type="radio"/>	Defiant, talks back to staff . . .	406 <input type="radio"/>	407 <input type="radio"/>	408 <input type="radio"/>
d voice	367 <input type="radio"/>	368 <input type="radio"/>	369 <input type="radio"/>	Has difficulty learning . . . . .	409 <input type="radio"/>	410 <input type="radio"/>	411 <input type="radio"/>
e ability to swallow	370 <input type="radio"/>	371 <input type="radio"/>	372 <input type="radio"/>	Sleeps in class . . . . .	412 <input type="radio"/>	413 <input type="radio"/>	414 <input type="radio"/>
f consciousness . .	373 <input type="radio"/>	374 <input type="radio"/>	375 <input type="radio"/>	Apathetic or unmotivated . . . . .	415 <input type="radio"/>	416 <input type="radio"/>	417 <input type="radio"/>
g feeling on skin	376 <input type="radio"/>	377 <input type="radio"/>	378 <input type="radio"/>	Disrupts class discipline . . . . .	418 <input type="radio"/>	419 <input type="radio"/>	420 <input type="radio"/>
h other	379 <input type="radio"/>	380 <input type="radio"/>	381 <input type="radio"/>	Messy work . . . . .	421 <input type="radio"/>	422 <input type="radio"/>	423 <input type="radio"/>
(describe) _____				Behaves irresponsibly . . . . .	424 <input type="radio"/>	425 <input type="radio"/>	426 <input type="radio"/>
_____				Demands must be met immediately, easily frustrated . . . . .	427 <input type="radio"/>	428 <input type="radio"/>	429 <input type="radio"/>
_____				Inattentive, easily distracted . . .	430 <input type="radio"/>	431 <input type="radio"/>	432 <input type="radio"/>
Worries that something bad will hap- pen to people he/she is close to	382 <input type="radio"/>	383 <input type="radio"/>	384 <input type="radio"/>	Feels hurt when criticized . . . . .	433 <input type="radio"/>	434 <input type="radio"/>	435 <input type="radio"/>
Cranky	385 <input type="radio"/>	386 <input type="radio"/>	387 <input type="radio"/>	Unclean personal appearance . . .	436 <input type="radio"/>	437 <input type="radio"/>	438 <input type="radio"/>
Has trouble enjoying self . . . . .	388 <input type="radio"/>	389 <input type="radio"/>	390 <input type="radio"/>	Afraid of making mistakes . . . . .	439 <input type="radio"/>	440 <input type="radio"/>	441 <input type="radio"/>
Worries a lot about health . . . . .	391 <input type="radio"/>	392 <input type="radio"/>	393 <input type="radio"/>	Dislikes school . . . . .	442 <input type="radio"/>	443 <input type="radio"/>	444 <input type="radio"/>
Has difficulty awaiting turn in games or groups . . . . .	394 <input type="radio"/>	395 <input type="radio"/>	396 <input type="radio"/>				

## Appendix 1D: Selected items from OCHS Child Behavior

## Checklist - youth self-report (for ages 12 to 16).

## PART A:

Below is a list of statements that describe some of the feelings and behaviour of kids and young people. For each statement, please mark the circle that best describes you now or within the past 6 months.

Please mark only one of the three circles for each statement. Mark your answers like this ⊗.

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
I act too young for my age . . . . .	001 <input type="radio"/>	002 <input type="radio"/>	003 <input type="radio"/>	I destroy things belonging to others . . . . .	061 <input type="radio"/>	062 <input type="radio"/>	063 <input type="radio"/>
I have an allergy . . . . .	004 <input type="radio"/>	005 <input type="radio"/>	006 <input type="radio"/>	I damage schools or other property . . . . .	064 <input type="radio"/>	065 <input type="radio"/>	066 <input type="radio"/>
I argue a lot . . . . .	007 <input type="radio"/>	008 <input type="radio"/>	009 <input type="radio"/>	I disobey my parents . . . . .	067 <input type="radio"/>	068 <input type="radio"/>	069 <input type="radio"/>
I have asthma . . . . .	010 <input type="radio"/>	011 <input type="radio"/>	012 <input type="radio"/>	I disobey at school . . . . .	070 <input type="radio"/>	071 <input type="radio"/>	072 <input type="radio"/>
I like animals . . . . .	013 <input type="radio"/>	014 <input type="radio"/>	015 <input type="radio"/>	I don't eat as well as I should . . . . .	073 <input type="radio"/>	074 <input type="radio"/>	075 <input type="radio"/>
I brag . . . . .	016 <input type="radio"/>	017 <input type="radio"/>	018 <input type="radio"/>	I don't get along with other kids . . . . .	076 <input type="radio"/>	077 <input type="radio"/>	078 <input type="radio"/>
I have trouble concentrating or paying attention . . . . .	019 <input type="radio"/>	020 <input type="radio"/>	021 <input type="radio"/>	I don't feel guilty after doing something I shouldn't . . . . .	079 <input type="radio"/>	080 <input type="radio"/>	081 <input type="radio"/>
I can't get my mind off certain thoughts . . . . .	022 <input type="radio"/>	023 <input type="radio"/>	024 <input type="radio"/>	I am jealous of others . . . . .	082 <input type="radio"/>	083 <input type="radio"/>	084 <input type="radio"/>
I have trouble sitting still . . . . .	025 <input type="radio"/>	026 <input type="radio"/>	027 <input type="radio"/>	I am willing to help others when they need help . . . . .	085 <input type="radio"/>	086 <input type="radio"/>	087 <input type="radio"/>
I'm too dependent on adults . . . . .	028 <input type="radio"/>	029 <input type="radio"/>	030 <input type="radio"/>	I am afraid of certain animals, situations, or places, other than school . . . . .	088 <input type="radio"/>	089 <input type="radio"/>	090 <input type="radio"/>
I feel lonely . . . . .	031 <input type="radio"/>	032 <input type="radio"/>	033 <input type="radio"/>	I am afraid of going to school . . . . .	091 <input type="radio"/>	092 <input type="radio"/>	093 <input type="radio"/>
I feel confused or in a fog . . . . .	034 <input type="radio"/>	035 <input type="radio"/>	036 <input type="radio"/>	I am afraid I might think or do something bad . . . . .	094 <input type="radio"/>	095 <input type="radio"/>	096 <input type="radio"/>
I cry a lot . . . . .	037 <input type="radio"/>	038 <input type="radio"/>	039 <input type="radio"/>	I feel that I have to be perfect . . . . .	097 <input type="radio"/>	098 <input type="radio"/>	099 <input type="radio"/>
I am pretty honest . . . . .	040 <input type="radio"/>	041 <input type="radio"/>	042 <input type="radio"/>	I feel that no one loves me . . . . .	100 <input type="radio"/>	101 <input type="radio"/>	102 <input type="radio"/>
I am mean to others . . . . .	043 <input type="radio"/>	044 <input type="radio"/>	045 <input type="radio"/>	I feel that others are out to get me . . . . .	103 <input type="radio"/>	104 <input type="radio"/>	105 <input type="radio"/>
I am mean to animals . . . . .	046 <input type="radio"/>	047 <input type="radio"/>	048 <input type="radio"/>	I feel worthless or inferior . . . . .	106 <input type="radio"/>	107 <input type="radio"/>	108 <input type="radio"/>
I day dream a lot . . . . .	049 <input type="radio"/>	050 <input type="radio"/>	051 <input type="radio"/>	I accidentally get hurt a lot . . . . .	109 <input type="radio"/>	110 <input type="radio"/>	111 <input type="radio"/>
I deliberately try to hurt or kill myself . . . . .	052 <input type="radio"/>	053 <input type="radio"/>	054 <input type="radio"/>	I get in many fights . . . . .	112 <input type="radio"/>	113 <input type="radio"/>	114 <input type="radio"/>
I try to get a lot of attention . . . . .	055 <input type="radio"/>	056 <input type="radio"/>	057 <input type="radio"/>	I get teased a lot . . . . .	115 <input type="radio"/>	116 <input type="radio"/>	117 <input type="radio"/>
I destroy my own things . . . . .	058 <input type="radio"/>	059 <input type="radio"/>	060 <input type="radio"/>	I hang around with kids who get in trouble . . . . .	118 <input type="radio"/>	119 <input type="radio"/>	120 <input type="radio"/>

## Appendix 1D - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
I hear things that nobody else seems able to hear . . . . .	121 <input type="radio"/>	122 <input type="radio"/>	123 <input type="radio"/>	I would rather be with older kids than with kids my own age . . . . .	208 <input type="radio"/>	209 <input type="radio"/>	210 <input type="radio"/>
I act without stopping to think . . . . .	124 <input type="radio"/>	125 <input type="radio"/>	126 <input type="radio"/>	I would rather be with younger kids than with kids my own age . . . . .	211 <input type="radio"/>	212 <input type="radio"/>	213 <input type="radio"/>
I like to be alone . . . . .	127 <input type="radio"/>	128 <input type="radio"/>	129 <input type="radio"/>	I refuse to talk . . . . .	214 <input type="radio"/>	215 <input type="radio"/>	216 <input type="radio"/>
I lie and cheat . . . . .	130 <input type="radio"/>	131 <input type="radio"/>	132 <input type="radio"/>	I repeat certain actions over and over . . . . .	217 <input type="radio"/>	218 <input type="radio"/>	219 <input type="radio"/>
I am nervous or tense . . . . .	133 <input type="radio"/>	134 <input type="radio"/>	135 <input type="radio"/>	I run away from home . . . . .	220 <input type="radio"/>	221 <input type="radio"/>	222 <input type="radio"/>
Parts of my body twitch or make nervous movements . . . . .	136 <input type="radio"/>	137 <input type="radio"/>	138 <input type="radio"/>				
I have nightmares . . . . .	139 <input type="radio"/>	140 <input type="radio"/>	141 <input type="radio"/>	I scream a lot . . . . .	223 <input type="radio"/>	224 <input type="radio"/>	225 <input type="radio"/>
I am not liked by other kids . . . . .	142 <input type="radio"/>	143 <input type="radio"/>	144 <input type="radio"/>	I am secretive or keep things to myself . . . . .	226 <input type="radio"/>	227 <input type="radio"/>	228 <input type="radio"/>
I can do certain things better than most kids . . . . .	145 <input type="radio"/>	146 <input type="radio"/>	147 <input type="radio"/>	I see things that nobody else seems able to see . . . . .	229 <input type="radio"/>	230 <input type="radio"/>	231 <input type="radio"/>
I am too fearful or anxious . . . . .	148 <input type="radio"/>	149 <input type="radio"/>	150 <input type="radio"/>	I am self-conscious or easily embarrassed . . . . .	232 <input type="radio"/>	233 <input type="radio"/>	234 <input type="radio"/>
I feel dizzy . . . . .	151 <input type="radio"/>	152 <input type="radio"/>	153 <input type="radio"/>	I get fired . . . . .	235 <input type="radio"/>	236 <input type="radio"/>	237 <input type="radio"/>
I feel too guilty . . . . .	154 <input type="radio"/>	155 <input type="radio"/>	156 <input type="radio"/>				
I eat too much . . . . .	157 <input type="radio"/>	158 <input type="radio"/>	159 <input type="radio"/>	I can work well with my hands . . . . .	238 <input type="radio"/>	239 <input type="radio"/>	240 <input type="radio"/>
I feel overtired . . . . .	160 <input type="radio"/>	161 <input type="radio"/>	162 <input type="radio"/>	I snow off or clown . . . . .	241 <input type="radio"/>	242 <input type="radio"/>	243 <input type="radio"/>
I am overweight . . . . .	163 <input type="radio"/>	164 <input type="radio"/>	165 <input type="radio"/>	I am shy . . . . .	244 <input type="radio"/>	245 <input type="radio"/>	246 <input type="radio"/>
I physically attack people . . . . .	166 <input type="radio"/>	167 <input type="radio"/>	168 <input type="radio"/>				
Physical problems without known medical cause				I sleep less than most kids . . . . .	247 <input type="radio"/>	248 <input type="radio"/>	249 <input type="radio"/>
a. Aches or pains . . . . .	169 <input type="radio"/>	170 <input type="radio"/>	171 <input type="radio"/>	I sleep more than most kids during day and/or night . . . . .	250 <input type="radio"/>	251 <input type="radio"/>	252 <input type="radio"/>
b. Headaches . . . . .	172 <input type="radio"/>	173 <input type="radio"/>	174 <input type="radio"/>				
c. Nausea, feel sick . . . . .	175 <input type="radio"/>	176 <input type="radio"/>	177 <input type="radio"/>	I have a good imagination . . . . .	253 <input type="radio"/>	254 <input type="radio"/>	255 <input type="radio"/>
d. Problems with eyes . . . . .	178 <input type="radio"/>	179 <input type="radio"/>	180 <input type="radio"/>	I have a speech problem . . . . .	256 <input type="radio"/>	257 <input type="radio"/>	258 <input type="radio"/>
e. Rashes or other skin problems . . . . .	181 <input type="radio"/>	182 <input type="radio"/>	183 <input type="radio"/>	I stand up for my rights . . . . .	259 <input type="radio"/>	260 <input type="radio"/>	261 <input type="radio"/>
f. Stomachaches or cramps . . . . .	184 <input type="radio"/>	185 <input type="radio"/>	186 <input type="radio"/>	I steal things at home . . . . .	262 <input type="radio"/>	263 <input type="radio"/>	264 <input type="radio"/>
g. Vomiting, throwing up . . . . .	187 <input type="radio"/>	188 <input type="radio"/>	189 <input type="radio"/>	I steal things from places other than home . . . . .	265 <input type="radio"/>	266 <input type="radio"/>	267 <input type="radio"/>
h. Other (describe) _____	190 <input type="radio"/>	191 <input type="radio"/>	192 <input type="radio"/>				
I pick my skin or other parts of my body . . . . .	193 <input type="radio"/>	194 <input type="radio"/>	195 <input type="radio"/>	I store up things I don't need . . . . .	268 <input type="radio"/>	269 <input type="radio"/>	270 <input type="radio"/>
I can be pretty friendly . . . . .	196 <input type="radio"/>	197 <input type="radio"/>	198 <input type="radio"/>	I do things other people think are strange . . . . .	271 <input type="radio"/>	272 <input type="radio"/>	273 <input type="radio"/>
I like to try new things . . . . .	199 <input type="radio"/>	200 <input type="radio"/>	201 <input type="radio"/>	I have thoughts that other people would think are strange . . . . .	274 <input type="radio"/>	275 <input type="radio"/>	276 <input type="radio"/>
My school work is poor . . . . .	202 <input type="radio"/>	203 <input type="radio"/>	204 <input type="radio"/>	I am stubborn . . . . .	277 <input type="radio"/>	278 <input type="radio"/>	279 <input type="radio"/>
I am poorly coordinated or clumsy . . . . .	205 <input type="radio"/>	206 <input type="radio"/>	207 <input type="radio"/>	My moods or feelings change suddenly . . . . .	280 <input type="radio"/>	281 <input type="radio"/>	282 <input type="radio"/>

## Appendix 1D - continued

	Never or Not true	Sometimes or Somewhat true	Often or Very true		Never or Not true	Sometimes or Somewhat true	Often or Very true
I enjoy being with other people . . .	283 <input type="radio"/>	284 <input type="radio"/>	285 <input type="radio"/>	I see myself as more unwell or sickly than I really am . . .	368 <input type="radio"/>	369 <input type="radio"/>	390 <input type="radio"/>
I am suspicious . . . . .	286 <input type="radio"/>	287 <input type="radio"/>	288 <input type="radio"/>	I worry that terrible things might happen . . . . .	361 <input type="radio"/>	362 <input type="radio"/>	363 <input type="radio"/>
I swear or use dirty language . . . .	289 <input type="radio"/>	290 <input type="radio"/>	291 <input type="radio"/>	I am not as happy as other children . . . . .	384 <input type="radio"/>	385 <input type="radio"/>	386 <input type="radio"/>
I think about killing myself . . . .	292 <input type="radio"/>	293 <input type="radio"/>	294 <input type="radio"/>	I am easily distracted, have difficulty sticking to any activity . . . . .	367 <input type="radio"/>	368 <input type="radio"/>	369 <input type="radio"/>
I like to make others laugh . . . . .	295 <input type="radio"/>	296 <input type="radio"/>	297 <input type="radio"/>	I have a poor appetite, am not hungry . . . . .	370 <input type="radio"/>	371 <input type="radio"/>	372 <input type="radio"/>
I talk too much . . . . .	298 <input type="radio"/>	299 <input type="radio"/>	300 <input type="radio"/>	I have without physical cause suddenly lost my . . . . .			
I tease others a lot . . . . .	301 <input type="radio"/>	302 <input type="radio"/>	303 <input type="radio"/>	a sight . . . . .	373 <input type="radio"/>	374 <input type="radio"/>	375 <input type="radio"/>
I have a hot temper . . . . .	304 <input type="radio"/>	305 <input type="radio"/>	306 <input type="radio"/>	b ability to move my arms or legs . . . . .	376 <input type="radio"/>	377 <input type="radio"/>	378 <input type="radio"/>
I threaten to hurt people . . . . .	307 <input type="radio"/>	308 <input type="radio"/>	309 <input type="radio"/>	c hearing . . . . .	379 <input type="radio"/>	380 <input type="radio"/>	381 <input type="radio"/>
I like to help others . . . . .	310 <input type="radio"/>	311 <input type="radio"/>	312 <input type="radio"/>	d voice . . . . .	382 <input type="radio"/>	383 <input type="radio"/>	384 <input type="radio"/>
I am too concerned about being neat or clean . . . . .	313 <input type="radio"/>	314 <input type="radio"/>	315 <input type="radio"/>	e ability to swallow . . . . .	385 <input type="radio"/>	386 <input type="radio"/>	387 <input type="radio"/>
I have trouble sleeping . . . . .	316 <input type="radio"/>	317 <input type="radio"/>	318 <input type="radio"/>	f consciousness . . . . .	388 <input type="radio"/>	389 <input type="radio"/>	390 <input type="radio"/>
I cut classes or skip school . . . .	319 <input type="radio"/>	320 <input type="radio"/>	321 <input type="radio"/>	g feeling on my skin . . . . .	391 <input type="radio"/>	392 <input type="radio"/>	393 <input type="radio"/>
I don't have much energy . . . . .	322 <input type="radio"/>	323 <input type="radio"/>	324 <input type="radio"/>	h other (describe) . . . . .	394 <input type="radio"/>	395 <input type="radio"/>	396 <input type="radio"/>
I am unhappy, sad, or depressed . . .	325 <input type="radio"/>	326 <input type="radio"/>	327 <input type="radio"/>				
I am louder than other kids . . . .	328 <input type="radio"/>	329 <input type="radio"/>	330 <input type="radio"/>	I feel that my health should be better . . . . .	397 <input type="radio"/>	398 <input type="radio"/>	399 <input type="radio"/>
I use alcohol or drugs other than for medical conditions . . . .	331 <input type="radio"/>	332 <input type="radio"/>	333 <input type="radio"/>	I worry that something bad will happen to people I am close to . . . . .	400 <input type="radio"/>	401 <input type="radio"/>	402 <input type="radio"/>
I try to be fair to others . . . . .	334 <input type="radio"/>	335 <input type="radio"/>	336 <input type="radio"/>	I am cranky . . . . .	403 <input type="radio"/>	404 <input type="radio"/>	405 <input type="radio"/>
I enjoy a good joke . . . . .	337 <input type="radio"/>	338 <input type="radio"/>	339 <input type="radio"/>	I bite my fingernails . . . . .	406 <input type="radio"/>	407 <input type="radio"/>	408 <input type="radio"/>
I like to take life easy . . . . .	340 <input type="radio"/>	341 <input type="radio"/>	342 <input type="radio"/>	I have trouble enjoying myself . . . . .	409 <input type="radio"/>	410 <input type="radio"/>	411 <input type="radio"/>
I try to help other people when I can . . . . .	343 <input type="radio"/>	344 <input type="radio"/>	345 <input type="radio"/>	I worry a lot about my health . . . . .	412 <input type="radio"/>	413 <input type="radio"/>	414 <input type="radio"/>
I keep from getting involved with others . . . . .	346 <input type="radio"/>	347 <input type="radio"/>	348 <input type="radio"/>	I have difficulty awaiting my turn in games or groups . . . . .	415 <input type="radio"/>	416 <input type="radio"/>	417 <input type="radio"/>
I worry a lot . . . . .	349 <input type="radio"/>	350 <input type="radio"/>	351 <input type="radio"/>	I worry about doing the wrong thing . . . . .	418 <input type="radio"/>	419 <input type="radio"/>	420 <input type="radio"/>
I become overly upset when leaving someone I am close to . . . . .	352 <input type="radio"/>	353 <input type="radio"/>	354 <input type="radio"/>	I cannot keep friends . . . . .	421 <input type="radio"/>	422 <input type="radio"/>	423 <input type="radio"/>
I become overly upset while away from someone I am close to . . . . .	355 <input type="radio"/>	356 <input type="radio"/>	357 <input type="radio"/>	I fidget . . . . .	424 <input type="radio"/>	425 <input type="radio"/>	426 <input type="radio"/>
				I am constipated, have trouble moving my bowels . . . . .	427 <input type="radio"/>	428 <input type="radio"/>	429 <input type="radio"/>

**Appendix 1E: Selected items from OCHS follow-up study Youth Self-Report - (for ages 17 to 20).**

<p>79 In the last 6 months, have you had a spell or attack when all of a sudden you felt frightened, anxious or very uneasy in situations when most people would not be afraid?</p> <p>1 <input type="radio"/> Yes</p> <p>2 <input type="radio"/> No → Go to 82</p>	<p>82 Some people have phobias - that is, such a strong fear of something or some situation that they try to avoid it, even though they know there is no real danger. In the last 6 months, have you avoided any of the following things or situations? Mark "yes" or "no" in the circle to the right</p>																																																																																				
<p>80 Think of one of your worst spells or attacks in the last 6 months. Mark "yes" if you felt any of the following at the same time as you were feeling frightened and "no" if you did not feel this way</p> <table border="0"> <thead> <tr> <th></th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>(a) Were you short of breath or did you have trouble catching your breath? .....</td> <td>81 <input type="radio"/></td> <td>82 <input type="radio"/></td> </tr> <tr> <td>(b) Did your heart pound? ... ..</td> <td>83 <input type="radio"/></td> <td>84 <input type="radio"/></td> </tr> <tr> <td>(c) Were you dizzy or light headed?</td> <td>85 <input type="radio"/></td> <td>86 <input type="radio"/></td> </tr> <tr> <td>(d) Did your fingers or feet tingle? . .</td> <td>87 <input type="radio"/></td> <td>88 <input type="radio"/></td> </tr> <tr> <td>(e) Did you have tightness or pain in your chest? . . .</td> <td>89 <input type="radio"/></td> <td>90 <input type="radio"/></td> </tr> <tr> <td>(f) Did you feel like you were choking or smothering? . . . . .</td> <td>91 <input type="radio"/></td> <td>92 <input type="radio"/></td> </tr> <tr> <td>(g) Did you feel faint? . . . . .</td> <td>93 <input type="radio"/></td> <td>94 <input type="radio"/></td> </tr> <tr> <td>(h) Did you sweat? .....</td> <td>95 <input type="radio"/></td> <td>96 <input type="radio"/></td> </tr> <tr> <td>(i) Did you tremble or shake? . . . .</td> <td>97 <input type="radio"/></td> <td>98 <input type="radio"/></td> </tr> <tr> <td>(j) Did you feel hot or cold flashes?</td> <td>99 <input type="radio"/></td> <td>100 <input type="radio"/></td> </tr> <tr> <td>(k) Did things around you seem unreal? ... ..</td> <td>101 <input type="radio"/></td> <td>102 <input type="radio"/></td> </tr> <tr> <td>(l) Were you afraid either that you might die or that you might act in a crazy way? .....</td> <td>103 <input type="radio"/></td> <td>104 <input type="radio"/></td> </tr> </tbody> </table>		Yes	No	(a) Were you short of breath or did you have trouble catching your breath? .....	81 <input type="radio"/>	82 <input type="radio"/>	(b) Did your heart pound? ... ..	83 <input type="radio"/>	84 <input type="radio"/>	(c) Were you dizzy or light headed?	85 <input type="radio"/>	86 <input type="radio"/>	(d) Did your fingers or feet tingle? 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(h) Eating in front of other people (either people you know or in public) . . . . .	95 <input type="radio"/>	96 <input type="radio"/>																																																																																			
(i) Speaking in front of a small group of people you know .....	97 <input type="radio"/>	98 <input type="radio"/>																																																																																			
(j) Speaking to strangers or meeting new people .....	99 <input type="radio"/>	100 <input type="radio"/>																																																																																			
(k) Storms or thunder or lightning . .	101 <input type="radio"/>	102 <input type="radio"/>																																																																																			
(l) Being in water, for instance in a swimming pool or lake . . . .	103 <input type="radio"/>	104 <input type="radio"/>																																																																																			
(m) Spiders, bugs, mice, snakes, bats, birds or cats . . . . .	105 <input type="radio"/>	106 <input type="radio"/>																																																																																			
(n) Being near any (other) harmless animal or a dangerous animal that could not get to you ..	107 <input type="radio"/>	108 <input type="radio"/>																																																																																			
<p>81 In the last 6 months have you had 3 or more spells or attacks like this close together; for example, within a 3 week period?</p> <p>1 <input type="radio"/> Yes</p> <p>2 <input type="radio"/> No</p>	<p>83 Have there been 2 consecutive weeks or more in the last 6 months when you felt sad, blue, depressed, or when you lost interest and pleasure in things that you usually cared about or enjoyed?</p> <p>1 <input type="radio"/> Yes</p> <p>2 <input type="radio"/> No → Go to 89</p>																																																																																				

## Appendix 1E - continued

84 Think of those 2 weeks, in the last 6 months, when you felt most sad and depressed. Mark "yes" if you had any of the following difficulties at that time and "no" if you did not.

- |  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| (a) You lost your appetite . . . . .   | 01 <input type="radio"/> | 02 <input type="radio"/> |
| (b) You lost weight without trying to - as much as 2 pounds per week or 10 pounds altogether . . . . .                           | 03 <input type="radio"/> | 04 <input type="radio"/> |
| (c) Your eating increased so much that you gained as much as 2 pounds a week for several weeks or 10 pounds altogether . . . . . | 05 <input type="radio"/> | 06 <input type="radio"/> |
| (d) You had trouble falling asleep staying asleep or waking up too early . . . . .   | 07 <input type="radio"/> | 08 <input type="radio"/> |
| (e) You were sleeping too much . . . . .   | 09 <input type="radio"/> | 10 <input type="radio"/> |
| (f) You felt tired out all the time . . . . .  | 11 <input type="radio"/> | 12 <input type="radio"/> |
| (g) You talked or moved more slowly than is normal for you . . . . .   | 13 <input type="radio"/> | 14 <input type="radio"/> |
| (h) You had to be moving all the time - that is, you could not sit still and paced up and down . . . . .                         | 15 <input type="radio"/> | 16 <input type="radio"/> |
| (i) Your interest in your normal activities was a lot less than usual . . . . .  | 17 <input type="radio"/> | 18 <input type="radio"/> |
| (j) You felt worthless, sinful or guilty . . . . .   | 19 <input type="radio"/> | 20 <input type="radio"/> |
| (k) You had a lot more trouble concentrating than is normal for you . . . . .  | 21 <input type="radio"/> | 22 <input type="radio"/> |
| (l) Your thoughts came much slower than usual . . . . .  | 23 <input type="radio"/> | 24 <input type="radio"/> |
| (m) You thought a lot about death - either your own, someone else's, or death in general . . . . .                               | 25 <input type="radio"/> | 26 <input type="radio"/> |
| (n) You felt like you wanted to die . . . . .  | 27 <input type="radio"/> | 28 <input type="radio"/> |
| (o) You felt so low you thought of committing suicide . . . . .  | 29 <input type="radio"/> | 30 <input type="radio"/> |
| (p) You attempted suicide . . . . .  | 31 <input type="radio"/> | 32 <input type="radio"/> |

85 In the last 6 months, did you tell a doctor or other professional about the trouble you were having feeling sad or depressed?

- 1 ☐ Yes  
2 ☐ No

86 Did you take medication more than once in the last 6 months because of feeling sad or depressed?

- 1 ☐ Yes  
2 ☐ No

87 Did your feelings of sadness or depression interfere a lot with your life and activities in the last 6 months?

- 1 ☐ Yes  
2 ☐ No

88 Did your feelings of sadness or depression start after someone close to you died?

- 1 ☐ Yes  
2 ☐ No

89 Have you had 2 consecutive years or more in your life when you felt depressed or sad most days even if you felt okay sometimes?

- 1 ☐ Yes  
2 ☐ No → Go to 91

90 Think of those 2 years when you were feeling sad and depressed most days, did you have any of the following difficulties during that time, for 2 consecutive weeks or more? Mark "yes" or "no" in the circle to the right of each statement.

- |  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| (a) You had lots of crying spells or cried easily . . . . .  | 01 <input type="radio"/> | 02 <input type="radio"/> |
| (b) You felt that life was hopeless . . . . .  | 03 <input type="radio"/> | 04 <input type="radio"/> |
| (c) You had trouble falling asleep staying asleep, or waking up too early . . . . .                      | 05 <input type="radio"/> | 06 <input type="radio"/> |
| (d) You were sleeping too much . . . . .   | 07 <input type="radio"/> | 08 <input type="radio"/> |
| (e) You felt tired out all the time . . . . .  | 09 <input type="radio"/> | 10 <input type="radio"/> |
| (f) You talked or moved more slowly than is normal for you . . . . .                                     | 11 <input type="radio"/> | 12 <input type="radio"/> |
| (g) You had to be moving all the time - that is, you could not sit still and paced up and down . . . . . | 13 <input type="radio"/> | 14 <input type="radio"/> |
| (h) Your interest in your normal activities was a lot less than usual . . . . .                          | 15 <input type="radio"/> | 16 <input type="radio"/> |
| (i) You felt worthless, sinful or guilty . . . . .   | 17 <input type="radio"/> | 18 <input type="radio"/> |
| (j) You had a lot more trouble concentrating than is normal for you . . . . .                            | 19 <input type="radio"/> | 20 <input type="radio"/> |
| (k) Your thoughts came much slower than usual or seemed mixed up . . . . .                               | 21 <input type="radio"/> | 22 <input type="radio"/> |
| (l) You thought a lot about death - either you own, someone else's, or death in general . . . . .        | 23 <input type="radio"/> | 24 <input type="radio"/> |
| (m) You felt like you wanted to die . . . . .  | 25 <input type="radio"/> | 26 <input type="radio"/> |
| (n) You felt so low you thought of committing suicide . . . . .  | 27 <input type="radio"/> | 28 <input type="radio"/> |



**APPENDIX 2: CRITERIA USED TO MEASURE  
MALADJUSTMENT IN OCHS**

## APPENDIX 2

**Table A2.1: Criteria and items used to measure maladjustment in the Ontario Child Health Study**

<b>Emotional or Behavioral Problem</b>	<b>Criterion (Items)</b>
<b>Conduct Disorder</b> requires one or both of criteria A and B to be fulfilled	<b>A:</b> physical violence against persons or property as part of a persistent pattern: (cruel to animals; cruelty, bullying or meanness to others; physically attacks people; gets in many fights; destroys his/her own things; destroys things belonging to his/her family or other children; vandalism; sets fires.)  <b>B:</b> severe violation of social norms: (disobedient at school; truancy, skips school; threatens people; lying or cheating; steals at home; steals outside the home; runs away from home.)
<b>Hyperactivity</b> requires all of criteria A, B and C to be fulfilled	<b>A:</b> inattention: (can't concentrate, can't pay attention for long; distractible, has trouble sticking to any activity.  <b>B:</b> impulsivity: (impulsive or acts without thinking; has difficulty awaiting turn in game or group.)  <b>C:</b> hyperactivity: (can't sit still, restless, or hyperactive; fidgets.)

Table A2.1 - continued

Emotional or Behavioral Problem	Criterion (Items)
Neurosis requires any of criteria A, B or C to be fulfilled	<p>A: dysphoric mood: (has trouble enjoying him/herself; not as happy as other children; unhappy, sad, or depressed; cries a lot; talks about killing self; deliberately harms self or attempts suicide.)</p> <p>B: compulsive, obsessive behavior: can't get his/her mind off certain thoughts, obsessions; feels he/she has to be perfect; repeats certain acts over and over, compulsions; too concerned with neatness or cleanliness.)</p> <p>C: strong feelings of tension: (nervous, high strung or tense; fearful or anxious; worrying.)</p>
Somatization requires both of criteria A and B to be fulfilled	<p>A: distressing recurrent symptoms without evident physical cause: (constipated, doesn't move bowels; feels dizzy; physical problems without known medical cause including: aches or pains, headaches, nausea, problems with eyes, rashes or other skin problems, stomach-aches or cramps, vomiting.)</p> <p>B: perception of self as generally sick, usually unwell: sees him/herself as more unwell or sickly than really is; worries a lot about health; feels his/her health should be better.</p>

**APPENDIX 3: NCDS QUESTIONNAIRES**

**Appendix 3A: Selected items from NCDS Parental Questionnaire - parent or guardian's report of communication disorders and other chronic disorders.**

14

**99. SPEECH**

	No	Yes	Don't know	Col.	
(a) By two years of age was the child talking? (i.e. putting two words)	2	1	0	Col. 14	If not, at what age? ...
(b) Has there ever been any stutter or stammer?	2	1	0	Col. 15	Age at onset? ... Present now? ...
(c) Any other speech difficulty?	2	1	0	Col. 16	Specify ...
(d) Is English the mother's usual language with this child?	2	1	0	Col. 17	

For all items on only Card No. 

4
---

Col. 1 

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

 Col. 11 

--

 Col. 11

**99. OUT PATIENT AND CLINIC ATTENDANCES**

Has the child attended any of the following?

	No	Yes	Don't know	Col.	Name of Hospital or Clinic, and Town	Age
(a) Eye dept. or clinic, optician, or orthoptist	2	1	0	Col. 12		
(b) Physiotherapy or remedial exercises	2	1	0	Col. 13		
(c) Child guidance clinic	2	1	0	Col. 14		
(d) Speech therapy	2	1	0	Col. 15		
(e) Hearing or audiology	2	1	0	Col. 16		
(f) Dental clinic, dentist or orthodontist	2	1	0	Col. 17		
(g) Have there been any outpatient, clinic or specialist appointments?	2	1	0	Col. 18		

Specify

	No	Yes	Don't know	Col.	
99. Has the child ever had a dental gas?	2	1	0	Col. 19	If yes, how many times? ...

## Appendix 3A - continued

17

## 67 ALIMENTARY AND UROGENITAL SYSTEMS

Has the child ever been or had

	Ans.	Yes	Don't Know		
(a) Periodic vomiting or bilious attacks	2	1	0	Cat. 46	No. of times in past 12 mths
(b) Periodic abdominal pain	2	1	0	Cat. 47	No. of times in past 12 mths
(c) Recurrent mouth ulcers	2	1	0	Cat. 48	
(d) Hernia of any sort	2	1	0	Cat. 49	Site
(e) Other serious digestive, bowel or alimentary disorder	2	1	0	Cat. 50	Specify
(f) Infection in the urine (requiring medical treatment)	2	1	0	Cat. 51	No. of times in past 12 mths
(g) Wet by day after 3 years of age (ignore occasional mishaps)	2	1	0	Cat. 52	How often in past 12 mths
(h) Wet by night after 5 years of age (ignore occasional mishaps)	2	1	0	Cat. 53	How often in past 12 mths
(i) Soiled by day after 4 years of age (ignore occasional mishaps)	2	1	0	Cat. 54	How often in past 12 mths
(j) Nephritis or other kidney or U-G disorder	2	1	0	Cat. 55	Specify
(k) Parent, brother or sister with disorder of alimentary or U-G tract	2	1	0	Cat. 56	Age

## 68. METABOLISM AND BLOOD

Is there a history of

(a) Sugar diabetes	2	1	0	Cat. 57	Age of onset
(b) Any diabetes in parents, brothers or sisters	2	1	0	Cat. 58	Specify
(c) Any thyroid, pituitary or adrenal gland disorder	2	1	0	Cat. 59	Specify
(d) Any blood disorder	2	1	0	Cat. 60	Specify

## 69 SKIN

Is there a history of

(a) Eczema in the first year	2	1	0	Cat. 61	Month of onset
(b) Eczema after the first year	2	1	0	Cat. 62	Any present now?
(c) "Strawberry marks" (raised vascular naevi)	2	1	0	Cat. 63	Age
(d) "Port wine stains" (flat vascular naevi)	2	1	0	Cat. 64	Age
(e) Other skin condition including hair or nail disorder	2	1	0	Cat. 65	Specify

## Appendix 3A - continued

16

## MEDICAL HISTORY

## 61. GENERAL

(a) Has the child, to the mother's knowledge, any physical handicap or disabling condition?

No	Yes	Don't know	Col. 99	Specify
2	1	0		

(b) Does the mother consider the child to be particularly sensitive or highly strung?

No	Yes	Don't know	Col. 99	Specify
2	1	0		

## 62. EAR, NOSE AND THROAT

(a) Has the child had more than 3 throat and/or ear infections (with fever) in the past year?

No	Yes	Don't know	Col. 31
2	1	0	

Has the child ever had

(b) Hay fever or sneezing attacks

No	Yes	Don't know	Col. 32
2	1	0	

(c) Mouth opening or mouth breathing

No	Yes	Don't know	Col. 33
2	1	0	

(d) Running ears (i.e. pain, not wet)

No	Yes	Don't know	Col. 34
2	1	0	

No. of times in past 12 mths

(e) Earache, without running ears

No	Yes	Don't know	Col. 35
2	1	0	

No. of times in past 12 mths

(f) Hearing difficulty (suspected or confirmed)

No	Yes	Don't know	Col. 36
2	1	0	

Specify Present now?

Age

(g) Other ear trouble

No	Yes	Don't know	Col. 37
2	1	0	

Specify

## 63. RESPIRATORY SYSTEM

Has the child ever had

(a) Attacks of asthma

No	Yes	Don't know	Col. 38
2	1	0	

No. of times in all?

No. of times in past 12 mths

(b) Bronchitis with wheezing

No	Yes	Don't know	Col. 39
2	1	0	

No. of times in past 12 mths

(c) Pneumonia

No	Yes	Don't know	Col. 40
2	1	0	

At what age?

(d) Other respiratory disease

No	Yes	Don't know	Col. 41
2	1	0	

Specify

## 64. C.V.S.

Has the child had

(a) Rheumatic fever

No	Yes	Don't know	Col. 42
2	1	0	

At what age?

(b) Chorea (St. Vitus Dance)

No	Yes	Don't know	Col. 43
2	1	0	

At what age?

(c) Congenital heart condition

No	Yes	Don't know	Col. 44
2	1	0	

Specify

(d) Patent, broken or other with congenital heart condition

No	Yes	Don't know	Col. 45
2	1	0	

Specify

# **Appendix 3B: Selected items from NCDS Medical Questionnaire - physician's report.**

11

## **SPEECH TEST**

26. Method: (1) Position the child close to and facing you.  
 (2) Please explain that you would like the test sentences repeated after you.  
 (3) Use a natural voice and observe the child's face during the replies.  
 (4) The sentences may be repeated if necessary.  
 (5) Please underline any mispronounced words (dropped syllables may be ignored) and record the total at the end.  
 (If unable to test, score 9/9 and state reason \_\_\_\_\_)

### (a) Test sentences

*Carol threaded a needle with wool*  
*She measured her sister's frock*  
*Roger grasped a bundle of sticks*  
*Eating porridge gives him strength*  
*Mr. Bradshaw rode his bicycle to school*  
*Philip had scrambled eggs for breakfast*

Total mispronounced words \_\_\_\_\_  
 (e.g. for 3 enter 03).

Col 49	50

### (b) Is there any stammer?

No	slight	moderate	severe	Don't know
1	2	3	4	5

Col 51

### (c) Assessment of intelligibility of speech

Speech fully intelligible \_\_\_\_\_  
 Almost all words are intelligible \_\_\_\_\_  
 Many words are unintelligible \_\_\_\_\_  
 All or almost all words are unintelligible \_\_\_\_\_  
 Don't know or unable to test \_\_\_\_\_  
 (Reason) \_\_\_\_\_

Col 52
1
2
3
4
5

## **HEARING TEST**

27. Method: (1) Conditions should be reasonably quiet.  
 (2) Position the child 10 feet away with the ear under test towards you and the child's finger occluding the other ear.  
 (3) Ask the child to repeat each test word after you.  
 (4) The words should be spoken in a quiet conversational tone (not whispered), giving plenty of time for each reply.  
 (5) Please underline incorrect responses and record the totals.  
 (6) The assistance of a second person is desirable to hear the replies.  
 (If unable to test, score X and state reason below)

(a) Right Ear Test words: shoe, horn, cart, nut, cup, book  
 cat, bike, fan, stick, fish, sheep  
 Total incorrect responses \_\_\_\_\_  
 (If over 9, enter 9)

Col 53

(b) Left Ear Test words: spoon, ball, star, fox, bus, coat  
 hat, knife, snake, pig, duck, sheep  
 Total incorrect responses \_\_\_\_\_  
 (If over 9, enter 9)

Col 54

### (c) Assessment of hearing

Normal hearing \_\_\_\_\_  
 Some impairment of hearing (include those corrected by wearing a hearing aid) \_\_\_\_\_  
 Understanding of speech impaired (even with a hearing aid) \_\_\_\_\_  
 Speech not understood, even with a hearing aid and raised voice \_\_\_\_\_  
 Don't know, or unable to test \_\_\_\_\_  
 Reason \_\_\_\_\_

Col 55
1
2
3
4
5



## Appendix 3B - continued

4

## MEDICAL HISTORY

## 6. GENERAL

(a) Has the child, to the mother's knowledge, any physical handicap or disabling condition?

No	Yes	Don't know
2	1	0

Specify \_\_\_\_\_

(b) Does the mother consider the child to be particularly sensitive or highly strung?

No	Yes	Don't know
2	1	0

Specify \_\_\_\_\_

## 7. EAR, NOSE AND THROAT

(a) Has the child had more than 3 throat and/or ear infections (with fever) in the past year? \_\_\_\_\_

2	1	0
---	---	---

Has the child ever had \_\_\_\_\_

(b) Hay fever or sneezing attacks? \_\_\_\_\_

2	1	0
---	---	---

(c) Habitual snoring or mouth breathing? \_\_\_\_\_

2	1	0
---	---	---

(d) Runny nose (i.e. post nasal)? \_\_\_\_\_

2	1	0
---	---	---

No. of times in past 12 months \_\_\_\_\_

(e) Earache, without runny nose? \_\_\_\_\_

2	1	0
---	---	---

No. of times in past 12 months \_\_\_\_\_

(f) Hearing difficulty (suspected or confirmed)? \_\_\_\_\_

2	1	0
---	---	---

Specify \_\_\_\_\_  
Present now? \_\_\_\_\_ Age \_\_\_\_\_

(g) Other ear trouble? \_\_\_\_\_

2	1	0
---	---	---

Specify \_\_\_\_\_

## 8. RESPIRATORY SYSTEM

Has the child ever had \_\_\_\_\_

(a) Attacks of asthma? \_\_\_\_\_

2	1	0
---	---	---

No. of times in all \_\_\_\_\_  
No. of times in past 12 months \_\_\_\_\_

(b) Bronchitis with wheezing? \_\_\_\_\_

2	1	0
---	---	---

No. of times in past 12 months \_\_\_\_\_

(c) Pneumonia? \_\_\_\_\_

2	1	0
---	---	---

At what age? \_\_\_\_\_

(d) Other respiratory disease? \_\_\_\_\_

2	1	0
---	---	---

Specify \_\_\_\_\_

## 9. C.V.S.

Has the child had \_\_\_\_\_

(a) Rheumatic fever? \_\_\_\_\_

2	1	0
---	---	---

At what age? \_\_\_\_\_

(b) Chorea (St. Vitus' Dance)? \_\_\_\_\_

2	1	0
---	---	---

At what age? \_\_\_\_\_

(c) Congenital heart condition? \_\_\_\_\_

2	1	0
---	---	---

Specify \_\_\_\_\_

(d) Parent, brother or sister with congenital heart condition? \_\_\_\_\_

2	1	0
---	---	---

Specify \_\_\_\_\_

## Appendix 3B - continued

6

## MEDICAL HISTORY

## 14. ALIMENTARY AND UROGENITAL SYSTEMS

Has the child ever been or had	No	Yes	Don't know	
(a) Periodic vomiting or bilious attacks	2	1	0	No. of times in past 12 mths
(b) Periodic abdominal pain	2	1	0	No. of times in past 12 mths
(c) Recurrent mouth ulcers	2	1	0	
(d) Hernia of any sort	2	1	0	Site
(e) Other serious digestive, bowel or alimentary disorder	2	1	0	Specify
(f) Infections in the urine (requiring medical treatment)	2	1	0	No. of times in all No. of times in past 12 mths
(g) Wet by day after 3 years of age (ignore occasional mishaps)	2	1	0	How often in past 12 mths
(h) Wet by night after 5 years of age (ignore occasional mishaps)	2	1	0	How often in past 12 mths
(i) Soiled by day after 4 years of age (ignore occasional mishaps)	2	1	0	How often in past 12 mths
(j) Nephritis or other kidney or U-G disorder	2	1	0	Specify Age
(k) Parent, brother or sister with disorder of alimentary or U-G tract	2	1	0	Specify

## 15. METABOLISM AND BLOOD

Is there a history of	No	Yes	Don't know	
(a) Sugar diabetes	2	1	0	Age of onset
(b) Any diabetes in parents, brothers or sisters	2	1	0	Specify
(c) Any thyroid, pituitary or adrenal gland disorder	2	1	0	Specify
(d) Any blood disorder	2	1	0	Specify

## 16. SKIN

Is there a history of	No	Yes	Don't know	
(a) Eczema in the first year	2	1	0	Month of onset Site
(b) Eczema after the first year	2	1	0	Any present now? Site
(c) "Strawberry marks" (raised vascular naevi)	2	1	0	Age Site
(d) "Port wine stains" (flat vascular naevi)	2	1	0	Age Site
(e) Other skin condition including hair or nail disorder	2	1	0	Specify

**Appendix 3C: Items from Modified Rutter Scale included in Parental Questionnaire - parent or guardian's report.**

24. When the child first started school, how soon did he/she "settle down"? (This refers to nursery school, where appropriate, and other schooling, where not.)

Please ring appropriate number:

Within a month	Col. 44
Within 1-3 months	1
Was still unsettled after 3 months	2
Don't know or inapplicable	3
	0

25. Is the child happy at his/her present school?

(If the child has been at his/her present school less than three months, please ring "0")

Happy	Col. 45
Not altogether happy	1
Unhappy	2
Don't know or inapplicable	3
	0

26. Would the parents like the child to be able to stay on at secondary school after the maximum school leaving age?

Yes	Col. 46
No	1
Don't know or inapplicable	2
Other (Please specify)	3
	0

27. Is the child at all awkward or clumsy when:

Not at all      A little      Considerable      Don't know or inapplicable

(a) Walking?	2	3	1	0	Col. 47
(b) Running?	2	3	1	0	Col. 48
(c) Climbing stairs?	2	3	1	0	Col. 49
(d) Tying a bow?	2	3	1	0	Col. 50

28. Is the child:

Normally active	Col. 51
Inactive and quiet (prefers to sit and watch)?	1
Restless and overactive (can't keep still)?	2
Don't know or inapplicable	3
	0

29. Does the child meet other children outside the household? (Exclude going to and from, and in school.)

Most days, or every day	Col. 52
Quite often	1
Very little	2
Not at all	3
Don't know or inapplicable	4
	0

## Appendix 3C - continued

7

30. Please read this to the mother: "I am going to mention a few difficulties of various kinds which many children have at some time. I'd like you to tell me first whether any of these things have occurred during the last 3 months.  
(If occurred only during some interval, please ring '0'.)"

	Has occurred in last 3 months			Col. 29
	Yes	No	Don't know or applicable	
(a) Has complained of headaches (more than once) —	1	2	0	Col. 29
(b) Has had temper tantrums —	1	2	0	Col. 29
(c) Has been reluctant to go to school —	1	2	0	Col. 29
(d) Has had bad dreams or night terrors —	1	2	0	Col. 29
(e) Has had difficulty in getting off to sleep —	1	2	0	Col. 29
(f) Has sleepwalked —	1	2	0	Col. 29
(g) Has been faddy—many dislikes over food —	1	2	0	Col. 29
(h) Has had poor appetite —	1	2	0	Col. 29
(i) Has overeaten for more than the usual meal —	1	2	0	Col. 29

31. "Were you concerned about any of these or other problems before the child started school?"

Yes \_\_\_\_\_  
No \_\_\_\_\_  
Don't know \_\_\_\_\_

Col. 29  
1  
2  
0

If Yes, please specify which problems caused concern \_\_\_\_\_

32. "Have you been concerned about any of these or other problems since he/she has been at school?"  
(But excluding last 3 months.)

Yes \_\_\_\_\_  
No \_\_\_\_\_  
Don't know \_\_\_\_\_

Col. 29  
1  
2  
0

If Yes, please specify which difficulties have caused concern \_\_\_\_\_

33. Has the child been in the care of the local authority?

Yes, is "in care" now \_\_\_\_\_  
Yes, has been "in care" in the past but is not now \_\_\_\_\_  
No, has never been "in care" \_\_\_\_\_  
Don't know \_\_\_\_\_

Col. 29  
1  
2  
3  
0

If Yes, please give child's age at the time and local authority or agency \_\_\_\_\_

## Appendix 3C - continued

24. Please read this to the mother: "Now I want to mention some descriptions of behaviour shown by many children. I'd like you first to tell me whether these kinds of behaviour never happen with whether they happen sometimes or frequently at the present time."

	Please ring appropriate number				Col. 68
	Never	Sometimes	Frequently	Don't know or unapplicable	
(a) Has difficulty in settling to anything for more than a few moments	3	2	1	0	Col. 68
(b) Prefers to do things on his/her own rather than with others	3	2	1	0	Col. 68
(c) Is bullied by other children	3	2	1	0	Col. 69
(d) Destroys own or others' belongings (e.g. tears or breaks)	3	2	1	0	Col. 68
(e) Is miserable or tearful	3	2	1	0	Col. 69
(f) Is squirmy or fidgety	3	2	1	0	Col. 70
(g) Worries about many things	3	2	1	0	Col. 71
(h) Is irritable, quick to fly off the handle	3	2	1	0	Col. 72
(i) Sucks thumb or finger during day	3	2	1	0	Col. 73
(j) Is upset by new situations, by things happening for first time	3	2	1	0	Col. 74
(k) Has rashes or sores on the face, eyes or body	3	2	1	0	Col. 75
(l) Fights with other children	3	2	1	0	Col. 76
(m) Bites nails	3	2	1	0	Col. 77
(n) Is disobedient at home	3	2	1	0	Col. 78

  

25. Did any of these or other aspects of behaviour cause you any concern before the child started school?

Yes \_\_\_\_\_  
 No \_\_\_\_\_  
 Don't know \_\_\_\_\_

If Yes, please specify the aspects involved \_\_\_\_\_

26. Have any of these or other aspects caused you any concern since he/she has been at school? (but not at present)

Yes \_\_\_\_\_  
 No \_\_\_\_\_  
 Don't know \_\_\_\_\_

If Yes, please specify the aspects involved \_\_\_\_\_

Col. 79
1
2
0
Col. 80
1
2
0

## Appendix 3D: Items from Bristol Social Adjustment Guide

Completed by Teachers - NCDS (ages 7 and 11).

## LIST OF ITEMS

## U

Unforthcomingness: a lack of confidence with people and with fresh things or new situations; finds all such a great strain. 1-11 are the less severe; 12-17 the more severe.

1. Chats only when alone with teacher
2. Bursts into tears (*when corrected*)
3. Never offers but pleased if asked (*helping* &.)
4. Submissive (takes less wanted position—a ball fetcher)
5. Too timid to be naughty
6. Lies from timidity
7. Likes sympathy but reluctant to ask
8. Never brings flowers, gifts, although class mates often do
9. Never brings objects he has found, drawings, models, etc. to show teacher though classmates often do
10. Associates only with one other child and mostly ignores the rest
11. Waits to be noticed before greeting
12. Never makes any first approach (*talking to* &.)
13. Too shy to ask (*for help*)
14. Gets nervous, blushes, cries when questioned
15. Shrinks from active play
16. Mumbles shyly, awkwardly (*when greeted*)
17. Says very little, can't get a word out of him

(Not in order of severity except that 12-17 represent the more pronounced form)

## D

Depression: in its lightest forms (1-6) ups and downs of energy; 7-8 are irritability; continuous depression and neuro-physical exhaustion are shown in ascending degree of severity from 9-20.

1. Sometimes eager, sometimes doesn't bother (*answering*)
2. Depends on how he feels (*asking help*)
3. Varies very noticeably from day to day (*persistence, class-work*)
4. Sometimes alert, sometimes lethargic (*games*)
5. Sometimes lacks interest (*free activity*)
6. Varies greatly (*persistence in manual work*)

—

HA

U

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U

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7. Impatient, loses temper with job
8. Flies into a temper if provoked
9. Can work alone but has no energy
10. Lacks physical energy (*manual work*)
11. Has no life in him (*in classroom*)
12. Apathetic ('just sits') (*attentiveness*)
13. Slumps, lolls about
14. Shuffles listlessly
15. Too apathetic to bother (*asking help*)
16. Dull, listless (*eyes*)
17. Always sluggish, lethargic (*games*)
18. Frequently wanders off alone
19. Thick, mumbling, inaudible (*sr-sch*)
20. Miserable, depressed ('under the weather'), seldom smiles

'D' items are normally found to accompany the HA/XA syndrome, especially in its more severe stages, so that single 'D's' are not given an alternative HA/XA interpretation. They probably truly represent an element of depressive exhaustion. Where however 'D' items specified as 'HA' alternatives appear with a number of 'HA' items, but no other 'D', they can be regarded as 'HA'.

## W

Withdrawal: the child sets up defences against human contact and against being loved.

1. Absolutely never greets
2. Does not answer (*when greeted*)
3. Makes no friendly or eager response
4. Avoids talking (distant, deep)
5. Dreamy and distracted (lives in another world)
6. Distant and uninterested (*manual work*)
7. Dreamy, uninterested (*team games*)
8. Distant, shuns others
9. Keeps clear of adults even when hurt or wronged
10. Quite cut off from people ('you can't get near him as a person')
11. Unresponsive ('doesn't seem to see you')
12. Incoherent rambling chatter
13. Like a suspicious animal

## XA

Anxiety or uncertainty about adult interest and affection.

- 1-6 Making sure of acceptance and notice.
- 7-10 Seeking attention and over-demanding of affection.
- 11-16 Great anxiety for acceptance.
- 1 Very anxious to do jobs

N

## Appendix 3D - continued

2. Over eager to greet
3. Over talkative (tires with constant chatter)
4. Very anxious to bring flowers, gifts
5. Very often brings objects he has found, drawings, models, etc., to show teacher
6. Over friendly
7. Talks excessively to teacher about own doings, family or possessions
8. Sidles up to or hangs round teacher
9. Always finding excuses for engaging teacher
10. Constantly needs petty correction
1. Craves for sympathy (comes unnecessarily with minor scratches, bumps, etc., complains of being hurt by others)
12. Tries to monopolise teacher
3. Tells fantastic yarns
4. Wants adult interest but cannot put himself forward
5. Trades on sympathy or interest
6. Put out if he can't get attention

## HA

- hostility to adults.
- 1-4 A mild rejecting attitude which may be incipient hostility or merely depression.
- 5-9 Hostile rejecting moods alternating with anxiety for acceptance.
- 10-17 Active hostility showing itself in anti-social behaviour.
- 18-24 A more thoroughgoing, uncontrolled habitual hostility (verging on extreme K).
1. Varies with mood (*ability at class jobs*)
  2. Eager except when in one of his moods (*answering questions*)
  3. Depends on his mood (*persistence at manual work*)
  4. Inclined to be moody
  5. Offers except when in a bad mood (*helping t.*)
  6. Sometimes very forward, sometimes sulky (*asking help*)
  7. Sometimes eager, sometimes definitely avoids (*greeting*)
  8. Can be surly or suspicious (*response to greeting*)
  9. Sometimes friendly, sometimes in a bad mood
  10. Very variable (seems at times to do badly on purpose) (*standard at manual work*)
  11. Damage to personal property (cars, tradesman's vans, occupied houses or gardens, teacher's or workmen's belongings, etc.)
  12. Bad language; vulgar stories, rhymes, drawings
  13. Suspicious (on the defensive)
  14. Resentful muttering and expression at times
  15. Becomes antagonistic (*effect of correction*)
  16. Sometimes a fluent liar
  17. Has stolen money, sweets, valued objects—once or twice

18. Bears a grudge, always regards punishment as unfair.
19. Has a wild hostile look; looks from under brows
20. Very naughty, difficult to discipline
21. Aggressive defiance (screams, threats, violence)
22. Associates mostly with unsettled types
23. Has stolen money, sweets, valued objects—frequently
24. Obscene behaviour

## XC

Anxiety for approval of and acceptance by other children, sometimes to the extent of being led into mischief. All items rank equally.

1. Plays the hero (*when corrected*)
2. Can't resist playing to the crowd
3. Inclined to fool around (*games*)
4. Over brave (takes unnecessary risks)
5. Over-anxious to be in with the gang (tries to curry favour, toadies, easily led)
6. Likes to be the centre of attention
7. Plays only or mainly with older children
8. Strikes brave attitudes but funks
9. Brags to other children
10. Shows off (pulls silly faces, mimics, clown)
11. Mis'rhaves when teacher is out of the room
12. Spivish dress, hairstyle (*boys*). Overdoes dress, make up (*girls*)
13. Damage to public property, etc. (of school fences, unoccupied houses)
14. Foolish pranks when with a gang
15. Follower in mischief

(All items rank equally)

## K

An attitude of unconcern for adult approval and a 'writing off' of adults; in its severe forms it amounts to a loss of human feeling and moral impairment.

- 1-9 Lack of a desire to please, unconcern about being in good books of adults.
- 5-9 in older children may merely indicate a certain 'independence'.
- 10-14 Lack of fellow feeling and moral compunction in minor matters.
- 16-17 Regards adults as unfriendly outsiders.
- 17-21 Serious loss of feeling and moral impairment.

1. Won't bother to learn
2. Only works when watched or compelled (*classwork*)
3. Only works when watched or compelled (*manual work*)
4. Not shy but unconcerned (*answering questions*)
5. Not shy but never comes for help willingly
6. Has no wish to volunteer (*helping t.*)
7. Unconcerned about approval or disapproval

## Appendix 3D - continued

8. Minimises contacts (*with teacher*) but not backward with other children
9. Avoids teacher but talks to other children
10. Copies from others
11. Takes books from others' desks without permission
12. Selfish, scheming, a spoil sport
13. Cunning, dishonest (*individual games*)
14. Bad sportsman (plays for himself only, cheats, fouls)
15. Cannot look you in the face
16. Not open or friendly, 'seems to be watching you to see if you know'.
17. Can never keep a friend long (tries to pal up with newcomers)
18. Untrustworthy (*class jobs*)
19. Treats lenience as weakness
20. Plausible, sly; will abuse trust, hard to catch
21. Habitual slick liar, has no compunction about lying

## HC

Hostility to other children, from jealous rivalry in the lower numbers (1-4), to enmity and lack of human feeling (analogous to K) in the higher.

1. Disturbs others' games; teases, likes frightening
2. Sometimes nasty to those outside own set
3. Hurts by pushing about, hitting
4. Squabbles, makes insulting remarks
5. Tells tales, underhanded (tries to get others into trouble)
6. Spoils or hides other children's things
7. Mostly on bad terms with others
8. Spiteful to weaker children
9. Disliked, shunned (*by other children*)
10. Fights viciously (bites, kicks, scratches, uses dangerous objects as weapons)

## R

Restlessness: an inability to persevere, concentrate or reflect and a liking for easy moment-to-moment satisfaction—the avoidance-response to long-standing anxiety or, in an otherwise normal child, a carry-over from earlier insecurity.

1. Gets very dirty during day
2. Starts off others in scrapping and rough play
3. Gives up easily (*manual*)
4. Is too restless (*individual games*)
5. Careless, untidy; often loses or forgets books, pen
6. Rough and ready, slapdash (*manual*)
7. Feckless, scatterbrain (*classroom jobs*)
8. Too restless ever to work alone
9. Cannot attend or concentrate for long

10. Does not know what to do with himself, can never stick at anything long
11. Too restless to remember for long (*effect of correction*)

## M

Miscellaneous symptoms of emotional tension, strain or disturbance.

1-5 Immaturity.

6-7 High fears.

8-10 Truancy and unpunctuality.

1. Plays childish games for his age
2. Eager to play but soon loses interest
3. Babyish (mispronounces simple words) (*speech*)
4. Too immature to heed (correction)
5. Plays only or mainly with younger children
6. Timid, poor spirited, can't let himself go
7. Gets bullied
8. Has truanted once or twice, often; suspected of truancy
9. Often late
10. Has cut lessons
11. Destructive, defaces with scribbling
12. On the fringe, somewhat of an outsider

D, HA, XC

## MN

Miscellaneous nervous symptoms. Their gravity may depend on the child's age; they may also be the aftermath of earlier disturbance.

1. Stutters, halts, can't get the words out
2. Jumbled (*Speech*)
3. Blinking (*Eyes*)
4. Unwilled twitches, jerks; makes aimless movements with hands
5. Bites nails badly
6. Jumpy
7. Sucks finger (over 10 years)  
(*no order of severity*)

## E

Environmental or other disadvantage

Frequently absent for day or half day

Has had long absences

Parent condones absences, malingering, etc.

Stays away to help parent

Scruffy, very dirty

Looks very underfed

Not so attractive as most



## Appendix 3D - continued

**B**

Backwardness.

Poor for age (*Reading*)

Cannot read

Poor for age (*Arithmetic*)

Completely incompetent (*Arithmetic*)

Gets cheated, fooled

Just stupid (*class jobs*)

**S**

Sexual development Early; very keen on  
opposite sex

Delayed

Abnormal tendency

**PS**

Ailment possibly psycho-somatic or aggravated  
by strain.

Poor breathing, chesty, asthmatic, easily  
puffed

Frequent colds, tonsillitis, catarrh

Running nose

Mouth breather

Running, infected ears

Skin troubles, sores

Complains of tummy aches, feeling ill or sick

Is sometimes sick

Headaches

Bad turns, goes very pale, fits

Nose bleeding

Sore, red eyes

Very cold hands

Squint, bulging eyes

Gawky, bad co-ordination

Contorted features (face screwed up on one  
side, eyes half closed, etc.)

Holds limb or body in unnatural posture

**PD**

Physical defect.

Bad eyesight

Poor hearing

Diminutive

Very fat

Has some abnormal feature

# Appendix 3E: Items from Malaise Inventory - NCDS (age 23)

## Malaise inventory

"I am now going to ask you some questions about your own health. Simply answer YES or NO to these questions."

PLEASE GIVE THE CORRECT ANSWER

1. Do you often have back-ache?	Yes	No
2. Do you feel tired most of the time?	Yes	No
3. Do you often feel miserable or depressed?	Yes	No
4. Do you often have bad headaches?	Yes	No
5. Do you often get worried about things?	Yes	No
6. Do you usually have great difficulty in falling asleep or staying asleep?	Yes	No
7. Do you usually wake unnecessarily early in the morning?	Yes	No
8. Do you wear yourself out worrying about your health?	Yes	No
9. Do you often get into a violent rage?	Yes	No
10. Do people often annoy and irritate you?	Yes	No
11. Have you at times had a twitching of the face, head or shoulders?	Yes	No
12. Do you often suddenly become scared for no good reason?	Yes	No
13. Are you scared to be alone when there are no friends near you?	Yes	No
14. Are you easily upset or irritated?	Yes	No
15. Are you frightened of going out alone or of meeting people?	Yes	No
16. Are you constantly keyed up and jittery?	Yes	No
17. Do you suffer from indigestion?	Yes	No
18. Do you often suffer from an upset stomach?	Yes	No
19. Is your appetite poor?	Yes	No
20. Does every little thing get on your nerves and wear you out?	Yes	No
21. Does your heart often race like mad?	Yes	No
22. Do you often have bad pains in your eyes?	Yes	No
*23. Are you troubled with rheumatism or fibrositis?	Yes	No
24. Have you ever had a nervous breakdown?	Yes	No

\* Fibrositis is muscular aches and pains.

**APPENDIX 4: PATTERN VARIABLES  
USED IN NCDS**

**APPENDIX 4**

In the NCDS sample, information regarding health status and other key determinants was available at ages 11 and 16 as well as at age 7. The data reduction strategy used to deal with health status and socioeconomic status at the three time points was adopted from the work of Professor Harvey Goldstein, Head of the Statistical Section of the National Children's Bureau in England and statistician in charge of the NCDS. When dealing with changes in health status or socioeconomic status, it was recognized that if a separate variable was used for age 11 and age 16, the association between them would be high, and thus the estimation of some of the parameters would be inaccurate. Thus a composite variable was created for changes in health status between ages 11 and 16, and another was created for changes in socioeconomic status between ages 7 and 16.

**Health Status:** For health status, four combinations or patterns of change exist. These are depicted in Table A4.1. For example, in the second row of the first column, the condition was present at age 11 and absent at age 16.

Tables A4.2 and A4.3 include cell frequencies and percentages for these conditions. Based on the requirement that change should reflect most importantly differences in the condition at the time immediately

**TABLE A4.1: Possible patterns of health status at  
ages 11 and 16 - NCDS**

	Age 16		
	Absent (0)	Present (1)	Missing (9)
Age 11			
Absent (0)	000	001	009
Present (1)	010	011	019
Missing (9)	090	091	099

**TABLE A4.2: Health status patterns: communication  
disorders at ages 11 and 16 (number and percentage)  
- NCDS**

	Age 16		
	Absent N (%)	Present N (%)	Missing N (%)
Age 11			
Absent	3826 (34.57)	236 (2.13)	3409 (30.81)
Present	170 (1.54)	42 (0.38)	220 (1.99)
Missing	1020 (9.22)	48 (0.43)	2095 (18.93)

**TABLE A4.3: Health status patterns: other chronic disorders at ages 11 and 16 (numbers and percentages) - NCDS**

		Age 16		
		Absent N (%)	Present N (%)	Missing N (%)
<b>Age 11</b>				
Absent	4026 (35.23)	336 (2.94)	3359 (29.40)	
Present	94 (0.82)	58 (0.51)	154 (1.35)	
Missing	1138 (9.96)	129 (1.13)	2133 (18.67)	

prior to the outcome measure, 3 patterns were constructed: a reference pattern of healthy at ages 11 and 16; one reflecting a resolving condition (the disorder was present at age 11 but was no longer present at age 16); and, a combination pattern reflecting a more persistent condition (the disorder was present at ages 11 and 16, or age 16 only).

**Socioeconomic Status:** Combinations of patterns for socioeconomic status, a trichotomous variable, were adapted directly from Goldstein (1979). He used changes in socioeconomic status between ages 7 and 16, using socioeconomic status at age 11 as a reference point, to predict reading scores at age 16. In Goldstein's analysis of the NCDS, the 27 possible combinations of socioeconomic status change were grouped into 5, those appearing in Table 3.23 plus a reference category of no change.

**Missing values:** For cases that contained missing information at either 11 or 16, but not both, missing values were replaced using the relative frequency of patterns of complete data. Essentially, the strategy required that for each level of the age 7 measure all possible patterns, including missing values, be determined. For health status variables, there were 16 possible combinations of values as may be seen by examining Tables A4.4 (excluding those combinations corresponding to missing values at more than two time points, i.e. 099 or 199).

From the relative frequencies of each of the 8 patterns for each level of health status at age 7, missing values were replaced with a true value. If the pattern was 1,0,9, there were 2 possible options: 1,0,1 or 1,0,0. Based on the 8 possible patterns, the relative frequencies of these 2 patterns were determined. For example, if there were a total of 1000 cases and 200 cases displayed pattern 1,0,1 and 300 cases 1,0,0, then 50 percent of the cases were accounted for by these two patterns. If 25 cases had pattern 1,0,9, the missing value could be either 1, or 0. Based on the frequencies, 40% of cases would have 1 and 60% would have 0. Thus 10 of the cases (40% of 25) with missing values were randomly assigned a 1 and the remainder a 0. Random assignment to replace missing values were computer generated. The variables with imputed values were then used in logistic regression models.

**TABLE A4.4: Possible patterns of dichotomous variables  
at ages 7, 11, and 16 - NCDS**

		Age 16		
		Absent (0)	Present (1)	Missing (9)
Age 7	Age 11			
	Absent (0)	000	001	009
Absent (0)	Present (1)	010	011	019
	Missing (9)	090	091	099
Present (1)	Absent (0)	100	101	109
	Present (1)	110	111	119
	Missing (9)	190	191	199



**APPENDIX 5: STRATIFIED ANALYSIS**

**OCHS 1983**

**APPENDIX 5**

A stratified analysis of the 1983 OCHS data was conducted to determine possible effect modifiers and to substantiate the results of the logistic regression model (Rothman 1986). The results are shown in Table A5.1. Adjusted odds ratios, controlling for each of the categorical variables, were determined by Mantel-Haenszel summary procedures. Separate confidence intervals and point estimates are provided for the two comparisons: (1) communication disordered children compared with healthy children (2) and other chronic disorders compared with healthy children. Strata specific odds ratios permit an examination of effect modification.

Several of the strata specific estimates were imprecise due to small numbers and those are indicated by an asterisk. This imprecision results in large confidence intervals and point estimates that are often contrary to what was expected. For example, the strata specific odds ratio adjusted for poverty indicate that children with communication disorders whose parents are below the poverty line are less likely to be maladjusted than those whose parents are not poor. The point estimates are 1.7 and 3.5, respectively. However, due to the fact that the expected counts in 25% of the cells of the smaller strata are less than 5, Mantel-Haenszel estimates are unreliable, and this must be noted when examining the results.

The only interaction term that entered the logistic

**TABLE A5.1: Health status related to maladjustment adjusted for potentially confounding variables (summary odds ratios, strata specific odds ratios, and 95% confidence intervals) - OCHS, 1983**

<b>Variable</b>	<b>Communication Disorders vs. Healthy</b>	<b>Chronic vs. Healthy</b>
Gender	3.4 (2.1 - 5.6)	1.7 (1.2 - 2.4)
male	3.6 (1.9 - 6.9)	1.8 (1.1 - 2.8)
female	2.9 (1.3 - 6.7)*	1.7 (1.0 - 2.7)
Subsidized Rent	3.4 (2.1 - 5.5)	1.7 (1.2 - 2.4)
yes	2.1 (0.3 - 13.4)*	1.8 (0.5 - 6.8)*
no	3.6 (2.1 - 6.1)	1.7 (1.2 - 2.4)
Overcrowded	3.4 (2.1 - 5.6)	1.8 (1.3 - 2.5)
yes	4.1 (1.3 - 12.4)*	2.4 (1.0 - 6.0)*
no	3.3 (1.8 - 5.8)	1.7 (1.2 - 2.4)
Welfare	3.2 (2.0 - 5.2)	1.7 (1.2 - 2.4)
yes	1.4 (0.3 - 5.9)*	1.7 (0.6 - 4.5)
no	3.8 (2.2 - 6.5)	1.7 (1.2 - 2.4)
Poverty	3.0 (1.9 - 5.0)	1.6 (1.2 - 2.3)
yes	1.7 (0.4 - 6.3)*	1.2 (0.5 - 3.1)
no	3.5 (2.0 - 6.1)	1.7 (1.8 - 2.5)
Single parent	3.5 (2.2 - 5.7)	1.7 (1.2 - 2.4)
yes	6.5 (1.6 - 25.4)*	2.2 (1.0 - 5.2)
no	3.1 (1.8 - 5.5)	1.6 (1.1 - 2.4)
Functional limitations	3.0 (1.8 - 4.9)	1.5 (1.1 - 2.1)
yes	2.0 (0.5 - 7.4)*	0.5 (0.2 - 1.3)
no	3.3 (1.8 - 5.9)	1.9 (1.3 - 2.8)

TABLE A5.1 - continued

Variable	Communication Disorders vs. Healthy	Chronic vs. Healthy
Alcohol abuse	3.3 (2.0 - 5.5)	1.7 (1.3 - 2.4)
yes	2.3 (0.6 - 8.6) *	0.6 (0.2 - 2.0) *
no	3.6 (2.1 - 6.4)	2.0 (1.4 - 2.8)
Maternal emotional disorder	3.4 (2.1 - 5.6)	1.7 (1.2 - 2.3)
yes	6.0 (2.5 - 14.5) *	1.3 (0.7 - 2.4)
no	2.5 (1.3 - 4.8)	1.8 (1.2 - 2.7)
Paternal emotional disorder	3.5 (2.1 - 6.0)	1.7 (1.1 - 2.4)
yes	2.8 (0.7 - 10.7) *	1.8 (0.5 - 6.3) *
no	3.7 (2.0 - 6.9)	1.6 (1.1 - 2.4)
Health problem of mother	3.5 (2.2 - 5.7)	1.6 (1.2 - 2.3)
yes	2.4 (0.8 - 7.1) *	2.5 (1.4 - 4.5)
no	4.0 (2.2 - 7.1)	1.3 (0.9 - 2.0)
Health problem of father	3.1 (1.8 - 5.3)	1.6 (1.1 - 2.4)
yes	2.0 (0.7 - 5.7) *	1.2 (0.5 - 2.6)
no	3.9 (2.0 - 7.5)	1.8 (1.2 - 2.8)
Family dysfunction	3.4 (2.1 - 5.5)	1.8 (1.3 - 2.5)
yes	1.2 (0.3 - 5.0) *	1.6 (0.7 - 3.8)
no	4.3 (2.5 - 7.5)	1.8 (1.3 - 2.6)
Parental separation	3.4 (2.0 - 5.8)	1.7 (1.2 - 2.4)
yes	2.7 (0.2 - 31.8) *	1.2 (0.2 - 6.2) *
no	3.5 (2.0 - 6.1)	1.7 (1.2 - 2.5)
Spouse abuse	3.0 (1.7 - 5.3)	1.5 (1.0 - 2.3)
yes	**	1.1 (0.1 - 11.3) *
no	3.3 (1.8 - 6.0)	1.5 (1.0 - 2.3)

\* expected counts less than 5 in at least 25% of cells

\*\* OR not computed - zero cell

regression model comparing the prevalence of maladjustment in the communication disordered children with that of the healthy was between communication disorders and maternal emotional disorder. The p-value for the homogeneity of the odds ratio for this term was 0.08. The stratified analysis provides evidence to confirm this interaction. Specifically, the strata-specific odds ratio for communication disordered children who have a mother with an emotional disorder is 6.0 (95% CI: 2.5, 14.5) compared with 2.5 (95% CI: 1.3, 4.8) for those whose mothers do not have an emotional disorder.

Similarly, in the logistic regression model including children with chronic physical disorders, there was a significant interaction between chronic physical disorders and functional limitations. The strata-specific odds ratio for children with chronic physical disorders who have functional limitations is 0.52 (95% CI: 0.2, 1.3) compared with 1.9 (95% CI: 1.3, 2.8) for those who do not have functional limitations.

**APPENDIX 6: LOGISTIC REGRESSION WITHOUT  
IMPUTED VALUES - OCHS 1983**

**TABLE A6.1: Logistic regression with interaction terms relating maladjustment to health status (estimate of coefficient and standard error [SE]) with no imputed values - OCHS, 1983**

Variable	Communication Disorders vs. Healthy	Other Chronic Disorders vs. Healthy
	Regression Coefficient (SE)	Regression Coefficient (SE)
Health status	0.91 (0.39)	0.51 (0.22)
Age	0.08 (0.02)	0.08 (0.02)
Functional limitations	1.04 (0.33)	1.20 (0.35)
Emotional disorder of mother	0.19 (0.20)	#
Annual income	-0.05 (0.03)	-0.05 (0.03)
Marital discord	0.06 (0.02)	0.05 (0.02)
HS*EDM <sup>a</sup>	0.66 (0.67)	#
HS*FL <sup>b</sup>	#	-1.30 (0.57)
Intercept	-3.19 (0.43)	-3.03 (0.40)

# This variable or interaction term did not enter the model for this group.

<sup>a</sup>This is the interaction term for Health status and Emotional disorder of mother.

<sup>b</sup>This is the interaction term for Health status and Functional limitations.

Log likelihood=-575.29 for communication disorders; for other chronic disorders log likelihood=-641.60.

Goodness of fit chi-square=1.58, d.f.=2, p=0.46 for communication disorders; for other chronic disorders goodness of fit chi-square=2.19, d.f.=2, p=0.34.

**APPENDIX 7: STRATIFIED ANALYSIS**  
**NCDS (AGE 7)**



## APPENDIX 7

As with the OCHS sample, a stratified analysis was conducted for the NCDS sample to determine possible effect modifiers and confirm the results of the logistic regression (see Appendix 5 for details). Again, several of the strata specific estimates were imprecise due to small numbers and those are indicated by an asterisk. Thus, similar caution must be exercised when examining the results of this analysis.

**Table A7.1: Relationship between health status and teachers' assessment of maladjustment adjusted for potentially confounding variables (summary and strata specific prevalence odds ratios and 95% confidence intervals) - NCDS, age 7**

<b>Variable and Strata</b>	<b>Communication Disorder vs. Healthy</b>	<b>Chronic Disorder vs. Healthy</b>
<b>Demographic factors</b>		
Gender	2.11 (1.62, 2.75)	1.33 (1.08, 1.63)
male	1.86 (1.32, 2.62)	1.38 (1.08, 1.78)
female	2.72 (1.73, 4.26)	1.22 (0.85, 1.75)
<b>Socioeconomic status</b>		
Social class	2.11 (1.61, 2.77)	1.04 (0.20, 5.42)
I	0.91 (0.33, 2.52)	1.63 (1.04, 2.57)
II	2.07 (1.39, 3.09)	1.11 (0.81, 1.53)
III	2.64 (1.72, 4.07)	1.53 (1.09, 2.15)
<b>Home environment</b>		
Housing problems	2.22 (1.69, 2.92)	1.37 (1.11, 1.70)
yes	1.69 (0.76, 3.77)*	1.91 (1.00, 3.63)
no	2.32 (1.73, 3.13)	1.32 (1.06, 1.65)
Financial problems	2.05 (1.53, 2.75)	1.29 (1.03, 1.61)
yes	1.82 (0.87, 3.79)*	1.74 (1.01, 2.99)
no	2.11 (1.52, 2.92)	1.21 (0.95, 1.56)
Mental illness	2.15 (1.62, 2.85)	1.31 (1.06, 1.63)
present	1.90 (0.56, 6.39)*	1.22 (0.39, 3.85)
absent	2.17 (1.61, 2.92)	1.32 (1.05, 1.64)
Divorce, separation	2.23 (1.70, 2.94)	1.41 (1.14, 1.73)
yes	2.58 (0.80, 8.34)*	2.41 (0.96, 6.09)
no	2.21 (1.66, 2.95)	1.37 (1.10, 1.70)
Father deceased	2.21 (1.69, 2.90)	1.35 (1.09, 1.66)
yes	11.29 (0.97, 131.6)*	0.81 (0.09, 6.98)*
no	2.16 (1.63, 2.86)	1.35 (1.10, 1.67)

Table A7.1 - continued

Variable and Strata	Communication Disorder vs. Healthy	Chronic Disorder vs. Healthy
Mother deceased	2.24 (1.71, 2.93)	1.33 (1.08, 1.64)
yes	8.20 (0.44, 152.22)*	**
no	2.21 (1.68, 2.92)	1.33 (1.08, 1.64)
Domestic tension	2.19 (1.63, 2.94)	1.37 (1.10, 1.71)
present	3.47 (1.38, 8.73)*	1.41 (0.81, 3.27)
absent	2.06 (1.49, 2.84)	1.35 (1.06, 1.70)
Alcoholism	2.02 (1.49, 2.74)	1.35 (1.08, 1.69)
present	8.71 (1.47, 51.49)*	13.06 (1.28, 133.38)*
absent	1.91 (1.39, 2.63)	1.31 (1.04, 1.65)

\*expected counts less than 5 in at least 25% of cells.

\*\*POR not computed - zero cell.

**APPENDIX 8: SUPPLEMENTARY ANALYSES  
FOR SPEECH AND HEARING  
DISORDERS - NCDS**

## APPENDIX 8

During the analyses of the NCDS sample, it was discovered that the association between communication disorders and maladjustment was greater for those with speech disorders than those with hearing impairment. Accordingly, this appendix includes the results when children with speech disorders were examined separately from those with hearing impairments. Those children who had both a speech disorder and a hearing impairment were excluded from the analyses. The strategy of analysis parallels that found in the text for the communication disordered group as a whole.

In Table A8.1, the distribution of subjects by

**Table A81: Distribution of subjects by diagnostic grouping  
(number and percent of total) - NCDS, age 7**

	N	Percent of Total
Communication disorders	317	2.7
a) Speech disorders	118	1.0
b) Hearing impairment	191	1.6
c) Speech disorder and hearing impairment	8	0.1
Other chronic disorders	792	6.7
Healthy	10635	90.6
Total	11744	100.0

health status group at age 7 is given. There were 118 children with pure speech disorders, 191 children with pure hearing impairment, and 8 children with both a speech disorder and a hearing impairment.

Table A8.2 includes the unadjusted prevalence odds ratio for health status related to parent-reported maladjustment at age 7. The prevalence odds ratio for children with pure speech disorders was 1.26 (95% CI: 0.55, 2.88); the prevalence odds ratio for children with hearing impairments was 1.66 (95% CI: 0.93, 2.94).

**Table A82: Parents' assessment of maladjustment by health status (prevalence, crude prevalence odds ratio [POR], and 95% confidence interval) - NCDS, age 7**

Health Status	Prevalence (%)	POR <sup>a</sup>	95% confidence interval on POR
Communication disorders	6.9	1.47	0.91, 2.35
a) Speech disorders	5.9	1.26	0.55, 2.88
b) Hearing impairment	7.7	1.66	0.93, 2.94
Other chronic disorders	5.3	1.12	0.80, 1.57
Healthy	4.8	1.00	Reference

<sup>a</sup>The POR was computed using the healthy children as the reference group (POR=1.00).

When health status is related to teacher-reported maladjustment at age 7, the speech impaired children had an unadjusted prevalence odds ratio of 4.14 (95% CI: 2.89, 5.94) in contrast to the unadjusted odds ratio of 1.23 (95% CI: 0.82, 1.86) for the hearing impaired (Table A8.3).

**Table A83: Teachers' assessment of maladjustment by health status (prevalence, unadjusted prevalence odds ratio [POR], and 95% confidence interval) - NCDS, age 7**

Health Status	Prevalence (%)	POR <sup>a</sup>	95% confidence interval on POR
Communication disorders	23.2	2.22	1.70, 2.89
a) speech disorders	36.0	4.14	2.89, 5.94
b) hearing impairment	14.36	1.23	0.82, 1.86
Other chronic disorders	15.6	1.36	1.11, 1.67
Healthy	12.0	1.00	Reference

<sup>a</sup>The POR was computed using the healthy children as the reference group (POR=1.00).

