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Comorbidity of attention deficit hyperactivity disorder and educational classification among in-patient populations of children and adolescents

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COMORBIDITY OF ATTENTION DEFICIT HYPERACTIVITY DISORDER AND EDUCATIONAL CLASSIFICATION *AMONG IN-PATIENT POPULATIONS OF CHILDREN AND ADOLESCENTS*

by
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ABSTRACT

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COMORBIDITY OF ADHD AND EDUCATIONAL CLASSIFICATION AMONG IN-PATIENT POPULATIONS OF CHILDREN AND ADOLESCENTS

1995
Dr. Roberta Dihoff
Masters of School Psychology

This thesis is an *ex post facto* study of an in-patient population of 39 adolescents between the ages of twelve and eighteen at a New Jersey State Psychiatric Hospital for Adolescents and 74 pre-adolescents and adolescents between the ages of seven and fifteen at a Private Residential School in New Jersey . Of this population of N=113, n=48 were determined to have Attention Deficit Hyperactivity Disorder (ADHD) with an incidence rate of 42.5%. Significant co-morbidity of ADHD and Depression, Conduct Disorder/Oppositional Defiant Disorder, Psychotic Disorders, and Learning Disabilities were found. The incidence of co-morbidity of ADHD and Educational Classification was found to be significantly higher than the incidence researched among more diverse population groups as represented by the New Zealand (Anderson et. al., 1985) and Puerto Rico (Bird et. al., 1988) large population surveys. The ranked correlation's between ADHD and Educational Classification was found to be r=.985 ($P \geq .01$), and between ADHD, Classification and Other Behavioral Disorders was found to be r=.854 ($P \geq .01$). This procedure supports the premise of utilizing Child Study Teams to provide data to plan globally and programmatically as well as to prepare individual education plans.

MINI ABSTRACT

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COMORBIDITY OF ADHD AND EDUCATIONAL CLASSIFICATION AMONG IN-PATIENT POPULATIONS OF CHILDREN AND ADOLESCENTS

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An *ex post facto* study of N=113 children (aged 7-18) placed at a State Mental Hospital or Private Residential School. Via hypothesis testing and ranked correlation's, n=48 (42.5%) showed significant ($P \geq .01$) comorbidity of Attention Deficit Hyperactivity Disorder with Learning Disabilities (r=.985) and/or Depression, Conduct Disorder/Oppositional Defiant Disorder, Psychotic Disorder (r=.854).

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Special thanks in creation of this thesis go to my research assistants at both facilities; **Donna Galarza** at the New Jersey State Psychiatric Hospital for Adolescents and **Marie Adams** at the Private Residential School for Boys without whom there would be no possibility of *ex post facto* study. Gratitude also goes to my professors and advisors, **Dr. John Klanderman** and **Dr. Roberta Dihoff**, with a special mention to **Dr. Greg Potter**, for their tireless technical assistance, support and optimism that research projects do, in fact, get completed. Lastly, a loving honorable mention goes to my husband and children, **Raymond, Stewart and Ahren Ricker**, without whom there would be no affective purpose to my pursuit of higher education.

"Knowledge yeilds the highest-quality power."

(Toeffler, 1990, p. 468.)

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CHAPTER I: THE PROBLEM

NEED:

Like the Nature vs. Nurture debate, Comorbidity of Attention Deficit Hyperactivity Disorder (ADHD) with the other Disruptive Behavior Disorders, such as Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD), as well as with Depression, has long been an issue of philosophical dissension in the psychological and psychiatric diagnostic community. Is there, demonstrably, a separate category of ADHD + CD/ODD or are the defined behavioral difficulties symptoms of the same disorder with differing levels of severity or presentation (Fletcher, Morris & Francis, 1991). Similar concerns have been expressed regarding studies of ADHD as comorbid with Depressive Disorders. Since the introduction of the Diagnositic and Statistical Manual (DSM-III-R), there is a reliable bellwether of clinical thought. The DSM-III-R and the DSM-IV both define ADHD as a separate clinical condition among the Disruptive Behavior Disorders (DSM-III-R, 1987; Barkley, 1993). The diagnosis of ADD-Hyperactivity (Barkley, 1990) or 314.00, Undifferentiated Attention-deficit Disorder (DSM-III-R, 1987) has been discarded and will not be considered in this study as comorbid with Depression.

Recently, with these new definitions of ADHD, assumed rates of comorbidity with other disorders have fallen. Conversely, rates of ADHD + specific Learning Disabilities (LD) have risen as the definition of ADHD has been defined to exclude symptoms of reading difficulties (Cantwell & Baker, 1991, Dykman & Ackerman, 1991, Shaywitz & Shaywitz, 1991). Elevated incidences of negative adolescent outcomes, however, have remained fairly stable as has the comorbidity of Juvenile Delinquency and Disruptive Behavior Disorders (Fischer, et.al., 1990; Hahn, 1987, Moffitt, 1990). While there have been studies of rates of comorbidity in adolescent populations with ADHD, and rarer studies with in-patient populations (Strober, et.al., 1988; Woolston, et. al., 1989), these have focused on rates of CD/ODD and/or Depression in the families and individuals already diagnosed as having ADHD. The proposed study will review the incidence rates of ADHD in individuals already diagnosed as having CD/ODD, Depression, or related Emotional Disturbance as defined during their Educational Classifications. The population of in-patients will be comparable to earlier in-patient studies where Strober evaluated 81 individuals, Woolston 35 (Biederman, Newcorn & Sprich, 1991) and the proposed study will examine between 40 and 60 individuals currently receiving in-patient treatment under Class-B commitment to a New Jersey State Psychiatric Hospital for Adolescents as well as 70 individuals residing at a private residential school for boys in New Jersey.

PURPOSE:

It is this author's contention that Child Study Services are chronically under-utilized by educational administrations. Besides problems with the referral process, the Child Study Teams are gatherers and repositories of vast amounts of data that could be processed and used in a wide variety of administrative decision-making. This became clear in the Spring of 1993, when decision-making regarding Title XI, Chapter 1 grant applications and classroom procedures became an issue at a New Jersey State Psychiatric Hospital for Adolescents. In order to define the need for Chapter 1 (as per the Individuals With Educational Disabilities Act, I.W.E.D., PL 89-313; and Elementary and Secondary Schools Improvement Act, E.S.S.I.A., PL 100-297) basic skills classrooms at the facilities' school an in-depth study of the students was proposed. Protocols were to be given to current students, teachers and administrators were to be interviewed, classes would be observed in progress. The facilities' Child Study Team mentioned that these evaluations were routinely performed as a part of the Educational Classification process.

The Certified School Social Worker for the program in question had amassed a database of between 30 to 40 pupils who had used the educational services during the past year. Organization and analysis of this data revealed that approximately one third of these students scored in the Below Average, Poor or Very Poor range of adaptive functioning on the Slossen Adaptive Behavior Inventory (Slossen, 1987) and would benefit from basic and adaptive skills remediation. It is to be assumed

that Learning Disability Teacher/Consultant evaluations would provide similarly specific information to determine curricular needs and that School Psychologist's reports would yield information regarding performance potentials and ways these potentials are effected by the medication rates and other behavioral factors relevant to the therapeutic milieu.

It is hoped that this study will provide further insight into the nature of the educational challenges of in-patient adolescent and pre-adolescent populations. This may enhance the hospital's ability to develop education plans, programs and curricular options for it's unique student population. It may provide a model for future feasibility or background studies by educational decision-makers using pre-existing Child Study Team documents and pupil records. In the private school setting, this study may lead to targeted in-services for the teachers and residential staff.

STATEMENT OF THEORY:

As early as 1964, in profiling the child with *Minimal Brain Dysfunction*, clinical indicators were presented which in retrospect appear to be allusions to dual-diagnosis or comorbidity. The list of outstanding characteristics presented by Dr. Clements (Clements, 1964) includes "specific learning deficits," "perceptual-motor deficits," equivocal or soft neurological signs," and "borderline abnormal or abnormal EEG" Much of the article deals with assessment of specific reading

disorders included at that time with hyperkinesis as a facet of *Minimal Brain Dysfunction*, as well as mentioning dyslexia and lability of mood.

By 1979, "...brain damage had been relegated to an extremely minor role as a cause of the disorder (Barkley, 1990; p. 20)," and in 1980 the DSM-III had a separate and more clearly defined category of Attention Deficit Disorder with and without Hyperactivity (Barkley, 1990). As diagnostic criteria were being refined and responses to methylphenidate, stimulants and other drugs demonstrated a range of behavior and mood disorders, differences between these syndromes were defined. Much of the research on comorbidity of ADHD and other disorders dates from the DSM-III and DSM-III-R (Biederman, Newcorn & Sprich, 1991).

A high incidence rate of comorbidity of ADHD and other behavioral and cognitive disorders has long been accepted, "On one level, the large number of children affected and the high degree of comorbidity clearly mandate intense efforts to better understand the nature of the disorder (Shaywitz & Shaywitz, 1991, p. 69)." But to what end are these diagnostic efforts headed? According to these authors, and the iInteragency Committee on Learning Disabilities (1987), the goal is, "...the development of a classification system that more clearly defines and diagnoses learning disabilities, conduct disorders and attention deficit disorders, and the inter-relationships (Shaywitz & Shaywitz, 1991)." This information would lead to improved treatment and planning for the effected children. "Given the presence of two or more diagnosable conditions, what are the sequential treatment foci? (Clarkin & Kendall, 1992, p. 907)."

Why is clarification of comorbidity with ADHD important other than epidemiologically, and why focus on the adolescent and pre-adolescent population? Hahn (1987) identified ten major risk factors for dropping out of high school, five of which directly effected the dually-diagnosed adolescent; behind in grade level and older than classmates, poor academic performance, dislike school, detention and suspension and undiagnosed learning disabilities and emotional problems. These risk factors effect pupils with comorbidity of ADHD and CD, ADHD and ODD, ADHD and LD, ADHD and Depression, and related Juvenile Delinquency.

Most studies of comorbid populations focus upon clinically referred populations of children diagnosed as ADHD who presented with related comorbid symptomology but resided in community settings and participated in the studies on an out-patient basis. Significant rates of comorbidity were found, particularly in populations already considered at risk such as Juvenile Delinquents (Moffitt, 1990), comorbid neurological disorders (Fischer, et. al., 1990), comorbid mood disorders (Barkley, et. al., 1992) and interrelated behavior disorders (Biederman, Newcorn & Sprich, 1991). Even higher correlations were found in the rare in-patient population studies (Woolston, et. al., 1989). These correlates all pointed towards risk of negative adolescent outcomes and the search for effective and targeted treatment programs continues.

The present study was conceived to approach the dilemma from an opposite angle. The present adolescent and pre-adolescent populations have already demonstrated negative outcomes, viz., psychiatric hospitalization under a "Class B"

commitment and/or residential placement ("most restrictive" educational program placement) via the County Children's Assessment Resource Team (CART) process. They have already been diagnosed with related disorders other than ADHD. This study will determine the rate of comorbid ADHD in this population that has already been classified as having a learning disability via educational classification, as well as a behavior disorder or mood disorder as per psychiatric diagnosis. Rates of comorbid ADHD will be determined secondary to the outcome. It is expected that the correlates between these disorders will be very high and that they may demonstrate a predictive quality that may lead to targeted treatment in an educational setting. A discrete in-patient population of adolescents and pre-adolescents with ADHD + Educational Classification + Behavior or Mood Disorders may be identified that may require unique interventions.

HYPOTHESES:

Given the severity of symptomology required for a Class B commitment or a "most restrictive" educational program placement via the CART process, it is hypothesized that the study population will present with a measurably higher incidence of ADHD then the general population. Further, it is proposed that the study population will present with a significantly higher incidence of ADHD and Educational Classification than a more diverse population educated in a variety of settings identified via a literature review. Likewise, the rate of comorbidity of ADHD

and education classification should be significantly higher in the study population when compared to populations in less restrictive settings.

The correlation between ADHD and educational classification in the inpatient study group is hypothesized to be statistically significant and will be comparable to correlations of comorbidity found in earlier inpatient studies of ADHD populations. It is further hypothesized that there will be a statistically significant correlation between the study group with ADHD + educational classification and other comorbid behavioral problems such as CD, ODD and/or Depression.

I. The incidence of co-morbididty of ADHD and Classification among the in-patient adolescents and pre-adolescents will be higher than the incidence among more diverse population groups.
II. There will be a statistically significant correlation between ADHD and Classification in the in-patient adolescent and pre-adolescent population.
III. There will be a statistically significant correlation between ADHD + Classification and other behavioral problems in the in-patient adolesecent and pre-adolescent population.

DEFINITIONS:

Wherever possible, definitions will be taken from the DSM-III-R, as presumably any diagnoses found during records review will have been based upon the DSM-III-R. Lists of Diagnostic Criteria for ADHD, CD, Depressive Disorders, and ODD will be found in Appendix A. Those aspects of NJAC 6:28 related to Educational Classifications will also be included in Appendix A.

Adolescent:

Although Adolescence may be defined to correspond exactly with the physiological stage of pubescence, for the purposes of this study it shall be defined as per funding and program criteria for admission into adolescent treatment programs, both in-patient and out-patient, in the state of New Jersey. Adolescent means an individual between the ages of twelve years zero months and their eighteenth birthday who would be eligible, if necessary, for inclusion in a state or federally funded program for adolescents.

Attention-Deficit Hyperactivity Disorder (ADHD):

> *ADHD children are commonly described as having chronic difficulties in the areas of inattention, impulsivity, and overactivity - what one might call the "holy trinity" of ADHD. They are believed to display these characteristics early; to a degree that is inappropriate for their age or developmental level; and across a variety of situations that tax their capacity to pay attention, inhibit their impulses, and restrain their movement (Barkley, 1990, p. 40).*

In addition to the criteria as established in the DSM-III-R for ADHD (314.01), Barkley considers the diagnostic criteria for Hyperkinetic Disorder from the

International Classification of Diseases, 10th Edition (Barkley, 1990) in compiling his definition of ADHD. For the purposes of this study, any mention of chronic problems with "inattention," "impulsivity," or "overactivity/hyperactivity /hyperkinesis" in the pupil's record as may have been defined using the Child Behavior Checklist (CBCL, 1983), Adaptive Behavior Measures, Connor Scales, or other objective or informal measures, or Case History, as in a mention of these symptoms in an earlier report or protocol, or suggestion of ADHD in the evaluations prepared by a certified child study team member (School Social Worker, School Psychologist, Learning Disability Teacher Consultant), clinical staff member (Psychologist, Psychiatrist, Psychiatric Social Worker), will be considered to define the existence of ADHD in the individual's clinical picture. ADHD and Undifferentiated ADD will be considered to be the same clinical grouping as per revisions in the DSM-IV (Barkley, et. al. 1992).

Children's Assessment Resource Team (CART):

The CART process was established by the Bring the Children Home Act (BCHA, PL 1992-111) to reduce out of state placement of New Jersey resident children as well as reduce incidences of educational and other placements in too restrictive settings. BCHA targeted children in out of state placements, children at rsik of residential placement, youth in ABCTC, children in state residential facilities and children in extended out of home placement. Prior to placement at the Private Residential School in New Jersey included in the study, adolescents and pre-adolescents between the ages of seven and fifteen are assessed individually by their County CART's to determine that all local and less restrictive interventions have been exhausted. Records are reviewed and interviews are conducted including Division of Youth and Family Services (DYFS), Educational, Out-patient and In-patient Counseling, Parental and other documentation.

Class B Commitment:

Involuntary placement in a New Jersey State Psychiatric Hospital, Class B Commitment (Involuntary Commitment of Minorts pursuant to R.4:74-7) requires the signature of two mental health professionals including at least one psychiatrist as well as a psychologist or psychiatric social worker. This commitment is reviewed at least every three weeks and certifies that;

> *1) the minor is menally ill; 2) mental illness causes the minor to be dangerous to self or others or property as defined by NJSA 30:4-27.2h and .2I, or alternatively, that the minor is in need of intensive psychiatric therapy which cannot practically or feasibly be rendered in the home or in the community or on any outpatient basis; and 3) appropriate facilities or services are not available (DHS/DMH&H R.4:74-7).*

While some individuals have been placed at New Jersey State Psychiatric Hospital for Adolescents on a voluntary commitment, this is a rare enough occurrence as to have no effect upon this study if such cases were separated out into a separate category for statistical analysis. They will be grouped inclusively with other adolescents in the study population.

Comorbidity:

"At its simplest, comorbidity is the occurrence at one point in time of two or more DSM-III-R disorders (Clarkin & Kendall, 1992)." Clarkin and Kendall go on to define two types of comorbidity. Cross-sectional comorbidity is the type studied in most previous ADHD/Comorbidity research and will be the major focus of the present study. Longitudinal comorbidity implies a predictive component of specific disorders which may precede the emergence of other conditions. An example of this would be specific learning disorders that are comorbid with ADHD and predict a more negative adolescent outcome than either condition alone (Abikoff & Klein, 1992; Fischer et. al., 1990). This definition of comorbidity will be important when evaluating the current research problems and applications.

Conduct Disorder (CD):

Conduct Disorder will be defined as per the diagnostic criteria in the DSM-III-R Conduct Disorder (312). For the purposes of this study, any mention of chronic problems with "conduct," "aggression," or "socialization" in the pupil's record as may have been defined using Adaptive Behavior Measures, Connor Scales, or other objective or informal measures, or Case History, as in a mention of these symptoms in an earlier report or protocol, or suggestion of CD in the evaluations prepared by a certified child study team member (School Social Worker, School Psychologist, Learning Disability Teacher Consultant), clinical staff member (Psychologist, Psychiatrist, Psychiatric Social Worker), will be considered to define the existence of CD in the individual's clinical picture. As per other studies of comorbidity, CD will not be classified into sub-groups including Group Type (312.20), Solitary Aggressive Type (312.00) or Undifferntiated Type (312.90) but all clinical mentions of CD will be grouped inclusively in this study.

Depressive Disorders:

Depressive Disorder will be defined as per the diagnostic criteria in the DSM-III-R Mood Disorders. For the purposes of this study, any mention of chronic problems with "Depression," "Dysthymia," "Cyclothymia" or "Bi-Polar Disorder" in the pupil's record as may have been defined using Adaptive Behavior Measures or other objective or informal measures, or Case History, as in a mention of these symptoms in an earlier report or protocol, or suggestion of depression, vegetative symptoms, or sucidality in the evaluations prepared by a certified child study team member (School Social Worker, School Psychologist, Learning Disability Teacher Consultant), clinical staff member (Psychologist, Psychiatrist, Psychiatric Social Worker), will be considered to define the existence of Depression in the individual's clinical picture. As per other studies of comorbidity, Depression will not be classified into sub-groups including Dysthymia (300.40), Cyclothymia (301.13), Major Depression (296.20), Depressive Disorder NOS. (311.00), Bi-Polar Disorder Manic (296.40), Bi-Polar Disorder Depressed (296.50) or Bi-Polar Disorder NOS. (296.70). Rather, all clinical mentions of Depressive Disorder will be grouped inclusively in this study.

Disruptive Behavior Disorders:

For purposes of this study, Disruptive Behavior Disorders will be defined as that group of externalizing behavioral disorders as specifically defined in the DSM-III-R.

> *This subclass of disorders is characterized by behavior that is socially disruptive and is often more distressing to others than to the people with the disorders. The subclass includes Attention-deficit Hyperactivity Disorder, Oppositional Defiant Disorder, and Conduct Disorder (DSM-III-R, p.49).*

Educational Classification:

This term will refer to either the process of referral, evaluation by a team of New Jersey State Certified educational professionals resulting in the educational classification of a pupil as per NJAC 6:28, sec. 3 or the resulting educational label. For the population being studied, these labels most often will include Emotionally Disturbed, Perceptually Impaired, Educable Mentally Retarded, Neurologically Impaired and/or Multiply Handicapped referring to a combination of the above mentioned educational classifications (NJAC 6:28, sec. 3.5).

Emotionally Disturbed (ED):

Emotionally Disturbed is the most frequent educational classification in the population as defined in this study and the standard criteria for this classification will have been applied in all classification conference reports.

> *"Emotionally Disturbed" means the exhibiting of seriously disordered behavior over an extended period of time which adversely affects educational performance and shall be characterized by (d)5 I or ii below. An evaluation by a psychiatrist experienced in working with children is required. I. an inability to build or maintain satisfactory interpersonal relationships; ii. Behaviors inappropriate to the circumstances, a general or pervasive mood of depression or the development of physical symptoms or irrational fears (NJAC 6:28, sec. 3.5 (d)5).*

Learning Disabled (LD):

Learning Disabilities and Specific Learning Disabilities are terms defined by federal law to necessitate Special Education. These terms are generic for a wide range of academic problems experienced by individual pupils. In New Jersey, the term learning disability is generally supplanted by the educational classification "Perceptually Impaired." According to some definitions, Learning Disabilities may include ADHD, but for the purposes of this study, Learning Disabilities such as reading disorders, sequencing problems, memory problems and dyslexias will be defined separately as per this general definition:

> *All learning disabled students have an academic problem in one or more areas, and this problem is not primarily due to emotional disturbance, mental retardation, visual or auditory impairment, motor disability, or environmental disadvantage. In their problem area(s) they are not achieving in accordance with their potential ability. Social-emotional problems may or may not be present (Haring & McCormick, 1990, p. 110).*

Certain early studies implied that specific reading disabilities, particularly in sequencing and word recognition, may have been an element of ADHD, however, later research distinguished that this correlation had been due to sampling error and was a byproduct of the high coincidence of comorbidity between ADHD and learning disabilities (Cantwell & Baker, 1991; Dykman & Ackerman, 1991; Love & Thompson, 1988).

Oppositional/Defiant Disorder (ODD):

Oppositional/Defiant Disorder will be defined as per the diagnostic criteria in the DSM-III-R, Oppositional/Defiant Disorder (313.81). For the purposes of this study, any mention of chronic problems with "oppositional behavior," or "defiance to authority" in the pupil's record as may have been defined using Adaptive Behavior Measures or other objective or informal measures, or Case History, as in a mention of these symptoms in an earlier report or protocol, or suggestion of ODD in the evaluations prepared by a certified child study team member (School Social Worker, School Psychologist, Learning Disability Teacher Consultant), clinical staff member (Psychologist, Psychiatrist, Psychiatric Social Worker), will be considered to define the existence of ODD in the individual's clinical picture. Attempts will be made to discriminate between cases of ODD and behaviors related to Depressive Disorders, however, in cases where Depressive Disorders are being ruled out in the individual's psychiatric diagnosis, or where Depressive Disorders are "not otherwise specified(NOS.)" discrimination may not be possible.

ASSUMPTIONS:

The difficulty with any *ex post facto* study is its dependence upon pre-existing records, records that have perhaps been generated by a multitude of different practitioners. Additionally, this study reviews records generated by a variety of members of an interdisciplinary team. However, the terms being researched are very well defined either by the DSM-III-R or by New Jersey Educational Law (NJAC 6:28). It is assumed that all State and clinically certified practitioners, whether Child Study Team members (School Social Worker, School Psychologist, Learning Disability Teacher Consultant), clinical staff member (Psychologist, Psychiatrist, Psychiatric Social Worker), will be sufficiently familiar with these diagnostic criteria as to apply them consistently and within the norms of current clinical practice.

In this way the studies of more diverse population groups may be considered and compared to one another to establish baseline rates of comorbidity among diverse populations with ADHD and other clinical syndromes, learning disabilities and disorders as well as establish a history of correlation between conditions comorbid with ADHD. It is assumed that these may be compared with the current study population because of standard definitions in use in general clinical practice and because of certain standards of that clinical practice monitored and up-held by professionals as well as by the certification process. It is assumed that precedent comparisons and overviews of ADHD comorbidity studies are equally valid to the

present study (Barkley, et. al., 1992; Biederman, Newcorn & Sprich, 1991; Shaywitz & Shaywitz, 1991).

The random selection of the study population is assumed to be assured by the time limit established for gathering the data. The study will encompass only those adolescents and pre-adolescents who happen to be committed to the New Jersey State Psychiatric Hospital or resident at the Private Residential School during the specific time period of the study. In other words, the study population will consist of those adolescents identified for Class B Commitment or CART-ed for a particular "most restrictive" placement during a given period of time. The rates of comorbidity of ADHD and educational classification found during this period of time can be assumed to be consistent with rates found during any other randomly selected period at the same or similar in-patient programs.

LIMITATIONS:

The consistency of definitions will be limited by the large number of practitioners contributing to the records. There will be variations as per differing test protocols contributing to the educational and clinical evaluations. These inconsistencies should be lessened by the careful application of the above mentioned definitions by a single researcher evaluating all the pertinent records. Additionally, as mentioned above, these practitioners all used the same DSM-III-R definitions in

their clinical work. The culture of a shared professional setting should also influence the individual clinicians to a greater uniformity of practice.

Due to the timeline constrictions of the study, there will be a relatively small study population of between thirty-five and seventy-five pupils per facility. This population base is comparable to other in-patient comorbidity studies and is in fact at the median between the above-mentioned in-patient studies. (Biederman, Newcorn & Sprich, 1991).

Unfortunately, this study will be vulnerable to all of the criticisms that could be made regarding any of the above mentioned professions or regarding any of the protocols they may use in diagnosing or evaluating an adolescent. However, the intensive scrutiny of case histories inherent in the court process which leads to psychiatric commitment and during the CART procedure would tend to insure that if there were questions of the veracity of these records they would have been addressed previously. One of the stated purposes of this study is to determine if there is an appropriate application for *ex post facto* study of data gathered and generated by Child Study Teams in educational research and planning.

Finally, the debate regarding ADHD as a discrete disorder or as a subset of symptoms for other syndromes and disorders continues. Changes in the definition of ADHD since the 1960's have contributed to this debate. The clinical picture continues to present similarities between symptoms of ADHD and more severe manifestations of the syndromes and disorders with which it exhibits the greatest

rates of comorbidity (Barkley, 1990; Biederman, Newcorn & Sprich, 1991). Further research projects, such as the present study, will be necessary to provide a body of evidence to help resolve this issue in the future.

OVERVIEW:

This thesis will be an *ex post facto* study of an in-patient population of adolescents between the ages of twelve and eighteen at a New Jersey State Psychiatric Hospital for Adolescents and pre-adolescents bewteen the ages of seven and fifteen resident at a Private Residential School in New Jersey. Access to pertinent client files, psychiatric evaluations, psychological tests, case histories, educational evaluations and behavioral logs will be provided in such a way as to ensure the confidentiality of the individual adolescents and pre-adolescents. This information will be gathered and synthesized as per the "Definitions" section parameters above and will be organized into specific populations as per the research directives in Chapter III.

In Chapter II, the literature will be researched to identify rates of incidence of comorbidity of ADHD and classifiable educational disabilities in diverse populations of adolescents and pre-adolescents living in a variety of settings, community, residential, restrictive and unstructured. These populations will be synthesized into a control group (defined as the independent variable) which may then be compared to the hospitalized adolescent population (defined as the dependent variable). The

incidence rate of comorbidity of ADHD and educational classification in the discrete hospitalized population of adolescents will be measured via records review.

Chapter IV, will compare these incidence rates and any correlation between ADHD and educational classification will be computed. Correlation between the identified population of in-patient adolescents and pre-adolescents with ADHD + educational classification and notations of acting out behavioral problems, such as delinquency and conduct disorder, will be computed and compared with the above stated hypotheses as per Chapter V which will also revisit the literature review to re-examine weaknesses in comparisons between independent study populations as defined in the "Assumptions" section above.

CHAPTER II: REVIEW OF LITERATURE

Introduction:

It seems that ADD ADHD is unique to everyone who has it. All the stories I hear are somewhat different. In our group we say that we "Blink Out" when this happens we don't get the message, and don't realize that we even missed it. This can happen anytime. We still have the problems of all information getting the same amount of attention and problems with "filtering" or "focusing". Life's a struggle isn't it. Things are better though for me, with meds, and a support group I'm having lots of improvement.

Steven LedinghamSubj: ADD Evaluation
Date: 92-04-28 03:23:19 EDT
From: FNHSteven: Posted on: America Online

Taxonomic questions surrounding ADHD and the high rates of related or comorbid disorders, such as the "splitting-lumping" debate (Dykman & Ackerman, 1991) are given a sense of extreme urgency as researchers realize that the definitions reflect real students such as the one above struggling to avoid clinical outcomes that are to date, not encouraging (Gittelman, et. al., 1985, Frick, et. al., 1991). Definitions are important only insofar as they lead to targeted treatment and improvement of the clinical picture over time:

> *Severe learning deficits in children are quite costly, in terms of both the enormous expenses related to special education and the personal suffering and frustration for children and families; furthermore, they are quite persistent, with continuing achievement difficulties triggering accompanying problems in self-esteem, peer relations, and adult adjustment....Thus, development of effective intervention strategies for underachieving children must be viewed as a major societal issue (Hinshaw, 1992, p. 894).*

Splitting individuals into groups and subgroups works for diagnostic purposes. Lumping best describes the current classroom situation, especially in in-patient classrooms that service those pupils which are, by definition and early outcome, most at-risk. A knowledge of the population to be served is necessary to planning and implementing treatment (Clarkin & Kendall, 1992).

Categories of ADHD are controversial at present. According to Shaywitz & Shaywitz (1991), "Estimates suggest that ADD affects 10% to 20% of the school age population." Barkley, et. al., (1993) estimate that between 60 and 80% of these children have comorbid conditions. These conditions may prove to be early symptoms of developing conditions other than ADHD or may be different subgroups of ADHD, as yet undefined clinically (Clarkin & Kendall, 1992).

These issues related to comorbidity and differential diagnosis as well as the outcomes for students presenting with ADHD and comorbid conditions will be examined in detail. The differential diagnoses of ADHD – CD, ADHD + ODD, ADHD + LD, ADHD + Depression, as well as ADHD + Psychosis will be examined and defined. A chart will be constructed to define incidence rates of ADHD comorbidity and will be compared to two seminal studies of general populations in New Zealand and Puerto Rico (Anderson, et. al., 1987, Bird et. al., 1988) as well as earlier in-patient research of populations with ADHD and comorbid conditions (Woolston, et. al., 1988; Biederman, et. al., 1990).

ADHD + CD:

The area of greatest overlap or comorbidity is in the Disruptive Behavior Disorders (Barkley, 1990). These overlaps occur in either direction but are very obviously skewed in the favor of Conduct Disorders having comorbid ADHD (Shaywitz & Shaywitz, 1991). It has been debated since the beginning of the DSM effort whether these conditions, CD and ADHD, are actually separate disorders or different steps in the progression of a syndrome, "....children with ADDH and ADDH + CD/OD generally resemble each other more than they differ in sex, age of onset and presentation, frequency of perinatal insults, psychosocial stress, and impairment in cognition and achievement." (Woolston, et. al., 1988).

Barkley (1990) suggests that there may be multiple instances where these conditions have been misdiagnosed as each other, particularly ADHD and CD, by practitioners who are not familiar with all of the diagnostic criteria for each condition. According to the DSM-III-R, there are areas of significant overlap between CD and ADHD as well as a developmental quality in that adolescents with impulsivity are more likely to express it through Conduct Disordered symptomology and younger children with impulsivity are not likely to have the opportunity to express those behaviors.

Another area in which misdiagnoses may have occurred is in studies of comorbidity of ADD and Juvenile Delinquency. The conditions for Juvenile Delinquency closely match the DSM-III-R diagnostic criteria for conduct disorder, viz.; theft (criterion 1), elopement (criterion 2), truancy (criterion 3), breaking and entering (criterion 6), sexual assault (criterion 9), assault and assault with a weapon (criteria 10, 11 and 13), as well as mugging, purse-snatching, extortion, armed robbery (criterion 12). If these activities are treated through the mental health system they are considered behavioral disorders and if there are charges brought and sustained, these are considered as Juvenile Delinquency. Therefore, rates of comorbidity of Juvenile Delinquency and ADHD may be considered along with other rates of comorbid ADHD and CD. Moffitt (1990) found significant correlates between ADD + delinquency and specific reading disorders as well as a predictive quality for future acts of aggression and vandalism.

Epstein et. al. (1991) found a distinction between referral sources and diagnosing professionals and the treatment of ADHD + Conduct Disorder and ADHD + Learning Disability as comorbid or overlap conditions. They studied diagnostic patterns and treatment outcomes from four referral groups; Child Neurology, Child Psychiatry, Pediatricians and Psychologist clinics. These were out-patient samples with the exception of the Child Psychiatry sample. Out of the population N=82 children with presenting problems of learning disabilities or "school problems," n=62 were diagnosed with comorbid ADD (Epstein et. al., 1991). The in-patient sample from the Child Psychiatry clinic were even higher with a significant

comorbidity of other behavioral disorders such as CD/ODD and Psychiatric problems.

Although he found ADHD and CD/ODD to be separate syndromes with clear distinctions between them, Hinshaw (1992) found several considerations which qualify these differential diagnoses including familial, socio-economic, definitional, and social-emotive factors which can effect the labeling of individual cases. However, Hinshaw found, "...overlap between externalizing behavioral syndromes and under achievement occurs at levels that are far above chance rates (p.895)." ADHD occurs with a frequency of 3% to 6% of school aged population and CD occurs in 3% to 7% of this population, according to Hinshaw's sources and he estimates that these conditions overlap between 10% and 50%.

177 clinically referred boys were tested and diagnosed by Frick et. al. (1991) and diagnosed with CD or ADD of which n=49 were diagnosed with both. Academic under achievement was found to be elevated in both the ADD with CD group and the ADD alone group. Biederman et. al. (1987) found that of N=22 children with ADD, 64% or n=14 met diagnostic criteria for an additional diagnosis of CD/ODD. Szatzmari et. al. (1989) found a diagnostic overlap of 40%, and these children appeared to represent a separate diagnostic category with elevated levels of school and behavioral difficulties.

As per Hinshaw (1992), Biederman (1991), and others, Abikoff and Klein (1992) found rates of comorbidity of CD/ODD with previously diagnosed ADHD as

20% to 60% . These results were markedly skewed in the opposite direction as children with previously diagnosed CD presented with comorbid ADHD up to 90% of the time tested. Further, they found this prevalence of comorbidity to be a chronological comorbidity. "In clinical samples, the influence of CD on diagnoses of ADHD is not straightforward because, typically, the onset of ADHD precedes CD (Abikoff & Klein, 1992, p. 882)." Therefore, these rates of comorbidity will vary related to the age of the population sample.

ADHD + ODD:

> *The term 'oppositional defiant disorder' is applied to a problem that is less serious than a conduct disorder but more serious than simply being a difficult child. Children and adolescents with this condition are persistently arrogant, argumentative, short-tempered, resentful, angry, and defiant, especially towards their parents; it is as though they are trying to be annoying (Harvard, 1989, p. 2).*

Most studies have grouped CD and ODD for purposes of measuring rates of comorbidity with ADHD and, according to Biederman (1991), Barkley (1990) and Hinshaw (1987), until recently the condition of ODD has been diagnosed as Conduct Disorder, Solitary, Aggressive Type (DSM-III-R). This diagnosis of Conduct Disorder has almost completely disappeared or been supplanted by the ODD diagnosis. This may represent an evolution or refinement of the diagnostic process

(Fletcher et. al., 1991) or may simply be the nature of Behavior Disorders in general. Nonetheless, Barkley, et. al., found rates of comorbidity to be significant in at least two studies of ADHD and ODD as separate syndromes. "Approximately 40% of the ADD+H children met criteria for oppositional defiant disorder (ODD), and more than 21% received a diagnosis of conduct disorder (CD)...(Barkley, et. al., 1990, p. 780)." In 1992, Barkley stated, "ODD is known to occur as a co-morbid disorder in as many as 65% of ADHD children...(p. 265)."

For the purposes of this study, CD and ODD are being grouped together statistically. This is theoretically supported by Biederman et. al. (1991):

> *In terms of severity of the clinical picture, the available data suggest that children with attention deficit hyperactivity disorder plus oppositional defiant disorder plus oppositional defiant disorder may form in intermediate subgroup between those who have attention deficit hyperactivity disorder alone and those with attention deficit hyperactivity disorder plus conduct disorder...These findings are consistent with the hypothesis that oppositional defiant disorder may be a subsyndromal manifestation of conduct disorder...(p. 569)*

ADHD + LD:

During the 1960's the syndrome of Minimal Brain Dysfunction was globally defined to include hyperkinesis, specific reading disorders, certain neurological soft signs, attentional difficulties, impulsivity and minor coordination delays (Clements, 1964). Since that time, further definition of ADHD and LD as separate syndromes with significant overlap or comorbidity has occurred. Barkley (1990) clarifies this distinction thusly:

> *As discussed in Chapter 3, ADHD children are considerably more likely than normal or control groups of children to display associated problems with academic achievement skills, language, and motor coordination. Approximately 20 to 25 percent will have significant delays in the development of math, reading, or spelling, and 10 to 30 percent may have problems with language. Parents of ADHD children also describe their children as being less coordinated, on average, than those of normal children (p. 186).*

The comorbidity of learning disabilities, or specific developmental delays (as per the DSM-III-R and DSM IV), is one of the most heavily researched areas of ADHD comorbidity. Cantwell & Baker (1991) catalogue almost two decades of such research. A 1980 study found that 53% of boys with hyperactivity were

underachieving in either reading or math, the 1987 New Zealand study found 80% comorbidity of ADHD and LD conditions. In their longitudinal study of N=600 students with speech and language impairments, Cantwell & Baker found that ADHD occurred in 19% of the children. Of the children with clinically significant levels of LD, the percents were higher with a ADHD rate of 40% initially. At the four to five year follow-up the rates intensified with ADHD occurring in 37% of the total sample and 53% of the LD sample.

Dykman & Ackerman (1991) found that almost half of a sample of N=182 children diagnosed with ADHD were clinically reading disabled. Of these n=82 ADHD and dyslexic children, those with other comorbid disorders demonstrated the most significant performance deficits, "The poorest performers overall were those with both emotional (internalizing) and behavioral (externalizing) diagnoses (Dykman & Ackerman, 1991, p. 101)." Barkley, et. al. (1990) found that a cohort of ADHD children with externalizing behaviors, n=48, were more at risk for special education placements than ADHD children with internalizing behaviors, n=42. These children all had comorbid LD but were dually diagnosed and were compared with control groups of normal and LD diagnosed children.

Of N=116 children studied by Love et. al. (1988), n=44 or 37.9% of the boys and n=12 or 10.3% of the girls were diagnosed with dual language and attention deficit disorders. Epstein, et.al., (1991) report research results that, "Children in this group exhibited deficits in lexical decoding and rapid word naming. Such findings support a language-based deficit for reading disability in children with attention

deficit disorder (p. 80)." These results were similar to the New Zealand study of the previous year (Andersen, et. al., 1987). Whereas Love and Epstein attribute these rates of comorbidity to a possible symptom of language deficit related to ADD, Andersen like Barkley (1990) treats them as separate syndromes which are found to be comorbid frequently. Neurological explanations for this overlap have been proposed but conclusive research has not been forthcoming but this line of reasoning may be promising (Hinshaw, 1992; Barkley, et. al., 1992).

ADHD + Depression:

Similar speculation as to a neurological or genetic link has been inspired by the rates of comorbidity of affective disorders and ADHD both in children with comorbid disorders and among their families. Barkley et. al., (1992) and Biederman, et. al., (1990, 1991, and 1990) have provided preliminary epidemiological studies of this relationship.

Jensen, et. al. (1988), found significant overlap between Major Depressive Disorder and ADHD to be skewed in the direction of ADHD children showing many more symptoms of Depression than Depressed boys showed of ADHD in a study of N=35 boys. This supports earlier studies that show a significant correlation between ADHD and the externalizing/behavioral disorders and a lesser power of correlation between ADHD and internalizing/mood disorders (Steingard, et. al., 1991). Barkley,

et. al. (1992) found significantly elevated levels of familial and proband comorbidity of mood disorder, behavior disorder and family conflict in a study of N=83 adolescents and their mothers.

Biederman, et. al., undertook two separate studies of children diagnosed with ADHD and comorbid mood disorders, control groups and their relatives. The first study, N = 73 probands with ADHD, found a 33% rate of comorbid mood disorder, n=24. Furthermore, the relatives of all the ADHD children, not just those with comorbid mood disorders, demonstrated a significantly greater risk for ADHD and/or mood disorders (Biederman, et. al, 1990). In 1991, Biederman, et. al., studied a group of 140 probands and their relatives with strikingly similar results. In 1990, he completed a survey of prior research in this area and concluded:

> *The weight of the available literature indicates the frequent occurrence together of conduct, mood, and anxiety disorders, as well as learning disabilities, with attention deficit hyperactivity disorder in childhood, adolescence and adulthood. The observed comorbidity does not appear to be either random or artifactual. Rather, specific patterns of symptoms and syndromes tend to occur together in individuals and families (Biederman, Newcorn & Sprich, 1990, p.574).*

ADHD + Psychosis:

Many of the out-patient studies screened for neurologic insult and psychosis when developing their study population (Biederman, et. al., 1992; Gittelman, et. al., 1985; Barkley et. al., 1992). However, the in-patient studies (Woolston, et. al., 1988; and Szatmari, et. al., 1989) present sub-groupings of ADHD comorbid with atypical psychosis, as do the two large population studies from Puerto Rico and New Zealand (Bird, et. al., 1987; and Andersen et al., 1985).

This provides a significant sub-grouping of children with multiple diagnoses. Barkley (1990) calls this the "Multiplex Developmental Disorder" or mixed thought and affective disorders (p. 196). These children meet all DSM-III-R criteria for Atypical Psychosis (298.90) as well as presenting with specific developmental disorders and ADHD. They form a small but statistically significant grouping of the in-patient populations in these studies and present with the worst prognoses educationally and socially. Their influence will be discussed further with the specific in-patient population studies by Woolston (1988) and Szatzmari (1989).

Features of Atypical Psychosis and the MDD child, according to Barkley (1990) include specific developmental disorders, thought disorders, odd or peculiar behaviors, ADHD, and severe social and adaptive deficits especially in the area of interpreting and presenting social cues. These symptoms are considerably weaker

than those associated with autism or schizophrenia but are global, pervasive and comorbid (Barkley, 1990). Children and adolescents with MDD or atypical psychosis are uniquely challenged among comorbid ADHD subgroupings in that they have a very high level of peer rejection (Abikoff & Klein, 1992; Fletcher, et al., 1991). They will form a significant subgrouping in the study population.

Comorbidity Issues:

The debate regarding comorbidity is taxonomic and epidemiological in nature and, thus, integral to the present discussion. Is ADHD a separate disorder or grouping of symptoms endemic to several subcategories of other syndromes. Barkley (1990) devotes most of "Chapter Six: Differential Diagnoses" to this question. "Minimal Brain Dysfunction" lumped several conditions together which are considered to be highly comorbid but distinct syndromes today.

Splitting diagnoses too greatly has its own taxonomic disadvantages as demonstrated by the debates surrounding the DSM-III, DSM-III-R and DSM-IV definitions of attention deficit and evolution from attention deficit disorder (ADD) to attention deficit disorder plus hyperactivity (ADD+H) and attention deficit disorder, undifferentiated (ADD- or ADD without) as per Barkley et. al., (1987). DSM-IV categorized ADHD as a separate category of disorders with a diagnostic choice of discriminating between ADHD, Combined Type, ADHD, Predominantly Inattentive Type, ADHD, Predominantly Hyperactive-Impulsive Type and ADHD, NOS (DSM-IV, p.65).

> *Theoretically it is important to consider the hierarchical nature of a diagnostic system. Followed in a rigid manner, exclusionary rules could limit the accumulation of important data and narrow the focus of the clinician. To advance the field, future research must not only continue to use criteria based on empirical data but must also address the potential shortcomings of a hierarchical diagnostic system...(Clarkin & Kendall, 11992, p. 907)*

Each of the comorbid conditions considered in the study encompasses a range of diagnostic criteria with a range of potential interpretations. In examining case histories and diagnostic processes for individual children, there is a notable range of diagnostic impressions. However, these fall into the general composite groups of the DSM-III-R as well as the general groupings of either extrinsic/behavioral or intrinsic/affective disorders (Jensen, 1988; Bird, 1987), behavioral disorders, depressive disorders, psychoses, specific developmental disorders (DSM-III-R; Barkley, 1990) or learning disabilities and behavioral disorders (Shaywitz & Shaywitz, 1991; Epstein, et. al., 1991) and so on used in the above mentioned studies since the New Zealand and Puerto Rican surveys of DSM-III diagnoses and comorbidity.

This diagnostic category approach to "lumping" serves to weight the statistics in favor of broader comorbid tendencies and is justified by the multimodal approach to treatment favored in both out-patient and in-patient clinics today (Abikoff & Klein,

1992). For the purposes of this study, such lumping will be continued in these pre-established groupings. "For both clinically derived and quantitative classifications of attention-related disorders, the crux of the problem is how to disentangle the disorder of interest from other, overlapping disorders (Fletcher, et. al., 1991, p. 72)." For the purposes of this study it does not matter. Hierarchical and taxonomic considerations are secondary to the applications of this research in existing special education classroom environments. Under New Jersey law (NJAC 6:28, sec. 3.5), diagnostic lumping is necessary and under the Plan to Revise, lumping solely by behavior and educational requirements is mandated (NJAC 6:28, sec. 11).

At-Risk Populations:

Two of the most influential studies of rates of ADHD as well as rates of ADHD with comorbid conditions, in the general population were the New Zealand study (Andersen, et. al., 1985) and the Puerto Rico study (Bird, et. al., 1988). They are significant for their large populations and are considered to be extremely adept in their ability to accurately represent the population at large. In New Zealand, N=792 eleven year olds were studied longitudinally over a period of six years duration. The Bird (1988) study provided an epidemiological survey of a probability sample of the entire Puerto Rican population aged 4 through 16 years using two groups of n=777 and n=386 for a total study population of N=1163. Studies of such magnitude provide a large degree of statistical power and are very expensive to replicate. These

two studies have provided important baselines for comparison research of specific, smaller populations since they were first published.

In the first year of the New Zealand study (Andersen, et. al., 1985), a group of n=53 children were identified to have ADD, "...the most strongly supported category was ADD, followed by conduct disorder (p. 72)." Of n=219 cases of classifiable DSM-III disorders, including the ADD category, there presented a 55% rate of comorbidity. Of these children a subgroup of n=14 children with multiple internalizing/behavioral disorders was significant in that they accounted for a disproportionate amount of the single diagnoses in the study. An additional group of n=15 children had ADD plus CD/ODD. These figures were followed up by additional parent and teacher interviews for certain subgroups of classified children. The longitudinal results are significant for the study at hand; "For the other groups, particularly the group with multiple disorders and that with ADD plus conduct-oppositional disorder, teacher-reported aggressivity increased markedly with age (Andersen, et. al., 1985, p. 73)." Additionally, these two groups were most likely to be referred for clinical assistance. This is the subgroup, n=29, that most resembles the study population of in-patient adolescents and pre-adolescents and provides the appropriate baselines for this study.

The results of the Bird, et. al. (1988) study were weighted against the 1985 census of Puerto Rico and were carefully matched against the census population, age range and socio-economic data. It is also a large sample survey and thus has very high correlational power. The results were a rate of ADD of 9.5% of the study

population and estimated 6.6% of the general population of Puerto Rico. Comorbidity rates of four diagnostic domains was computed as per the following chart (Bird, et. al., 1988, p. 1124):

	AFFEC	TIVE	CD/	ODD	ADHD		ANXI	ETY
AFFECTIVE		(n=60)	51.70%	(n=27)	30.70%	(n=18)	31.80%	(n=19)
CD/ODD	28.90%	(n=27)		(n=118)	44.70%	(n=55)	34.70%	(n=36)
ADD	17.00%	(n=18)	53.60%	(n=55)		(n=96)	22.60%	(n=23
ANXIETY	16.60%	(n=19)	39.20%	n=36)	21.20%	(n=23)		(n=81)

WEIGHTED % (UNWEIGHTED N)

Table 2.1

Significant to the study, the comorbidity between the ADD and CD/ODD groups was significant. The two groupings CD and ODD were combined as they will be in the study population. The findings statistically among Puerto Rican study population and among the weighted census projections were significant and will also be used as baselines for study comparisons. "More than half of the children classified as having ADD were also classified as having Conduct/Oppositional Disorders, and almost half of the conduct/Oppositional group were also classified as having ADD (Bird, et. al., 1988, p.1124)"

In-Patient Studies:

The most relevant comparisons among previous study groups and the current study population will be found in the few studies that employ in-patient cohorts among their proband population groups. As defined in Biederman, et. al. (1991), there is only one study in which the entire cohort is in-patient youth, Woolston, et. al.(1989). According to the Biederman survey, Strober (1988) evaluated the families of in-patient youth. Epstein, et. al. (1991) uses an in-patient cohort. "The child-psychiatric-referred group was composed of children referred to an in-patient child psychiatry service and may not be totally representative of children seen as outpatients in mental health centers (p. 84)." This group is weighted heavily in the present comparison study and will be considered both as grouped with the general population study by Epstein and as a separate cohort.

Woolston et. al. (1988), studied N=35 hospitalized children between the ages of 4 and 14. There is great overlap between Woolston and the present study. In fact, Woolston's first two hypotheses differ from the hypotheses of the present study mainly in that he focuses on demographics where the present study focuses on educational classifications (Woolston, 1988, p. 708):

> *1. The prevalence of mixed behavior and affective/anxiety disorders will be higher in psychiatric inpatients than in outpatients.*
> *2. Children with behavioral disorders only and those with mixed behavior and affective/anxiety disorders will have similar demographic and cognitive characteristics.*

The sample consists of n=35 children with behavior disorders from a population of N=65. These children were screened for Psychosis and other "organic" syndromes such as mental retardation, Tourette's, pervasive developmental disorder, etc. Of this cohort, there was a comorbidity in all three domains of cognitive, behavioral and affective disorders as per DSM-III-R diagnoses for n=35 children. An additional n=17 children were comorbid in two domains and n=7 children only presented with behavioral disorders (Woolston, et. al., 1988).

Although the present study has many parallel features with the Woolston study, it is by no means an attempt to replicate this study. Rather, the present study builds upon Woolston's work. Both studies are comparable because they rely upon previously determined DSM-III-R diagnoses and examples of adaptive, social and educational skills for the specific ADHD cohorts. However, the present study begins with a group that is both educationally classified and ADHD. The present study will return to Woolston's findings:

> *The hypothesis that those children with mixed disorders would be more impaired was not supported by this study. In fact, those differences found between groups in adaptive behavior indicated that the Beh. – Aff./Anx. group exhibited more age appropriate skills in the area of daily living skills (p. 711).*

> *...[a] substantial number of children (21/35) who were in fact having significant academic difficulties. These children were equally distributed in both groups and represent a diagnostic category representing considerable clinical concern. These children with learning disabilities and borderline functioning evidenced impairment in all areas of behavior (p. 712).*

The current study will create a grouping of children with ADHD, LD and other behavior disorders as well as groupings of children with ADHD, LD and Affective disorders, such as Depression. Children with comorbid Psychosis may also be considered. It is presumed that these children may comprise the significantly at-risk group with "impairment in all areas of behavior," mentioned by Woolston, et. al.(1988) and alluded to by Biederman, et. al. (1991) and Barkley (1990).

Summary:

The above studies have been organized delineating various rates of comorbidity among the various populations, population and comorbid conditions researched. Some study populations were listed multiple times as they were divided into multiple comorbid sub-groupings. The appropriate mean rates of comorbidity were computed for a general population, a specific ADHD population, in-patient populations and out-patient populations. Correlation's between various comorbid conditions and ADHD will be computed for significance, as per the large population studies of Andersen et. al., (1985) and Bird et. al., (1988). This data will be compared with the study population of adolescents and pre-adolescents in the two in-patient programs (on a given date as per the Jensen, et. al. (1988) methodology). These charts will be presented as part of the chapter on methodology and the computations related above will be presented among the study results.

CHAPTER III: DESIGN OF THE STUDY

SAMPLE:

The sample will be drawn from the total population of children resident in the two programs specified above, the New Jersey State Psychiatric Hospital for Adolescents and the Private Residential School in New Jersey, on a specified date. Determining a specific date and choosing the total resident population at that time will ensure random selection as any child who is mentally ill and educationally classified in the state of New Jersey may or may not be eligible to reside at the above facilities on any given date through the process of the CART team or "Class B" commitment.

From the sample of the total population on that date, a sub-grouping of those children who have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) will be drawn. Due to the requirements of the CART team process and/or the "Class B" commitment process, all of the population will be diagnosed with a mental illness as per the DSM-III-R and will be educationally classified or referred for child study services.

MEASURES:

This is an *ex post facto* study of the subject's records in residential school facilities. No measures, either formal or informal will be administered. The subjects will not be interviewed and have been previously diagnosed and classified via the facilities admissions procedures, either by the CART team process or "Class B" commitment.

DESIGN:

This is an *ex post facto* study of the records of subjects who reside at the New Jersey State Psychiatric Hospital for Adolescents and the Private Residential School in New Jersey, on a specified date. These records will be used to determine the subject's educational classifications and DSM-III-R diagnosis or diagnoses. The number of subjects with ADHD will be determined per each population and the rate of ADHD will be computed for the entire study population. For the puposes of these calculations, a subject will be considered to have ADHD if they have a DSM-III-R diagnosis of ADHD (314.01) or ADD (314.00), or with a history of Ritalin (methylphenidate) use as Ritalin is not prescribed for any other treatment purpose

except to geriatric populations as per the PDR (Physician's Desk Reference; Barkley, 1992).

From the group of subjects determined to have ADHD, the following groups and subgroups will be determined; subjects with ADHD and Educational Classification, subjects with ADHD and Conduct Disorder/Oppositional Defiant Disorder, subjects with ADHD and Depression, subjects with ADHD and Learning Disabilities (i.e. Specific Developmental Disorders and/or Educational Classifications other than Emotionally Disturbed) and subjects with ADHD and multiple disorders as specified above. Subjects may fall into more than one of the subject groups.

The rates of occurrance and correlates between subgroups will be computed. These statistics will be compared in detail with the study findings in Chapter II and made into chart. The two large-population baseline studied, Andersen et. al. (1985) and Bird et. al. (1988), will be considered a control group (defined as the independent variable) which may then be compared to the hospitalized adolescent population (defined as the dependent variable).

TESTABLE HYPOTHESIS:

I. The incidence of co-morbididty of ADHD and Classification among the in-patient adolescents and pre-adolescents will be higher than the incidence among more diverse population groups.
II. There will be a statistically significant correlation between ADHD and Classification in the in-patient adolescent and pre-adolescent population.
III. There will be a statistically significant correlation between ADHD + Classification and other behavioral problems in the in-patient adolesecent and pre-adolescent population.

SUMMARY:

This will be an *ex post facto* study of an in-patient population of adolescents between the ages of twelve and eighteen at a New Jersey State Psychiatric Hospital for Adolescents and pre-adolescents bewteen the ages of seven and fifteen resident at a Private Residential School in New Jersey. Access to pertinent client files, psychiatric evaluations, psychological tests, case histories, educational evaluations and behavioral logs will be provided in such a way as to ensure the confidentiality of the individual adolescents and pre-adolescents. This information will be gathered and synthesized as per the "Definitions" section parameters in Chapter I and will be organized into specific populations as per the research directives listed above.

CHAPTER IV: ANALYSIS OF RESULTS

ORDER AND ORGANIZATION OF RESULTS:

The sample population was drawn from the total population of children resident in the two programs specified above, the New Jersey State Psychiatric Hospital for Adolescents and the Private Residential School in New Jersey, on October 11, 1994. On this date there was a Population of N=112 subjects residing at the two facilities with birthdays between 09/12/87 and 01/18/77 making the study group's age parameters from 7 years, 1 month to 17 years, 7 months. The population was overwhelmingly male with only 22 females or 19.6 %. Of these subjects n=48 or 42.9 % presented with Attention Deficit Hyperactivity Disorder (ADHD).

The population of subjects at the New Jersey State Psychiatric Hospital for Adolescents (To be referred to as the "Hospital Population") was N=39, with ages between 12 years, 0 months and 17 years, 7 months (birthdays between 10/08/82 and 01/18/77). There were 17 males and 22 females in this group. The rate of ADHD in the Hospital Population was found to be n=10 subjects or 25.6 %. The Population of subjects at the Private Residential School in New Jersey (To be referred to as the "Residential Population") was N=74, with ages between 7 years, 1 month and 15

years, 1 month (birthdays between 09/12/87 and 09/03/79). This Residential Population was entirely male. The rate of ADHD in the Residential Population was found to be n=38 subjects or 52 %. Both groups were found to be extremely homogeneous in terms of socio-economic status (low) and cultural makeup (integrated).

RESTATEMENT OF HYPOTHESIS:

Given the severity of symptomology required for a Class B commitment or a "most restrictive" educational program placement via the CART process, it is hypothesized that the study population will present with a measurably higher incidence of both ADHD then the general population. Further, it is proposed that the study population will present with a significantly higher incidence of ADHD – Educational Classification than a more diverse population educated in a variety of settings identified via a literature review. Likewise, the rate of comorbidity of ADHD and education classification should be significantly higher in the study population when compared to populations in less restrictive settings.

The correlation between ADHD and educational classification in the inpatient study group is hypothesized to be statistically significant and will be comparable to correlation's of comorbidity found in earlier inpatient studies of ADHD populations. It is further hypothesized that there will be a statistically significant correlation

between the study group with ADHD + educational classification and other comorbid behavioral problems such as CD, ODD and/or Depression.

I. The incidence of co-morbididty of ADHD and Classification among the in-patient adolescents and pre-adolescents will be higher than the incidence among more diverse population groups.
II. There will be a statistically significant correlation between ADHD and Classification in the in-patient adolescent and pre-adolescent population.
III. There will be a statistically significant correlation between ADHD + Classification and other behavioral problems in the in-patient adolescent and pre-adolescent population.

INTERPRETATION OF RESULTS:

The statistical analyses were performed on the population sample as a total as well as on the two discrete sub-groups of Hospital and Residential Populations. The first analyses was percentages of various sub-groupings of the population in terms of percent with ADHD as stated above. Next, analyses was made of percents with psychiatric diagnoses (as per the DSM-III-R, 1987) in the four sub-groups of Depression, Psychosis, Conduct Disorder and/or Oppositional Defiant Disorder (CD/ODD), and Multiple Diagnoses. Percentages of the population with dual diagnoses of the above disorder as well as ADHD were also computed as in Table 4.1:

TOTAL GROUP			
GROUP TYPE	TOTAL	% OF N	% OF ADHD
(population) N=	113	100.00%	
ADHD population (n=)	48	42.50%	100.00%
Depression	33	29.20%	
ADHD + Depression	7	6.20%	14.60%
Psychosis	50	44.20%	
ADHD + Psychosis	19	16.80%	39.60%
CD/ODD	52	46.00%	
ADHD + CD/ODD	26	23.00%	54.20%
LD(Ed. Classification)	107	94.70%	
ADHD + LD	48	42.50%	100.00%
Multi	20	17.70%	
ADHD + Multi	6	5.30%	12.50%

Table 4.1.

Similar percentages were calculated for each of the sub-groups. The Hospital Population totals and percentages are represented in Table 4.2 and the Residential Population totals and percentages are represented in Table 4.3:

HOSPITAL			
GROUP TYPE	TOTAL	% OF N	% OF ADHD
(population) N=	39	100.00%	
ADHD population (n=)	10	25.60%	100.00%
Depression	20	51.30%	
ADHD + Depression	4	10.30%	40.00%
Psychosis	22	56.40%	
ADHD + Psychosis	7	17.90%	70.00%
CD/ODD	16	41.00%	
ADHD + CD/ODD	6	15.40%	60.00%
LD(Ed. Classification)	33	84.60%	
ADHD + LD	10	100.00%	100.00%
Multi	17	43.60%	
ADHD + Multi	6	15.40%	60.00%

Table 4.2.

RESIDENTIAL			
GROUP TYPE	TOTAL	% OF N	% OF ADHD
(population) N=	74	100.00%	
ADHD population (n=)	38	51.40%	100.00%
Depression	13	17.60%	
ADHD + Depression	3	4.10%	7.90%
Psychosis	28	37.80%	
ADHD + Psychosis	12	16.20%	31.60%
CD/ODD	36	48.60%	
ADHD + CD/ODD	20	27.00%	52.60%
LD(Ed. Classification)	74	100.00%	
ADHD + LD	38	51.40%	100.00%
Multi	3	4.10%	
ADHD + Multi	0	0.00%	0.00%

Table 4.3.

The above proportions were compared to the rates of occurrence provided by the two large population studies discussed in Chapter 2, the New Zealand Study (Andersen et. al., 1985) and the Puerto Rican Study (Bird et. al., 1988). As stated above, these studies have been used repeatedly to provide baselines due to the care with which they were executed. Also, due to their large population base, they have a very high degree of statistical power. Since these two studies provide the comparison baselines for many of the other studies of ADHD comorbidity quoted in the current research, using them improves the validity of any comparisons of results.

The rates of occurrence above were compared with the New Zealand (1985) and Puerto Rican (1988) studies using a hypothesis Z-test of two population proportions. The Null Hypothesis was that the rate of occurrence found in the study population was less than or equal to either the Andersen (1985) or the Bird (1988)

results. All of the Test-Z scores were calculated with a .01 significance level. These results are listed in Table 4.4 below:

POPULATION N=	ANDERSEN test z	critical z	BIRD test z	critical z
TOTAL/ADHD	11.3019	2.3268	10.9767	2.3268
HOSP/ADHD	4.3645	2.3268	3.7664	2.3268
RES/ADHD	11.9806	2.3268	11.5663	2.3268

Table 4.4.

As per the above table, all of the statistical Z-scores were significantly enough above the critical Z-scores (2.3268) to reject the null hypothesis with a 99% level of confidence. These results were significant across both sub-groups and in comparison to both the Andersen (1985) and the Bird (1988) study baselines.

A final hypothesis test was run to determine the homogeneity of the population sample. The population proportions of ADHD were compared between the Hospital population and the Residential Population with mixed results. The null hypothesis was that the two populations were equal. At a .01 significance level, the null hypothesis was rejected with a Test-Z score of -2.6286, and a Critical-Z score of +/- 2.5762. However, the range of confidence was from - 0.5091 to - 0.0051 which includes the Test-Z score. When the test was recomputed at the .05 significance level the results were similar with a Test-Z score again falling within the standard error of measurement of -.44885 and -.0654. This reduces the confidence in the internal consistency of the Total Population sample to less than 95%.

In computing correlation's, a non-parametric ranked correlation was considered to be more appropriate than a linear correlation. The resulting

correlation's were quite high, in the strongly significant range (greater than r=.8). Because of the internal consistency issues, the ranked correlation's of the sub-groups, Hospital and Residential Populations, these correlation's were only calculated to the .05 significance level. The Hospital Population ranked correlation between ADHD and Educational Classification was r=.877 with a standard error of measurement of +/- 1.29. For the Residential Population, the ranked correlation between ADHD and Educational Classification was r=.982 with a standard error of measurement of 2.71. These correlation's included all of the Educational Classifications listed in Table 4.5:

Population	ED	MH	PI/NI	REG
TOTAL	80	19	8	6
ADHD	36	11	1	0
HOSP	22	5	6	6
HOSP/ADHD	7	3	0	0
RES	58	14	2	0
RES/ADHD	29	8	1	0

Table 4.5

The Total Population correlation's were calculated to a .01 significance level. The first correlation compared ADHD and Educational Classification as per the above Table 4.5. This ranked correlation was found to be .985 with a standard error of measurement of +/- 3.67. The Total Population sample was then measured for correlation of ADHD and Diagnosis with a ranked correlation of .854 and standard error of measurement of +/- 9.66. This high variance may be secondary to the weakened internal consistency of the total population sample mentioned above. These rates of diagnosis were taken from Table 4.1.

Before leaving the comparisons of rates of occurrence, another method of demonstrating significance was supported by these statistically significant hypothesis tests and correlation's. The rates of occurrence of diagnoses in the total population was compared with the rates of occurrence of diagnoses in the ADHD population. The same calculations were made for the Hospital and Residential populations as in Figure 4.1.

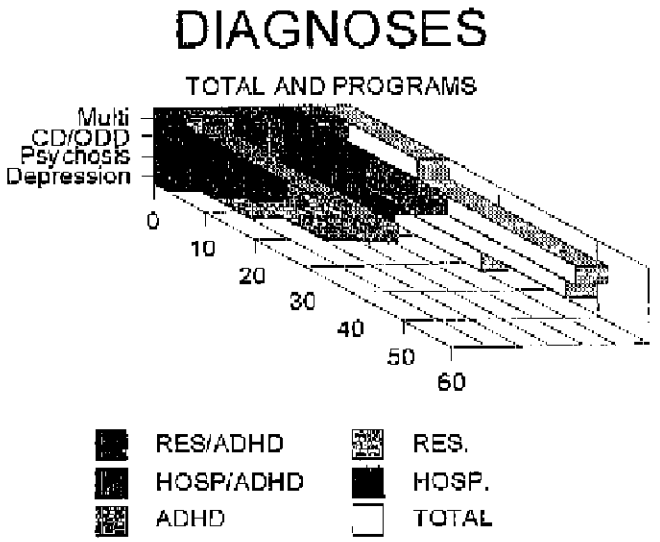

Figure 4.1.

Further, the rates of occurrence of specific Learning Disabilities (LD) as per State of New Jersey Educational Classifications of Emotionally Disturbed (ED), Multiply Handicapped (MH), and Perceptually Impaired (PI) or Neurologically Impaired (NI). Regular Education (REG) comprises those students who had not been educationally classified at the time of the study. It should be noted that of the n=6 students in this group, five have since been referred for educational evaluation and four have since been classified educationally as per NJAC 6:28. The results of these comparisons can be found in Table 4.2.

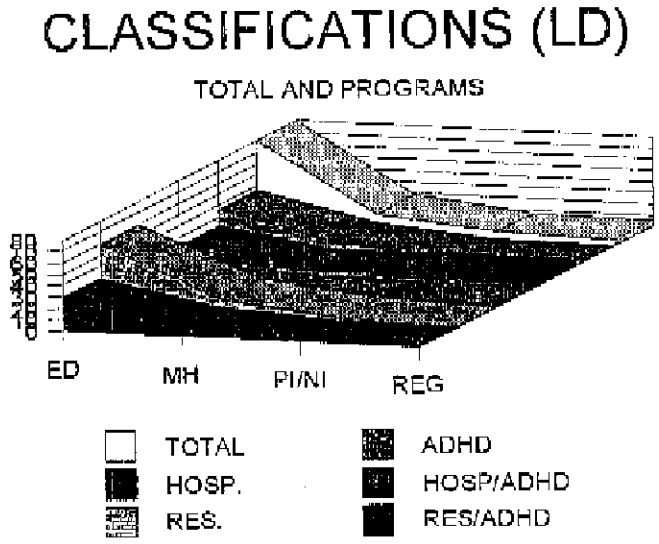

Figure 4.2.

STATEMENTS OF SIGNIFICANCE:

The results of the current research in relation to Hypothesis I above support rejection of the null hypothesis of an equal or similar incidence of co-morbidity and support the theory that the incidence of co-morbidity of ADHD and Classification among the in-patient adolescents and pre-adolescents is significantly higher than the incidence among more diverse population groups. These results were to reject the null hypothesis with a 99% level of confidence and significant hypothesis Z-test of two population proportions were found for the total population sample and both sub-groups.

Regarding Hypothesis II, the current research failed to support the null hypothesis that there was no statistically significant correlation between ADHD and Classification in the study population and found a significantly strong correlation which supported the hypothesis. The ranked correlation between ADHD and Educational Classification was found to be r=.985 for the Total Population sample with a 99% level of confidence.

Similarly, hypothesis III was strongly supported by a statistically significant correlation between ADHD, Classification and other behavioral problems as corroborated by the co-morbidity of ADHD and psychiatric diagnosis. Here the correlation between ADHD and Classification and Diagnosis (Other Behavioral Disorder) was found to be r=.854 with a 99% level of confidence using a ranked correlation.

All of the null hypotheses were rejected as per the results and statistical testing procedures outlined above. These results were found to be consistent in comparisons of the study population as a whole as well as in comparisons of the study populations as two discrete groups defined as Hospital and Residential in the above charts. Statistical tests of these sub-groups similarly failed to support the null hypotheses and yielded significant correlation's between ADHD and Classification. The sub-group populations were not large enough to test for correlation between ADHD, Classification and other behavioral problem with any statistical strength.

SUMMARY:

In Chapter II, the literature was researched to identify rates of incidence of comorbidity of ADHD and classifiable educational disabilities in diverse populations of adolescents and pre-adolescents living in a variety of settings, community, residential, restrictive and unstructured. Two studies, Andersen et. al. (1985) and Bird et. al. (1988) were used as a control group(defined as the independent variable) which was compared to the Hospitalized and Residential populations (defined as the dependent variables). The incidence rate of comorbidity of ADHD and educational classification in the discrete hospitalized population of adolescents were measured via *ex post facto* records review.

Incidence rates were computed as was correlation between ADHD and educational classification. Correlation between the identified population of in-patient adolescents and pre-adolescents with ADHD + educational classification and notations of acting out behavioral problems, such as delinquency and conduct disorder, were computed and compared with the above stated hypotheses. All of the studies' null hypotheses were rejected and the stated hypotheses were supported with a 99% level of confidence.

CHAPTER V: SUMMARY AND CONCLUSIONS

ABSTRACT:

This thesis is an *ex post facto* study of an in-patient population of 39 adolescents between the ages of twelve and eighteen at a New Jersey State Psychiatric Hospital for Adolescents and 74 pre-adolescents and adolescents between the ages of seven and fifteen at a Private Residential School in New Jersey . Of this population of N=113, n=48 were determined to have Attention Deficit Hyperactivity Disorder (ADHD) with an incidence rate of 42.5%. Significant co-morbidity of ADHD and Depression, Conduct Disorder/Oppositional Defiant Disorder, Psychotic Disorders, and Learning Disabilities were found. The incidence of co-morbidity of ADHD and Educational Classification was found to be significantly higher than the incidence researched among more diverse population groups as represented by the New Zealand (Anderson et. al., 1985) and Puerto Rico (Bird et. al., 1988) large population surveys. The ranked correlation's between ADHD and Educational Classification was found to be $r=.985$ ($P \geq .01$), and between ADHD, Classification

and Other Behavioral Disorders was found to be r=.854 (P≥ .01). This procedure supports the premise of utilizing Child Study Teams to provide data to plan globally and programmatically as well as to prepare individual education plans.

CONCLUSIONS:

In the total population studied, N=113 aged from 7 years, 1 month to 17 years, 7 months, presented with the following proportions of psychiatric diagnoses as defined in Chapter One: 42.50% with ADHD; 29.20% with Depression; 44.20% with Psychosis; 46% with CD/ODD; and 94.70% classified educationally. As the above numbers would show, 17.70% presented with multiple diagnoses. Of those students diagnosed with ADHD (42.50% of the total populations) 14.60% presented with comorbid Depression, 39.60% had comorbid Psychosis, 54.20% had comorbid CD/ODD and 100.00% had educational classifications. The rate of multiple diagnoses other than the comorbid ADHD was 12.50% of this group.

These rates were found to be significantly higher for the study population than for the general populations of the control groups defined by Andersen et. al. (1985) and Bird et. al. (1988). The hypothesis test against the Andersen study shows a test z of 11.30 with a critical z of 2.33 showing significance with a 99% level of confidence. The hypothesis test against the Bird study was similarly significant with a test z of 10.98 and a critical z of 2.33, again showing significance with a 99% level of confidence. A hypothesis test of internal consistency between the two pools of subjects comprising the study population at both a New Jersey State Psychiatric

Hospital for Adolescents as well as the Private Residential School for Boys in New Jersey was not significant implying that the two populations were the same showed significant variance at both the 95% and 99% level of confidence. These tests were not conclusive within the full range of confidence interval limits but were significant enough to warrant study of both populations as individual groups.

The Hospital population was a mixed sex group of 17 males and 22 females. This population of N=39 ranged in age from 12 years, 0 months to 17 years, 7 months and presented with the following proportions of psychiatric diagnoses: 25.60% with ADHD; 51.30% with Depression; 56.40% with Psychosis; 41.00% with CD/ODD and 84.60% with educational classifications. There was an overlap of multiple diagnoses in 43.50% of these cases. Of the ADHD subgroup (n=10), 40.00% had comorbid Depression, 70.00% percent had comorbid Psychosis, 60.00% had comorbid CD/ODD and 100.00% were classified educationally. The rate of multiple diagnoses other than the comorbid ADHD was 60.00% of this group. Although the hypothesis tests for this group were significant to a 99% confidence level in comparison to both the Andersen et. al. (1985) and Bird et. al. (1988) studies, the test z was much closer to the critical z than in the total population. Compared to the Andersen study, the test z was 4.36 and the critical z was 2.33 and the Bird study comparisons showed a test z of 3.77 and a critical z of 2.33.

The Residential population was an all male group of N=74 ranged in age from 7 years, 1 month to 15 years, 1 month and presented with the following proportions of psychiatric diagnoses: 51.40% with ADHD; 17.60% with Depression; 37.80% with

Psychosis; 48.60% with CD/ODD and 100.00% with educational classifications. There was an overlap of multiple diagnoses in only 4.10% of these cases. Of the ADHD subgroup (n=38), only 7.90% had comorbid Depression, 31.60% percent had comorbid Psychosis, 52.60% had comorbid CD/ODD and 100.00% were classified educationally. There was no incidence of multiple diagnoses other than the comorbid ADHD among this group. The hypothesis tests for this group were significant to a 99% confidence level in comparison to both the Andersen et. al. (1985) and Bird et. al. (1988) studies, and strongly influenced the total population scores. Viz., compared to the Andersen study, the test z was 11.98 and the critical z was 2.33 and the Bird study comparisons showed a test z of 11.57 and a critical z of 2.33.

Hypothesis testing for correlation's involved ranked correlation tests. It was felt that non-parametric statistics were appropriate to the study of population proportions and ranked diagnoses. The ranked correlation's between ADHD and Educational Classification was found to be r=.985 ($P \geq .01$), and between ADHD, Classification and Other Behavioral Disorders was found to be r=.854 ($P \geq .01$). The tested conditions yielded very high correlation's due to reasons to be considered during the discussion of the above results.

DISCUSSION:

The current studies' findings have been strongly supportive of the existence of significant comorbid groups among the study population. The incidence rates of comorbid ADHD and CD/ODD, ADHD and Depression, as well as ADHD and Psychosis. These findings will best be reviewed in individual sub-groups despite some overlap of diagnosis.

The incidence of ADHD and Learning Disability as defined by Educational Classification was very large with a correlation (r=.985, $P \geq .01$) approaching 1.0! This near-perfect correlation may be due to the admission criteria for the most restrictive educational settings represented by the Hospital and Residential programs via the CART and Class "B" hospitalization procedures. It further demonstrates the degree to which this comorbid population remains significantly "at risk" for negative academic outcomes and requires educational interventions supporting the findings of Moffitt (1990) and Frick et. al. (1991), and for special education placement as per Barkley (1990). These rates were similar to the New Zealand study's rate of 80% comorbidity of ADHD and LD conditions (Andersen et. al., 1987).

The rate of comorbidity of CD/ODD and ADHD in the study population was 54.20%. The individual sub-groups of Residential (52.60%) and Hospital (60.00%) populations were fairly consistent with the total population rate. These rates were significantly higher than the Andersen et. al. (1985) and Bird et. al. (1988) population

studies. As far as other studies of smaller, but equally heterogeneous populations in terms of educational and residential environments: Frick et. al. (1991) found a comorbidity rate of 26.7% with CD and ADHD among clinically referred boys; Biederman et. al. (1987) found a rate of 64% comorbidity of CD/ODD and ADHD; and Szatzmari et.al. (1989) found a diagnostic overlap of 40%. Barkley (1990) found an incidence rate of 40% for ADHD with comorbid ODD and a rate of 21% for comorbid ADHD with CD.

Comparisons with the present study results are difficult because the grouping included both CD and ODD as one diagnostic category as per Biederman et. al. (1991), Barkley (1990) and Hinshaw (1987), therefore skewing the results towards a higher incidence rate. However, these rates would seem to be comparable with the above named studies as per Abikoff and Klein (1992) where rates of comorbidity between CD/ODD and previously diagnosed ADHD were found to range from 20% to 60%. The present study, representing an in-patient, and therefore more significantly impacted population, would be expected to fall into the high end of that range.

There were less study groups of comorbid ADHD and Depression. In the current study population, the rate of comorbidity was only 6.20%. The Hospital population sub-group had a comorbidity rate of 10.30% and while the Residential population only presented with 4.10%. In the Biederman et. al. (1990) study of n=73 probands with ADHD, he found a 33% rate of comorbid mood disorder. The rate found in the Bird et. al. (1988) study was also higher, at 17% comorbidity between

affective disorders and ADHD. It would be difficult to speculate at this time whether these discrepancies are due to differences in definitions between Depressive and Affective Disorders or if the behaviors necessary for a CART residential or Class "B" commitment would preclude certain types of vegetative and phobic/anxiety disorders which were included in the Bird and Biederman studies.

Prior study rates of ADHD comorbid with Psychotic Disorders were subsumed by the study group of multiply diagnosed. Although there was an incidence of multiple diagnoses of 17.70% in the total population, this can be explained by the comorbidity of ADHD and other diagnoses, or of multiple diagnoses in the non-ADHD population. The rate of multiple diagnoses plus ADHD was only 5.30%. The incidence of multiple diagnoses plus ADHD did not show Multiplex Developmental Disorder to be significant to this population at the time of the study as hypothesized by Barkley (1990). It was interesting to note an absence of MDD population among the ADHD group in the Private Residential School as this would be a population considered "at risk" for MDD features. This apparent absence of MDD may be due to differences in diagnostic approaches since pre-existing medical records were used in this study rather than any standard testing battery.

Certain outliers bear mentioning at this juncture. There were six unclassified students at the Hospital program. Of these, four were subsequently classified as Emotionally Disturbed. Further, there were eight students at the Residential program and two at the Hospital program who were diagnosed with developmental delays of various types, six with mental retardation, severe reading delays or borderline

intellectual ability. This population would represent an area for future, more in-depth research involving educationally handicapping conditions in in-patient settings and may in fact comprise the missing MDD population. Another outlier is the single student in the study who was diagnosed with ADHD without psychiatric comorbidity. He was placed at the Hospital program and presented with ADHD, Educational Classification and Tourette's syndrome and presents with such a severe degree of hyperactivity, impulsivity and behavioral symptomology that his history includes three prior long-term in-patient hospitalizations.

The final important comparison is between the current study and the in-patient study cohorts studied by Epstein et. al. (1991) and Woolston et. al.(1988). The Epstein study was more concerned with agreement of diagnostic techniques than incidence rates. Also, there was a very small cohort and little difference in results between the in-patient cohort and other populations of the study. Woolston, however, found a comorbidity rate of 51% between behavioral and affective diagnoses among the two in-patient populations studied. Similarly to the present study, Woolston et. al. (1988) concluded:

The adaptive functioning patterns for both of these groups of psychiatrically hospitalized children indicated that they demonstrated significantly poorer socialization than communication skills; poorer expressive versus written communication skills; and tended to exhibit poorer coping skills than play and leisure skills. In other words, in addition to globally delayed adaptive behavior, both groups of children have particular difficulties expressing themselves and coping with difficult social situations (p. 712).

The implications of the above quoted research for child study services are obvious. The current research procedure supports the premise of utilizing Child Study Teams to provide data to plan globally and programmatically as well as to prepare individual education plans. In analyzing the above mentioned comorbidity rates, the following programmatic interventions would be supported.

For the New Jersey State Hospital for Adolescents, with an ADHD population of approximately 25% (n=10), plans should include one to two classrooms with teachers who have been specially trained in ADHD issues and interventions. Resources such at the LRC annotated subject report on Attention Deficit Disorders (1994) should be available and related high school worksheets and check lists should be employed in every subject area. Simply knowing the rate of comorbid ADHD for this facility would not be sufficient. Monitoring the teaching staff for the effects of

stresses particular to daily interactions with these populations would be supported by Biederman et. al. (1991) and Biederman et. al. (1992).

The Private Residential School has more issues regarding comorbid ADHD and a significantly higher rate of comorbidity of approximately 50%. If the research had counted specific behaviors related to ADHD in the areas of impulsivity, distractibility and hyperactivity, there may have been an even greater incidence noted. For this program, it is recommended that all teachers be trained in classroom interventions effective with a comorbid ADHD population. Resources such as the "Prevention, Teaching and Responding" best practices manual (Hamilton, et. al., 1994) should be consulted regularly in advance of curricular decisions and in preparing lesson plans in light of the population configuration.

IMPLICATIONS FOR FUTURE RESEARCH:

ADHD and comorbidity should be studied further. This was a common theme in all of the research studies mentioned above. One of the biggest problems in establishing rates of occurrence was the diagnostic overlap between behaviors related to ADHD and behaviors related to commonly comorbid conditions such as Conduct Disorder, Oppositional Defiant Disorder, Depressive Disorders, and Psychoses. Specific Learning Disabilities may promote the development of ADHD like behaviors as a response to the emotional stresses of being in the classroom over time. The

issue of "masking" of symptoms between ADHD and other affective disorders has not been thoroughly addressed by the research community although it seems to have gone out of fashion as an explanation of behavioral syndromes since the early 1980's.

Further study of the differences between in-patient and out-patient comorbid populations would be strongly indicated by the above research review. Studies of the effect of behavioral interventions upon specific restrictive setting classrooms is also indicated as the above study comprised a needs analysis, not an intervention strategy. A repeat of the above study with independently applied batteries of diagnostic tests and procedures rather than acceptance of prior diagnoses would be useful to corroborate the findings in a more scientifically stringent manner.

The current research did not suggest any explanation for the discrepancy in rates of comorbid ADHD between the predominantly adolescent Hospital population and the mixed adolescent and pre-adolescent Residential population. It may be speculated that some of the reduction of incidence from 51.41% to 25.60% respectively may be a function of age. Barkley (1990) and other researchers have mentioned a cut-off in effectiveness of methyphenidate at approximately the age of 13 for some of the population previously diagnosed with ADHD (40%). These findings suggest further research in this area. Another subject for further research is whether or not the behavioral symptoms of ADHD may have been "masked" or overshadowed by more dangerous behaviors such as suicidal, homicidal, aggressive acting out or self-mutilating behaviors which led to the Psychiatric commitment.

Further refinement of our definition of Multiplex Developmental Disorder as it occurs among in-patient populations is also indicated.

Knowledge of their specific population configurations has been demonstrated to have significance for both of the above programs with the potential to effect every aspect of educational planning. As this high degree of program-specific data was gathered and processed in an *ex post facto* study, it strongly supports the suitability of child study teams as a resource for similar population studies. In terms of best practice, the creation of local population constructs to increase the validity of test protocols is recommended by Anastasi (1988) in a number of validation contexts. These population profiles should be considered more frequently as appropriate uses for Child Study Team practitioners.

The National Agenda for Achieving Better Results For Children and Youth With Serious Emotional Disturbance (1990) is being considered for national implementation as part of the Goals 2000 initiative. The following are seven interdependent strategic targets for the initiative (1990, p. 21):

- *Strengthen School and Community Capacity*
- *Value and Address Diversity*
- *Collaborate With Families*
- *Promote Appropriate Assessment*
- *Provide Ongoing Skill Development and Support*
- *Create Comprehensive and Collaborative Systems*

The type of research demonstrated by this thesis will be essential to target the appropriate interventions directed to the above goals as well as to provide baselines and intermediate measures of progress targeted to the specific in-patient populations and should be encouraged.

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INDEX OF TABLES AND FIGURES

APPENDIX A

FIGURES

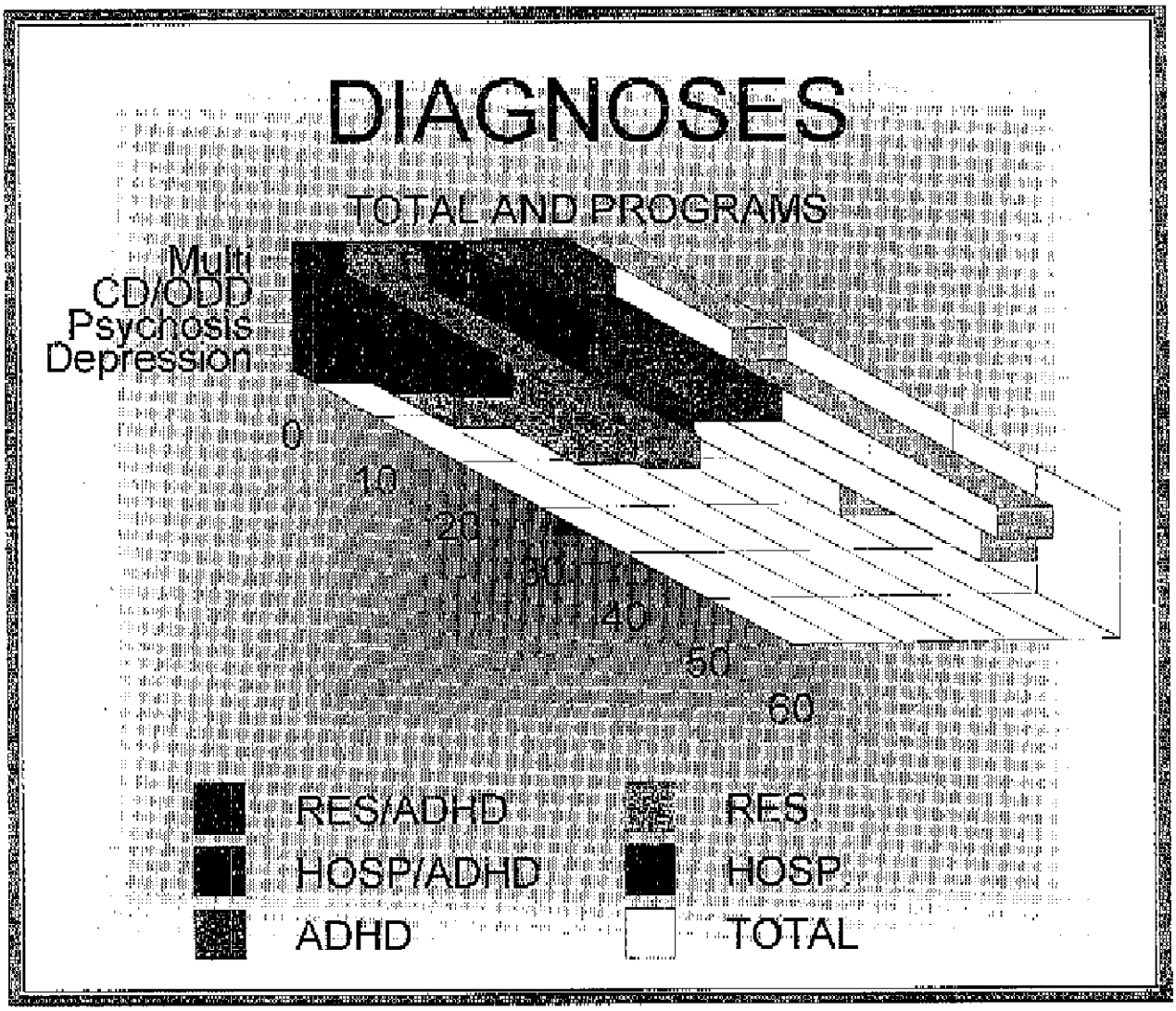

DIAGNOSES
TOTAL AND PROGRAMS
Multi
CD/ODD
Psychosis
Depression
0
10
20
30
40
50
60
RES/ADHD
HOSP/ADHD
ADHD
RES
HOSP
TOTAL

Figure 4.1.

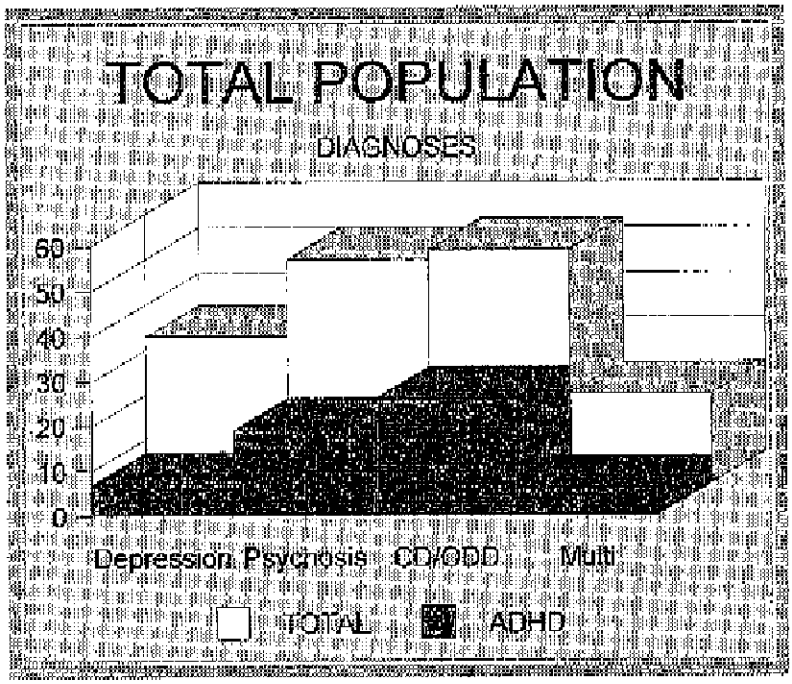


Figure 4.1A

Figure 4.1B

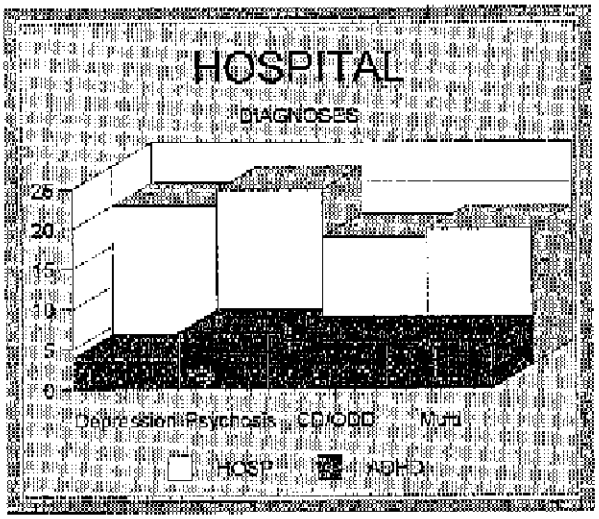
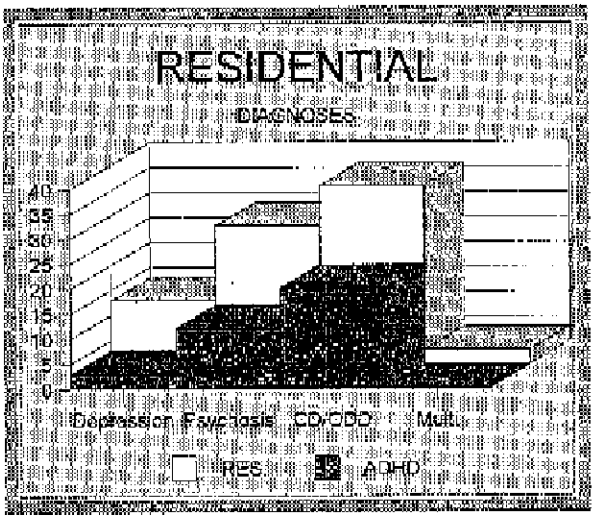


Figure 4.1C



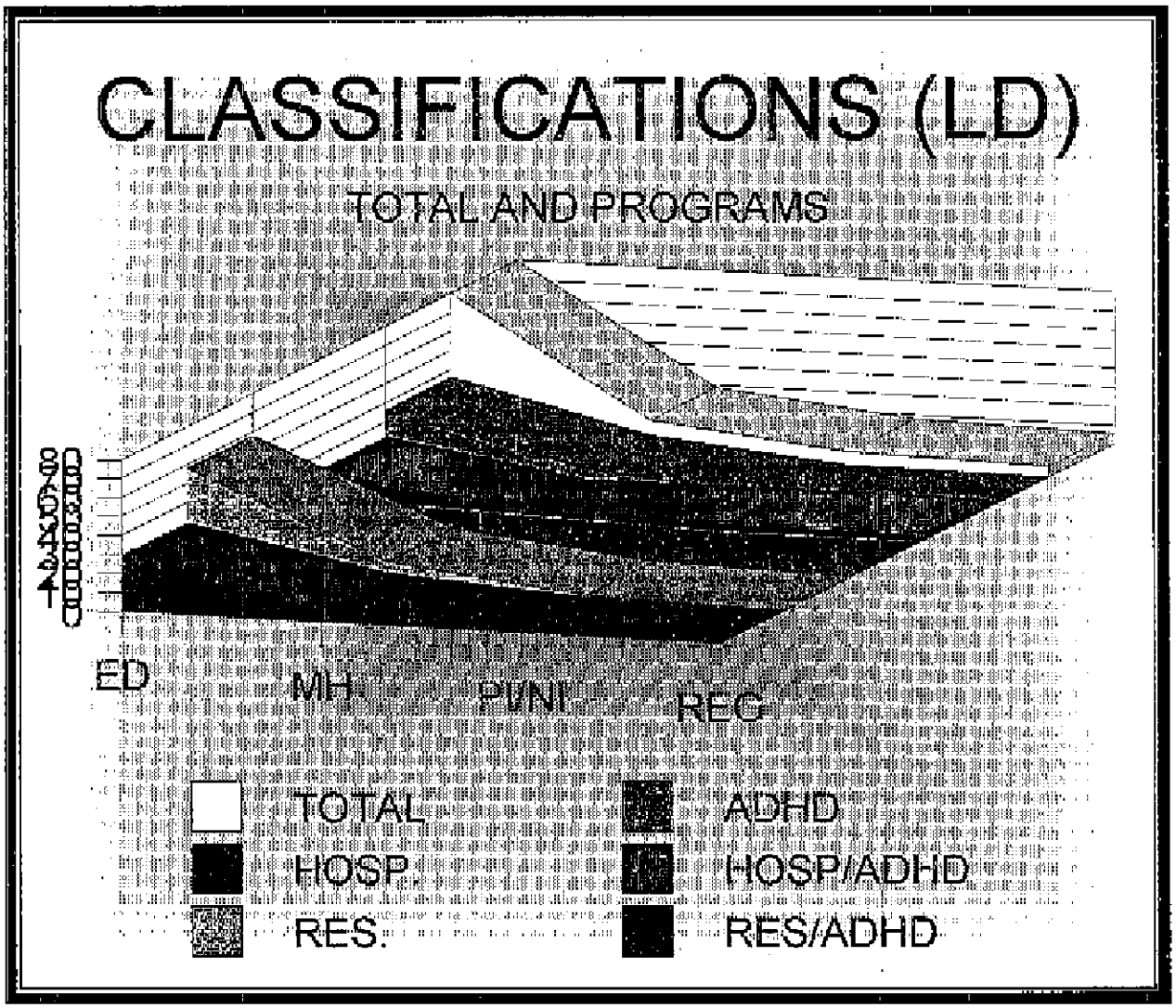

CLASSIFICATIONS (LD)
TOTAL AND PROGRAMS
ED
MH
PVNF
REG
TOTAL
HOSP.
RES.
ADHD
HOSP/ADHD
RES/ADHD

Figure 4.2.

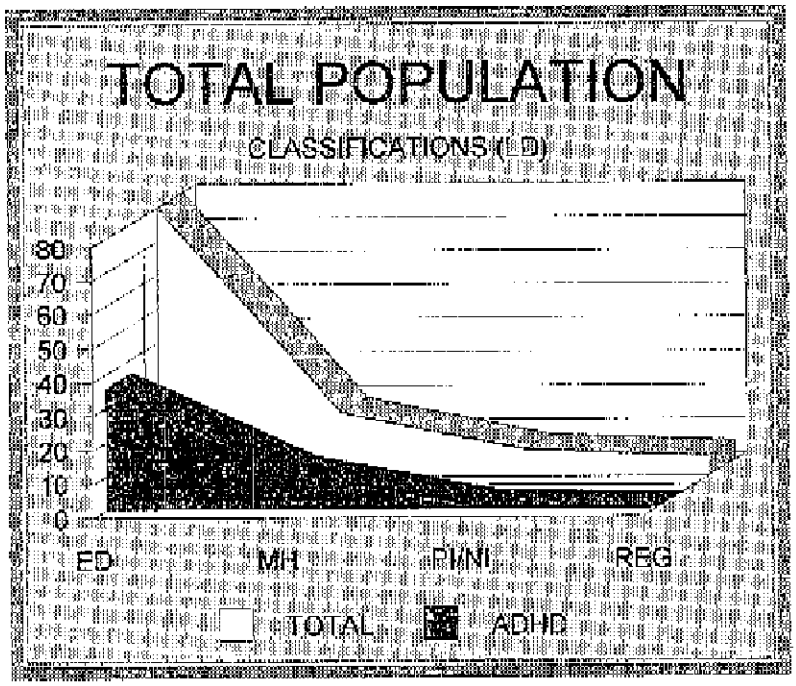


Figure 4.2A

Figure 4.2B

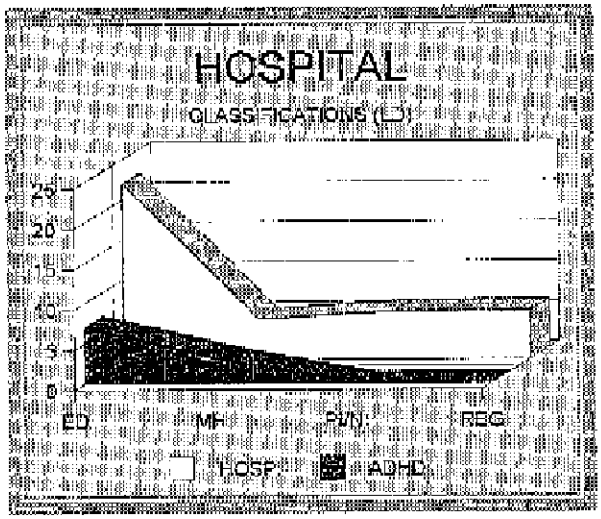
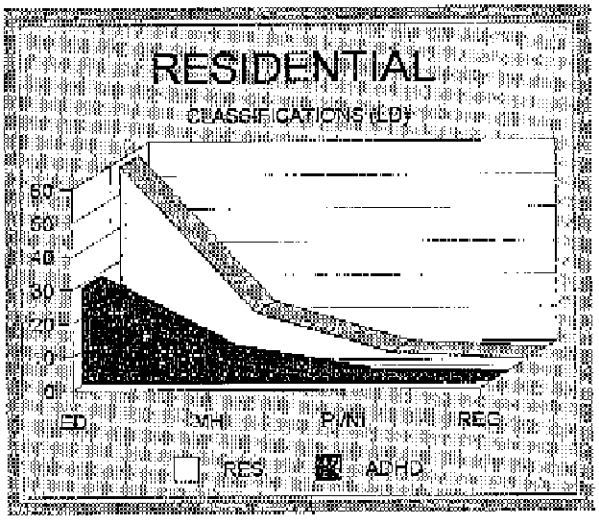


Figure 4.2C



APPENDIX B

DATA

CASE	AXIS IA	AXIS IB	AXIS IC	AXIS IIA	AXIS IIB	ADHD	CLASSI	SCHOOL
1001	312.90	317.00		315.31		NO	MH	RES
1005	309.40					NO	ED	RES
1008	298.90					NO	ED	RES
1010	313.81			301.70		NO	ED	RES
1013	298.90					NO	ED/PI	RES
1014	298.90					NO	ED	RES
1015	312.34	300.40				NO	ED	RES
1016	312.90					NO	ED	RES
1021	298.90					NO	ED	RES
1028	296.70					NO	MH	RES
1030	300.40		309.40			NO	ED	RES
1033	312.90	301.70		315.90		NO	ED	RES
1034	312.90	312.33		311.00		NO	ED	RES
1035	309.40					NO	ED	RES
1036	298.90					NO	ED	RES
1039	313.81			315.90		NO	PI	RES
1043	313.81					NO	MH	RES
1044	313.81					NO	ED	RES
1045	298.90					NO	ED	RES
1046	309.40			317.00		NO	ED/EMR	RES
1047	312.90					NO	ED	RES
1048	296.34					NO	ED	RES
1052	312.90			315.39		NO	ED	RES
1054	313.81					NO	ED	RES
1059	295.95					NO	MH	RES
1062	298.90					NO	ED	RES
1063	296.30					NO	ED	RES
1064	298.90			V71.02		NO	ED	RES
1065	309.40			315.90		NO	ED	RES
1066	313.81					NO	ED	RES
1068	312.90			V71.02		NO	ED	RES
1070	312.90			V71.02		NO	ED	RES
1071	300.40					NO	ED	RES
1072	298.90					NO	ED	RES
1073	312.90			V71.02	315.90	NO	ED	RES
1074	298.90					NO	ED	RES
3036	296.70			301.83		NO	ED	HOSP
3081	309.89	312.39		301.83		NO	PI	HOSP
3091	298.90	305.90	311.00			NO	ED	HOSP
3127	312.39	300.40	309.89	301.90		NO	NI	HOSP
3134	296.34					NO	ED	HOSP
3145	295.40					NO	ED	HOSP
3146	296.70					NO	ED	HOSP
3149	298.90	305.90				NO	ED	HOSP
3150	311.00	312.39		312.90		NO	OD/PI	HOSP
3151	309.89	298.90		315.90		NO	PI	HOSP
3156	298.90	295.95				NO	PI	HOSP

CASE	AXIS IA	AXIS IB	AXIS IC	AXIS IIA	AXIS IIB	ADHD	CLASSI	SCHOOL
3157	295.40					NO	ED	HOSP
3158	311.00			301.84		NO	ED	HOSP
3159	296.34			301.83		NO	REG	HOSP
3161	295.70					NO	ED	HOSP
3162	312.34	300.02	312.39			NO	ED	HOSP
3163	309.89			301.20		NO	PI	HOSP
3164	298.90	296.70	309.89	301.22		NO	ED	HOSP
3165	296.70	312.90		305.90		NO	REG	HOSP
3166	312.39	311.00		301.83		NO	ED/PI	HOSP
3168	309.89					NO	REG	HOSP
3169	296.30			301.83		NO	REG	HOSP
3170	309.89	311.00		301.83		NO	ED	HOSP
3171	311.00	312.39				NO	ED	HOSP
3172	309.89			301.83		NO	REG	HOSP
3175	309.89	315.90				NO	REG	HOSP
3176	312.34	310.10		317.00		NO	ED	HOSP
3177	312.39	300.40		317.00		NO	NI	HOSP
3178	312.34	296.70		315.90		NO	ED	HOSP
1002	314.01					YES	MH	RES
1003	314.01			313.81		YES	ED	RES
1004	312.90			V71.02		YES	ED	RES
1006	314.01	312.90		313.81		YES	MH	RES
1007	314.01			313.81		YES	MH	RES
1009	314.01	312.34		315.90		YES	ED	RES
1011	314.01			313.81		YES	ED	RES
1012	314.01			312.90		YES	ED	RES
1017	314.01			312.90		YES	ED	RES
1018	314.01			312.90		YES	ED	RES
1019	314.01	312.90		315.90		YES	ED	RES
1020	312.90	314.01		V71.02		YES	ED	RES
1022	314.01	313.81		315.31		YES	MH	RES
1023	314.01					YES	ED/NI	RES
1024	314.01	309.40				YES	ED	RES
1025	312.90	314.01		V71.02		YES	ED	RES
1026	314.01			315.90		YES	ED	RES
1027	296.70			314.01		YES	ED	RES
1029	314.01			309.40		YES	ED	RES
1031	314.01			298.90		YES	ED	RES
1032	314.01			313.81		YES	ED	RES
1037	298.90	314.01		315.90	315.31	YES	NI	RES
1038	314.01	298.90				YES	ED	RES
1040	296.70			314.01		YES	ED	RES
1041	314.01			313.81		YES	ED	RES
1042	314.01	298.90				YES	MH	RES
1049	314.01			298.90		YES	ED	RES
1050	314.01			309.40		YES	ED	RES
1051	314.01			313.81		YES	ED	RES

CASE	AXIS 1A	AXIS 1B	AXIS 1C	AXIS 11A	AXIS 11B	ADHD	CLASSI	SCHOOL
1053	314.01	298.90		315.90		YES	MH	RES
1055	314.01			309.89		YES	ED	RES
1056	314.01			312.90		YES	ED	RES
1057	314.01			312.34		YES	ED	RES
1058	314.01			300.40		YES	ED	RES
1060	314.01					YES	ED	RES
1061	314.01			309.40		YES	MH	RES
1067	314.01			313.81		YES	ED	RES
1069	314.01			312.90		YES	ED	RES
3063	310.10	298.90		301.83		YES	ED	HOSP
3123	309.89	312.39		315.90		YES	ED	HOSP
3124	298.90	312.90		314.01		YES	PI/ED	HOSP
3132	314.01	312.34	309.89			YES	ED	HOSP
3133	313.81	309.89	311.00	314.01		YES	ED	HOSP
3136	314.01	310.10	298.90	315.90	305.00	YES	ED	HOSP
3160	312.34	311.00	314.01	315.90		YES	ED	HOSP
3167	296.30	312.39	309.89	315.90		YES	PI/ED	HOSP
3174	296.70	314.01		315.90		YES	ED	HOSP
3179	304.80	307.23		314.01		YES	PI/ED	ABCTC