A Population-Based Analysis of Behavior Problems in Children with Cerebral Palsy

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Used the National Health Interview Survey, Child Health Supplement for 1987 and 1988, to analyze parent-reported behavior problems of children, ages 4-17 years, with cerebral palsy (n = 47), with mental retardation (n = 50), with other chronic conditions (n = 6,038), and with no known health problem (n = 5,930), using the Behavior Problem Index (developed by Zill & Peterson). Behaviors with scores greater than the 90th percentile of the entire sample were considered problem behaviors. Parent-reported behavior problems were 5 times more likely in children with cerebral palsy (25.5%) compared with children having no known health problem (5.4%). The adjusted odds ratio for behavior problems of children with cerebral palsy without mental retardation was 4.9 and of children with mental retardation without cerebral palsy was 7.9. Specific behaviors that were most problematic for children with cerebral palsy were identified as dependency, headstrong, and hyperactive.

KEY WORDS: behavior problems; cerebral palsy; mental retardation.

This analysis uses an epidemiological approach to assess the association between behavior problems and cerebral palsy (CP) in children. Epidemiology is the study of diseases in populations rather than in individuals. To assess the impact of cerebral palsy on the population, we analyzed the association between cerebral

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palsy and behavior problems using a national data source. Drotar (1994) addressed the issue of limited generalizability when clinic-based studies are used to study pediatric patients. Bias occurs because researchers miss eligible children and families who live within the catchment area but do not get included in the study. This population-based analysis, of a nationally representative sample of American children, provides data to address Drotar's criticism of past clinic-based studies.

The term cerebral palsy refers to a nonprogressive motor disorder, with resultant tonal and/or movement abnormalities and frequently associated disabilities, that follows damage to an immature brain. Overall, CP prevalence by early school age is approximately 1.2–2.3/1,000 children (Cowan, Leviton, & Nelson, 1992; Nelson, 1989). Recent analysis indicates the prevalence has increased in the United States by 20% during the period 1960–1986 (Bhushan, Paneth, & Kiely, 1993). This increase is believed to be based on the increased survival of very low birth weight infants (Taft & Matthews, 1992). However, these authors still estimate a prevalence of 2.3/1,000 live births, which is in keeping with the Metropolitan Atlanta Developmental Disabilities Study of school age children (Yeargin-Allsop et al., 1992).

Epidemiological studies of CP have been widely published and reviewed during the past 10 years. The majority of these studies have addressed risk factors for development of CP (Stanley, 1984; Stanley & Blair, 1994). Little epidemiological research has explored the question of whether, and to what degree, children with CP experience behavior problems. Behavior problems are commonly reported by parents of children with disabilities, as well as by their physicians and educators. We chose to address this question using a large (N = 23,586) nationally representative survey, the 1981 and 1988 National Health Interview Survey (NHIS) Child Health Supplement. This data set is particularly appropriate to address the question of behavior problems in children with CP compared to those without CP as these data include children based on their parent's address and not dependent on whether they attend a specific clinic. The parents were asked a range of questions, including their child's health status (chronic and acute health problems) and their report of behavior problems. The focus of this ongoing national survey supplement is to estimate the prevalence of health problems in children.

Selection bias may be a problem with clinical studies in which subjects with CP are selected as cases and those without CP are sampled from another clinic (presumably with another health problem). Those included as CP cases, who attend clinics, may have more significant health problems either associated with CP or with other comorbidities, than do children with CP who do not regularly attend clinics. Selection bias may also affect a comparison group of children without CP sampled from other clinics. These children may have other health problems that may result in an increased probability that they may develop
behavior problems. This inappropriate comparison may result in underestimating the true association between CP and behavior problems. By using the NHIS Child Health Supplement we eliminate this bias by including children sampled from their communities and not from clinics.

**Theoretical Framework for Hypotheses**

Our analysis of a national data set focuses on the occurrence of behavior problems in children with CP. We believe the presence of a physical disability is compounded by social and emotional challenges. The causal pathway for the development of emotional and behavior problems is not clear. It is possible that emotional problems are the inevitable comorbidities of specific conditions of childhood. It is also possible that some of the behavior problems are preventable. To establish whether the behavior problems are preventable we must first determine if children with specific chronic health conditions have different behavior problems or different magnitudes of these problems. With this understanding we will be able to design prevention interventions.

There is a notable progression in the magnitude of the association between behavior problems and health conditions as we move from episodic to chronic and from non-central nervous system (CNS) to CNS-involved conditions. For over 20 years researchers have reported a positive association of childhood chronic conditions and behavior problems (Breslau, 1985; Breslau & Marshall, 1985; Cadman, Boyle, Szatamari, & Offord, 1987; Pless & Roghmann, 1971). Researchers have reported stress, anxiety, and limited contacts with peers, related to childhood diabetes, rheumatic disease, cystic fibrosis, diabetes, sickle cell anemia, and asthma (Billings, Moos, Miller, & Gottlieb, 1987; Daniels, Moos, Billings, & Miller, 1987; Noll, Bukowski, Rogosch, LeRoy, & Kulkarni, 1990; Steinhausen, 1988; Varni, Bebani, Banis, & Wilcox, 1988; Wicks-Nelson & Isreal, 1991). Wallander et al. (1988) used maternal reports on the Child Behavior Checklist and found that children with chronic physical disorders had more behavior problems than control children although the magnitude of their behavior problems was not very severe. It appears that emotional adjustment is associated with the severity of the condition and the degree of functional limitations experienced by the child (Billings et al., 1987; Fowler, Johnson, & Atkinson, 1985). Gortmaker, Walker, Weitzman, and Sobol (1990) analyzed the 1981 NHIS Child Health Supplement to assess the effect of chronic conditions and socioeconomic factors on behavior problems in children, ages 4–17 years. Their results indicate that "rates of extreme behavior problem scores (those in the top 10th percentile) were 1.55 times higher among children with a chronic health condition compared to children without a chronic health condition (95% confidence interval of 1.29 to 1.86).” This result suggests that chronic conditions are a risk factor for behavior problems independent of socioeconomic factors.
The literature on chronic conditions in children also includes studies of children with CNS conditions. Cadman et al. (1987) compared social and school adjustment of children with chronic illness alone to children with chronic illness and disability. The latter group, which included children with CNS impairments, had more significant problems. Similar results were reported by Howe, Feinstein, Reiss, Molock, and Berger (1993). They found that children with chronic illness without CNS involvement were more like the comparison children than children with CNS conditions. Likewise, Weiland, Pless, and Roghmann (1992) found that primary care providers were significantly more likely to report that children with serious conditions involving the CNS had behavior problems whereas those without CNS involvement were not reported to be significantly different from normal children. These studies indicate that children with a disability involving the CNS are at increased risk for behavior problems compared to children with other types of chronic conditions.

Since CP is a subset of chronic CNS conditions we reviewed the literature to determine if there are reports on the severity of the problem or specific behavioral domains affecting children with CP. The prevalence of behavioral problems in children with CP and the nature of these problems have been reviewed by a number of researchers. The prevalence of disturbed behaviors or emotional maladaptations in different groups of children with CP have been reported to be from 30–80% (Denhoff & Holden, 1954; Graham & Rutter, 1968b; Hourcade & Parette, 1984; McDonald, 1987; Rosenbloom, 1971; Storrow & Jones, 1960). The stability of behavior problems over time was described by Breslau and Marshall (1985) in a 5-year study of 255 children with physical disabilities. They found that mental retardation problems (items related to short-term memory and school performance) and isolation were consistent and significant problems for the 82 children with cerebral palsy. In school-age children with CP, other researchers have found behavioral problems including passivity, immaturity, and anxiety (Graham & Rutter, 1968b; Haslett, 1978; Hourcade & Parette, 1984; Rosenbloom, 1971). Based on the literature and our clinical experience we anticipated that issues related to isolation and dependency could be problematic for children with CP (Blum, Resnick, Nelson, & St. Germaine, 1991; Breslau, 1983; Hirst, 1989; Livneh & Antonak, 1994).

In addition, we felt it was important to analyze the independent association of mental retardation (MR) and CP and behavior problems as well as the combined effect. Murphy, Yeargin-Allsopp, Decoufle, and Drews (1993) analyzed the population-based Metropolitan Atlanta Developmental Disabilities Study and reported that 65% of the children with CP had MR. This confirmed our clinical impression that these two conditions were often highly associated. Thus, since both MR and CP are CNS conditions it would be beneficial to compare the behavior problems associated with the two conditions.

The behavior categories used in our analysis were selected by Zill (1990).
who "tapped some of the more common behavior syndromes in young people." The same scale has been used in several published articles and the problem behavior factors identified in this study are consistent with those in the literature (Breslau & Marshall, 1985; Graham & Rutter, 1968a; Haslett, 1978, Hourcade & Parette, 1984; Rosenbloom, 1971).

This study provides an analysis of data from the NHIS. It was designed to answer the question: Are behavior problems identified by parents of children with cerebral palsy in a nonclinical setting? The specific hypotheses that were tested are:

1. Children with CP have more behavior problems than children with no chronic or acute health conditions.
2. Children with MR have more behavior problems than children with no chronic or acute health conditions.

METHODS

The data for this analysis were obtained from the 1981 and 1988 NHIS Child Health Supplement. The NHIS is a U.S. sample survey conducted by the National Center for Health Statistics since 1957. The survey staff conduct in-person interviews with approximately 40,000 households. Information in the NHIS includes reports by adults about their health and the health status of their children as it relates to acute and chronic conditions and health services utilization. Supplements to the NHIS focus on special populations and health concerns. The 1981 and 1988 supplements focused on child health and included the Behavior Problem Index (BPI; Zill, 1990). The 1981 survey includes 11,746 children and the 1988 survey includes 11,840 children whose parents responded about their children’s behavior on the BPI. Children 4–17 years of age, whose parents reported that they had a diagnosis of CP, were selected as cases. The same procedure was used to obtain children with MR, and children with other chronic health conditions (CHC). CHCs included chronic respiratory, cardiovascular, glandular, digestive, or other chronic conditions, excluding CP and MR. The comparison group throughout the analysis was children without any chronic or acute health condition. We could only assess which behavioral problems were associated with CP unconfounded by the presence of MR for the 1981 survey because the 1988 survey did not specify MR presence. The distinct category of MR was not included in the problem list read to parents for the 1988 interview. Instead children with MR were included in a broad coding category of neurologic conditions. Therefore, a subanalysis was conducted on the 1981 survey in which children with CP (and no MR) and those with MR (and no CP) were compared to children having no chronic or acute diseases to assess their relative frequency of behavioral problems.
We first assessed behavioral problems among all children with CP compared to children with no health conditions. There were 47 children with CP, 50 children with MR, 6,038 children with some chronic health condition excluding CP and MR, and 5,930 children with no acute or CHC. We combined the children with CP from the 1981 and the 1988 surveys in order to increase the number of cases. We felt this was justified since the diagnosis of CP is often made before a diagnosis of MR can be ruled out. This second analysis, with a mixed groups of children with CP, is useful since it represents an actual group of children with CP selected from the population.

Measurement Instrument

Behavioral problems were assessed in the NHIS Child Health Supplement using a 28-item BPI based on parent report. The Index was developed by Zill and Peterson, based on numerous preexisting instruments (Achenbach & Edelbrock, 1981; Graham & Rutter, 1968a; Kellam, Branch, Agorwal, & Ensminger, 1975; Langner et al., 1976; Rutter, Tizard, & Whitmore, 1970; National Center for Health Statistics, 1971). The high reliability of the scale has been reviewed by numerous researchers (Gortmaker et al., 1990; McCormick, Gortmaker, & Sobol, 1990; Peterson & Zill, 1986; Zill, 1988). Gortmaker et al. (1990) reported their validation of the BPI based on its ability to discriminate between children who were and were not referred for clinical help.

Parents were asked to report the frequency with which their children exhibited a range of behavioral problems. Weighted scores were obtained for response categories by assigning 2 (often true), 1 (sometimes true), and 0 (not true). We used the procedure described by Gortmaker et al. (1990) for dichotomizing the behavior variables into the children in the bottom 90th percentile and those in the top 10th percentile. Gortmaker et al. reported validity of the BPI and the 1981 NHIS for children with chronic health conditions by correlating the scores on the BPI with parental reports of the child ever seeing a psychiatrist, psychologist, or psychoanalyst (r = .28). We repeated this method of validation for the 1981 and 1988 children with CP, using our weighted scores, and found a significant correlation between the BPI scores and receipt of mental health services (r = 0.42, p = .0001). We found that overall, 10.7% of the children in the sample received mental health services. Among those children who score in the top 10th percentile of the BPI, 49% got mental health services. Only 7% of all other children received mental health services. The 90th percentile corresponds to a score of 13 or more for the 1981 survey and to a score of 15 or more for the combined surveys using sometimes true or often true responses to behavior problems. The cutoff scores for dichotomizing the specific behaviors, for 1981 and the combined surveys, were antisocial 2.0 and 3.0, anxiety 3.0 and 4.0,
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headstrong 5.0 and 5.0, hyperactive 4.0 and 4.0, peer conflict 1.0 and 1.0, and dependency 2.0 and 3.0, respectively. Thus, the case definition for having a behavior problem was established by high scores on the subset behaviors. In fact, at a minimum, a behavior problem was defined as having *sometimes true* responses at least once for peer conflict, at least twice for dependency and antisocial, at least three times for anxiety, at least four times for hyperactive, and at least five times for headstrong. This weighting was used for all of the procedures described in the statistical analyses. The period of reference for reporting was the previous 3 months.

The item composition of the Behavior Problem Index (all items) is as follows: **Antisocial**: cheats or tells lies, bullies, cruel or mean; disobedient at school, not sorry after misbehaving; trouble getting along with teachers (5 items); **Anxious/Depressed**: sudden changes in mood; feels unloved; too fearful or anxious; feels worthless; unhappy, sad, depressed (5 items); **Headstrong**: high strung; argues too much; disobedient at home; stubborn, sullen; very strong temper (5 items); **Hyperactive**: cannot concentrate; easily confused; impulsive; obsessive; restless (5 items); **Immature/Dependent**: (4–11 years only) clings to adults only, cries a lot, demands a lot of attention, too dependent on others (4 items); **Peer Conflict/Social Withdrawal**: has trouble getting along with other children; not liked by other children; withdrawn (3 items).

### Statistical Analysis

The scores were calculated for the subscales and for a composite variable "any problems," for the total sample, and for the subsets of the sample. The scores were weighted by the frequency of occurrence reported by the parent. The "any problem" variable was created by summing the subset scores. Frequency distributions of demographic factors for the total sample and its subsets were calculated in order to justify comparisons based on these factors. Chi-square tests were used to compare the demographic characteristics for children with CP, children with MR, and children with a CHC excluding CP, and MR (chronic group) with children with no acute or CHC.

Multiple logistic regression was used to calculate the adjusted odds ratios for the relationship between selected behavioral problems in the three groups of children (CP, MR, and CHC) and children in the control group. Logistic models were used because the dependent variable is dichotomous (presence or absence of a behavior problem) and the independent variable is discrete (CP or control). We controlled for additional variables (race, gender, age, family structure, region of the U.S.). The result (odds ratio) can be interpreted as the likelihood of an outcome given a condition. Thus, an odds ratio (OR) of 2.4 can be interpreted as a behavior being 2.4 times more likely to have a score greater than the 90th
percentile of the overall sample, given a child with CP, compared to children in the survey with no chronic or acute conditions (odds ratio of 1 is neutral).

Scores greater than the 90th percentile from the overall sample mean scores were used as the cut point for each problem behavior. The following problem behaviors for the 4- to 17-year-olds were assessed from the BPI: being antisocial, anxious, headstrong, hyperactive, and having peer conflict. Cases with missing data for any of the variables were excluded from the logistic regression models. Race of the child (white, nonwhite), gender of the child (female, male), age of the child (under 12 years of age, 12 years or older), family intactness (two-parent homes, single parent or foster care), and geographic region of residence of the family (northeast, midwest, south, west) were considered potential confounders in the analyses (the risk groups are italicized). Dependency was assessed for the 4- to 11-year-old children controlling for race, gender, family intactness, and geographic region of residence.

RESULTS

The prevalence of CP in the 1981 data sample was 1.5/1,000 children (n = 16 children with CP) and was 2.67/1,000 children (n = 31 children with CP) in the 1988 sample. This increase in prevalence is consistent with the literature which suggests that survival of very low birth infants increased during the study period and this increase contributed to an increase in prevalence of CP over time (Bhushan et al., 1993). We compared the mean behavior scores for the sample of children with CP and chronic health conditions in 1981 and 1988. For the 1981 survey, the children with CP only mean score was 11.1 (SD 10.3) compared to children with other chronic conditions mean score of 7.1 (SD 6.7). For the 1988 survey, the children with CP mean score was 9.5 (SD 9.0) compared to children with other chronic conditions mean score of 7.5 (SD 7.5). This analysis indicates that the mean scores for the two samples are not statistically different (using t tests) and can be combined for further analysis. In addition, the mean age for the combined sample was 11.3 years (SD 3.9), within the range of 4-17 years.

We assessed demographic risk factors for CP, MR, and other chronic conditions in children by comparing the proportion of children in these three groups (CP n = 47, MR n = 50; other chronic conditions n = 6,038) whose parents reported the identified demographic factors (child's age, race, gender, region of residence, and family intactness) with the proportion of controls (those without CP, MR, or other chronic and acute conditions) reporting these demographic attributes. Table I presents these comparisons. Compared to controls, those with CP were more likely to be white (OR = 2.6) and male (OR = 1.9). Younger age (< 12), region of residence, and family intactness were not significantly associated with CP. Compared with children having no chronic conditions, those with
Table I. Sample Distribution by Selected Demographic Characteristics for 1981 and 1988 Surveys Combined

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>Cerebral palsy (n = 47)</th>
<th>Mental retardation* (n = 50)</th>
<th>Chronic conditions (n = 6,038)</th>
<th>No chronic or acute conditions (controls) (n = 5,930)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-11</td>
<td>28</td>
<td>59.6</td>
<td>24</td>
<td>48.0</td>
</tr>
<tr>
<td>12-17</td>
<td>19</td>
<td>40.4</td>
<td>26</td>
<td>52.0</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>41</td>
<td>87.2*</td>
<td>42</td>
<td>84.0</td>
</tr>
<tr>
<td>Non-white</td>
<td>6</td>
<td>12.8</td>
<td>8</td>
<td>16.0</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>66.0*</td>
<td>34</td>
<td>68.0*</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>34.0</td>
<td>16</td>
<td>32.0</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>5</td>
<td>10.6</td>
<td>15</td>
<td>30.0</td>
</tr>
<tr>
<td>Midwest</td>
<td>13</td>
<td>27.7</td>
<td>14</td>
<td>28.0</td>
</tr>
<tr>
<td>South</td>
<td>19</td>
<td>40.4</td>
<td>16</td>
<td>32.0</td>
</tr>
<tr>
<td>West</td>
<td>10</td>
<td>21.3</td>
<td>5</td>
<td>10.0</td>
</tr>
<tr>
<td>Family intactness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two parents in home</td>
<td>22</td>
<td>46.8</td>
<td>24</td>
<td>48.0</td>
</tr>
<tr>
<td>Single parent or foster care</td>
<td>25</td>
<td>53.2</td>
<td>26</td>
<td>52.0</td>
</tr>
</tbody>
</table>

*1981 only for mental retardation excluding cerebral palsy or other chronic conditions

MR were twice as likely to be male (OR = 2.1). Younger age (< 12), being white, region of residence, and family intactness were not significantly associated with MR. Due to the large sample of children with chronic conditions (n = 6,038) compared with those having no chronic conditions (n = 5,930) even small differences in proportions can be statistically significant yet not meaningfully different. Compared with children having no chronic conditions, those with chronic conditions were more likely to be white (OR = 2.6), male (OR = 1.1; slight yet statistically significant), to reside in the Midwest (OR = 1.3), and to have intact (two parents in home) families (OR = 1.3). Age, race, gender, region of residence, and family intactness were all included in subsequent multiple logistic regression models.

Table II presents the percentage of parent responses (greater than 90th percentile of the total sample score) for each of the identified problem behaviors, by the three categories of children (CP, CHC, and control group). A significantly greater proportion of parents whose children had CP reported behavioral problems (25.5%) than did parents of children in the CHC group (11.9%) or those...
with no conditions (5.4%). Of parents of children with CP, 39.3% reported that dependency was a problem. Being headstrong, hyperactive, anxious, having a peer group conflict, and being antisocial were also noteworthy problems for parents of children with CP. Parents of children in the chronic group also reported more behavioral problems than did parents of children in the control group. Parents of children in the CHC group reported that 6—12% were either headstrong, hyperactive, dependent, anxious, had peer conflict, or were antisocial.

Table III presents the adjusted odds ratios (aOR) for the association between having behavioral problems among the groups: the CP group compared to controls and the CHC group compared to controls. Children with CP were 5.3 times more likely to have any behavioral problem compared with the control group. The specific problem behaviors disproportionately reported by parents of children with CP were anxiety, being headstrong, hyperactivity, having peer group conflict and being dependent. All odds ratios, except that for being antisocial, were statistically significant and were adjusted for confounders including the child's age, race, gender, geographic region of residence, and family intactness.
Table III. Adjusted Odds Ratios (aOR) and 95% Confidence Intervals (CI) for Behavior Problems by Children's Condition (1981 and 1988)∗

<table>
<thead>
<tr>
<th>Behavior problem</th>
<th>CP (n = 47) vs. control (n = 5,930)</th>
<th>Chronic (n = 6,038) vs. control (n = 5,930)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aOR</td>
<td>CI</td>
</tr>
<tr>
<td>Antisocial</td>
<td>2.3</td>
<td>0.9-6.0</td>
</tr>
<tr>
<td>Anxiety</td>
<td>3.5</td>
<td>1.4-8.4</td>
</tr>
<tr>
<td>Headstrong</td>
<td>5.1</td>
<td>2.5-10.2</td>
</tr>
<tr>
<td>Hyperactive</td>
<td>5.2</td>
<td>2.6-10.2</td>
</tr>
<tr>
<td>Peer conflict</td>
<td>3.0</td>
<td>1.3-7.3</td>
</tr>
<tr>
<td>Dependency</td>
<td>17.2</td>
<td>7.6-38.9</td>
</tr>
<tr>
<td>Any problem</td>
<td>5.3</td>
<td>2.7-10.5</td>
</tr>
</tbody>
</table>

∗Adjusted odds ratios (aOR) are adjusted for age, race (white/nonwhite), gender, family intactness, (both parents, single parent or foster), and geographic region (Northeast, Midwest, South, West).

∗∗n = 28 since dependency questions were asked for children 4–11 years old.

∗∗∗n = 2,884.

†Statistically significant at p = .05

Children in the CHC group were more than twice as likely to have a behavioral problem (aOR = 2.5) and were more than twice as likely to be anxious, headstrong, hyperactive, and be dependent. In addition, children with chronic health conditions were more likely, compared to controls, to have antisocial behaviors and peer conflict.

When comparing adjusted odds ratios for children with CP to those of the CHC group it is clear that children with CP have a much higher risk for behavioral problems. Being dependent and headstrong are the most problematic behaviors for children with CP. Since children with CP and MR were not excluded from the analysis presented in Table III it is possible that those children with both conditions may be at increased risk of developing behavioral problems independent of the CP. For this reason, we conducted a subanalysis to evaluate behavioral problems in children with CP without MR (CP-only group) and those with MR and no CP (MR-only group) compared with the control group.

Table IV provides the results to suggest that children in the CP-only group were 4.9 times more likely to have any behavioral problem than the controls. And the MR-only group were 7.9 times more likely to have any behavioral problem than the controls. The comparison of the adjusted odds ratios (aOR) for all these groups across the various behavior problems indicate that not all of the behavior problems identified in Table III could be attributed to CP. Children with MR were at highest risk for problems in the domains of antisocial, anxiety, hyperactivity, and peer conflict. Children with CP were at highest risk for problems in the domains of headstrong and dependent.
Table IV. Adjusted Odds Ratio (aOR) and 95% Confidence Intervals (CI) for Behavior Problems by Children's Condition (1981) Sample

<table>
<thead>
<tr>
<th>Behavior problem</th>
<th>CP-only (n = 12) vs. control (n = 1,980)</th>
<th>MR-only (n = 50) vs. control (n = 1,980)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aOR</td>
<td>CI</td>
</tr>
<tr>
<td>Antisocial</td>
<td>0.7</td>
<td>0.9-5.5</td>
</tr>
<tr>
<td>Anxiety</td>
<td>4.6</td>
<td>1.2-18.2</td>
</tr>
<tr>
<td>Headstrong</td>
<td>7.7</td>
<td>2.2-26.7</td>
</tr>
<tr>
<td>Hyperactive</td>
<td>3.9</td>
<td>0.9-15.6</td>
</tr>
<tr>
<td>Peer conflict</td>
<td>3.7</td>
<td>0.8-17.5</td>
</tr>
<tr>
<td>Dependency</td>
<td>12.6*</td>
<td>2.9-53.5</td>
</tr>
<tr>
<td>Any problem</td>
<td>4.9</td>
<td>1.4-17.4</td>
</tr>
</tbody>
</table>

*Adjusted odds ratios (aOR) are adjusted for age, race (white/nonwhite), gender, family intactness, (both parents, single parent or foster), and geographic region (Northeast, Midwest, South, West).

MR-only: n = 50
CP-only: n = 12

We also analyzed the 47 children with CP to assess proxy measures for severity of their condition. We found that 48.9% of the children with CP (n = 23) attended special self-contained classrooms and 29.5% received psychiatric services. Of the children with CP, 10 went to special school as well as received psychiatric services. We found that the children with CP had other chronic conditions or problems: respiratory (14), gastrointestinal (10), circulatory (4), musculoskeletal (8), sensory (24), and others. In total, 41 of the 47 children with CP (2 cases in 1981 and 4 cases in 1988 had no other medical condition) had other impairments or health problems.

DISCUSSION

The primary focus of the present study was to identify behavior problems associated with CP in children, using a population-based national survey and parent reports. This analysis is responsive to Drotar (1994), who called for a wider array of research methods and designs in order to provide replication and to improve generalizability of results. A limitation of previous research results from biased case accrual through tertiary care centers, and restrictions to the case definition of CP which exclude children with MR and other comorbidities. Our analysis gives us insight into the complex challenges facing children with CP and their families.

The results of this analysis indicate that the previous estimates of the fre-
quency of behavior problems may be exaggerated. Our finding that 25.5% of children with CP had a behavior problem, which is lower than previous estimates of 30–80%, probably results from our use of a national data source which does not restrict the cases to children with CP who attend specialty practices or other sites of research (Graham & Rutter, 1968a; Houcade & Pasrette, 1984; McDonald, 1987; Rosenbloom, 1971). It is likely that there are many children with CP who function well and receive little extraordinary medical care. Thus, the sample used in our analysis is more likely to represent the wide array of children with CP including those not attending specialty clinics.

The general pattern of our findings corroborates previous studies suggesting increased levels of behavioral disorders among children with chronic illness (Gortmaker et al., 1990), with chronic disability (Cadman et al., 1987), and chronic illness with CNS involvement (Breslau & Marshall, 1985; Howe et al., 1993). Although children with CP are at greater risk for developing behavior problems, across all dimensions of the BPI, they are considerably less likely to develop problems assessed by the antisocial and peer conflict scales. As a group, children with CP are at considerable risk for developing problems assessed by the headstrong and the dependency scales. An examination of the item content of the headstrong scale reveals a combination of noncompliance at home and mood content, whereas the dependency scale items appear to be more internally consistent. It is interesting to speculate about the possible antecedent conditions contributing to the development of problems in these behavioral domains. It is quite possible that parental management practices may be a contributing factor to these behavioral problems. Headstrong behaviors, for example, may be the consequence of inconsistent disciplinary practices or the failure of parents to set appropriate limits in their management practices. Likewise, dependency may also be fostered by the failure to teach skills which lead to the development of independent functioning. For children with CP, the physical limitations may also influence their ability to function independently. Clearly, future research should be undertaken to determine how parent disciplinary practices and parent–child interactions influence the behavioral development of children with CP. Additionally, research should also be extended to examine behavioral consistency across situations (i.e., home, school) using behavioral rating scales and observational methods.

The number of children with CP was relatively low in the NHIS since CP is a rare event. Therefore, we are cautious about the interpretation of this analysis since the number of children with CP with each behavior is small. Another limitation of our analysis is that cross-sectional data can only show an association. Additional studies that have a longitudinal design are necessary to provide information about the development of behavior problems over time and causality.

Our inability to separate out MR from CP in the 1988 data represents a confound which, because of the data, cannot be addressed. However, since all
the behavior problems, except being headstrong and dependent, were more severe for children with MR (1981 data set) we believe that these behaviors, which continued to be significant and severe for the combined group, are truly problematic for a mixed group of children with CP.

Our analysis indicates that approximately 87% of the children had another health or school problem. The list of comorbidities was quite extensive, including respiratory, gastrointestinal, circulatory, musculoskeletal, sensory, and other conditions. Other researchers have reported that the most common comorbidities for children with CP include MR, epilepsy, and sensory impairments. The reported frequency of MR in children with CP was 65%; 46% of children with CP had epilepsy, 15% had a sensory impairment (Murphy et al., 1993). For those with severe mental retardation (IQ < 50) the percentage with CP ranges from 20–40% (Blomquist, Gustavson, & Holmgren, 1981; Fryers, 1984; Gustavson, Holmgren, Jonsell, & Blomquist, 1977).

Some researchers question the use of a data set that is not designed specifically for the study of chronic conditions, since the severity of the condition is not assessed (Brooks-Gunn, Phelps, & Elder, 1991; Drotar, 1994; Stein & Jessop, 1989). The severity of MR and CP was not available in this data set and this should be investigated in further research to discern how problem behaviors vary along this dimension.

Another limitation of this study is the sole reliance upon parents as the source of the child's adjustment. Wallander et al. (1988) suggested that maternal perception of child behavior is probably dependent on certain child and maternal characteristics. Future research should seek to validate parent reports using other informants such as professionals and teachers, and behavioral observation schedules. Another approach to validation is to identify the correlation between high scores (above the 90th percentile) and referral to counseling services. We found that 7 of the 12 children with CP who had scores above the 90th percentile for behavior problems were referred to psychologists, psychiatrists, and other counselors. This validation of the Behavior Problem Index used for the 1981 NHIS was reported previously by Gortmaker et al. (1990).

The implications of this analysis are multifaceted. It is clear that parents perceive some behavior problems are associated with CP in children. Although a substantial proportion of children with CP experience significant behavioral problems, our findings also reveal most do not develop such problems. Additional research, therefore, needs to focus on identifying protective factors related to children and their environments that may reduce the risk of developing the onset of behavioral problems. These factors could include social support networks and school placements. Finally, research needs to address the effectiveness of anticipatory guidance, therapeutic effects of ongoing interventions for the disability (e.g., occupational, physical, and speech and language therapy), and psychological counseling for the children and/or families.
This study adds a population-based analysis to the literature on behavior problems associated with childhood cerebral palsy. Breslau (1985) reported that "brain involvement conferred a risk for social isolation independent of mental retardation" for 98 children with CP who were seen in teaching hospital clinics. We suggest that perhaps social isolation is a problem associated with children with severe CP. Our results imply that dependency and headstrong behaviors are challenges faced by a diverse and, therefore, representative group of children with CP.

REFERENCES


