# Clusters of problem behaviors in adolescents

By: Robin Bartlett, Diane Holditch-Davis, Michael Belyea

**This is the peer reviewed version of the following article:**

Bartlett, R., Holditch-Davis, D., & Belyea, M. (2005). Clusters of problem behaviors in adolescents. *Research in Nursing & Health, 28* (3), 230-239.

**which has been published in final form at https://doi.org/10.1002/nur.20078. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions.**

## Abstract:

This study was designed to examine clusters of problem behaviors in a sample from the National Longitudinal Study of Adolescent Health at two time points. The technique employed was a person-oriented approach, cluster analysis. Three clusters were identified, a *normal* behaviors cluster, a *problem* behaviors cluster, and a *deviant* behaviors cluster. The clusters were tested for stability and for their relationships to the demographic variables gender, race, age, and socioeconomic status. The mean values for most of the problem behaviors in the problem behaviors cluster were higher than for those in the normal behaviors cluster and lower than for those in the deviant behaviors cluster. Selling drugs and weapon use distinguished the deviant behaviors cluster from the other two. Different interventions probably will be required to address the needs of those in each of the different clusters.

**Keywords:** problem behaviors | deviant behaviors | cluster analysis | adolescents

## Article:

Adolescence is a time of great change for children, an in-between time when the individual is no longer a child but is not yet an adult. Adolescents experience dramatic physical, emotional, psychological, and social changes, and they are at risk for the development or exacerbation of problem behaviors, externalizing behaviors that are socially disruptive and distressing to others (Brooks, 1997). These problem behaviors may be short-lived and limited to the adolescent period or harbingers of longer-term behavioral concerns.

The prevalence of problem behaviors among adolescents in the United States is high. In the nationally representative Youth Risk Surveillance Survey, 17.1% of students in grades 9–12 self-reported that they had carried a weapon on at least 1 of the 30 days prior to the survey, with 6.1% carrying a gun. Thirty-three percent reported being in a physical fight one or more times in the 12 months prior to the survey, with boys nearly twice as likely as girls to report this. Nearly three quarters of the students reported having had one or more drinks of alcohol during their lifetime, and 45% had ingested one or more drinks of alcohol in the 30 days prior to the survey. More than 28% of the students in grades 9–12 reported drinking five or more drinks of alcohol in a row in the 30 days prior to the survey. More than 40% reported having used marijuana during their

lifetime, and over 22% reported using marijuana in the 30 days prior to the survey. Lifetime use of other drugs ranged from a high of 12.1% for inhalants and 11.1% for ecstasy to 8.7% for cocaine, 7.6% for methamphetamines, 6.1% for illegal steroids, and less than 5% for heroin or illegal injection drugs. Nearly 47% of the students reported having had sexual intercourse, and nearly 15% had had four or more sexual partners. Of the nearly 35% of students who were currently sexually active, more than 25% had used either drugs or alcohol prior to their last sexual encounter that included intercourse (Department of Health and Human Services, Centers for Disease Control and Prevention, 2004).

There are two primary ways of classifying problem behaviors in adolescents. One is the diagnostic classification system of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000). Attention-deficit/hyperactivity disorder (AD/HD), oppositional defiant disorder (ODD), and conduct disorder (CD) are disruptive behavior disorders identified in the DSM-IV-TR. AD/HD is characterized by persistent inattention and/or hyperactivity-impulsivity that is more severe than in individuals at a comparable developmental level. ODD is characterized by frequent temper outbursts and anger problems. CD is a more serious behavior disorder characterized by violations of the rights of others (APA). The categorical approach of the DSM-IV-TR represents variations in behavior by classifying individuals as either disordered or non-disordered; the sub-clinical case is considered a non-case. Thus, with this method of classification, adolescents with significant problem behaviors may be deprived of diagnosis and subsequent treatment or other sources of help, simply because they do not meet the threshold criteria for a disorder.

Another way of viewing problem behaviors is dimensional. The dimensional (scale) approach classifies individuals on one or more continua where the range of dysfunctional behavior is from absent to severe. Using this approach, two broad dimensions of child psychopathology have been identified: externalizing problems and internalizing problems (Reynolds, 1992). Externalizing problems are manifested outwardly by the child (problem behaviors) while internalizing problems are manifested within the child (depression, anxiety). Sub-dimensions of the broader externalizing dimension include attention problem, delinquent behavior, and aggressive behavior dimensions (Achenbach, 1993a,b). These dimensions suggest that the disruptive behavior diagnoses of the DSM-IV-TR may exist along one or more continua, rather than being discrete diagnoses.

A major challenge to the dimensional approach is that there is no standard way of determining at what cutoff point on a given continuum psychopathology exists or when an individual may be in need of treatment (Frauenglass & Routh, 1999). However, the dimensional approach does reveal how a child's pattern of behavioral responses corresponds to a point on a continuum, thereby allowing comparison of the child to others of similar age and gender. The dimensional scales created by Achenbach (1991) limit the kinds of problem behaviors considered. For example, most risky sexual behavior is not addressed.

Orthogonal, independent dimensions of behaviors, which combine elements of both categorical and dimensional methods of identification of problem behaviors, were derived by Frick et al. (1993). Their overt-covert and destructive-nondestructive dimensions creating a property violations, an aggression, a status violations, and an oppositional quadrant may be helpful in

understanding behavior problems in adolescents. The clustering procedure employed to examine the problem behaviors of the participants in this study was used to reveal these patterns or others.

In this study we examined problem behaviors in adolescents at two time points in order to determine whether clusters of problem behaviors existed in the adolescents at Time 1, whether these clusters of problem behaviors were stable from Time 1 to Time 2 (1 year later), and whether the clusters at Time 1 differed based on age, gender, SES, and race. The problem behaviors examined were lying, stealing, fighting, using a weapon against another person, public disruption, lack of use of birth control, having multiple sex partners, having sex while under the influence of drugs or alcohol, property destruction, being loud/rowdy, running away, skipping school, and alcohol or marijuana use. The specific research questions addressed were:

1. Are there patterns (clusters) of problem behaviors in the Add Health adolescents at Time 1?
2. Are the clusters of problem behaviors found in the Add Health adolescents stable from Time 1 to Time 2 (1 year later)?
3. How do the clusters of problem behaviors differ in specific problem behaviors?
4. How do the clusters differ at Time 1 based on age, gender, socioeconomic status (SES), and race?

## METHOD

Data from a sample of adolescents from the National Longitudinal Study of Adolescent Health (Add Health) were examined. The Add Health study, begun in the mid-1990s, is an on-going, nationally representative, probability-based survey of students in grades 7 through 12. The original intent was to explore the causes of health-related behaviors, with a focus on the influence of the adolescent's social context using multiple informants. In this particular analysis, adolescents reported their problem behaviors, although data on some demographic variables were parent-reported. Stringent data collection procedures were used in the Add Health study to provide adolescents with protection when revealing sensitive information such as substance use and sexual practices. The Add Health study used a longitudinal design, allowing for the study of change over time or development. Two time points of data collection were used in this analysis. The Time 1 data were collected in 1994–1995 and the Time 2 data were collected approximately 1 year later, in 1996, from the same participants.

### Sample

Schools were the sampling unit of the Add Health study; they were identified using a stratified, random sample of all high schools (public, private, and parochial) in the United States. High schools were stratified into clusters based on region of the country, urbanicity, size, type, percent White, percent Black, and grade span (National Longitudinal Study of Adolescent Health, 2004). Of the 14,736 participants from the Add Health dataset eligible for inclusion in this study, 12,617 had no missing data on any of the problem behaviors of interest at either time. There were no differences between the final analysis dataset of 12,617 and those removed due to having missing values based on the variable age. The mean age of the final sample was 15.8 years (SD 1.58), and the age range was 11.56–21.16 years. There was a significant difference, however,

between the two samples based on biological sex. The final sample included 48% boys and 52% girls, while among the participants removed due to missing values, a higher percentage were boys (55%). Race was categorized using a four category method provided by the Carolina Population Center (Joyce Tabor, personal communication, July 22, 2002). This method did not separate out Latinos. The final sample was composed of 69% Whites, 22% Blacks, 2% Native Americans, and 8% Asians. Those removed due to missing values included a larger proportion of Blacks (30%). With a very large sample size such as this, however, very small differences can be statistically different.

## Instruments

In this analysis, 24 individual items from the Add Health survey were used to examine problem behaviors. From these, several composite variables were constructed from two or more items. The following variables were constructed: stealing, fighting, lack of use of birth control, sex while using substances, property damage, and alcohol use. For example, stealing was composed of four items: taking something from a store without paying, stealing an item worth more than $50, going into a house to steal, and stealing an item worth less than $50. Internal consistency for each of the constructed variables was calculated at both data collection times using Cronbach's alpha (Waltz, Strickland, & Lenz, 2004). The other problem behaviors—lying, using a weapon against another person, public disruption, having multiple sex partners, being loud/rowdy, running away, skipping school, and marijuana use—were measured with single items, so no alpha was calculated. Coefficients testing the internal consistency of the constructed variables ranged from .47 to .92. As would be expected, constructed variables consisting of several items demonstrated a higher coefficient than those consisting of only two items.

## Procedure

Descriptive statistics were calculated on all of the problem behaviors and demographic characteristics of interest. The participants at Time 1 were randomly divided into two groups and submitted for cluster analysis to examine the data for patterns of problem behaviors. Cluster analysis refers to a large number of techniques that can be used to group units, usually people, into homogeneous subsets based on their similarities (Lorr, 1983). Ward's method, known as the incremental sums of squares approach (Khattree & Naik, 2000), was employed for this study. Ward's method is a hierarchical agglomerative method of clustering that by calculating a similarity matrix, forms clusters of cases (Blashfield & Aldenderfer, 1988), with the goal of finding the fewest number of clusters that can best describe the data (Estell, Cairns, Farmer, & Cairns, 2002). Once clusters were identified in the first random half of the Time 1 data, this same method was used on the second random half of the participants and the clusters identified were then compared to those found in the first half to confirm the existence of the clusters.

Discriminant function analysis (DFA) was used to determine which problem behaviors distinguished one cluster from another and to classify cases based on those variables (McGroder, 2000). This procedure helped in naming the clusters identified. Using the stepwise method for entering or removing variables in DFA, the appropriate number of discriminant functions was determined and evaluated for how well they separated each cluster from all the others (Tabachnick & Fidell, 2001). Then the cases were assigned to groups and the group

classifications were tested for accuracy. The demographic variables were examined in relation to the clusters using ANOVA, logistic, and multinomial logistic regression.

## RESULTS

### Patterns of Problem Behaviors

To answer the first research question, the dataset at Time 1 was submitted to cluster analysis, and a three-cluster solution was obtained. Next, to answer the second research question, the temporal stability of the cluster solution from Time 1 to Time 2 was examined using DFA and ANOVA. The three clusters obtained at Time 2 represented the same problem behaviors as the Time 1 clusters, so the clusters were deemed stable over time.

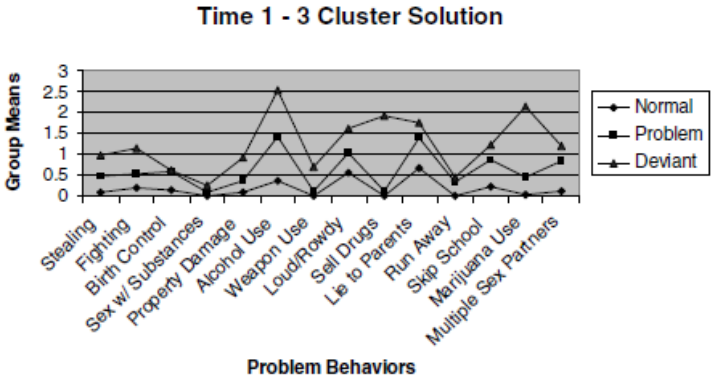


**Figure 1.** Line graph of group means of problem behaviors of the three clusters in all of the Time 1 data.

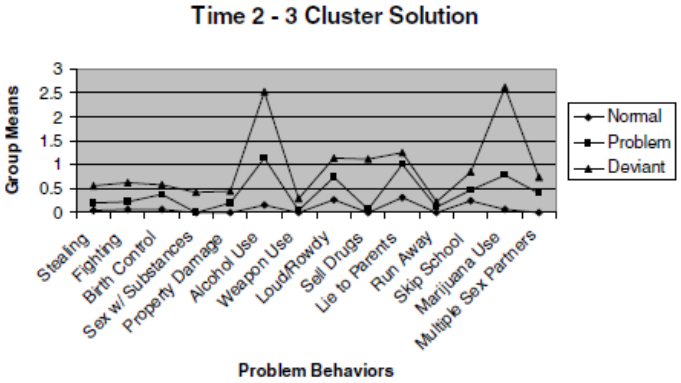


**Figure 2.** Line graph of group means of problem behaviors of the three clusters in all of the Time 2 data.

To determine how the clusters differed in the specific problem behaviors, research question number three, the group means for the three clusters at Times 1 and 2 were graphically represented. These can be found in Figures 1 and 2. Cluster 1 included participants who reported few, if any, problem behaviors and thus was named the *normal* behaviors cluster. In Cluster 2 higher means were reported for most problem behaviors than in Cluster 1, and lower means than Cluster 3. Thus Cluster 2 was named the *problem* behaviors cluster. Based on the high means for most of the behaviors in Cluster 3 and the largest number of problem behaviors reflecting

deviant, conduct-type problems like selling drugs and weapon use, the third cluster was called the *deviant* behaviors cluster. At Time 1, 73% of the participants were in the normal cluster, 23% were in the problem cluster and 4% were in the deviant cluster. At Time 2, only 47% were in the normal cluster, 45% were in the problem cluster, and 8% were in the deviant cluster.

To examine which problem behaviors distinguished the three groups, the unstandardized canonical discriminant functions at the group means (centroids) were identified. The problem behaviors with the highest values discriminated the clusters. In Table 1, the highest canonical discriminant function coefficients for each cluster solution are displayed. Function 1 discriminated Cluster 3 from Clusters 2 and 1, and Function 2 discriminated Cluster 2 from Cluster 1. The percent of cases originally clustered together that were correctly classified by the discriminant function procedure were 89.1% in Time 1 and 84.5% in Time 2.

**Table 1.** Highest Standardized Canonical Discriminant Function Coefficients by Function for Each Analysis

| Sample | Function | Problem behavior | Coefficient |
|---|---|---|---|
| Time 1 | 2 | Sell drugs | .621 |
| | | Runaway | .422 |
| | | Lack of use of birth control | .322 |
| | | Multiple sex partners | .319 |
| | 1 | Sell drugs | .586 |
| | | Marijuana use | .354 |
| | | Weapon use | .349 |
| | | Sex w/ substances | .257 |
| Time 2 | 2 | Multiple sex partners | .422 |
| | | Alcohol use | .410 |
| | | Lie to parents | .404 |
| | | Lack of use of birth control | .401 |
| | 1 | Sex w/ substances | .868 |
| | | Sell drugs | .608 |
| | | Weapon use | .139 |

Relationship of Demographic Variables to Clusters at Time 1

To answer the final research question, the clusters were examined by each demographic variable, to see if there were cluster differences based on mean age level and mean SES level. When the omnibus *F* from the ANOVAs were significant, Tukey's pairwise HSD test was run to determine which group means were actually different. The results showed significant differences between the groups on age ($F$ (2, 12,616) = 238.50, $p < .001$) and SES ($F$ (2, 10,314) = 25.19, $p < .001$). The post-hoc Tukey's test (.05 alpha level) for age revealed that the normal behaviors cluster differed significantly from the problem and deviant behaviors clusters, but the problem and deviant behaviors clusters did not significantly differ from each other. The mean age for adolescents in the problem behaviors cluster was 16.28 years and for those in the deviant behaviors cluster, 16.38 years. The normal behavior cluster's mean age was younger, 15.62 years.

Because SES was not specifically identified in the dataset, based on a coding scheme provided by the Carolina Population Center (Joyce Tabor, personal communication, July 22, 2002), the SES variable was constructed using information about the mothers' and the fathers' highest level

of education and their occupations. The range of scores was set at 1–10, with 6 considered middleclass and higher scores corresponding to higher SES. The post-hoc Tukey's test revealed that adolescents in the normal behaviors cluster had a significantly higher SES than those in the other two clusters. The mean score for SES was 6.09 for the normal cluster; the problem and deviant behaviors clusters had means of 5.68 and 5.59, respectively.

At Time 1, logistic regression revealed that the clusters differed significantly from each other based on the sex of the participants (see Table 2). The normal behaviors cluster included more girls than boys; the problem behaviors cluster had more boys than girls, and the deviant behaviors cluster had many more boys than girls.

**Table 2.** Cluster Membership at Time 1 by Gender

| Cluster | | Male | Female |
|---|---|---|---|
| | Total sample size (%) | 6,020 (49.14%) | 6,597 (50.86%) |
| Normal | Sample size | 4,157 (46.75%) | 5,033 (53.25%) |
| Problem | Sample size | 1,476 (52.68%) | 1,407 (47.32%) |
| Deviant | Sample size | 387 (71.20%) | 157 (28.80%) |

**Table 3.** Odds Ratios (OR) and 95% Confidence Intervals (CI) for Race[a] by Cluster Membership at Time 1[b]

| Race[a] (log-odds) | Normal | Problem | Deviant |
|---|---|---|---|
| 1 versus 4 | | | |
| OR[c] | 1.00 | .80 | .33 |
| 95% CI | 1.00–1.00 | .58–1.12[d] | .16–.69 |
| 2 versus 4 | | | |
| OR | 1.00 | 1.88 | 1.85 |
| 95% CI | 1.00–1.00 | 1.30–2.73 | .88–3.87[d] |
| 3 versus 4 | | | |
| OR | 1.00 | 1.18 | 1.48 |
| 95% CI | 1.00–1.00 | .97–1.43[d] | 1.11–1.97 |
| 1 versus 4 | | | |
| OR | 1.25 | 1.00 | .42 |
| 95% CI | .90–1.73[d] | 1.00–1.00 | .23–.75 |
| 2 versus 4 | | | |
| OR | .53 | 1.00 | .98 |
| 95% CI | .37–.77 | 1.00–1.00 | .47–2.07[d] |
| 3 versus 4 | | | |
| OR | .85 | 1.00 | 1.26 |
| 95% CI | .70–1.03[d] | 1.00–1.00 | .98–1.62[d] |

[a]Race 1, Asian American; Race 2, Native American; Race 3, Black; Race 4, White (recoded).
[b]Note two different runs with different reference level designated.
[c]The reference group is indicated by an OR of 1.00.
[d]An OR of 1.0 implies that the event is equally likely in the reference and comparison groups. If a confidence interval includes 1.0, then there is no significant difference between the groups on that variable.

To examine the clusters by race (a four category independent variable), multinomial logistic regression was employed. The p-value for the Wald *F* test was significant (Wald $F$ [6, 128] = 5.44, $p < .001$) suggesting that the clusters differed significantly based on race. The results are presented in Table 3. When the reference cluster was the normal behaviors cluster, Asian Americans were significantly less likely than Whites to be in the deviant cluster. Native

Americans were more likely than Whites to be in the problem behaviors cluster. Blacks were nearly 1.5 times as likely as Whites to be in the deviant behaviors cluster. When the reference cluster was the problem behaviors cluster, the deviant behaviors cluster contained significantly fewer Asian Americans than Whites and significantly more Blacks than Whites, the normal behaviors cluster contained significantly fewer Native Americans than Whites.

## DISCUSSION

The adolescents in the Add Health study clustered into three groups: a normal behaviors cluster, a problem behaviors cluster, and a deviant behaviors cluster. These cluster configurations were found in data collected across a 1 year interval on the same students. Participants in the normal behaviors cluster reported relatively low levels of problem behaviors; yet adolescents in this cluster still reported significant alcohol use, being loud and rowdy in public, and lying to their parents. While being loud and rowdy and lying to parents may be considered developmentally appropriate behaviors for adolescents, mean alcohol use was sufficiently high in the normal behaviors cluster that alcohol use failed to distinguish the three clusters. Alcohol use puts adolescents at risk for a number of negative outcomes including abuse and addiction, engaging in other risky behaviors such as driving under the influence, and engaging in sex without protection (APA, 2000; Kalichman & Cain, 2004; U.S. Department of Transportation, 2002).

In a recently released study by the Kaiser Family Foundation (2003), nearly a third of a nationally representative sample reported that alcohol and drugs had contributed to their doing more sexually than they would have done while sober, and a significant number of sexually active youth (20%) reported that they had engaged in unprotected sex while under the influence of drugs or alcohol. The findings of our study suggest that all adolescents may be at risk for these outcomes and that alcohol use by adolescents is normative (Schmid et al., 2003; Warner, Canino, & Colon, 2001). This information might be useful to those developing preventative education programs aimed at helping adolescents explore the dangers associated with alcohol use.

The adolescents in the problem behaviors cluster exhibited behaviors similar to those in the deviant behaviors cluster, but at a lower rate. Weapon use and selling drugs were exceptions; those in the problem behaviors cluster reported these behaviors at a rate similar to those in the normal behaviors cluster. Lack of use of birth control and multiple sex partners distinguished the problem behaviors cluster from the normal cluster, and selling drugs and weapon use distinguished the deviant cluster from the others. In the problem behaviors cluster, alcohol use, being loud and rowdy, and lying to parents were the problem behaviors reported most frequently; and in the deviant cluster, fighting, alcohol use, being loud and rowdy, selling drugs, lying to parents, and marijuana use were most often reported. Those in this group also exhibited higher levels of stealing, property damage, skipping school, and having multiple sex partners than did the students in either of the other two clusters. Thus, adolescents in the deviant behaviors cluster were qualitatively different from adolescents in either of the other two clusters. These adolescents may be less amenable to or need different interventions than adolescents in either of the other two groups.

### Relationship of Demographic Variables to the Clusters

The clusters differed significantly based on age, with adolescents in the normal behaviors cluster younger than those in the other two clusters. This finding was expected, because the problem behaviors examined increase with age across adolescence. Offord et al. (1987) also found that problem behaviors seem to be manifested more as age increased, and Lahey et al. (2000) found that aggressive behaviors peaked during middle adolescence. Zweig, Lindberg, and McGinley (2001), in a similar study of the Add Health participants where boys and girls were examined separately, found that one of their risk profiles for each gender was older than the others (for girls, the group high on sexual activity and substance use; and for boys, the group high on all the health risk behaviors except suicide), but the differences were small. It is important to note that in the Zweig et al. study, however, the sample was limited to adolescents in grades 9–12 (high school), rather than including adolescents in grades 7–12, as in our study. Thus, Zweig et al. were likely to find smaller differences than did the current study because we included those in middle school and high school, a developmental period across which problem behaviors are known to increase in occurrence. The problem behaviors selected for examination in the current study seem to be those that increase in prevalence as age increases. This finding should be viewed with caution, however, because there was less than a year's difference in the mean ages of participants in all three clusters. In addition, because the participants were approximately 1 year older at Time 2 of data collection than they were at Time 1, this could help explain the increase in percentages of participants in the problem and deviant behavior clusters at Time 2.

The only cluster that was predominantly female was the normal cluster. While the problem behaviors cluster had nearly equal percentages of boys and girls, the deviant behaviors cluster had nearly three times as many boys as girls. This cluster is the cluster most closely related to conduct disorder, and conduct disorder is much more often diagnosed in boys (prevalence rate of 6%–16% in boys vs. 2%–9% in girls; APA, 2000). In their community sample, Lahey et al. (2000) found that more severe problem behaviors like aggression, property and status violations were more frequent in boys than in girls.

Family SES also significantly predicted cluster membership, with the normal behaviors cluster having a significantly higher SES than the other two clusters. As with age, SES did not significantly differ between the problem and deviant behaviors clusters. This is consistent with the few studies that have examined problem behaviors in children living in poverty. Mcleod and Shanahan (1996) and Offord et al. (1992) found that poverty seemed to be a predictor of problem behaviors and psychiatric disorders. While in our study the mean SES level of the problem and deviant behaviors clusters were not at the poverty level, they were significantly lower than the mean SES level of participants in the normal behaviors cluster. In the Zweig et al. (2001) study, few SES differences were noted. Only the girls in the group high on sexual activity and substance use had a significantly higher SES than those in the female group that reported high levels of fighting and suicide.

The three clusters differed significantly by race, although all of the clusters, like the general population, were predominantly White. One of the most striking findings was that there was a higher percentage of adolescents in the deviant behaviors cluster who were Black than in either of the other two groups. Asian Americans were the group least likely to be in the problem or the deviant behaviors clusters, followed by Whites. These findings are consistent with the findings of prior studies that Black high school students reported more lifetime sexual partners than did

White students (Warren et al., 1998) and with a study by Ezpeleta, Keeler, Erkanli, Costello, and Angold (2001) where, in a community sample, Blacks and Native Americans were at greater risk for disruptive problem behaviors than were White students. In the study of the Add Health participants by Zweig et al. (2001), Black girls were more likely to be in lower risk groups (in the group at risk for being sexually active or the group at risk for fighting and engaging in suicidal behavior) than were White girls, but Zweig et al. also found that Black boys were overrepresented in their highest risk male problem behavior group. The males in this group were at risk for sexual activity, all of the substance use behaviors studied, and fighting.

Findings from this study supported both the categorical and dimensional ways of viewing problem behaviors. The problem and the deviant behaviors clusters might be viewed as different points along a continuum of problem behaviors because they were similar in the behaviors reported, and the major difference between the two clusters was in the degree to which adolescents reported these behaviors. One major difference between the problem and deviant behaviors clusters was in the reports of behaviors like weapon use and selling drugs. Both the problem and normal behaviors clusters had very low rates of these behaviors. One interesting finding is that the items about sexual behavior distinguished the problem behaviors cluster from the normal behaviors cluster. None of the other researchers attempting to identify the best way to view problem behaviors included sexual behaviors, as we did (Achenbach, 1991; Ezpeleta et al., 2001; Fergusson & Horwood, 1995; Fergusson, Horwood, & Lynskey, 1994; Frick et al., 1993; for a review see Loeber, Lahey, & Thomas, 1991; Rey & Morris-Yates, 1993).

The previously identified issue of what cutoff point determines psychopathology also surfaced in this study. One could argue that any exhibition of behaviors like selling drugs and weapon use constitutes deviant behavior. Other behaviors that might be associated with delinquency like stealing and fighting did not, however, distinguish the deviant behaviors cluster from the other clusters in this study.

Based on the deviant behaviors of weapon use and selling drugs, the clusters seemed to be qualitatively different, supporting a categorical way of viewing problem behaviors. Yet because of the limited nature of the Add Health study examined here, there were insufficient time points of data collection and insufficient time between the two data points to make predictions about the trajectory of problem behaviors from a categorical perspective. With additional data, problem behaviors and deviant-type behaviors such as selling drugs and weapon use might be correlated with other behaviors and form syndromes and perhaps families of disorders as proposed by Krueger and Piasecki (2002). More study is required to make this determination, however.

This analysis relied primarily on data from the adolescents themselves, and they may not be the best informants of their own problem behaviors, especially those perceived by others as deviant or illegal. Adolescent self-report data may also be affected by adolescent subcultures, where some behaviors may be perceived as *cool* and thus reported with greater frequency than they actually occurred. There were no attempts to objectively validate the self reports by adolescents in the Add Health survey. The findings of this study should be considered preliminary because of this. Many studies of adolescents engaging in problem behaviors use clinic-referred samples rather than community-referred ones resulting in artificially inflated prevalence rates for problem behaviors. The community sample available in the Add Health study avoids such problems.

Finally, the Add Health data lacks information about the age of onset of problem behaviors. In order to study the trajectory of problem behaviors, longitudinal data for participants would be required.

**Acknowledgements**

We wish to thank Elizabeth Tornquist for editing a draft of this article. The research presented in this study was supported by two predoctoral fellowships awarded to the first author by the UNC-Chapel Hill School of Nursing T32 NR07091, 1997–1999 from NINR and by the Center for Developmental Science at UNC-Chapel Hill T32 HD07376, 2001. This research was also supported by grants from Gamma Zeta Chapter of Sigma Theta Tau International, 1998 and 2002. This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (http://www.cpc.unc.edu/projects/addhealth).

**REFERENCES**

Achenbach, T.M. (1991). Child behavior checklist for Ages 4–18. Burlington, VT: University Associates in Psychiatry.

Achenbach, T.M. (1993a). Empirically based taxonomy: How to use syndromes and profile types derived from the CBCL/4-18 and 1991 profile. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T.M. (1993b). Taxonomy and comorbidity of conduct problems: Evidence from empirically based approaches. Development and Psychopathology, 5, 51–64.

American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders (4th ed.—text revision). Washington, DC: Author.

Blashfield, R.K. & Aldenderfer, M.S. (1988). The methods and problems of cluster analysis. In J.R. Nesselroade & R.B. Catell (Eds.), Handbook of multivariate experimental psychology (2nd ed.; pp. 447–470). New York: Plenum Press.

Brooks, J.A. (1997). Age differences in the relationship between behavior problems and self-esteem: A developmental approach. Unpublished doctoral dissertation, Oklahoma State University, Stillwater, OK.

Department of Health and Human Services, Centers for Disease Control and Prevention (May 21, 2004). Morbidity and Mortality Weekly Report, 53, SS-2, pp. 1–96. Retrieved May 25, 2004, from http://www.cdc.gov/mmwr/PDF/ss/ss5302.pdf

Estell, D.B., Cairns, R.B., Farmer, T.W., &Cairns, B.D. (2002). Aggression in inner city early elementary classrooms: Individual and peer-group configurations. Merrill Palmer Quarterly, 48, 52–76.

Ezpeleta, L., Keeler, G, Erkanli, A., Costello, E.J., & Angold, A. (2001). Epidemiology of psychiatric disability in childhood and adolescence. Journal of Child Psychology and Psychiatry and Allied Disciplines, 42, 901–914.

Fergusson, D.M. & Horwood, L.J. (1995). Predictive validity of categorically and dimensionally scored measures of disruptive childhood behaviors. Journal of the American Academy of Child and Adolescent Psychiatry, 34, 477–485.

Fergusson, D.M., Horwood, L.J., & Lynskey, M.T. (1994). Structure of DSM-III-R criteria for disruptive childhood behaviors: Confirmatory factor models. Journal of the American Academy of Child and Adolescent Psychiatry, 33, 1145–1155.

Frauenglass, S. & Routh, D.K. (1999). Assessment of the disruptive behavior disorders: Dimensional and categorical approaches. In H.C. Quay & A.E. Hogan (Eds.), Handbook of disruptive behavior disorders (pp. 49–71). New York: Kluwer Academic/Plenum.

Frick, P.J., Van Horn, Y., Lahey, B.B., Christ, M.A.G., Loeber, R., Hart, E.A., et al. (1993). Oppositional defiant disorder and conduct disorder: A meta-analytic review of factor analyses and cross-validation in a clinic sample. Clinical Psychology Review, 13, 319–340.

Kaiser Family Foundation, Hoff, T., Greene, L., & Davis, J. (2003). National survey of adolescents and young adults: Sexual health knowledge, attitudes and experiences. Retrieved May 19, 2004 from the Henry J. Kaiser Family Foundation Web site: http://www.kff.org/youthhivstds/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=14270

Kalichman, S.C. & Cain, D. (2004). A prospective study of sensation seeking and alcohol use as predictors of sexual risk behaviors among men and women receiving sexually transmitted infection clinic services. Psychology of Addictive Behaviors, 18, 367–373.

Khattree, R. & Naik, D.N. (2000). Multivariate data reduction and discrimination with SAS software. Cary, NC: SAS Institute, Inc.

Krueger, R.F. & Piasecki, T.M. (2002). Toward a dimensional and psychometrically-informed approach to conceptualizing psychopathology. Behaviour Research and Therapy, 40, 485–499.

Lahey, B.B., Schwab-Stone, M., Goodman, S.H., Waldman, I.D., Canino, G., Rathouz, P.J., et al. (2000). Age and gender differences in oppositional behavior and conduct problems: A cross-sectional household study of middle childhood and adolescence. Journal of Abnormal Psychology, 109, 488–503.

Loeber, R., Lahey, B.B., & Thomas, C. (1991). Diagnostic conundrum of oppositional defiant disorder and conduct disorder. Journal of Abnormal Psychology, 100, 379–390.

Lorr, M. (1983). Cluster analysis for social scientists: Techniques for analyzing and simplifying complex blocks of data. San Francisco: Jossey-Bass.

McGroder, S.M. (2000). Parenting among low-income, African American single mothers with preschool-age children: Patterns, predictors, and developmental correlates. Child Development, 71, 752–771.

Mcleod, J.D. & Shanahan, M.J. (1996). Trajectories of poverty and children's mental health. Journal of Health and Social Behavior, 37, 207–220.

National Longitudinal Study of Adolescent Health. (2004, March 26). Design facts at a glance. Retrieved February 20, 2005, from the University of North Carolina at Chapel Hill, Carolina Population Center http://www.cpc.unc.edu/projects/addhealth/designfacts

Offord, D.R., Boyle, M.H., Racine, Y.A., Fleming, J.E., Cadman, D.T., Blum, H.M., et al. (1992). Outcome, prognosis, and risk in a longitudinal follow-up study. Journal of the American Academy of Child and Adolescent Psychiatry, 31, 916–923.

Offord, D.R., Boyle, M.H., Szatmari, P., Rae-Grant, N.I., Links, P.S., Cadman, D.T., et al. (1987). Ontario Child Health Study: II. Six-month prevalence of disorder and rates of service utilization. Archives of General Psychiatry, 44, 832–836.

Rey, J.M. & Morris-Yates, A. (1993). Are oppositional and conduct disorders of adolescents separate conditions? Australian and New Zealand Journal of Psychiatry, 27, 281–287.

Reynolds, W.M., (Ed.). (1992). Internalizing disorders in children and adolescents. New York: Wiley.

Schmid, H., Ter Bogt, T., Godeau, E., Hublet, A., Dias, S.F., & Fotiou, A. (2003). Drunkenness among young people: A cross-national comparison. Journal of Studies on Alcohol, 64, 650–661.

Tabachnick, B.G. & Fidell, L.S. (2001). Using multivariate statistics (4th ed.). Upper Saddle River, NJ: Allyn & Bacon.

U.S. Department of Transportation. National Highway Traffic Safety Administration. (2002). Traffic safety facts 2002: Young drivers. Retrieved January 17, 2005, from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2002/2002ydrfacts.pdf.

Waltz, C.F., Strickland, O.L., & Lenz, E.R. (2004). Measurement in nursing and health research (3rd ed.). New York: Springer.

Warner, L.A., Canino, G., & Colon, H.M. (2001). Prevalence and correlates of substance use disorders among older adolescents in Puerto Rico and the United States: A cross-cultural comparison. Drug and Alcohol Dependence, 63, 229–243.

Warren, C.W., Santelli, J.S., Everett, S.A., Kann, L., Collins, J.L., Cassell, C., et al. (1998). Sexual behavior among U.S. high school students, 1990–1995. Family Planning Perspectives, 30, 170–172, 200.

Zweig, J.M., Lindberg, L.D., & McGinley, K.A. (2001). Adolescent health risk profiles: The co-occurrence of health risks among females and males. Journal of Youth and Adolescence, 30, 707–728.