From Early to Late Adolescence: American Indian Youths’ Behavioral Trajectories and Their Major Influences

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ABSTRACT

Objective: This article identifies behavioral trajectories of American Indian adolescents and examines their predictors.

Method: A total of 401 urban and reservation American Indian adolescents were interviewed yearly from 2001 to 2004 (with 341 youths, or 85%, retained to 2004, and 385 completing at least two interviews). The Youth Self-Report total problem score is used to model behavior change trajectories, with psychological (addictions and mental health) and environmental (family, peer, community, and services) variables as independent variables. Analyses were based on PROC TRAJ, an SAS macro.

Results: Five trajectory groups were found. Youths who started with a Youth Self-Report score less than the clinical cutoff were low stable (n = 142) or low improving (n = 175). Youths with initial scores over the cutoff were very high chronic (n = 5), high improving (n = 30), or high chronic (n = 33). High improvers scored close to the low improving group by 2004. At baseline, the high improving group was more likely than the high chronic group to be from the reservation (odds ratio 5.94), have greater family satisfaction (1.14), and have fewer school problems (0.84). Over time, the high improving group had substance use and depression drop, family satisfaction increase, fewer parents with mental health or addictions problems, fewer peers using substances, and a decrease in neighborhood problems and stressors.

Conclusions: A significant majority (more than 82%) of the youths exhibited relatively low levels of problem behaviors over all 4 years, and 42% of those with clinically significant problems improved over time. J. Am. Acad. Child Adolesc. Psychiatry, 2007;46(7):849–858. Key Words: behavior, trajectories, American Indian.

Little is known about behavioral trajectories across adolescence, and less is known about the potential predictors of different trajectories. This article addresses that knowledge gap in a population of American Indian youths, which is particularly appropriate because this group has higher rates of addictions and mental health problems than many other ethnic groups (U.S. Department of Health and Human Services, 2001). By understanding trajectories of behavior problems, including feelings, social, school, and family dysfunction, as well as mental health and addictions symptoms, we can better identify high-risk subgroups and risk factors that may be prime targets for intervention. We use the word “trajectory” to mean “a path, progression, or line of development” in behavior, whereas others use the terms “stability,” “continuity,” “pathways,” “patterns,” “desistance,” or “reduction” to describe the same concept (Laub and Sampson, 2001).

American Indian youths have high rates of mental health problems, including antisocial behavior, pathological gambling, and panic disorder (Dick et al., 1993; Novins et al., 1996; Walker et al., 1993; Westermeyer et al., 1993). One study revealed that 29% met...
Several studies have particular relevance to research on trajectories. Costello et al. (1997) show that American Indian children (not only youths) have rates of disorders similar to those of white children from neighboring areas, indicating that environment may be the reason that rates appear so high in other studies. Other studies also demonstrate that social-contextual factors are related to increased risk at any one point in time for a variety of addictions or mental health problems: These factors include socioeconomic status, family structure, parental monitoring, family history of such problems, neglect, trauma, urbanicity, developmental stage, co-occurrence of drug and alcohol problems with mental health problems (Costello et al., 2003; Federman et al., 1997), exposure to violence (Stiffman et al., 1996), child abuse (Cunningham et al., 1994), problem peers (Oetting and Beauvais, 1991), and neighborhood and school deterioration (Stiffman et al., 1999). Parental drug or alcohol abuse or psychopathology may also lead to increased risk (Barnard and McKeganey, 2004; Barnes et al., 2005).

The meager literature on behavioral, mental health, or addiction trajectories focuses on crime, substance use, HIV risk, or violence (e.g., Coffey et al., 2000; Elliott, 1994; Farrington and Hawkins, 1991; Mitchell et al., 2004, 2006). The trajectories of desistance from all of these multiple forms of problem behavior seem to be similar (Ferdinand et al., 1995; Laub and Sampson, 2001). Research shows that the same complex processes associated with initiation of problem behaviors are also associated with desistance (Loeb et al., 1999). Mitchell et al. (2004, 2006) have examined trajectories based on the correlates of starting points and trajectory outcomes. Costello et al. (2003) have also shown that improvement in several mental health and behavioral factors are related to changes in family economic well-being.

Desistance for crime rates (Elliott, 1994; Jessor et al., 1991; Pape and Hammer, 1996) and alcohol addiction or misuse (Colder et al., 2002; Pape and Hammer, 1996) occurs most often during and immediately after adolescence (Laub and Sampson, 2001). However, sociological processes appear to have the strongest influence on trajectories (Costello et al., 2003; Graham and Bowling, 1995; Horney et al., 1995; Sampson and Laub, 1997). Positive changes in income, jobs, home, family, and friends are related to improvements in a variety of outcomes, including HIV risk, mental health, and substance use (e.g., Costello et al., 2003; Elliott, 1994; Farrington et al., 1986; Hirschi and Gottfredson, 1990; Laub and Sampson, 2001; Sampson and Laub, 1997; Simons et al., 2002; Trasler, 1979). Those whose trajectories improve also appear to have lowered stress (Costello et al., 2003; Windle and Wiesner, 2004; Windle et al., 2005). However, much of the research relies on a priori identification of trajectory groups or only two waves of data.

The most important clinical question concerns going beyond the mere description of trajectories to identify potential correlates and causes. For example, what distinguishes a group of teenagers who start out with high levels of problem behaviors, but then improve over time? The above-cited literature strongly indicates that the social ecological theory of Bronfenbrenner (1979), which emphasizes relationships between environment (e.g., family, peers, schools, communities) and problem behaviors, should direct the development of hypotheses about trajectories and their causes. According to ecological theory, each of the psychological and environmental variables would first affect a youth’s initial behavioral state, and then changes in these psychological or environmental variables or new environmental situations would affect the trajectory of that behavior. Based on assumptions inherent in the ecological framework, we can make several hypotheses.

First, we hypothesize that behavioral trajectories are subject to discontinuities over time. Second, we hypothesize that these discontinuities in behavioral trajectories will be related to factors in the social environment rather than to individual or psychological factors alone.

**METHOD**

This article is based on data from the longitudinal American Indian Multisector Help Inquiry, a National Institute on Drug Abuse–funded study of service use and drug use information in two American Indian populations: one urban and one reservation-based, from a single southwestern U.S. state.
A sample of 401 youths (205 reservation and 196 urban) was interviewed in person in 2001 and interviewed annually through 2004. In 2001, youths ages 12 to 19 were recruited through a two-stage method. Only one child per household was enrolled (Stiffman et al., 2003). The 401 youths at wave 1 decreased to 376 at wave 2, to 352 at wave 3, and to 341 at wave 4, indicating an 85% overall retention. Three hundred twenty-five youths completed all four waves. In all, the study retained 78.6% of the urban youths and 91% of the reservation youths. This article is based on analyses of the 385 youths who completed the Youth Self-Report (YSR) at both baseline and at least one other time point (Achenbach, 1991). There were no significant differences in YSR scores for dropouts versus youths who continued in the study.

Internal review boards at Washington University, the tribal council, and the urban school district reviewed and shaped the consent and protection procedures. Personnel from local American Indian educational and health services made the initial contact with the families.

Screening, Identification, and Recruitment. To obtain the sample of 401, we began with a sample of 300 reservation-based and 300 urban-based youths who were randomly selected from complete tribal enrollment and urban school records, respectively. Because the Johnson O’Malley Act provides reimbursement to school systems for every American Indian youth enrolled, the school systems maintain full rosters of youths who were ever enrolled in school. These rosters also include information about youths who are dropouts or in alternate training or GED programs. Directors of the urban schools’ American Indian Programs assured us that this information is current because the school systems regularly contact dropouts to encourage them to re-enroll.

Interview Procedures. In 2001, trained interviewers contacted the 300 randomly selected youths from each area and administered a brief interview that tapped behavior and functioning: the YSR (Achenbach, 1991), the child version of the Columbia Impairment Scale (Bird et al., 1993), and substance use questions from the Youth Risk Behavior survey (Centers for Disease Control and Prevention, 1998). Using this screening information, 150 youths from each area were then randomly selected for the longitudinal study. Interviewers and supervisors were either members of American Indian communities or had long histories of working with or for those communities.

To enrich the sample with youths likely to need services, the first 50 of those youths who were not randomly selected in this 150, but had scores at more than the borderline clinical cutoff point (T > 63) for the Achenbach YSR Total score (Achenbach, 1991) and above 15 for the Columbia Impairment Scale (Bird et al., 1993), were added to the sample. For descriptive statistics, the sample was then weighted to represent the distribution of problems found in the purely random sample. These youths were given a longer interview assessing demographic, diagnoses, environment, and service use (Stiffman et al., 2003). Only 2.7% of those youths who completed the brief interview and were scheduled for the long interview refused to participate or had a parent withdraw consent.

Instruments

All of the measures were piloted with representative youths from the community who then gave feedback about their responses, difficulties with the questions, and any potential changes they may recommend.

Dependent Variable. Youth problems were assessed at each wave (2001, 2002, 2003, 2004) to obtain the YSR Total score (Achenbach, 1991). Of the 118 YSR items, 102 were counted in the problem score and covered the problem behavior syndromes for somatic complaints, anxious/depressed, social problems, thought problems, attention problems, self-destructive/identity problems, delinquent behavior, and aggressive behavior. The other items were nonscored and were either positive or concerned physical health. Alpha coefficients and clinical cutoff points for American Indian youths were similar to those reported by Achenbach for other populations (Walker et al., 1993). The YSR has been tested with other American Indian populations, and a few items were found difficult to translate culturally (Oesterheld and Haber, 1997), but the authors simply recommend introducing those questions with a brief explanation. Test/retest reliability of the YSR on multiracial, low socioeconomic status delinquent teens was r = 0.97 (DeFrancesco et al., 1996). Focus groups responded positively to all of the items and agreed with the amended explanations recommended by Oesterheld and Haber. An additional minor modification, changing the word “school” to “work,” was made for youths who were aging out of school.

Independent Variables. Psychological variables (addictions and comorbid mental health problems) were assessed in 2001 and 2004. Questions concerning depression, conduct disorder, and substance (alcohol and other drugs) abuse or dependence came from the National Institute of Mental Health’s Diagnostic Interview Schedule IV (Robins and Helzer, 1994). The Diagnostic Interview Schedule IV section on drug abuse or dependence was modified to exclude drugs used exclusively for spiritual or healing ceremonies. Also, by request of the American Indian community, symptom questions were asked generically for any of the drugs used, yielding diagnoses for abuse or dependence for illicit substances as a class (Stiffman et al., 2005). We used the number of symptoms, responding to Manson’s (1995) concerns that research should recognize that culture shapes the expression and course of mental illness. This is particularly important for depression, wherein somatic complaints and emotional distress are not well differentiated from each other (Manson et al., 1990).

In 2001, 2002, and 2003, we also used five ordinal items from the Youth Risk Behavior Survey to assess frequencies of use of tobacco, alcohol, and other drugs. These questions allow comparisons with nationally representative samples (Centers for Disease Control and Prevention, 1998).

Environmental Variables. Family, peer, and community variables were assessed in 2001 and 2004.

Familial environment. For family mental health, interviewers presented youths with thumbnail sketches of a variety of substance use/behavioral/mental health problems (as described in Stiffman, 1989). The scale consisted of 10 dichotomous yes/no items tapping parental and sibling emotional and mental health problems, alcohol and drug use, suicide attempts, gambling, and fighting (Stiffman et al., 1999). Positive responses to these 10 items were summed (Cronbach α = .63), with higher scores indicating more family mental health problems. Parent–child relationships were assessed with an adaptation of the Family Satisfaction Scale (Hudson, 1982). The scale included five items asking youths to report how they felt about their family during the past 6 months (e.g., really enjoying one’s family, being able to depend on one’s family). The response options ranged from 1 (rarely or none of the time) to 5 (most or all of the time). Responses to these five items were summed (Cronbach α = .70), with higher scores indicating greater family satisfaction. The questions concerning stressful life events came from the
tests of difference, were then retained in a regression analysis ($r = .68$). Negative school environment consisted of $r = .85$).

Peer environment. To measure peer misbehaviors, the youths rated how many of their peers do each of the following: have trouble with the police; use alcohol, marijuana, or other drugs; are both unemployed and out of school; sell drugs; belong to a gang; and have become pregnant or fathered a child (Chen et al., 1997). These friends’ misbehaviors have been correlated with other problem and risk behaviors (Stiffman et al., 1995; Cronbach $\alpha = .85$).

Community environment. Youths also rated their neighborhood and school problems (Hadley-Ives et al., 2000; Stiffman et al., 1999). Negative neighborhood environment consisted of the extent to which the following existed in the areas where they lived: drug dealing, shootings, murders, abandoned buildings, neighbors on welfare, homeless people living on the street, and prostitution (Cronbach $\alpha = .68$). Negative school environment consisted of questions relating to drug dealing, shootings or knifings, teachers injured by students, school equipment damaged, gangs, discrimination, and anger/stress at school. Each question was scored with 0 (none), 1 (some), or 2 (a lot; Cronbach $\alpha = .77$). The items were summed to yield the two scales.

Analyses

Choosing an appropriate method to identify trajectory patterns is a critical issue. Various methods have been used to examine behavioral trajectories over time, including cluster analysis (Power et al., 2005), latent growth modeling (Duncan and Duncan, 1996; Wills and Stoolmiller, 2002), and, more recently, group-based trajectory modeling (Chung et al., 2002; Windle and Wiesner, 2004). The cluster analysis strategies depend on an a priori classification schema and are therefore subject to the researcher’s particular theoretical orientation. Latent growth curve models provide a more empirically based method for identifying trajectory groups, but have the disadvantage of assuming a continuous distribution of trajectories within the population (Nagin, 1999).

Group-based trajectory methods instead use a finite mixture model that clusters individual trajectories into unique groups (Nagin, 2005). For this reason, group-based methods may be more useful in a situation in which both the number and structure of the trajectories are unknown, as is the case in the present study. Another advantage of the group-based modeling method is that the probability of membership in each group can be estimated for every subject, providing an intuitive measure of how well the subjects fit into their respective trajectory groups.

The trajectory, bivariate, and univariate analyses were completed using SAS software (SAS Institute Inc., 1999). The group-based modeling methods described above were used to identify trajectory subgroups in the sample population. As recommended by Nagin (2005), we used a two-stage strategy for analyses. First, we chose the optimal number of groups based on testing the comparative fit of a series of models with different numbers of groups, using an SAS macro named PROC TRAJ (Jones et al., 2001). YSR raw scores were used for all of the analyses. For these analyses, PROC TRAJ enabled us to include subjects who had a YSR score for wave 1 and at least one other wave ($n = 385$) because it allows the incorporation of missing data in the analysis. A series of models that contained from two to six groups and included both a linear and a quadratic term for each group was systematically examined and compared. The inclusion of a quadratic term tests the possibility that the total YSR score over time has a curved shape (e.g., increasing then decreasing) instead of a straight-line shape. Additionally, one must also specify the general distributional form of the outcome variable (censored normal, Poisson, or binary), which for a summed survey such as the YSR is most closely matched using a censored normal distribution.

The best model was chosen based on the Bayesian information criterion (BIC). Given the problems in using the standard likelihood ratio test statistic in this sort of analysis (D’Unger et al., 1998), the BIC has been demonstrated to be a reliable indicator of the probability of a model with a given sample size and number of groups (Nagin, 2005) and is useful for deciding the optimum number and shape of trajectory groupings.

In the second stage of analysis, we compared the different trajectory groups based on baseline values of the demographic, psychological, and environmental variables listed above. Variables that were significantly different among trajectory groups, using $\chi^2$ and $t$ tests of difference, were then retained in a regression analysis that predicted the likelihood of membership in each group when compared to a selected reference group.

The different groups were treated as a categorical variable in the final multinomial logistic regression. In addition, we used the posterior probabilities of group membership that were estimated by the PROC TRAJ macro as weights to test the independent influence of various factors on group assignment. This method provides a more accurate estimate of parameters in the regression analysis when compared to the option of assuming a 100% probability of membership for a particular subject in a specific group (Nagin, 1999). We used the STATA software (StataCorp, 2004) to estimate the weighted multinomial model.

RESULTS

Demographics

At wave 1, 43% of the youths were male and 57% were female. The average age was 15.6 years. Twenty-four percent of youths were in junior high school, and 63% were in high school. Four percent each had dropped out, were working on a GED, or had received a high school diploma. One percent were in community college or vocational training. There were no significant demographic differences between the weighted and unweighted samples.

Behavioral Trajectories

Starting with a two-group model that included both a linear and quadratic term and progressing to a six-group model, the BIC value steadily improved (became less negative). Because there was little difference in BIC between the five- and six-group models, the model containing five trajectory groups was chosen as the best fit to the observed data, based on the dual standards of
parsimony and the BIC (−6424). The five identified groups contained two groups with significant quadratic parameters, indicating a curved relationship between time and YSR scores, and when the nonsignificant parameters were deleted from the model, BIC was further improved (model 4b in Table 1). The average probabilities of group membership ranged from 0.83 to 0.96, indicating that the individual trajectories matched empirically determined groupings fairly well and also that classification errors would have little effect on the bivariate analyses.

To test whether attrition influenced the group identification process, we ran a second analysis using only subjects that had YSR scores for every wave (n = 325 versus 385). The same five groups were identified, so the following results use the initial sample (n = 385). The similar results support the assumption that differential dropout rates did not affect the trajectory groupings.

**Trajectory Group Characteristics**

For those youths who started with a YSR total score less than the clinical cutoff point, there were two different trajectories: one low stable and one low improving. Most youths fell into these positive behavioral categories, and they were approximately evenly divided, with 142 youths in low stable and 175 in low improving. The low improving group was curvilinear with behavior improving over time (Fig. 1). Although both of these groups differed from one another, the behavior of neither group was of clinical importance, so we do not report it in detail here. Upon request, the authors will make more information available.

Those youths who began at YSR scores above the clinical cutoff point fell into three different trajectory groups. One small group of only five youths fell into a very high chronic group. These were the youths who started (and ended) with far higher scores on the YSR than other youths, with an average score of 120. Two other groups started above the clinical cutoff point, but not quite that high: one group we called high improving, consisting of 30 youths, and the other, high chronic, consisting of 33 youths. The high improving trajectory was curvilinear, with youths dramatically improving during the course of the 4 years to the point that they reached a score that was close to that of the best group (low improving; Table 2). The very high chronic youths were clearly a small percentage who had a 90% higher average initial YSR score than the other two clinically significant groups. Because there were only five youths, and their starting point was so different from the other two, they were not included in further analyses.

**Correlates and Predictors of Trajectories**

We used the five trajectories as a basis for examining how Bronfenbrenner’s ecological model applied to behavior changes across time. Of most interest for potential prevention or intervention research was the difference between the high improving and high

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**TABLE 1**

<table>
<thead>
<tr>
<th>Model</th>
<th>No. of Groups</th>
<th>BIC</th>
<th>Group Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>−6491</td>
<td>78.69</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>−6454</td>
<td>65.27</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>−6440</td>
<td>50.01</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>−6424</td>
<td>44.26</td>
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<tr>
<td>4b</td>
<td>5</td>
<td>−6416</td>
<td>44.33</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>−6423</td>
<td>43.30</td>
</tr>
</tbody>
</table>

*Note:* Boldface indicates model selected; BIC = Bayesian information criterion.

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**Fig. 1** Predicted and observed Youth Self-Report scores for each trajectory group.
chronic groups, whose initial average YSR scores were similar (although the high improving group started with significantly worse average scores than the high chronic), but diverged dramatically at later time points. There were no significant initial differences among the psychological variables at the 2001 time point (Table 3). There were, however, three significant initial differences between the high improving and high chronic groups: reservation status, family satisfaction, and school problems. The high improving group had a much higher proportion of reservation youths than the high chronic group (76.67% versus 39.39%). Family satisfaction was also higher, and school problems were lower (Table 4).

**Logistic Regression Analysis**

A multinomial logistic regression model was used to examine the joint predictors of group membership in the two key groups of interest. After controlling for YSR score at wave 1, living on the reservation, higher family

| TABLE 2 |
| Five-Group Model Parameter Estimates |
| Variable | Coefficient Estimate | SE | z Score|
| Group 1 (low improving) | | |
| Intercept | 29.86 | 1.72 | 17.36 |
| Linear | −14.69 | 2.31 | −6.37 |
| Quadratic | 3.34 | 0.72 | 4.68 |
| Group 2 (low stable) | | |
| Intercept | 46.55 | 1.74 | 26.81 |
| Linear | −2.83 | 0.85 | −3.34 |
| Group 3 (high chronic) | | |
| Intercept | 70.43 | 3.20 | 21.98 |
| Linear | −1.27 | 1.57 | −0.81 |
| Group 4 (high improving) | | |
| Intercept | 75.50 | 5.03 | 15.00 |
| Linear | −57.41 | 7.37 | −7.79 |
| Quadratic | 12.21 | 2.14 | 5.70 |
| Group 5 (very high chronic) | | |
| Intercept | 123.13 | 6.61 | 18.64 |
| Linear | −10.33 | 3.38 | −3.01 |

**TABLE 3**

<p>| Psychological Variables at Each Time Point for High Chronic and High Improving Groups |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 3: high chronic (n = 33)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YSR total score</td>
<td>72.18</td>
<td>71.09</td>
<td>67.84</td>
<td>69.24</td>
</tr>
<tr>
<td>Depressive symptoms</td>
<td>4.79</td>
<td>4.10</td>
<td>51.72%</td>
<td>—</td>
</tr>
<tr>
<td>Depression diagnosis</td>
<td>30.30%</td>
<td>24.14%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Suicidal thoughts or attempts</td>
<td>54.55%</td>
<td>—</td>
<td>5.72%</td>
<td>—</td>
</tr>
<tr>
<td>PTSD symptoms</td>
<td>4.00</td>
<td>3.37</td>
<td>2.17</td>
<td>2.57</td>
</tr>
<tr>
<td>Total symptoms</td>
<td>28.30</td>
<td>24.14</td>
<td>4.52%</td>
<td>17.10</td>
</tr>
<tr>
<td>Alcohol symptoms</td>
<td>3.61</td>
<td>6.03</td>
<td>—</td>
<td>6.53</td>
</tr>
<tr>
<td>Alcohol dependence diagnosis</td>
<td>15.15%</td>
<td>6.90%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Drug abuse symptoms</td>
<td>8.42</td>
<td>8.62</td>
<td>—</td>
<td>10.79</td>
</tr>
<tr>
<td>Drug dependence diagnosis</td>
<td>21.21%</td>
<td>3.45%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total substance use</td>
<td>2.91</td>
<td>24.14</td>
<td>0.50%</td>
<td>—</td>
</tr>
<tr>
<td>Group 4: high improving (n = 30)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YSR total score</td>
<td>81.83*</td>
<td>29.13*</td>
<td>10.21*</td>
<td>10.57*</td>
</tr>
<tr>
<td>Depressive symptoms</td>
<td>6.40</td>
<td>—</td>
<td>—</td>
<td>0.00%</td>
</tr>
<tr>
<td>Depression diagnosis</td>
<td>23.33%</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Suicidal thoughts or attempts</td>
<td>60.00%</td>
<td>—</td>
<td>—</td>
<td>8.70%</td>
</tr>
<tr>
<td>PTSD symptoms</td>
<td>3.52</td>
<td>2.17</td>
<td>—</td>
<td>1.60</td>
</tr>
<tr>
<td>Total symptoms</td>
<td>31.53</td>
<td>4.52%</td>
<td>—</td>
<td>7.49</td>
</tr>
<tr>
<td>Alcohol symptoms</td>
<td>6.07</td>
<td>—</td>
<td>—</td>
<td>1.39%</td>
</tr>
<tr>
<td>Alcohol dependence diagnosis</td>
<td>10.00%</td>
<td>—</td>
<td>—</td>
<td>3.68</td>
</tr>
<tr>
<td>Drug abuse symptoms</td>
<td>9.60</td>
<td>—</td>
<td>—</td>
<td>1.78%</td>
</tr>
<tr>
<td>Drug dependence diagnosis</td>
<td>20.00%</td>
<td>—</td>
<td>—</td>
<td>4.38</td>
</tr>
<tr>
<td>Total substance use</td>
<td>4.03</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: YSR = Youth Self-Report; PTSD = posttraumatic stress disorder.
* p < .05 (t test or χ² difference between groups 4 and 3 at same time point).
satisfaction, and fewer school problems were associated with a higher probability of membership in the high improving group when compared with the high chronic group (Table 5). After controlling for other variables in the model, the odds of being in the high improving group versus the high chronic group were almost six times higher for youths living on the reservation in 2001 than for urban youths. A 1-point increase in the family satisfaction scale was associated with a 12% increase in the odds of being in the high improving group versus the high chronic group. In a similar manner, each point higher on the school problems scale decreased the odds of being in the high improving group by a factor of about 15%.

We next examined psychological and environmental variables that were assessed between 2001 and 2004. Youths in the high improving group made several psychological changes during the 4 years (Table 3). By wave 3 (2003), the Youth Risk Surveillance Addictions Scale indicated that their substance use averaged less than half that of the high chronic group (0.50 vs. 2.27). Reported alcohol and drug symptoms were also much lower for the high improving group at the 2004 time point. Depression symptoms paralleled these same findings, with high improving youths having only about one tenth of the symptoms of the high chronic youths by 2004 (0.78 versus 7.23). The percentage of youths having thoughts about or attempting suicide was reduced from 60% to just less than 9% from 2001 to 2004 in the high improving group, whereas the high

**TABLE 4**

Environmental Variables at Each Time Point for High Chronic and High Improving Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>2001 Mean/SD</th>
<th>2002 Mean/SD</th>
<th>2003 Mean/SD</th>
<th>2004 Mean/SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservation (vs. urban)</td>
<td>39.39%</td>
<td>41.38%</td>
<td>17.48%</td>
<td>91.30%*</td>
</tr>
<tr>
<td>Traumatic experiences</td>
<td>2.39</td>
<td>2.00</td>
<td>1.79</td>
<td>1.57</td>
</tr>
<tr>
<td>Recent stressors</td>
<td>3.76</td>
<td>3.79</td>
<td>0.92</td>
<td>1.57</td>
</tr>
<tr>
<td>Family satisfaction</td>
<td>16.55</td>
<td>17.48</td>
<td>21.14*</td>
<td>18.63*</td>
</tr>
<tr>
<td>Family conflict</td>
<td>3.79</td>
<td>2.84</td>
<td>0.50*</td>
<td>2.00</td>
</tr>
<tr>
<td>Total family problems</td>
<td>3.03</td>
<td>5.15</td>
<td>2.15</td>
<td>3.31</td>
</tr>
<tr>
<td>Parent with mental health problem</td>
<td>81.82%</td>
<td>50.00%</td>
<td>9.21%</td>
<td>86.21%</td>
</tr>
<tr>
<td>Peer substance use</td>
<td>5.76</td>
<td>5.28</td>
<td>2.19</td>
<td>5.53</td>
</tr>
<tr>
<td>Neighborhood problems</td>
<td>3.15</td>
<td>2.54</td>
<td>2.53</td>
<td>2.76</td>
</tr>
<tr>
<td>School problems</td>
<td>5.14</td>
<td>2.18</td>
<td>2.82</td>
<td>3.07</td>
</tr>
<tr>
<td>Discrimination</td>
<td>1.55</td>
<td>0.72</td>
<td>1.82</td>
<td>1.57</td>
</tr>
</tbody>
</table>

**TABLE 5**

Multinomial Logistic Regression Results Showing the Influence of 2001 Variables on the Probability of Being in the High Improving Group versus the High Chronic Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservation (vs. urban)</td>
<td>5.94**</td>
<td>2.30–15.33</td>
</tr>
<tr>
<td>Family satisfaction</td>
<td>1.14*</td>
<td>1.02–1.28</td>
</tr>
<tr>
<td>School problems</td>
<td>0.84*</td>
<td>0.74–0.96</td>
</tr>
</tbody>
</table>

*p < .05; **p < .0001.
chronic group showed little change in these reports (55% and 52%, respectively).

There were also a number of environmental differences. By wave 4 (2004), high improving youths had significantly higher family satisfaction (21.14% versus 17.48) and reported only one half as many parents with mental health problems (24% versus 50%). Newly differentiating environmental variables included peer substance use, neighborhood problems, and stressors. The high improving group had only about half as many peers who used illicit substances (3.21 versus 5.28), only one fifth the reported neighborhood problems (.50 versus 2.54), and one fourth of the stressors (0.50 versus 2.2) as the high chronic group (Table 4). Levels of family conflict showed a downward trend from 2001 to 2003 in the high improving group, but increased in the high chronic group over this same time period.

DISCUSSION

We found that some trajectories indicated that youths improved their behavior over time. One group was able to “turn things around” during the course of this study. Although this may seem to contradict a body of evidence that behavioral trajectories are stable (Ferdinand et al., 1995; Kowaleski-Jones and Duncan, 1999; Pape and Hammer, 1996), it supports the position that behavior over time reflects a change in psychological and environmental characteristics (Laub and Sampson, 2001) and that a substantial portion of adolescents with clinically significant YSR total scores improve over time. Of most interest are the different trajectories of the high improving and high chronic groups. Differences between these groups may reveal potential avenues for ameliorating problem behaviors or indicate the profile of groups likely to improve over time. Our analyses support the key role also found by others for the importance of social or environmental factors in behavioral trajectories (cf. Costello et al., 2003), as well as a significant but lesser role of individual level factors.

Further examination of environmental changes in the reservation (who were overrepresented in the high improving group) during this time may shed light on the improving trajectory. Between 2001 and 2004, there were no service changes or new interventions in the urban area; however, there were many changes on the reservation. In 2001 they initiated their first casino and sold some land to the state, which funded community programs, per capita payouts, a better standard of living, and more jobs. The community added more service providers in schools, courts, and jails. They also added family-oriented social treatment and prevention programs, as well as family programs for youths in treatment. They focused a number of programs on youths: recreational, physical, social, and employment. They also added youth treatment and prevention programs. The timing of the reservation addition of a casino and per capita payouts with the trajectory of the high improving group is consistent with findings by Costello et al. (2003) of improved behaviors of youths whose families were no longer poor due to casino payouts and associated opportunities.

Limitations

The reader should be aware of methodological issues that may qualify the interpretation of our study. Foremost among them is the confinement of the study to one reservation and one urban area. Furthermore, the reservation and urban youths are both from acculturated populations with relatively easy access to urban centers rather than from isolated, more traditional American Indian communities. However, because 39% of American Indians and Alaska Natives are younger than age 20 and most belong to mid- to small-size periurban reservations (U.S. Census Bureau, 2001), the similarities enhance the potential generalizability of results. Additional limitations include the reliance of the study on only youths’ report data, which may provide an incomplete sense of the youths’ problems, resources, and service utilization. Also, the differential dropout of urban participants may have affected the urban reservation differences, although statistical cross-checking showed no such effects. Urban youths who dropped out did not differ statistically in behavior problems from the other youths.

A major potential limitation relates to the validity of the drop in YSR scores among reservation youths. However, the YSR scores correlated with other internal interview measures in a similar fashion at each wave, and there was no relationship between interviewer and YSR score improvement. The community reported simultaneously experiencing declines in problems (arrests and rates of babies born with addiction problems) that paralleled our results. Thus, we are encouraged that the YSR score drop is indeed valid.
Clinical Implications

A clinician can derive several messages from this study. First, some youths can and do improve over time. The major contributors to improving behavior appear to be environmental. Thus, it behooves clinicians to also structure the environment of youths by addressing family and school issues, even if clinicians cannot make community changes themselves. Finally, it appears that reductions in substance use clearly parallel behavior improvement, indicating the necessity of addressing substance issues. Our data indicate that full community mobilization of interventions (more than just for youths, but including family, economic, social, and addictions interventions) may have affected the behavioral trajectories of the high improving youths, who were largely based on the reservation where that mobilization occurred. The extent to which clinicians may be able to provide youths with such a variety of interventions and activities may help predict clinical success. American Indian communities and policy planners can also derive some degree of direction from the apparent success of the major community mobilization that appears related to the youths’ behavior.

The implications of our results open a number of potential questions for future research. For instance, what was the actual exposure of the high improving youths to the community changes? Can similar changes in youths’ behavior be induced by the controlled application of similar community changes? Which of the community changes was critically related to the improved behavior? Will the behavioral trajectories be maintained? Can exposing youths to other similar varieties of activities and interventions accomplish the same improvement that these community-wide changes appear to have accomplished? In sum, our study has import both for what it demonstrates about trajectories and also for the questions that it raises to guide future studies.

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