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ABSTRACT

Objectives. Project Northland is an efficacy trial with the goal of preventing or reducing alcohol use among young adolescents by using a multilevel, communitywide approach.

Methods. Conducted in 24 school districts and adjacent communities in northeastern Minnesota since 1991, the intervention targets the class of 1998 (sixth-grade students in 1991) and has been implemented for 3 school years (1991 to 1994). The intervention consists of social–behavioral curricula in schools, peer leadership, parental involvement/education, and communitywide task force activities. Annual surveys of the class of 1998 measure alcohol use, tobacco use, and psychosocial factors.

Results. At the end of 3 years, students in the intervention school districts report less onset and prevalence of alcohol use than students in the reference districts. The differences were particularly notable among those who were nonusers at baseline.

Conclusions. The results of Project Northland suggest that multilevel, targeted prevention programs for young adolescents are effective in reducing alcohol use. (*Am J Public Health.* 1996;86:956–965)

Introduction

Adolescent drinking and other drug use remain major public health problems in this country, despite some encouraging declines in the prevalence of use.[1–7] Alcohol use among adolescents is widespread (e.g., 88% of 12th graders reported any lifetime use in 1992), even though drinking is illegal for essentially all high school students.[3] Motor vehicle crashes are the leading cause of death for adolescents,[8] with one third to one half of such crashes involving alcohol.[9] Furthermore, early onset of alcohol and tobacco use is a risk factor for progression to more serious forms of drug use.[10]

The pervasiveness and promotion of alcohol use in our society,[6] contrasted with the needs and skills of youth, create a social environment that puts many adolescents at risk for alcohol-related problems. Public health strategies to prevent alcohol-related problems typically adopt either demand- or supply-reduction approaches.[5,11] School-based programs addressing individual characteristics and peer influence (i.e., demand reduction) are the most common approaches to preventing onset of alcohol and other drug use.[6] Early adolescence has been targeted for program implementation because this is the developmental period just prior to experimentation. School programs focusing on social influences, such as peer resistance training or attempts to change perceived norms, have shown considerable promise for changing alcohol use rates.[5,6,12–20] Several factors emerge from this literature as potentially critical to adolescent alcohol use prevention efforts: (1) the need for an adequate number of hours of curricula over at least 3 years[19]; (2) fidelity of implementation to the intervention protocol[17]; (3) peer involvement in implementation[17,18,21]; (4) an intervention focus on social influences, life skills, and peer resistance skills[15,19,22]; (5) an intervention focus on changing perceived alcohol norms[23]; (6) the need for parent, peer, and community involvement in changing alcohol use norms[22,24]; and (7) school-based demand reduction strategies (as necessary but not sufficient components of successful prevention efforts).[11,15,24–27] Unfortunately, multilevel interventions that include both individual behavior change (demand) and environmental change (supply) strategies are far less common in alcohol use prevention programs,[6] despite their utility in reducing tobacco use during adolescence.[28–30]

Project Northland is a communitywide research program to prevent young adolescent alcohol use. The project was designed to test the efficacy of a multilevel, multiyear intervention program for youth.[11] It is the first such trial that has randomized school districts and adjoining communities to an intervention condition, specifically targeted young adolescent alcohol use, and used a multilevel interven-

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tion program. It was anticipated that this multilevel program would change parent–child communication about alcohol use, the functional meanings of alcohol use for young people, the students' self-efficacy to resist alcohol, peer influences to drink, alcohol use norms, and the students' ease of access to alcohol in their communities. This paper describes the initial outcomes of Project Northland after 3 years of intervention.

Methods

Subjects

Project Northland, conducted in northeast Minnesota, involves mostly rural, lower-middle-class to middle-class communities. The population of the six participating counties is 235 000, and residents are primarily of European ethnic backgrounds. This area of Minnesota rates at the top in terms of alcohol-related problems in the state.[31] There are seven American Indian reservations in the area. The 24 school districts were recruited systematically[11]; 4 smaller school districts were combined with nearby districts (to ensure an adequate sample size in each unit to be randomized), and these 20 combined districts were blocked by size (small, medium, large, very large) and randomized to an intervention condition (n = 10) or a reference condition (n = 10). The primary study cohort is the class of 1998 in these school districts; these students were sixth graders at baseline in fall 1991 (n = 2351). Ninety-four percent of these students are White. American Indian students constitute about 5.5% of the study's cohort. Because of their small number, analyses of intervention effects with this subgroup were not possible.

Intervention Programs

The intervention programs were implemented with the class of 1998 during sixth, seventh, and eighth grades and in the intervention communities as a whole during the same period (1991 to 1994). These intervention programs include parent involvement/education programs, behavioral curricula, peer participation, and community task force activities.[5,11] Each intervention year had an overall theme that uniquely identified Project Northland's programs and was tailored to the cohort's developmental level and school organization, since most of the students moved from elementary to junior high schools between sixth and seventh grades. The programs underwent extensive pilot tests in a different, but comparable, Minnesota community, and revisions were made prior to implementation.

Sixth grade. The Slick Tracy Home Team Program, implemented in 1991/92, involved a "home team" approach[32] consisting of four sessions of activity–story books (with characters Slick Tracy and Breathtest Mahoney as role models). The intervention students completed the activity books as homework with their parents during 4 consecutive weeks.[33] In addition, issues of *Northland Notes for Parents,* containing information on young adolescent alcohol use, were included in each Slick Tracy activity book. The intervention also involved small-group discussions around the themes of the books during school and the Slick Tracy Family Fun Night, an evening fair at which students' posters and projects from the program were displayed. Details of the content and implementation of the Slick Tracy program have been presented elsewhere.[33]

Project Northland communitywide task forces were formed during 1992. Task force members were recruited by field staff on the basis of their willingness to participate and roles in their communities. The first task force training session was held in April 1992 for 25 representatives from 13 task forces across the intervention communities. The task forces include members from a cross section of the community: government officials, law enforcement personnel, school representatives, business representatives, health professionals, youth workers, parents, concerned citizens, clergy, and adolescents.

Seventh grade. The Amazing Alternatives! Program, implemented in 1992/93, consisted of (1) a kickoff evening with parents (the Awesome Autumn Party), (2) an 8-week peer-led classroom curriculum (Amazing Alternatives!), (3) a peer participation program to create alternative alcohol-free activities (The Exciting and Entertaining Northland Students [T.E.E.N.S.]), (4) four Amazing Alternatives! Home Program booklets mailed directly to parents, and (5) three new issues of *Northland Notes for Parents.* The overall theme of the seventh-grade programs was to introduce members of the intervention cohort and their parents to ways to resist and counteract influences on teens to use alcohol.

The Amazing Alternatives! Classroom Program included eight sessions of peer- and teacher-led activities over 8 weeks. This program was based on that used in a World Health Organization study[18] and the Saving Lives Program.[34] The program used audiotape vignettes, group discussions, class games, problem solving, and role plays related to themes of why young people use alcohol and alternatives to use, influences in terms of drinking, strategies for resisting those influences, normative expectations that most people their age do not drink, and intentions not to drink. Peer leaders for the classroom program were selected with an open election in which students chose individuals they "liked and respected," without any admonishments from adults to restrict the leaders to nonusers of alcohol.

The peer participation program was named T.E.E.N.S. by the students involved.[35] The program was designed to provide peer leadership experience outside the classroom through participants' involvement in planning alcohol-free activities for seventh-grade students. Adult volunteers were recruited from the middle and junior high schools to facilitate the T.E.E.N.S. groups. One-day leadership training sessions were held in fall 1992 for 73 student representatives from 18 schools. The training included learning methods to determine seventh graders' favorite activities, how to plan a budget for an activity, and how to publicize an activity. Planning booklets were given to the students. Sixteen percent of the intervention cohort (166 students) participated in planning at least one activity for their peers.

Parental involvement was obtained through the Amazing Alternatives! Home Program, patterned after the sixth-grade program (with the exception that booklets were mailed directly to parents). The home program consisted of four booklets that included direct behavioral prescriptions for parents and activities for parents to complete with their seventh graders (T. Toomey, C. Williams, C. L. Perry, D. M. Murray, B. Dudovitz, and S. Veblen-Mortenson, unpublished data, 1996). In addition, three new issues of *Northland Notes for Parents* provided an update of Project Northland events and another format for educational messages.

The communitywide task force activities in 1992/93 involved the passage of five alcohol-related ordinances and three resolutions, including enactment of local ordinances requiring responsible beverage service training to prevent illegal alcohol sales to underaged youth and intoxicated patrons in three of the communities. Other activities included the initiation of a gold card program to link community

businesses and schools (in which businesses provided discounts to students who pledged to be alcohol and drug free).

Eighth grade. PowerLines, implemented in 1993/94, consisted of an eight-session classroom curriculum (PowerLines); a theater production, "It's My Party," involving eighth-grade actors and performed at each school for classmates, parents, and community members; three new issues of *Northland Notes for Parents;* and the continuation of the T.E.E.N.S. groups and communitywide task force activities.

The goals of the eighth-grade interventions were to introduce students to the "power" groups (individuals and organizations) within their communities that influence adolescent alcohol use and availability and to teach community action/citizen participation skills.[36] Students interviewed parents, local government officials, law enforcement personnel, schoolteachers and administrators, and retail alcohol merchants about their beliefs and activities concerning adolescent alcohol use. Students conducted a "town meeting" in which small groups of students represented various community groups and made recommendations for community action for alcohol use prevention.

Live theater was seen as a potentially useful prevention strategy with parents in the third year.[37] This idea led to a collaboration with the Child's Play Theatre Company of Minneapolis. Development of a production of "It's My Party" began with script writing by Child's Play and Project Northland staff. Two teams of actor-educators were trained to conduct a half-day workshop with approximately 10 eighth-grade students from each of the 20 intervention schools and then went on tour. After the workshop (on the same day), the students performed the play for their peers, parents, and members of the community.

T.E.E.N.S. continued during the eighth grade, and alternative activities took place in all intervention school districts. In addition, three editions of *TEENSpeak,* a newsletter written by and for eighth-grade students in the Project Northland cohort, were sent to parents and peers.

The communitywide task forces continued their efforts throughout 1993/94, resulting in 28 task force meetings during the year. Increased emphasis was given to collaborating with existing organizations to make as many linkages as possible with local groups directly influencing underage drinking. Activities during 1993/94 included (1) discussions with local alcohol merchants about their alcohol-related policies concerning young people; (2) distribution of materials that support policies concerning the sale of alcohol to minors, including identification checks and legal consequences for selling alcohol to minors; (3) ongoing meetings to initiate new gold card programs to link community businesses and schools; and (4) the continued sponsorship of alcohol-free activities for young teens, including the establishment of a teen center in one community.

In summary, students in the intervention communities in the class of 1998 have been exposed to 3 years of parental involvement, behavioral curricula, peer leadership opportunities, and communitywide task force activities. The students were educated with skills to communicate with their parents about alcohol (sixth grade), to deal with peer influence and normative expectations about alcohol (seventh grade), and to understand methods that bring about community-level changes in alcohol-related programs and policies (eighth grade). At the same time, changes were sought in how parents communicated with their children, how peers influenced each other, and how the communities responded to young adolescent alcohol use. Therefore, not only were students learning skills to affect their social environment, but changes in the social environment were also directly sought.

Reference school districts. The reference districts' usual alcohol and other drug education programs continued in these districts and adjoining communities from 1991 through 1994. A survey of these programs was undertaken in 1992. Nearly all of the students (more than 90%) in the reference districts had taken part in Project DARE, as compared with 40% in the intervention districts.[33] Also, 21% of students in the reference districts, in comparison with 2% in the intervention districts, had taken part in Project Quest, sponsored by the Lion's Club. For the most part, the sixth-grade Slick Tracy program had replaced these programs in the intervention school districts. During the 1994/95 school year, Project Northland school programs were offered to the reference school districts, beginning with the sixth-grade program; 7 of the 10 districts have chosen to adopt these programs.

Evaluation

Subjects. Students in the intervention and reference school districts were surveyed in their classrooms at baseline (fall 1991) and follow-up (spring 1992, 1993, and 1994). Of the 2351 students present at baseline, 93% (n = 2191), 88% (n = 2060), and 81% (n = 1901) were surveyed at the end of the sixth, seventh, and eighth grades, respectively. Of the 450 (19%) lost to follow-up at the end of eighth grade in spring 1994, 231 (51.3%) were in the intervention condition. There were no significant differences in baseline alcohol use between those who were lost to follow-up in the intervention and reference conditions. Of those lost to follow-up, 62% moved out of the area, 19% were parent or student refusals, 9% moved across treatment conditions, 7% were absent, and 3% were deleted because of inconsistent responding. No significant differences were found in baseline alcohol use between those who were lost to follow-up and those who remained.

Measures. The student questionnaire contained items related to Project Northland program exposure, psychosocial factors, and behavior.[38] The survey included measures of alcohol use, tobacco use, other drug use, peer influences, self-efficacy (confidence in being able to refuse offers of alcohol), functional meanings of alcohol use (reasons not to use alcohol), communication with parents, normative expectations concerning alcohol use, perceptions of ease of access to alcohol, attendance at activities with/without alcohol, and demographic factors.

A scale was created that measured an adolescent's tendency to use alcohol. The Tendency to Use Alcohol Scale combined items about intentions to use alcohol and items concerning actual alcohol use. The measures of peer influence, self-efficacy, and perceptions of access to alcohol also formed scales with satisfactory psychometric properties.[38] These scales were scored by summing the points for each individual item. Because the distributions of many items in these scales were skewed and the items involved differing response options, z scores were used in tests of significance.

Other measures were used to assess the social environment of the cohort at baseline and to examine differences between the intervention and reference groups. These measures included a phone survey of parents in half of the households of the class of 1998 cohort, alcohol purchase attempts by young buyers,[39]

TABLE 1—Alcohol and Other Drug Use, Peer Influence, Self-Efficacy, and Access to Alcohol Scales: Comparison of Class of 1998 Students in the Intervention and Reference School Districts

	All Students		Baseline Nonusers		Baseline Users	
	Intervention	Reference	Intervention	Reference	Intervention	Reference
Tendency to use alcohol scale score,[a] mean (95% CI)						
Fall 1991	11.5 (11.0, 12.0)	11.0 (10.5, 11.5)	9.4 (9.2, 9.5)	9.5 (9.3, 9.7)	14.5 (13.8, 15.2)	13.6 (12.9, 14.4)
Spring 1992	11.7 (11.2, 12.2)	11.6 (11.1, 12.1)	10.1 (9.6, 10.6)	10.2 (9.7, 10.7)	14.3 (13.5, 15.1)	14.1 (13.2, 14.9)
Spring 1993	14.5 (13.3, 15.7)	14.9 (13.7, 16.1)	12.2 (11.2, 13.2)	13.2 (12.2, 14.2)	18.3 (16.3, 20.3)	17.8 (15.8, 19.8)
Spring 1994	16.0 (15.1, 16.8)*	17.5 (16.7, 18.5)	13.8 (13.1, 14.4)**	15.3 (14.6, 15.9)	19.7 (18.0, 21.6)	21.1 (19.3, 22.9)
Past month alcohol use,[b] % (95% CI)						
Fall 1991	6.9 (5.0, 8.8)*	3.9 (2.0, 5.9)	0 . . .	0 . . .	16.6 (12.7, 20.5)*	10.6 (6.4, 14.9)
Spring 1992	7.6 (4.9, 10.4)	6.3 (3.5, 9.0)	2.4 (1.0, 3.7)	3.1 (1.7, 4.4)	15.6 (10.1, 21.1)	11.6 (5.9, 17.3)
Spring 1993	14.9 (10.3, 19.4)	17.5 (13.0, 22.0)	8.3 (5.1, 11.9)	11.8 (8.7, 15.3)	25.5 (17.1, 33.5)	27.9 (19.5, 36.4)
Spring 1994	23.6 (20.1, 27.1)*	29.2 (25.6, 32.8)	15.3 (11.7, 18.9)*	21.2 (17.7, 24.8)	36.9 (29.5, 44.2)	43.1 (35.2, 51.0)
Past week alcohol use,[b] % (95% CI)						
Fall 1991	3.8 (2.6, 5.0)*	2.0 (1.0, 3.2)	0 . . .	0 . . .	9.1 (6.3, 11.9)	5.3 (2.2, 8.4)
Spring 1992	3.4 (1.4, 5.5)	3.4 (1.4, 5.4)	1.0 (0, 2.2)	1.5 (0.4, 2.7)	7.1 (2.6, 11.7)	6.7 (2.1, 11.4)
Spring 1993	7.4 (4.0, 10.8)	8.4 (5.1, 11.8)	5.0 (2.5, 8.1)	6.1 (3.6, 9.0)	11.1 (5.4, 16.7)	13.2 (7.2, 19.0)
Spring 1994	10.5 (8.0, 13.0)*	14.8 (12.2, 17.4)	5.3 (3.0, 7.6)**	9.8 (7.5, 12.1)	18.4 (12.4, 24.5)	23.6 (17.0, 30.1)
Cigarette use,[c] % (95% CI)						
Fall 1991	6.9 (4.9, 8.9)*	4.7 (2.6, 6.7)	1.5 (0.6, 2.3)	0.9 (0, 1.7)	13.8 (8.9, 18.6)	11.5 (6.4, 16.6)
Spring 1992	8.4 (6.1, 10.6)	8.8 (6.5, 11.0)	3.1 (1.5, 4.7)	2.8 (1.2, 4.4)	15.9 (12.0, 19.8)	18.5 (14.3, 22.7)
Spring 1993	17.8 (13.5, 22.1)	19.4 (15.2, 23.7)	9.8 (5.7, 13.8)	14.3 (10.3, 18.2)	29.8 (23.4, 36.1)	29.4 (22.7, 36.1)
Spring 1994	24.8 (20.2, 29.5)	30.7 (26.0, 35.4)	15.5 (10.3, 20.7)*	24.6 (19.6, 29.7)	39.1 (32.8, 45.4)	42.7 (35.7, 49.6)
Smokeless tobacco use,[c] % (95% CI)						
Fall 1991	1.5 (0.4, 2.5)	1.5 (0.5, 2.6)	0 . . .	0 . . .	3.1 (0.8, 5.3)	4.0 (1.6, 6.4)
Spring 1992	3.2 (2.2, 4.3)	3.4 (2.3, 4.5)	1.2 (0, 2.4)	1.3 (0, 2.5)	6.6 (4.5, 8.7)	6.8 (4.4, 9.2)
Spring 1993	7.8 (4.7, 11.0)	9.4 (6.2, 12.5)	4.0 (1.7, 6.4)	6.8 (4.5, 9.1)	14.1 (8.3, 19.9)	14.2 (8.2, 20.3)
Spring 1994	13.5 (10.2, 16.8)	16.3 (13.0, 19.7)	7.4 (3.7, 11.1)	12.3 (8.7, 16.0)	23.4 (18.9, 27.8)	23.8 (18.7, 28.9)
Marijuana use,[d] % (95% CI)						
Fall 1991	0.7 (0, 1.3)	0.4 (0, 1.0)	0 . . .	0 . . .	1.7 (0, 3.4)	5.8 (0, 2.3)
Spring 1992	0.6 (0, 1.2)	1.2 (0, 1.8)	0 . . .	0 . . .	1.1 (0, 2.4)	2.2 (0.1, 3.6)
Spring 1993	3.5 (0.9, 6.1)	3.2 (0.6, 5.8)	1.7 (0.4, 3.1)	2.6 (1.3, 3.9)	4.4 (1.2, 7.7)	5.12 (1.7, 8.6)
Spring 1994	7.4 (4.4, 10.4)	8.6 (5.5, 11.6)	3.1 (1.3, 4.9)*	6.2 (4.4, 8.0)	14.3 (8.1, 20.5)	13.2 (6.6, 19.8)
Peer influence scale score,[e] mean (95% CI)						
Fall 1991	19.4 (18.8, 20.1)	18.6 (18.0, 19.3)	18.2 (17.7, 18.7)	17.7 (17.2, 18.2)	21.0 (20.0, 22.0)	20.2 (19.2, 21.3)
Spring 1992	19.0 (18.5, 19.5)	19.1 (18.6, 19.6)	18.1 (17.6, 18.5)	18.0 (17.6, 18.5)	20.5 (20.0, 21.0)	20.6 (20.1, 21.2)
Spring 1993	21.9 (20.4, 23.4)	23.0 (21.5, 24.5)	20.5 (19.3, 21.8)	21.8 (20.6, 23.1)	23.9 (22.0, 25.9)	24.9 (23.0, 26.9)
Spring 1994	24.6 (23.3, 26.0)*	27.0 (25.7, 28.4)	22.8 (21.5, 24.1)*	25.4 (24.1, 26.7)	27.7 (25.83, 29.6)	29.9 (27.9, 31.8)
Self-efficacy scale score,[f] mean (95% CI)						
Fall 1991	21.9 (21.5, 22.2)	22.0 (21.6, 22.4)	22.9 (22.4, 23.3)	22.8 (22.4, 23.2)	20.6 (20.1, 21.1)	20.5 (20.0, 21.1)
Spring 1992	21.9 (21.6, 22.3)	21.8 (21.4, 22.1)	22.9 (22.6, 23.1)	22.5 (22.2, 22.8)	20.4 (19.8, 21.1)	20.5 (19.8, 21.2)
Spring 1993	20.4 (19.4, 21.4)	20.4 (19.4, 21.4)	21.5 (20.7, 22.3)	21.2 (20.4, 22.0)	19.0 (17.7, 20.2)	19.0 (17.8, 20.3)
Spring 1994	20.2 (19.7, 20.8)	19.6 (19.0, 20.2)	21.6 (21.1, 22.0)*	20.4 (20.0, 20.9)	18.2 (17.2, 19.1)	18.4 (17.3, 19.4)
Perceived access scale score,[g] mean (95% CI)						
Fall 1991	14.7 (14.2, 15.2)	14.7 (14.2, 15.2)	14.0 (13.4, 14.6)	14.3 (13.7, 14.9)	15.8 (15.4, 16.2)	15.6 (15.1, 16.1)
Spring 1992	15.3 (14.7, 15.9)	15.1 (14.5, 15.7)	14.5 (13.8, 15.2)	14.6 (13.9, 15.3)	16.5 (16.1, 17.0)	16.1 (15.6, 16.6)
Spring 1993	17.7 (17.0, 18.5)	18.1 (17.3, 18.8)	17.1 (16.3, 18.0)	17.7 (16.9, 18.5)	18.6 (17.8, 19.4)	18.7 (17.9, 19.5)
Spring 1994	19.2 (18.6, 19.9)	19.7 (19.1, 20.4)	18.8 (17.9, 19.7)	19.4 (18.5, 20.2)	20.0 (19.6, 20.5)	20.4 (19.9, 20.9)

Note. Values were adjusted for race and baseline measures. All-student sample sizes for all analyses were as follows: fall 1991, n = 2351; spring 1992, n = 2191; spring 1993, n = 2060; spring 1994, n = 1901. Baseline nonusers sample sizes were as follows: fall 1991, n = 1443; spring 1992, n = 1353; spring 1993, n = 1273; spring 1994, n = 1176. Finally, baseline user sample sizes were as follows: fall 1991, n = 881; spring 1992, n = 816; spring 1993, n = 766; spring 1994, n = 712. CI = confidence interval.

[a]The score range was 8 (no tendency to use alcohol) to 48 (high levels of use and intentions).

[b]At least 1 occasion.

[c]More than 1–2 occasions (occasionally or regularly).

[d]At least 1 occasion in the past year.

[e]The score range was 15 (no influence) to 71 (high peer influence).

[f]The score range was 5 (not being able to refuse alcohol) to 25 (being able to refuse).

[g]The score range was 6 (very difficult to obtain alcohol) to 30 (easy to obtain).

*$P < .05$ (differences between conditions based on F statistic).

**$P < .01$ (differences between conditions based on F statistic).

alcohol merchant telephone surveys,[40] and interviews with community leaders (S. Sosale, J. Finnegan, and C. L. Perry, unpublished data, 1994).[11]

Analysis

Differences between the intervention and reference conditions were tested at baseline and at each follow-up by means of mixed model regression methods (mixed model analyses of covariance), which can accommodate fixed effects, random effects, and correlated observations within assignment units found in community trial research.[41] The unit of randomization, the combined school district, was specified as a nested random effect. The school district intraclass correlation coefficients ranged from .002 (past week alcohol use, spring 1994) to .03 (past year alcohol use, spring 1993), with a median value of .015. (Other intraclass correlation coefficients are available from the authors.) Because the students changed classrooms each year, and because they changed schools between sixth and seventh grades, classes and schools were not directly examined as nested effects.[41,42]

More students in the intervention districts than in the reference districts reported alcohol use at baseline.[33] Therefore, analyses were performed for the entire sample and then separately for baseline users (any lifetime use at fall 1991) and nonusers. Baseline measures of alcohol use were used as covariates in the longitudinal analyses of the entire sample and the baseline users. Since there were no significant differences and no interaction effect between gender and intervention condition, data from boys and girls were pooled. Students in the intervention districts were slightly (0.1 years) older at baseline. However, baseline differences in alcohol use between conditions persisted, even when adjusted for age. There were fewer White students in the intervention districts than in the reference districts; race was controlled in all outcome analyses. Baseline measures of the psychosocial variables, if available (some parent communication and functional meaning items were not assessed at baseline), were used as covariates in analyses of those variables at follow-up. Thus, within-subjects factors were incorporated in each analysis by adjusting for baseline measures and race.

TABLE 2—Norms, Family Communication, and Functional Meaning Items: Comparison of Class of 1998 Students in the Intervention and Reference School Districts

	Intervention	Reference	P[a]
Norms, % true (95% CI)			
Not many people my age drink alcohol			
Fall 1991 (n = 2351)	41.4 (35.3, 47.4)	55.1 (49.1, 61.2)	.003
Spring 1992 (n = 2191)	43.5 (35.3, 51.7)	50.2 (42.0, 58.9)	.24
Spring 1993 (n = 2060)	35.7 (25.3, 46.0)	28.6 (18.3, 38.9)	.32
Spring 1994 (n = 1901)	26.0 (19.3, 32.6)	15.5 (8.8, 22.2)	.03
Most people my age will drink alcohol by the time they are seniors in high school			
Fall 1991 (n = 2351)	46.3 (40.9, 51.6)	45.9 (40.6, 51.2)	.92
Spring 1992 (n = 2191)	49.4 (45.9, 52.9)	44.8 (41.2, 48.4)	.07
Spring 1993 (n = 2060)	62.3 (55.0, 70.0)	67.1 (59.8, 74.4)	.35
Spring 1994 (n = 1901)	72.7 (66.8, 78.6)	78.4 (72.5, 84.3)	.17
Parent communication, % true (95% CI)			
My parents talk with me about problems drinking alcohol can cause young people			
Fall 1991 (n = 2351)	63.5 (59.5, 67.4)	70.6 (66.7, 74.6)	.01
Spring 1992 (n = 2191)	72.6 (69.0, 76.1)	64.7 (61.1, 68.3)	.005
Spring 1993 (n = 2060)	62.9 (59.1, 66.6)	58.7 (54.9, 62.5)	.12
Spring 1994 (n = 1901)	62.2 (57.1, 67.3)	55.2 (50.0, 60.4)	.06
My family has rules against young people drinking alcohol			
Fall 1991 (n = 2351)	55.7 (52.0, 59.5)	61.0 (57.2, 64.8)	.06
Spring 1992 (n = 2191)	64.3 (61.5, 67.0)	62.9 (60.0, 65.7)	.46
Spring 1993 (n = 2060)	70.9 (65.0, 76.9)	66.6 (60.7, 72.6)	.30
Spring 1994 (n = 1901)	74.0 (69.8, 78.1)	68.7 (64.5, 72.9)	.08
I think my parents will allow me to drink by the time I am a high school senior			
Fall 1991 (n = 2351)	7.5 (5.4, 9.5)	6.9 (4.8, 9.0)	.69
Spring 1992 (n = 2191)	9.6 (6.8, 12.3)	8.4 (5.7, 11.1)	.54
Spring 1993 (n = 2060)	12.8 (9.1, 16.5)	11.8 (8.2, 15.5)	.70
Spring 1994 (n = 1901)	17.1 (13.3, 20.9)	18.4 (14.6, 22.3)	.60
My parents have told me what would happen if I were caught drinking alcohol[b]			
Spring 1993 (n = 2060)	67.5 (61.8, 73.1)	56.1 (50.5, 61.8)	.01
Spring 1994 (n = 1901)	65.3 (59.8, 70.9)	55.1 (49.5, 60.7)	.01

(Continued)

Results

Participation in the Intervention Programs

Project Northland was able to maintain widespread participation in the program, including 3 years of curriculum implementation in all intervention schools, parent participation in alcohol education activities, and participation by nearly half of the students in peer-planned alcohol-free activities outside of school (T. Toomey, C. Williams, C. L. Perry, D. M. Murray, B. Dudovitz, and S. Veblen-Mortenson, unpublished data, 1996).[33,35] The sixth-grade intervention was implemented primarily in students' homes, and high rates of participation were demonstrated.[33] In seventh grade, all intervention schools implemented the program curriculum using elected, trained peer leaders (n = 273) and held the fall evening party, with about 1700 people attending. Participation in the seventh-grade parent education program has been described by T. Toomey, C. Williams, C. L. Perry, D. M. Murray, B. Dudovitz, and S. Veblen-Mortenson (unpublished data, 1996). In the eighth grade, all intervention schools implemented the curriculum, as well as a theater production (with approximately 2700 people attending 20 performances). Peer-planned alternative activities occurred in seventh and eighth

TABLE 2— *Continued*

	Intervention	Reference	*P*[a]
Functional meaning item score,[c] mean (95% CI)			
There are many other ways to have fun besides drinking alcohol			
Spring 1992 (n = 2191)	4.4 (4.3, 4.5)	4.4 (4.3, 4.5)	.80
Spring 1993 (n = 2060)	4.2 (4.0, 4.4)	4.0 (3.8, 4.2)	.16
Spring 1994 (n = 1901)	3.9 (3.8, 4.1)	3.8 (3.6, 3.9)	.17
My parents have rules against alcohol use by people my age			
Spring 1992 (n = 2191)	4.1 (4.0, 4.2)	4.2 (4.1, 4.4)	.04
Spring 1993 (n = 2060)	3.9 (3.7, 4.1)	3.7 (3.5, 3.8)	.09
Spring 1994 (n = 1901)	3.8 (3.7, 3.9)	3.5 (3.4, 3.6)	.002
It would hurt my reputation			
Spring 1994 (n = 1901)	3.8 (3.7, 3.9)	3.3 (3.2, 3.5)	.0001
I'm afraid I might become an alcoholic			
Spring 1992 (n = 2191)	3.5 (3.3, 3.6)	3.7 (3.6, 3.8)	.02
Spring 1993 (n = 2060)	3.6 (3.4, 3.7)	3.4 (3.3, 3.6)	.14
Spring 1994 (n = 1901)	3.6 (3.5, 3.7)	3.4 (3.2, 3.5)	.003
Using alcohol could threaten my eligibility to participate in sports or other activities			
Spring 1994 (n = 1901)	4.2 (4.1, 4.3)	4.0 (3.9, 4.1)	.01
Drinking alcohol costs too much money			
Spring 1992 (n = 2191)	3.5 (3.4, 3.7)	3.4 (3.3, 3.6)	.36
Spring 1993 (n = 2060)	3.6 (3.4, 3.7)	3.2 (3.1, 3.4)	.001
Spring 1994 (n = 1901)	3.1 (3.0, 3.2)	2.8 (2.7, 3.0)	.01
I would be breaking school policies and rules			
Spring 1994 (n = 1901)	3.2 (3.0, 3.3)	2.9 (2.7, 3.0)	.01
Alcohol use can be bad for my health			
Spring 1992 (n = 2191)	4.5 (4.4, 4.6)	4.5 (4.4, 4.6)	.62
Spring 1993 (n = 2060)	4.2 (4.1, 4.4)	4.0 (3.9, 4.2)	.06
Spring 1994 (n = 1901)	4.0 (3.8, 4.1)	3.8 (3.6, 3.9)	.02
Using alcohol could hurt my performance as a student or athlete			
Spring 1992 (n = 2191)	4.6 (4.5, 4.7)	4.6 (4.5, 4.7)	.93
Spring 1993 (n = 2060)	4.4 (4.3, 4.5)	4.3 (4.1, 4.4)	.10
Spring 1994 (n = 1901)	4.2 (4.1, 4.3)	4.1 (3.9, 4.2)	.02
I want to be able to make my own decisions and not give in to peer pressure			
Spring 1992 (n = 2191)	4.4 (4.3, 4.5)	4.4 (4.3, 4.6)	.65
Spring 1993 (n = 2060)	4.2 (4.1, 4.4)	4.1 (3.9, 4.3)	.31
Spring 1994 (n = 1901)	4.1 (4.0, 4.2)	3.8 (3.7, 3.9)	.003

Note. Values were adjusted for race and baseline measures (if available). CI = confidence interval.
[a]Differences between conditions based on *F* statistic.
[b]Not available at baseline (fall 1991).
[c]These items were structured as follows: A young person can have many reasons NOT to use alcohol. Please rate how important each of these reasons is to you (1 = not too important to me, 5 = very important to me).

grades.[35] Communitywide task force activities were ongoing in all of the communities from 1992 through 1994.

Alcohol and Other Drug Use Outcomes

Alcohol use outcomes were measured by the Tendency to Use Alcohol Scale and its separate items from fall 1991 to spring 1994 (Table 1). Among all students (n = 1901), those in the intervention districts had statistically significant lower scores on the Tendency to Use Alcohol Scale (indicative of less likelihood of drinking) by the end of eighth grade than did students in the reference districts. The scale score was also significantly lower among baseline nonusers in the intervention districts. Although the scale score was lower among baseline users in the intervention districts, the difference was not statistically significant.

The percentages of past month and past week alcohol users are also shown in Table 1 for all four data points. For all students, the percentages who reported alcohol use in the past month and past week were significantly lower in the intervention group at the end of eighth grade. For baseline nonusers, students in the intervention districts consistently showed lower onset rates (differences were significant for past month and past week use at eighth grade). The percentages of students who reported past year alcohol use were also significantly lower among baseline nonusers in the intervention districts at the end of the seventh (21.1% ± 2.6% [SE] vs 29.1% ± 2.6%; $P < .05$) and eighth grades (30.4% ± 2.6% vs 41.6% ± 2.5%; $P < .006$).

For baseline users, recent alcohol use substantially increased between the end of sixth grade and eighth grade, with rates among baseline users at the end of eighth grade more than double those of baseline nonusers. There were more users in the intervention districts at baseline and at the end of the sixth grade; however, a crossover occurred by the end of the seventh grade, with fewer students in the intervention districts reporting past month and past week alcohol use. This difference was more substantial, but not significant, at the end of the eighth grade.

The percentages of cigarette users, smokeless tobacco users, and marijuana users are also shown in Table 1. Cigarette use and smokeless tobacco use were defined as more than two or three lifetime occasions of use (indicated by occasionally but not regularly, regularly in the past, or regularly now). Marijuana use was defined as any use in the past year. Among all students, there were no significant differences in the percentages of cigarette users, smokeless tobacco users, or marijuana users between conditions. However, the percentage of cigarette users was 19% lower in the intervention districts, and the difference approached significance ($P < .08$) at the end of the eighth grade. For baseline nonusers of alcohol, the percentages of students reporting cigarette use and marijuana use were significantly lower in the intervention districts, and smokeless tobacco use approached significance ($P < .06$) at the end of the eighth grade. There were no significant differences between conditions for baseline users.

Differences between conditions in polydrug use among all students were examined by calculating the prevalence of combinations of alcohol use, cigarette use,

and marijuana use. None of the combinations involving marijuana use were statistically significant. However, among all students, 14.3% ± 1.6% of those in the intervention districts reported both using alcohol in the past month and having smoked cigarettes on more than one or two occasions; the corresponding rate in the reference districts was 19.6% ± 1.6%. This difference was significant ($P < .03$) and indicated a 27% reduction in "gateway" drug use.

Psychosocial Factors

The three psychosocial scales (Peer Influence, Self-Efficacy, and Perceived Access) were examined for differences between conditions at each of the four data points. These differences are shown for each of the three scales in Table 1. Among all students, those in the intervention districts had significantly lower scores on the Peer Influence Scale by the end of eighth grade. There were no significant differences in the Self-Efficacy or Perceived Access scales. However, the intervention students were significantly more likely to report that they could resist alcohol at a party or dance (3.94 ± 0.06 vs 3.74 ± 0.06; $P < .03$) or when offered it by a boyfriend or girlfriend (3.74 ± 0.04 vs 3.60 ± 0.05; $P < .05$), even though the Self-Efficacy Scale showed no significant differences between groups. Among baseline nonusers, students in the intervention districts had significantly lower scores by eighth grade on the Peer Influence Scale and higher scores on the Self-Efficacy Scale, indicating less peer influence and greater self-efficacy to refuse alcohol than students in the reference districts. Scores on the Peer Influence, Self-Efficacy, and Perceived Access scales were not significantly different between groups of baseline users. However, the baseline users in the intervention districts were significantly more likely to report that it is difficult "to find a party that has alcohol" (1.77 ± 0.06 vs 1.59 ± 0.06; $P \leq .05$), even though the Perceived Access Scale showed no differences between groups.

Differences between conditions for the remaining psychosocial items were examined for all students. Table 2 presents data by condition for all students from sixth to eighth grade for the perceived norms, family communication, and functional meanings items. At baseline, students in the intervention districts were significantly less likely to perceive that "not many people my age drink alcohol." By the end of the eighth grade, students in the intervention districts were significantly more likely to perceive that peer drinking was not normative. They were also significantly less likely to report that people their age drink alcohol when they go out on a date (11.8% ± 1.9% vs 17.8% ± 2.0%; $P < .04$).

There were four parent communication items. At baseline, students in the intervention districts were significantly less likely to report that their parents talked with them about problems drinking alcohol can cause young people, and they were marginally less likely ($P < .06$) to report that their families had rules against young people drinking alcohol. By the end of the sixth grade (spring 1992), students in the intervention districts were significantly more likely to report that their parents talked with them about the problems involved with drinking alcohol. By the end of the eighth grade, students in the intervention districts were marginally ($P < .06$) more likely to report that their parents talked with them about the problems involved with drinking, marginally ($P < .08$) more likely to report that their families had rules against young people drinking, and significantly more likely to report that their parents had told them what would happen if they were caught drinking.

Ten items measured functional meanings of alcohol use or reasons for not using alcohol. These items were not measured at baseline. At the end of sixth grade (spring 1992), students in the intervention districts were significantly less likely to view the following reasons for not using alcohol as important: parents have rules against alcohol use by people their age and fear of becoming an alcoholic. At the end of the eighth grade, students in the intervention districts were significantly more likely to view 9 of the 10 reasons as important for not using alcohol: parents have rules, hurts reputation, fear of becoming an alcoholic, sports eligibility, costs too much money, school rules, bad for health, hurts performance, and not giving in to peer pressure.

Among the remaining psychosocial variables,[38] there were no significant differences between students in the two conditions in the perception of their influence on their communities in terms of alcohol-related issues. For the consequences of driving after drinking items, students in the intervention districts reported a greater likelihood of being disciplined by the school (2.5 ± 0.05 vs 2.2 ± 0.05; $P < .001$); there were no significant differences for the other six consequences. Finally, students in the intervention districts were marginally more likely to report never attending parties where people their age drink alcohol (63.2% ± 3.2% vs 54.0% ± 3.2%; $P < .06$).

Among baseline nonusers, significant differences between conditions for the perceived norms, parent communication, and functional meaning items paralleled those among all students. In addition, baseline nonusers in the intervention districts were more likely to report that they had significantly more influence in their communities in terms of alcohol-related issues at the end of eighth grade (2.3 ± 0.05 vs 2.1 ± 0.05; $P < .01$) than baseline nonusers in the reference condition.

Among baseline users at the end of eighth grade, students in the intervention districts were more likely than students in the reference districts to report that not many people their age drink alcohol (26.5% ± 3.9% vs 14.3% ± 4.1%; $P < .05$), that their parents have told them what would happen if they were caught drinking (63.5% ± 3.6% vs 51.9% ± 3.8%; $P < .04$), that there are 2 reasons (out of a possible 10) not to use alcohol (i.e., their parents have rules against it [3.5 ± 0.1 vs 3.2 ± 0.1; $P \leq .05$] and it would hurt their reputation [3.5 ± 0.1 vs 3.0 ± 0.1; $P < .02$]), and that they are more likely to attend parties where no alcohol is present (3.61 ± 0.11 vs 3.26 ± 0.12; $P < .05$).

Discussion

The outcomes of Project Northland, after 3 years of intervention during early adolescence, provide additional evidence supporting communitywide, multicomponent, multiyear approaches to alcohol use prevention. The project has demonstrated that a large number of school districts and communities can become involved in primary prevention efforts targeting adolescent alcohol use over a sustained period of time and will fully participate in multiple levels of social–behavioral interventions. This commitment and fidelity appears to have yielded promising changes in self-reported adolescent behavior. Even with significantly greater reported alcohol use among students in the class of 1998 in the intervention districts at baseline (despite randomization to condition), at the end of the eighth grade these students had significantly less reported tendency to use alcohol. Also, there was significantly less reported past month and past week alcohol use among the intervention students, and past year use was nonsignificantly lower as well (44.1% ± 2.4% vs

50.6% ± 2.4%; $P < .08$). In addition, use of cigarettes and alcohol in combination was significantly lower among intervention students. At the end of the eighth grade, the intervention students also reported significantly less peer influence to use alcohol and drugs, perceived fewer drinking peers, endorsed most of the listed reasons to not use alcohol, indicated greater self-efficacy to resist influences to drink at parties or with a boyfriend/girlfriend, perceived a greater likelihood of disciplinary action by the school for driving after drinking, and reported more communication with their parents about the consequences of their drinking. For intervention students as a group, then, Project Northland appears to have been successful in (1) reducing alcohol use, (2) reducing the tendency to use alcohol, (3) reducing the combination of cigarette and alcohol use, (4) changing the functional meanings of alcohol use, (5) reducing peer norms and peer influence to use, (6) introducing skills to resist peer influences, and (7) increasing parent–child communication about the consequences of drinking. The larger social environment, including access to alcohol in the community, perceptions of social groups that influence teen alcohol use, and consequences of driving after drinking, was less likely to be affected.

Project Northland appears to have been more successful with students who had not used alcohol at the beginning of sixth grade than among students who had initiated use. Baseline nonusers in the intervention districts were significantly less likely to drink at all levels of use, and they were significantly less likely to use tobacco or marijuana at the end of 3 years. In addition to the psychosocial factors cited for all students, these baseline nonusers also reported greater personal influence in their communities in terms of alcohol-related issues than did students in the reference districts. Baseline nonusers, then, were strongly influenced not to initiate drinking by their parents and peers and reported greater efficacy to resist offers to drink and to affect alcohol-related issues in their communities. Since these were the key themes of the Project Northland intervention programs—parents (Slick Tracy), peers (Amazing Alternatives!), and community (PowerLines)—the intervention goals appear to have been most realized with the baseline nonusers.

Baseline users in the intervention districts, in comparison with baseline users in the reference districts, perceived that fewer people their age drink alcohol, were more likely to have been told by their parents what would happen if they were caught drinking, had attended more parties where no alcohol was present, had more reasons not to drink alcohol, and reported greater difficulty in finding a party that had alcohol. Despite these changes in the baseline users, the relative lack of significant differences in alcohol use at follow-up suggests that alcohol use may be difficult to reverse as early as the beginning of sixth grade. This resistance to change has also been noted for cigarette smoking, for which prior behavior has been shown to be the strongest predictor of future behavior.[30,43,44] Interventions for these students may need to be more acutely focused on the reasons for preadolescent alcohol use, and interventions designed around those reasons may need to be implemented prior to the sixth grade. Still, baseline users in the intervention districts, relative to users in the reference districts, went from significantly higher alcohol use at baseline to nonsignificantly less use at follow-up, with a crossover occurring between the sixth- and seventh-grade surveys. Regression to the mean may explain the reduction in differences between groups from the beginning to the end of the sixth grade. However, after the sixth grade, the slopes of onset appeared to be consistently different for students in the two conditions, with an unexpected crossover[45] and absolute differences in use rates for the two groups comparable to those involving the baseline nonusers. The fact that the baseline users constituted only about a third of the entire cohort substantially reduced the power to detect significant differences between conditions for this subgroup. For example, among baseline users, we had 80% power to detect an absolute difference of 14% in past month alcohol use between conditions. We were able to detect differences among baseline nonusers, for whom the sample size was almost double that of users, with an absolute difference of 6% (see Table 1). Importantly, there were no significant interactions between baseline use status and treatment condition for past month or past week alcohol use at eighth grade. It is notable that the psychosocial factors that were different for the baseline users included parental communication about consequences and normative changes such as perceiving that not many people their age drink, having difficulty in finding a party with alcohol, and attending parties where no alcohol is present. For baseline users, these social barriers, in addition to enforced community regulations that reduce access to alcohol for underaged youth,[5] may be as critical as changes in personal factors in preventing future alcohol use and alcohol-related problems. Also, the Slick Tracy program, which encouraged parent–child communication during the sixth grade, may not have been powerful enough to change alcohol use behavior for the baseline users, a finding that has been noted elsewhere,[46] even though baseline users were just as likely to complete Slick Tracy booklets and attend Slick Tracy nights as nonusers.[33] Earlier attention to peer resistance and life skills training may have been more appropriate for this group.

The Project Northland design would have been strengthened by greater equivalence between intervention and reference districts at baseline. School districts and adjoining communities were recruited in the northeastern counties of Minnesota. Because adequate sample size was a concern, we blocked by size of school district and then randomized to condition. Sample sizes between groups were equivalent and adequate to detect the differences sought.[3] However, there were more White students in the reference districts, and there was greater alcohol use in the intervention districts. Had we also blocked by baseline alcohol use and/or race, or had we selected pairs of comparable communities and randomized among pairs, baseline measures might have been more equivalent; these strategies should be considered in future community randomized trials.

An additional concern, the reliance on self-reported data, was examined by conducting an experiment using a pipeline technique,[47] by reviewing prior work with community interventions and self-report measures of students,[48] and by conducting tests of convergent validity.[38] The test of the pipeline technique revealed no significant differences in self-reports of alcohol use of sixth and eighth graders among those who also took part in a biochemical measure as compared with those who did not.[47] It was concluded that self-report measures of alcohol use should be valid for this study, as well as being more cost-effective.[38,47] A related concern might be that students in the intervention communities became more sensitive to reporting alcohol use because they were part of the intervention and, therefore, underreported their use. This would be more strongly supported had the psychosocial factors, such as students' percep-

tions of how many people their age drink or reported peer influences, not been so concordant with students' alcohol use. In addition, in a similar study on cigarette smoking, students in the intervention community were significantly less likely to underreport than were students in the reference community.[48]

Project Northland has initiated a primary prevention program with young adolescents in primarily rural communities in northeastern Minnesota. Many of the components of the Project Northland intervention, such as the use of the home team approach[32,49] and peer-led social influences curricula,[18,19] have been successful in urban communities, which suggests that such approaches may be generalizable to these settings. The initial outcomes of Project Northland, in delaying alcohol use onset and preventing alcohol use among sixth- through eighth-grade students, suggest the potential fruitfulness of sustained, multilevel efforts, particularly for behaviors that are normative in our society, and provide a model for intervening with other behaviors of young adolescents that are of considerable concern in the United States in the 1990s. □

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Call for Abstracts for Epidemiology Late-Breaker Sessions

Oral Exchange Session

The Epidemiology Section will sponsor a late-breaker epidemiology oral exchange session on Wednesday, November 20, 1996, during the American Public Health Association's 1996 annual meeting in New York, NY. The exchange will provide a forum for oral presentation of investigations, analyses, or methods that have been conceived, conducted, and/or completed so recently that authors could not meet the deadline for regular submission to other epidemiology sessions.

Abstracts of fewer than 250 words (any format) and a stamped, self-addressed return envelope should be submitted to John M. Horan, MD, MPH, Chief, State Branch, Division of Field Epidemiology, EPO, Centers for Disease Control and Prevention, Mailstop C-08, 1600 Clifton Rd, Atlanta, GA 30333; (404) 639-3689.

Abstracts must be received by *September 27, 1996.* Decisions will be made by November 7, 1996.

Poster Session

The Epidemiology Section will again sponsor a late-breaker poster session on Wednesday, November 20, 1996, at the APHA annual meeting in New York, NY. This session permits the presentation of work that has been completed too late in the last year for regular paper submission. Abstracts should report on work conducted during the past year.

Along with a stamped, self-addressed return envelope, abstracts of less than 250 words (any format) should be submitted to Cathey Falvo, MD, MPH, Graduate School of Health Science, Learning Center–310, New York Medical College, Valhalla, NY 10595; (914) 993-4250.

Abstracts must be received by *September 27, 1996.* Decisions will be made by November 7, 1996.