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Original article

It Takes Two: Reducing Adolescent Smoking Uptake Through Sustainable Adolescent–Adult Partnership

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Abstract

Purpose: To assess the effects of a long-term intervention for tobacco use prevention that targets adolescents (Tobacco Free Duo).

Methods: School-based community intervention combined with repeated cross-sectional surveys over seven years. The intervention was performed in the County of Västerbotten, Sweden, where survey data were collected in grade seven to nine schools on an annual basis for seven years. Data for comparison were collected in grade nine on the national level in Sweden. In the intervention area, the annual number of seventh to ninth grade students participating in the study varied between 1300 and 1650. In the reference data, the number of participating ninth grade students approximated 4500 annually.

Results: A significant decrease of nearly 50% was seen in smoking prevalence in the intervention area. The decrease was evident in grades eight and nine (ages 14–15 years) in both boys and girls. At the start of the intervention, smoking prevalence in grade nine was 16.1% in the intervention area and 23% in the national reference group. Although the prevalence in the national sample remained stable, there was a decrease to 9.0% in the intervention area at the end of the study period.

Conclusions: These results suggest that the Tobacco Free Duo program contributed to a reduction in adolescent smoking among both boys and girls. Using a multi-faceted intervention that includes adolescent–adult partnership can reduce adolescent smoking uptake, and the intervention has been proven to be sustainable within communities.

Keywords: Smoking; Tobacco; Prevention; Intervention; Adolescents; Schools; Evaluation

Looking back at the history of tobacco prevention, interventions that target adolescents have evolved from a focus on knowledge of tobacco's health effects to interventions based on broader psychosocial concepts [1]. There is no simple way to prevent adolescents from starting to smoke. Smoking uptake is a complex process that includes societal factors such as legislation, pricing and marketing of tobacco, as well as social and individual characteristics [1–3] in which the influence of family, friends and peers is evident [2,4]. Adolescent smoking initiation can be affected by these key persons' smoking habits and/or attitudes toward smoking [5–6]. Factors on the school level, such as how well schools enforce rules against smoking, have also been identified [4]. This complexity is a challenge in the modeling and implementation of interventions.

The school has long been seen as a natural arena for prevention because of the possibility of targeting all children. In school-based programs, different social-influence components of various intensity have often been

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used, generally performed by outside actors such as researchers or by inside actors such as school staff. Studies on school-based educational programs, predominately performed in the United States, have shown mixed results [7]. The Hutchinson Smoking Prevention Project (HSSP), using a teacher-led tobacco use prevention curriculum, found no evidence that their school-based social influences approach was effective in long-term deterrence of smoking among youth [8]. The HSSP evaluation had a strong design, and the results have led to a discussion on smoking prevention research and programming. It has been noted that some intervention components in a social-influence approach possibly important for a prevention effect, such as listening and communication skills, decision-making, and making a commitment, were not included in HSSP [9]. Tobler et al [10], in a meta-analysis of adolescent drug prevention programs, including social-influence components, concluded that at a one-year follow-up there was strong support for their effectiveness. Interactive programs that focused on the development of interpersonal skills were found to be more effective [10]. School-based programs have shown short-term results [11–13], but it has also been shown possible to achieve long-term effects [14–16]. Comprehensive strategies using several components are generally more effective than information-based interventions, which have shown limited or no effects [17,18]. An increased awareness and understanding of the combined effects of social, environmental, and cultural factors on adolescents' use of tobacco has resulted in more interest in community-based interventions. These interventions have focused on influencing individual behavior as well as community norms on adolescents' use of tobacco. The common goal has been to create a supportive nonsmoking environment. Community-based interventions have involved several community resources such as schools, youth clubs, churches, nongovernmental organizations (NGOs), shop owners, health care, social service, media, etc. There are relatively few studies evaluating the effect of the community interventions, but some support is found for effectiveness in preventing the uptake of smoking in adolescents [19].

The primary aim of this article is to describe an intervention against tobacco use that targets adolescents, and to assess the program effects on smoking prevalence. The program, which is long-term and school-based, has used a social influence approach and involved other community actors. Of special interest are the questions: 1) does tobacco use decrease in schools participating in a community intervention project using adolescent–adult partnership (Tobacco Free Duo)?; 2) are there age and/or gender differences in the use of tobacco in the intervention area?; 3) is the smoking prevalence different in the intervention area compared with a national reference?

Methods

Intervention

A program called Tobacco Free Duo started in Sweden in 1993 as a small-scale pilot project. The aim was to prevent adolescents, aged 12–15 years, from starting to use tobacco. Comprehensive strategies were used, including increasing knowledge and awareness on tobacco-related issues, positive reinforcement by different rewards, and social support and influence from friends, parents, and significant others. The different activities in the program focused on increasing individual awareness and affecting attitudes and behaviors regarding tobacco.

A number of objectives were highlighted in the intervention's design. It was considered important to let the adolescents make their own decisions and take public stands about tobacco. Essential elements included the possibility of creating a positive, nonsmoking influence from friends as well as providing a supportive adult in the decision to be tobacco-free. Adults were involved and encouraged to express messages against tobacco. Parents were informed about the harms of tobacco, and information was given about the importance of their taking a clear stance against the use of tobacco by their children and their children's friends. Education in tobacco-related issues was offered annually for students, school staff and others.

The program focused on adolescents but also involved school staff, parents and significant others. Some factors were prioritized when building the intervention: cooperation over sector borders; integration of the intervention into daily work; and local ownership and participation. The people involved, both young and old, were invited to take active parts and influence the intervention model.

During the pilot years, the Department of Community Health at the County Council further developed the program. They hosted the management and worked in close cooperation with four municipalities in the county. Each year new schools joined, and in 1997 the program was offered to all municipalities in the county. This was possible because the Dental Health Service was involved in building a professional basic program organization that covered the whole county.

Tobacco Free Duo was introduced to the students before they left for summer holiday in grade six (age 12 years). It ran for the next three years, until the students finished grade nine. Each subsequent year the new sixth graders were invited to participate. In this way, the intervention gradually expanded. After three years, all sixth to ninth grades at the school were involved.

During the sixth school year, students and school staff discussed issues involving tobacco. At that age, almost none of the adolescents used tobacco. Before students completed the school year, they were given the opportunity to team up with a tobacco-free adult to form a tobacco-free pair—or

Table 1
Tobacco Free Duo, Intervention Components: Lessons and Meetings in Minutes on Tobacco and Tobacco Free Duo, Grades 6–9

	Grade 6	Grade 7	Grade 8	Grade 9
Classroom curriculum	120	120	120	120
County council representative, lesson in class	90			
Parents meeting at school	60	60		
Discussion on tobacco; parent/teacher		10	10	10
Meeting at school signing contracts	60			
Total	330	190	130	130

"duo." The name Tobacco Free Duo originated from the idea that the pairs signed a contract to stay tobacco-free together for the next three years. The adult involved was thereby making a commitment to both provide a good example and to actively support the student to stay tobacco-free. Informational meetings were held for the involved adults to provide knowledge and encouragement. The contracts were signed at a meeting at the end of grade six that all the pairs were invited to attend. The participating students were given a membership card valid until the end of grade nine, and local sponsors provided rewards of discounts and small prizes. The participating students and adults signed an assurance of fulfillment of the contract annually in grades seven through nine. A newsletter for the program was delivered twice a year. In Table 1, intervention components as lessons and meetings are shown in minutes by grades.

Each school was encouraged to appoint a planning group composed of seventh to ninth grade students and adults. This group had local responsibility for activities within the framework of Tobacco Free Duo. Schools were encouraged to work closely with the local community, such as youth clubs, organizations, and shop owners. Once a year students from the planning groups were invited by the County Council to one day of activities aiming at strengthening the local work and the student participation.

To sum up, the intervention consisted of a number of lessons and meetings (Table 1), a contract and membership card signed in grade six valid for the coming three years, an annual assurance of fulfillment in grades seven through nine, lotteries and discounts, a student activity day, and a newsletter. Regular checkups by regional and local County Council representatives were carried out to assure that the intervention components were delivered.

Population and Data

The study had a repeated cross-sectional design. In the intervention area, information about tobacco habits was collected every spring from 1994 to 1999 and in 2001. No data were collected in 2000 because of financial restrictions. The numbers of students surveyed each year are shown in Table 2.

The surveys were performed at the same schools in the same six school districts. Districts were chosen at random before the first survey. Schools on the coast and the inland were represented, and included both rural and urban settings. One of the school districts had less then 75 students a year and the rest had between 300 and 550 students. All intervention schools with surveyed students participated in Tobacco Free Duo, but started during different years. In 1994, four of these schools started the intervention in grade six. They introduced it to a new grade every coming year, meaning that in 1997 they involved all sixth through ninth grades. The remaining two schools in the study population started Tobacco Free Duo in 1995, with all grades six through nine participating in 1998.

For comparison of smoking prevalence and trends, national reference data were used. There was no overlap of students surveyed across the two samples. The national reference data were from CAN (The Swedish Council for Information on Alcohol and other Drugs) [20]. CAN has conducted annual surveys in grade nine on national samples since 1971, and approximately 4500 students participated every year. In 1997, CAN studied adolescents' use of tobacco, using two questionnaires. The rationale for the different questionnaires was a wish to change the question on smoking and pose it differently in the future. To analyze whether a different estimate of

Table 2
Numbers of Students Surveyed Each Year in Intervention Area 1994–99 and 2001, Grades 6–9

Grade	1994		1995		1996		1997		1998		1999		2001	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Six	526	(24.3)	504	(26.4)	426	(23.2)	428	(24.8)	574	(26.4)	461	(21.6)	337	(20.6)
Seven	572	(26.4)	494	(25.9)	487	(26.5)	388	(22.4)	559	(25.7)	591	(27.6)	489	(29.9)
Eight	543	(25.1)	525	(27.5)	466	(25.4)	482	(27.9)	498	(22.9)	584	(27.3)	417	(25.5)
Nine	526	(24.3)	388	(20.3)	458	(24.9)	431	(24.9)	546	(25.1)	503	(23.5)	394	(24.0)
Total	2167	(100.0)	1911	(100.0)	1837	(100.0)	1729	(100.0)	2177	(100.0)	2139	(100.0)	1637	(100.0)

Table 3
Students Signing Contracts in Intervention Area 1994–99 and 2001 in Percent, Grade 6–9

	1994	1995	1996	1997	1998	1999	2001
School area 1	94	96	94	93	94	95	93
School area 2	86	85	81	83	83	79	80
School area 3	82	85	78	80	80	78	71
School area 4	91	90	87	88	87	89	91
School area 5	—	98	96	94	94	92	94
School area 6	—	77	82	83	84	74	61

smoking prevalence occurred with this change, half of the study population got the old questionnaire and the other half got the new one. CAN's analysis showed a rise in smoking prevalence with the new question, and this was due to detection of more smokers, not an actual increase in prevalence. In the intervention area, the question in CAN's first questionnaire was used for all years. For comparison purposes, a recalculation was done on the national data from 1998–1999 and 2001 that adjusted for this change. The same reasons for nonparticipation (< 15% per year) were seen in the national sample as in the intervention study. For the present study, there was no access to national primary data, only prevalences. The survey methodology was comparable across the intervention and reference groups over time. The questions and methods used for questionnaire completion were the same in the national survey and the intervention study. The data were both collected in the classroom, at the same time of year, with a teacher present. To emphasize anonymity, the students received an envelope to enclose the completed questionnaire. A passive consent procedure was used where schools informed parents about the questionnaire and how to proceed if they did not want their children to participate in the study. Necessary ethics approval was given from the Research ethics committee at Umeå University.

The following definitions were used to describe tobacco use: 1) a smoker was a regular or occasional smoker; 2) a regular smoker was a daily or almost daily smoker; 3) a snuffer was a regular or occasional snuffer; 4) a regular snuffer was a daily or almost daily snuffer; 5) a tobacco user was using tobacco (either smoking and/or snuffing) regularly or occasionally; 6) an occasional smoker, snuffer or tobacco user was using tobacco during weekends or more seldom.

Statistics

Data were analyzed using SPSS (SPSS Inc., Chicago, IL) and Stata 9.0 (Stata Corporation, College Station, TX). The analysis of changes over time within the intervention area sample was performed using logistic regression, where clustering due to school was taken into account. Analysis of trends between the intervention and reference areas was performed using year by region interaction.

Results

Since 1997, approximately 2500 sixth grade children have become new members of the intervention program every year. Table 3 shows the percentage of youth forming duos in the different school areas each year. All together, there were more than 8000 members annually in grades six through nine. Since the start of the program, which is still running, about 25,000 adolescents in the county, paired with adults, have been members of Tobacco Free Duo. Ninety-six percent of the grade seven through nine schools in the county were working with the program.

There were few tobacco users in the sixth grade in the intervention area. The results are therefore limited to grades seven through nine (ages 13–15 years). The response rate was high, varying between 80% and 95% over the studied years. The nonparticipants consisted mainly of students absent from class or school when the questionnaire was answered. Almost all students who were present answered the questionnaire.

Table 4 describes the use of tobacco in the different grades during the survey years.

Table 4
Prevalence of Tobacco Use in Intervention Area 1994–99 and 2001, Grade 6–9

Grade	1994		1995		1996		1997		1998		1999		2001	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Six	4	.8	10	2.1	6	1.5	10	2.4	16	3.0	11	2.5	13	3.9
Seven	37	6.9	20	4.2	36	8.0	28	7.7	25	4.5	25	4.2	32	6.5
Eight	81	15.4	60	12.0	63	14.4	69	15.0	56	11.4	46	7.9	37	8.9
Nine	119	23.3	90	23.8	91	20.9	81	19.7	105	19.4	56	11.2	52	13.2
Total	241	11.6	180	9.8	196	11.3	188	11.4	202	9.5	138	6.6	134	8.2

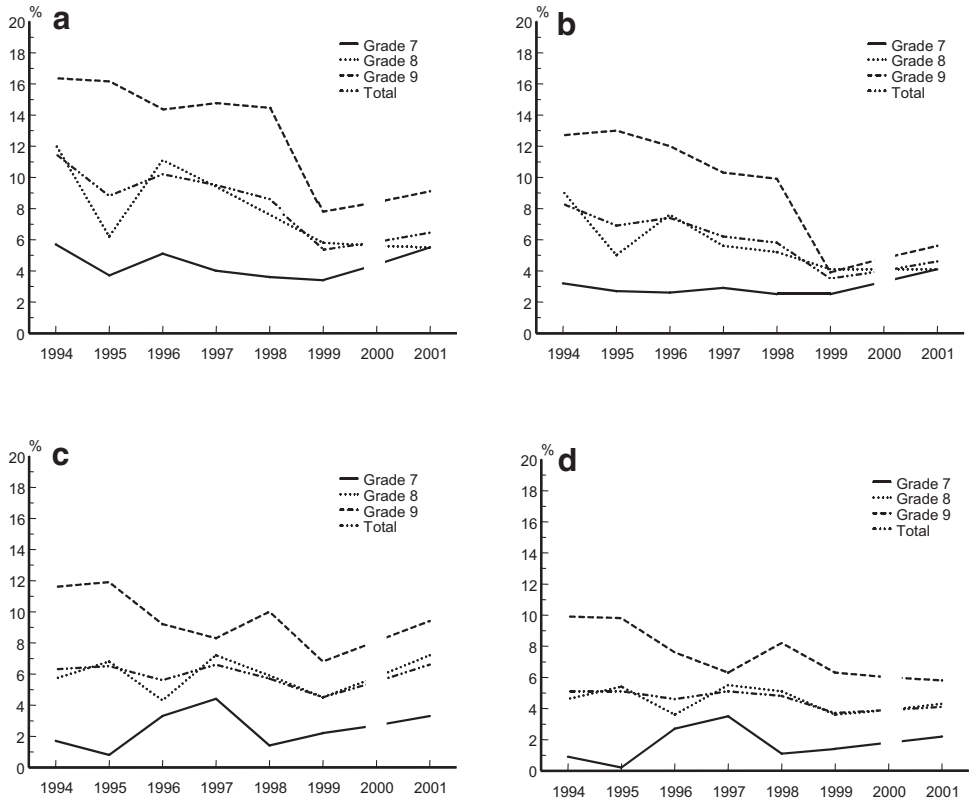

Figure 1. (a) Prevalence of smoking in the intervention area, grades 7–9, 1994–1999 and 2001. (b) Prevalence of regular smoking in the intervention area, grades 7–9, 1994–1999 and 2001. (c) Prevalence of snuffing in the intervention area, grades 7–9, 1994–1999 and 2001. (d) Prevalence of regular snuffing in the intervention area, grades 7–9, 1994–1999 and 2001.

Smoking and snuffing prevalence in the intervention area by grades are shown for the survey years in Figure 1.

The smoking prevalence among adolescents decreased in the intervention area during the study period. If one considers overall smoking as well as regular smoking, there was a significant decrease of nearly 50% ($p < .001$). Differences in time trends were seen between the grades. In grade eight, there was a decrease in smoking from 12.2% to 6.8%. In 1995, 1998, 1999, and 2001, smoking was significantly lower compared with 1994, with p-values ranging from .038 to $p < .001$. Regular smoking in grade eight decreased from 9.4% to 3.9%, significantly lower in the same years, with p-values ranging from .055 to $p < .001$. In grade nine, a decrease in smoking was also seen, from 16.1% to 9.0%. In 1999 and 2001, smoking was significantly lower compared with 1994, with $p < .001$. Regular smoking in grade nine decreased from 12.3% to 6.0%, significantly lower in the same years with $p < .001$ in 1999 and .021 in 2001. There was no significant decrease seen in grade seven. The decreases in smoking and regular smoking were significant for both boys ($p < .01$) and girls ($p < .01$). In boys, smoking decreased from 9.3% to 6.1% and in girls from 13.3% to 7.5%. Regular smoking decreased from 6.9% to 3.8% in boys and from 9.7% to 6.2% in girls. No significant decrease in the use of moist snuff was seen. Figure 2 illustrates smoking prevalence in grade nine for intervention and reference areas.

There was a significant difference in smoking prevalence in grade nine (age 15 years) between the intervention and reference areas for all study years (year by region interaction significant, $p < .001$). The prevalence was lower and the decrease greater in the intervention

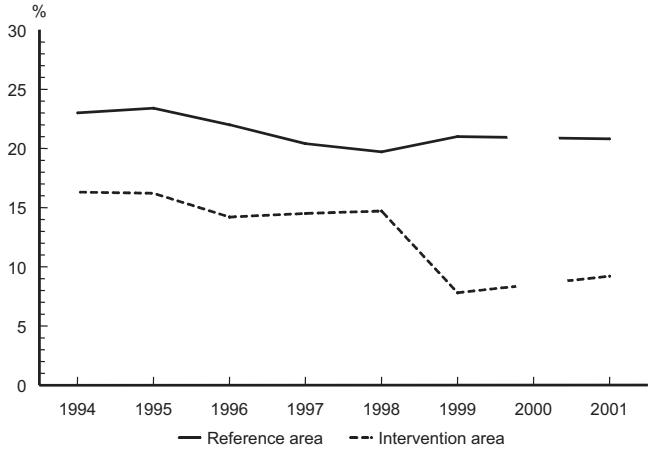

Figure 2. Prevalence of smoking in the intervention and reference areas, grade 9, 1994–1999 and 2001.

area compared with the reference area. In 1998, the decrease in smoking was the most pronounced. In 1994, the difference in smoking between the intervention and reference areas was 6.9 percentage units. In 2001, the difference had almost doubled to 12.5 percentage units, with a greater decrease and lower smoking prevalence in the intervention area. The same pattern was found for daily smoking, but the trend was not as pronounced. Smoking decreased in the intervention area during the seven studied years, but it was stable in the reference area.

The changes in snuffing were smaller and less stable. The intervention area had a higher prevalence of snuffing at the beginning of the study, but in 1999 there was a shift and the reference area had a higher prevalence.

Discussion

School-based educational programs have shown mixed results. Favorable results from school-based anti-tobacco interventions have been proven, but effects often tend to disappear. Because smoking uptake is a complex process, Tobacco Free Duo used a multi-factorial approach and considered the adolescent's context in relationship to peer groups, adults, and the surrounding community. Fergusson et al conclude that effective programs need to be embedded in a developmental approach that attempts to reduce both early smoking experimentation and the effects of peer pressure on the development of cigarette smoking [21].

In Tobacco Free Duo, attention was given to the school setting as a social system that could function as a supportive environment when interacting with other parts of the community. The surrounding society was addressed and supporting systems were created.

A system-oriented and empowering approach, sensitive to internal as well as external influencing factors, was considered important in the program. The individual was addressed by the intervention, given a chance to develop and assert a personal decision, but put in a context where involvement and a feeling of ownership were essential. A dialogue with the target group assured that the intervention was based on the adolescents' reality.

Parents function as role models not only by being smoke-free. The way they react to the children's smoking is also very important to adolescent smoking uptake [5–6]. A majority of adolescents express that parents should try and influence children not to smoke [22,23]. As part of this intervention, parents were invited to informational meetings and discussions on how to support their children in staying tobacco-free. A majority of the students chose their parents as partners in a duo. Part of Tobacco Free Duo was addressing adolescent experimentation with tobacco by giving adult support in school. Other studies evaluating comprehensive interventions have emphasized the importance of teacher training and involvement of parents to decrease adolescent tobacco use [24].

In teaching refusal skills, there might be a risk that the peer group could be considered a negative influence. Identification with a peer group can provide a positive psychosocial effect that, in turn, can prevent the use of tobacco [25]. In Tobacco Free Duo it was considered essential to show that the majority of the young decided to stay tobacco-free. Doing it all together in tobacco-free pairs gave an imaginary audience, which could increase the possibility that the adolescent identified with a healthy peer group.

By working on a long-term, broad strategy involving many people, the objective was to decrease the social acceptance for tobacco in the local society and establish a tobacco-free norm. The intention was that the intervention would become a part of daily life. The County Council worked as a booster—giving knowledge, inspiration and motivation to contribute to an intervention with continuous effectiveness and staying power.

In Tobacco Free Duo, both smoking and snuffing were addressed. There was a concern in schools of snuff being a gateway to smoking. During the first years of the program, the information given mainly addressed smoking. This might be reflected in the results showing a decrease in smoking in the intervention area, whereas the prevalence of snuffing was more stable.

When evaluating and interpreting the findings of this study, it is important to consider the limitations. One is that the self-reports of smoking behavior were not validated by objective measures such as serum cotinine or exhaled carbon monoxide. However, previous studies have shown that self-reports of adolescent tobacco use are reliable in Swedish settings [26].

Smokers are more frequently absent from school. If you assume that the nonrespondents are more likely to be smokers, we could have an under-estimation of smoking prevalence during the study years. If this is the case, such a pattern could be expected to be stable in the two study areas over time, and would not explain the decrease in smoking in the intervention area.

The level of smoking prevalence was higher on the national level compared with the intervention area in all years. This was also the case for other factors related to adolescent risk taking behavior, such as abortion rates and alcohol use. The same difference has also been found in smoking prevalence among the adult population, and this indicates regional cultural differences with a healthier lifestyle in Northern Sweden [27].

The design of the study was quasi-experimental. With regard to internal validity of the program, it must be pointed out that schools had some flexibility in designing the intervention. Apart from main rules that were common to all schools, there were some variations in the implementation that are not assessed in this study. Therefore, it is not possible to specify which intervention components are re-

sponsible for our outcomes. Of note, data on smoking behavior were collected from the start primarily to follow smoking trends in the county and not for research purposes. Because of the way the intervention evolved, a randomized assignment was not feasible and a quasi-experimental design was chosen for the study. It was felt that local ownership was essential in maintaining engagement for a long-term intervention. Local ownership resulted in an intervention with a similar core, with some differences in local adaptations.

In conclusion, the results suggest that the Tobacco Free Duo program contributed to a reduction in adolescent smoking in both boys and girls that was most evident in grades eight and nine (age 14–15 years). Multi-faceted interventions such as this can successfully reduce smoking uptake, and the intervention has been proven to be sustainable within communities.

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