

# The Effects of Community Policies to Reduce Youth Access to Tobacco

## ABSTRACT

**Objectives.** This study tested the hypothesis that adoption and implementation of local policies regarding youth access to tobacco can affect adolescent smoking.

**Methods.** A randomized community trial was conducted in 14 Minnesota communities. Seven intervention communities participated in a 32-month community-organizing effort to mobilize citizens and activate the community. The goal was to change ordinances, merchant policies and practices, and enforcement practices to reduce youth access to tobacco. Outcome measures were derived from surveys of students before and after the intervention and from tobacco purchase attempts in all retail outlets in the communities. Data analyses used mixed-model regression to account for the clustering within communities and to adjust for covariates.

**Results.** Each intervention community passed a comprehensive youth access ordinance. Intervention communities showed less pronounced increases in adolescent daily smoking relative to control communities. Tobacco purchase success declined somewhat more in intervention than control communities during the study period, but this difference was not statistically significant.

**Conclusions.** This study provides compelling evidence that policies designed to reduce youth access to tobacco can have a significant effect on adolescent smoking rates. (*Am J Public Health*. 1998;88:1193-1198)

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## Introduction

A number of studies have shown that enforcing tobacco age-of-sale laws results in merchants' altering their practices and in reductions in illegal tobacco sales to minors.<sup>1</sup> It is believed that, consequently, young people who are experimenting with tobacco or considering initiation of tobacco use will be less likely to find a reliable and convenient source and thus will be discouraged from establishing the habit of regular use. New policies and enforcement practices also are believed to establish a normative climate in which provision of tobacco to minors and use of tobacco by youth are not acceptable.<sup>2</sup> These assumptions led the US Department of Health and Human Services, in January 1996, to issue rules to implement the Synar amendment, which requires that each state receiving a federal Substance Abuse Prevention and Treatment Block Grant adopt and enforce a tobacco age-of-sale law and show progressive reductions in tobacco sales to minors.<sup>3</sup> Following the same reasoning, the Food and Drug Administration issued regulations in August 1996 designed to restrict youth access to tobacco, including a requirement that retailers request identification of purchasers, a ban on tobacco vending machines and self-service displays in most locations, and a prohibition against free tobacco samples.<sup>4</sup> These actions came after a period of almost a decade during which similar provisions were adopted and/or enforced by hundreds of local jurisdictions and many state legislatures.<sup>5-10</sup>

Despite this intensive activity, little is known about the effects of these policies on tobacco use by youth. Reductions in smoking prevalence among youth in single communities before and after policy adoption and/or enforcement have been reported.<sup>11-13</sup> Recently, Rigotti et al. reported that after intensive enforcement of local youth access

laws, retailer compliance with the laws was significantly higher in intervention communities than in comparison communities, but youth smoking rates were unchanged.<sup>14</sup>

Tobacco Policy Options for Prevention (TPOP) is a randomized community trial designed to test the effects of changes in local policies to limit youth access to tobacco. The study hypothesizes that local policy change brought about by community mobilization will have a positive effect on adolescent tobacco use through reductions in commercial availability. This paper reports the effects of the intervention on ordinances in TPOP communities, on cigarette purchase success by youth, and on adolescents' perceptions of availability and self-reported smoking behavior.

## Methods

### Design

Fourteen communities in Minnesota were randomly assigned to experimental or control conditions. Criteria for inclusion of communities in the study were 90 or more students in each of grades 8, 9, and 10; location outside the primary Minnesota American Stop Smoking Intervention Study (ASSIST) geographic area; and no recent ordinance changes regarding tobacco. With the exception

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of school officials, from whom permission was needed to survey students, no one was contacted in potential communities before the intervention was begun. Twenty-two school districts (representing 22 communities) were contacted to achieve the desired sample size of 14 communities. The 8 districts that refused our invitation cited the burden of other surveys in the schools. Study communities ranged in size from 3200 to 13 100 residents, and each was the largest community in its rural county. Communities were stratified prior to randomization by population and baseline student smoking rate. All communities in the TPOP study required that tobacco retailers be licensed at the beginning of the study, as did approximately 94% of Minnesota communities.<sup>6</sup>

### *Intervention*

The goals of the 32-month intervention were to make tobacco access by youth a salient community issue, to change local ordinances to more effectively restrict youth access to tobacco, to change retailers' and other adults' practices regarding provision of tobacco to youth, and to promote enforcement of tobacco age-of-sale laws. The intervention followed a direct action community organizing model that called for mobilizing large numbers of people, encouraging individuals to take active roles as citizens and to hold leaders accountable for public decisions, highlighting conflicts between citizens' values and the status quo, and using that conflict to move individuals to action.<sup>15</sup> The process in each community was the same, but the implementation varied as the communities developed ownership of the project.

The intervention was staffed by a half-time community organizer in each community. After interviewing about 100 people in their community, organizers recruited a team of 8 to 15 members to lead the policy change effort. Team members came from varying backgrounds but participated as individuals, not organizational representatives.

The local team planned and executed activities to raise community awareness about youth tobacco access and use and to develop and demonstrate broad support for policy change. Teams conducted group presentations, letter and petition drives, media campaigns, and tobacco purchase attempts with underserved youth. Technical assistance and materials were provided by University of Minnesota staff, but the local teams decided how to use these resources.

Teams drafted their own ordinance based on models from other communities, introduced the ordinance to their city council,

and then marshaled the support of community leaders and the public for their proposal. Team members and community supporters lobbied city councilors, met with tobacco retailers, and attempted to obtain the support of law enforcement officials for the proposed ordinance.

Following ordinance passage, teams worked to ensure enforcement of the ordinances, including mobilizing citizens again if the police delayed enforcement. The intervention implementation and process evaluation measures have been described in more detail elsewhere.<sup>16</sup>

### *Evaluation*

Data were collected regarding adolescent tobacco use, tobacco acquisition behaviors, and perceptions about tobacco availability via surveys administered in spring 1993 and at the end of the intervention in spring 1996. University staff administered the survey during school time to all students in grades 8 through 10. Details of the survey have been reported elsewhere.<sup>2</sup> The final sample consisted of 6014 students in 1993 and 6269 students in 1996. Surveys were completed by 91.8% of eligible students in 1993 and 92.9% in 1996. More than 94% of the students in both the baseline and follow-up samples were White. There were no differences between students from treatment and control communities at baseline on any of the outcome variables.

Tobacco purchase attempts were completed at all retail tobacco outlets in each community in June 1993 and June 1996, following a standard protocol.<sup>2</sup> A list of all businesses (over the counter and vending machine) licensed to sell tobacco was obtained from each city clerk. Two purchase attempts were carried out at each business (one each on successive days) by 2 different 15-year-old female buyers from outside the study communities. Buyers were accompanied by an adult employee of the study. Immediately following the purchase attempt, buyers and supervisors recorded data about the purchase attempt and the store environment, including location and types of tobacco displays.

### *Measures*

Prevalence of smoking among students was based on a smoking index constructed by combining answers to questions about lifetime smoking, smoking in the previous 7 days, and smoking in the previous 24 hours.<sup>17</sup> This index was used to classify students as never, monthly, weekly, or daily smokers. Students were asked to indicate

how hard or easy it would be to obtain cigarettes from a variety of sources. The proportion who responded 1 (not at all difficult) to 3 (little difficulty) on a 7-point scale was calculated for each community. Students who had smoked were also asked how they had obtained their most recent cigarette. Those who selected either salesperson or vending machine were classified as having used a commercial source, while friend, sibling, parent, and another teenager or adult were considered social sources. Students were also asked how many times they had tried to buy cigarettes in the past 30 days, and the percentages of respondents who indicated one or more attempt were calculated for each community.

### *Analysis*

Mixed-model regression procedures, implemented via SAS PROC MIXED (version 6.11),<sup>18</sup> were used in analyzing the school survey data. For each dependent variable, the primary analysis was conducted in 2 stages. The full model included fixed effects for condition, time, the time  $\times$  condition interaction, and covariates identified as related to the dependent variable in question based on preliminary analyses (e.g., gender, age, grade, family structure, socioeconomic status, presence of an adult in the home after school, and discretionary income). Random effects were included for community (condition), for the time  $\times$  community (condition) interaction, and for residual error. The reduced model eliminated covariates found to be nonsignificant in the full model ( $P > .05$ ). The intervention effect, estimated as the net change over time between the 2 conditions, was represented by the time  $\times$  condition interaction. The standard error for that effect reflected the multiple sources of random variation in the data and was based on the time  $\times$  community (condition) interaction. Degrees of freedom were based on the number of communities. All random effects were presumed to be independently and identically distributed Gaussian effects, based on the recent report that this assumption is appropriate for data from group-randomized trials even when the observation-level data are dichotomous.<sup>19</sup>

Following the primary analysis for the school survey data, the reduced model was repeated after separate post hoc stratification by gender and grade. In those models, fixed-effect terms were added for the condition  $\times$  stratum, time  $\times$  stratum, and time  $\times$  condition  $\times$  stratum interactions, and random-effect terms were added for the stratum  $\times$  community (condition) and time  $\times$  stratum  $\times$  community (condition) interactions. The

**TABLE 1—Ordinances Passed in Tobacco Policy Options for Prevention (TPOP) Intervention Communities and Penalties Applied Following Enforcement: Minnesota, 1993–1996**

| Community | Date Adopted        | License Fee | Vendor Penalty | Clerk Penalty | Vending Machine Ban | Self-Service Ban | Purchaser Penalty | Compliance Checks Required | Penalty Following Enforcement |
|-----------|---------------------|-------------|----------------|---------------|---------------------|------------------|-------------------|----------------------------|-------------------------------|
| A         | 2/16/95 and 3/11/96 | \$50        | Yes            | Yes           | Yes                 | No               | Yes               | Yes                        | Warning                       |
| B         | 8/11/95             | \$100       | Yes            | No            | Yes                 | Yes              | No                | Yes                        | Fine                          |
| C         | 2/22/95             | \$15        | Yes            | Yes           | Yes                 | Yes              | Yes               | Yes                        | Fine                          |
| D         | 7/10/95             | \$25        | Yes            | No            | Yes                 | Yes              | No                | Yes                        | Warning                       |
| E         | 4/3/95              | \$36        | Yes            | Yes           | Yes                 | Yes              | Yes               | Yes                        | Fine                          |
| F         | 12/12/94            | \$250       | Yes            | Yes           | Yes                 | No               | Yes               | No                         | Fine/suspension               |
| G         | 10/17/95            | \$50        | Yes            | No            | Yes                 | Yes              | No                | Yes                        | Warning                       |

intervention effect in the stratified analyses was represented by the time  $\times$  condition  $\times$  stratum interaction and was assessed against the time  $\times$  stratum  $\times$  community (condition) interaction. Degrees of freedom were based on the number of communities and strata.

The tobacco purchase attempt data were analyzed via similar procedures, modified to reflect the slightly different design used in this survey. Fixed effects were included for condition, time, and the time  $\times$  condition interaction. Covariates were type of outlet and age and gender of seller. For dependent variables in which the value could vary between the 2 visits to each outlet, visit was included as a random effect. For all dependent variables, community (condition), time  $\times$  community (condition), and residual error were included as random effects; in addition, the confederate's identification number was included as a random-effect covariate. The intervention effect, estimated as the net change over time between the intervention and comparison conditions, was represented by the time  $\times$  condition interaction. The standard error for that effect reflected the multiple sources of random variation in the data and was based on the time  $\times$  community (condition) interaction. Degrees of freedom were based on the number of communities.

## Results

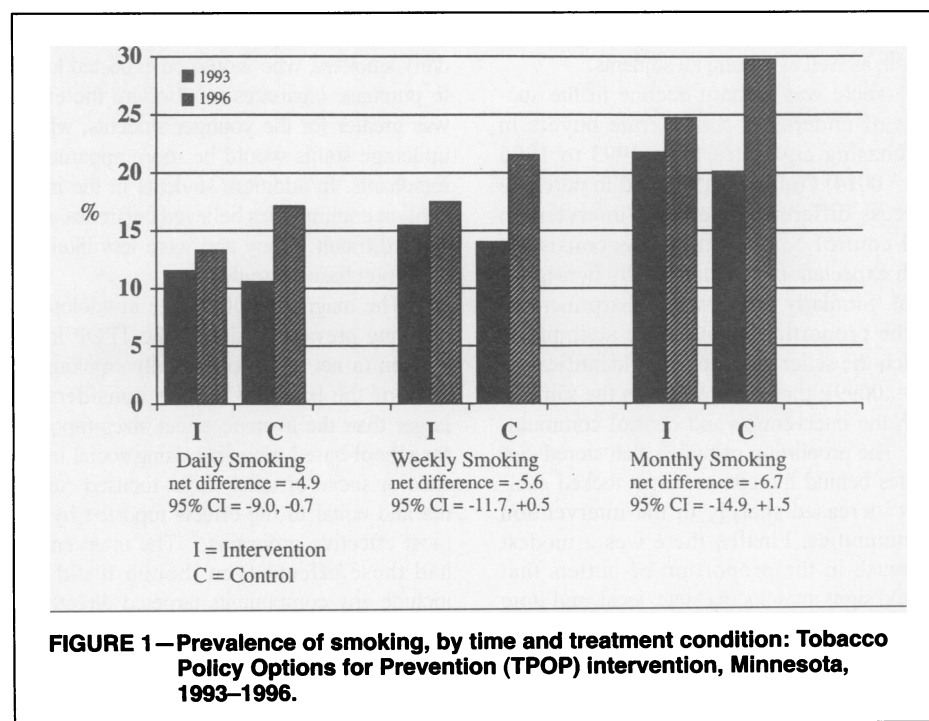
By the end of the intervention period, all 7 TPOP intervention communities had adopted a comprehensive ordinance aimed at ensuring merchant compliance with tobacco age-of-sale laws and reducing youth access to tobacco. The provisions of the ordinances are shown in Table 1. All communities increased the license fee to cover administrative costs, added a graduated system of civil penalties for the license holder, and banned tobacco vending machines, and 6 required that at least 2 unannounced compliance checks be carried out annually. In addition, 5

communities prohibited self-service displays of tobacco products, and 4 included fines for both salespersons who made illegal sales and minors who attempted to purchase tobacco. By the end of the intervention period, compliance checks had been carried out by police in all 7 intervention communities, according to police records. In 4 communities, violators were given fines or license suspensions; in the other 3 communities, only warnings were issued.

During the intervention period, 3 control communities adopted modifications of their tobacco ordinance: one community adopted a self-service ban to take effect in August 1997, another adopted civil penalties for tobacco sales to minors, and a third adopted a model ordinance proposed by the tobacco retail industry. The latter prohibited tobacco self-service displays and vending machines except when they were in view of an employee and permitted the community to conduct compliance checks. Ordinances

passed in the control communities were weaker and much less comprehensive than those passed in intervention communities.

As Figure 1 indicates, the intervention resulted in a lower net prevalence of smoking in the intervention communities than in the control communities. The prevalence of daily, weekly, and monthly smoking climbed sharply in the control communities over the course of the study. However, the increase in the intervention communities was less pronounced, with net differences between intervention and control communities of  $-4.9\%$  for daily smoking (95% confidence interval [CI] =  $-9.0, -0.7$ ),  $-5.6\%$  for weekly smoking (95% CI =  $-11.7, 0.5$ ), and  $-6.7\%$  for monthly smoking (95% CI =  $-14.9, 1.5$ ). In addition to the main effects models, stratified models were examined to determine whether the effects were homogeneous across gender and grade. The intervention was equally effective in slowing the rate of increase in male and female students. For monthly and



**FIGURE 1—Prevalence of smoking, by time and treatment condition: Tobacco Policy Options for Prevention (TPOP) intervention, Minnesota, 1993–1996.**

**TABLE 2—Perceived Availability and Sources of Cigarettes, by Time and Treatment Condition (Student Survey): Minnesota, 1993–1996**

|   | Stratum         | Intervention, % |      | Control, % |      | Net Difference, % | 95% Confidence Interval |
|---|-----------------|-----------------|------|------------|------|-------------------|-------------------------|
|   |                 | 1993            | 1996 | 1993       | 1996 |                   |                         |
| High perceived availability from social sources       | All             | 79.9            | 85.1 | 81.2       | 84.1 | 2.3               | -2.5, 7.1               |
| High perceived availability from commercial sources   | All             | 79.8            | 77.2 | 80.1       | 83.9 | -6.4              | -12.6, -0.1             |
| Commercial source for most recent cigarette (smokers) | Male students   | 28.5            | 19.5 | 24.0       | 27.2 | -12.2             | -21.4, -3.0             |
|   | Female students | 17.3            | 14.3 | 18.0       | 20.5 | -5.5              | -14.8, 3.9              |
| Any purchase attempt in past month                    | All             | 9.0             | 6.5  | 8.0        | 9.9  | -4.4              | -8.2, -0.7              |
|   | Smokers         | 34.9            | 23.8 | 31.8       | 33.3 | -12.5             | -25.6, 0.5              |

weekly smokers, the intervention was also equally effective across grades 8 through 10. For daily smokers, there was a nonsignificant trend toward greater effectiveness among younger students.

Differences in perceived availability and cigarette acquisition patterns reported on the student survey were also noted (Table 2). The intervention had no effect on the perceived availability of cigarettes from social sources, with most students in both conditions reporting that it was easy to obtain cigarettes from family members, friends, or acquaintances. Perceived availability of cigarettes from commercial sources showed a net decrease among students in the intervention condition. There was a net decline among boys in reporting a commercial source for their most recent cigarette; the trend among girls was also favorable. The proportion of adolescents who reported at least one purchase attempt in the previous month declined in the intervention communities, while it increased in the control communities. This was true among students who had smoked at least once in the previous month as well as among all students.

There was a sharp decline in the success of underage confederate buyers in purchasing cigarettes from 1993 to 1996 ( $P = .0014$ ) (Table 3). The trend in purchase success differences between intervention and control communities was consistent with expectations but statistically nonsignificant. Similarly, there was a sharp increase in the proportion of purchase attempts in which the seller requested age identification ( $P = .0099$ ); that trend also was the same in both the intervention and control communities. The proportion of outlets that stored cigarettes behind the counter or in locked cabinets increased sharply in the intervention communities. Finally, there was a modest increase in the proportion of outlets that posted signs announcing state, local, and store age-of-sale policies in the intervention communities relative to the control communities.

In summary, the results indicate that comprehensive ordinances passed in all

intervention communities resulted in a lower smoking prevalence among young adolescents in these communities than in control communities. This net reduction in smoking prevalence was associated with a lower perceived availability of tobacco from commercial sources, a reduction in commercial sources of cigarettes, and fewer cigarette purchase attempts reported by adolescents in intervention than in control communities. Cigarettes were more likely to be displayed behind a counter in intervention communities, and stores were more likely to post signs about age-of-sale policies.

## Discussion

This study provides evidence that a community mobilization intervention resulting in policy adoption and enforcement to reduce youth access to tobacco can affect adolescent smoking rates. The effects were consistent across grades and genders. Among daily smokers, who would be expected to try to purchase cigarettes most often, the effect was greater for the younger students, whose underage status would be more apparent to merchants. In addition, students in the intervention communities believed cigarettes were more difficult to buy and were less likely to try to purchase cigarettes.

The magnitude of change in adolescent smoking prevalence due to the TPOP intervention (a net reduction in daily smoking of 28% of the baseline rate) is considerably larger than the average effect sizes reported for school-based programs using social influence or social or other skills-focused curricula and equal to the effects reported by the most effective programs.<sup>20</sup> The intervention had these effects even though it did not include any components targeted directly at adolescents.

Although more than 6000 children were surveyed in both 1993 and 1996, all of the analyses were conducted at the level of the

community (as was appropriate given that community was the unit of randomization). Thus, the degrees of freedom for all intervention effects reported here were based on the number of communities in the study (14) rather than the number of students. This approach to the analysis both protected the type I error rate and provided the statistical basis for generalizing to communities similar to those included in the study.<sup>21</sup> We believe that even though the confidence intervals included zero at the upper bound, the differences in weekly and monthly smoking prevalence in this study are noteworthy given the limited degrees of freedom.

Our findings suggest that refusals by sellers at the time of purchase attempts by young people do not account for the lower adolescent smoking rates observed in the intervention communities. Both intervention and control communities showed reductions in the proportion of businesses that sold cigarettes to underage study confederates. Salespeople in both treatment and control communities were equally likely to ask these students for age identification. However, the community mobilization and awareness campaigns that were part of the intervention, as well as the policies that were adopted, may have increased the perception among students that they would not be able to purchase tobacco and/or discouraged them from trying to do so. Businesses in the intervention communities were more likely to display cigarettes behind a counter, thus requiring that individuals request the products from salespeople, and they were more likely to post signs announcing local or store policies regarding sale of tobacco to minors. These actions may account for the findings that students in the intervention communities were less likely to try to purchase cigarettes than students in control communities and that they believed cigarettes were more difficult to purchase. These findings are consistent with previous studies reporting that stores with self-service displays of tobacco products are more likely to sell tobacco to minors.<sup>2,22</sup>

TABLE 3—Purchase Success and Transaction Characteristics, by Time and Treatment Condition

|  | Stratum          | Intervention, % |      | Control, % |      | Net Difference, % | 95% Confidence Interval |
|--|------------------|-----------------|------|------------|------|-------------------|-------------------------|
|  |                  | 1993            | 1996 | 1993       | 1996 |                   |                         |
| Purchase success   | All              | 38.8            | 4.9  | 41.9       | 12.5 | -4.5              | -18.7, 9.7              |
|  | Over the counter | 36.7            | 3.1  | 41.0       | 8.8  | -1.5              | -11.7, 8.6              |
| Identification requested                                     | Over the counter | 62.3            | 86.3 | 58.9       | 83.4 | 0.0               | -11.2, 10.3             |
| Cigarettes stored behind counter                             | Over the counter | 52.6            | 83.8 | 55.2       | 57.2 | 29.2              | 3.1, 55.3               |
| Signs posted on state, local, and store age-of-sale policies | All              | 10.9            | 23.4 | 9.2        | 7.7  | 14.1              | -3.0, 31.1              |

The reduction in tobacco purchase success across both the intervention and control communities is not surprising given the level of attention to the issue of youth access to tobacco in Minnesota recently. During the intervention period (1993 through 1996), a strong effort to pass state legislation to reduce youth access to tobacco was accompanied by statewide media attention. State retailers' associations and the tobacco industry launched statewide campaigns to educate retailers and their employees about the Minnesota tobacco age-of-sale law and ways to avoid violating it. In addition, Minnesota participates in both the ASSIST and Smokeless States projects. Moreover, local health agencies throughout the state became interested in the issue and began implementing tobacco purchase attempts in their communities. Other recent studies also suggest that retailers respond to the changing policy and enforcement climate of a region rather than simply to local efforts.<sup>23,24</sup>

Results from this study emphasize the value of local policy changes in the context of intensive education for action, public debate, and involvement of hundreds of community members. In addition to the policy and practice changes and law enforcement efforts, the mobilization process changed perceptions of availability and (very likely) community norms about tobacco sales to and use by youth. The effects on youth tobacco use seen in this study must be attributed to effects of the local policies and their enforcement in the context of an intensive community organizing effort.

Our results are relevant to the debate among tobacco control advocates about whether an emphasis on reducing youth access to tobacco is warranted given available evidence concerning its effectiveness in reducing youth tobacco use.<sup>25-27</sup> This debate intensified in light of the finding of Rigotti and colleagues<sup>14</sup> that enforcement of the tobacco age-of-sale law was not associated with a reduction in adolescent smoking prevalence. In the Rigotti et al. study,

enforcement efforts resulted in a reduction in tobacco sales to minors to about 20% in the 3 intervention towns (vs 54% in control towns) after 1 year. In the TPOP study, purchase success in the intervention communities was reduced to about 5%, as compared with 12.5% in the control communities. Because of the intensive activity leading to policy changes in the study communities, our results do not directly predict the effectiveness of efforts focused specifically on enforcement. It is possible that the level of reduction in purchase success achieved in our study is what is necessary to effectively reduce youth access, or it may be that an intensive community mobilization intervention is needed to change the perceptions and behaviors of young people.

Conclusions from this study are limited by the fact that our results reflect short-term effects only, based on data collected immediately following the intervention. Furthermore, all of the communities in the study are located in one state, and all are small towns in rural counties with relatively homogeneous, almost entirely White populations. Clearly, longer-term studies in a variety of communities are needed. Because of limitations in the standard purchase attempt methodology, we cannot be sure whether or not commercial access to tobacco was actually reduced. Changes in purchase success rates in intervention communities cannot be reliably distinguished from temporal trends. Nevertheless, these results provide encouraging evidence that efforts to limit commercial access to tobacco by youth represent an effective component of a multidimensional approach to reducing tobacco use. □

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## *War and Public Health*

*Edited by Barry S. Levy and Victor W. Sidel, 1996*

For health professionals, educators or students of public health or medicine, people involved in international studies, diplomacy or the military

**T**his is the first book that documents the impact of war on public health, and describes what health professionals can do to prevent war and to minimize its consequences. The effects of war on health, human rights, and the environment are comprehensively described. Among the 26 chapters are chapters on the Vietnam War, the Persian Gulf War, and the war in Central America, as well as the roles of health professionals in the prevention of war and during war. Also discussed are the health effects of nuclear, chemical and biological weapons systems and the public health consequences. The book deals with both the direct consequences of the use of conventional weapons and the role of the international arms trade, including the diversion of resources that could otherwise be used for health and human welfare. Separate chapters cover particularly vulnerable populations, such as women, children, and refugees.

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