
Original Article

Restricting the retail supply of tobacco to minors

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Abstract To examine the impact of enforcement of age-restricted tobacco sales on adolescent tobacco purchasing and smoking, we compared the Central Coast intervention area to the rest of New South Wales (NSW) and Australia. We collected data on students in school years 7–12 from triennial health surveys at baseline in 1993 through 2002. Attempts by minors to purchase tobacco in the intervention area declined by 73.6 per cent between 1993 and 2002. Between 1993 and 1996 the prevalence of smoking declined in the Central Coast intervention area, while remaining unchanged in NSW as a whole and nationally ($P < 0.0001$). Between 1993 and 2002, the prevalence of current smoking in the intervention area was reduced by half. Effective enforcement of an age-restricted tobacco sales law was accompanied by a substantial reduction in attempted purchases of tobacco and of smoking by youth. The long-term follow-up in this study allows us to observe that the impact of the intervention was not only sustained but also increased with time.

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Introduction

In 1991, changes to the Public Health Act in New South Wales (NSW), Australia made it an offence to sell tobacco to anyone under 18 years of age, representing an increase in minimum age from 16 that had been in effect for nearly 90 years, but rarely enforced.¹ In 1994, following 18 months of extensive retailer



education about the law, teenage volunteers tested retailer compliance by attempting to purchase cigarettes from more than a quarter of the retailers in the Central Coast region of NSW. Compliance was less than 70 per cent; more than 30 per cent of retailers made illegal sales when tested.

Although weak efforts to encourage compliance with age-restricted tobacco sales laws at the community level have often failed to change merchant behavior or reduce smoking among youth,²⁻⁶ in several studies, strong enforcement programs have sharply curtailed illegal sales and have been accompanied by substantial reductions in youth smoking rates.⁷⁻¹¹ It is important to study the long-term impact of interventions, because it is possible that black markets might develop that would undermine their impact over time. Alternatively, the impact might increase with time, as a reduction in smoking among a same-age cohort would reduce the number of older smoking role models – potential sources of tobacco for following cohorts. Only rarely has the impact of interventions been evaluated for more than a year or two.^{9,12}

Another limitation of prior studies is that they were often limited to single communities, potentially allowing youth to obtain tobacco in neighboring communities, thus undermining the impact of the intervention. Interventions involving wider geographic areas may be more effective.

In 1995 the Health Promotion Unit on the Central Coast initiated the first determined effort in Australia to enforce age-restricted sales of tobacco. Here we present the first long-term (9 years) evaluation of this aggressive wide area enforcement program. We describe changes in retailer compliance, adolescent attempts to purchase tobacco, and smoking rates.

Methods

Design

Ours was a non-randomized, controlled intervention using nested control groups. The intervention was instituted in the Central Coast region of NSW, whereas the rest of the state of NSW and the rest of Australia served as control groups. Baseline surveys were available for these three geographic areas and follow-up surveys were conducted at 3-year intervals in each.

Setting

The NSW Central Coast comprises a primarily urban area with a population of over a quarter million, lying between metropolitan Sydney to the south and Newcastle to the north. In 1994, more than 400 tobacco retailers operated in this area (exclusive of liquor licensed premises). Low socio-economic status in the Central Coast intervention area, with 25 per cent of households earning less than \$A400 per week in 2001, was slightly more common than for the rest of NSW¹³ and the whole of Australia, at 21 per cent each.¹⁴ There were no significant differences in baseline smoking rates across the three areas (see results), suggesting comparability between the intervention and two control areas in our primary outcome measure at baseline.

Intervention

Following the demonstration that education alone had failed to halt illegal tobacco sales, enforcement began in 1995 through a partnership between the Central Coast Health Promotion Unit and police. They adopted a three-part strategy to change retailer behavior: retailer education; active enforcement through the use of under-age decoys, and publicity about prosecutions. To increase retailers' perceptions of the likelihood of being caught and prosecuted, the random compliance checks were intensively publicized in local media, including large front-page headline stories and supportive editorial comment. In 1995, an advertising campaign in concert with local World No Tobacco Day invited the public to phone a 'hotline' to report illegal retailer activity. Local TV crews with hidden cameras undertook their own purchase attempts, confronting retailers who sold. One major network ran a segment on Operation 'Undercover Kids' the following year.

Compliance tests of retail establishments were performed by pairs of volunteers, aged 14–16 years, supervised by teams of health promotion officers, and sometimes police. The volunteers were assessed as looking their age, instructed to dress normally, practiced in asking for a particular product and required to be honest if asked about their age or proof of age. In the first year, retailers within 3 km of the surveyed schools were compliance tested. In subsequent years,



inspections were conducted every 3–6 months rotating through different regions to include the entire Central Coast. No more than a third of retailers were inspected in any given year. Only a small proportion of violators were prosecuted. During this period, prosecution was usually limited to those failing two tests. Prosecuted violators were summoned to appear before a Magistrate in a Local Court. The Health Promotion Unit obtained extensive media coverage of all successful prosecutions and penalties. A maximum fine of \$A5000 was possible, but the highest penalty in practice was \$A1000, and many penalties were for lesser amounts. One retailer was fined \$A1000 for each of two separate offences. Excellent compliance was maintained by inspecting at least 10 per cent of retailers each year. Media articles covering the prosecution of retailers were included in merchant education packages and combined with any warning letters to promote the perception that violators were likely to be caught and prosecuted. This regular direct mail contact with retailers continued throughout the years. Within 2 years of the initiation of enforcement, compliance improved from under 70 per cent to more than 90 per cent. Compliance was sustained at more than 95 per cent and reached 100 per cent in 1998/1999.¹⁵ The absence of violations was also publicized to ensure that retailers understood that inspections were ongoing.

In 1996, compliance testing by Public Health Units (complementary services to Health Promotion) expanded to other Areas of NSW, after the state adopted policies to enable random testing.¹⁶ By 1999, four other Areas in NSW were reporting greater than 90 per cent compliance and by 2002 compliance exceeded 90 per cent in 9 of 17 NSW Health Areas. Across NSW, more than 150 prosecutions by local environmental health officers and police had taken place by 2002.¹⁷ By 2003, all NSW Health Areas had undertaken compliance testing, but not all Areas engaged in a sustained publicity effort, relying more on quiet enforcement and retailer education packages. Thus, compared to the Central Coast, enforcement in the remainder of NSW was delayed, less publicized, and limited in geographic coverage.

In the early 1990s, Western Australia had an interest in tobacco sales to minors, but by 2000, had only about 50 prosecutions.¹⁸ Tasmania, South Australia, and Victoria started some enforcement in the late 1990s. Queensland, and the Northern Territory did not

initiate enforcement using this methodology. No national compliance data are available.

Adolescent surveys

To evaluate the impact of this program, we conducted school-based surveys of students in years 7–12 in the Central Coast in 1993, 1996, 1999 and 2002, coinciding with state and national triennial school surveys. The 1993 survey was conducted as a baseline before the initiation of retailer education and enforcement.

To maintain consistency, the same four schools participated in all four surveys. To provide representation of the geographic and socio-economic diversity of the area, two schools were selected from each of the two major areas of the Central Coast, Gosford City and Wyong Shire. Each school was in a discreet region, at a substantial distance from the others, covering the northern, southern and central parts of the narrow coastal strip comprising the study area. One school specialized in students with high academic performance, whereas another serviced an economically disadvantaged area. The other two schools were considered ‘ordinary’ being comprehensive, co-educational, state system schools in locations not considered to be disadvantaged. At two of the schools, a regional school restructuring moved either upper classmen or lower classmen to nearby schools, so to capture these grades and maintain age and socio-economic consistency with the prior surveys, we expanded the survey to include three additional schools from these neighborhoods for the 2002 survey. This increased the sample size substantially, to more than a quarter of the Area’s secondary schools, increasing the likelihood that the sample was representative of the Area. The population served by these seven schools had the same proportion of low-income families (<\$A400/week) as the whole Central Coast.¹⁹ Because the law applies to youth under 18, only the data about students aged 12–17 were analyzed.

The project was approved by the Area Health Service Board and by school principals. All students in attendance were invited to participate in an anonymous and voluntary survey, but as we were unable to obtain attendance records, we have not calculated a response rate. The survey obtained demographic information and asked students if they currently smoked cigarettes at least once



a month, and if they had made an attempt to purchase tobacco in the previous 6 months.

The prevalence of smoking in the past month for the Central Coast was compared to similar data for students in years 7–12 from state (NSW) and national surveys. The Cancer Council NSW provided summary data from its 1993 NSW Secondary School Age Smoking, Alcohol and Sun Protection Survey ($n=4823$),²⁰ and its successor, the Australian School Students' Alcohol and Drugs Surveys (NSW) of 1996, 1999, and 2002 ($n=9390$, 4258, and 6180, respectively).^{21,22} Central Coast data were also compared to the Australian Secondary Students' Drug and Alcohol Survey which included a nationally representative sample of students in government, Catholic, and independent schools in 1993 ($n=22\,696$), 1996 ($n=29\,850$), 1999 ($n=25\,486$), and 2002 ($n=23\,417$).^{23–25} Whereas the Central Coast survey asked about smoking in the past month, the NSW and national surveys asked about smoking in the past 4 weeks. We refer to these data as monthly smoking.

Analysis

Group differences were compared using the Student's *t*-test and the chi-square with a *P*-value of <0.05 used as the test of statistical significance. Only proportional statistical comparisons could be made between local, state, and national data as we did not have access to the raw data for the state and national surveys.

Results

The numbers of usable surveys for the Central Coast were 2827, 3148, 2337, and 4313 for 1993, 1996, 1999, and 2002, respectively. The mean age of the respondents increased slightly from 14.2 to 14.4 years from 1993 to 2002 ($P<0.0001$ by paired *t*-test), reflecting a slight change in the time of year schools administered the questionnaire. Because the prevalence of smoking increases with age through the teen years, as shown in the periodic national surveys,^{23–26} this would bias the results against finding a decrease in smoking. The mean age for the NSW surveys varied between 14.2 and 14.5, whereas the mean age for the national surveys bounced between 14.4 and 14.5.

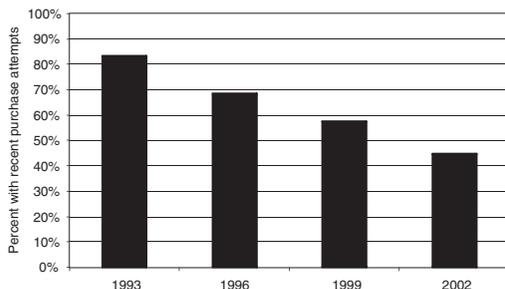


Figure 1: Proportion of under-age smokers reporting having made an attempt to purchase cigarettes within the past 6 months in four cross-sectional surveys conducted over 9 years in the Central Coast region of New South Wales, Australia. There was a significant decline ($P < 0.001$) from each survey to the next.

We examined the impact of improved retailer compliance on the cigarette purchasing behavior of youth. In 1993, 83 per cent of smokers reported a purchase attempt in the previous 6 months (Figure 1). The prevalence of recent purchase attempts among smokers dropped significantly with each subsequent survey ($P < 0.001$ by chi-square) to 45 per cent by 2002. These data, however, underestimate the absolute decline in purchase attempts as the prevalence of smoking also declined. The change in the prevalence of purchase attempts was therefore re-examined with all surveyed youth as the denominator. As depicted in Figure 2, the proportion of all youth with recent purchase attempts fell by three quarters (73.6 per cent) from 21.6 per cent in 1993 to 5.7 per cent in 2002. Each decline from one survey to the next was significant at $P < 0.001$ by chi-square analysis.

As depicted in Figure 3, at baseline in 1993 the prevalence of monthly smoking in the Central Coast (25.9 per cent, 95 per cent confidence interval (CI) 24.2–27.5) was slightly higher but not statistically different from NSW as a whole (24.7 per cent) or the whole of Australia (25.2 per cent). Between 1993 and 2002, the prevalence of monthly smoking on the Central Coast declined by half, with a statistically significant reduction seen from each triennial survey to the next, 1996: 22.7 per cent (CI 21.3–24.2); 1999: 17.1 per cent (CI 15.6–18.6); 2002: 12.9 per cent (CI 11.9–13.9). The prevalence of monthly smokers across Australia showed little change between 1993 and 1996^{23,24} but declined significantly between 1999

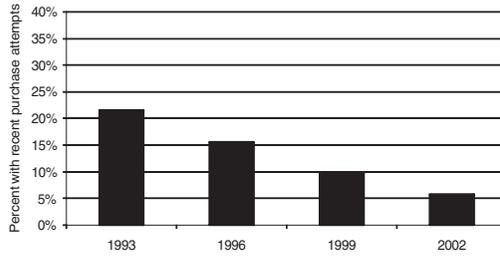


Figure 2: Proportion of all youth reporting having made an attempt to purchase cigarettes within the past 6 months in four cross-sectional surveys conducted over 9 years in the Central Coast region of New South Wales, Australia. There was a significant decline ($P < 0.001$) from each survey to the next.

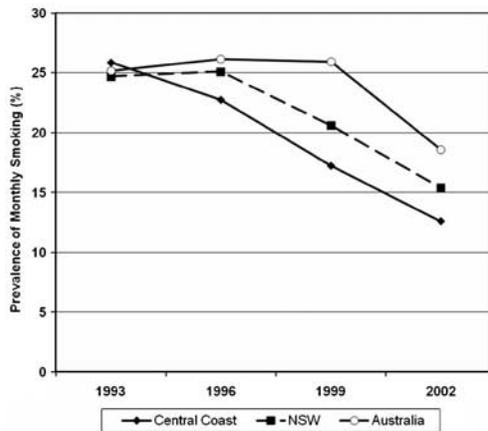


Figure 3: Trends in the prevalence of past month smoking among adolescents in the Central Coast, in New South Wales (NSW) and Australia between 1993 and 2002. The differences between Central Coast and Australia are significant for 1996, 1999 and 2002 ($P < 0.0001$ for each comparison). Differences between Central Coast and NSW are also significant for 1996 ($P < 0.01$), 1999 and 2002 ($P < 0.0001$). Differences between NSW and Australia are significant for 1999–2002 ($P < 0.0001$).

and 2002.^{25,26} At each survey after baseline, the prevalence of monthly smoking on the Central Coast was significantly lower than the national rate ($P < 0.0001$, by chi-square). Despite a statistically significant reduction in smoking in the Central Coast between 1993 and 1996, the smoking rate for NSW as a whole did not change during this period suggesting that statewide tobacco control

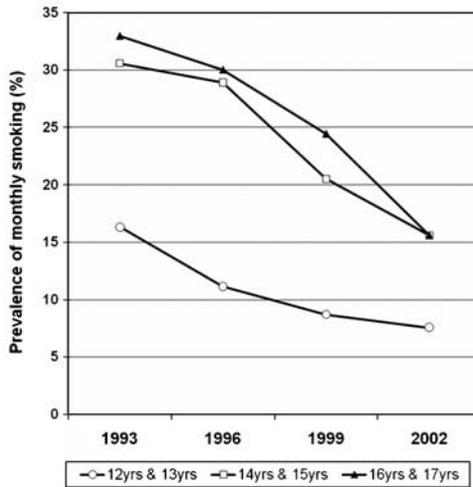


Figure 4: Trends in age-specific point prevalence of monthly smoking in the Central Coast region of New South Wales, Australia between 1993 and 2002.

programs, tobacco prices, or media were not responsible for the Central Coast decline. Coincident with the spread of enforcement programs to the rest of NSW, smoking rates started to decline after 1996 but lagged behind those of the Central Coast through 2002 ($P < 0.01$ for 1996, $P < 0.0001$ for 1999 and 2002).

Figure 4 depicts the age-specific prevalence of monthly smoking. A careful examination of these data shows that the decline in smoking prevalence was steepest for the youngest cohort, aged 12–13 years, during the initial period between 1993 and 1996. For the older subjects the steepest decline appears after 1996. This may be a cohort effect as youth who were 12–13 years old in 1993 were 15–16 years old in 1996.

Discussion

The Health Promotion Unit of the Central Coast region of NSW, in cooperation with police, instituted a comprehensive program combining merchant education with enforcement of a law prohibiting the sale of tobacco to youth under 18 years of age. Subsequent to this, attempts by under-age youth to purchase tobacco declined by



three quarters whereas the prevalence of smoking in this group declined by half. This outcome is consistent with that seen in prior controlled studies in which smoking rates in communities with strong enforcement have shown relative reductions in youth smoking of 28 per cent,^{8,9} 44 per cent¹⁰ and 50 per cent.¹¹

Before the intervention, the prevalence of smoking among youth, aged 12–17, was the same on the Central Coast as in NSW as a whole, and Australia as a whole, suggesting that our intervention and control areas were well matched in regard to smoking. This is important because this was not a randomized trial. As the intervention was gearing up between 1993 and 1996, the prevalence of adolescent smoking fell in the Central Coast while remaining unchanged in the rest of NSW and Australia. We would like to stress that the enforcement program was the only anti-tobacco initiative unique to the Central Coast during that period. There were no additional special school curricula or youth-oriented prevention programs. The decline in smoking was geographically specific to the area where enforcement was pursued, providing reassurance that the drop in smoking rates in the Central Coast was not attributable to secular trends, changes in cigarette prices, or state or national anti-smoking initiatives, all of which would have also been expected to affect smoking rates in NSW or Australia as a whole.

When laws are enforced, younger adolescents have more difficulty than older youth in purchasing tobacco.²⁷ In some studies, the effects of enforcement on youth smoking were confined to the youngest age cohorts.^{2,28} Consistent with these observations, the reduction in smoking observed in the Central Coast between 1993 and 1996 reflected a sharper decline in smoking among the youngest age cohort. The impacts of the intervention on older cohorts were strongest after the intervention had been in effect for many years and the youngest cohort had aged. This suggests that many youth who were discouraged from smoking at ages 12–13 did not initiate smoking when they were 15 or 16. Long follow-up periods – several years – may be best suited to detecting the impact of enforcement interventions on older adolescents. The 9-year duration of this study is longer than any previously reported and allows us to conclude that the impact of the intervention did not wear off, suggesting that any black market that might have developed for tobacco was not nearly enough to compensate for the effect of the enforcement intervention.

The years following the initiation of enforcement in the Central Coast region saw the spread of the enforcement approach throughout NSW. By 1999, retailer compliance topped 90 per cent in nearly a third of Health Areas across the state. This was accompanied by a sharp decline in adolescent smoking observed in NSW from 1996 to 1999, while the prevalence of smoking in the national survey remained unchanged through 1999 (Figure 3). With time, several other states launched enforcement programs. National surveys show a gradual decline in the proportion of adolescent smokers who purchased their own tobacco.²⁶ A sharp drop in the prevalence of smoking in the national survey was first observed between 1999 and 2002.

A potential confounding factor post-1999 was a change in the national tax regime on tobacco and its effect on cigarette prices. This was probably the main reason for a more than 30 per cent rise in the recommended retail price of a popular brand during that 3-year period (from \$A6.90 to \$A9.10).^{29,30} Previously, pricing was comparatively stable with the midpoint price our volunteers paid in 1996 being \$A6.10. Whether or not pricing affected national smoking rates is open to debate, but universal pricing changes do not explain the differences between Central Coast and NSW or national figures. The pattern of declining adolescent smoking tracks the initiation of enforcement on the Central Coast and its subsequent spread to the rest of the state of NSW and then to other Australian states.

A randomized controlled enforcement intervention involving six communities in an urban area outside of Boston, Massachusetts failed. The intervention had no impact on youth smoking rates, nor did it have any effect on youths' purchasing behavior.³ An enforcement intervention cannot be expected to affect youth smoking if it does not change merchant behaviors. Our data demonstrate that the proportion of youth who made recent purchase attempts declined by three quarters, providing evidence that youth had felt the impact of the enforcement program. Among smokers, the proportion who had made purchase attempts declined from 83 to 45 per cent. Only interventions aimed at reducing access to tobacco would be expected to change the purchasing behavior of smokers.

It is reassuring to note that improved merchant compliance did not lead to increased purchase attempts by frustrated but determined



youth. By 2002, shopkeepers were dealing with only a quarter as many under-age cigarette customers because there were only half as many smokers, and the remaining smokers made fewer purchase attempts.

Study limitations include a lack of randomization and the use of a convenience sample. Given the accumulated weight of evidence in support of the effectiveness of youth access interventions,³¹ there would now be ethical issues associated with randomly assigning communities to ignore age-restricted sales laws.³²

Strengths of this study include:

- inclusion of two nested control populations;
- assessment of the impact of the intervention on retailer compliance;
- achieved and sustained high compliance rates;
- large samples in all surveys;
- extended time over which the intervention was applied;
- long follow-up after the initiation of the intervention;
- diverse socio-economic areas covered by the intervention;
- large geographic area of the intervention area (making it more difficult for youth to walk to another jurisdiction to purchase tobacco);
- use in all surveys of consistent measures across multiple years; and
- assessment of the mediating variable of purchase attempts.

Prior studies with negative outcomes have been limited by short follow-up periods^{3,28} and a failure to demonstrate that the enforcement program prevented illegal sales.³⁻⁶

A false controversy surrounds the issue of youth access to tobacco. Several early attempts to improve compliance with the law failed to alter merchant behavior substantially and accordingly had no impact on youth smoking.³⁻⁵ These failed interventions have prompted some to call for abandoning any further effort toward this end.³³ A recent review of 250 publications about youth access to tobacco concluded that none of the studies in which interventions failed to impact youth smoking had demonstrated a significant reduction in the retail availability of tobacco.³¹ On the other hand, every intervention that successfully reduced the availability of tobacco reported a favorable impact on youth smoking.

Many policies that are accepted as useful for discouraging smoking, such as taxation, clean indoor air policies, and bans on tobacco advertising have never been subjected to randomized controlled studies. To require that level of proof only for youth access interventions would set a double standard. Our controlled study demonstrates that an enforcement program in a large urban area was very successful in reducing illegal tobacco sales to minors. Other factors like effective school education, media anti-smoking campaigns, changes in tax and pricing, or greater environmental restrictions on smoking may play a role in reducing tobacco use, but there were no such interventions unique to the Central Coast, and nothing to suggest why state or national campaigns would have affected the Central Coast more than the rest of the state. Despite the lack of randomization and the possibility that those factors may have played a role, we believe it is quite reasonable to conclude that Central Coast's policy contributed to the observed marked decline in youth smoking. On the basis of these results, we encourage government officials everywhere to implement strong enforcement of laws that prohibit the sale of tobacco to minors.

About the Authors

Douglas Tutt is Area Director of Health Promotion for Northern Sydney/Central Coast Area Health Service in NSW, Australia. His unit has a long history in tobacco control in cessation, preventing teen uptake, and in smoke-free environments. In addition, interventions designed by the unit on alcohol and minors, and on obesity prevention among children have led work in various parts of Australia.

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Joseph DiFranza is a family physician practicing at the University of Massachusetts Medical School. He has been conducting smoking research for 25 years.

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