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Increasing the age for the legal purchase of tobacco in England: impacts on socio-economic disparities in youth smoking

Christopher Millett¹, John Tayu Lee¹, Daniel C Gibbons¹, and Stanton A Glantz^{2,3}

¹Department of Primary Care and Public Health, Imperial College, London, UK

²Division of Cardiology, Department of Medicine, University of California, San Francisco, California, USA

³Center for Tobacco Control Research and Education, University of California, San Francisco, California, USA

Abstract

Background—The minimum age for the legal purchase of tobacco increased from 16 to 18 years in England, Scotland and Wales on 1 October 2007. The authors examined the impact of this legislation on disparities in smoking behaviour and access to cigarettes among youth in England.

Methods—A multivariate logistic regression analysis was carried out adjusting for secular trends in regular smoking using data from the Smoking, Drinking and Drug Use Survey, a national survey of 11e15 year olds. The primary outcome measure was regular smoking and the predictor variables were the law increasing the minimum age for purchase and eligibility for free school meals (FSM).

Results—Increasing the minimum age for purchase was associated with a significant reduction in regular smoking among youth (adjusted OR 0.67; 95% CI 0.55 to 0.81, $p=0.0005$). This effect was not significantly different in pupils eligible for FSM compared with those that were not (adjusted OR 1.29; 95% CI 0.95 to 1.76, $p=0.10$ for interaction term). The percentage of pupils who stated that they found it difficult to buy cigarettes from a shop did not increase in those eligible for FSM (25.2% to 33.3%; $p=0.21$) but did increase significantly in others (21.2% to 36.9%; $p<0.01$) between 2006 and 2008. No differences in ease of purchase were found between pupils eligible for FSM and those not before or after the legislation (2006: $p=0.34$, 2008: $p=0.55$).

Conclusions—Increasing the age for the legal purchase of tobacco was associated with reduced regular smoking among youth in England and appeared to have a similar impact in different socio-economic groups.

INTRODUCTION

Tobacco use and smoking-induced harm are strongly patterned by social position with the greatest burden falling on lower socio-economic status (SES) groups.¹ Identifying effective strategies to reduce disparities in youth smoking is essential to address this unequal burden given that marked disparities in tobacco use present during adolescence increase throughout

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Correspondence to Christopher Millett, Imperial College, 3rd Floor Reynolds Building, St Dunstons Rd, London W6 8RP, UK; c.millett@imperial.ac.uk.

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the life course² because people from poorer backgrounds are less likely to quit smoking than people from affluent backgrounds.²³

The minimum age for the legal purchase of tobacco increased from 16 to 18 years in England, Scotland and Wales on 1 October 2007. A preliminary study conducted in England found that this legislation was associated with greater reductions in smoking prevalence among adolescents than in adults (7.1% vs 2.4%) who were not affected by the legislation.⁴ However, the study was unable to assess impacts of this legislation on disparities, an important consideration for all public health policy.⁵ Youth from lower SES groups could be less affected by this legislation, even if enforcement is uniform in deprived and affluent settings, because they may have greater access to cigarettes through their family and social networks and through illicit sources.^{6–8}

This study used national survey data to examine the hypothesis that raising the age for the legal purchase of tobacco had a lesser impact on access to cigarettes and regular smoking prevalence among young people from lower SES groups than those from more affluent groups because they were able to gain access to tobacco from other sources.

METHODS

Sampling and data collection

The data used in this study were derived from the Smoking, Drinking and Drug Use Among Young People in England (SDDU) survey. The survey is conducted by the National Centre for Social Research and the National Foundation for Educational Research. The SDDU is an annual survey that provides national estimates of smoking behaviour in youths aged 11–15 years in England. The methods of the survey are described in detail elsewhere.⁹ In brief, the survey is conducted at secondary schools selected from 12 strata (school type: comprehensive/grammar/secondary modern/ private; pupil sex: boys/girls/mixed sex) in the National Foundation for Educational Research database. The database contains details of all schools in England. Schools that participated in the survey closely reflect the composition of schools in England generally. A random sample of 35 students in years 7–11 in participating schools is approached to complete the survey at the same time in a classroom under 'exam conditions'. The survey covers a number of core measures and since 2000 has included detailed questions on where pupils obtain cigarettes and how difficult purchase from shops is during alternate years. We use data from 2003 to 2008 and exclude data for 2007. The question used to ascertain smoking status was different prior to 2003 and the law was implemented in the middle of (October) 2007.

Variables

The primary outcome measure was regular smoking status (defined as usually smoking at least one cigarette per week) and the secondary outcome measures were usual source of tobacco and ease of tobacco purchase. The predictor variables were the law raising minimum age for purchase and student eligibility for free school meals (FSM), a proxy measure for low SES, which is assessed on the basis of parental employment status and income levels.¹⁰

Statistical analysis

Multivariate logistic regression was used to estimate the effect of the increase in minimum age for purchase on smoking status by controlling for the previous time trend, students' characteristics and alcohol and drug use. The dummy variable Law indicated whether the minimum age increase law was in effect (1 for 2008, 0 otherwise). The dummy variable FSM indexed SES group (1 if student receiving FSM, 0 otherwise). An interaction term

between Law and FSM was included to determine whether the law had a differential impact on the likelihood of regular smoking depending on FSM status. Pupil records with missing values (eg, not answering) for outcome variables and covariates were removed (10.4%). In total, there were 40 582 observations (numbers of observations in each year are given in the caption for figure 1).

We also included the year (with the year 2003 set to 0), students' age, gender, ethnicity and whether they ever used alcohol or drugs. Multicollinearity of the models was checked with the variance inflation factor. The results of multi-collinearity diagnosis were all less than 1.5, except for Year and Law, which were below 3, indicating that the assumption of independence among the predictor variables was met. Adjusted ORs were reported, heteroscedasticity-consistent standard errors were used for hypothesis testing. We examined differences in usual source of tobacco and ease of tobacco purchase in respondents eligible for FSMs and those not eligible in 2006 and 2008 (the year before and after the legislation) using the χ^2 test. All statistical analyses were performed using Stata 11.

RESULTS

In 2008, 264 schools agreed to take part in the survey (response rate 58%) and within these schools 7798 pupils aged between 11 and 15 years completed the survey (response rate 88%). The FSM group was significantly younger (mean age: 13.1 vs 13.2 years, $p=0.002$), more likely to be female (53% vs 49%, $p=0.042$) and contained significantly more pupils from ethnic minorities (22% vs 13% non-white, $p<0.001$) than the non-FSM group in 2008.

Impact of the age restriction on regular smoking

The prevalence of regular smoking in the FSM and non-FSM groups together with the predicted values based on the logistic regression are shown in figure 1 and the results for multivariate logistic model are presented in table 1. As expected, students receiving FSM were more likely to smoke (adjusted OR for FSM: 1.87, $p<0.001$). The increase in minimum age for purchase significantly reduced regular smoking (adjusted OR 0.67, $p<0.001$). This effect was not significantly different for FSM students than the others, which suggests all students benefited from the law similarly; that is, increasing the minimum age for the purchase of tobacco in England was neutral with regard to disparities.

Usual source of cigarettes

The percentage of regular smokers who usually bought cigarettes from a supermarket, newsagent or garage decreased significantly ($p<0.01$) between 2006 and 2008 in both the FSM and non-FSM groups (table 2). The percentage of regular smokers who usually bought cigarettes from a vending machine decreased significantly in the non-FSM but not in the FSM group. Regular smokers who were eligible for FSM were no more likely to usually buy their cigarettes from a supermarket ($p=0.94$ in 2006, $p=0.37$ in 2008), newsagent ($p=0.53$ in 2006, $p=0.77$ in 2008), garage ($p=0.81$ in vending 2006, $p=0.20$ in 2008) or machine ($p=0.42$ in 2006, $p=0.57$ in 2008) than those not eligible for FSM in either year.

The percentage of regular smokers who usually bought cigarettes from friends and relatives or from other people increased significantly in the non-FSM but not the FSM group after the introduction of age restriction. Regular smokers who were eligible for FSM were no more like to usually buy their cigarettes from friends and family ($p=0.10$ in 2006, $p=0.43$ in 2008) or from other people ($p=0.15$ in 2006, $p=0.77$ in =2008) than those not eligible for FSM in either year.

There was no significant change in the percentage of regular smokers who were usually given cigarettes by their siblings, parents or friends between 2006 and 2008 in the FSM or

non-FSM groups. Regular smokers eligible for FSM were significantly more likely to be given cigarettes by their parents in 2006 ($p < 0.001$) but this was no longer the case in 2008 ($p = 0.42$).

Ease of buying cigarettes

The percentage of regular smokers who stated that they found it difficult to buy cigarettes from a shop increased significantly in the non-FSM but not the FSM group between 2006 and 2008. The percentage of regular smokers who were successful in buying cigarettes from a shop during their latest attempt decreased significantly in the non-FSM but not the FSM group between 2006 and 2008. No differences in ease of purchase were found between pupils eligible for FSM and those who were not ($p = 0.34$ in 2006, $p = 0.55$ in 2008).

DISCUSSION

The findings suggest that increasing the minimum age for the purchase of tobacco in England was associated with a significant reduction in youth smoking and was neutral with regard to disparities. Previous studies examining the impact of age restrictions on youth smoking rates have produced mixed results^{11–13} and there has been very little research examining impacts in different SES groups. The finding that this tobacco control policy was neutral with respect to health disparities is consistent with results from the United States indicating that implementing strong smoke-free legislation and increasing tobacco taxes had similar effects on adult smoking across SES and ethnic groups.¹⁴

This study had a number of strengths and limitations. The SDDU is a nationally representative survey of secondary school children in England that provides detailed information about youth smoking behaviour. The analysis took into account the underlying trend in regular smoking and adjusted for important covariates. The SDDU survey relies on self-reported measures of tobacco use. However, under-reporting of tobacco use has been found to be low in the SDDU compared with the Health Survey for England because it is conducted in the school rather than home environment.¹⁵ Validation of smoking status with cotinine measurement conducted in this survey between 1990 and 1998 found that very few students were dishonest about their smoking status in this survey.⁹ Comparing outcomes across time using cross-sectional surveys always has the possibility of introducing bias, given that there may be systematic differences in students sampled in the different survey years. However, response bias is likely to be low in this study because the pupil response rate to the survey was very high (88% in 2008) in the participating schools. Although the response rate for schools was lower (58% in 2008) the sampling frame ensured that schools participating in the survey closely reflect the composition of schools in England generally.

The survey did not include 16 and 17 year olds who were most directly affected by the increase in age for the legal purchase of tobacco. The findings are robust because the sample size was sufficient to detect a 10% relative reduction in smoking prevalence in the non-FSM group compared with the FMS group (at 80% power at the 5% level of significance). However, the sample size did not permit us to examine whether the legislation reduced the volume of cigarettes smoked. The study used eligibility for FSM, which is assessed using parental income and employment status, as a proxy indicator for SES. This measure has been previously used for this purpose in health research^{16,17} but has faced some criticism for not adequately capturing all children from unemployed or low-income households.¹⁸ This result could mean that there may have been some heterogeneity in the SES of children in the comparison group, which meant achieving significant findings was less likely.

Consistent with the WHO Framework Convention for Tobacco Control¹⁹ a number of European countries, including the UK, France, Germany and Denmark have joined

numerous other countries in raising the age for the legal purchase of tobacco to 18 years in recent years. The findings from this study suggest that the introduction of legislation in England made it more difficult for youths to purchase cigarettes from shops. Contrary to the authors' hypothesis, the study did not find that pupils from lower SES groups were more likely to buy or be given cigarettes from members of their family and social networks than pupils from more affluent groups before or after the legislation, although some changes seen between 2006 and 2008 were only statistically significant in pupils not receiving FSM.

Tobacco control policies are increasingly being used to target growing socio-economic disparities in smoking prevalence and tobacco-related harm.²⁰ The findings from this study indicate that increasing the minimum age for purchase provided similar benefits for adolescents, independent of SES status in England. The reductions in youth smoking identified by this study suggest that similar legislation is likely to be important and an effective addition to national tobacco control strategies worldwide.

Key messages

What is the key question?

- ▶ What was the impact of legislation increasing the age for the purchase of cigarettes from 16 to 18 years on disparities in youth smoking behaviour in England?

What is the bottom line?

- ▶ The introduction of this legislation was associated with reduced regular smoking among youth in England and appeared to have a similar impact in different socio-economic groups.

Why read on?

- ▶ The reductions in youth smoking identified by this study suggest that similar legislation may be an important and effective addition to national tobacco control strategies worldwide.

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REFERENCES

1. Jha P, Peto R, Zatonski W, et al. Social inequalities in male mortality, and in male mortality from smoking: indirect estimation from national death rates in England and Wales, Poland, and North America. *Lancet*. 2006; 368:367–70. [PubMed: 16876664]
2. Gilman SE, Abrams DB, Buka SL. Socioeconomic status over the life course and stages of cigarette use: initiation, regular use, and cessation. *J Epidemiol Community Health*. 2003; 57:802–8. [PubMed: 14573586]
3. Pierce JP, Fiore MC, Novotny TE, et al. Trends in cigarette smoking in the United States. Educational differences are increasing. *JAMA*. 1989; 261:56–60.
4. Fidler JA, West R. Changes in smoking prevalence in 16-17-year-old versus older adults following a rise in legal age of sale: findings from an English population study. *Addiction*. 2010; 105:1984–8. [PubMed: 20722633]

5. Fair society, healthy lives. [accessed 22 Feb 2010] The Marmot Review. <http://www.ucl.ac.uk/gheg/marmotreview/FairSocietyHealthyLives>
6. Borland T, Amos A. An exploratory study of the perceived impact of raising the age of cigarette purchase on young smokers in Scotland. *Public Health*. 2009; 123:673–9. [PubMed: 19854455]
7. NEMS Market Research. [accessed 7 Jan 2011] North of England Illicit Tobacco Survey. 2009. http://www.illicittobaconorth.org/FileUploads/NEMS_Full_Report.pdf
8. Joossens, L.; Chaloupka, F.; David, Merriman D., et al. Issues in the smuggling of tobacco products. In: Jha, P.; Chaloupka, F., editors. *Tobacco Control in Developing Countries*. World Bank; Washington, DC: 2000. <http://www1.worldbank.org/tobacco/tcdc/393TO406.pdf>
9. The Information Centre and for Health and Social Care. *Smoking, Drinking and Drug Use among Young People in England in 2008*. <http://www.ic.nhs.uk/pubs/sdd08fullreport>
10. Direct Gov. *Nutrition and school lunches*. [accessed 20 Sep 2010] http://www.direct.gov.uk/en/Parents/Schoolslearninganddevelopment/SchoolLife/DG_4016089
11. Fichtenberg CM, Glantz SA. Youth access interventions do not affect youth smoking. *Pediatrics*. 2002; 109:1088–92. [PubMed: 12042547]
12. Stead LF, Lancaster T. Interventions for preventing tobacco sales to minors. *Cochrane Database Syst Rev*. 2005; 1:CD001497. [PubMed: 15674880]
13. Richardson L, Hemsing N, Greaves L, et al. Preventing smoking in young people: a systematic review of the impact of access interventions. *Int J Environ Res Public Health*. 2009; 6:1485–514. [PubMed: 19440530]
14. Dinno A, Glantz S. Tobacco control policies are egalitarian: a vulnerabilities perspective on clean indoor air laws, cigarette prices, and tobacco use disparities. *Soc Sci Med*. 2009; 68:1439–47. [PubMed: 19282078]
15. Craig, R.; Mindell, J.; *Health Survey for England*. [accessed 22 Sep 2010] *Obesity and Other Risk Factors in Children*. The Information Centre. 2006. http://www.ic.nhs.uk/webfiles/publications/HSE06/HSE06_VOL2.pdf
16. Power C. Social and economic background and class inequalities in health among young adults. *Soc Sci Med*. 1991; 32:411–17. [PubMed: 2024156]
17. Brabin L, Roberts SA, Stretch R, et al. Uptake of first two doses of human papillomavirus vaccine by adolescent schoolgirls in Manchester: prospective cohort study. *BMJ*. 2008; 336:1056–8. [PubMed: 18436917]
18. Hobbs, G.; Vignoles, A. *Is Free School Meal Status a Valid Proxy for Socio-Economic Status (in Schools Research)?* London School of Economics. 2007. <http://cee.lse.ac.uk/cee%20dps/ceedp84.pdf>
19. WHO. *Framework Convention on Tobacco Control*. World Health Organisation; <http://www.who.int/fctc/en>
20. Giskes K, Kunst AE, Ariza C, et al. Applying an equity lens to tobacco-control policies and their uptake in six Western-European countries. *J Public Health Policy*. 2007; 28:261–80. [PubMed: 17585326]

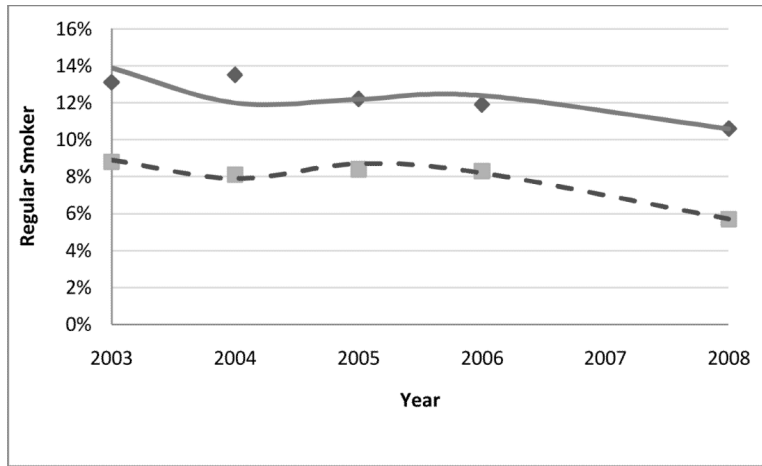


Figure 1. Prevalence of regular smoking among 11–15 year olds in England by free school meal status. Lines indicate predicted values and points indicate observed smoking prevalence. Regular smoking prevalence (free school meals (FSM)/non free school meals (NFSM)): 2003: 13.1%/8.8%; 2004: 13.5%/8.1%; 2005: 12.2%/8.4%; 2006: 11.9%/ 8.3%; 2008: 10.6%/5.7%. Number of observations: 2003:9430 (1164 FSM/8266 NFSM), 2004:8893 (1048 FSM/7845 NFSM), 2005:8229 (1208 FSM/7021 NFSM), 2006:7148 (1100 FSM/6048 NFSM), 2008:6882 (983 FSM/5899 NFSM).

Table 1

Impact of the age restriction law on regular smoking*

	Adjusted OR (95% CI)	VIF	p Value
FSM	1.87 (1.66 to 2.11)	1.23	0.0005
Law	0.67 (0.55 to 0.81)	3.00	0.0005
Law*FSM	1.29 (0.95 to 1.76)	1.38	0.102
Age	1.74 (1.67 to 1.81)	1.32	0.0005
Year	1.02 (0.98 to 1.06)	2.83	0.325
Male	0.54 (0.50 to 0.58)	1.00	0.0005
White ethnicity	1.53 (1.31 to 1.78)	1.08	0.0005
Ever alcohol use	5.81 (4.75 to 7.12)	1.45	0.0005
Ever drug use	10.99 (9.98 to 12.10)	1.15	0.0005
Constant	-12.94		0.0005

FSM, pupils eligible for free school meals; VIF, variance inflation factor.

* Smoking at least one cigarette per week.

Table 2

Usual source* of cigarettes among regular smokers by free school meal status

	FSM		Others		p Value	p Value
	2006	2008	2006	2008		
N	141	106	534	358		
Bought from						
Supermarket	26.3%	11.8%	<0.01	26.6%	15.3%	<0.01
Newsagent	64.2%	45.1%	<0.01	67.1%	46.7%	<0.01
Garage	28.5%	10.8%	<0.01	29.5%	15.9%	<0.01
Vending machine	14.6%	13.7%	0.85	17.5%	11.6%	0.02
Friends and relatives	36.5%	41.2%	0.46	29.1%	36.8%	0.02
Someone else	25.5%	35.3%	0.10	19.8%	33.7%	<0.01
Given by						
Siblings	17.5%	13.7%	0.43	14.5%	13.0%	0.55
Parents	18.2%	11.8%	0.17	7.1%	9.1%	0.90
Friends	49.6%	49.0%	0.93	49.5%	50.4%	0.85
Ease of purchase from shop						
Difficult to buy cigarettes from shop	25.2%	33.3%	0.21	21.2%	36.9%	<0.01
Bought cigarettes at shop at last attempt	82.0%	77.4%	0.48	84.8%	71.6%	<0.01

χ^2 test used to test whether percentage differences were statistically significant.

FSM, pupils eligible for free school meals.

* Students were able to select more than one usual source.