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# The impact of the point-of-sale tobacco display ban on young people in Scotland: before-and-after study

*Sally Haw, Dorothy Currie, Douglas Eadie, Jamie Pearce, Andy MacGregor, Martine Stead, Amanda Amos, Catherine Best, Michael Wilson, Mark Cherrie, Richard Purves, Gozde Ozakinci and Anne Marie MacKintosh*





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Sally Haw<sup>1\*</sup>, Dorothy Currie<sup>2</sup>, Douglas Eadie<sup>3</sup>,  
Jamie Pearce<sup>4</sup>, Andy MacGregor<sup>5</sup>, Martine Stead<sup>3</sup>,  
Amanda Amos<sup>6</sup>, Catherine Best<sup>1</sup>, Michael Wilson<sup>1</sup>,  
Mark Cherrie<sup>4</sup>, Richard Purves<sup>3</sup>, Gozde Ozakinci<sup>7</sup>  
and Anne Marie MacKintosh<sup>3</sup>

<sup>1</sup>Faculty of Health Sciences and Sport, University of Stirling, Stirling, UK

<sup>2</sup>Centre for Adolescent and Child Health Research, School of Medicine, University of St Andrews, St Andrews, UK

<sup>3</sup>Institute for Social Marketing, Faculty of Health Sciences and Sport, University of Stirling, Stirling, UK

<sup>4</sup>Institute of Geography, School of GeoSciences, University of Edinburgh, Edinburgh, UK

<sup>5</sup>ScotCen Social Research, Edinburgh, UK

<sup>6</sup>Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh, UK

<sup>7</sup>School of Medicine, Medical & Biological Sciences, University of St Andrews, St Andrews, UK

\*Corresponding author

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# Abstract

## The impact of the point-of-sale tobacco display ban on young people in Scotland: before-and-after study

Sally Haw<sup>1\*</sup>, Dorothy Currie<sup>2</sup>, Douglas Eadie<sup>3</sup>, Jamie Pearce<sup>4</sup>,  
Andy MacGregor<sup>5</sup>, Martine Stead<sup>3</sup>, Amanda Amos<sup>6</sup>,  
Catherine Best<sup>1</sup>, Michael Wilson<sup>1</sup>, Mark Cherrie<sup>4</sup>, Richard Purves<sup>3</sup>,  
Gozde Ozakinci<sup>7</sup> and Anne Marie MacKintosh<sup>3</sup>

<sup>1</sup>Faculty of Health Sciences and Sport, University of Stirling, Stirling, UK

<sup>2</sup>Centre for Adolescent and Child Health Research, School of Medicine, University of St Andrews, St Andrews, UK

<sup>3</sup>Institute for Social Marketing, Faculty of Health Sciences and Sport, University of Stirling, Stirling, UK

<sup>4</sup>Institute of Geography, School of GeoSciences, University of Edinburgh, Edinburgh, UK

<sup>5</sup>ScotCen Social Research, Edinburgh, UK

<sup>6</sup>Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh, UK

<sup>7</sup>School of Medicine, Medical & Biological Sciences, University of St Andrews, St Andrews, UK

\*Corresponding author [s.j.haw@stir.ac.uk](mailto:s.j.haw@stir.ac.uk)

**Background:** Tobacco displays at point of sale have been shown to increase young people's pro-smoking attitudes, susceptibility to smoking and smoking initiation. In Scotland, legislation that prohibited tobacco point-of-sale displays was implemented in large stores (i.e. those > 280 m<sup>2</sup>) in April 2013 and in small retailers in April 2015.

**Objective:** To assess the impact of the point-of-sale tobacco display ban on young people's exposure to tobacco advertising, their attitudes to smoking and smoking susceptibility, and their risk of smoking initiation.

**Design:** Multimodal before-and-after study design using mixed methods to collect data at baseline (2013) and then longitudinally for 4 years.

**Setting:** Four main study communities in the central belt of mainland Scotland, UK, purposively selected to reflect two levels of urbanity (urban vs. small town) and two levels of deprivation (high vs. medium/low). Four matched communities.

**Participants:** In the main study communities, 94 tobacco retail outlets. All Secondary 2 (aged 13 years) and Secondary 4 (aged 15 years) pupils in 2013 and 2014 together with all Secondary 1 to Secondary 6 (aged 12–17 years) pupils in 2015–17. This included 6612 pupils who completed 14,344 questionnaires over 5 years. Three hundred and eighty-two participants in 80 focus groups who were recruited from Secondary 2 and Secondary 4 in 2013–17. In matched communities, 24 retail panel members in 2013–17.

**Main outcome measures:** Tobacco product and tobacco storage visibility, density of retail outlets (the number of retailers in a pre-defined area such as a residential neighbourhood), tobacco product exposure, brand awareness, perceived accessibility of tobacco, pro-smoking attitudes, pro-smoking norms, smoking susceptibility and smoking initiation.

**Data platform and methods:** The study had four components – a mapping and spatial analysis of retail outlets; a tobacco marketing audit, including retail panel interviews in matched communities; school surveys; and focus group discussions with secondary school pupils.

**Limitations:** The study was based on a small number of communities and did not include communities in remote areas.

**Results:** Compliance with the point-of-sale legislation in Scotland was high. This led to a large reduction in the visibility of tobacco products in retail outlets. However, when the results were stratified by socioeconomic status, declines in retailer density, weighted by total product visibility, were restricted to the least disadvantaged tertile of participants. Nevertheless, the implementation of the legislation was associated with a reduction in risk of both smoking susceptibility and smoking initiation in young people, as well as a reduction in the perceived accessibility of tobacco and in pro-smoking attitudes after both the partial and the comprehensive bans were introduced.

**Conclusions:** The Scottish point-of-sale legislation has been successful in reducing the overall visibility of tobacco products and is associated with improvements in attitudinal and behavioural outcomes in young people. However, cues that tobacco is for sale are still highly visible, particularly in retail outlets in areas of deprivation. In addition, the increase in retailer density that was observed after 2015 increased inequalities in product visibility. There was also evidence that the emergence of e-cigarettes may have disrupted the full impact of the legislation.

**Future work:** Our research indicates that further research is needed to examine the longitudinal relationships between tobacco outlet availability and product visibility inequalities; and the impact of e-cigarettes and standardised packaging on smoking initiation and prevalence.

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# Contents

List of tables	xi
List of figures	xiii
List of boxes	xv
List of supplementary material	xvii
List of abbreviations	xix
Plain English summary	xxi
Scientific summary	xxiii
<b>Chapter 1</b> Introduction	<b>1</b>
Background and existing research	1
Study aims	2
Intervention	2
Original research questions	3
Changing retail and sociocultural landscapes	4
<i>E-cigarettes</i>	4
<i>Standardised packaging</i>	5
Report structure and final research questions	6
<b>Chapter 2</b> Study design	<b>9</b>
Setting	9
Study design	9
Data platform and measures	10
<i>Outcome measures</i>	10
Data collection	13
<i>Mapping and spatial analysis of the location and density of tobacco retail outlets</i>	13
<i>Tobacco advertising and marketing audits of tobacco retail outlets</i>	13
<i>Cross-sectional school survey of school children with embedded cohorts</i>	15
<i>Focus group interviews with purposive samples of pupils</i>	16
Data analysis	17
<i>School survey data analysis</i>	17
<i>Missing data</i>	18
Project management	18
Service users and public involvement	19
Ethics	19
<i>Mapping and spatial analysis</i>	19
<i>Marketing audit</i>	19
<i>School survey</i>	20
<i>Focus group study</i>	20

<b>Chapter 3</b> Retailers' implementation of and compliance with point-of-sale legislation	<b>21</b>
Key findings	21
Introduction	21
Characteristics of tobacco point-of-sale displays at baseline	21
<i>Methods</i>	21
<i>Results</i>	22
Compliance with the legislation	23
<i>Compliance in large supermarkets</i>	23
<i>Compliance in small shops</i>	23
Conclusions	24
<b>Chapter 4</b> Small retailers' perspectives on the implementation and impact of point-of-sale legislation	<b>27</b>
Key findings	27
Introduction	27
Methods	27
Results	28
<i>Small retailers' initial expectations about implementation</i>	28
<i>The implementation process</i>	30
<i>Impact on the retail environment</i>	31
Conclusions	34
<b>Chapter 5</b> The impacts of point-of-sale legislation on exposure to tobacco products in the retail environment	<b>37</b>
Key findings	37
Introduction	37
Point-of-sale tobacco visibility tool	38
<i>Methods</i>	38
<i>Results</i>	38
<i>Discussion</i>	40
Changes in the availability and visibility of tobacco products between 2012 and 2017	40
<i>Methods</i>	41
<i>Results</i>	42
<i>Conclusions</i>	46
<b>Chapter 6</b> Implementation of point-of-sale legislation and young people's tobacco brand awareness and perceptions of tobacco accessibility and smoking acceptability	<b>47</b>
Key findings	47
Introduction	47
Brand awareness	47
<i>Brand awareness prior to the introduction of point-of-sale legislation</i>	48
<i>Change in brand awareness after the implementation of point-of-sale legislation</i>	50
Perception of tobacco accessibility and smoking acceptability	54
<i>Methods</i>	55
<i>Results</i>	56
Perceived availability of black-market tobacco	59
<i>Method</i>	59
<i>Results</i>	59
Conclusions	60

<b>Chapter 7</b> Impacts of point-of-sale legislation on young people's perceptions of smoking prevalence, smoking susceptibility and smoking initiation	<b>61</b>
Key findings	61
Introduction	61
Perceived smoking prevalence	62
<i>Methods</i>	62
<i>Results</i>	62
<i>Discussion</i>	64
Smoking susceptibility	64
<i>Methods</i>	64
<i>Results</i>	65
<i>Discussion</i>	66
Smoking initiation	67
<i>Methods</i>	67
<i>Results</i>	67
<i>Discussion</i>	69
Paths to impact	69
<i>Introduction</i>	69
<i>Research questions</i>	69
<i>Methods</i>	71
<i>Results</i>	71
<i>Discussion</i>	71
Conclusion	73
<b>Chapter 8</b> Changing retail and sociocultural landscapes	<b>75</b>
Key findings	75
Introduction	75
Methods	75
Results	76
<i>Patterns and trends in e-cigarette use</i>	76
<i>Socioeconomic patterning of e-cigarette use and smoking</i>	76
<i>Exposure to e-cigarettes</i>	77
<i>Relationship between exposure to point-of-sale e-cigarette displays and subsequent e-cigarette use</i>	79
<i>Developing social norms around e-cigarette use</i>	80
<i>Use of e-cigarettes and subsequent smoking initiation</i>	81
<i>Relationship between use of e-cigarettes and change in psychosocial risk factors and smoking initiation</i>	82
<i>Standardised packs</i>	83
Conclusion	84
<b>Chapter 9</b> Discussion and conclusions	<b>85</b>
Summary of findings	85
<i>Point-of-sale displays and compliance with the legislation</i>	85
<i>Changing retailer density, tobacco product visibility and storage unit visibility</i>	86
Outcomes for young people	86
<i>Smoking susceptibility and smoking experimentation</i>	86
Other outcomes for young people	87
Socioeconomic patterning in tobacco availability, exposure to tobacco products and tobacco displays and smoking-related outcomes	88

## CONTENTS

E-cigarettes	89
Strengths of the study	90
Limitations of the study	91
Inference of causation	92
Implications of the research	94
<i>Policy</i>	94
Unintended consequences	95
Further research	95
<b>Acknowledgements</b>	<b>97</b>
<b>References</b>	<b>101</b>
<b>Appendix 1</b> Estimated sample sizes and smoking prevalence	<b>111</b>
<b>Appendix 2</b> School survey response rates	<b>113</b>
<b>Appendix 3</b> Tobacco retailers in Scotland	<b>115</b>
<b>Appendix 4</b> Fake-brand recognition	<b>117</b>

# List of tables

<b>TABLE 1</b> Characteristics of study communities in 2013	<b>10</b>
<b>TABLE 2</b> Timeline of the study	<b>11</b>
<b>TABLE 3</b> Repeat cross-sectional school surveys with embedded cohorts	<b>15</b>
<b>TABLE 4</b> Number of survey waves completed by pupils	<b>16</b>
<b>TABLE 5</b> Focus group samples by year	<b>17</b>
<b>TABLE 6</b> Comparison of tobacco product visibility in C4 with that in the rest of the study communities	<b>39</b>
<b>TABLE 7</b> Number of tobacco retailers in each study community	<b>44</b>
<b>TABLE 8</b> Relationship between brand awareness and shop visit frequency and noticing cigarettes in shops	<b>49</b>
<b>TABLE 9</b> Change in brand awareness after the partial POS ban, by school year (S2 and S4 pupils)	<b>52</b>
<b>TABLE 10</b> Change in brand awareness after the comprehensive POS ban, by school year (S1–S4 pupils)	<b>53</b>
<b>TABLE 11</b> Change in tobacco accessibility, pro-smoking norms and pro-smoking attitudes after implementation of the POS legislation	<b>56</b>
<b>TABLE 12</b> Change in availability of black-market tobacco (S2 and S4 pupils)	<b>59</b>
<b>TABLE 13</b> Change in mean perceived smoking prevalence (S2 and S4 pupils)	<b>63</b>
<b>TABLE 14</b> Change in perceived smoking prevalence among peers and among adults after the POS legislation	<b>63</b>
<b>TABLE 15</b> Change in risk of smoking susceptibility by year of entry to the study	<b>66</b>
<b>TABLE 16</b> Change in risk of smoking initiation by year of entry to the study	<b>68</b>
<b>TABLE 17</b> Standardised structural equation model of effects of tobacco retailer density on young people's perceptions of youth smoking prevalence	<b>72</b>
<b>TABLE 18</b> Standardised structural equation model of effects of tobacco retailer density on brand awareness	<b>72</b>
<b>TABLE 19</b> Change in young people's use of e-cigarettes over survey waves 2014–16	<b>76</b>
<b>TABLE 20</b> Young people's use of e-cigarettes in 2017	<b>77</b>

## LIST OF TABLES

<b>TABLE 21</b> Relationship between recall of seeing e-cigarettes in shops and on the internet in 2015 and use of e-cigarettes in 2017 ( <i>n</i> = 1601)	<b>79</b>
<b>TABLE 22</b> Relationship between e-cigarette use and smoking initiation	<b>82</b>
<b>TABLE 23</b> Proportion of total effect of e-cigarette experience on smoking initiation mediated by friends' smoking status and attitude to smoking	<b>82</b>
<b>TABLE 24</b> Estimated sample sizes and smoking prevalence and incidence by age and year group	<b>111</b>
<b>TABLE 25</b> Response rates by school and year	<b>113</b>
<b>TABLE 26</b> Number of tobacco retailers in Scotland, by local authority (2012–17)	<b>115</b>
<b>TABLE 27</b> Fake-brand recognition (cigarettes and rolling tobacco)	<b>118</b>
<b>TABLE 28</b> Fake-brand recognition (cigarette brands only)	<b>118</b>

# List of figures

<b>FIGURE 1</b> Logic model of activities, outputs and outcomes associated with POS legislation	12
<b>FIGURE 2</b> Change in average tobacco product visibility over time by study area	39
<b>FIGURE 3</b> Change in average tobacco storage visibility over time by study area	40
<b>FIGURE 4</b> Tobacco retailer density estimates for Scottish data zones by SIMD income deprivation quintile (2012–17)	42
<b>FIGURE 5</b> Tobacco retailer density estimates for participants' neighbourhood and activity space, for the four display communities, by visibility weighting and FAS score tertile (2013–17)	44
<b>FIGURE 6</b> Comparison of predictive margins of risk of becoming susceptible to smoking by year of entry into study and frequency of visiting small shops	66
<b>FIGURE 7</b> Comparison of predictive margins of risk of becoming an ever-smoker by year of entry to the study and frequency of visiting small shops	68
<b>FIGURE 8</b> Structural equation model for pathways from tobacco retailer density and proximal smoking	70
<b>FIGURE 9</b> E-cigarette use by FAS score tertile	77
<b>FIGURE 10</b> Smoking prevalence by FAS score tertile	78





# List of boxes

<b>BOX 1</b> Young people's views of tobacco displays prior to the comprehensive POS ban	<b>50</b>
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# List of supplementary material

## Report Supplementary Material 1 Supplementary materials

Supplementary material can be found on the NIHR Journals Library report project page ([www.journalslibrary.nihr.ac.uk/programmes/phr/10300007/#/documentation](http://www.journalslibrary.nihr.ac.uk/programmes/phr/10300007/#/documentation))

Supplementary material has been provided by the authors to support the report and any files provided at submission will have been seen by peer reviewers, but not extensively reviewed. Any supplementary material provided at a later stage in the process may not have been peer reviewed.



## List of abbreviations

CI	confidence interval	POS	point of sale
CTN	confectioners, tobacconists and newsagents	RRR	relative rate ratio
DMEC	Data Monitoring and Ethics Committee	SCN	Scottish Candidate Number
EU	European Union	ScotCen	Scottish Centre for Social Research
FAS	Family Affluence Scale	SD	standard deviation
NatCen	National Centre for Social Research	SIMD	Scottish Index of Multiple Deprivation
OR	odds ratio		



## Plain English summary

**T**obacco displays at shop checkouts have been shown to encourage young people to take up smoking. In Scotland, a law was passed that requires tobacco retailers to cover up tobacco displays. The law came into force in large supermarkets in April 2013 and in small shops in April 2015.

This study aimed to assess the effect of the legislation on young people's exposure to tobacco displays, their attitudes towards smoking and their smoking behaviour. It was conducted in four communities on mainland Scotland between 2013 and 2017. In each community, information was collected annually on the location of shops that sold tobacco and the characteristics of their tobacco displays. Annual school surveys collected information about pupils' exposure to tobacco displays; their attitudes to smoking; their susceptibility to smoking; and whether they, their friends or their family members smoked. Annual focus group discussions with pupils explored themes from the school survey in more detail.

The study found that almost all of the retailers complied with the legislation and that the visibility of tobacco products at point of sale was greatly reduced. However, the shuttered tobacco gantries remained highly visible.

After the ban on tobacco displays, the younger pupils recognised a much smaller number of tobacco brands. The pupils thought that tobacco products were less easy to buy and negative views towards smoking increased. Young people also thought that fewer young people and adults smoked, while young people's susceptibility to smoking and the risk of starting to smoke were reduced.

The point-of-sale legislation has been successful in reducing young people's exposure to tobacco, their pro-smoking attitudes and their risk of taking up smoking. However, tobacco as a generic product is still highly visible and available. Furthermore, both the availability of tobacco retailers and the visibility of tobacco products are much greater in more deprived areas.





# Scientific summary

## Background

Among young people, exposure to tobacco promotions at point of sale has been shown to increase the perceived ease of purchasing tobacco, estimated smoking prevalence, smoking susceptibility and smoking initiation. Among adults, images of tobacco packs elicit craving in smokers, while tobacco displays prompt impulse purchasing in smokers and urges to start smoking in recent ex-smokers.

Legislation that prohibits tobacco displays at point of sale has been implemented in a number of countries, including Thailand, Canada, Ireland, Norway, Australia, Finland, New Zealand, England, Wales and Northern Ireland. In Scotland, a ban on point-of-sale tobacco displays was introduced in large stores (i.e. those > 280 m<sup>2</sup>) in April 2013. The ban was extended to small retailers in April 2015.

The aims of the current study (henceforth referred to as the DISPLAY study) were to determine the impact of the Scottish point-of-sale legislation on young people's exposure to tobacco advertising, their attitudes towards smoking and their smoking behaviour; and to identify any 'unintended consequences' of the legislation.

## Methods

The study had a multimodal before-and-after design and used mixed methods to collect data in four purposively selected communities. For the purposes of the study, community was defined as the catchment areas of four secondary schools selected for study. Schools were selected to reflect two levels of urbanisation (large urban vs. other urban/small town) and two levels of deprivation (high vs. medium to low) and were located in the central belt of mainland Scotland.

The study had the following four main components.

### *Mapping and spatial analysis of the location and density of tobacco retail outlets*

Data (address and full postcode) for all tobacco retail outlets in Scotland were downloaded from the *Register of Tobacco and Nicotine Vapour Product Retailers* at baseline (January 2013) and then annually until 2017. Data on tobacco retailers located in the four study communities were then extracted. The retail outlets selected were restricted to large supermarkets and small retailers, including off-licences; confectioners, tobacconists and newsagents; small grocers (including licensed); petrol stations; and fish and chip shops. The retail outlets identified were then verified through field visits and integrated into a Geographical Information System for analysis.

### *Marketing audits of tobacco retail outlets most used by young people*

Researchers visited all retail outlets in the study communities in pairs to record brief information about the visibility and placement of tobacco products in the store; how tobacco products were displayed; how tobacco products were actively promoted for sale (both externally and internally); the branding of display units and pack sizes available; the most prominent brand, if any; the communication and visibility of pricing information; and tobacco control signage. The audits were discreet and did not require retailer co-operation. Data collection was by making a token purchase in each retail outlet to gain access to the tobacco counter. Observers also devised techniques to accurately recall and unobtrusively record information.

A panel of 24 retailers was also recruited from four communities matched with our main study areas. Researchers visited these retail outlets annually between July and August from 2013 to 2017 to collect observational data on point-of-sale advertising and marketing strategies and to conduct in-depth interviews with retail managers/owners from each outlet.

### ***Cross-sectional school surveys of pupils, with embedded pupil cohorts***

The school survey had a repeat cross-sectional design with embedded pupil cohorts. Data collection took place between February and March 2013 (baseline) in all study communities, with longitudinal follow-up for 4 years. In 2013 and 2014, all Secondary 2 (13-year-olds) and Secondary 4 (15-year-olds) pupils were surveyed. Between 2015 and 2016 the survey included all pupils in Secondary 1 to Secondary 6 (12- to 17-year-olds). Data were collected using an anonymous self-complete questionnaire administered by class teachers under exam conditions. The questionnaire included questions on sociodemographics; pupil smoking behaviours and attitudes; family and peer smoking behaviours and attitudes; access to tobacco products; brand awareness; frequency of visits to large supermarkets and small shops; and exposure to tobacco marketing and advertising. Questions on patterns of e-cigarette use were included from 2014 onwards; on exposure to e-cigarette marketing from 2015 onwards; and on awareness of standardised packs in 2017.

### ***Focus group discussions with purposive samples of pupils***

Four single-sex focus groups were conducted annually with Secondary 2 and Secondary 4 pupils in each study community. Focus group participants were recruited, with the help of teachers in the study schools, to include young people who were smokers or were thought to be most at risk of smoking. In order that the focus group discussions did not influence questionnaire responses, the focus groups were conducted 1–2 weeks after the school survey and audio-recorded with the permission of group participants. Groups lasted between 30 and 50 minutes and included discussions about the community; leisure time activities; local smoking behaviours and cultures; access to tobacco products, including direct, indirect/proxy and black-market; awareness of and views on tobacco promotion, including point of sale, packaging and branding; awareness and perceptions of the impact of the legislation; and views about preventing youth smoking. The subject of e-cigarettes arose spontaneously in three of the focus groups in 2013 and was included as a topic from 2014 onwards.

## **Results**

### ***Retailers' implementation of and compliance with point-of-sale legislation***

Before the implementation of the legislation, tobacco displays were highly visible in small shops, placed at customer eye-level, and often next to products of particular interest to children, most notably confectionery. The majority of young people in the 2013 school survey (80%) recalled seeing tobacco displays both in supermarkets and in smaller shops, with young people from the least affluent backgrounds more likely to recall seeing them.

Compliance with the legislation was high when assessed by the marketing audit 2 weeks after the implementation deadlines in both supermarkets (in early May 2013) and small shops (in April 2015). A few instances of non-compliance were observed and these were mostly minor and temporary.

Although compliance with the legislation was found to be high, tobacco as a generic product continued to maintain a strong visible presence. Storage units were still clearly visible, with most located in a prominent position behind the service counter and most continuing to carry large generic signage promoting tobacco availability.

### ***Small retailers' perspectives on the implementation and impact of point-of-sale legislation***

Retailers expressed some concerns before the point-of-sale legislation was implemented in small shops, but the majority found that implementation was straightforward. Concerns that transaction times would increase proved to be unfounded, and there was no evidence of an increase in shoplifting or trade in black-market tobacco. Retailers had mixed views regarding the potential impact on consumer behaviour and tobacco sales, with some perceiving no difference and others perceiving a drop in sales, although this was not solely attributed to the point-of-sale legislation.

It is notable that the use of retailer incentives by tobacco company representatives persisted even after tobacco gantries were covered up. Retailers continued to be rewarded for product placement, availability and sales, and there was evidence that retailers were also incentivised to promote products verbally to customers.

### ***The impacts of point-of-sale legislation on exposure to tobacco products in the retail environment***

The number of retail outlets selling tobacco in the study communities remained stable, with only a small number of openings and closures over the course of the study. High levels of compliance with the Scottish point-of-sale display ban led to a considerable reduction in exposure to tobacco products in the study communities. However, the point-of-sale legislation has had very little impact on the visibility of tobacco storage units. Furthermore, at an individual level, there was evidence of an increase in socioeconomic inequalities: the decline in retailer density, when weighted by product visibility, was restricted to young people in the highest Family Affluence Scale tertile.

At a national level, tobacco retailer density fell across all deprivation quintiles between 2013 and 2015, but less so in the most deprived neighbourhoods. This was followed by a modest increase in 2016 and 2017. By the end of the study period the overall number of retailers had reduced and was similar to the number at baseline. The increase in retailer density was largely driven by an increase in the number of tobacco retailers in the most disadvantaged neighbourhoods of one-fifth of local authorities, resulting in an increase in inequality of tobacco availability.

### ***Outcomes for young people***

Previous research has suggested that point-of-sale legislation might lead to a reduction in brand awareness, perceived accessibility of tobacco products, perceived smoking prevalence, pro-smoking attitudes, smoking susceptibility and smoking initiation in young people.

Prior to implementation of the point-of-sale display ban, young people reported that tobacco displays were very eye-catching, colourful and attractive, and the number of tobacco brands they were aware of was positively associated with both regularly visiting small shops (adjusted relative rate ratio 1.19, 95% confidence interval 1.01 to 1.40;  $p < 0.01$ ) and noticing point-of-sale displays in large supermarkets (adjusted relative rate ratio 1.15, 95% confidence interval 1.01 to 1.30;  $p < 0.01$ ) and small shops (adjusted relative rate ratio 1.24, 95% confidence interval 1.03 to 1.51;  $p < 0.01$ ). Brand awareness fell both after the partial ban (Secondary 2 pupils only) and after the comprehensive ban (Secondary 1 pupils only), but only among younger pupils.

Crude trends in the perceived accessibility of tobacco products and pro-smoking attitudes increased over time. However, after controlling for sociodemographics and a range of smoking-related covariates, implementation of both the partial and the comprehensive point-of-sale display bans was associated with a reduction in the perceived accessibility of tobacco (partial ban: adjusted odds ratio 0.80, 95% confidence interval 0.64 to 0.99,  $p < 0.01$ ; comprehensive ban: adjusted odds ratio 0.72, 95% confidence interval 0.57 to 0.90,  $p < 0.001$ ) and a reduction in pro-smoking attitudes after the comprehensive ban (adjusted odds ratio 0.67, 95% confidence interval 0.49 to 0.91;  $p < 0.001$ ). However, it should be noted that significant reductions occurred only after e-cigarette use was included as a covariate.

Young people in the study overestimated smoking prevalence among young people by a factor of six and among adults by a factor of 2.5. Mean estimates of youth smoking prevalence fell by 3.4 percentage points (95% confidence interval -4.82 to -2.06;  $p < 0.001$ ) after the partial ban and by 2.9 percentage points (95% confidence interval -4.34 to -1.47;  $p < 0.001$ ) after the comprehensive ban (compared with baseline). Mean estimates of adult smoking prevalence also fell significantly but only after implementation of the comprehensive ban (1.7%, 95% confidence interval -3.0 to 0.40;  $p < 0.01$ ). Again, when models were adjusted for e-cigarette use, the reduction in estimated smoking decreased.

A key objective of the point-of-sale display legislation was to reduce smoking susceptibility and the risk of smoking initiation in young people. Risk of smoking susceptibility in young people was significantly lower after the implementation of both the partial ban (adjusted hazard ratio 0.57, 95% confidence interval 0.46 to 0.72;  $p < 0.001$ ) and the comprehensive ban (adjusted hazard ratio 0.44, 95% confidence interval 0.32 to 0.61;  $p < 0.001$ ) (compared with baseline). Risk of smoking initiation also fell after the partial ban (hazard ratio 0.60, 95% confidence interval 0.46 to 0.79;  $p < 0.001$ ) and continued to fall after the comprehensive ban (adjusted hazard ratio 0.27, 95% confidence interval 0.17 to 0.42;  $p < 0.001$ ). Including e-cigarettes as a covariate had only a marginal effect on the risk of smoking susceptibility and smoking initiation. We found no evidence of differential impact of the legislation on Family Affluence Scale tertiles.

This study has found significant positive relationships between the implementation of point-of-sale legislation in Scotland and a range of smoking-related outcomes in young people. Using path analysis, the underlying mechanisms for two of these outcomes – perceived smoking prevalence and brand awareness – were explored. It was found that, prior to the implementation of any tobacco display ban, tobacco retail density had a direct effect on perceived smoking prevalence, but this disappeared after implementation of a partial point-of-sale ban. The analysis also demonstrated that, after the implementation of the partial point-of-sale ban in large supermarkets, tobacco retailer density had an indirect effect on brand awareness through family smoking but not after implementation of the comprehensive ban. This suggests that the point-of-sale ban has disrupted the links between tobacco retailer density and brand awareness and between tobacco retailer density and perceived youth smoking prevalence.

### **E-cigarettes**

E-cigarettes emerged as an important contextual issue during the study. The proportion of pupils (Secondary 1 to Secondary 6) who had tried e-cigarettes rose from 19.4% in 2015 to 33.7% in 2017. Thus, by 2017, a greater proportion of young people had tried an e-cigarette than had tried smoking cigarettes (21.1%).

Young people reported that e-cigarettes were prominent and ubiquitous in the retail environment, and recall of seeing e-cigarettes for sale in small shops (adjusted odds ratio 1.49, 95% confidence interval 1.07 to 1.80;  $p < 0.01$ ) and on the internet (adjusted odds ratio 1.35, 95% confidence interval 1.01 to 1.80;  $p < 0.01$ ) was positively associated with young people trying e-cigarettes. In young 'never-smokers', the use of e-cigarettes was positively associated with smoking initiation both 1 year and 2 years later. The transition from e-cigarette use in 2015 to smoking initiation in 2017 was mediated by an increase in the number of smokers in friendship groups and in pro-smoking attitudes.

The rapid growth in e-cigarette use during the study is notable, and our findings suggest that the use of e-cigarettes may have disrupted the impact of the point-of-sale legislation on a number of the smoking-related outcomes. The evidence is strongest with respect to the impact of the point-of-sale legislation on perceived accessibility and acceptability of smoking. Further research is required to explore this in greater detail.

## Conclusions

The Scottish legislation that bans point-of-sale tobacco displays has been successful in reducing exposure to tobacco products at both a community and an individual level. This has been accompanied by significant reductions in brand awareness (in younger pupils only), perceived accessibility of tobacco products, perceived smoking prevalence, pro-smoking attitudes, smoking susceptibility and smoking initiation in young people from the study communities.

However, even after tobacco storage units have been covered up, the storage units themselves continue to be prominent in retail outlets. Thus, the point-of-sale display ban has not fully eliminated tobacco as a generic product from the retail environment in Scotland. Cues that tobacco is for sale are still highly visible in many shops. The continuing existence of these cues in the retail environment was observed, particularly in areas of deprivation, where inequalities in storage visibility have widened since the point-of-sale ban was implemented. Furthermore, the availability and density of tobacco retailers has remained high across Scotland, with greater availability in more disadvantaged neighbourhoods. The regulation of the number of tobacco retail outlets, the size, design and position of storage units, and the use of generic signage to indicate tobacco availability are all likely to contribute to reducing these inequalities. The recent emergence of e-cigarettes may also have disrupted the impact of point-of-sale legislation.

This study suggests that further research is needed to examine the longitudinal relationships between tobacco outlet availability and product visibility and inequalities; the impact of generic tobacco cues in the retail environment on smoking behaviour; the development of social norms about the use of e-cigarettes among school leavers; and the impact of e-cigarettes and standardised packaging on smoking initiation and prevalence.

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# Chapter 1 Introduction

## Background and existing research

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Exposure to tobacco advertising and promotions increases smoking prevalence by encouraging smoking initiation in young people,<sup>2</sup> maintaining smoking in adult smokers<sup>3</sup> and precipitating relapse in those trying to quit smoking.<sup>4</sup> Article 13 of the World Health Organization's Framework Convention for Tobacco Control called for a comprehensive ban on all tobacco advertising and promotions in all media.<sup>5</sup> However, the implementation of legislation to regulate tobacco advertising at a global level is still limited, with only about 15% of the world's population protected by legislation that bans tobacco advertising and sponsorship.<sup>6</sup> In Europe, the European Union (EU) Tobacco Products Directive 2004 required all member states to implement a ban on tobacco advertising and sponsorship by 2005.<sup>7</sup> A 2008 report from the European Commission on the implementation of the EU Tobacco Advertising Directive concluded that laws to transpose the Directive were in place and had been well implemented, with many Member States having wider advertising and sponsorship bans than those required by the Directive.<sup>8</sup> Within the EU, traditional tobacco brand advertising and direct sponsorship of a cross-border nature has ceased; however, in response to the advertising ban, tobacco marketing and promotion at point of sale (POS) has intensified and POS displays have become critical to the promotion of tobacco products. POS displays not only alert customers to the brands that are available, but, combined with a strengthening of pack design, allow tobacco companies to communicate the values associated with their particular brands.<sup>9</sup> Tobacco products are also displayed alongside ordinary consumer goods, including products targeted at children, such as snacks, soft drinks, toys and collectables.<sup>10</sup> It has been argued that this creates the impression that tobacco is more socially acceptable and commonly used than is the case.<sup>11</sup> Data from the USA suggest that POS tobacco promotion may increase sales by between 12% and 28%.<sup>12</sup>

An important development in POS advertising has been the tobacco power wall. Tobacco power walls are typically located close to or directly behind the POS and contain many brands of tobacco that are often organised to make attractive patterns of cigarettes<sup>13</sup> and deliberately designed to communicate brand values, thus potentially blurring the line between display and promotion.<sup>11</sup> In the UK they became a common sight in supermarkets, and typically dominated smaller retail outlets, such as convenience stores, which are frequented regularly by young people. Exposure to such displays is thought to normalise tobacco use<sup>14</sup> and increase positive brand imagery.<sup>15</sup> Another way in which tobacco companies have succeeded in increasing POS exposure of their brands is by developing new variants of existing brands. Since 1998, brand families have grown in size by > 50%, with popular brands such as Benson & Hedges (Philip Morris International Inc., Neuchâtel, Switzerland) increasing brand variants from four in 1998 to 23 by 2012. The increase in brand variants was intended to maximise their visual impact on shop shelves.<sup>16</sup>

There have been two reviews of studies exploring the impact of POS tobacco displays; the first was conducted in 2009<sup>17</sup> and the second was conducted in 2015.<sup>18</sup> Both found that among young people there were associations between exposure to tobacco promotions at POS and beliefs about the ease of purchasing tobacco, perceived smoking prevalence among peers, smoking susceptibility and smoking

initiation. Among adults, images of tobacco packs elicited craving in smokers, while tobacco displays prompted impulse purchasing in smokers and urges to relapse to smoking in recent ex-smokers. The later review, conducted by Robertson *et al.*,<sup>18</sup> concluded that the more recent studies demonstrated the strongest associations. Paynter and Edwards<sup>18</sup> argue in their review that the most common outcome was smoking status, which limited the conclusions that could be drawn about the direction of the association. It is plausible that young people who have just started smoking visit stores more often, thereby increasing their exposure to and awareness of POS displays. By contrast, the later review examined smoking susceptibility in never-smokers, thus eliminating the confounding effect of tobacco purchasing behaviour. Furthermore, the later review included five studies that examined the dose–response relationship, four of which found a positive dose–response effect, strengthening the view that the relationship was causal.

Iceland was the first country to introduce a ban on POS tobacco displays, in 2001. Since then, Thailand (2005), Canada (2005–10), Ireland (2009), Norway (2010), Australia (2010–12), Finland (2012), New Zealand (2012), England, Wales and Northern Ireland (2012–15), Scotland (2013–15), Croatia (2014) and Russia (2015) have followed suit. A small number of studies have examined the impact of POS display bans.<sup>19–22</sup> All have reported high levels of compliance. In addition, following the implementation of bans in Australia and Canada, the exposure of smokers to tobacco advertising from POS displays declined steeply from 74% to 6% in Canada and from 74% to 43% in Australia.<sup>19</sup> In Ireland, the implementation of a comprehensive ban was accompanied by a decline in the recall of POS displays from 49% to 22% in adults, and a decline from 81% to 22% in young people. There was also a reduction in perceived youth smoking prevalence among young people, and an increase in beliefs that the law made it easier for adults to quit smoking and for children not to initiate smoking.<sup>20</sup> In Norway, 20% of smokers/snus users thought that the ban made it more difficult to buy tobacco products, while 32% said that it had made it more difficult to choose a brand. There was no difference by age group in reported difficulty of purchase, but younger respondents were more likely than older respondents to indicate that it was more difficult to choose a brand.<sup>21</sup> In New Zealand, smoking initiation decreased from 23% in 2011 at baseline to 17% in 2014, 2 years after the ban was implemented. Current smoking prevalence also declined from 9% to 7%, while initiation in the last year decreased from 13% to 11% over the same time period. Between 2012 and 2013, the attempted purchase of cigarettes in the past 30 days by smokers also decreased, from 30% in 2012 to 26% in 2013.<sup>22</sup>

## Study aims

The aims of the DISPLAY study were to:

- determine the impact of Scottish legislation to ban POS tobacco advertising on young people's exposure to tobacco advertising, their attitudes towards smoking and their smoking behaviour
- identify any 'unintended consequences' associated with the implementation of the legislation.

## Intervention

The Tobacco and Primary Medical Services (Scotland) Act 2010 includes provisions that prohibit advertising tobacco products at POS (Sections 1 to 3).<sup>23</sup> The legislation also prohibits the display of tobacco products or tobacco-related products in places where those products are for sale and requires retailers to conceal cigarettes from general view, either by covering up gantries/dispensers or by storing cigarettes under the counter. Under the legislation, displays of tobacco products (section 1) or tobacco-related products (section 2) and prices (section 3) are also considered to be advertisements. The overall policy objective of the legislation was to reduce the attractiveness of tobacco products to children and adolescents (i.e. under the age of 18 years), which in turn could contribute to a reduction in smoking initiation and, in the longer term, a reduction in smoking prevalence.



The importance that the tobacco industry places on POS advertising as a mechanism for promoting and maintaining smoking behaviour among adults and children was exemplified by the vigour with which it fought the Scottish legislation. A petition by Imperial Brands plc (Bristol, UK), which sought a ruling that sections of the Tobacco and Primary Medical Services (Scotland) Act 2010 were outside the legislative competence of the Scottish Parliament, was dismissed both at the original hearing and at appeal. Sinclair Collis Limited (Four Ashes, Wolverhampton) also challenged measures in the Act (Section 6) to ban vending machines but, again, this was dismissed. The attempts to disrupt and delay the legislative process were considerable, and Scottish civil servants viewed these as much greater than those in response to the Scottish smoke-free legislation (John Glen, Scottish Government, 2012, personal communication).

The Scottish legislation was implemented on 26 April 2013 in large retail outlets (mainly supermarkets, and referred to as 'large supermarkets' from here on) that have > 280 m<sup>2</sup> of internal floor area used for displaying goods and serving customers; it was extended to the remaining smaller tobacco retail outlets on 6 April 2015. Similar legislation, the Health Act 2009,<sup>24</sup> prohibiting the display of tobacco products was implemented in England, Wales and Northern Ireland in larger stores in April 2012 and in all other retail outlets in April 2015.

The Scottish government has provided guidance on the implementation of the Tobacco and Primary Medical Services (Scotland) Act 2010.<sup>23</sup> The main points are as follows:

- All tobacco products and smoking-related products covered by the ban must be placed out of sight of customers.
- Retailers may choose their own means of covering or remove products. When covers are removed temporarily for customer service or for restocking, the area of open display should not exceed 1000 cm<sup>2</sup>.
- Any temporary uncovering of products for customer service or for restocking should last only as long as is necessary for the activity to be completed.
- Smoking-related products and accessories covered by the ban include products designed specifically for smoking tobacco. These include cigarette papers, cigarette holders, tobacco pipes and apparatus for making cigarettes.
- Smoking accessories that can be used for other purposes, such as matches and lighters, are not covered by the ban. These can continue to be displayed and kept in public view. They should not be stocked in the same storage unit as products covered by the ban.
- There should be no tobacco branding on price lists or labels. Only three forms of price information are permitted: poster-style lists up to A3 size; a picture price list available on request only; and price labels on shelving, storage units and tobacco jars.
- All price information should be in a specified standard font. Unbranded generic signs, such as 'tobacco sold here', are allowed in any format.

## Original research questions

Our original research questions were:

1. Does implementation of the POS regulations of the Tobacco and Primary Medical Services (Scotland) Act 2010 in (1) supermarkets alone (partial ban) and (2) all tobacco retailers (complete ban) result in changes in exposure to tobacco advertising among young people aged 12–17 years (see *Chapters 3–5*)?
2. Is a reduction in exposure to POS advertising associated with changes in brand awareness, the perceived accessibility of tobacco, the perceived prevalence of youth smoking, susceptibility to smoking, and the incidence and prevalence of smoking among young people aged 12–17 years (see *Chapters 6 and 7*)?

3. Is there any evidence of socioeconomic patterning in any of the attitudinal or behavioural outcomes in young people (see *Chapters 6 and 7*)?
4. What is the association between area-level deprivation and (1) levels of POS tobacco advertising and availability of cigarettes pre and post legislation or (2) enforcement of the legislation once implemented (see *Chapter 5*)?
5. Is there any evidence of a dose-response relationship between changes in exposure to POS advertising and interim and longer-term outcome measures in young people (see *Chapters 6 and 7*)?
6. Are there any unintended adverse consequences associated with the legislation, for example an increase in cigarette purchases from black-market sources (see *Chapter 6*)?
7. Is there any evidence of changes in POS advertising and marketing strategies in the lead-up to or after the implementation of measures of the Tobacco and Primary Medical Services (Scotland) Act 2010 in either supermarkets or small retailers (see *Chapter 4*)?

## Changing retail and sociocultural landscapes

Two important developments occurred during the study that affected both the tobacco retail environment specifically and the wider sociocultural landscape. First, there was a rapid increase both in the visibility of e-cigarettes in the retail environment and in the use of these products among both adult smokers and young people. Second, legislation was passed that required all tobacco products to be sold in standardised packaging. This meant that retailers had to implement another major change in relation to their tobacco products shortly after implementing the POS display ban. This further reduced customers' exposure to branded tobacco products. Thus, at the same time that tobacco products were becoming less visible thanks to the POS display ban and standardised packaging legislation, other nicotine delivery devices were becoming more available and their use was becoming more prevalent. This had implications for the study's hypothesised causal pathways, as described in the logic model presented in *Chapter 2*.

### E-cigarettes

E-cigarettes, also known as nicotine vapour products, are battery-operated devices that produce a nicotine vapour that is inhaled. The vapour contains far fewer toxins than cigarette smoke and those that are present are far less concentrated. Evidence about the impact of the long-term use of e-cigarettes on health is not yet available; in the UK, vaping is generally regarded as much less harmful than smoking tobacco<sup>25</sup> in the short term but could be potentially damaging to health after long-term use.<sup>26</sup> In the UK, e-cigarettes are now more popular as a quit aid than as nicotine replacement therapy and it is estimated that there are about 2.9 million adult users, the vast majority of whom are smokers or ex-smokers.<sup>25</sup> Evidence is still limited and is subject to varying interpretations, but some argue that e-cigarettes show promise both as a quit aid and as a harm-reduction aid<sup>27</sup> and, with their considerable reach into the smoking population, should be made widely available and be heavily promoted to reduce morbidity and mortality among smokers who cannot quit smoking.<sup>28</sup>

Although e-cigarettes may benefit smokers, they are unlikely to be beneficial for young people. In Scotland, e-cigarette use among young people is mainly experimental or a 'once- or twice-off' event<sup>29</sup> and is most common among young people who already smoke. Nevertheless, the number of never-smokers experimenting with e-cigarettes is increasing and, by 2015, 8% of 13-year-old and 14% of 15-year-old never-smokers in Scotland had tried an e-cigarette.<sup>29</sup> Direct comparisons with data collected from elsewhere in the UK are difficult to make because of the different age groups surveyed; UK-level surveys conducted in 2016 found that only 4–5% of 11- to 16-year-old never-smokers had tried e-cigarettes, whereas in Wales in 2015, 10% of 11- to 16-year-old never-smokers had.<sup>30</sup> However, vaping is a relatively new phenomenon and it is not possible to predict with confidence how patterns of use will develop. The market is also rapidly evolving, with new products, such as JUUL (Juul Labs, Inc., San Francisco, CA, USA), entering the marketplace, and there is some concern that vaping could become a lifestyle choice for young never-smokers.<sup>31</sup>

There is also concern that e-cigarettes could act as a catalyst for cigarette-smoking in young never-smokers.<sup>32</sup> The majority of published data on this are cross-sectional, which does not allow causation to be inferred. However, a growing number of longitudinal studies have found a positive association between e-cigarette use and smoking initiation in young never-smokers at 6- or 12-month follow-up.<sup>33-40</sup> Common liability, where there are common risk factors for both smoking and e-cigarette use, is a plausible explanation of these findings.<sup>41</sup> However, some of the US studies did control for smoking susceptibility.<sup>33,34</sup> Most of the longitudinal studies were conducted in the USA, where policies on tobacco and e-cigarette marketing restrictions are much less stringent than in the UK. However, three studies from the UK have now reported similar findings.<sup>42-44</sup>

In 2016, a revised EU Tobacco Products Directive<sup>45</sup> came into force that included measures to regulate the sale, promotion and marketing of e-cigarettes. Cross-national marketing of e-cigarettes and refill containers on television and radio, in newspapers and in most magazines is prohibited. These controls came into force in the UK in May 2016, with non-compliant products and refill containers allowed to be sold until May 2017.<sup>46</sup> The new e-cigarette regulations are much less stringent than the regulations for tobacco, and individual jurisdictions may decide whether or not to introduce further restrictions on the domestic marketing of e-cigarettes, for example at POS or on billboards. In Scotland, the government is considering whether or not further restrictions are required to 'reduce the visibility and attraction of e-cigarettes to children and young people under 18 and adult non-smokers' (© Crown copyright. Contains public sector information licensed under the Open Government Licence v3.0).<sup>47</sup> Unlike in England, external advertising (e.g. billboards and bus shelters) may not be permitted in Scotland in the future.

### **Standardised packaging**

In the face of ever-stricter controls over tobacco advertising, cigarette packs have become a powerful marketing tool. Pack shape and colour increase attractiveness and aid brand differentiation. Recent innovation in pack design, including novel closing mechanisms, textures or coatings to create tactile effects and olfactory and auditory cues, can also reduce risk perceptions and increase brand appeal, purchase interest, sales and market share.<sup>48,49</sup> In December 2012 Australia was the first country to introduce standardised cigarette packs (standard size and colour, no branding and only the brand name in a standard small font) with large graphic health warnings.<sup>50</sup> Early research suggests that, since these packs were introduced, there has been a shift in the attitudes and beliefs of adult smokers, who reported disliking their packs more and that packs had less appeal. The enhanced graphic health warnings also increased motivation to quit.<sup>51</sup> This was accompanied by a decline in expenditure on cigarette products between 2012 and 2015<sup>52</sup> and a decline in adult smoking prevalence from 16.1% to 14.7% in a similar period.<sup>53</sup> In 12- to 17-year-olds, smoking prevalence also fell, from 7% in both 2008 and 2011 to 5% in 2014 following the introduction of standardised tobacco packs.<sup>54</sup> Survey data suggest that young people find cigarette packs less appealing,<sup>55</sup> but, to date, there has been no evidence of increased cognitive processing of the larger graphic health warnings.<sup>56</sup>

Following an extensive public consultation, underpinned by a major evidence review,<sup>57</sup> standardised cigarette packs were introduced in Scotland and the rest of the UK in May 2016. The new regulations<sup>58,59</sup> are compliant with, and go beyond, the requirements of the revised EU Tobacco Products Directive.<sup>45</sup> As in Australia, the pack shape, colour, opening mechanism and font are regulated, together with the size and the position of health warnings and the number of cigarettes in a pack. Misleading descriptors such as 'lite' are also prohibited. After May 2016 UK retailers were able to continue to sell branded products to use up old stock, but from May 2017 only the sale of cigarettes and tobacco in standardised packs was allowed.

## Report structure and final research questions

The research questions outlined in our original protocol<sup>1</sup> were necessarily broad and, as the project developed, these were refined. The structure of the report is as follows.

Following a discussion in *Chapter 2* of the study design and research methods used, we present the main outcomes of the study in *Chapters 3–8*.

In *Chapter 3* we focus on retailers' implementation of and compliance with the POS legislation by answering the following questions:

- What were the characteristics of tobacco POS displays at baseline, prior to implementation of the POS legislation?
- What was the level of compliance with the legislation in large supermarkets and small shops?

In *Chapter 4* we explore small retailers' perspectives on the implementation and impact of the POS legislation by answering the following questions:

- What were small retailers' expectations about the implementation and impact of the POS legislation?
- What were small retailers' experiences of implementing the POS legislation?
- What were small retailers' perceptions of the impact of the POS legislation on customers and the retail environment?

In *Chapter 5* we report the findings on the impact of POS legislation on environmental exposure to POS displays. In addition to describing the development of a new visibility measure, we address the following questions:

- In our four DISPLAY communities, were there changes in exposure to tobacco products either at a community level or for young people in our sample following the implementation of POS legislation?
- Has there been a change in the national availability of tobacco products in Scotland between 2012 and 2017?
- To what extent do changes in the national availability of tobacco products vary between local authorities and by area-level indicators of socioeconomic deprivation and urban/rural status?
- What are the implications of these changes, at both a national and a local level, for social inequalities?

In *Chapter 6* we examine the impact of the POS legislation on young people's brand awareness, perceived accessibility of tobacco and pro-smoking attitudes. The questions addressed are:

- What was the relationship between POS displays of cigarettes and brand awareness prior to the introduction of the POS legislation in 2013?
- How did brand awareness change after the introduction of the partial and comprehensive POS bans?
- What were the trends in perceived tobacco accessibility, pro-smoking attitudes and pro-smoking norms between 2013 and 2017?
- To what extent did perceived tobacco accessibility, pro-smoking attitudes and pro-smoking norms change after the introduction of the partial and comprehensive POS bans?
- Did shop visit frequency influence the impact of the legislation on change in perceived tobacco accessibility?
- Were there any changes in the perceived availability of black-market tobacco associated with the POS legislation pro-smoking attitudes and pro-smoking norms?

In *Chapter 7* we focus on the smoking-related outcomes – perceived smoking prevalence, smoking susceptibility and smoking initiation – and assess their relationship with the implementation of the POS legislation. The questions we answer are:

- Was the introduction of the partial and comprehensive POS display bans associated with a reduction in perceived youth and adult smoking prevalence?
- Did shop visit frequency have an influence on these associations?
- Was the introduction of comprehensive POS legislation associated with a reduction in smoking susceptibility in young people?
- Did shop visit frequency influence the association between introduction of comprehensive POS legislation and smoking susceptibility?
- Was the introduction of the comprehensive POS legislation associated with a reduction in the risk of smoking initiation in young people?
- Did shop visit frequency influence the association between POS legislation and risk of smoking initiation?

In the last of our outcome chapters, *Chapter 8*, we consider the impact of the increase in marketing and use of e-cigarettes and the introduction of standardised packaging, and answer the following questions:

- What are the patterns and trends in e-cigarette use among young people aged 12–17 years?
- What are the influences on developing social norms among adolescents around e-cigarettes and their use?
- Is there a relationship between exposure to e-cigarette promotions and e-cigarette use among young people aged 12–17 years?
- Is there a relationship between e-cigarette use and future smoking initiation in never-smokers aged 12–17 years?
- What is the level of awareness of standardised packs in young people aged 12–17 years?
- What are young people's reactions to the new standardised packs and pictorial health warnings?

Finally, in *Chapter 9* we bring together and integrate the findings from across the study components and discuss them in the context of what is already known about the impact of legislation that bans tobacco displays at POS. We then go on to consider the strengths and weaknesses of the study and to consider the implications for future tobacco control policy and research.



## Chapter 2 Study design

Parts of this chapter have been adapted from the protocol for the study by Haw *et al.*<sup>1</sup> © 2014 Haw *et al.*; licensee BioMed Central Ltd. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

### Setting

The study was conducted in four communities on mainland Scotland, UK.

### Study design

We regarded the Scottish POS legislation as a complex intervention as it was intended to act on a variety of targets at both the community and the individual level and to have multiple outcomes in the retail environment both among young people and in the community.<sup>60</sup> The legislation was rolled out simultaneously across all areas of Scotland on the same day; hence an experimental design, such as a randomised controlled trial, to evaluate the legislation was not possible. Instead, we conducted a longitudinal study in four purposively selected communities using a multimodal before-and-after design and mixed methods to collect data.<sup>61</sup> Mixed methods were chosen to collect data as this allowed us to collect a range of quantitative and qualitative data and thus answer a much broader range of questions than would otherwise have been possible. This was necessary to make a comprehensive assessment of the effects of the POS legislation in the retail environment and on young people. The collection of qualitative data from both young people and tobacco retailers was intended to provide important contextual information with which to interpret some of the findings on outcomes.

For the purposes of the study, 'community' was defined as the catchment areas of the secondary schools selected for study. Schools were purposively selected according to set criteria. Candidate schools were initially identified from those in the central belt of Scotland that had a school enrolment of > 1000 (about 46% of Scottish secondary schools fell into this category at the start of the study), were non-denominational and had an ethnic minority population of < 10%. An upper limit was placed on schools' ethnic minority population because in Scotland ethnic minority pupils represent only 4% of the total Scottish secondary school population.<sup>62</sup>

Schools were then classified by level of social deprivation using the Scottish Index of Multiple Deprivation (SIMD).<sup>63</sup> The estimate was based on the mean (population-weighted) of the deprivation scores for the data zones (a small-area statistical geography) that fell within the school catchment areas. The schools were also classified by level of urbanisation using the Scottish Government Urban/Rural Classification, which combines measures of population and accessibility<sup>64</sup> to give six categories of urbanisation: large urban, other urban, accessible small town, remote small town, accessible rural areas and remote rural areas. In total, 61 schools met the size (pupil roll of > 1000) and ethnicity (< 10% non-white) criteria. Eight were then shortlisted that best met the deprivation (high vs. medium to low) and urbanisation (large urban vs. other urban/small town) criteria, as well as giving a reasonable spread within the central belt of Scotland. The team selected four first-choice schools and four second-choice schools. The final school sample consisted of three first-choice schools and one second-choice school. The fourth first-choice school declined to participate in the study because of pressure of work. *Table 1* gives the characteristics of the catchment areas served by the study schools.

TABLE 1 Characteristics of study communities in 2013

Community characteristic	Study communities (urban/rural classification)			
	C1 (large urban)	C2 (large urban)	C3 <sup>a</sup> (small town)	C4 (small town)
Socioeconomic deprivation	High	Medium/low	High	Medium/low
Population 10–19 years old in 2013	4817	3427	2307	2226
Geographic area (km <sup>2</sup> )	10.0	21.17	19.06	910.57

a The classification of school C3 changed from 'small accessible town' (defined as settlements of 3000–10,000 people within 30 minutes' drive time of a settlement of  $\geq 10,000$  people) to 'other urban' (defined as settlements of  $> 10,000$ –125,000 people) during the course of the study.

There were four main components to the study:

- mapping and spatial analysis of the location and density of tobacco retail outlets
- marketing audits of tobacco retail outlets most used by young people, comprising observational audits in the study communities, and interviews with a panel of retailers in four matched communities
- cross-sectional school surveys of pupils, with embedded pupil cohorts
- focus group discussions with purposive samples of pupils.

## Data platform and measures

In each study community, data for all components were collected annually for 5 years between 2013 and 2017. With the exception of the marketing audits (see *Tobacco advertising and marketing audits of tobacco retail outlets*), data collection took place between February and March of each year. Data collected in 2013 prior to the implementation of a partial POS display legislation in large supermarkets on 29 April that year formed the first baseline, with follow-up data collected between February and April in 2014 and 2015.

Data collected in 2015 also provided a second baseline against which to assess the impact of the implementation of the POS legislation in smaller retailers on 6 April 2015. Two further years of follow-up data were collected in 2016 and 2017. *Table 2* shows the timeline of the study and when data collection took place.

## Outcome measures

A logic model was developed to provide a framework for the evaluation (*Figure 1*). It proposed pathways that linked together the implementation of the POS legislation with a set of short-term, intermediate and longer-term outcomes, which were to be assessed by the four study components. Rather than defining primary and secondary outcomes, we set out a time frame within which we believed the outcomes would occur. We classified outcomes as short term if they were likely to occur within 3 months of implementation of the legislation, as intermediate if they were likely to occur up to 1 year post implementation and as longer term if they were likely to occur more than 1 year post implementation. Short-term outcomes of interest were prevalence of POS advertising in tobacco retail outlets (assessed by components 1 and 2) and exposure to POS advertising (assessed by components 1, 2 and 3). Intermediate outcomes of most interest were awareness of POS advertising, tobacco brand awareness, perceived accessibility of cigarettes, perceived youth smoking prevalence, pro-smoking norms and pro-tobacco attitudes. Long-term outcomes of most interest were smoking susceptibility, smoking initiation and prevalence of smoking.



TABLE 2 Timeline of the study

	Year and quarter																							
	2013				2014				2015				2016				2017							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
	Partial POS display ban in place								Comprehensive POS display ban in place															
Mapping and spatial analysis	W1 BP				W2: FP				W3: FP/BC				W4: FC				W5: FC							
Marketing audit																								
Observational panel	W1: BP	W1a <sup>a</sup>			W2: FP				W3: FP/BC				W3a: <sup>b</sup> FC				W4: FC				W5: FC			
Retailer panel <sup>c</sup>	W1				W2				W3				W4				W5							
School survey	W1: BP				W2: FP				W3: FP/BC				W4: FC				W5: FC							
Focus groups	W1: BP				W2: FP				W3: FP/BC				W4: FC				W5: FC							
BC, baseline comprehensive ban; BP, baseline partial ban; FC, follow-up comprehensive ban; FP, follow-up partial ban; W, wave. a Follow-up partial ban audits were conducted in supermarkets only. b Follow-up comprehensive ban audits were conducted in small shops only. c Conducted in matched communities only.																								

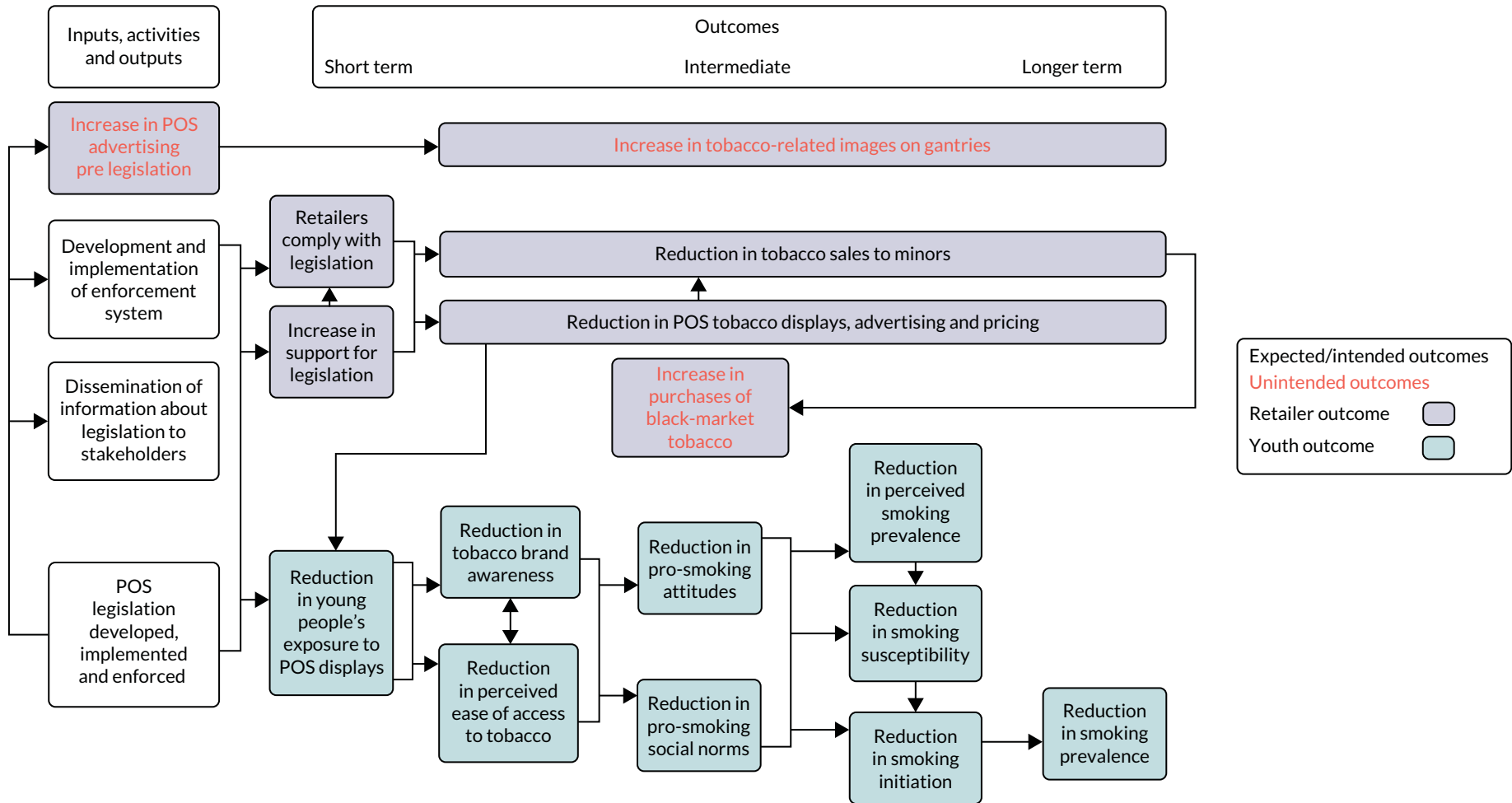


FIGURE 1 Logic model of activities, outputs and outcomes associated with POS legislation.

Data obtained from the retailer panel interviews (component 2) and focus group discussions with young people (component 4) provided contextual qualitative data facilitating the interpretation of findings about outcomes. In addition to the outcomes outlined above, the study design enabled us to identify, to a limited extent, any unintended or adverse consequences associated with the legislation. We hypothesised that if the ban on tobacco displays reduced perceived accessibility, then smokers (including young smokers) might turn to other sources of tobacco, including the black market. Retailers or the tobacco industry might also increase tobacco promotions before the new regulations were implemented or might develop strategies to circumvent them. Indeed, this was observed in Ireland, where, following implementation of POS legislation, images of tobacco-related paraphernalia such as cigarette lighters regularly appear on the blank covers of the cigarette gantries.<sup>20</sup>

## Data collection

### *Mapping and spatial analysis of the location and density of tobacco retail outlets*

For each year of the study, geographical data on the tobacco retailers were collected, geocoded and integrated into a Geographical Information System. Data (including address and full postcode) for all tobacco retailers in the study communities were extracted from the *Register of Tobacco and Nicotine Vapour Product Retailers*<sup>65</sup> and mapped at baseline (January 2013) and then annually to 2017. These data were then verified through field visits during which every street in the four communities was inspected. The community-level data enabled the monitoring of the number and rate (per population) of tobacco outlets in each wave. In addition, it provided a verified list of outlets to be visited and observed as part of the observational audit of all retailers in each community (see *Tobacco advertising and marketing audits of tobacco retail outlets*). This in turn ensured the accuracy of the number and rate per head of population of outlets selling tobacco in each community during the study period.

Baseline tobacco outlet data were geocoded using Code-Point® [Ordnance Survey Limited, Southampton, UK; [www.ordnancesurvey.co.uk/business-government/products/code-point](http://www.ordnancesurvey.co.uk/business-government/products/code-point) (accessed 16 December 2019)] to provide geographical co-ordinates and then integrated into the Geographical Information System. These data were combined with data from the marketing audits (see *Tobacco advertising and marketing audits of tobacco retail outlets*) and analysed to provide an assessment of changes in tobacco retailing and advertising over the study period. In the analysis, the focus was restricted to large supermarkets and small retailers most likely to sell cigarettes to young people, including off-licences; confectioners, tobacconists and newsagents (CTN); small grocers (including licensed); petrol stations; and fish and chip shops. In the final stage, the outlet data were integrated with the audit data to provide information on exposure to tobacco retailing (combining availability with visibility of tobacco products).

National-level data were also extracted from the *Register of Tobacco and Nicotine Vapour Product Retailers*<sup>65</sup> and used to assess changes in the availability of tobacco products across Scotland. This information provided broader insights into how the availability changed during the study period in response to new tobacco control policies, sector-wide interventions and/or the economic climate. The national availability of tobacco products was compared across local authorities and across neighbourhoods, stratified by a measure of area-level deprivation and by urban/rural status.

Full details of all methods are provided in *Chapter 5*.

### *Tobacco advertising and marketing audits of tobacco retail outlets*

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As with the mapping and spatial analysis component, the tobacco marketing audit focused on large supermarkets and small shops, including off-licences, CTN, small grocers (including licensed), petrol stations, and fish and chip shops.

There were two parts to this study component.

### **Observational audit**

The observational audit included all tobacco retail outlets in the study communities that fell into one of the six categories identified above. Baseline data (February to March 2013) were collected by experienced researchers using an audit tool informed by previous studies of tobacco exposure.<sup>14,66,67</sup>

The researchers visited all outlets in pairs to record brief information about tobacco product availability and display. This included data on the visibility and placement of tobacco products in the store; whether or not and how tobacco products were displayed; whether or not and how tobacco products were actively promoted for sale (both externally and internally); branding of display units and pack sizes available; the most prominent brand, if any; the communication and visibility of pricing information; and tobacco control signage.

The audits were discreet and did not require retailer co-operation, and data collection was facilitated by a token purchase made in each retail outlet to gain access to the tobacco counter. Observers also devised memory aides and techniques to accurately recall and unobtrusively record marketing and advertising information. Mobile phones were used to record key numeric data, and audit protocols were completed away from the retail sites immediately following each observation, with observers comparing notes to verify key characteristics. Where inconsistencies or gaps emerged, these were addressed by an immediate follow-up visit to the study outlet. For most items, observers simply noted the presence or absence of particular features.

The observational audit was repeated immediately after the implementation of the POS legislation in large supermarkets in April 2013 and in small shops in April 2015. As well as assessing exposure, this audit assessed degree of compliance with both the current and the new POS legislation, along with any evidence of strategies used to circumvent the legislation. The observational audit was repeated annually until 2017.

The data collected were used to develop a metric for POS exposure, with measures developed to assess location, size, proximity and visibility of displays from key reference points such as till points and entrance areas. Where appropriate, measures were developed with the aid of visual prompts, for example to indicate the relative visibility of the display. We anticipated that POS exposure would be affected by a number of factors, including increased industry activity, particularly in the lead-up to full implementation in 2015, and retailer non-compliance (e.g. delays in removing gantries or gantries being reused for other non-tobacco products) or poor implementation (e.g. leaving sales shutters open after a sale is made).

### **Retailer panel interviews**

A panel of 24 retailers (representing the main retail types) was recruited from four communities matched to our four main study areas. The communities selected were those that were in our original shortlist of eight communities (see *Study design*) but were not selected for the main study. They were adjacent to their matched main study areas, but geographically discrete, and had a similar population profile. We chose not to recruit the retailer panel from the main study communities in order to minimise the likelihood that the identities of the study areas would be made public and thereby compromise the integrity of the study. Large supermarkets were excluded from the panel sample for the same reason.

The retail panel sample was purposively selected to represent the range of small stores (CTN, convenience stores, petrol stations and off-licences) found in the main study areas using a combination of making contact using details provided in the *Register of Tobacco and Nicotine Vapour Product Retailers*<sup>65</sup> and cold-calling at the retail premises.

The decision was taken not to recruit the managers of large supermarkets to the retailer panel, as contacting their head offices would risk disclosing the study areas, which again might potentially compromise the integrity of the study. Managers were, however, included in the discreet audit, which indicated that supermarkets made up only 10% of the tobacco retail outlets in the study communities and therefore represented a relatively small subgroup of tobacco retailers.

As in the observational audit, but later in the year (between July and August), the retail panel outlets were visited annually to collect observational data on POS advertising and marketing strategies. An adapted version of the audit tool was used, as described above. In addition to the in-store observations, in-depth interviews were conducted with retail managers/owners of each outlet. These were audio-recorded and again were repeated annually to explore views and experiences before, during and after the implementation of the POS ban and to assess changes from the retailers' perspective. This included exploring their experiences of preparing to and eventually implementing the ban, and identifying any problems that arose and how retailers dealt with these. Additionally, the data enabled us to understand how the sales process changed and to examine how customers dealt with a new procedure for asking for cigarettes. Data governance required that the identity of all retail sites audited, and of all retailer panel members interviewed, remain confidential.

### Cross-sectional school survey of school children with embedded cohorts

#### Survey design

The school survey had a repeat cross-sectional design with embedded cohorts, with data collection at baseline and longitudinal follow-up for 4 years in each community. Details of the sample size calculation are given in *Appendix 1*. We hypothesised that the implementation of a partial ban on POS advertising (larger retailers only) would have only a small impact on young people's outcomes. Therefore, the school surveys conducted in February and March 2013 and 2014 included only young people in Secondary 2 (i.e. 13-year-olds) and Secondary 4 (i.e. 15-year-olds). To assess the impact of the implementation of POS legislation on smaller retailers in 2015, a second baseline survey was conducted with all pupils (Secondary 1 to Secondary 6) (i.e. aged 12–17 years) from study schools in February and March 2015, with repeat surveys conducted for 2 years post implementation in smaller retail outlets. From here on, school years will be referred to as S1, S2, and so on.

The smaller samples in 2013 and 2014 helped to minimise both the resource requirements of the study and disruption to the schools participating in the surveys, while at the same time allowing the follow-up of different cohorts across the school years. *Table 3* gives details of the embedded cohorts and the phases of the legislation.

TABLE 3 Repeat cross-sectional school surveys with embedded cohorts

Survey year	S1	S2	S3	S4	S5	S6	Phase of legislation
2013							Baseline pre implementation in large supermarkets
2014							Post implementation in large supermarkets (partial POS ban)
2015							Post implementation in large supermarkets (partial POS ban)
							Pre implementation in small shops
2016							Post implementation in small shops (comprehensive POS ban)
2017							Post implementation in small shops (comprehensive POS ban)

Squares of the same colour indicate embedded cohorts of pupils over time.

### Pupil questionnaire

Data were collected using an anonymous self-complete questionnaire administered by class teachers under exam conditions. The questionnaire included questions on sociodemographics; pupils' smoking behaviours and attitudes towards tobacco use, as well as families' and peers' smoking behaviours and attitudes; access to tobacco products; brand awareness; frequency of visits to large supermarkets and smaller retailers; and exposure to tobacco marketing and advertising. In response to the changing retail and sociocultural landscape, questions on patterns of e-cigarette use were included from 2014 onwards, questions on exposure to e-cigarette marketing were included from 2015 onwards and questions on awareness of standardised packs were included in 2017.

Validation exercises were conducted during questionnaire development and throughout the study period. Focus groups and cognitive interviews were conducted to validate new questions. A total of five pilot studies were conducted to finalise the questionnaire: three before the baseline in 2013, one in 2014 and one in 2016. The pilots were designed to assess the appropriateness of question items and time to complete the questionnaire. The number of questions varied from 59 to 66 across the survey waves and the average time taken to complete the questionnaire was 20–35 minutes.

An additional School Level Questionnaire intended for the head teacher or deputy head teacher was used to gather information on the characteristics, resources and health-promoting aspects of all the participating schools. However, it proved not possible to control how the data were compiled, and the consistency and quality of information provided varied considerably across years. We therefore decided not to use any of these data in our analyses; however, the details are presented in *Report Supplementary Material 1*.

Details of the pupil survey administration and images of standardised packs used in the school survey are given in *Report Supplementary Material 1*.

### Response rates

Response rates to the survey were high across all survey years and ranged from 86% to 87%. Full details of response rates by school are given in *Appendix 2*. A total of 6612 pupils completed the surveys over the 5 years, and 14,344 completed questionnaires were collected. A total of 4513 pupils (68.3%) completed questionnaires on more than one occasion (*Table 4*).

### Focus group interviews with purposive samples of pupils

Sixteen focus groups were conducted every year with S2 and S4 pupils in each study community. All were single-sex groups of between 3 and 9 participants, and they lasted between 30 and 50 minutes. Focus group participants were recruited with the help of teachers in the study schools so that they included young people who were smokers or had regular contact with smoking, such as having friends who smoke or living in a home with smoker(s). The aim was to include young people who were most at risk of becoming adult smokers. These recruitment methods have been used successfully in a recent study by one of the research team (AA) on young people's sources of cigarettes.<sup>68</sup> The focus groups were repeated annually until 2017 and provided more detailed and nuanced contextual information and insights into young people's experiences and perceptions.

TABLE 4 Number of survey waves completed by pupils

Surveys completed (N = 6612)	n (%)
1	2099 (31.7)
2	1944 (29.4)
3	1919 (29.0)
4	650 (9.8)

In order that the pupils' discussions did not influence their questionnaire responses, the focus groups were conducted 1–2 weeks after the school survey and were audio-recorded with the permission of group participants. The topic guide included general discussion about the community; leisure time activities; local smoking behaviours and cultures; access to tobacco products including direct, indirect/proxy and black-market; awareness of and views on tobacco promotion, including POS, other direct marketing methods, packaging, branding; awareness and perceptions of the impact of the legislation; and views about preventing youth smoking.

Table 5 shows the number of focus groups achieved and the number of participants involved.

## Data analysis

A range of quantitative and qualitative analytical strategies were used. Details of the approaches taken in the development of the visibility tool are given in *Chapter 5, Point-of-sale tobacco visibility tool* and details of the mapping study are given in *Chapter 5, Changes in the availability and visibility of tobacco products between 2012 and 2017, Methods*. A range of approaches was used in the schools survey data and an overview is given below.

### School survey data analysis

As previously described, the school survey sample was mixed longitudinal and cross-sectional in design (see *Cross-sectional school survey of school children with embedded cohorts, Survey design*). That is, some young people took part in the survey only once, whereas others were followed up annually for 3 or 4 years consecutively. The DISPLAY study examined a range of outcomes. The analysis approach by outcome type is described below.

### Incident outcomes

Outcomes that could be described as one-off irreversible events were analysed as time-to-event data in a survival analysis. This category includes outcomes such as a 'never-smoking' young person becoming susceptible to smoking or a never-smoker progressing to trying smoking. Although it would be possible to change in the opposite direction (from being susceptible to non-susceptible), we followed the idea of a staged progression towards becoming a regular smoker. Becoming susceptible and having tried smoking are acknowledged risk factors for future progression to regular smoking and, as such, represent distinct thresholds. In a sample that is mostly longitudinal (i.e. the majority of young people take part in multiple surveys), there would be no point in repeatedly asking the same young people whether or not they have ever tried smoking. This is because we would be able to detect change only in those who had never smoked at baseline. Therefore, the analysis would reduce to a discrete time survival analysis in baseline never-smokers. Thus, we conducted a survival analysis and compared the hazard for the event of interest before the POS ban with the hazard after.

### Prevalence outcomes

These outcomes described the proportion of the sample meeting some criteria in a given survey wave, for example the proportions of pupils who thought that they could easily buy tobacco, that smoking was acceptable and that their friends thought that smoking was acceptable. These were not theorised

TABLE 5 Focus group samples by year

Sample size	Year				
	2013	2014	2015	2016	2017
Number of focus groups	16	16	16	16	16
Number of participants	86	72	63	79	82

as unidirectional changes because new legislation could theoretically make young people believe that cigarettes would be harder to obtain or that smoking was less acceptable. The main question related to these outcomes concerned whether or not the POS display ban had changed the proportion of young people who held these views. Therefore, we used a repeated cross-sectional approach but focused on only two school year groups, S2 and S4, as these years had data for 2013 and 2014. Using only two school years minimised the repeated-measures element in the data; however, it did not completely eliminate it. To account for the remaining non-independence among the measurements, we used generalised estimating equations for the analysis. Generalised estimating equations produce marginal or population-averaged estimates appropriately adjusted for correlated outcomes. Population-averaged estimates are appropriate for the research question, which focused on how the prevalence of these attitudes in young people was influenced by the POS ban.

### Continuous outcomes

Outcomes such as estimated smoking prevalence were analysed as continuous measures. Estimated smoking prevalence, that is, asking young people what percentage of people they think smoke, measures social norms as it reflects how common young people believe smoking to be. We would expect that this could increase or decrease in response to policy. Therefore, we included the full longitudinal and cross-sectional sample. We were interested in how the ban affected individual young people's estimates of smoking prevalence; therefore, we used a multilevel model with a random intercept for individuals. This model produces subject-specific parameter estimates.

### Missing data

In common with most longitudinal samples, subject attrition differentially affected male young people, young people from lower socioeconomic groups and young people with more smokers in their social circle. The data were tested for missing completely at random by conducting multiple logistic regressions on the 'missingness' of each variable using all of the other variables in the model. The proportion of significant results suggested that the hypothesis of missing completely at random should be rejected. 'Missingness' in the recording of smoking status was associated with the observed variables 'age' and 'low family affluence' and therefore likely to be missing at random. As there was information in the observed data that predicted 'missingness', the data were assumed to be missing at random.<sup>69</sup>

Multiple imputation by chained equations was used where there was concern about numbers of missing data (e.g. for e-cigarette longitudinal analyses and the smoking prevalence models) so that the effect of missing data on the parameter estimates could be assessed. All dependent and independent variables in the estimation models were included in the imputation model with the following auxiliary variables: mother in employment, father in employment, entitlement to free school meals and whether or not lives with both parents. One hundred imputed data sets were produced with a burn-in of 10. Trace plots were inspected to confirm the stationarity of each chain by the end of the specified burn-in period. This results in valid statistical inferences that properly reflect the uncertainty due to missing data.<sup>70</sup> Few differences were found between the imputed and the complete-case analysis results.

Analyses were conducted in IBM SPSS Statistics versions 21 and 23 (IBM Corporation, Armonk, NY, USA) or in Stata® version 15 (StataCorp LP, College Station, TX, USA).

### Project management

The University of Stirling was the sponsor for the study, with the University of St Andrews, the University of Edinburgh and the Scottish Centre for Social Research (ScotCen) acting as subcontractors. A Steering Committee was set up at the start of the project with representatives from the Scottish Government, NHS Health Scotland and ASH Scotland and experts in tobacco control and youth behaviours. The Steering Committee met at the start of the project and then annually to review the progress of the study. A list of Steering Group members is given in *Report Supplementary Material 1*.



In addition, we appointed a Data Monitoring and Ethics Committee (DMEC). Ordinarily, the appointment of a DMEC is limited to clinical trials; however, there was concern that the DISPLAY study might be subject to freedom of information inquiries from the tobacco industry or from organisations linked to the tobacco industry, and so advice on procedures that should be put in place was sought. The DMEC met on three occasions during the study. A list of DMEC members is given in *Report Supplementary Material 1*.

## Service users and public involvement

With the exception of the schools involved in the study, there was no service user or public involvement either in the development of the study protocol or during data collection between 2013 and 2017. Such involvement is usually highly desirable, if not essential, in most studies. However, as noted previously, there was considerable concern that if the identity of the study communities became widely known, this might compromise the integrity of the study. This was particularly the case with the marketing audit, as normal retailer behaviour might have been disrupted had the study or the researchers' presence become known.

During the study, the research team responsible for the school survey kept in close contact with participating schools to ensure the smooth running of the surveys. In addition, annual meetings were held with head teachers and/or school representatives a few months before each wave of data collection to discuss planned procedures and iron out any problems. Following the completion of the study, the study schools are being consulted about what dissemination activity they would prefer. This is likely to take the form of bespoke data sets for schools to use with their pupils and a dissemination event to be held at each school.

To ensure co-ordination of all components of the study, a Research Co-ordination Group was set up. This was chaired by the lead applicant (SH), with at least one representative from each of the study component's research teams attending each meeting. The Research Co-ordination Group met three or four times per year to ensure complete integration of the study components and to provide a vehicle for the detailed monitoring of the study's progress, the development of a co-ordinated analytical strategy and the sharing of interim findings. Another function of the group was to make decisions about the feedback of interim findings to the Scottish Government.

Finally, a biweekly teleconference was held with the school survey, mapping study and audit teams, and study analysts from the third year of study onwards to co-ordinate data entry and data linkage and the analytical strategy for the quantitative data.

## Ethics

Ethics approval was sought for each of the study components from the institutions leading on the individual study components, as follows.

### *Mapping and spatial analysis*

Ethics approval for the mapping study was confirmed by the School of GeoSciences Ethics Committee, University of Edinburgh. No ethical issues were identified.

### *Marketing audit*

The protocol for the marketing audit and retailer panel interviews was approved by the University of Stirling School of Management Research Ethics Committee. In relation to the discreet audit, we argued that conducting observational research without consent was in the public interest (the legislation was passed to protect the health of young people) and that disclosing the observational research would

have risked jeopardising the whole study. The ethics application made it clear that all observations would be restricted to spaces readily accessible to members of the general public, that no retailer or premises could be identified, that no retailer or customer behaviour would be recorded and that researchers would use memory aids to enable them to record information after leaving the premises (i.e. no photographic records would be made). The approach taken in this study is consistent with accepted norms within the retail sector, where it is standard practice to collect information in store from rival chains. Similar precedents have also been set with regard to research studies involving test purchasing of age-restricted goods, where pre-notification would have confounding effects. As previously indicated, the study was not designed to assess brand-level or pricing effects and photographic data were not collected.

In line with ethics requirements, all sites and participants were assigned non-identifiable codes to maintain their anonymity. Identifiable data (e.g. participant names and premises names and addresses) were held in a separate database and were linked to electronic data files using these non-identifiable codes. Technical reports, presentations and publications ensured that no participants or retail premises could be identified. Appropriate measures were in place to ensure the safety of fieldworkers. These procedures have been developed and tested as part of other studies undertaken by the research team.

### *School survey*

The survey research protocol was approved by the University of St Andrews School of Medicine Ethics Committee. In addition, research approval was obtained from all local authorities (for both first- and second-choice schools). The research team also made contact with all of relevant health boards to obtain 'unofficial' support and backing for the study. For each validation and pilot study, ethics approval was gained from the St Andrews School of Medicine Ethics Committee.

In all survey waves, parental opt-out consent was gained before survey completion. This is the standard consent procedure used in the majority of national school surveys and is believed to result in less biased samples in terms of pupil demographic characteristics and health behaviours.<sup>71</sup> Parents were given 2 weeks to decide whether or not to provide consent. Pupils were also given the opportunity to withdraw from the survey on the day of the survey.

Data were collected using the anonymous self-completed pupil questionnaire, which was administered by class teachers under exam conditions. Each pupil was given an envelope in which to place and seal the completed questionnaire. Therefore, teachers did not have access to the data provided by the pupils. In Scotland, all school pupils have a unique Scottish Candidate Number (SCN). This was linked to the questionnaire serial number. The SCN was used to link questionnaires completed in different years using a deterministic linkage process. The SCN and questionnaire serial numbers were stored on a secure server, separate from the questionnaire data. Data sets were shared with the research team without identifiers (date of birth and postcode); date of birth was converted to age, and postcode was converted to the SIMD quintile.

### *Focus group study*

Ethics approval for the focus group interviews was obtained from the National Centre for Social Research (NatCen) Research Ethics Committee. This committee reviews research projects conducted by NatCen and ScotCen that are not subject to the committee's approval, has a membership comprising senior NatCen staff, external research experts and external professional experts and is consistent with the requirements of the Economic and Social Research Council and Government Social Research Professional Guidance. Opt-out consent was sought from participants before they took part in the focus groups using the same approach as with the school surveys. At the start of each focus group, participants were assured that their anonymity would be maintained, and ground-rules were established about disclosure.

# Chapter 3 Retailers' implementation of and compliance with point-of-sale legislation

## Key findings

- Before the legislation was implemented, tobacco displays were highly visible in small shops, placed at customer eye level and next to products of particular interest to children, most notably confectionery.
- The majority of young people in the 2013 school survey (80%) recalled seeing tobacco products displayed for sale both in supermarkets and in smaller shops, with young people from the least affluent backgrounds more likely to recall seeing them.
- Compliance with the legislation was high when this was assessed 2 weeks after the implementation deadlines in both supermarkets (in April 2013) and small shops (in April 2015). However, two small shops that had a limited range of tobacco products were observed to display them on open shelves. Some other instances of non-compliance were observed, which were mostly minor and temporary.
- Although compliance with the legislation was found to be high, tobacco as a generic product continued to maintain a strong visible presence. Storage units were still clearly visible, with most located in a prominent position behind the service counter and continuing to carry large generic signage promoting tobacco availability. These features may continue to convey the message that tobacco is an important and normal retail product.

## Introduction

To assess the impact of the implementation of POS legislation in tobacco retail outlets, it is important to understand how retailers implemented the legislation and their degree of compliance with the regulations. In this chapter, we use data from the observational audit and retailer panel interviews (see *Chapter 2, Tobacco advertising and marketing audits of tobacco retail outlets*) and from the school survey (see *Chapter 2, Cross-sectional school survey of school children with embedded cohorts*) to answer the following questions:

- What were the characteristics of tobacco POS displays at baseline, prior to the implementation of the POS legislation?
- What was the degree of compliance with the legislation in large supermarkets and small shops?

## Characteristics of tobacco point-of-sale displays at baseline

The following findings on the characteristics of tobacco POS displays at baseline have been published in full in Stead *et al.*<sup>10</sup> © 2016 The Authors. Published by Elsevier Ltd on behalf of The Royal Society for Public Health. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>). Adapted with permission from The Royal Society for Public Health.

## Methods

In examining POS tobacco display characteristics we focused on seven key features: internal and external visibility of storage units and products (i.e., whether they could be seen both inside the shop and from the street outside); any internal and external tobacco advertising (e.g., on the window or door);

the style of storage unit; any brand advertising on the storage unit itself; the visibility of on-pack health warnings when packs were stocked in the unit; storage unit size; and proximity of tobacco products to products with potential appeal to children. For most items, observers simply noted their presence or absence, while overall visibility inside the outlet was rated on a scale of 1–5 and visibility from outside the shop was rated as 'not very visible', 'fairly visible' or 'very visible'. Retail outlets were linked to the SIMD<sup>63</sup> by their postcode and grouped by SIMD quintile for the purpose of analysis by area deprivation. Data analysis was conducted in IBM SPSS Statistics version 21.

The methods for the school survey are described in *Chapter 2, Cross-sectional school survey of school children with embedded cohorts*. The findings in this paper focus on young people's recall of tobacco POS displays and their frequency of visiting small shops and supermarkets. The data presented are from February 2013, wave 1 (see *Table 2*), before the legislation was implemented in large supermarkets.

## Results

### Characteristics of tobacco displays in retail outlets

In total, 96 outlets were mapped and observed across the study areas: grocery/convenience stores ( $n = 58$ ), CTN ( $n = 16$ ), large supermarkets (> 280 m<sup>2</sup> of retail space) ( $n = 9$ ), petrol station forecourt shops ( $n = 10$ ) and fast-food/takeaway outlets ( $n = 3$ ).

The internal main tobacco display was visible from the main entrance of most (69%) outlets. Displays were nearly always positioned behind the main service counter, at customer eye-level and within arm's reach of the server. Tobacco displays were rated to be most prominent in supermarkets (mean 4.3) and petrol station forecourt stores (mean 3.5), and less prominent in grocery/convenience stores (mean 3.0) and CTN (mean 2.6). External visibility of tobacco products or descriptors was noted in only a small minority of outlets.

Nearly all of the displays were purpose-designed storage units with the cigarette packs displayed upright, facing forwards and with branding clearly visible. However, over one-third of storage units were designed in such a way that pack health warnings were wholly or partially obscured by the front shelf strip. Half of the storage units featured brand advertising, typically on shelf-edge strips. The majority of units also featured generic tobacco messages such as the words 'cigarettes' or 'rolling tobacco' on the top panel. Storage units ranged in size from 0.0 m<sup>2</sup> (where tobacco products were stored out of customer sight) to 6.9 m<sup>2</sup>, with an average of 2.0 m<sup>2</sup>. Price information was provided on shelf strips on 90% of the units, and on price-marked packs on 64% of the units. In the majority of outlets, tobacco products were displayed in proximity to products with potential appeal to children and young people. There was higher proximity of tobacco products to confectionery in CTN (81%) and grocery/convenience stores (72%) than in other outlets.

### Young people's frequency of visiting different retail outlets and recall of tobacco displays

In the school survey, young people were asked 'How often, if ever, do you visit?' the following shop types: newsagents/corner shops; garage shops/petrol stations; grocery shop or mini-marts; large supermarkets; fish and chip shops; takeaway shops; and mobile ice cream/burger vans. Response options were on a seven-point scale (every day; most days; about two or three times per week; about once per week; less than once per week; never; and don't know). They were also asked whether they could remember seeing cigarette and tobacco packs in large supermarkets or small shops in the past 30 days. The response options were 'yes', 'no' and 'don't know'. In 2013, young people visited large supermarkets and small shops (including CTN and grocery/convenience stores) more often than they visited other types of outlet. Overall, boys visited all retail outlets more often than girls, particularly CTN and fast-food/takeaway outlets. Eighty per cent of young people recalled noticing tobacco products for sale in both supermarkets and small shops, and there was higher recall among young people living in areas of greater socioeconomic deprivation ( $p < 0.007$ ). Those aged  $\geq 15$  years were

more likely to recall displays in small shops than were those aged < 15 years ( $p < 0.004$ ). In the stores young people visited more often (large supermarkets, CTN, grocery/convenience stores), tobacco displays were less likely to be visible from outside the store ( $p < 0.001$ ), and pack health warnings were more likely to be visible ( $p < 0.001$ ). There were few significant differences in tobacco display characteristics by level of deprivation, but, as area deprivation increased, the likelihood that cigarette pack warnings were obscured by the design of the display unit decreased ( $p < 0.001$ ). When the analysis by area-level socioeconomic deprivation included only CTN and groceries (two of the three categories of outlet more frequently visited by young people), tobacco display units were on average significantly larger in areas of more deprivation than in areas of less deprivation ( $p = 0.03$ ).

## Compliance with the legislation

Compliance with the legislation was assessed in two observational audit waves: wave 1a (see *Table 2*) was conducted in April 2013, 1–2 weeks after the implementation deadline for large shops, and wave 3a was conducted in April 2015, 1–2 weeks after the implementation deadline for small shops.

### Compliance in large supermarkets

Nine large supermarkets (i.e. > 280 m<sup>2</sup>) were in the sample at wave 1a; these represented five supermarket chains. An additional supermarket opened at a later wave but was not in operation at wave 1a. All nine large supermarkets audited were 100% compliant for all measures relating to displaying tobacco products and price information. Three out of the nine stores also had petrol station shops that were classed as small shops (i.e. ≤ 280 m<sup>2</sup>) and these, therefore, were not assessed for compliance at wave 1a.

### Compliance in small shops

Findings on small retailers' compliance with the legislation have been published in full in an article in *PLOS ONE* by Eadie *et al.*<sup>72</sup> © 2016 Eadie *et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## Methods

The findings in this section are from wave 3a of the observational audit, which was conducted in April 2015, 7–14 days after the display ban came into force in small shops. Only outlets classified as small shops ( $n = 83$ ) in the sample were audited. We recorded whether or not the retail outlet had modified its tobacco storage unit to comply with the ban, and we assessed compliance against four measures of potential non-compliance: (1) any permanent displays of products covered by the ban (e.g. cigarettes, loose tobacco, cigarette papers, cigarette filters); (2) the effectiveness of storage unit maintenance and design at covering products; (3) any exposure to display of banned products as a result of poor server practices; and (4) any exposure to display of banned products as a result of poor storage practices.

## Results

### Physical changes

Nearly all outlets (96.4%) had made some form of physical change to the way tobacco products were stored to comply with the ban, with around four-fifths (80.7%) placing tobacco products in new, professionally adapted storage units, most of which were in a prominent position at eye level directly behind the till point. Seven shops (8.4%) had made 'do-it-yourself' adaptations to the storage unit, while the remaining six shops (7.4%) had removed their tobacco stock completely away from public view, typically placing their tobacco products in pull-out drawers under the service counter.

Nearly three-quarters of shops (71.1%) used horizontal hinged flaps of the type used in large supermarkets in the UK; 8.4% used vertically suspended blinds, which enabled retailers to access products from between the individual slats; and 9.6% used a combination of these.

### ***Areas of non-compliance***

Two outlets (a café/grocery store and a fish and chip shop) continued to display tobacco products on generic shelf units. Both stocked relatively small ranges (three or four cigarette brands). Thirteen outlets had other smoking-related products, typically cigarette papers and filters, on open shelves, often below eye level. Seven outlets had vertical slats that were only partially effective at concealing products. In five outlets, products were visible because storage unit flaps were poorly fitting or in a poor state of repair. Three outlets used flaps that appeared to reveal an area greater than was permitted under the ban (no more than 1000 cm<sup>2</sup> at any one time). The display legislation requires that smoking-related products and accessories covered by the ban, such as pipes and paraphernalia for making cigarettes, are not stored in the same covered space as other products used for other purposes. Seventeen outlets were found to breach this part of the legislation, in most cases by storing matches and lighters alongside cigarette papers and cigarette filters. In seven other cases, retailers were observed storing cartons containing tobacco products on an open storage unit or on a shelf underneath the main storage unit. Eight minor contraventions were observed regarding server/assistant practices, such as opening more than one flap at a time, or storage unit flaps and blinds being left open at the time of visit.

### ***Price information and tobacco signage***

Compliance with the legislation governing the communication of price information was high, with few contraventions recorded; one tobacco price list appeared to exceed the restrictions on font size and page length, and another outlet had handwritten product labels on storage flaps that clearly exceeded the permitted font size.

## **Conclusions**

Before the implementation of the legislation, tobacco displays were highly visible not only inside the store, but also, in over half the stores, from the public footway outside. In the study stores, nearly all of the tobacco displays were behind till points at customer eye level, and in proximity to a range of products of particular interest to children, most notably confectionery. This proximity ensures that cigarette products have the potential to be noticed by children from a young age. The majority of young people in the school survey (80%) recalled seeing tobacco products displayed for sale both in supermarkets and in smaller shops, and it is of concern that young people from the least affluent backgrounds were more likely to recall seeing them. When CTN and grocery/convenience stores (two of the three types of outlets most often visited by young people) were examined separately, those located in more deprived areas (based on outlet postcode SIMD quintile) were found to have significantly larger average display units than CTN and grocery/convenience stores in areas of less deprivation. In countries without display bans, these remain a key vector in most countries for advertising tobacco products, and it is important to develop robust measures of exposure.

Compliance was high in the period immediately after the implementation date in small shops. Compliance studies in other countries that have implemented complete bans or restrictions on the visibility of tobacco products and advertising at POS have found similarly high levels of compliance. Historically, where partial restrictions have been introduced, compliance has been lower, suggesting that complete bans are likely to be both more effective and easier to implement. The high compliance found in this study demonstrates that it is possible to implement comprehensive bans across a wide range of retail outlets. Whereas nearly all outlets attempted to comply with the ban, two outlets with a limited range of tobacco products continued to display these on open shelves. Most other cases of

non-compliance were relatively minor and temporary and probably due to lack of awareness. These findings underline the need for advice, monitoring and, where necessary, enforcement.

Although compliance with the legislation was found to be high, thus reducing exposure to tobacco brands, tobacco as a generic product continues to maintain a strong visible presence in small shops, with most retailers opting to retain their existing tobacco unit rather than moving tobacco products to other parts of the store completely away from public view. These new and adapted storage units are still clearly visible, with most located in a prominent position behind the service counter and most continuing to carry generic signage promoting tobacco availability. These features continue to convey the message that tobacco is an important and normal retail product.





# Chapter 4 Small retailers' perspectives on the implementation and impact of point-of-sale legislation

## Key findings

- Despite small retailers' initial concerns about implementation, the process was straightforward for the majority. Concerns that transaction times would increase proved unfounded, and there was no evidence of increases in shoplifting or illicit trade.
- Retailers had mixed views about the potential impact of the legislation on consumer behaviour and tobacco sales, with some perceiving no difference and others perceiving a drop in sales, although this was not attributed solely to the legislation.
- Towards the end of the study, standardised packaging and the revised EU Tobacco Products Directive were implemented (between 2016 and 2017), which further affected the tobacco retail environment.
- Use of retailer incentives by tobacco companies persisted after gantries were covered up, with retailers continuing to be rewarded for product placement, availability and sales, and there was evidence that retailers were also incentivised to promote products verbally to customers.

## Introduction

There has been little research into retailer expectations about the process of implementation of POS legislation, retailer views on the potential impact of POS legislation or whether or not their expectations were met. This information will be of great value to jurisdictions planning to implement similar legislation. In this chapter we address the following questions, using data from the retailer panel interviews:

- What were small retailers' expectations about the implementation and impact of the POS legislation?
- What were small retailers' experiences of implementing the POS legislation?
- What were small retailers' perceptions of the impact of the POS legislation on customers and the retail environment?

## Methods

The methods for the retailer panel are described in *Chapter 2, Tobacco advertising and marketing audits of tobacco retail outlets*. In this chapter we focus on data from a number of waves. To explore retailers' expectations, we focus on waves 1–3. Waves 1 and 2 were conducted in 2013 and 2014, prior to the implementation deadline for small shops (April 2015), and wave 3 was conducted shortly after that deadline. To explore retailers' experiences of implementation, we used data from qualitative interviews from waves 3 and 4 (2015 and 2016). To explore retailers' perceptions of the impact of the legislation, we used data from qualitative interviews from waves 4 and 5 (2016 and 2017). All of the interviews were transcribed verbatim, coded in a single NVivo (QSR International, Warrington, UK) file and analysed thematically. Coding themes were reviewed and revised at each wave to allow new and emerging themes to be analysed.

## Results

We report findings under two headings: small retailers' initial expectations about implementation, and the implementation process.

### *Small retailers' initial expectations about implementation*

Retailers' initial attitudes towards and expectations of the implementation of the legislation were predominantly negative, and focused on three main themes: practical concerns, perceived government interference and perceived effects of the legislation.

Retailers raised concerns at wave 1 (prior to the implementation of the POS display ban in April 2013) about the logistical implications of covering their tobacco storage units (typically referred to as gantries), perceiving that this would involve 'hassle' and potential expense. All but one of the retailers had a contract with a tobacco company for the provision of a gantry, and views differed about the amount of help that retailers could expect from a tobacco company: some assumed that company representatives would arrange the gantry adaptation as part of the contract, whereas others worried that they would bear the responsibility themselves. One retailer whose storage unit was not provided by a tobacco company was particularly uncertain about what would happen in terms of covering it up.

Several retailers were concerned that customer transactions would take longer as staff struggled to locate the right product in the gantry, and that this would lead to customer frustration and potential loss of custom, with customers choosing to go elsewhere if the process was too slow:

*Yes, definitely . . . there's no doubt about it. Where at the moment we know exactly where everything is, fair enough if the display behind the curtain or what not, it's going to be the same, but it's still going to be the hassle of opening the curtain or shutters and adding a few more seconds, if not longer to serving . . . onto the time it takes to serve a customer, and you know yourself nowadays people are in more of a hurry.*

*Retailer S, Wave 1 (W1)*

Protracted transaction times were felt to be particularly likely for price-conscious customers, who might ask to see all of the lower-price brands on the gantry, requiring the retailer to open each flap in turn or to consult a price list. Concerns were also expressed in some shops that the covered gantries would require retailers to turn their backs on customers for longer to retrieve products, and that this could lead to increased thefts:

*We can't turn our body around for like 10 seconds just to lift a shutter and find the fags, 'cause there's folk trying to steal and that . . . we have to have our eagle eyes in the shop all the time.*

*Retailer C, W1*

Many of the retailers stocked price-marked tobacco products (packs with the price printed on the wrapper or box, commonly used for value and mid-range brands); these were perceived as attractive to price-sensitive customers, and the transparent pricing protected the retailer from accusations of overcharging or non-competitive prices. Retailers noted that, once the gantries were covered, customers would no longer be able to scan the shelves to see pack prices at a glance. They realised that the onus would be on counter staff to familiarise themselves with the prices and pass this information on to customers verbally, and some expressed concerns about how this would work in practice and whether or not customers would complain that they were being 'ripped off' once they could no longer see price-marked packs. At wave 1, some retailers were unaware that they would be permitted to display a price list, assuming that price lists would also be banned under the legislation. As a result of customers not being able to scan the gantry to see the full range of products available, some retailers anticipated an impact on the relative availability and sales of different brands. It was suggested that there would be

little point in stocking more obscure brands because sales would dry up if customers could not see that the product was in stock, leading to a concentration on best-selling brands.

Some retailers regarded the display ban as yet another example of *government interference*. The legislation was framed as a ‘big brother’ (retailer Q, W1) response, and several contended that the government was hypocritical, simultaneously benefiting from tobacco profits and wanting to be seen to be implementing populist health measures. Arguments were not always coherent; for example, some framed the legislation as a way of generating revenue. Some resented what they perceived to be an implication that retailers themselves had some responsibility for encouraging people to smoke, with several observing that they were simply selling tobacco, not promoting it, and that if the product was so harmful then it should not be allowed to be sold. Linked to these views was something of a siege mentality evident among some retailers, with the POS legislation seen as part of a wider set of forces making life difficult for small retailers, tying them up in ever-increasing regulations, undermining their already perceived precarious existence:

*I mean your margins are getting closed all the time and then you're losing money to, you know silly government schemes and, it just doesn't make any sense, you know.*

Retailer F, W1

Several retailers *disputed that the legislation would have its intended effects* and dismissed it as ‘pointless’ on this basis. A common view was that existing smokers would not be deterred because they would carry on buying tobacco, and that young people were primarily influenced by peers and family, and therefore reducing exposure in shops would have little effect. To back up their contention that the legislation would be ineffective, several referred to articles they had read in the trade press or to conversations with tobacco representatives:

*I talked to my rep[resentative] and ... the Irish model, and they reckon that cigarette sales have gone up there, it's not really affected it.*

Retailer M, W3

In addition, some claimed that illicit trade would increase following the ban and would even threaten the viability of small shops. The basis for this argument was not always clear, but again it seemed to have been partly informed by stories read in the trade press:

*I mean, [see] that trade magazine ... There is your biggest danger because they can't monitor, they can't monitor out the back of the van, they can't monitor the illegal trade ... It's driving it to the illegal market, which is completely unscrupulous.*

Retailer Q, W3

Although very much a minority view among our sample, one or two retailers did acknowledge the possibility that the ban could discourage young people from smoking by reducing their ability to see tobacco products:

*I mean you want folk tae stop smoking ... Kids, like I've got kids, three kids, 4, 5 and 11; I wouldnae like tae see my 11-year-old smoking, you know ... so it's a good thing tae shut it off so the next generation doesn't know what's [behind the shutter].*

Retailer L, W1

It was also suggested, however, that the shutters could create a ‘forbidden fruit’ effect, with the barrier giving tobacco products extra appeal.

Other comments retailers made implicitly, and in some cases explicitly, acknowledged the role of the gantry in drawing attention to the availability of tobacco products and in shaping customers' preferences. For example, a few were worried that, without a visual reminder that tobacco products were on sale, some customers might go elsewhere. It was acknowledged that seeing a product on display acted as a visual cue that could reinforce or trigger purchases, and that the absence of such a cue could, at least in the short term, have an impact on smokers:

*I think personally that it's going to drop sales as well then because . . . people can't visualise what they're buying, and a lot of people won't remember . . . some people actually just remember by looking at a packet what it is . . . so I think it will have some sort of knock-on effect in terms of sales and stuff as well, yeah . . .*

*Retailer A, W1*

*I think it will cut sales. Maybe impulse because you don't really see . . . I don't know how visual it is . . . I just don't really know, you know, it's uncharted territory.*

*Retailer O, W3*

### **The implementation process**

The majority of retailers found that implementation was straightforward. At baseline (wave 1), all but one of the retailers in our sample had a contract with a major tobacco company to provide a tobacco storage unit. As part of this contract, the tobacco company supplied, maintained and periodically updated the storage unit, in return for which the retailer was required to stock and display the manufacturers' products, usually in accordance with a detailed planogram or layout diagram. Financial payments or reward scheme points that could be converted subsequently to cash or gifts were sometimes offered as part of these contracts: 'they [Imperial] pay us for having a gantry, they pay us £250 a year' (retailer, grocery/convenience store, wave 1). In the months leading up to the 2015 implementation deadline in small shops, 17 of the retailers were contacted by tobacco companies and informed that the company would continue their contract and would arrange for covers to be fitted to their existing storage units or for the storage unit to be replaced or adapted without charge. Despite the anxieties and concerns expressed (see *Small retailers' initial expectations about implementation*), these retailers generally described the process of storage unit conversion as straightforward and incurring little disruption and no cost. Gantry re-fits by tobacco companies began several months before May 2015, meaning that many retailers potentially were compliant well in advance of the deadline. However, the retail audit found that none of the study retailers was fully compliant at baseline.

For the remaining retailers with contracts, the tobacco manufacturer chose to terminate the existing contract and offered either to remove the storage unit or to leave it in situ, free of charge, with the retailer then bearing responsibility for making the storage unit compliant. The termination of contracts was generally perceived by retailers to be a commercial decision based on the level of tobacco sales their business was able to generate, although some were unsure of the rationale:

*It's an Imperial one, but . . . they came back and said we will either take it out or you can sign it away, or we will sign it away to you which is what we have done . . . They will take nothing to do with this. They will do for selected retailers, for the ones I presume that have very, very high volume and it's worth their while, but for the likes of us they have said no, so it's up to us to cover it up at our cost.*

*Retailer Q, W3*

One retailer opted to move tobacco stock to another part of the store, out of public view, rather than go to the effort of trying to modify an existing unit; the remaining retailers whose contracts had been terminated decided to continue to store tobacco in the existing unit. In some cases, retailers had been given information by tobacco representatives about third-party fitters who offered deals for gantry adaptation through wholesalers, and a few had taken up these offers. Others felt that they had received

little advice or help, and some had become anxious and frustrated in the months leading up to the implementation deadline:

*But what they did is, instead of helping us, they said . . . 'Oh no, you just keep this one an' we don't have to worry about it,' an' then, I was really disappointed . . . They were just giving us an alternative ways to, do yourself . . . in the end I said, 'Are you guys helping or what?' . . . in my point of view, they need to help because, end of the day, we selling their Imperial tobaccos [sic].*

*Retailer L, W4*

In the end, four retailers were offered, and agreed to, new storage unit covers supplied by the Philip Morris International Inc. subsidiary e-cigarette brand Vivid. This was sometimes facilitated by a Philip Morris representative offering to put a Vivid representative in touch with the retailer to discuss their storage unit requirements; retailers varied in their awareness of the links between the brand and the company. The Vivid covers supplied and fitted were printed with large, colourful images of Vivid products.

### **Impact on the retail environment**

We report findings under two headings: transactions and customers, and changes in tobacco marketing practices.

#### **Transactions and customers**

##### **Transaction times**

Most retailers adapted quickly to the gantries being covered and reported that, despite earlier concerns, this had not had a significant impact on transaction times. Although transaction times were reported to have increased slightly in the first weeks following implementation, any difficulty locating the brands once the gantry had been covered tended to subside as shop assistants adjusted to dealing with the gantry covers and memorised the layout:

*In terms of looking for the stuff, we didn't change the gantry at all. We left it the way it was, simply because you do know roughly where everything is, so there has not been a terrible slow-down in terms of the time it takes to sell a packet of cigarettes.*

*Retailer Q, W4*

Strategies such as maintaining gantry layouts similar to those used before the covers had been installed, or applying small labels to gantry covers indicating the location of different brands, assisted in this regard. Only one or two retailers described difficulties as a result of price-conscious customers trying to find a brand they could afford, or because the outlet had a number of staff who did not work in the shop frequently enough to familiarise themselves with the gantry covers.

Previously expressed concerns that customers would be frustrated by not being able to see the product range and by having to wait for shop assistants to lift gantry covers were generally unfounded. Customers were already aware that tobacco products had been covered up in supermarkets (from 2013) and appeared to adapt quickly to being unable to see the product range and prices. In the first few weeks after implementation, some retailers reported that customers had enquired whether or not they were still selling cigarettes, but this became less frequent once customers became used to the new appearance of the gantry.

##### **Thefts, underage sales and illicit tobacco**

There were no reports of increases in shoplifting as a result of the retailer turning their back on the customer to retrieve products from the gantry. Retailers who had such concerns had instructed their staff to open the gantry in a certain way to avoid turning their back on the customer completely. However, this was done only as a precaution rather than resulting from any evidence of an increase in shoplifting. Most retailers stated that many of their customers visited the shop regularly and were not

likely to steal. If a customer was unfamiliar, the retailers said that they would not turn their back on them or leave them alone at any point. This was standard practice for any product located behind the counter and not unique to tobacco products:

*If you didn't trust the customer you'd just say no I haven't got any, and don't bother going and looking for it. But I'd say probably about 80% of our customers are return customers you know.*

*Retailer K, W4*

There was little evidence from the retailer interviews to suggest that the display ban had had an impact on sales to underage customers. Most of the retailers did not mention that this had been a problem before the ban; several described operating strict ID systems and knowing their customers well, so that few young people would attempt to buy tobacco underage. Although some retailers acknowledged that proxy sales were a problem, they did not believe that the display ban had had any impact on attempted proxy purchases. However, retailers did indicate that monitoring this was very difficult unless they were able to view customer interactions on their external closed-circuit television (CCTV) cameras. Although some retailers had expressed concerns prior to implementation that the display ban would be associated with an increase in illicit trade, there was no evidence from the interviews to suggest that there had been any local increases in the availability of black-market and counterfeit tobacco.

### **Customer behaviour**

Retailers had mixed views about whether or not the display ban was associated with any change in overall tobacco sales. The majority felt that there was little difference over the course of the study: 'I just sell the same' (retailer P, W5); 'it's not impacted on my sales. I think it's a waste of time' (retailer B, W5). Others suggested that it was 'too soon to tell' (retailer C, W5), or that any effect would not start to be felt until standardised packaging and changes to pack size were implemented in 2017: 'I think it will affect it next May when they stop all the tens, that's when it will impact' (retailer G, W5).

A few, however, perceived that sales had declined somewhat by later waves of the study and that this was partly driven by the ban – 'sales have dropped, yeah, because people can't see what they want' (retailer W, W5) – although increasing austerity and declining disposable income were also identified by some retailers as factors, as were other tobacco control policies introduced between 2016 and 2017 (standardised packaging and the Tobacco Products Directive regulations on pack size).

Among continuing tobacco customers, retailers described two trends: customers remaining loyal to their regular brand and customers switching to lower-priced brands:

*We have Player's [John Player & Sons, Lenton, UK] and stuff, and they go for these cheaper makes, they don't go for the same brands that they used to smoke. I think it's all about monetary value.*

*Retailer F, W5*

Again, the latter trend was attributed partly to austerity and rising living costs, but some retailers also perceived a connection between the display ban and the trend towards customers buying value brands, suggesting that not being able to see the full range of brands on the gantry weakened budget-conscious customers' attachment to particular brands and encouraged them simply to 'go for whatever is the cheapest' (retailer E, W5).

As noted in *Chapter 3*, most retailers in early waves of the study expressed the view that the display ban would have little impact on children's and young people's interest in smoking. Although many persisted with this view, some were more inclined by later waves of the study to acknowledge the possibility that covering up tobacco displays might have had a deterrent effect:

*I think that it [does] have some difference on the children because previously children came and they stare at the cigarettes. Now they don't see that and they don't bother that, 'Where are the cigarettes?'...*

*Now they, because they can't see anything, they don't have interest in that . . . The sale – there's no effect on the sale but . . . from children's point of view, you know, for children, I think that it is good for them, that they can't see that.*

*Retailer T, W4*

Again, the view was expressed that any impact would probably take a few years to be felt:

*Initially it might seem a bad idea for this but I personally think it's probably a good idea, in the long term, just from the kids' point of view the only exposure they're ever going to get is through seeing it in a shop or through family members or friends smoking and now the only exposure is through family and friends. So, I would say it's a long-term thing.*

*Retailer H, W4*

### **Changes in tobacco marketing practices**

Changes were observed in three aspects of tobacco marketing practices over the waves of the study: product range, pricing, and tobacco companies' use of incentives with retailers.

#### **Product range**

Implementation of the display ban was associated with some changes in product range. Once gantries had been covered up, some retailers removed brands that had very low sales, the rationale being that selling these brands would be harder now that customers could no longer see the full range of stock. The introduction of standardised packaging and the Tobacco Products Directive regulations on pack size between 2016 and 2017 were associated with a further reduction in range, as retailers could sell only those products that conformed to the new minimum pack size of 20 cigarettes, and thus could not sell the same brand in smaller packs of 10 or 20. This streamlining of the product range was generally welcomed as it made stock control and gantry replenishment much simpler and also reduced the amount of stock that retailers had to hold at any one time.

#### **Pricing**

Before the ban, retailers had been uncertain initially about how they would communicate price information to their customers once the gantries were covered. Few chose to display price lists, but, after the gantries were covered up, several had been provided by their tobacco representatives with labels to stick on to gantry flaps displaying the prices of popular brands. Around the time of implementation in 2015, some retailers were unsure if telling customers the price of products was prohibited under the legislation in case this could have constituted advertising. However, these concerns tended to abate in subsequent years, and retailers became more relaxed about discussing prices and the range of products on offer.

Because customers could no longer see price-marked packs on the gantry, retailers noted that they would be less aware of prices, and would have to enquire about the price of a specific brand or ask the retailer which brand was the cheapest. This enabled retailers to direct customers towards brands they were particularly keen to sell or to increase margins slightly on some brands. The introduction of standardised packaging between 2016 and 2017, which prohibited price markings on packs, provided some retailers with the opportunity to slightly increase their tobacco prices. However, other retailers followed tobacco manufacturers' advice to continue to sell their tobacco products at or close to the Recommended Retail Price so that they would remain competitive:

*We tend to stick very close to [recommended retail price]. Again nobody is going to pay 15 to 20p more for the same packet. They're going to go down the road and if the shop has got the same one for 15p cheaper . . . we tend to stick very close to it.*

*Retailer H, wave 5*

### ***Tobacco companies' use of retailer incentives***

Before the display ban was implemented, retailers engaged to varying extents with tobacco company representatives, with many receiving incentives linked to displaying and selling tobacco products. It might have been expected that once tobacco products were covered up, the use of incentive schemes would decline.

### **Results**

Interviews conducted with retailers<sup>73</sup> found that most had been offered, and had benefited from, a range of financial and other incentives from tobacco company representatives. The majority (17/24) had received tobacco manufacturer support for converting their storage unit to comply with the new regulations (see *The implementation process*). Several participated in manufacturer 'loyalty' or 'reward' schemes, in which points (redeemable for gifts or money) or cash were awarded for various practices.

Incentives and bonuses were offered for maintaining stock levels and availability, and retailers perceived that tobacco companies were keen to avoid a drop in stock levels as there was less of a need to maintain full shelves now that the gantry was covered up. Although customers could no longer see the full gantry layout, retailers described continuing to be offered rewards for maintaining a company's brands in prime positions on the gantry. Some described being offered incentives linked to sales, for example retaining barcodes from wholesaler packaging to demonstrate proof of sale, which could then be converted to cash. Incentives were also offered for trialling new brands.

Several retailers described being offered incentives for participating in specific promotions, such as a 2016 promotion for the Philip Morris value brand Chesterfield. Retailers were offered payments or vouchers for each Chesterfield pack sold above an agreed base rate. Some retailers had been told that they would be visited by a 'mystery shopper', who would ask for a rival brand; if the shop staff recommended Chesterfield instead, they would be awarded £100. Other promotional strategies representatives suggested that retailers use included placing a promoted brand immediately next to a competitor brand in the gantry to create incidental exposure when the gantry flaps were opened, or picking up a promoted brand 'by mistake' to bring it to a customer's attention.

### **Conclusions**

Small retailers had largely negative expectations of the legislation prior to its implementation, anticipating that the task of converting their tobacco storage units might incur expenses on their part and be inconvenient, and that customer transactions would take longer. Some worried that they would have to turn their backs on customers, which might lead to shoplifting. They were uncertain how price information would be conveyed once customers were no longer able to see price-marked packs and other information on the tobacco gantry. There was scepticism that the ban would have any of its intended effects, and some resented the perceived government interference. Some concerns were also expressed that illicit trade might increase. It is possible that some of these concerns reflected conversations with tobacco company representatives or coverage in the retail trade press.

The actual implementation process was straightforward for the majority of small retailers. All but one of the 24 retailers interviewed had a contract with a tobacco company at baseline, and these contracts continued for 17 of the retailers; as part of the contract, the tobacco company converted the gantry at no cost and with minimal disruption. The remaining retailers had their contracts terminated and the gantry handed over to them free of charge, so that making it compliant with the legislation became the retailer's responsibility. Some experienced difficulty in this regard, and four retailers accepted storage unit covers supplied by the Philip Morris subsidiary e-cigarette brand Vivid.



The expected negative consequences of the gantries being covered were generally not realised. Retailers and their staff adapted to the gantry covers and found that transaction times were largely unaffected. Retailers also felt that customers had adapted quickly to the new situation, perhaps because tobacco products had been covered up in large shops for 2 years already. There is little evidence from the retailer interviews to suggest that shoplifting or illicit trade had increased, and nor was there any evidence to suggest that the ban had had an impact on underage or proxy sales. However, a few felt that young people were becoming less interested in tobacco now that they could no longer see products behind the counter. Regarding the ban's potential impact on consumer behaviour and tobacco sales, views were mixed, with some retailers perceiving no difference and others perceiving a drop in sales, although this was not attributed solely to the POS legislation.

Towards the end of the study, standardised packaging and the revised EU Tobacco Products Directive were implemented (between 2016 and 2017), which further affected the tobacco retail environment. A number of changes were observed in tobacco marketing practices over the course of the study. Some retailers amended their product range once the gantries were covered up, focusing primarily on bestsellers, and the product range was restricted further when branded packs, price-marked packs and packs smaller than 20 sticks of cigarettes or 30 g of rolling tobacco were prohibited. Some retailers took advantage of the changes to increase prices slightly, although others adhered to the recommended retail price so that they would remain competitive. Tobacco companies' use of retailer incentives persisted after the gantries were covered up, with retailers continuing to be rewarded for product placement, availability and sales, and there was evidence that retailers were also incentivised to promote products verbally to customers.



# Chapter 5 The impacts of point-of-sale legislation on exposure to tobacco products in the retail environment

## Key findings

- In our study communities, high compliance with the Scottish POS display ban has led to a considerable reduction in the visibility of tobacco products at POS, but it has had very little impact on where tobacco products are stored or on the visibility of tobacco storage units.
- Although retail density has remained fairly stable, at an individual level, there is evidence of an increase in socioeconomic inequalities in the availability of tobacco retailers and the total visibility of tobacco products. The observed decline in availability and product visibility was restricted to young people in the highest Family Affluence Scale (FAS) score tertile.
- At a national level, retailer density fell across all deprivation quintiles between 2013 and 2015, but less so in the most deprived neighbourhood quintiles.
- This was followed by a modest increase in 2016 and 2017 and by the end of the study period the overall number of retailers had reduced to a number similar to that at baseline.
- The increase in tobacco retailer density was largely driven by an increase in the number of tobacco retailers in about one-fifth of local authorities. The increases in retailer density occurred in the most disadvantaged neighbourhoods, resulting in an increase in inequalities in tobacco availability.
- Tobacco continues to be very available across Scotland.

## Introduction

To assess the impact of POS tobacco display bans, it is important to be able to accurately measure the impact of these bans on tobacco visibility as well as any differential impacts related to community characteristics such as socioeconomic deprivation<sup>74</sup> and retailer type.<sup>67,75</sup> There are several existing tools for measuring tobacco advertising in shops, such as ImpacTeen<sup>76,77</sup> and Operation Storefront,<sup>78</sup> but these are of limited value in a context where little POS advertising remains, as is the case following the implementation of the POS display ban in Scotland.

Other standardised tools for measuring tobacco marketing include the Standardised Tobacco Assessment for Retail Settings (STARS).<sup>79</sup> This was developed to assess a wide range of marketing variables, based on the '4 Ps' of marketing – product availability, placement, promotion and price – but it does not provide detailed measurements of either tobacco displays or storage unit visibility. Other protocols that have been developed also fail to capture all of the display characteristics relevant to measuring visibility,<sup>80,81</sup> such as the proximity of customer traffic flows to tobacco displays in the store. The key limitation of existing tools is that they do not capture the two main dimensions of POS tobacco visibility: (1) visibility of tobacco products, which forms the main focus of legislation designed to reduce POS tobacco exposure; and (2) visibility of tobacco storage units. This latter dimension is often neglected in the development of POS legislation.

In this chapter we describe the development of a POS tobacco visibility tool and assess its efficacy for assessing changes in visibility following the implementation of POS legislation in large supermarkets

and small shops. We then go on to examine changes in the availability and visibility of tobacco products over the DISPLAY study period and answer the following questions:

- In our four DISPLAY communities, were there changes in exposure to tobacco products either at a community level or for young people in our sample following the implementation of POS legislation?
- Was there a change in the national availability of tobacco products in Scotland between 2012 and 2017?
- To what extent do changes in national availability of tobacco products vary between local authorities and by area-level indicators of socioeconomic deprivation and urban/rural status?
- What are the implications of these changes, both at a national and local level, for social inequalities?

### Point-of-sale tobacco visibility tool

Details of the methods used to develop the POS tobacco visibility tool are provided in Eadie *et al.*<sup>82</sup> This text has been adapted with written permission from *Tobacco Regulatory Science*.

The paper by Eadie *et al.*<sup>82</sup> presents our approach to measuring tobacco visibility. A summary of the work is provided in this section. This has been adapted from the published paper with permission of the Tobacco Regulatory Science Group. Subsequent sections report changes in exposure to tobacco products over the DISPLAY study period using the methods that we developed.

#### Methods

As there was no comprehensive tool for assessing tobacco visibility, we developed a dedicated tool to assess the visibility of tobacco products and tobacco storage units. Data were collected as part of observational audits of all fixed retail outlets selling tobacco in our four study communities over a 5-year period carried out annually from February 2013 to February 2017. The data were used to compute annual visibility scores for the two dimensions of visibility: tobacco products and tobacco storage units. Full details of the methods for the observational audit and retailer panel are in *Chapter 2, Tobacco advertising and marketing audits of tobacco retail outlets*.

Measurement of tobacco product visibility was assessed using a 5-point categorical scale on which '4' represented full visibility and '0' represented no visibility. Assessment of storage unit visibility involved measuring five key storage characteristics: visibility of storage units at POS, proximity of storage units to traffic flows through the store, storage unit size, storage unit conspicuousness and visibility of storage units from outside the store. Storage unit visibility scores for each outlet were computed by aggregating the individual scores for all five measures (range 0–22).

In the analysis we examined changes in visibility scores by SIMD quintile and study community. These were represented graphically using plots of means and associated standard errors. We carried out multivariable regression analyses for continuous measures and used alternative non-parametric methods for ordinal outcomes to assess whether or not observed differences remained significant after adjustment was made for other factors, such as type of store and interactions between 'time' and 'study community'.

#### Results

The scale was assessed for inter-rater reliability. There was considerable inter-rater agreement, with all measurement items exceeding the suggested 70% threshold for acceptable inter-rater agreement using the percentage approach (range 92–100%).

## Product visibility

Mean product visibility scores for all retail outlets ( $n = 96$ ) fell from 3.96 [standard deviation (SD) 0.41, range 0–4] before the ban to 3.16 (SD 1.33, range 0–4) after the partial ban was implemented. It then fell further to 1.13 (SD 0.57, range 0–3) after the ban was extended to include small shops ( $n = 93$ ). Table 6 shows the results of two cross-sectional Mann–Whitney  $U$ -tests that indicate that retail outlets in one of the study communities (C4) had lower product visibility than those in the other three areas and that this difference was not affected by the display ban.

Figure 2 shows the mean product visibility over time across the four study areas. There were no differences in product visibility between outlets in high-deprivation areas and those in low-deprivation areas before the display ban and no differences in product visibility scores between outlets in high-deprivation areas and those in low-deprivation areas after implementation of the comprehensive display ban.

An examination of change in product visibility scores over time by outlet type revealed that product visibility in supermarkets reduced markedly after 2013 (after the display ban in large shops came into force). However, for other retail outlet types there was a more gradual change, with grocers and petrol stations, in particular, having a wide range of product visibility scores in early 2015, before the ban was extended to include smaller outlets. This indicates that some small grocery stores and garage shops had modified their tobacco product displays before the ban was extended to include small shops.

## Storage unit visibility

The mean storage unit visibility score for all outlets ( $n = 96$ ) before the display ban was 15.91 (SD 1.82, range 5–19). After the ban had been implemented in supermarkets, the mean storage unit visibility score

TABLE 6 Comparison of tobacco product visibility in C4 with that in the rest of the study communities

Wave	Community	$n$	Rank-sum	Expected	$z$	$p$ -value
2013	C4	19	883	921.5	2.013	0.0441
2013	C1, C2, C3	77	3773	3734.5		
2017	C4	17	646	799	1.985	0.0471
2017	Rest	76	3725	3572		

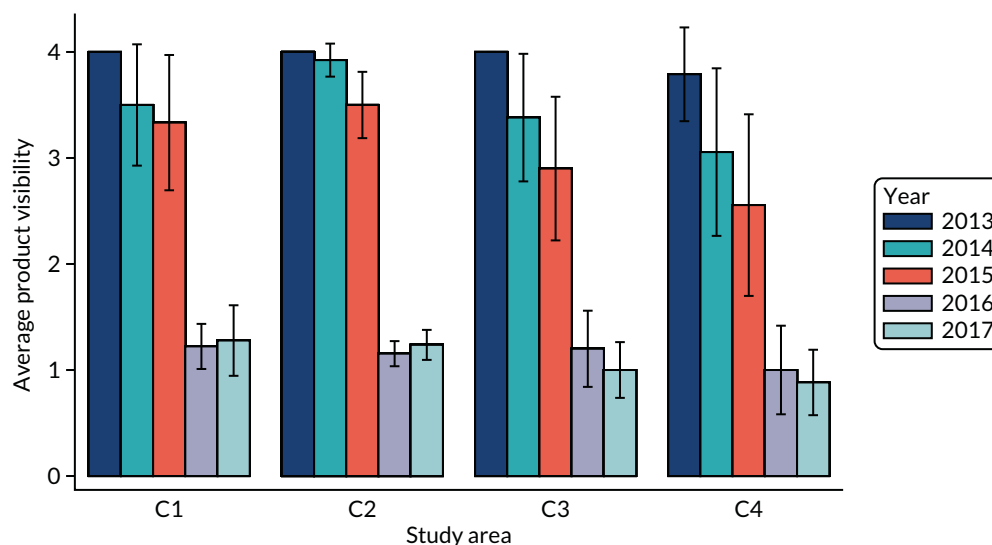


FIGURE 2 Change in average tobacco product visibility over time by study area.

for all outlets ( $n = 94$ ) dropped slightly, to 15.52 (SD 2.52, range 5–20), and then dropped further, to 14.20 (SD 3.20, range 5–19), after the ban had been implemented fully in all shop types ( $n = 93$ ). The change in storage unit visibility can be attributed largely to a reduction in the conspicuousness of storage units. Storage units that are used to display tobacco products stand out more in the shop environment when they are uncovered than do storage units in which products are concealed by shutters or covers.

Figure 3 shows the change in mean storage visibility over time across the four communities. C4 (small town, medium/low deprivation) had lower mean storage unit visibility scores than the other areas before and after the ban. Interacting time and area as a predictor had no effect, indicating that the display ban did not lessen the difference between C4 and the other areas in mean storage unit visibility. This suggests that the display bans did not eliminate shop-level urban/rural differences in tobacco storage unit visibility.

Finally, there was a marginal decline in mean storage visibility scores for most outlet types over time, with the exception of large supermarkets.

### Discussion

The visibility tool was a robust and reliable means of measuring tobacco visibility and proved practical to use in a range of retail environments and shop types without causing any recognisable disruption or being detected by shopkeepers or their customers. Findings show that the Scottish POS display ban has been effective in removing products from public view, thereby reducing young people’s exposure to tobacco brands, but it has had very little influence on where tobacco products are stored or on the visibility of tobacco storage units.

The visibility tool has the potential to be used elsewhere to measure product and storage unit visibility where tobacco POS display bans are planned or have been implemented. It could also be modified to assess the visibility of tobacco displays in jurisdictions where tobacco products are sold outdoors.

## Changes in the availability and visibility of tobacco products between 2012 and 2017

In the first part of this section, we assess changes in the availability of tobacco products across the whole of Scotland, including in the 32 Scottish local authorities and neighbourhoods stratified by social deprivation and urban/rural status. In the second part of the section, we integrate information on the

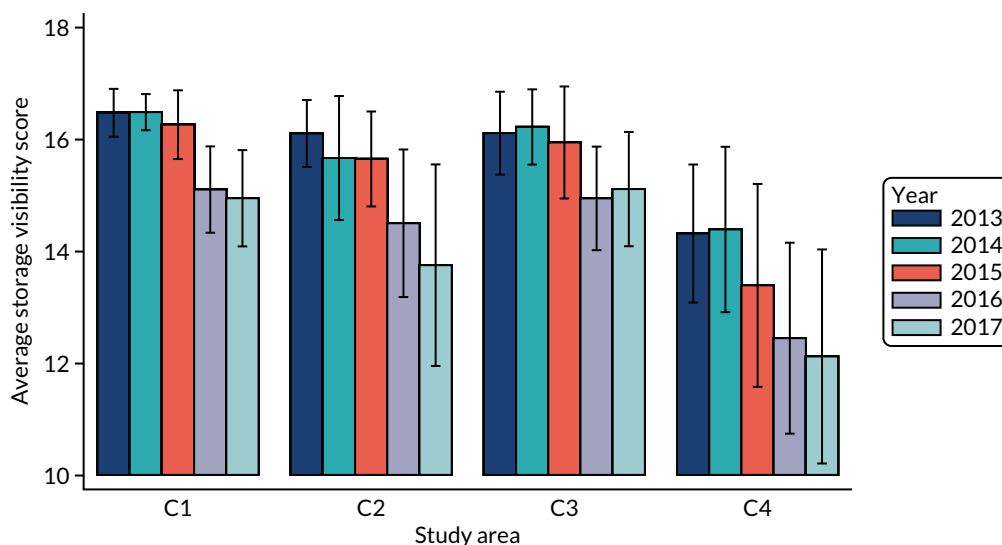


FIGURE 3 Change in average tobacco storage visibility over time by study area.

availability of tobacco products for the four study communities with information on the visibility of tobacco products (using the visibility tool detailed above) and examine how exposure to the availability and visibility of tobacco products in our study communities changed during the study period.

A paper has been published in *Tobacco Control* as Pearce *et al.*<sup>83</sup> A summary has been adapted with permission of the BMJ Publishing Group Ltd. © Author(s) (or their employer(s)) 2019. No commercial re-use. See rights and permissions. Published by BMJ.

## Methods

### Scotland-level data and analyses

Data on all tobacco retailers across Scotland were sourced from the *Register of Tobacco and Nicotine Vapour Product Retailers*<sup>65</sup> for the study period 2013–17, with a January download for each year. Retailers included large shops or supermarkets, small grocery/convenience stores, CTN, fast-food/takeaway outlets, petrol station stores and off-licences. After cleaning, the numbers of outlets were 10,161 in 2012, 10,206 in 2013, 9010 in 2014, 8847 in 2015, 9042 in 2016 and 9118 in 2017. All data were then geocoded using Code-Point to provide a precise x,y location for each retailer for each year. This geocoded information was then used to generate kernel density estimation surfaces (for each year). The approach adopted involved splitting the entire country into 50 m<sup>2</sup> grid cells, and then for all grid cells calculating the number and proximity of retailers within a defined radius (we selected 800 m as it represented a likely walking distance). Sensitivity analysis examined radii of 400 m and 1200 m, but these did not alter the substantive findings; therefore, we have presented the analysis for the 800 m radius. Density is based on the number of retailers divided by the area of the grid cell area, weighted by the quartic kernel function.<sup>84</sup> This approach ensures that retailers in proximity to the grid cell have a higher weight than those further away. These measures were used to consider national-level time trends in tobacco retailer density between 2012 and 2017. The results were stratified by Scottish local authority, neighbourhood deprivation and a sixfold categorisation of urbanity (for further details on how this classification was derived, see the Scottish Government's Urban Rural Classification<sup>85</sup>).

### Visibility scores in the four DISPLAY communities

The next stage was to consider the four study communities in more detail using the POS tobacco visibility tool combined with information from the DISPLAY school surveys. The analysis in this section included measures of (1) total storage visibility and (2) total product visibility. Higher scores indicate greater visibility of tobacco products or storage units. Scores were calculated for all retailers in the four study communities ( $n = 95$  in 2013).

### DISPLAY school survey data

We used data from each wave of the DISPLAY study annual school surveys (2013 to 2017) to calculate individual-level tobacco retail 'exposure' scores.

Variables extracted from the survey data included the FAS.<sup>86</sup> This provides an assessment of individual family material well-being, including information on material circumstances such as the number of cars and the number of holidays abroad per year. We included in the analyses only pupils who provided their full postcode ( $n = 5527$ ).

### Individual-level analyses

For each year (2013–17), a set of overall tobacco retailing exposure measures was calculated for each participant in the school surveys. These were based on the retail environments first in their immediate residential neighbourhood and second on their route to school (a proxy measure that estimates exposure in the participants' 'activity spaces'). For each respondent, we used the Google Maps™ Directions Application Programming Interface [Google, Mountain View, CA, USA; <https://developers.google.com/maps/documentation/directions/start> (accessed 16 December 2019)] to calculate an optimal route to school, based on the trip from residential postcode to school. The mean density for

each study participant was measured and the results were stratified by the four study communities. The analyses were then repeated but with the kernel density estimates weighted by the each of the outlet visibility measures. Finally, the two stages above were repeated for the participant’s estimated route to school (by calculating the sum of all of the grid cells through which the participant passed). These results measures were stratified by the participant’s FAS score tertile. All analyses were undertaken in R version 3.3.2 (The R Foundation for Statistical Computing, Vienna, Austria).

**Results**

**National-level changes in availability by deprivation and urban/rural category**

The number of tobacco retailers declined following the introduction of the POS legislation in 2013. However, large spatial variations were evident. For example, during the study period, in around one-fifth of local authorities in Scotland the provision of tobacco retail outlets increased from 2015 onwards (see Appendix 3).

The national-level findings demonstrated that tobacco retailer density was highest in the most deprived quintile throughout the study period (Figure 4). The drop in density found at the national level

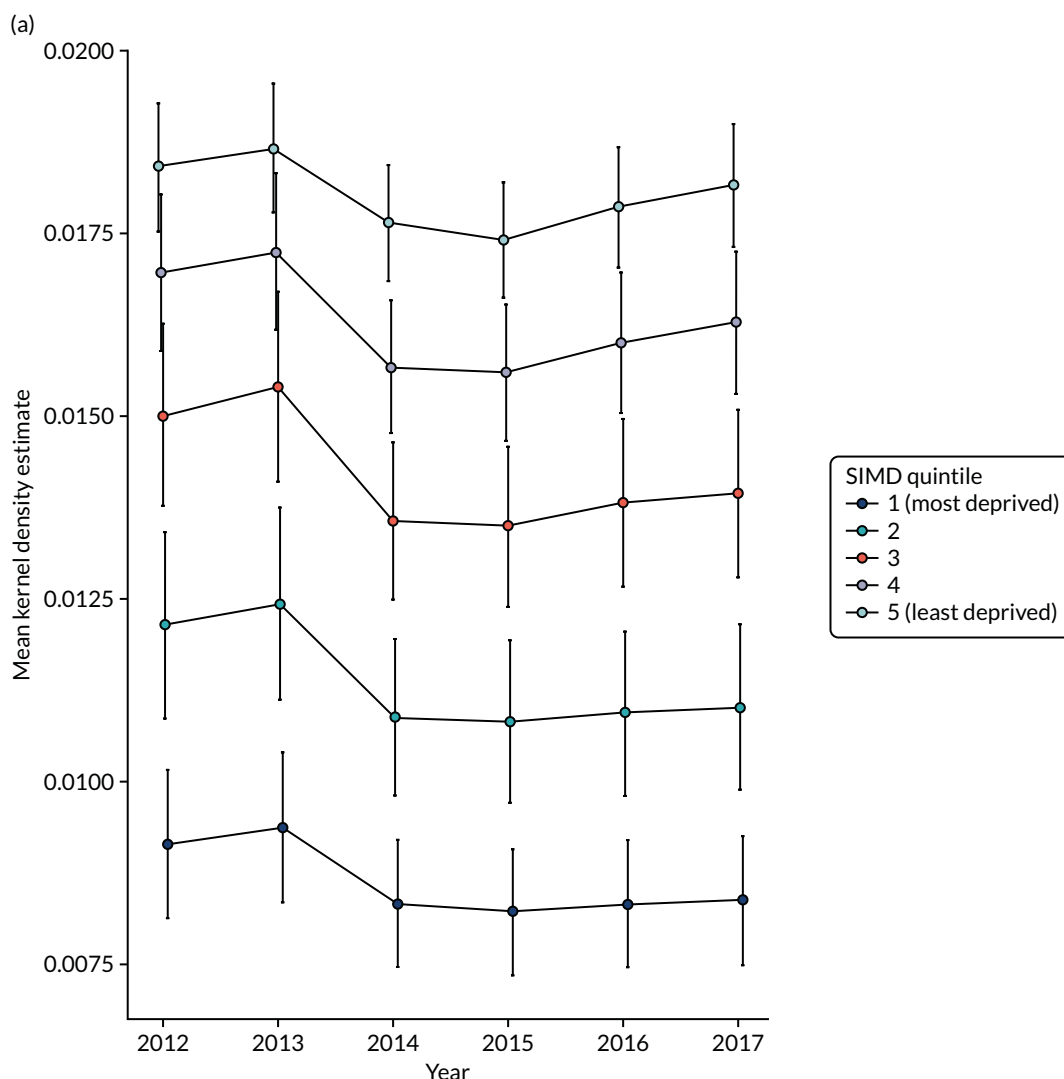


FIGURE 4 Tobacco retailer density estimates for Scottish data zones by SIMD income deprivation quintile (2012–17). (a) Density by SIMD quintile; and (b) density by SIMD quintile (scaled to individual SIMD quintile). (continued)



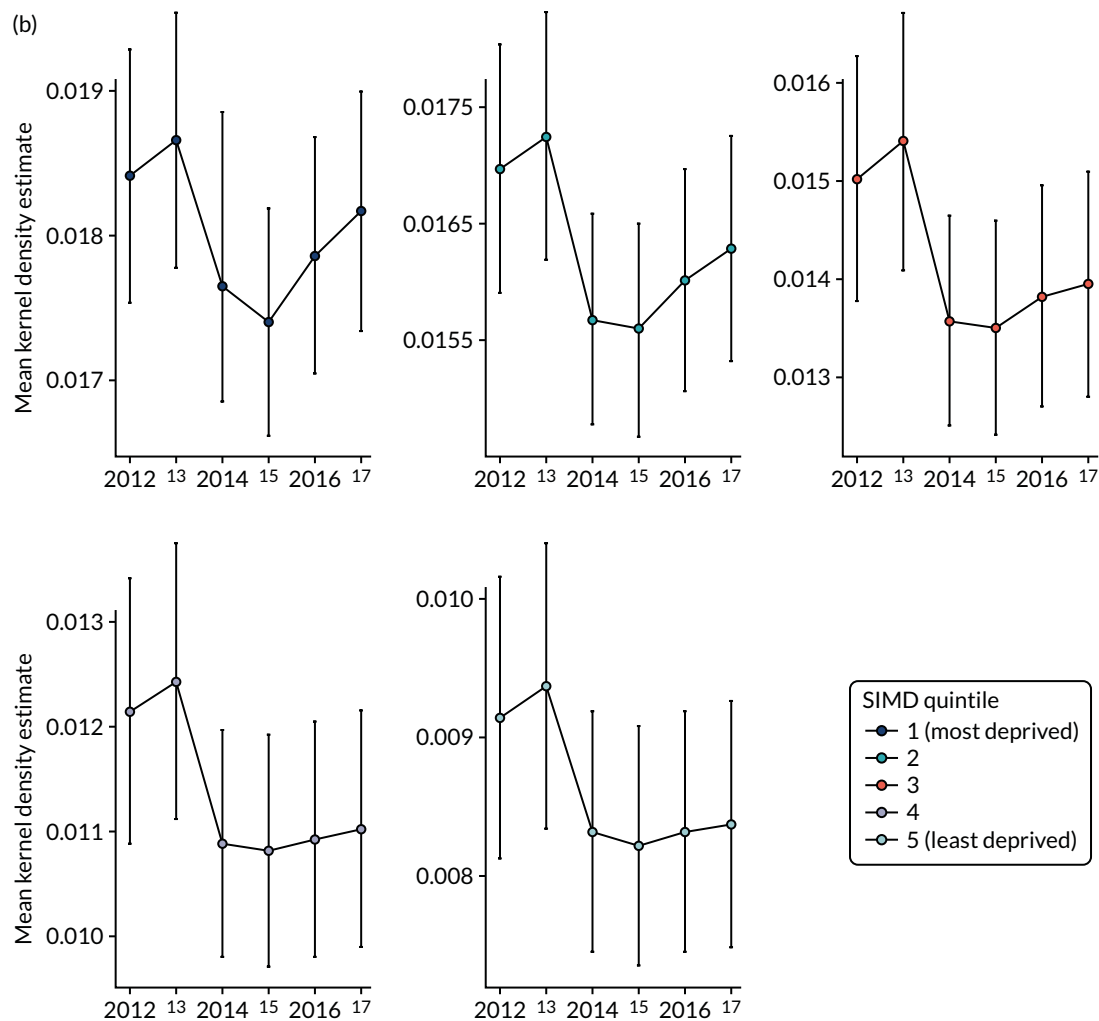


FIGURE 4 Tobacco retailer density estimates for Scottish data zones by SIMD income deprivation quintile (2012–17). (a) Density by SIMD quintile; and (b) density by SIMD quintile (scaled to individual SIMD quintile).

was apparent in all of the deprivation quintiles during the study period; however, the reduction was smaller in the most deprived quintile. The rise in density towards the latter part of the study period (2015–17) was observed in all deprivation quintiles but was significantly greater in the two highest quintiles. The ratio between the most deprived and least deprived quintiles increased from 2.01 : 1 at the start of the study period to 2.17 : 1 by 2017.

There were also significant differences in the change in tobacco retailer density by urban/rural category. Large urban areas had twice the retailer density of other urban areas, accessible small towns and remote small towns. In the first part of the study period (2012–15) there was a notable drop in retailer density across all urban/rural categories. Post 2015, the downwards trends in retailer density deviated, with substantial increases in both large urban areas and other urban areas. In accessible small towns, remote small towns and accessible rural areas, retailer density changed very little in this latter period; in remote rural areas, it dropped slightly.

### Changes in visibility in the four DISPLAY study communities

During the study period, tobacco retail provision in the four study communities was fairly stable. The total number of retailers across the four communities was 95 during the period 2013–16. This fell slightly to 93 in 2017 (Table 7). The number of outlets in each community ranged from 17 in C4 (2014) to 40 in C1 (2013).

TABLE 7 Number of tobacco retailers in each study community

Year	Number of retailers				Total
	C1	C2	C3	C4	
2013	40	19	18	18	95
2014	39	21	18	17	95
2015	38	21	18	18	95
2016	39	20	18	18	95
2017	38	19	18	18	93

Between each year, there was a small number of store openings and closures in each of the communities, but this figure did not exceed two retailers in any communities for any year.

Figure 5 shows the change in the availability and visibility of tobacco products for the study participants in the four study communities. Unsurprisingly, given the stability in the number of tobacco retailers during the study period, before weighting by the visibility score there was little change in the exposure estimates (Figures 5a and 5c). However, and as anticipated, once the estimates were weighted by the total product visibility scores, there was a large reduction in total product visibility among young people from our study communities following the introduction of the POS legislation. Weighting the density measures by the visibility score showed that there was a significant reduction in the participants' neighbourhood exposure after the phased implementation of the POS legislation in 2013 (large supermarkets) and 2015 (small retailers) (Figures 5b and 5d). The drop was particularly notable between 2014 and 2017. By the end of the study period, there was a markedly smaller difference in the overall visibility scores between the four communities.

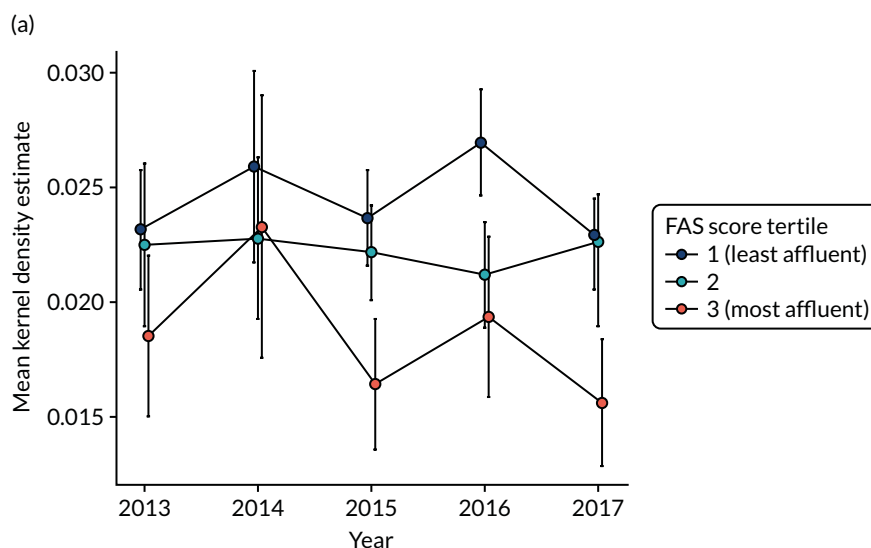
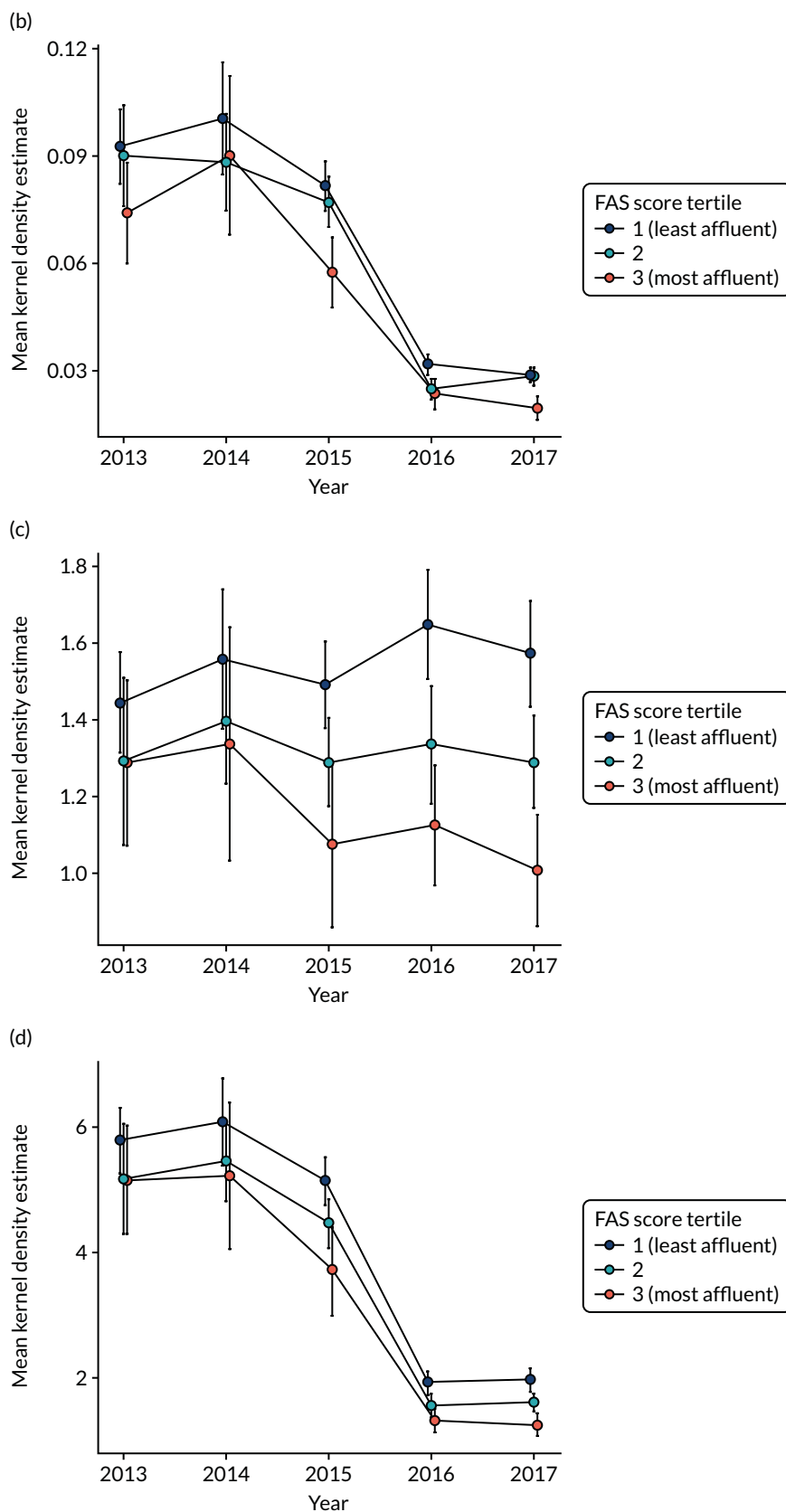


FIGURE 5 Tobacco retailer density estimates for participants' neighbourhood and activity space, for the four display communities, by visibility weighting and FAS score tertile (2013–17). (a) Neighbourhood; (b) neighbourhood weighted by visibility scores; (c) activity space; and (d) activity space weighted by visibility scores. Adapted from Pearce *et al.*<sup>83</sup> with permission of the BMJ Publishing Group Ltd. © Author(s) (or their employer(s)) 2019. No commercial re-use. See rights and permissions. Published by BMJ. (continued)



**FIGURE 5** Tobacco retailer density estimates for participants' neighbourhood and activity space, for the four display communities, by visibility weighting and FAS score tertile (2013-17). (a) Neighbourhood; (b) neighbourhood weighted by visibility scores; (c) activity space; and (d) activity space weighted by visibility scores. Adapted from Pearce *et al.*<sup>83</sup> with permission of the BMJ Publishing Group Ltd. © Author(s) (or their employer(s)) 2019. No commercial re-use. See rights and permissions. Published by BMJ.

The results based on the measures of the participants' neighbourhoods and activity spaces (see *Figures 5a* and *5c* vs. *Figures 5b* and *5d*) were broadly consistent. However, socioeconomic inequalities also increased in terms of the visibility of tobacco storage units during the study period (see *Figures 5b* and *5d*). When the results were stratified by participants' socioeconomic status (FAS score), the declines in retailer density, weighted by total product visibility, were found to be restricted to the least disadvantaged tertile of participants. This finding suggests that inequalities between the most deprived and the least deprived participants increased during the study period.

### **Conclusions**

Previous work has shown that there are strong geographical differences in the availability and visibility of tobacco products between communities;<sup>84,87</sup> tobacco retailing tends to be disproportionately located in more socially disadvantaged places. It is also apparent that higher neighbourhood availability of tobacco products is associated with higher levels of smoking prevalence and smoking initiation, and lower levels of smoking cessation. However, little was known about the implications of the introduction of POS legislation on the provision of tobacco retailing, or about the impact this has on inequalities.

This DISPLAY study has shown that the introduction of POS legislation in Scotland has been successful in reducing the exposure to and visibility of tobacco products in study communities. However, at a national level, although there was modest reduction in the number of tobacco retailers around the introduction of the POS legislation, after 2015 there was a small increase. There is also strong evidence of growing socioeconomic disparities in both the availability and the visibility of tobacco. Future research should focus on assessing the longitudinal relationships between tobacco outlet availability and visibility and intermediary outcomes such as attitudes to smoking, brand awareness and perceived ease of access to tobacco products. These findings are important from policy perspectives, as, despite the considerable progress being made in tobacco control in Scotland, tobacco products remain widely available in communities across Scotland.

# Chapter 6 Implementation of point-of-sale legislation and young people's tobacco brand awareness and perceptions of tobacco accessibility and smoking acceptability

## Key findings

- Prior to implementation of the POS display ban, young people found tobacco displays eye-catching, colourful and attractive.
- Among 13- and 15-year-olds, tobacco brand awareness was significantly associated with regularly visiting small shops and noticing POS displays in large supermarkets and small shops.
- Following implementation of a partial POS ban, brand awareness fell within 12 months of implementation and continued to do so for at least a further 2 years.
- Brand awareness also fell after the comprehensive ban but to a lesser extent.
- The impact of the POS ban was greatest among the youngest pupils (those in S1 and S2), who had been least exposed to tobacco displays.
- Implementation of both the partial and comprehensive POS display bans was followed by a decrease in perceived accessibility of tobacco products and a more negative attitude to tobacco.
- Around one in six young people were aware of the sale of black-market tobacco in their community.
- Although young people's interpretation of what constituted black-market tobacco varied, there was little evidence of an increase in their availability after implementation of the partial or comprehensive POS display bans, a potential unintended consequence of POS legislation.

## Introduction

In *Chapter 2* we presented a logic model that proposed causal pathways between the implementation of the POS legislation and expected short-term, intermediate and longer-term outcomes for young people. The outcomes of interest were changes in brand awareness, perceived tobacco accessibility, smoking attitudes (pro-smoking attitudes, smoking susceptibility) and estimated prevalence of youth smoking.

In this chapter we explore the impact of the legislation on the first three outcomes - brand awareness, perceptions of tobacco accessibility, and pro-smoking attitudes and pro-smoking norms - using data from the school survey and focus groups. Full details of the methods are in *Chapter 2, Cross-sectional school survey of school children with embedded cohorts* and *Focus group interviews with purposive samples of pupils*.

## Brand awareness

Point-of-sale displays are an important means of communication between potential new smokers and the tobacco industry.<sup>9</sup> Exposure to POS displays has been shown to increase young people's awareness of brands and new packaging, which in turn has been shown to influence their attitudes towards smoking, the perceived attractiveness of smoking, and the susceptibility to smoke among never-smokers.<sup>88-91</sup>

In this section we address the following questions about brand awareness:

- What was the relationship between POS displays of cigarettes and brand awareness prior to the introduction of the POS legislation in 2013?
- How did brand awareness change after the introduction of the partial and comprehensive POS bans?

Findings on the relationship between POS display of cigarettes and young people's brand awareness prior to the introduction of POS legislation have been published in full in van der Sluijs *et al.*;<sup>92</sup> a summary is provided below. Copyright © The Author 2016. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs licence (<http://creativecommons.org/licenses/by-nc-nd/3.0/>), which permits non-commercial reproduction and distribution of the work, in any medium, provided the original work is not altered or transformed in any way, and that the work is properly cited. For commercial re-use, please contact [journals.permissions@oup.com](mailto:journals.permissions@oup.com).

### ***Brand awareness prior to the introduction of point-of-sale legislation***

#### **Method**

We used data collected in cross-sectional surveys ( $n = 1406$ ) of S2 (aged 13 years) and S4 (aged 15 years) pupils conducted in the four DISPLAY study schools in 2013, immediately prior to implementation of the POS display ban in large supermarkets.

#### **Outcome measures**

We measured young people's cigarette brand awareness (hereon referred to as cigarette brand awareness) and frequency of visits to small shops and supermarkets. The primary outcome measure, cigarette brand awareness, was derived from the number of cigarette brands recognised from a list of 16 brands (including a fake brand) and brands recalled as free text when the 'other brand' response option was checked.<sup>93</sup>

Two measures of exposure to cigarette displays were included: frequency of shop visits and having seen tobacco products displayed in the past 30 days. To measure frequency of shop visits, young people were asked 'How often, if ever, do you visit?' the following shop types: newsagents/corner shops; garage shops/petrol stations; grocery shops or mini marts; large supermarkets; fish and chip shops; takeaway shops; and mobile ice cream/burger vans. Response options were on a seven-point scale (every day, most days, about two or three times a week, about once a week, less than once a week, never and don't know). In the analysis, frequency of shop visits was collapsed into two binary variables, one for visits to large supermarkets and one for visits to small shops. For each variable, shop visit frequency was categorised as 'about two or three times a week or more often' and 'about once a week or less often (including never)'. 'Don't know' responses were recoded as missing values. Young people were also asked if they could remember seeing cigarette and tobacco packs in large supermarkets or small shops in the past 30 days. The response categories were 'yes', 'no', and 'don't know'. In our analysis, 'don't know' responses were excluded.

The mean number of brands recognised was significantly larger among those who recognised the fake brand than among others (11.1 vs. 3.6;  $p < 0.001$ ). Therefore, these pupils ( $n = 76$ ) were excluded from the analysis. Using negative binomial regression, two models were developed to assess the relationship between exposure (frequency of shop visits, noticing cigarette displays) and outcome (brand awareness). The association between exposure variables and the outcome variable was examined in our first model and then variables found to be significantly associated with brand awareness, together with all sociodemographic factors, were included in the second model.

### Focus group procedure

Sixteen single-sex focus groups were conducted in March 2013: four groups per school, two with S2 and two with S4 pupils. Each group had between three and nine participants ( $n = 86$ ) and lasted 30–50 minutes.

### Results

Of the 1406 respondents, 33.6% recognised five or more brands, 26.1% recognised three or four brands, 26.5% recognised one or two brands and 13.9% recognised no brands at all. *Table 8* presents the two models from the analysis of the school survey data.

Model 2, the adjusted model, shows that young people who visited small shops at least twice a week or more, and were therefore most exposed to POS tobacco displays, knew of significantly more cigarette brands than young people who visited small shops less often [relative rate ratio (RRR) 1.19, 95% confidence interval (CI) 1.01 to 1.41]. However, the frequency of visits to large supermarkets had no impact on brand awareness. Perhaps unsurprisingly, young people who noticed cigarette displays in small shops (RRR 1.24, 95% CI 1.03 to 1.51) and large supermarkets (RRR 1.15, 95% CI 1.01 to 1.30) were also aware of more cigarette brands.

Findings from the focus groups clearly demonstrate that before the POS display ban young people found tobacco displays eye-catching, colourful and potentially attractive. The following extract from a focus group discussion with 13- and 14-year-old girls illustrates the general response to POS tobacco displays (*Box 1*).

TABLE 8 Relationship between brand awareness and shop visit frequency and noticing cigarettes in shops

Variable	Brand awareness					
	Model 1			Adjusted model 2 <sup>a</sup>		
	Mean brands	RRR	95% CI	Mean brands	RRR	95% CI
Visit small shops						
About once a week or less often	3.00	1		3.35	1	
About 2 or 3 times a week or more often	4.18	<b>1.39***</b>	1.20 to 1.62	4.00	<b>1.19**</b>	1.01 to 1.40
Visit large supermarkets						
About once a week or less often	3.74	1		3.69	1	
About 2 or 3 times a week or more often	4.02	1.08	0.95 to 1.23	4.02	1.09	0.95 to 1.26
Notice cigarettes in small shops						
No	3.09	1		3.13	1	
Yes	3.94	1.27	0.99 to 1.64	3.90	<b>1.24**</b>	1.03 to 1.51
Notice cigarettes in supermarkets						
No	3.27	1		3.39	1	
Yes	3.93	1.20	0.95 to 1.52	3.89	<b>1.15**</b>	1.01 to 1.30

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

<sup>a</sup> Adjusted for age, gender, FAS score, smoking status, parental smoking, sibling smoking, friend smoking, number of nights spent with friends and hanging about on streets.

Bold indicates significant result.

BOX 1 Young people's views of tobacco displays prior to the comprehensive POS ban

*They're in really shiny packets I think, when I'm just looking in the shops when you go to the counter it's just like in your face!*

*So really like bright and shiny.*

*If you go to like sweetie shops and that its like how they're displaying it, it's like . . . do you know how when you got to sweetie shops they have like a big section of bonbons and stuff, it's like that. I'm not saying colour coordinated, like if it's all the same make it will be in the same corner and it sort of looks like a sweetie shop or something.*

*It looks like an adult sweetie shop!*

*They're not allowed to have posters on the street. They're not allowed to have it on TV.*

*They don't really promote it, but when you go there it looks quite promoting.*

*School C3; S2 Females*

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## Discussion

This mixed-methods study showed that, prior to the ban on POS displays in large shops in Scotland, higher cigarette brand awareness among 13- and 15-year-olds was significantly associated with regularly visiting small shops and noticing POS displays in small and large shops, even when adjustment was made for young people's smoking status, smoking in their social networks, leisure activities and demographic characteristics.

By including focus groups, we provide insights into how POS displays may influence young people's social norms<sup>94,95</sup> about smoking by increasing their exposure to cigarette brands that they might not be exposed to through their social environment (e.g. family and friends). Smoking social norms are shaped by normative influences not only in the social environment but also in the physical and symbolic environments. In young people's accounts from the focus groups we found evidence of both effects.

Our findings highlight the importance of POS displays of tobacco products in increasing brand awareness, which is known to increase youth smoking susceptibility,<sup>93,96</sup> and thus the importance of implementing POS display bans in all tobacco outlets.

### *Change in brand awareness after the implementation of point-of-sale legislation*

## Method

To examine changes in brand awareness over time, we used data collected from cross-sectional school surveys conducted between 2013 and 2017 [ $n = 6426$  pupils (S1–S4);  $n = 11,653$  observations]. We considered the impact of the partial ban using data collected between 2013 and 2015 from S2 and S4 pupils only, and the impact of the complete ban using survey data collected between 2015 and 2017 from pupils in S1 to S4. These analyses were supplemented with data from 64 focus groups conducted with 296 S2 and S4 pupils after 2013.



### **Outcome measures**

As in the baseline analysis (see *Brand awareness prior to introduction of point-of-sale legislation, Results*), the primary outcome measure, namely brand awareness, was constructed by totalling the number of cigarette and hand-rolling tobacco brands recognised from a list of brands (including one fake brand of cigarettes and one of hand-rolling tobacco), and brands recalled as free text when the 'other brand' response option was checked. From 2014, three brands of Embassy (Imperial Brands plc) were combined into a single answer category, and one cigarette and one hand-rolling tobacco were excluded from the list of possible brands. Therefore, to allow for direct comparison across years, only the 12 cigarette brands and four hand-rolling tobacco brands, which were common to all four survey waves, were included in the analyses. We modelled brand awareness as a continuous variable (number of brands known). Pupils were excluded from the analysis for any year in which they checked either of the fake brands ( $n = 980$ , 8.4% of observations). Rate of recognition of fake brands was fairly stable over the survey, ranging between 7.8% (2015) and 9.2% (2013) (see *Appendix 4*). Analyses were carried out on the remaining 10,673 observations.

### **Potential confounders**

To separate the direct impact of changes in POS displays on brand awareness from the indirect effects via changes in other potential sources of exposure to tobacco products, the analyses were adjusted for frequency of shop visits; the smoking status of pupils and their family and friends (social circle); time spent out with friends in the evening (which has been shown to be associated with youth smoking<sup>27</sup>); and seeing tobacco adverts on the internet (2013–15) or seeing e-cigarette adverts on the internet (2015–17).

### **Analysis methods**

Negative binomial regression models were developed to assess the population-level change in brand awareness (mean number of brands known) over time for both the partial ban (2013–15, S2 and S4 pupils only) and the comprehensive ban (2015–17, S1–S4 pupils). For each time period, unadjusted models were developed; then, in the second models, all potential confounders and sociodemographic factors were included. Models were run both for combined year groups and for each year group separately.

## **Results**

### **Change in brand awareness after the partial ban**

In 2013, among S2 and S4 pupils, 13.5% (S2, 16.6%; S4, 9.9%) reported that they were not aware of any cigarette/tobacco brands. This increased to 22.4% by 2015 (S2, 29.5%; S4, 14.0%), with 27.3% (S2, 31.7%; S4, 22.3%), of pupils reporting knowing no brands in 2017. The mean number of brands known among S2 and S4 pupils also declined from 4.3 (S2, 3.7; S4, 5.0) in 2013 to 3.6 (S2, 2.8; S4, 4.6) in 2014 and 3.5 (S2, 2.6; S4, 4.4) in 2017.

The fully adjusted model (not shown) for the combined year group analysis (S2 and S4) indicates that brand awareness decreased significantly between 2013 and 2015 (in 2014: RRR 0.85, 95% CI 0.77 to 0.93; in 2015: RRR 0.87, 95% CI 0.80 to 0.95).

*Table 9* shows the mean number of brands recognised and the RRRs of mean number of brands recognised relative to the baseline year (2013) for each year group separately, following the partial ban. This analysis shows that, when split by year group, the fall in brand awareness was statistically significant only for S2 pupils. Mean brand awareness among S2 pupils in 2014 and 2015 was similar, but in both years the mean number of brands known by S2 pupils was around 20% smaller than it had been before the ban in 2013 (in 2014: RRR 0.76, 95% CI 0.67 to 0.86; in 2015: RRR 0.80, 95% CI 0.71 to 0.91).

TABLE 9 Change in brand awareness after the partial POS ban, by school year (S2 and S4 pupils)

Year	Model 1				Adjusted model 2 <sup>a</sup>			
	Mean brands	Standard error	RRR	95% CI	Mean brands	Standard error	RRR	95% CI
<b>S2 pupils</b>	<b>n = 2170</b>				<b>n = 2023</b>			
2013	3.71	0.16	1		3.09	0.16	1	
2014	2.76	0.12	0.74***	0.66 to 0.84	2.35	0.12	0.76***	0.67 to 0.86
2015	2.79	0.12	0.75***	0.67 to 0.85	2.47	0.13	0.80***	0.71 to 0.91
<b>S4 pupils</b>	<b>n = 1825</b>				<b>n = 1703</b>			
2013	4.96	0.22	1		4.15	0.22	1	
2014	4.60	0.21	0.93	0.82 to 1.05	3.92	0.22	0.95	0.83 to 1.08
2015	4.42	0.20	0.89	0.79 to 1.01	3.91	0.21	0.94	0.83 to 1.07

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

<sup>a</sup> Adjusted for age, gender, FAS score, school, smoking exposure (own and social circle smoking status), number of nights spent out with friends and exposure to internet advertising.

### Impact of the comprehensive ban

Considering all year groups (S1–S4) together, from 2015 onwards, the unadjusted data indicate that the proportion of pupils reporting knowing no brands increased slightly from 26.2% in 2015 to 33.2% in 2017, with a concomitant small reduction in mean number of brands known from 3.2 in 2015 to 3.0 in 2017.

The fully adjusted models (not shown) for the combined year groups (S1–S4) analysis indicate that mean brand awareness among pupils in S1–S4 declined between 2015 and 2016 (RRR 0.92, 95% CI 0.86 to 0.98), but in 2017 it was not significantly different from 2015.

Table 10 presents the analysis for year groups separately. It gives the mean number of brands recognised and the RRRs of mean number of brands recognised following the comprehensive ban, relative to the baseline year.

When analyses were split by school year, significant decreases in brand awareness were seen only among S1 pupils between 2015 and 2016 (in 2016: RRR 0.82, 95% CI 0.71 to 0.94; in 2017: RRR 0.93, 95% CI 0.80 to 1.07). No significant changes in mean brand awareness were seen in other age groups.

The focus group data provided a clear view of young people's reactions to the change in the retail environment following the covering up of tobacco displays in large supermarkets and small shops. In sharp contrast to focus groups conducted in 2013, prior to the introduction of any display ban, young people reported that the overall display appearance was now dull, boring and nondescript:

*It's better because, if they were on show, then it would like persuade a lot more people to actually buy them.*

*Mmm. But it doesn't look nice – like them all being behind shutters . . .*

*School C3, group S4, female*

TABLE 10 Change in brand awareness after the comprehensive POS ban, by school year (S1–S4 pupils)

Year	Model 1				Adjusted model 2 <sup>a</sup>			
	Mean brands	Standard error	RRR	95% CI	Mean brands	Standard error	RRR	95% CI
<b>S1 pupils</b>	<b>n = 2183</b>				<b>n = 2016</b>			
2015	2.10	0.10	1		1.96	0.11	1	
2016	1.77	0.08	0.84***	0.74 to 0.95	1.60	0.09	0.82***	0.71 to 0.94
2017	1.59	0.08	0.75***	0.66 to 0.86	1.81	0.10	0.93	0.80 to 1.07
<b>S2 pupils</b>	<b>n = 2127</b>				<b>n = 1964</b>			
2015	2.79	0.12	1		2.63	0.14	1	
2016	2.61	0.12	0.93	0.83 to 1.06	2.37	0.13	0.90	0.79 to 1.03
2017	2.62	0.12	0.94	0.83 to 1.06	2.66	0.14	1.01	0.89 to 1.15
<b>S3 pupils</b>	<b>n = 1954</b>				<b>n = 1813</b>			
2015	3.58	0.16	1		3.00	0.16	1	
2016	3.64	0.16	1.02	0.90 to 1.15	2.91	0.16	0.97	0.85 to 1.10
2017	3.58	0.16	1.00	0.89 to 1.13	3.33	0.17	1.11	0.97 to 1.27
<b>S4 pupils</b>	<b>n = 1789</b>				<b>n = 1649</b>			
2015	4.42	0.20	1		3.64	0.20	1	
2016	4.32	0.20	0.98	0.86 to 1.11	3.54	0.22	0.97	0.85 to 1.10
2017	4.41	0.20	1.00	0.88 to 1.13	3.90	0.21	1.07	0.94 to 1.22

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

a Adjusted for age, gender, FAS score, school, smoking exposure (own and social circle smoking status), number of nights spent out with friends and exposure to internet advertising.

Although young people did not specifically mention the effect of the POS ban on brand awareness, they did link not being able to see cigarette packs to changing behaviour:

*They're not like on display so then it's like ... most people would just be like ... if you see them you just get them, pick them up. If you don't like see them you'll just not get them. So it's better.*

*School C3, group S2, female*

Nevertheless, although the displays were covered up, some young people suggested that the displays still indicated that tobacco was for sale in these shops:

*I don't think there's any point in it ... Because like they're still there, like my little sister is 5 and when she goes to the shop with my gran she will tell my gran 'the fags are under the shutter'! So ... I don't see the point in it, it's not like it's hiding it, they're still selling them so ...*

*School C1, group S4, female*

The covered tobacco displays were also compared unfavourably with the e-cigarette and vape displays, which were often situated directly adjacent to the shuttered cabinets, and were spoken of as being colourful and eye-catching, very much mirroring the views about uncovered tobacco displays in the 2013–15 focus groups:

*Well most of ... the newsagents doon in my bit, all the cigarettes are behind shutters but then ... there's like a plastic see-through case thing and it's full of chargers and liquids and vapors.*

*School C2, group S2, male*

*There's this big box, this display telling you the oils you can get ...*

*Obviously because they've put laws on they're not allowed to show like cigarettes and all that but ... they're allowed to show it [e-cigarette display], it's right there ...*

*Which is a good alternative for somebody that's trying to stop smoking so they might like have an e-cigarette instead.*

*Yeah! But I think it being there encourages younger kids, I don't want to smoke but let's do this because this is also quite cool.*

*School C1, group S4, female*

## Discussion

In this analysis we assessed the impact of the ban in POS displays on brand awareness, which is known to increase smoking susceptibility and smoking initiation among young people.<sup>93</sup> We measured the impact at two points in the implementation process as well as exploring which age groups were particularly affected by the ban.

After the partial ban in large supermarkets, brand awareness among pupils was lower. This shift was evident within 12 months of the ban and continued for at least 2 years after implementation. Similarly, there was lower brand awareness in the 12 months following the comprehensive POS ban. However, only among younger pupils (S2 after the partial ban and S1 after the comprehensive ban) was there a significant reduction in mean brand awareness. Younger pupils will have had fewer years of exposure to uncovered tobacco POS displays, while older pupils are more likely to be exposed to smoking in their social circles. Thus, it may take longer than we originally envisaged for the impact of POS legislation on older pupils' brand awareness to emerge.

## Perception of tobacco accessibility and smoking acceptability

The perception that cigarettes are accessible and easy to obtain increases the risk of smoking initiation and regular tobacco use.<sup>98</sup> In 2013, 80% of young people in the DISPLAY school survey reported that they had seen tobacco displays in large supermarkets or small shops, indicating that tobacco products were highly visible in the retail environment.<sup>97</sup> Reducing exposure to POS displays was expected to result in a reduction in the short term in the perception that tobacco products are easy to access,<sup>10</sup> as has been found in Norway.<sup>21</sup> As a result of the decrease in accessibility, we hypothesised that smoking would become less acceptable to young people.<sup>1</sup>

In this analysis, we aimed to quantify changes in perceived tobacco accessibility and smoking acceptability among young people from our study communities following the implementation of the partial and comprehensive POS tobacco display bans. Using data from the school surveys, we addressed the following research questions:

- What were the trends in perceived tobacco accessibility and smoking acceptability between 2013 and 2017?
- To what extent did perceived tobacco accessibility and smoking acceptability change after the introduction of the partial and comprehensive POS bans?
- Did shop visit frequency influence the impact of the legislation on change in perceived tobacco accessibility and smoking acceptability?

Below we present a scientific summary of the findings, which has been adapted from Kuipers *et al.*<sup>99</sup> © Author(s) (or their employer(s)) 2019. Re-use permitted under CC BY. Published by BMJ. This is an open access article distributed in accordance with the Creative Commons Attribution 4.0 Unported (CC BY 4.0) license, which permits others to copy, redistribute, remix, transform and build upon this work for any purpose, provided the original work is properly cited, a link to the licence is given, and indication of whether changes were made. See: <http://creativecommons.org/licenses/by/4.0/>. The text below includes minor additions and formatting changes to the original text.

## Methods

The DISPLAY school survey formed the basis for this analysis. We selected data for all S2 and S4 young people, from all years of the school survey (i.e. 2013–17: observations,  $n = 7168$ ; individuals,  $n = 5376$ ), which allowed for a comparable group across all survey years. Including S5 and S6 pupils would have led to the selective inclusion of students who had better academic performance and may have been less likely to start smoking.

The outcome variables were self-reported perceived tobacco accessibility and smoking acceptability. A measure of perceived tobacco accessibility was derived from the following question: 'If you, or someone your age, tried to buy cigarettes or tobacco in a shop, do you think you would be successful?' Response categories were 'yes', 'no' and 'don't know'. 'Don't know' was categorised together with 'no', meaning that we distinguished those who were confident that people their age would be able to buy tobacco.

Smoking acceptability was measured in two ways. The first focused on the injunctive social norm (i.e. whether or not the behaviour would be approved of, hereafter called pro-smoking norm) and the second focused on the attitude of the respondent (hereafter called pro-smoking attitude). The smoking norm was measured with the question 'Do your friends think it is OK for people your age to smoke cigarettes or hand-rolled cigarettes (roll-ups)?' The response options were 'they think it's OK', 'they do not think it's OK' and 'don't know'. The young person's attitude towards smoking was measured with the question 'Do you think it is OK for someone your age to smoke cigarettes or hand-rolled cigarettes (roll-ups) once a week?', to which students responded 'it's OK', 'it's not OK' or 'don't know'. As for accessibility and smoking norm, 'don't know' responses were merged with 'it's not OK' responses.

To quantify the changes in our outcome variables with the introduction of the partial and comprehensive POS tobacco display bans, we segmented the five survey years into three time periods that matched the implementation of the POS legislation. Time was segmented into the year before the partial ban in supermarkets (2013), the years between the partial ban and the implementation of the comprehensive ban in small shops (2014–15), and years after the comprehensive ban (2016–17).

In this study, the variables for frequency of visits to large supermarkets and small shops were each computed using three categories: 'often' (every day, most days), 'sometimes' (two or two times per week, about once per week) and 'rarely' (less than once per week, never).

Smoking status was measured with the question 'Have you ever smoked cigarettes or hand-rolled cigarettes (roll-ups), even if it is just one or two puffs?'; among those answering 'yes', those who indicated that they were current smokers were considered smokers. This does not include those who had smoked only once or twice. E-cigarette use was categorised as 'not having tried', 'having tried once or twice' or 'occasional or regular use (currently or in the past)'. In 2013, the survey did not include questions on e-cigarettes, and all 2013 responses were therefore coded as missing.

To study the association between time segments and both the accessibility and the acceptability outcomes, we applied generalised estimating equations analyses. Nested models were fitted first to include sociodemographics and then to control for smoking-related variables. Fully adjusted models for

each outcome variable revealed large confounding effects when our e-cigarette variable was included. As a result, we added e-cigarettes to separate models.

We also considered whether or not potential reductions in accessibility and acceptability (pro-smoking norms and pro-smoking attitudes) after the POS display ban showed any association with frequency of visits to tobacco outlets. Differential associations were tested by assessing interactions between time segments and visits to shops (supermarkets and small shops separately) in the fully adjusted model.

### Results

Unexpectedly, the analysis of the school survey data showed that crude trends in smoking accessibility and both measures of smoking acceptability (pro-smoking attitudes and pro-smoking norms) increased over time. *Table 11* presents three models for each of the three outcome variables.

Our analysis shows that, after adjusting for sociodemographics and smoking status (models 1 and 2), there was no significant change in perceived tobacco accessibility and pro-smoking attitudes following the introduction of either the partial or the comprehensive POS display ban. However, pro-smoking norms increased following the implementation of the comprehensive ban. Only after e-cigarette use was included in the model (model 3) did we find a significant decline in perceived access [odds ratio (OR) 0.72, 95% CI 0.57 to 0.90] and in pro-smoking attitudes (OR 0.67, 95% CI 0.49 to 0.91). Including e-cigarette use in the model also eliminated the significant increase in pro-smoking norms (OR 1.00, 95% CI 0.78 to 1.29).

**TABLE 11** Change in tobacco accessibility, pro-smoking norms and pro-smoking attitudes after implementation of the POS legislation

Time segment	Adjusted model 1, <sup>a</sup> OR (95% CI)	Adjusted model 2, <sup>b</sup> OR (95% CI)	Adjusted model 3, <sup>c</sup> OR (95% CI)
Tobacco accessibility <sup>d</sup>			
2013	1	1	1
2014–15	0.90 (0.74 to 1.09)	0.97 (0.79 to 1.19)	0.80** (0.64 to 0.99)
2016–17	1.11 (0.91 to 1.34)	1.04 (0.85 to 1.27)	0.72*** (0.57 to 0.90)
Pro-smoking norms <sup>e</sup>			
2013	1	1	1
2014–15	0.86 (0.71 to 1.05)	1.05 (0.83 to 1.33)	0.82 (0.65 to 1.05)
2016–17	1.54*** (1.27 to 1.87)	1.53*** (1.22 to 1.91)	1.00 (0.78 to 1.29)
Pro-smoking attitudes <sup>f</sup>			
2013	1	1	1
2014–15	0.89 (0.71 to 1.12)	1.10 (0.83 to 1.45)	0.83 (0.62 to 1.11)
2016–17	1.09 (0.87 to 1.38)	1.09 (0.83 to 1.43)	0.67*** (0.49 to 0.91)

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

OR, odds ratio.

a Covariates included in model 1: school year, gender, age per year increase, ethnicity, FAS score.

b Covariates included in model 2: as in model 1, plus smoking status, family smoking status and friends smoking status.

c Covariates included in model 3: as in model 2, plus e-cigarette use.

d 'Tobacco accessibility' was defined as perceiving tobacco to be purchasable in shops by someone their age.

e 'Smoking norms' was defined as perceiving that friends think that it is OK for people their age to smoke.

f 'Smoking attitudes' was defined as thinking that it is OK for someone their age to smoke.

When testing for interactions between time segment and shop visit frequency (not shown), we found that young people who visited small shops frequently showed the greatest fall in perceived accessibility. Other interactions were not significant.

The focus group discussions provided insights into how young smokers accessed tobacco. This was achieved most commonly through proxy purchasing, which often involved approaching someone outside the shop (often described as a 'junkie' or 'jakey') to act as the purchaser ('jump-in') for them. At times, adult purchasers were allowed to keep the change or were given cigarettes by the young smoker. Family members were also a source of tobacco, although at times they did not providing this directly and the young smokers appeared to take the tobacco without permission:

*Get a junkie-looking guy man, an old junkie-looking guy . . .*

*For fags it's pure easy because see my bit, I have junkie flats a'round the corner fae me . . . You've literally got to walk past and ask 'will you go in for me?'*

*They always want one fag but that's the deal . . .*

*I tend to ask junkies they'll jump in a shop for you or young lassies, but mainly junkies, 'do you want to go into the shop for us and I'll give you a fag?'*

*Do they no' normally keep the change or something?*

*I'll just say 'gonna go in the shop and get fags for me, and ah'll gie ye wan', then I pretend tae tear off the wrapper an' run off . . .*

*School C1, group S2, male*

The focus group discussions conducted after 2015 suggested that access to tobacco was becoming more difficult for young people, hindering their ability to buy cigarettes directly from shops, which was possibly linked to increased test purchasing, Challenge 25, and changes in retailer practice in relation to underage sales. However, some young people also linked this to the effect of covering up of tobacco displays on young people's ability or inclination to ask for cigarettes:

*It's so you can't like see them as clearly so you're not like, 'Oh I'm going to turn around and get some cigarettes!'*

*It's like um . . . sort of not as eye drawing that you're wanting to go and get some.*

*So you don't just ask 'can I get some?', so you won't see them. If you need them you'd ask for them.*

*School C2, group S2, female*

Nevertheless, in every wave of qualitative interviews, young people reported that a few shops would sell tobacco to young people, and that on occasion the retailer waited for other customers to leave before doing so. These shops tended to be smaller and independent:

*I think if you don't look old enough they know and I think they just do it for the money and plus they see you outside the shops all the time, and they probably get fed up of standing outside the shop to stop you. So when you walk in I think they just know and they turn a blind eye and get you 'oot as fast as they can do, you know what I mean?*

*But some shops do it on the sly like they actual mean it, they get you to stand up the back and they walk down and give you them like down the back. But that's when you know it's sly . . .*

*School C1, group S4, female*

*Well, I was helping a pal. I went in for a pal. That's the only way I see it: I just went in to help a friend. Like she's smoked for like a year or two now, so it's like she went in and I think she didn't get sold, so she came back out, and I went in and got sold. And I basically . . . I just went in. I was like, 'Can I have 20 big Superkings yeah?' But he just gave me it, and he was like, 'Put it in your pocket before you leave'. I just gave him the money and put it in my pocket and took them, and I got out.*

*Yeah. I don't know how shopkeepers can be like stupid, like . . .*

*'Cause it wouldn't happen in like big shops like Asdas [Asda Stores Ltd, Leeds, UK] or that. That just wouldn't . . .*

*School C3, group S4, female*

The focus group discussions also demonstrated that both smokers and non-smokers held predominantly negative views about smoking. The young people described smoking as a disgusting, addictive and costly habit, with adverse longer-term health effects. Those who pursued active sports spoke of smoking affecting their performance, which in some instances had led them to quit tobacco. Smokers were also thought to be stigmatised by other young people in school, and were said to be 'dodgy', 'lower class' and unpopular. There was little evidence that these views had hardened after the POS display ban came into force:

*It's not good for your lungs and it's just . . . it's also not good for like you as a person because then you could get addicted to it and then not be able to stop.*

*School C3, group S2, female*

*It's pretty much why I have like nae mates, 'cause like everyone actually shuns upon smoking, and I only have like two mates 'cause of smoking. It's quite bad in that sense.*

*School C4, group S4, male*

However, some focus group participants did express positive views about smoking:

*. . . it just gave you a different feel like . . . when you started . . . you would get a nicotine rush and stuff. And then when the nicotine rush would go away you'd feel kind of calm and stuff.*

*School C3, group S2, female*

*Well, it is a disgusting habit, but it's like just the nicotine relieves stress . . .*

*. . . if we're out, it's more just because it's like the social factor. Everyone else around you's smoking.*

*School C4, group S4, female*

## Discussion

Crude data from the school survey indicated that perceived accessibility of tobacco, pro-smoking norms and pro-smoking attitudes had increased following the implementation of POS legislation. After controlling for sociodemographics and individual, family and friends' smoking status, the increase in perceived accessibility of tobacco and pro-smoking attitudes disappeared, but pro-smoking norms increased significantly after the comprehensive ban. Only when e-cigarette use was included in the final model were both the partial and the comprehensive bans seen to be followed by a decrease in perceived tobacco accessibility and a reduction in pro-smoking attitudes. The significant increase in pro-smoking norms was also eliminated. This suggests that the increase in e-cigarette use may have disrupted the impact of the legislation, particularly on processes associated with the perceived accessibility of tobacco and smoking acceptability as measured by pro-smoking attitudes.



Young people who visited small shops more frequently showed the largest reductions in perceived accessibility, but neither pro-smoking attitudes nor pro-smoking norms varied by shop visit frequency. Our focus group data support the view that the perceived accessibility of tobacco fell among young smokers and those at risk of smoking, particularly after the implementation of the comprehensive ban.

## Perceived availability of black-market tobacco

We hypothesised that one of the potential unintended consequences of the POS legislation might be an increase in the perceived availability of black-market tobacco, particularly if tobacco products were less accessible. This view had also been expressed by some members of the retailer panel. Again, using data from the school survey and focus groups, we answer the following question:

- Were there any changes in the perceived availability of black-market tobacco associated with the POS legislation?

### Method

In the school survey, we asked young people 'In the area where you live, do you know of people selling cigarettes on the black market (e.g. illegal, fake and dodgy cigarettes)?' The response options were 'yes', 'no' and 'don't know'. Using data from all school survey waves, we examined the perceived availability of black-market tobacco products among S2 and S4 pupils between 2013 and 2017.

To study the change in black-market cigarette availability, we applied a generalised estimating equations analysis, fitting an unadjusted model and a model adjusted for sociodemographic (age, gender, family affluence, school attended) and smoking-related (their own smoking status and the smoking status of their wider social circle) characteristics.

### Results

Table 12 presents the prevalence of black-market cigarette availability by survey year, and the ORs (and 95% CIs) from the unadjusted model (model 1) and the adjusted model (model 2). The prevalence of black-market cigarette availability did not change much between years, ranging from 16.0% in 2014 to 18.6% in 2017. The unadjusted and adjusted models gave similar findings; the odds of black-market tobacco availability were not significantly different from those at baseline (2013) in any subsequent year of the study. We therefore found no evidence of a change in the availability of black-market tobacco after the legislation was implemented either in large supermarkets in 2013 or in small shops in 2015.

TABLE 12 Change in availability of black-market tobacco (S2 and S4 pupils)

Year	People selling cigarettes on the black market, n (%)	Model 1 (n = 7028), OR (95% CI)	Adjusted model 2 <sup>a</sup> (n = 6764), OR (95% CI)
2013	257 (17.6)	1	1
2014	220 (16.0)	0.89 (0.73 to 1.09)	0.91 (0.74 to 1.12)
2015	247 (16.9)	0.95 (0.79 to 1.14)	1.01 (0.83 to 1.24)
2016	218 (16.3)	0.96 (0.79 to 1.17)	0.93 (0.75 to 1.15)
2017	259 (18.6)	1.13 (0.93 to 1.36)	1.08 (0.88 to 1.32)

a Adjusted for age, gender, FAS score, school, smoking status, parental smoking, sibling smoking and best friend smoking.

The focus group discussions indicated that young people interpreted 'black-market tobacco' in a number of ways, including tobacco brought back from abroad, often in bulk, and sold cheaply in the local community; counterfeit or 'fake' tobacco sold in markets or in some shops, often containing impurities and perceived to be of low quality; and cheap, imported tobacco from abroad:

*Some people get like counterfeit and it means like total fake, like it's got ... like I got one from someone and it had like a big stick in it, it's total minging!*

*Aye they put like shit and everything in them eh?*

*School C4, group S2, male*

*... somebody on the street that sells like them in huge packs. Yeah. They sell it for 50p, and it's like ... it's got Arabic on it, and that's ... it's like it's in a pack, and it's like an Amber Leaf pack, but it's in Arabic, and it's ... they sell it for 50p cause they can get it for ... so cheap.*

*It must be pretty dodgy.*

*School C4, group S2, male*

At waves 1 and 2, in particular, a small number of houses where tobacco and other goods were known to be sold unlawfully were mentioned:

*If they are cheap and they're JPS [John Player Special, John Player & Sons] they're fake ... If they're £2.50 they're fake.*

*Per 20?*

*No that's for 10 ... They're still fake if they're £2.50 ...*

*It's like his own hoose but it's like his little store as well if you know what I mean? It's like a little shop.*

*School C2, group S4, female*

From the focus group discussions, there was no evidence that the young people were more aware of black-market tobacco after the complete ban on POS promotions came into force – indeed, more accounts of black-market tobacco were provided in the earlier focus group waves – but, owing to the different views about what constitutes black-market tobacco, it is not possible to draw firm conclusions.

## Conclusions

Previous research<sup>20,21</sup> suggested that the implementation of legislation that bans POS tobacco displays is associated with a reduction in young people's brand awareness and perception of the accessibility of tobacco, but less was known about whether or not POS display bans also reduced the acceptability of smoking. In this study we have been able to show a decline in awareness of cigarette brands following both the partial and the comprehensive display bans, but only among younger pupils. We also found a reduction in the perceived accessibility of tobacco, as well as in the acceptability of smoking. However, we found no evidence that changes in the perceived accessibility of cigarettes from retailers was accompanied by any increase in black-market tobacco purchases, as had been hypothesised as a potential unintended outcome in our logic model.

The POS display ban in Scotland appears to have been successful in limiting younger pupils' awareness of brands, and in reducing both the perceived accessibility of cigarettes and pro-tobacco attitudes.

# Chapter 7 Impacts of point-of-sale legislation on young people's perceptions of smoking prevalence, smoking susceptibility and smoking initiation

## Key findings

- Young people consistently overestimated the prevalence of smoking both among their peers and among adults.
- Young people's perception of smoking prevalence among their peers was significantly lower than at baseline after both the partial and the comprehensive bans, but it did not fall between the bans.
- Young people's perception of smoking prevalence among adults also fell significantly but only after the comprehensive ban.
- Risk of smoking susceptibility in young people was significantly lower than at baseline after the implementation of both the partial and the comprehensive bans. However, the risk did not fall between the implementation of the partial ban and that of the comprehensive ban.
- Risk of smoking initiation fell after the implementation of the partial ban and continued to fall after the comprehensive ban.
- Path analysis indicated that, prior to the implementation of any tobacco display ban, tobacco retail density had a direct effect on perceived smoking prevalence, but this disappeared after the partial POS ban.
- Path analysis also showed that, after the implementation of the partial ban in large supermarkets, tobacco retailer density had an indirect effect on brand awareness through family smoking, but this was not the case after implementation of the comprehensive ban.
- This suggests that the POS bans have disrupted the links between tobacco retailer density and brand awareness and between tobacco retailer density and perceived youth smoking prevalence.

## Introduction

Evidence of the impact of POS display bans on smoking prevalence is mixed. Studies of a comprehensive POS display ban in Ireland and a partial (supermarket-only) ban in England did not find a reduction in smoking prevalence.<sup>20,100</sup> However, studies from Australia and New Zealand found a decrease in adolescent smoking 2 years after the introduction of the comprehensive ban.<sup>22,101</sup> A longer-term international European comparative study also found a significant decrease in adolescent smoking.<sup>102</sup> Hence, one of our original objectives was to assess the longer-term impact of the Scottish POS legislation on adolescent smoking prevalence. Our sample size estimates were based on smoking prevalence estimates of 4% (S2) and 15% (S4).<sup>103</sup> However, after our first wave of baseline data collection in 2013, we found that smoking prevalence (weekly) among young people in S2 and S4 was about half of that expected, at only 2.2% and 7.9%, respectively, and so our study was underpowered to detect a change in smoking prevalence. Therefore, we chose to focus on three more proximal outcome measures related to smoking prevalence: young people's perceptions of smoking prevalence among their peers and among adults, smoking susceptibility and smoking initiation. We used data from the school surveys and focus groups. Full details of the methods are in *Chapter 2, Cross-sectional school survey of school children with embedded cohorts* and *Focus group interviews with purposive samples of pupils*.

## Perceived smoking prevalence

Young people commonly overestimate the prevalence of smoking among both young people and adults and the degree of overestimation is often regarded as an indicator of the extent to which smoking is normalised.<sup>104,105</sup> Studies of the impact of POS legislation suggest that covering up tobacco displays may de-normalise smoking and reduce perceived smoking prevalence.<sup>101</sup> In this section, we answer the following research questions:

- Was the introduction of the partial and comprehensive POS display bans associated with a reduction in perceived youth and/or perceived adult smoking prevalence?
- Did shop visit frequency have an influence on these associations?

### Methods

In this analysis we used data from the DISPLAY school surveys conducted between 2013 and 2017. We restricted our analysis of cross-sectional means to S2 and S4 pupils in all survey years, which allowed a consistent comparison of perception over our time segments.

The outcome measure for our models was young people's perception of smoking prevalence. At each survey wave young people were asked two questions: (1) 'Out of 100 people your age, how many do you think smoke cigarettes or hand-rolled cigarettes at least once a week?' and (2) 'Out of 100 adults, how many of them do you think smoke cigarettes or hand-rolled cigarettes at least once a week?' A small number of responses (19 and 15, respectively) were outside the range 0–100 and were excluded from the analyses.

In the manner described in *Chapter 6, Perception of tobacco accessibility and smoking acceptability, Methods*, in the analyses of perceptions of tobacco accessibility and smoking acceptability, time was segmented into the year before the partial POS ban (2013), the years between the partial and the comprehensive POS bans (2014–15) and the years after the comprehensive POS ban (2016–17). Frequency of visits to both large supermarkets and small shops was recoded into binary variables: visit often (every day or most days) and visit less than two or three times per week.

We used mixed-effects regression models with robust standard errors to establish whether or not reductions in adolescents' perceptions of adult or youth smoking prevalence were associated with the implementation of either the partial or the comprehensive POS display ban. In the first instance, we included only the sociodemographic variables age, gender and FAS score, and the pupils' school attributes. We then included in our models smoking-related factors: smoking status, e-cigarette use, family and friends' smoking status, and susceptibility to smoking.

Further models were tested that included variables for frequency of visits to supermarkets and small shops. In these models, we tested the interaction effect between the frequencies of shop visits and the introduction of the partial and comprehensive bans (i.e. with our time segments) on the pupils' perceptions of smoking prevalence.

### Results

*Table 13* shows that pupils' estimates of peer smoking and adult smoking fell from 38.1% and 58.5%, respectively, at baseline (2013) to 36.7% and 56.1%, respectively, in the time segment 2016–17. The pupils' estimates of smoking prevalence are considerably higher than the prevalence estimates in 2016 national data for Scotland, which show that in 2016 smoking prevalence among 13-year-olds was only 2% and among 15-year-olds was 9%,<sup>106</sup> and that adult smoking prevalence was 18% in 2017.<sup>107</sup>

The results of the regression analyses are shown in *Table 14*. We developed two models each for both perceived smoking prevalence among peers and perceived smoking prevalence among adults. The first model adjusted for sociodemographics and individual and family and friends' smoking status.

TABLE 13 Change in mean perceived smoking prevalence (S2 and S4 pupils)

Population group	Time segment (%)			
	2013 (n = 1056)	2014–15 (n = 1895)	2016–17 (n = 1899)	All segments (n = 4850)
Among peers	38.1	36.1	36.7	36.8
Among adults	58.5	57.8	56.1	57.3

TABLE 14 Change in perceived smoking prevalence among peers and among adults after the POS legislation

Variable	Smoking prevalence among peers, coefficient (95% CI)		Smoking prevalence among adults, coefficient (95% CI)	
	Adjusted model 1 <sup>a</sup>	Adjusted model 2 <sup>b</sup>	Adjusted model 1 <sup>a</sup>	Adjusted model 2 <sup>b</sup>
2013 (pre ban)	0	0	0	0
2014–15 (pre comprehensive ban)	-2.95*** (-4.31 to -1.60)	-3.44*** (-4.82 to -2.06)	-0.94 (-2.20 to 0.32)	-1.19* (-2.5 to 0.1)
2016–17 (post comprehensive ban)	-2.16*** (-3.54 to -0.79)	-2.90*** (-4.34 to -1.47)	-1.33** (-2.60 to -0.05)	-1.70*** (-3.0 to -0.4)
Observations	9629	9629	9629	9629

\* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

a Adjusted for age, ethnicity, gender, FAS score, pupil's school attributes, family and friends' smoking status and smoking susceptibility, plus cigarette use.

b Adjusted for age, ethnicity, gender, FAS score, pupil's school attributes, family and friends' smoking status and smoking susceptibility, plus cigarette and e-cigarette use.

In the second model, e-cigarette use was also included as a covariate. Table 14 shows that the decline in smoking prevalence was significant in both models, but was greater when e-cigarettes were included. Thus, in the fully adjusted model (e-cigarettes included), peer smoking prevalence fell by 3.4% (95% CI -4.8% to -2.1%) following the partial POS ban (supermarkets) and by 2.9% (95% CI -4.3% to -1.5%) following the comprehensive ban (small shops), compared with the pre-ban period. However, it can be seen that the fall in perception of the prevalence of smoking among adults after the partial ban became significant only after controlling for e-cigarette use (coefficient -1.7, 95% CI -3.0 to -0.4).

The perception of smoking prevalence among peers varied significantly by frequency of visits to tobacco outlets. It was significantly lower than pre-ban only among those adolescents who visited supermarkets (coefficient -2.4, 95% CI -3.9 to -0.8) or small shops (coefficient -3.1, 95% CI -4.9 to -1.2) less often. The perception of smoking prevalence among both peers and adults showed no significant reduction among young people who visited outlets frequently.

In the focus group discussions, young people were asked about the prevalence of smoking among their peers, family members and local communities. As those who were recruited to the focus groups were smokers or those perceived to be at risk of smoking, it might be argued that they might overestimate smoking prevalence. The young people identified the school years in which smoking appeared to be most common. These tended to be the upper school years, from S4 to S6 (aged 15–18 years). Throughout the project, young people also reported communities in which 'everybody smokes', as well as areas in which smoking was very uncommon. On the whole, the young people did seem to overestimate smoking prevalence, particularly in the wider community, but there was little evidence that this changed over time.

## Discussion

We found that young people greatly overestimated the prevalence of smoking both among their peers and among adults. Perception of peer smoking at each school varied from 28.1% to 44.4% in the 2014–15 time period. In the same period, perception of adult smoking varied from 49.5% to 65.2%. At ward level, the highest prevalence at any ward in the whole of Scotland among adults was 37.3% for the period 2012–15, which is lower than any of the perceived adult smoking average by any school. Data on smoking prevalence at a ward level are not available for young people, but, given that the national prevalence of smoking in 2016 was 2% among 13-year-olds and 9% among 15-year-olds, young people's estimates of youth smoking prevalence far exceed local youth smoking prevalence.

The observed overestimation of smoking prevalence is consistent with the 'normalisation' of smoking behaviour, which has been attributed in part to the widespread availability of tobacco retailers and the promotion of tobacco through POS displays.<sup>20</sup> Perceived smoking prevalence among young people fell significantly both after the partial ban and after the comprehensive ban. However, perceived smoking prevalence among adults fell only after the implementation of the comprehensive ban and only after controlling for use of e-cigarettes. Our results mirror those of other POS studies that found a decline in perception of smoking prevalence.<sup>101,102</sup> However, our results again suggest that e-cigarette use may have disrupted the impact of the POS legislation on the de-normalisation of smoking behaviour.

Nevertheless, in our study we also found that there was no significant reduction among young people who regularly frequented small shops. In *Chapter 5*, we saw that, whereas the POS display ban had led to a reduction in the visibility of tobacco products, exposure to the storage units had decreased only slightly. The results reported here suggest that frequent exposure to tobacco storage units, which promote tobacco as a generic product, may contribute to the continued normalisation of smoking.

## Smoking susceptibility

Susceptibility to smoking is defined as the lack of a firm commitment not to smoke and it can therefore be useful for predicting which young people may become smokers. Susceptible young people are more likely to experiment with tobacco and to become regular smokers than the non-susceptible young people.<sup>108</sup> Cross-sectional research has found a strong association between noticing POS displays and smoking susceptibility among young people.<sup>100</sup> In longitudinal analyses the same association has been demonstrated.<sup>88</sup> Although rates of current smoking among adolescents in the UK are very low, rates of susceptibility in late adolescence remain high, which suggests that some may go on to smoke, for example, after leaving secondary school, probably reflecting delayed initiation.<sup>88</sup>

In this section, we answer the following questions:

- Was the introduction of comprehensive POS legislation associated with a reduction in smoking susceptibility among young people?
- Did shop visit frequency influence the association between the introduction of comprehensive POS legislation and smoking susceptibility?

## Methods

In this analysis, we used data from the DISPLAY schools surveys conducted between 2014 and 2017. The primary outcome measure in our models was the risk of the young person becoming susceptible to smoking in the year after they entered the study. Consequently, the analysis is restricted to young people who were non-susceptible never-smokers on entry to the study ( $n = 2409$ ). Data from the 2013 baseline survey were not included in the analysis as none of the participants in that wave was sampled in the 2014 wave (see *Chapter 2, Survey design*, and *Table 3*).

Our outcome variable, susceptibility to smoking, was measured using the answers to two questions, 'If one of your friends offered you a cigarette or hand-rolled cigarettes (roll-ups), would you smoke it?' and 'Do you think you will smoke a cigarette or hand-rolled cigarettes (roll-ups) at any time during the next year?', to which the young person could respond 'definitely yes', 'probably yes', 'probably not' or 'definitely not'. Any answer other than 'definitely not' for either of the questions indicated smoking susceptibility. If one of the responses was negative for susceptibility but the other response was missing, then the respondent was coded as missing for susceptibility.

The analysis was conducted using discrete time survival methods. We elected to use survival analysis as it enabled us to make use of information on cases that are censored (i.e. we included in the analysis participants who had not experienced the event before the end of the study) as long as the censoring was non-informative (i.e. unrelated to the outcome). We first examined the life tables to determine the proportion of young people who remained non-susceptible never-smokers for each year under observation. We then examined the effect of shop visit frequency on susceptibility using Kaplan–Meier survival estimates. Complementary log-log models were then used to examine the effect of year of entry to the study on susceptibility, with full adjustment made for other predictors of smoking susceptibility. Complementary log-log models were selected as this approach is deemed most suitable for discrete observations in an underlying continuous process.<sup>109</sup>

The event for which participants were 'at risk' was becoming susceptible to smoking. The sample consisted of all participants who were non-susceptible never-smokers on entry to the study. When a participant reported at the next wave that they either were susceptible to smoking (as defined above) or had smoked since the previous survey wave, then they were coded as the event having occurred. If a participant reported ever smoking, it was assumed that they had passed through a stage of susceptibility before doing so.

The independent variable was the year the young person entered the study. We hypothesised that young people who entered the study before the full ban, that is, up to 2015, would have higher odds of becoming susceptible to smoking than young people who entered the study after the full ban.

We also included an interaction effect between shop visit frequency and the year of entry to study, as we hypothesised that shop visit frequency would have a greater effect on probability of susceptibility before the ban than after it.

## Results

From the life tables we found that 73% of young people remained non-susceptible after 1 year in the study, 51% remained non-susceptible after 2 years and 36% remained non-susceptible after 3 years.

The results of the discrete survival analysis are presented in *Table 15*. Model 1 shows that the effect of year of entry to the study on the risk of becoming susceptible to smoking is highly significant. Young people who entered the study in 2016 after the introduction of the comprehensive ban were much less likely to become susceptible to smoking in the following year than young people who entered the study in 2014 (adjusted hazard ratio 0.42, 95% CI 0.32 to 0.54) when only the partial ban was in place. In model 2, we assessed whether or not there was an interaction between year of entry to the study and shop visit frequency. The interaction effect is not significant as measured by the hazard ratio; however, when examining the marginal probabilities, a significant interaction effect can be seen.

*Figure 6* compares the predictive margins for frequent and infrequent small-shop visitors. It suggests significant differences in the probability of becoming susceptible among young people entering the study in 2014 (pre ban), and the effect of shop visit frequency diminishes after the implementation of the POS ban first in supermarkets and then in small shops ( $\chi^2$  for contrasts of predictive margins = 4.12;  $p = 0.047$ ).

TABLE 15 Change in risk of smoking susceptibility by year of entry to the study

Variable	Adjusted model 1, <sup>a</sup> hazard ratio (95% CI)	Adjusted model 2, <sup>a</sup> hazard ratio (95% CI)
Year entered study		
2014 (post partial ban)	1	1
2015 (pre comprehensive ban)	0.58*** (0.48 to 0.70)	0.57*** (0.46 to 0.72)
2016 (post comprehensive ban)	0.42*** (0.32 to 0.54)	0.45*** (0.32 to 0.61)
Small-shop visit frequency		
Infrequent	1	1
Frequent	1.72*** (1.50 to 1.97)	1.75*** (1.40 to 2.18)
Interaction		
Enter study 2015 × frequently visit shops		1.02 (0.77 to 1.36)
Interaction		
Enter study 2016 × frequently visit shops		0.85 (0.58 to 1.27)
Observations	3397	3397

\*\*\**p* < 0.001.

a Adjusted for age, ethnicity, gender, FAS score, pupil's school attributes, and family and friends' smoking status.

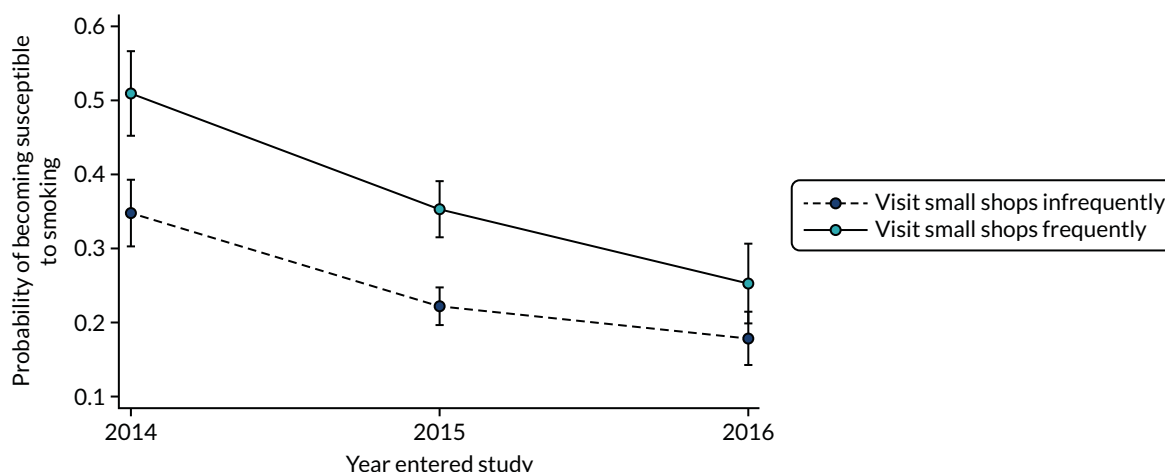


FIGURE 6 Comparison of predictive margins of risk of becoming susceptible to smoking by year of entry into study and frequency of visiting small shops.

As in the previous two analyses, we assessed a third model that included the use of e-cigarettes as a covariate. However, this made only a marginal difference to smoking susceptibility and was therefore rejected.

We also assessed an interaction effect between FAS score and the year of entry to the study (not shown) to assess whether or not there were any differential impacts of socioeconomic status on probability of susceptibility. However, this interaction was also found not to be significant.

**Discussion**

To our knowledge, this is the first study to look at the effect of a comprehensive ban on POS tobacco marketing on the risk of young people becoming susceptible to smoking. We found that young people who entered the study in 2016 after the comprehensive ban was in place were less likely to become



susceptible to smoking in the following year than participants who entered the study in 2014 when there was only a partial ban. Participants who entered the study in 2015 before the comprehensive ban were also less likely to become susceptible to smoking in the following year than those who entered in 2014. We hypothesised that, if the POS display ban causes a decrease in smoking susceptibility, the effect of shop visit frequency on smoking susceptibility should diminish after the comprehensive ban. This was indeed the case, with the difference in probability that young people would become susceptible to smoking between those who visited shops frequently and those who did not being significantly reduced in 2016 compared with 2014. This effect was significant only in the predicted marginal probabilities analysis and not in the hazard ratios. In addition, we found no evidence that the POS legislation increased inequalities in smoking susceptibility.

## Smoking initiation

Exposure to POS tobacco displays has been shown to be associated with smoking initiation in young people.<sup>100</sup> Using the same approach as that used with smoking susceptibility (see *Smoking susceptibility*), we investigated whether or not the POS display ban disrupted the association between exposure to tobacco retail outlets and risk of smoking initiation.

In this section, we answer the following questions:

- Was the introduction of the comprehensive POS legislation associated with a reduction in the risk of smoking initiation in young people?
- Did shop visit frequency influence the association between POS legislation and risk of smoking initiation?

## Methods

In this analysis we used the DISPLAY schools survey data for the years 2014–17. The analysis was restricted to young people who had never smoked on entry to the study ( $n = 8214$ ). As in the susceptibility study, analysis used discrete time survival methods. We first examined the life tables to determine the proportion of young people who remained never-smokers for each year under observation. We then examined the effect of small-shop visit frequency on susceptibility using Kaplan–Meier survival estimates.

Complementary log-log models were then used to examine the effect of year of entry to the study on smoking initiation, with full adjustment made for other predictors of smoking susceptibility. As noted above, this was regarded as the most suitable approach for analysing discrete observations on an underlying continuous process.<sup>109</sup> The event for which participants were ‘at risk’ was smoking initiation. When a participant reported at a survey wave that they had smoked since the previous survey wave, they were coded as the event having occurred.

The independent variable in the analysis was the year of entry into the study. We hypothesised that young people who entered the study before the comprehensive ban was in place (up to 2015) would have higher odds of smoking initiation than young people who entered the study after the comprehensive ban was in place.

We also included an interaction effect between small-shop visit frequency and the year of entry to study, as we hypothesised that shop visit frequency would have a greater effect on probability of smoking initiation before the ban than after the ban.

## Results

From the life tables we found that 87.8% of young people remained never-smokers after 1 year in the study, 72.4% after 2 years, and 59.3% were still never-smokers after 3 years in the study.

The results of the discrete survival analysis are presented in *Table 16*. Model 1 shows the effect of year of entry to the study on risk of smoking initiation without interaction effects. The year of entry to the study is highly significant. Both young people who entered the study in 2015 and those who entered in 2016 were much less likely to initiate smoking in the following year than young people who entered the study in 2014 (adjusted hazard ratio 0.72, 95% CI 0.59 to 0.88,  $p < 0.01$ ; and adjusted hazard ratio 0.35, 95% CI 0.25 to 0.48,  $p < 0.01$ ). Model 2 shows the effect of adding an interaction term between year of entry to study and shop visit frequency. The year of entry into the study remains highly significant but the interaction effect is not significant when measured by the hazard ratio; however, when examining the marginal probabilities, a significant interaction effect can be seen.

*Figure 7* compares the predictive margins for frequent and infrequent small-shop visitors. It suggests a significant difference in probabilities of smoking initiation by frequency of shop visits among young people when they entered the study in 2014 (pre ban). This significant difference in probabilities of

TABLE 16 Change in risk of smoking initiation by year of entry to the study

Variable	Adjusted model 1, <sup>a</sup> hazard ratio (95% CI)	Adjusted model 2, <sup>a</sup> hazard ratio (95% CI)
Year entered study		
2014 (post partial ban)	1	1
2015 (pre comprehensive ban)	0.72*** (0.59 to 0.88)	0.60*** (0.46 to 0.72)
2016 (post comprehensive ban)	0.35*** (0.25 to 0.48)	0.27*** (0.17 to 0.42)
Small-shop visit frequency		
Infrequent	1	1
Frequent	1.78*** (1.51 to 2.1)	1.44*** (1.12 to 1.86)
<b>Interaction terms</b>		
Entered study 2015 × frequently visit shops	-	1.38 (0.99 to 1.91)
Entered study 2016 × frequently visit shops	-	1.56 (0.92 to 2.64)
Observations	7480	7480

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .  
 a Adjusted for age, ethnicity, gender, FAS score, pupil's school attributes, and family and friends' smoking status.

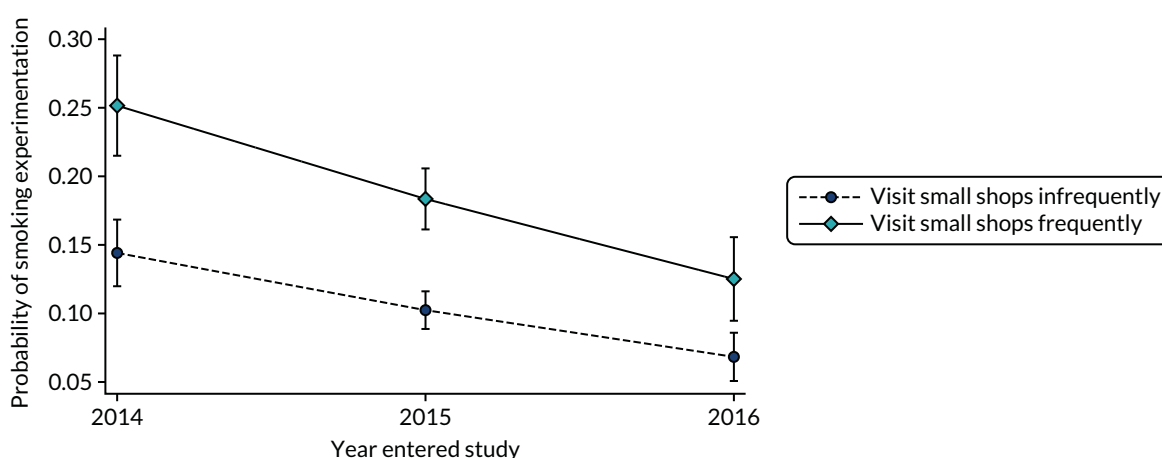


FIGURE 7 Comparison of predictive margins of risk of becoming an ever-smoker by year of entry to the study and frequency of visiting small shops.

smoking initiation by shop visit frequency remained in 2015 and 2016 but was attenuated slightly by 2016 after the implementation of the comprehensive ban ( $\chi^2$  for contrasts of predictive margins = 11.99;  $p = 0.0025$ ).

As in the analysis of smoking susceptibility, the inclusion of e-cigarette use as a covariate resulted in a marginal reduction in effect of year of entry on smoking initiation, but as the effect was very small the model was rejected. We then assessed whether or not there was an interaction between year of entry into the study and FAS score (not included), but again the interaction effect was found not to be significant.

### Discussion

The introduction of the comprehensive POS display ban was associated with a significant reduction in the proportion of young people transitioning from never having smoked to smoking initiation. We found that young people who entered the study in 2016, after the comprehensive ban was in place, were less likely to initiate smoking in the following year than young people who entered the study in 2014, prior to implementation. We also found that frequent visits to small shops were associated with an increased likelihood of smoking initiation but there was a significant reduction in the strength of this association after the comprehensive ban was implemented.

As noted in *Chapter 1, Original research question*, one of our research questions asked whether or not a reduction in exposure to POS advertising was associated with changes in smoking prevalence among young people aged 12–17 years. At the time the study was designed in 2011, the available data used in the power calculation suggested that the sample size we selected was sufficient to detect differences in smoking prevalence over time. However, we underestimated the rate of decline in youth smoking prevalence that occurred over the study period 2012–17, and therefore the study was not powered to detect changes in smoking in prevalence associated with implementation of the POS legislation.

## Paths to impact

### Introduction

A number of studies have found a significant positive relationship between exposure to tobacco retailing surrounding the home and smoking outcomes in adolescents,<sup>110</sup> but the mechanisms behind this association are poorly understood. One study showed direct effects, whereby greater tobacco retailer density was associated with higher brand awareness in never-smokers, and indirect effects through higher smoking among family and friends.<sup>111</sup> However, this study was at a single time point and therefore unable to explore differences in tobacco marketing practices either temporally or spatially. In this analysis, we used a repeated cross-sectional design to understand whether or not the tobacco visibility weighted outlet density (as explained in *Chapter 5, Point-of-sale tobacco visibility tool, Results*) was associated with the proximal smoking outcomes of brand awareness and perceived youth smoking prevalence for each year of the study (2013–2017). The hypothesised structural equation model is shown in *Figure 8*. It describes the relationship between tobacco outlet density, individual characteristics and proximal smoking outcomes.

### Research questions

In this section, we answer the following research questions:

- What was the direct relationship between tobacco retailer density and brand awareness and perceived youth smoking prevalence before, during and after the POS ban?
- What was the indirect relationship between tobacco retailer density, and brand awareness and perceived youth smoking prevalence before, during and after the POS ban?
- How were these associations modified by frequency of small-shop visits?

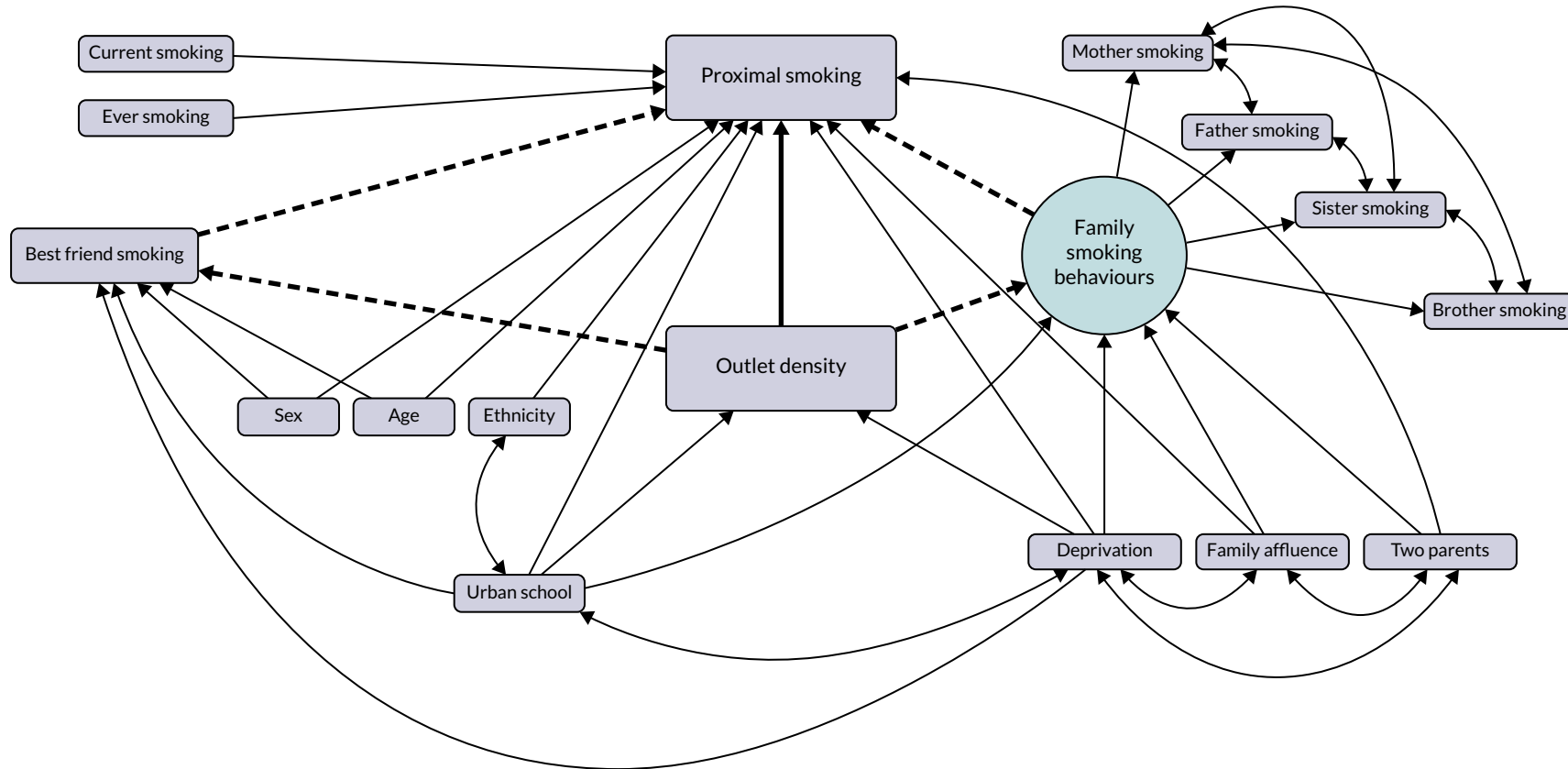


FIGURE 8 Structural equation model for pathways from tobacco retailer density and proximal smoking. Rectangles indicate measured variables, ellipses indicate latent variables, bold arrows indicate direct effects, bold dashed lines indicate indirect effects and curved lines indicate covariances.

## Methods

We used repeated cross-sectional samples of participants in S2 and S4 for 2013 ( $n = 1482$ ), 2014 ( $n = 1403$ ), 2015 ( $n = 3807$ ), 2016 ( $n = 3790$ ) and 2017 ( $n = 3861$ ). We excluded those with no density values (i.e. where the postcode was missing or incorrect).

We developed a structural equation model (see *Figure 8*) to examine the association between tobacco retailer density, weighted by total product visibility, and two proximal smoking outcomes. We hypothesised that declines in tobacco visibility as a result of the POS display ban would reduce the significance of both direct and indirect pathways between outlet density and the proximal smoking outcomes – brand awareness (as defined in *Chapter 6, Brand awareness prior to introduction of point-of-sale legislation, Method*) and perceived smoking prevalence (as defined in *Perceived smoking prevalence, Methods*) – among young people.

These outcomes were chosen as they show awareness of tobacco as a product and of smoking as a behaviour. We defined two mediators: whether or not the participant's best friend smoked and whether or not someone in their family smoked (a latent variable from mother, father, brother and sister smoking status). We used age, sex, ethnicity, urban/rural status of the school, current smoking status, SIMD deprivation quintile, FAS score and family structure (whether or not the participant lived with two parents) as covariates. We defined small-shop visitation (whether they visited more than once a week) as an effect modifier and ran separate stratified models based on this variable. The models were run in a complete-case analysis.

## Results

Analysis of crude trends in our data showed that brand awareness declined during the study period, whereas perceived youth smoking prevalence declined from 2013 to 2016, and rose in 2017. The prevalence of family members smoking also declined over the study period, but smoking among young people's best friends declined to 2015 and then rose year on year to 2017.

The results from the structural equation modelling indicate that, for most years, there were no significant associations between tobacco retailer density and either brand awareness or perceived youth smoking prevalence (*Tables 17 and 18*). However, we found a direct effect of tobacco retailer density on perceived youth smoking prevalence in 2013. For every SD increase in density, the perceived prevalence of youth smoking would be expected to increase by 0.17 (95% CI 0.03 to 0.31) of its own SD (24.29) from its own mean (38.67), holding all other paths constant (see *Table 17*). We also found evidence of an indirect effect of tobacco retailer density increasing brand awareness by 0.10 (95% CI 0.02 to 0.18; SD 0.057; mean 0.052) through a family smoking pathway in 2014 (see *Table 18*). Importantly, these effects were found only in young people who reported a high frequency of visiting small shops.

## Discussion

We found support in the data for a direct association between tobacco retailer density and perceived smoking prevalence before the implementation of the partial POS tobacco display ban in early 2013, and an indirect association through family smoking in 2014 before the implementation of the complete POS ban. However, this was among only those young people who visited small shops frequently and were therefore most exposed to tobacco marketing at POS. No significant effects were found after the comprehensive ban in 2016 or 2017. Our results suggest that the impact of tobacco retailer density on brand awareness is largely mediated by family smoking. This was also found in a study using another neighbourhood characteristic, deprivation.<sup>112</sup> Taken together, these findings suggest that, although a direct effect of legislation can be immediate, indirect effects through social networks can continue the impact on adolescent tobacco and smoking awareness for years after, highlighting the need to continue to emphasise reducing parental smoking in tobacco control policy. In conclusion, the POS ban may have disrupted the link between tobacco retailer density and brand awareness and perceived smoking prevalence. Further research is required to determine whether or not the POS ban has disrupted the link between tobacco retailer density and smoking susceptibility and smoking initiation.

TABLE 17 Standardised structural equation model of effects of tobacco retailer density on young people's perceptions of youth smoking prevalence

Effect	Year, standardised coefficient (95% CI)									
	2013 (n = 1482)		2014 (n = 1403)		2015 (n = 3807)		2016 (n = 3790)		2017 (n = 3861)	
	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>
Direct	0.06 (-0.02 to 0.14)	<b>0.17</b> <b>(0.03 to 0.31)*</b>	-0.01 (-0.11 to 0.08)	-0.08 (-0.22 to 0.05)	-0.04 (-0.12 to 0.03)	-0.02 (-0.08 to 0.04)	0.05 (-0.03 to 0.13)	-0.02 (-0.07 to 0.04)	0.05 (-0.01 to 0.11)	0.02 (-0.05 to 0.10)
Indirect best friend smoking	0.00 (-0.01 to 0.01)	-0.01 (-0.04 to 0.01)	0.00 (-0.01 to 0.01)	0.01 (-0.02 to 0.05)	0.00 (-0.00 to 0.00)	-0.00 (-0.01 to 0.00)	-0.00 (-0.01 to 0.00)	0.00 (-0.01 to 0.01)	-0.00 (-0.01 to 0.00)	0.00 (-0.00 to 0.01)
Family smoking	-0.00 (-0.01 to 0.1)	-0.02 (-0.08 to 0.04)	0.01 (-0.02 to 0.04)	-0.00 (-0.05 to 0.05)	0.00 (-0.00 to 0.01)	-0.00 (-0.01 to 0.00)	0.01 (-0.01 to 0.02)	-0.01 (-0.02 to 0.00)	-0.01 (-0.02 to 0.01)	0.00 (-0.00 to 0.01)
Total	0.06 (-0.03 to 0.14)	<b>0.13</b> <b>(0.01 to 0.26)*</b>	0.00 (-0.09 to 0.10)	-0.07 (-0.21 to 0.07)	-0.02 (-0.08 to 0.02)	0.00 (-0.01 to 0.02)	0.06 (-0.02 to 0.13)	-0.03 (-0.02 to 0.17)	0.04 (-0.02 to 0.10)	0.02 (-0.05 to 0.01)

\*p < 0.05.  
a Frequent is defined as more than once per week.  
Bold indicates significant result.

TABLE 18 Standardised structural equation model of effects of tobacco retailer density on brand awareness

Effect	Year, standardised coefficient (95% CI)									
	2013 (n = 1482)		2014 (n = 1403)		2015 (n = 3807)		2016 (n = 3790)		2017 (n = 3861)	
	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>	Infrequent small-shop visits	Frequent small-shop visits <sup>a</sup>
Direct	0.0 (-0.07 to 0.07)	-0.13 (-0.27 to 0.02)	-0.01 (-0.01 to 0.07)	-0.12 (-0.25 to 0.00)	-0.03 (-0.10 to 0.03)	-0.01 (-0.06 to 0.04)	-0.02 (-0.09 to 0.05)	0.04 (-0.01 to 0.09)	-0.03 (-0.08 to 0.02)	0.02 (-0.04 to 0.08)
Indirect best friend smoking	0.00 (-0.03 to 0.02)	0.00 (-0.00 to 0.01)	0.00 (-0.00 to 0.01)	0.00 (-0.01 to 0.02)	0.00 (-0.00 to 0.00)	-0.00 (-0.01 to 0.00)	-0.00 (-0.00 to 0.06)	-0.00 (-0.00 to 0.00)	-0.00 (-0.01 to 0.00)	0.00 (-0.01 to 0.02)
Family smoking	-0.01 (-0.03 to 0.02)	0.07 (-0.03 to 0.17)	0.02 (-0.01 to 0.05)	<b>0.10</b> <b>(0.02 to 0.18)*</b>	0.02 (-0.00 to 0.05)	-0.01 (-0.02 to 0.01)	0.02 (-0.01 to 0.06)	-0.00 (-0.02 to 0.01)	-0.01 (-0.02 to 0.00)	0.01 (-0.0 to 0.02)
Total	-0.01 (-0.08 to 0.07)	0.07 (-0.03 to 0.17)	0.01 (-0.07 to 0.09)	-0.02 (-0.13 to 0.10)	-0.01 (-0.07 to 0.05)	-0.02 (-0.06 to 0.03)	0.01 (-0.06 to 0.07)	0.03 (-0.02 to 0.01)	-0.04 (-0.04 to 0.08)	0.03 (-0.04 to 0.09)

\*p < 0.05.  
a Frequent is defined as more than once per week.  
Bold indicates significant result.

## Conclusion

Our analyses found that young people greatly overestimated the prevalence of smoking among both their peers and adults, but both of these overestimations reduced significantly following the introduction of the comprehensive POS ban. We also found that young non-smokers who entered the study after the comprehensive ban was in place were less likely in the following year either to (1) become susceptible to smoking or (2) transition from never having smoked to smoking initiation than participants who entered the study when only the partial ban was in place.

Young people's frequency of visiting small shops had an impact on all the three outcomes relating to smoking prevalence discussed in this chapter. Only the young people who visited small shops less often exhibited a significant reduction in their perceptions of smoking prevalence after the comprehensive ban. We conclude that young people who visit small shops frequently continue to be exposed to tobacco as a generic product at POS, which helps maintain the perception that smoking behaviour is still very common. However, our research also showed that the effect of shop visit frequency on individual smoking susceptibility, and to a lesser extent on smoking initiation, diminished after the comprehensive ban. The analysis of paths to impact of the POS legislation suggests that it may have disrupted the link between tobacco retailer density and brand awareness and perceived smoking prevalence, but only among frequent visitors to small shops. Further research is required to determine whether or not the POS ban has also disrupted the link between tobacco retailer density and smoking susceptibility and smoking initiation.





# Chapter 8 Changing retail and sociocultural landscapes

## Key findings

- The awareness and use of e-cigarettes among young people rose sharply during the study period.
- Young people reported that e-cigarettes were prominent and ubiquitous in the retail environment.
- Young people recalling seeing e-cigarettes for sale in small shops and on the internet is positively associated with them trying e-cigarettes.
- Among young never-smokers, using e-cigarettes is positively associated with subsequently trying combustible cigarettes.
- The transition from use of e-cigarettes to smoking initiation is mediated by increases both in the number of smokers in their friendship groups and in pro-smoking attitudes.
- In early 2017, about one in five young people recalled seeing a standardised pack of cigarettes. They thought that standardised packs may dissuade young non-smokers but would not affect older, more dependent smokers.

## Introduction

As noted in *Chapter 1*, two important developments occurred during the course of the study that affected both the tobacco retail environment specifically and the wider sociocultural landscape. E-cigarette use increased rapidly in the general population and legislation was passed that required all tobacco products to be sold in standardised packaging.

In this chapter, we answer the following research questions relating to e-cigarettes and standardised packaging:

- What are the patterns and trends in e-cigarette use among young people aged 12–17 years?
- What are the influences on developing social norms among adolescents around e-cigarettes and their use?
- Is there a relationship between exposure to e-cigarette promotions and e-cigarette use among young people aged 12–17 years?
- Is there a relationship between e-cigarette use and future smoking initiation in never-smokers aged 12–17 years?
- What is the level of awareness of standardised packs among young people aged 12–17 years?
- What are young people's reactions to the new standardised packs and pictorial health warnings?

## Methods

The results presented here are based on both the school survey and the focus group data. The general methods for the school survey and focus groups are presented in *Chapter 2* in *Cross-sectional school survey of school children with embedded cohorts* and *Focus group interviews with purposive samples of pupils*.

## Results

### *Patterns and trends in e-cigarette use*

Following spontaneous discussions about e-cigarettes in 3 of the 16 focus groups conducted in 2013, questions on e-cigarettes were added to the school survey in 2014. Regarding e-cigarette awareness, young people were given the following statement and question: 'An e-cigarette/vapouriser/shisha pen is a tube that may look like a normal cigarette. An e-cigarette or vapouriser may have a glowing tip and puffs a vapour that looks like smoke but, unlike normal cigarettes, they don't burn tobacco. Have you ever heard of e-cigarettes/vapourisers/shisha pens?' To this they could respond 'yes I have', 'no I have not' or 'don't know'. The question related to e-cigarette use was 'Which one of the following is closest to describing your experience of e-cigarettes/vapourisers/shisha pens?', for which the response options were 'I have never used them', 'I have tried them once or twice', 'I use them sometimes (more than once a month)' or 'I use them often (more than once a week)'. During the DISPLAY study period, there was a sharp increase in the awareness and use of e-cigarettes among young people. Awareness of e-cigarettes increased from 74.7% (1028/1376) in 2014 to 85.1% (3226/3702) in 2016. Young people who responded that they had not heard of e-cigarettes or did not know whether they had heard of them were recoded as never having used them. *Table 19* shows the change in frequency of use between 2014 and 2016.

It can be seen that the proportion of young people who had used e-cigarettes steadily increased over time from 14% to 28%. However, it should be noted that the majority of young people had tried e-cigarettes only once or twice. Nevertheless, the proportion of young people using e-cigarettes more than once per month increased from 3.9% in 2014 to 8.3% 2 years later.

In the 2017 survey, the question about awareness was dropped from the questionnaire and the response categories about frequency of use were changed to allow us to capture previous as well as current e-cigarette use. *Table 20* shows the frequencies of e-cigarette use responses in 2017.

It can be seen that, by 2017, the proportion of young people who had ever used e-cigarettes increased further, to 33.7%. Thus, by 2017, a greater proportion of young people had tried an e-cigarette than had tried a conventional cigarette (21.1%).

### *Socioeconomic patterning of e-cigarette use and smoking*

There was some evidence of socioeconomic patterning in e-cigarette use. Young people with high FAS scores were less likely on average to have tried e-cigarettes across all survey waves. This was ascertained using a logistic regression with FAS score, survey year, FAS score/survey wave interaction and robust standard errors for repeated measures on some participants (adjusted odds ratio for high FAS score vs. low FAS score 0.57, 95% CI 0.39 to 0.83).

*Figure 9* shows the proportion of young people in S2 and S4 (i.e. aged 13 and 15 years) who had tried an e-cigarette by survey wave and by FAS score tertile.

TABLE 19 Change in young people's use of e-cigarettes over survey waves 2014–16

Frequency of e-cigarette use	Year, n (%)		
	2014	2015	2016
Never used	1177 (85.7)	3008 (80.6)	2662 (70.2)
Ever used	196 (14.3)	726 (19.4)	1043 (28.2)
Tried once or twice	143 (10.4)	569 (15.2)	729 (19.7)
Used more than once per month	35 (2.6)	113 (3.0)	205 (5.5)
Used more than once per week	18 (1.3)	44 (1.2)	104 (2.8)
Total	1373 (100)	3734 (100)	3705 (100)

TABLE 20 Young people's use of e-cigarettes in 2017

Frequency of e-cigarette use	2017, n (%)
Never used	2501 (66.3)
Ever used	1199 (33.7)
Tried once or twice	736 (19.5)
Used them sometimes in the past	186 (4.9)
I occasionally use them	123 (3.3)
I use them at least once per month	59 (1.6)
I use them at least once per week	95 (2.5)
Total	3700 (100)

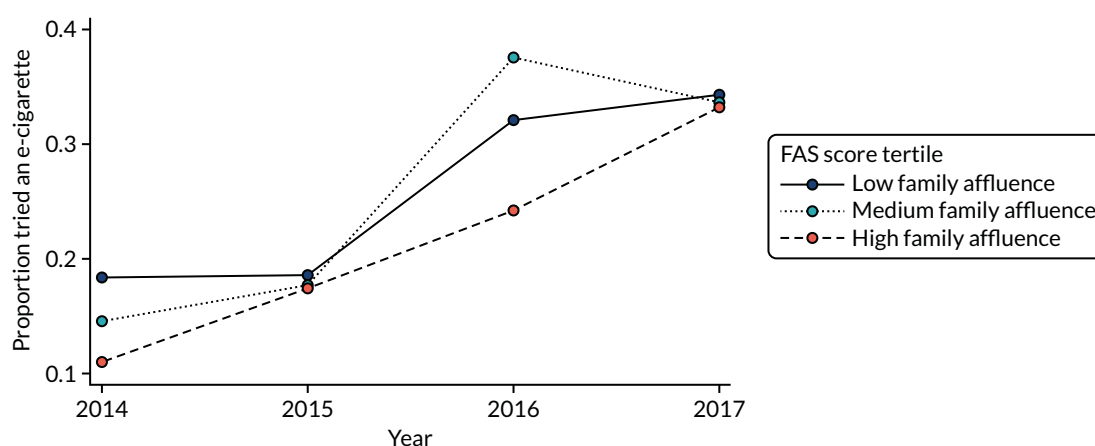


FIGURE 9 E-cigarette use by FAS score tertile.

The increase over time in the proportion of young people who had tried an e-cigarette can be seen clearly in *Figure 9*. There is some socioeconomic patterning in that those with a high FAS score have the lowest probability of trying e-cigarettes, but there is no significant interaction with time, suggesting that this pattern is fairly constant over the survey waves.

The proportion of young people in S2 and S4 (i.e. aged 13 and 15 years) who had tried smoking fell from 23.9% in 2013 to 15.3% in 2015 but then increased to 21.7% in 2017. The interaction between smoking prevalence by survey wave and FAS score is also shown below for comparison *Figure 10*. A logistic regression analysis found that there was a significant difference in the probability of having tried a cigarette between 2013 and 2015, and between 2013 and 2016, but no difference between 2013 and 2017. *Figure 10* shows that there was a slight drop in prevalence and then a recovery. The patterning by FAS score in probability of having tried smoking is not statistically significant.

### Exposure to e-cigarettes

During the DISPLAY study, the e-cigarette market underwent a period of substantial growth internationally<sup>113</sup> and the number of convenience-type stores stocking and displaying e-cigarettes markedly increased.<sup>114,115</sup> The retail audit element of the DISPLAY study found that around 77% of tobacco retailers sold e-cigarettes in 2014 and around 49% had e-cigarette POS displays.<sup>116</sup> The increase in awareness and use of e-cigarettes is mirrored in the focus group discussions with S2 and S4 pupils. During the first wave of focus groups in 2013, e-cigarettes were mentioned spontaneously by individuals in only three of the eight focus groups, but in the following year they were discussed in nearly every group.

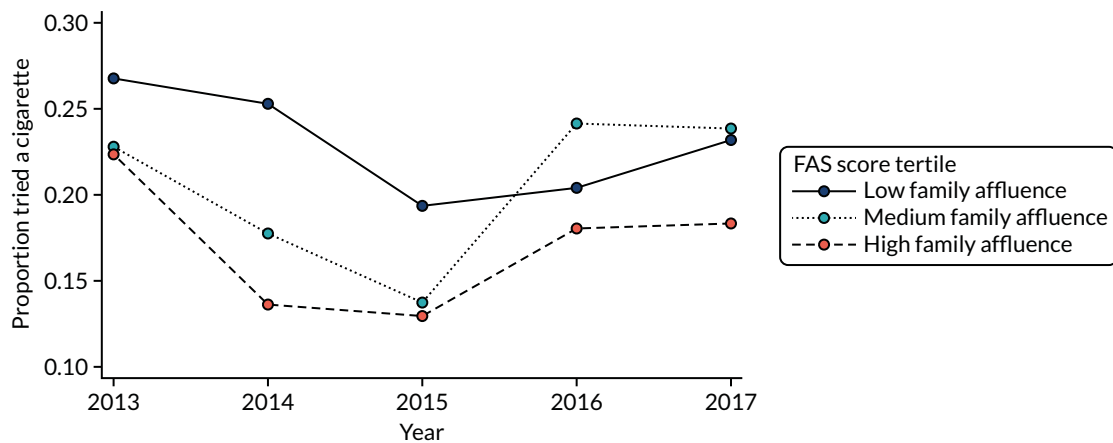


FIGURE 10 Smoking prevalence by FAS score tertile.

Therefore, from 2015 onwards, the topic guide was modified and addressed e-cigarettes directly. From the group discussions it was also evident that e-cigarettes and vapes were being actively promoted at the till point or adjacent to (or within) shuttered tobacco cabinets. These displays were described as striking and appealing, and caused the shuttered tobacco displays to be seen as very dull in comparison:

*Like you see you walk into a shop and you don't see it [tobacco], so you're like, 'Oh well. Fair enough. There's no point buying it then,' 'cause you can't see what you're actually buying.*

*Whereas e-cigs, it's all like decorated and everything.*

*Sitting right there - like all the colours.*

*And it influenced ...*

*... Like if you seen the colours in the corner of your eye, you'd look.*

*School C4, S4, female*

In addition, the young people spoke of other ways in which they were exposed to e-cigarettes. Important sources included family members and friends who used the devices:

*I don't really know ... but like when my uncle got it, like he was just ... well, he was passing it round to everyone 'cause he thought it was cool! But ... I don't know. Wasn't really ... Don't know.*

*School C2, S4, female*

*Well, I've tried a vape like quite a lot. I've just tried my brother's. Like just when he's got it out, I try it.*

*School C4, S2, male*

*... 'cause my mum bought it for me, and it just never worked.*

*School C4, S4, female*

Billboards, bus shelter adverts and social media websites, including YouTube (YouTube, LLC, San Bruno, CA, USA) and Facebook (Facebook, Inc., Menlo Park, CA, USA), were also frequently mentioned:

*Like sometimes on buses and bus stops, and there's TV adverts as well. Now there's that 'Vaping Rocks' thing as well.*

Like you just see them because they ...

... they're not like ... I dunno. They seem to advertise them now like they used to advertise cigarettes ages ago ...

I don't know what it is, but I've seen it on bus stop – like the posters that roll round. I've seen it there, and on TV, and the radio as well.

School C2, group S4, male

### Relationship between exposure to point-of-sale e-cigarette displays and subsequent e-cigarette use

It is well established that being exposed to POS cigarette displays influences smoking behaviour and intentions in young people. However, there is little evidence regarding the relationship between exposure to POS e-cigarette displays and e-cigarette use in young people.

In a cross-sectional study<sup>117</sup> using data from the 2015 DISPLAY school surveys, we investigated the impact of the increasing retail availability and in-store promotions of e-cigarettes on the likelihood of young people trying e-cigarettes. Text in the following section has been adapted from Best *et al.*<sup>117</sup> This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

The analysis was conducted by logistic regression adjusted for recall of other e-cigarette adverts, smoking status and demographic variables as covariates.

Young people who recalled seeing e-cigarettes in small shops were more likely to have tried an e-cigarette (OR 1.92, 99% CI 1.61 to 2.29). Adolescents who recalled seeing e-cigarettes for sale in small shops (OR 1.80, 99% CI 1.08 to 2.99) or supermarkets (OR 1.70, 99% CI 1.22 to 2.36) were more likely to intend to try them in the next 6 months.

We also examined the same relationships longitudinally following young people across 1 year from 2015 to 2016. This confirmed that young never-users of e-cigarette who recalled seeing e-cigarette displays in shops and also on the internet were more likely to have tried e-cigarettes within 1 year than those who did not (*Table 21*).

**TABLE 21** Relationship between recall of seeing e-cigarettes in shops and on the internet in 2015 and use of e-cigarettes in 2017 (n = 1601)

Type of recall	Tried e-cigarettes by 2017			
	Model 1		Adjusted model 2 <sup>a</sup>	
	OR	95% CI	OR <sup>a</sup>	95% CI
Seeing e-cigarettes in supermarkets in 2015	2.39**	2.00 to 2.86	1.18	0.85 to 1.62
Seeing e-cigarettes in small shops in 2015	3.06**	2.54 to 3.67	1.49**	1.07 to 1.80
Seeing e-cigarettes on the internet in 2015	1.77**	1.47 to 2.14	1.35**	1.01 to 1.80
Seeing other adverts for e-cigarettes in 2015	1.68**	1.42 to 1.98	0.96	0.74 to 1.24

\*\*p < 0.01.

<sup>a</sup> Adjusted for friend smoking status, family smoking status, own smoking status, age, sex, ethnic group, FAS score, and school.

### ***Developing social norms around e-cigarette use***

In the focus groups, young people's views about e-cigarettes became increasingly voluble and complex over the course of the study. By 2017, it was clear that the young people were giving detailed accounts of emerging social norms among young people in relation to e-cigarettes.

From the 2017 focus group discussions, we identified four types of social exposure that were having an impact on social norms around e-cigarettes and their use.

#### **Social exposure**

The pupils reported direct contact and/or observation of family, friends and peers, with e-cigarettes viewed as used for different purposes by adults (e.g. to quit smoking) and by peers (e.g. for fun). In schools, regular use was reported as low, but faddish use was high, with many saying that they had had 'a shot' of a vape:

*Well, they're sitting in the back of a bus ... and they'll just whip out this big like pink thing and then they'll be like jumping on top of each other, like, 'Oh, give me a shot!' ... it's just horrendous ...*

*... that's the weird thing with the year below. I don't think they realise what they're doing at all ...*

*... it tends to be more girls, but then, when guys do it, it's like ... I don't know. They just seem to actually do it - like usually a smoker, but with a vape ... Whereas, girls, they'll just treat it like a toy.*

*School C2, S4, male*

#### **Physical environment**

The pupils were very aware of POS promotion in shops, as well as signage related to age-of-sale restrictions, as well as specialist shops and stalls set up to sell e-cigarettes:

*It's everywhere. It's even ... It's on bus stops and ...*

*It's in like Boots [Boots UK, Nottingham, UK] and everything, so ...*

*... but there's a shop down the High Street that does it. There's two shops actually in the High Street that sells the vapes ...*

*They're in ... they're in movies, they're in posters, they're in advertising. It's ... it's every ... everywhere.*

*Taken the world by storm.*

*School C3, group S4, male, 2017*

#### **Symbolic environment**

The groups discussed the advertising and marketing of e-cigarettes, particularly depictions of e-cigarette use on social media, including clips of people doing vapour tricks and groups organising 'hot boxing' and vaping social events:

*There's adverts, but there's not really ...*

*There's videos.*

*... doing the loop ... loops or something ...*

*Doughnuts or something! What are they called? ...*

*There's like ... but on social media's there's now vaping tournaments taken on, like of styles ...*

*School C3, S4, male*

## Embodied norms

The participants described the taste, smells and different flavours of the various devices they had either used or were aware of. They also reported the production of vapour rings and hoops, and ways in which young people used different devices, such as vapes and box mods:

*And they taste good too . . . some fags don't like taste very nice they've . . . a horrible aftertaste, but like vapes like . . . you can get like cherry . . .*

*School C4, S4, female*

*Yeah. And vaping like. Yeah. Like in the toilets . . .*

*. . . Yeah. In the toilets, 'cause like they hot box the toilets and stuff.*

*School C4, S2, male*

*Like my one's about £200, and I saved up for it. It's one of these SMOK<sup>®</sup> [Hong Kong Ivps International Ltd, Hong Kong, China] ones, and . . . it's just fun to do. Like I can hot box in my room and that.*

*School C4, S4, male*

The qualitative research demonstrates that the pupils had experience of a range of different, and to some extent contradictory, information about e-cigarettes, which was shaping the development of their social norms in relation to acceptability and use. However, given that the e-cigarette market is rapidly changing, these social norms are clearly still emerging and may alter depending on the nature and scope of young people's social exposure to normative messages. Because of this, more research will be needed in the future to track the development of these social norms among young people.

## Use of e-cigarettes and subsequent smoking initiation

At the point in the DISPLAY study when we had two waves of data (2015 and 2016) with information on e-cigarette use and conventional tobacco use, eight longitudinal studies, all conducted in the USA, had identified an association between e-cigarette use and subsequent smoking initiation in young never-smokers.<sup>33-40</sup> All of these studies found that young people who were never-smokers at baseline but had used an e-cigarette were more likely to have tried a cigarette at follow-up. However, all of these studies were conducted in the regulatory framework and social context of the USA, which is very different from those of the UK. Therefore, we sought to investigate these relationships in the DISPLAY study sample.

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We found that, of the young people who had never smoked but had tried e-cigarettes in 2015 ( $n = 183$ ), 74 (40.4%) went on to initiate smoking conventional cigarettes at follow-up by 2016. This compares with 249 (12.8%) of those who had never smoked or tried an e-cigarette in 2015 ( $n = 1942$ ) who went on to initiate smoking cigarettes by 2016.

In the logistic regression model, those who had tried an e-cigarette were found to be more likely (adjusted odds ratio 2.42, 95% CI 1.63 to 3.60) to subsequently try smoking a cigarette than never-smokers who had never used an e-cigarette. The analysis was adjusted for smoking susceptibility, smoking status of friends and family, age, sex, FAS score, ethnic group and school.

The interaction between e-cigarette use and smoking susceptibility was also significant, with e-cigarette use having a greater impact on the odds of a non-susceptible never-smoker trying smoking than on the odds of a susceptible smoker (who was already at high risk of smoking) doing so. In addition, an interaction was found between e-cigarette use and smoking within the friendship group, with e-cigarette use having a greater impact on the odds of trying smoking among young people who had no friends who smoked.

These results seem to indicate that young people who traditionally would not have been regarded as at high risk of initiating smoking (i.e. those who were non-susceptible to smoking and those with no friends who smoked) were at higher risk of smoking initiation if they had used an e-cigarette. However, there is still difficulty attributing causality as it is possible that these young people were already at high risk in some other way that was not captured by the measures we used to assess susceptibility.

### **Relationship between use of e-cigarettes and change in psychosocial risk factors and smoking initiation**

More detailed analysis was possible once we had three waves of survey data with e-cigarette use, tobacco use and the other variables to explore the temporal relationships between the use of e-cigarettes and changes in psychosocial risk factors and smoking behaviour. Thus, it became possible to examine whether or not changes in psychosocial risk factors mediated the effects of e-cigarettes on tobacco use.

In the analysis we assessed whether or not e-cigarette use in 2015 in never-smoking young people predicted subsequent smoking by the 2-year follow-up in 2017. *Table 22* shows that at the 1-year follow-up discussed above there was a significant relationship between e-cigarette use at baseline and subsequent initiation of smoking.

In a separate mediation analysis using the Stata package 'ldecomp' (*Table 23*), we found that friends' smoking status in 2016 mediated 48.8% of the total effect of e-cigarette experimentation on subsequent smoking and that attitude to smoking mediated 49.1% of the total effect. The combined effect of the two mediators accounted for 66.7% of the total effect of e-cigarette use on subsequent smoking initiation.

TABLE 22 Relationship between e-cigarette use and smoking initiation

Frequency of e-cigarette use in 2015	Initiated smoking by 2017, OR (95% CI)	
	Model 1	Adjusted model 2 <sup>a</sup>
Never used an e-cigarette	1	1
Ever used an e-cigarette	3.96*** (2.71 to 5.79)	2.20*** (1.43 to 3.37)

\*\*\* $p < 0.001$ .  
 a Adjusted for age, sex, FAS score, number of friends who smoke, number of family members who smoke, ethnicity and school.

TABLE 23 Proportion of total effect of e-cigarette experience on smoking initiation mediated by friends' smoking status and attitude to smoking

Mediator	Proportion of total effect mediated	95% CI
Friends' smoking status	0.488	0.262 to 0.612
Respondent attitude to smoking	0.491	0.283 to 0.690
Combined effect	0.667	0.448 to 0.849



These results suggest that the effect of e-cigarette experience on subsequent smoking experimentation is mediated by psychosocial mechanisms, including changes both in whom young people associate with and in their own attitudes to smoking. These findings are at variance with the common liability hypothesis,<sup>41</sup> which suggests that the association between e-cigarettes and subsequent tobacco use is due to an underlying predisposition in young people to try such products. Instead, we suggest that there are changes in peer associations and attitudes following the use of e-cigarettes that make smoking initiation and tobacco use more likely.

### **Standardised packs**

Standardised cigarette packs were introduced in Scotland and the rest of the UK in May 2016. Retailers were permitted to continue to sell the branded products to use up old stock; however, from May 2017, only the sale of cigarettes and tobacco in standardised packs was allowed. Australia was the first country to implement standardised packaging in 2012, and the UK followed the Australian lead by regulating the pack shape, colour, opening mechanism and font, along with the size and position of health warnings and the number of cigarettes in a pack.

In the 2017 school survey, young people were asked ‘In the past 30 days, have you seen any of these new greenish brown plain packs of cigarettes or tobacco (similar to above)?’, and a colour picture of a standardised pack was shown. In total, 2812 (76.7%) said that they had not seen one in the past 30 days. Of those who had, the most common place that they had seen it was on the ground or in rubbish (13.7% of all respondents had seen a pack there). In the 2017 focus groups, the facilitator first sought unprompted views about standardised packs. After this, she distributed three or four examples of actual standardised packs to the young people in the group and asked them what they thought of these examples (see *Report Supplementary Material 1*). The focus groups took place 2 or 3 months before full implementation of standardised packaging of tobacco. In spite of this, there was a high level of awareness of standardised packs before May 2017. Smokers in the focus groups had purchased them, and they and other pupils had seen them in the possession of friends and family members, as well as in litter. Pupils’ views of the new packaging were generally negative. It was described as unattractive and depressing, and was compared unfavourably with branded tobacco packaging and current e-cigarette marketing:

*They're very depressing, you just want to sit there and slit your wrists.*

*School C1, group S2, male*

*It's like sludge green ...*

*... army green.*

*The Golden Virginia [Imperial Brands plc] ones are like scaffie green ...*

*School C4, group S4, female*

The images on the packs elicited particularly negative responses:

*See my niece? – she'd ... she'd cry if she saw that, that's not something you should expose children to ...*

*School C1, group S4, male*

*I hate that one with the hole [in throat] ...*

*Like that's so disgusting!*

*I don't really want to see that ...*

*Is it on the other side? Can we turn it over?!*

*It is on the other side. Oh!*

*It's so disgusting.*

*Makes me feel sick.*

*School C2, group S4, female*

However, there was no consensus about the standardised packs' likely impact. Some argued that they would have a widespread impact, whereas others stated that any impact would be restricted to young people who were non-smokers/occasional smokers and that established smokers would not change their practice:

*Just the fact that it's . . . you only see a bad image. You don't see like fancy colours or bright colours that make you look . . . well, 'Oh, that looks cool'.*

*But do like some people actually care about that?*

*People that smoke, I would say don't care about it because they just want to smoke, but for . . . for someone who's not tried it before . . . it will not tempt them so much I'd say. It is helpful to stop young people getting in to it in the first place.*

*School C2, group S4, male*

*Like so they've changed it, but anyone that smokes is gonna smoke regardless of what the box looks like.*

*They're not gonna give up just because of a fag packet.*

*School C4, group S4, female*

## Conclusion

The DISPLAY study found that awareness and use of e-cigarettes among young people in Scotland increased dramatically between 2013 and 2017. The proportion who had ever tried an e-cigarette increased from 14% in 2014 to 34% in 2017. Strikingly, in 2017, more young people in the study had tried an e-cigarette than had tried a cigarette. However, the regular use of both cigarettes and e-cigarettes is low in this population.

In the focus groups young people talked about the conspicuousness of POS e-cigarette displays. The young people also mentioned the widespread availability of e-cigarettes in the retail environment. Data from the school surveys indicate that seeing e-cigarettes displayed for sale in small shops is associated with an increased probability that young people will go on to try e-cigarettes. It is possible that the widespread availability of e-cigarettes and their positioning in small shops next to confectionery, and other products appealing to children, affects norms of use and perceptions of harm.

Our results also provide further support for the association between the use of e-cigarettes and subsequent experimentation with cigarettes found in many other previous studies.<sup>33-40,118</sup> Furthermore, the results from this study suggest that the transition from e-cigarettes to cigarettes is mediated by an increase both in smoking within young people's friendship groups and in pro-smoking attitudes. Although the DISPLAY study was not designed to assess e-cigarette outcomes, it has been well positioned to provide timely information on this emerging public health issue.

Regarding standardised packaging, even before the full implementation in May 2017, there was high exposure among young people, with one in five having seen a pack in early 2017. Young people disliked the appearance of the packs and thought that these would dissuade some young never-smokers from trying cigarettes.

## Chapter 9 Discussion and conclusions

Legislation prohibiting tobacco displays at POS was implemented in large retail outlets (mainly large supermarkets) with > 280 m<sup>2</sup> of internal floor area used for displaying goods and serving customers on 26 April 2013 and then extended to include smaller tobacco retail outlets on 6 April 2015. The overall policy objective was to reduce the attractiveness of tobacco products to children and adolescents under the age of 18 years and thereby reduce smoking initiation and regular smoking among this age group.

The aims of the DISPLAY study were to:

- determine the impact of Scottish legislation banning POS tobacco advertising on young people's exposure to tobacco advertising, their attitudes towards smoking and their smoking behaviour
- identify any 'unintended consequences' associated with the implementation of the legislation.

The POS legislation was complex, with multiple outcomes at different levels in the system. Therefore, we conducted a longitudinal study using a multimodal before-and-after study design in four communities located in the central belt of mainland Scotland. Data were collected annually from each of the four communities using mixed methods that included mapping and spatial analysis of retail outlets, discreet observational audits of tobacco retailers, and surveys of, and focus group discussions with, secondary school pupils attending schools located in those communities. Interviews with a panel of 24 retailers from four matched communities were also conducted. In this final chapter we bring together and integrate the findings from across the study components and discuss them in the context of what is already known about the impact of POS legislation. We then go on to consider the strengths and weaknesses of the study and consider the implications of the study for future tobacco control policy and research.

### Summary of findings

#### *Point-of-sale displays and compliance with the legislation*

The DISPLAY study found that, before the implementation of the POS tobacco display ban in Scotland, tobacco displays were highly visible in both large supermarkets and small shops. These displays were usually placed at customer eye-level, behind the POS, and often in proximity to goods, such as confectionery, that were likely to be of interest to children. Some POS displays were also visible from the public footpath outside small shops. The great majority of young people participating in the school surveys recalled seeing POS tobacco displays prior to the implementation of the POS legislation, with young people from the least affluent backgrounds most likely to recall seeing them. This seems to be consistent with the finding that CTN and convenience stores in areas of higher deprivation had larger average display sizes than those in less deprived areas. In focus group discussions, young people reported finding POS tobacco displays very eye-catching and colourful, and in one group they were likened to an 'adult sweetie shop'.

Small retailers had largely negative expectations about the potential impact of the POS legislation prior to its implementation. Concerns were expressed about the cost of converting tobacco gantries and the impact of shutters and covers on transaction times and shoplifting (while servers' backs were turned to access tobacco products). However, in practice, implementation was straightforward. Among the retailer panel members, gantries were most often supplied or converted by tobacco companies at no extra cost. Contrary to their expectations, retailers and staff adapted easily to the covered displays, and the anticipated increases in transaction times and shoplifting did not occur. Views about the impact on customer behaviour were mixed, with some retailers reporting no change and others reporting a drop in tobacco sales.

The observational audit demonstrated that compliance with the legislation was high after implementation both in large supermarkets and in small shops. Our findings are consistent with other evaluations of POS legislation. For example, an evaluation of legislation in Victoria, Australia,<sup>119</sup> found that 94% of retail outlets complied with POS legislation 3–4 months after implementation, and in Norway and Ireland compliance rates as high as 97% post implementation were recorded.<sup>21</sup> Historically, when only partial restrictions have been introduced, compliance has been lower, suggesting that complete bans are likely to be both more effective and easier to implement.<sup>9</sup>

The high compliance found in this study demonstrates that it is possible to implement comprehensive bans across a wide range of retail outlets. However, although the POS legislation was very successful in concealing tobacco products from public view, tobacco products continue to be stored at POS, with the covered storage units carrying large signs indicating that tobacco is for sale. Thus, tobacco as a generic product continues to have a very strong presence in the retail environment. Furthermore, the financial incentives retailers were offered by tobacco company representatives persisted even after gantries had been covered up, with retailers continuing to be rewarded for product placement, availability and sales. There was also evidence that retailers were incentivised to promote products verbally to customers.

### **Changing retailer density, tobacco product visibility and storage unit visibility**

Retailer density not only increases the availability of tobacco products by increasing opportunities to purchase them, but also enhances their visibility,<sup>120–124</sup> and it is a likely driver of smoking inequalities.<sup>84</sup> Other research in Scotland<sup>125</sup> has found that higher neighbourhood density of tobacco retailing is associated with higher odds of having ever smoked or reporting current smoking among adolescents. Similarly, adults living in areas with the higher densities of tobacco retailing also have higher odds of being a current smoker and lower odds of being an ex-smoker.<sup>126</sup>

In the four DISPLAY study communities, the overall availability of tobacco products as measured by retailer density remained largely unchanged; however, when the retailer density measure was weighted by total product visibility scores, we found that a significant reduction in young people's neighbourhood exposure to tobacco products, indicating that the POS legislation has been successful in reducing the visibility of branded tobacco products.

The study team was also able to extract data for the whole of Scotland from the *Register of Tobacco and Nicotine Vapour Product Retailers*.<sup>65</sup> Analysis of these national data showed that between 2013 and 2015 the number of retailers in Scotland reduced by 13% following the implementation of the partial POS ban. Retailer density fell across all deprivation neighbourhood quintiles, but less so in the most deprived ones. This was followed by a modest increase in 2016 and 2017, and by the end of the study period the overall number of retailers was similar to baseline (2013). The overall increase in tobacco retailer density was driven largely by an increase in the number of tobacco retailers in about one-fifth of local authorities, which occurred in the most disadvantaged neighbourhoods, resulting in increased inequality in tobacco availability.

The findings emphasise that tobacco remains ubiquitous across Scotland; this has important implications for public health policy.

## **Outcomes for young people**

### **Smoking susceptibility and smoking experimentation**

A key objective of the POS display legislation was to reduce smoking susceptibility and the risk of smoking initiation and regular smoking among young people. Previous research<sup>88,96</sup> has found that high levels of exposure to POS tobacco displays (as measured by shop visit frequency) increases smoking

susceptibility. However, there have been no studies of the impact of a POS display ban on smoking susceptibility.

Consistent with the earlier research, we found that young people who visited shops more frequently were at greater risk of smoking susceptibility than those who visited shops less often. Using survival analyses techniques, we found also that young people's risk of becoming susceptible to smoking after 1 year in the study was much lower among those who entered the study after the comprehensive ban than among those who entered the study after the partial ban. To our knowledge, this is the first study to demonstrate that legislation banning POS tobacco displays can reduce young people's susceptibility to smoking. Moreover, the finding that, compared with the partial ban, the comprehensive ban has reduced the impact of shop visit frequency on smoking susceptibility is suggestive of a dose-response relationship.

In our original study protocol, we intended to assess the impact of the POS display ban on smoking prevalence. However, in line with other national data,<sup>29,97</sup> smoking prevalence in our samples of young people was low. Therefore, the study was underpowered to assess the impact of the legislation on smoking prevalence. Previous research has demonstrated an association between exposure to POS displays and smoking initiation,<sup>127</sup> and so, instead, we examined the impact of POS legislation on smoking initiation.

Using survival analysis techniques, we also found that the risk of smoking initiation 1 year after entry into the study was lower among those who entered the study after the comprehensive ban than among those who entered after the partial ban. As in the analysis of smoking susceptibility, the implementation of a comprehensive ban of POS tobacco displays reduced the impact of shop visit frequency on smoking experimentation compared with only a partial ban, suggesting that there could be evidence of a dose-response relationship. However, it should be noted that the young people in our sample who initiated smoking are actually a subgroup of the young people who became susceptible to smoking. This is because, in the analysis of smoking susceptibility, young people who initiated smoking were defined as smoking susceptible, as they were assumed to have passed through a period of smoking susceptibility prior to smoking initiation. The two analyses are therefore not independent, and it is important to assess the impact of POS legislation on independent samples.

## Other outcomes for young people

In the study logic model, we hypothesised a series of short-term and intermediate outcomes that, in combination, would lead to a reduction in smoking susceptibility and smoking experimentation. The logic model predicted that covering up POS tobacco displays would lead to young people being exposed less often to branded tobacco products and therefore their knowledge and awareness of different tobacco brands would decrease. We hypothesised that this in turn would reduce the perceived accessibility of tobacco products and the view that tobacco was a 'normal product' and, therefore, reduce pro-tobacco attitudes.

The DISPLAY study has confirmed a strong positive association between exposure to POS displays (as measured by frequency of visits to large supermarkets and small shops) and brand awareness among young people prior to the ban. Brand awareness then fell after the partial ban in 2013 and, to a lesser extent, after the comprehensive ban in 2015. However, this reduction in brand awareness was restricted to younger pupils aged 12 and 13 years, who were in their first 2 years of secondary school. This is likely to be a cohort effect, with younger pupils having been exposed for fewer years to tobacco brands, both at POS and through friendship groups, than older pupils in the study. A reduction in brand awareness among older pupils may take longer than among younger, and therefore less exposed, cohorts, although the implementation of standardised packaging between 2016 and 2017, which minimises differences in appearance between brands, may hasten this. In both the 2017 school survey

and the focus group discussions that took place a few months after the ban of the sale of branded tobacco products came into force in May 2017, young people showed a high level of awareness of the new packs. In the focus group discussions, many made unfavourable comments about the appearance of the packs and the images that were displayed on them, but views differed about whether or not these images would deter young people from smoking.

The DISPLAY study also found a reduction in the perceived accessibility of tobacco products after both the partial and the comprehensive display bans were implemented and a reduction in pro-smoking attitudes after implementation of the comprehensive ban. This is consistent with findings from Ireland,<sup>20</sup> Australia<sup>101</sup> and New Zealand.<sup>21</sup> The reduction in perceived accessibility was greatest among the young people who visited small shops most frequently, but the reduction in pro-smoking attitudes did not vary by shop visit frequency. In the analyses of perceived accessibility, we controlled for a variety of sociodemographic and smoking status variables, but it is striking that only after controlling for e-cigarette use did we find a significant reduction associated with the implementation of the POS display ban. Furthermore, before controlling for e-cigarette use, pro-smoking norms actually increased after the comprehensive POS display ban was introduced, but then became insignificant when e-cigarette use was entered into the model. Taken together, our findings suggest that the use of e-cigarettes may have disrupted the impact of the POS legislation, in particular by increasing the perceived accessibility and acceptability of smoking, but further research is needed to explore this further.

The marketing of tobacco alongside everyday products potentially normalises smoking and creates the impression that tobacco is both an 'ordinary' and an essential commodity,<sup>11</sup> rather than a toxic product that poses a serious threat to life. Evidence suggests that young people who are heavily exposed to tobacco advertising are more likely to overestimate both adult and youth smoking prevalence than those who live in jurisdictions where tobacco marketing is largely prohibited.<sup>128</sup> In spite of the fact that tobacco advertising was totally prohibited in Scotland after 2013,<sup>129</sup> we found that the young people in the study dramatically overestimated smoking prevalence among their peers by a factor of 6 and among adults by a factor of 2.5. We found a small reduction in estimated smoking prevalence among peers after both the partial and the comprehensive bans and a small reduction in estimated smoking prevalence among adults only after the comprehensive ban. However, the reduction in perceived smoking prevalence among both peers and adults occurred only among young people who visited large supermarkets and small shops less often. As noted earlier, although product visibility reduced considerably following the POS legislation, exposure to tobacco storage units fell only slightly. It seems likely that frequent exposure to tobacco storage units at POS with large generic tobacco signs may contribute to the continuing normalisation of smoking.

### **Socioeconomic patterning in tobacco availability, exposure to tobacco products and tobacco displays and smoking-related outcomes**

Confectioners, tobacconists and newsagents and convenience stores in areas of higher deprivation had larger average display sizes than those in less deprived areas. At the beginning of the study, there were marked differences in product visibility across the study communities, but, by 2017, these had reduced markedly. However, alongside an overall reduction in product exposure, we found evidence of an increase in socioeconomic inequalities in exposure at an individual pupil level, as the decline in retailer density, when weighted by product visibility, was restricted to pupils from the most affluent tertile.

At a national level, following an initial fall in retailer density between 2013 and 2015, retailer density in the most disadvantaged neighbourhoods increased, resulting in an increase in inequalities in the availability of tobacco.

There was consistent evidence of socioeconomic patterning at both a community (high vs. medium/low deprivation) and an individual (FAS) level for all of the outcomes measures for young people. Young people from areas of high deprivation and low family affluence were aware of more brands of tobacco, perceived tobacco to be more accessible, had stronger pro-smoking attitudes, thought that smoking was more acceptable (social norms), overestimated smoking prevalence in their peers and adults to a greater extent, were more susceptible to smoking and were more likely to have tried smoking. They were also more likely to have tried e-cigarettes.

We also examined the effect of family affluence on two POS legislation outcomes, smoking susceptibility and smoking experimentation. However, there was no evidence of a differential impact of the legislation across family affluence tertiles. This suggests that, although there was evidence of an increase in inequalities in tobacco availability and tobacco display visibility, which is of some concern, the implementation of the comprehensive POS ban in itself did not lead to an increase in inequalities in smoking susceptibility and smoking experimentation among young people.

## E-cigarettes

From 2014, we began to collect data on e-cigarette displays and patterns of e-cigarette use to provide contextual information to the study findings. However, with the rapid increase in e-cigarette use over the course of the study, it became clear that our study was well positioned to provide timely information on an emerging public health issue. In 2014, 14% of young people had ever tried an e-cigarette by 2017 the figure increased to nearly 34%. By comparison, in 2017 only 21% had tried smoking cigarettes. However, regular use was uncommon with more than monthly use peaking at around 8% in 2016, but then falling back to 4% the following year.

As in other longitudinal studies in both the USA and the UK,<sup>33-38,40,42,44</sup> we found a positive association between e-cigarette use in never-smokers and smoking initiation 1 year later. This was still the case even after controlling for smoking susceptibility. Furthermore, the young people who initiated smoking after using e-cigarettes were in groups not traditionally regarded as being at risk of smoking, that is, young people who were not smoking susceptible and did not have smokers in their friendship groups. The association between e-cigarette use and subsequent smoking initiation was replicated in a 2-year follow-up. Mediation analysis indicated that smoking initiation was mediated in the intervening year by an increase both in the number of smokers in friendship groups and in pro-smoking attitudes. This may be because the use of e-cigarettes moves young people into more mixed social groups of smokers and vapers, which might change perceptions of and attitudes to smoking.

This interpretation is consistent with findings from our analysis of the impact of the legislation on the perceived accessibility of tobacco and acceptability of smoking. The crude data actually showed an increase in these two outcomes rather than a decrease, and only after controlling for e-cigarette use in the analysis were there significant reductions associated with the POS legislation. From this we conclude that the increase in use of e-cigarettes may have disrupted the impact of the POS legislation, in particular on processes associated with the perceived accessibility of tobacco and smoking acceptability.

It was not possible to determine from our data exactly why this might be. However, a decade ago, the public health messaging on cigarettes was unambiguous. Even very small children were aware that 'smoking kills'. One theory is that the emergence of e-cigarettes has diluted this message with the idea that some forms of 'smoking' may be less harmful. It is possible that this has created confusion among young people about the harmfulness and social acceptability of smoking. We might speculate that this blurring of the boundaries between smoking and not smoking is part of a deliberate strategy by the tobacco industry. The plethora of devices and continual innovation means that e-cigarettes and vaping are creating a landscape that is constantly shifting. With the addition of heat-not-burn devices, the

situation has become even more complex. As stated in *The Vaping Post* in 2016 about the industry, there is a 'clear willing to maintain a certain confusion between electronic and HNB [heat-not-burn] cigarettes with a portfolio that sometimes combines e-liquids pods and tobacco leaf use in the same device, where the term "smoke" becomes a synonym of "vapor" and vice versa to appeal to smokers in a marketing effort'.<sup>130</sup>

The increased likelihood of smoking initiation in never-smokers who have tried e-cigarettes has been explained by common liability theory.<sup>41</sup> This postulates that this group are already predisposed to initiate smoking. However, our data suggest that, for some young never-smokers, some psychosocial mechanisms come into play that facilitate smoking initiation after they have tried e-cigarettes. This is more consistent with the two-stage catalyst theory,<sup>131,132</sup> which suggests that perceived health risks, specific product characteristics (such as taste, price and inconspicuous use) and higher levels of acceptance among peers and others potentially make e-cigarettes initially more attractive to adolescents than tobacco cigarettes. Later, increasing familiarity with nicotine could lead to the re-evaluation of both electronic and tobacco cigarettes and, subsequently, to a potential transition to tobacco smoking.<sup>32</sup>

### Strengths of the study

The DISPLAY study was a complex longitudinal study in four communities with multiple components that used mixed methods to collect a wide range of data from different sources. The design allowed us to examine, in great detail, the impact of POS legislation over a 5-year period. We collected data on the physical and retail environments, young people's smoking attitudes and behaviours, and the views of retailers and young people before, during and after implementation of the legislation. The range of methods used allowed both the quantification and triangulation of outcomes and the interpretation of changes in multiple outcomes associated with the legislation.

The school survey provided the core data with which we were able to assess the impact of the legislation on young people. Items underwent extensive validation before being included in the questionnaire. Surveys were conducted under examination conditions after 'opt-out' consent had been provided by parents or by pupils on the day of the survey, which has been shown to minimise response bias. Pupils not present on the day of the survey were followed up for 2 weeks after the survey. This resulted in an exceptionally high pupil response rate of between 86% and 87% in each of the 5 survey years, reduced loss to follow-up and permitted longitudinal analyses of the relationships between the POS legislation and attitudinal and behavioural outcomes among young people. Although the questionnaire was lengthy, the completion rate for the great majority of questions lay in the range of 95–100%, giving relatively few missing data points. Questions with poor completion rates were dropped in following years and/or not used in the analyses. In all of our analyses, missing values were estimated using multiple imputation, which has been shown to produce valid statistical inferences that properly reflect the uncertainty due to missing data.<sup>70</sup>

Another strength of the study was the inclusion of measures of retailer density in the evaluation. There has been little research, in general, on the spatial changes in exposure to tobacco retailers and marketing, and studies have been limited in both their geographical<sup>131,132</sup> and their temporal coverage.<sup>133</sup> Only one longitudinal study has documented a reduction in the availability and advertising of tobacco.<sup>132</sup> The DISPLAY study is the first to investigate national-level tobacco retailer availability continuously over 6 years spanning the introduction of a POS ban, and then to link retailer density to area and individual estimates of socioeconomic status. Previous studies on retailer density have also been limited by failing to incorporate information about the marketing of tobacco by individual retailers. By applying audit weightings to our density estimates, ours is the first study to our knowledge that combines both sets of information. Finally, previous work has shown that, compared with traditional methods, tobacco outlet exposure can be estimated more accurately when young people's travel around their neighbourhood and routes to school (activity space) is accounted for.



The decision to rely on a discreet observation for the marketing audit allowed us to examine, in detail, POS tobacco displays and storage units, and how these changed over time, without risking influencing retailer behaviour. The tobacco marketing tool, which was developed for this purpose, relied on observer recall. This made the discreet measurement of storage unit size challenging. However, techniques were developed to overcome these difficulties, and inter-rater reliability was found to be very high, assuring us of the accuracy of the detailed data on tobacco displays that were collected.

We also considered using some mobile/web applications for monitoring tobacco displays, which had been found in an evaluation to be a promising way to collect tobacco display data,<sup>134</sup> but they proved unsuitable for this discreet audit because they required behind-the-counter access. An alternative approach would have been to use overt measurement of displays with retailer knowledge and consent; however, although this would have probably allowed for greater precision in measurement and collection, the risk of sampling and response bias would have been considerable. A study<sup>135</sup> of the English POS legislation that used photography found that only 57% of retailers agreed to take part. The approach we adopted in this study meant that we were able to assess POS sale displays in all tobacco retailers in our study areas.

The POS visibility tool that was also developed as part of the study uniquely includes two dimensions of visibility: tobacco product visibility and storage unit visibility. This represents a significant improvement on measures used previously and allows us to demonstrate that, although tobacco brands and products were much less visible, the storage units themselves remained highly visible and promoted tobacco as a generic product.

Exploring the views and expectations of retailers in longitudinal qualitative interviews was an important aspect of this study. It was not possible to conduct these interviews in the study communities, as this would have alerted retailers there to the wider study and potentially compromised our ability to collect discreet observational audit data. Therefore, these interviews were conducted in communities that were carefully matched on key characteristics to the four study communities. This allowed us to collect detailed information about retailers' expectations of the impact of the legislation and the process of implantation without exposing the identity of our study communities, which may have influenced some of the exposure outcomes.

Finally, focus group discussions were conducted annually by the same facilitator throughout the study, thus providing the research team with a longitudinal perspective on changes in the views and experiences of pupils at a school level. The qualitative data collected proved invaluable. First, they alerted us to the emerging issue of e-cigarettes in 2013, allowing items to be included in both the marketing audit and the school survey from 2014 onwards. Second, they provided additional contextual data that aided the interpretation of some of our outcome data.

## Limitations of the study

The study was based in four purposively selected communities that were defined by the catchment areas of Scottish secondary schools that had pupil rolls of 1000 and an ethnic minority population of < 10%. The final sample of four communities was selected to reflect two levels of urbanity, urban and small town (one of the small town communities was subsequently reclassified as other urban), and two levels of deprivation (high and medium/low). As the survey participants were drawn from only four schools, the sample was not nationally representative. However, a comparison of the demographic characteristics of study samples with those of nationally representative samples did not indicate any significant deviations.<sup>29,97</sup>

Based on current school profiles (2018), 85% of Scottish secondary school children attend schools in areas classified as urban, other urban or accessible small town. Although the two schools in areas classified as small town and other urban served large rural hinterlands, the study failed to capture data and perspectives from rural communities, which is a limitation.

When designing the school survey, we chose to include only pupils from years S2 and S4 in the survey years 2013 and 2014. Although this minimised both the cost of the study and the burden on schools associated with administering the survey, it also limited the opportunity to carry out longitudinal analyses associated with implementation of the partial POS display ban. The school survey also relied on self-report, which is subject to social desirability bias. Objective confirmation of smoking status through salivary cotinine<sup>136</sup> was not feasible on the scale required for this study and we do not yet know about the reliability of self-reported use of e-cigarettes.

The *Register of Tobacco and Nicotine Vapour Product Retailers*<sup>65</sup> provided the most up-to-date and comprehensive information on tobacco retail outlets in Scotland, but it is possible that some retailers have not registered. However, fieldwork verification by researchers on foot indicates that compliance with the requirement to register was very high in our study communities. Second, geocoding of tobacco retailers was completed at the postcode unit level, rather than for individual households. This might have resulted in measurement error in the individual density measures. Finally, it is likely that the young people who participated in the school survey occupy a range of difference spaces over the course of their daily lives, not just their local neighbourhoods and routes to school. It is possible that our activity space measures using optimal routes does not precisely replicate the actual route taken and/or fully capture the extent of the places visited over the course of a day.<sup>137</sup>

Focus group participants were pupils in school years S2 and S4, recruited to the study by school teaching staff contacts who perceived them to be smokers or to be at risk of smoking by virtue of having friends or family members who smoked. This group were likely to be the most knowledgeable about cigarettes and smoking, thus allowing us to explore a wide range of issues in depth. However, as noted above, smoking prevalence in the DISPLAY study schools was low, and, in practice, it was not always easy for teachers to identify those most at risk of smoking, particularly among S2 pupils.

In addition, focus groups were limited to 40 minutes, the length of a school period. Nevertheless, we were able to explore in detail how POS displays shape social norms around smoking, not only through normative influences in the social environment but also through the physical and symbolic environments.<sup>138</sup> Pupils were also able to comment on emerging issues of e-cigarettes, access to tobacco and standardised packaging.

### Inference of causation

Evaluating public health policies and interventions, such as the POS display legislation, and inferring causation present researchers with many challenges. First, as the legislation was rolled out simultaneously across Scotland on the same day, a controlled trial design, which is considered the gold standard in evaluation research, was not possible.

When designing the DISPLAY study we considered conducting a natural experiment but it was clear that it would not be possible to select a suitable geographical or historical control or to construct a comparison group; therefore, we chose a longitudinal study with a before-and-after design without a control. However, by minimising loss to follow-up and ensuring as far as possible the accurate assessment of exposure measures and outcomes in the individuals, the retail environment and the community (tobacco retail density), we judged that it would be possible to achieve a robust assessment of the impact of the POS display legislation using a before-and-after study design without a control. We collected data annually using mixed methods from multiple data sources, allowing multiple measures of exposure and outcomes. The trade-off, of course, was that the study was limited to four communities. This limits how generalisable the study findings are, but, by using the approaches described below, this limitation has been reduced.

Through the mapping and spatial analyses of retailers and the marketing audits, we were able to accurately assess changes in both exposure to tobacco products and tobacco storage units at a community level. School surveys provided simple individual-level measures based on frequency of visits to shops, and, when other data from the school survey on home postcode and journey to school were combined with the mapping and audit data, individual measures of exposure in home neighbourhood and 'en route' to school were computed.

The approach taken to the administration of the school surveys maximised the response rate, and the SCN, a unique identifier provided to all pupils when they start school, ensured that individual pupil responses were linked reliably across the survey waves. The logic model, which linked the implementation of the POS legislation with both intended and unintended outcomes, provided the framework for the analysis of young people's outcomes. In the main, we used longitudinal analytical techniques to assess the pupil outcomes, adjusting models for a range of sociodemographic, smoking status and related covariates.

Although longitudinal analyses can support the inference of causation, a number of other developments in tobacco control occurred during the study. First, two high-profile mass media campaigns that addressed tobacco accessibility were broadcast. However, these were targeted at adults, encouraging retailers to adhere to age verification regulations and those  $\geq 18$  years of age not to purchase tobacco for those aged  $< 18$ . Second, there was a rapid increase in the marketing and promotion of e-cigarettes in tobacco and other retail outlets and a corresponding rapid increase in their use. Third, a ban on cross-border advertising of e-cigarettes on television and other media came into force in 2016.

In addition, in October 2011, the Licensing (Scotland) Act 2005<sup>139</sup> was amended with the introduction of a mandatory condition for all premises licences and occasional licences. This requires premises to have an age verification policy in relation to the sale of alcohol. The law sets a minimum age of 25 years, whereby if it appears to the person selling alcohol that a customer may be under this age, they must ask the customer to provide proof that they are  $\geq 18$  years old and can lawfully buy alcohol. It is possible that retailers have also become more vigilant about tobacco sales, thus reducing underage sales and the perceived accessibility of tobacco.

Finally, standardised tobacco packaging carrying large graphic health warnings was introduced in Scotland and the rest of the UK in May 2016 (retailers were allowed to continue to sell branded products to use up old stock, but from May 2017 cigarettes and tobacco were allowed to be sold only in standardised packaging).

It is likely that these developments may also have influenced some of the outcomes under study. However, as noted above, we were able to adapt our data collection tools used in the observational audit, schools survey and focus group discussion to collect data on e-cigarettes, POS displays and patterns of e-cigarette use. We might anticipate that, in the longer term, standardised packs will reduce brand awareness and, potentially, pro-smoking attitudes among young people. However, this could not have occurred within the time frame of this study.

As with much policy-related research, this study has unavoidable methodological weaknesses. However, the consistency of findings and their close match to our hypothesised logic model suggest that the findings can be generalised and are sufficiently robust to inform policy development in both Scotland and the rest of the UK, as well as further afield. Finally, in our analysis of outcomes such as smoking susceptibility and smoking initiation, we found evidence of a dose-response relationship between these outcomes and levels of exposure to POS displays, as measured by frequency of shop visits. This strengthens the argument in favour of a causal relationship between these outcomes and the POS legislation.

## Implications of the research

### *Policy*

The high level of compliance found in this study demonstrates that it is possible to implement comprehensive legislation that prohibits POS displays across a wide range of retail outlets without disrupting the retail environment. In addition, as found with other tobacco control legislation, such as the smoke-free legislation, comprehensive bans are likely to be easier to understand and implement than partial bans.

However, before the legislation had been implemented, small retailers had some concerns about its impact on their businesses, and many looked to, and received advice and support from, tobacco industry representatives. Additional advice from trading standards support would have been welcomed, and would most likely have exposed retailers to a wider range of views regarding tobacco control measures. Some minor instances of non-compliance were observed, which further underline the need for advice and monitoring. Given that most of the contraventions observed were accidental, it is likely that only 'light touch' enforcement will be necessary in the future.

Small retailers are important stakeholders in tobacco control, and it is important to take into account their perspectives and to learn from their experiences. They can provide feedback on aspects of legislation that might be problematic to implement or might incur resistance. Future studies to evaluate or inform the development of tobacco control policies might include exploration of retailer perspectives.

The POS legislation has been successful in reducing exposure to tobacco products at both a community and an individual level. Although the research design precludes the conclusion that the relationships are causal, implementation of the legislation in the four study communities was associated with a reduction in the anticipated youth outcomes. However, although tobacco storage units have been covered up, the units themselves continue to be prominent in retail outlets. Thus, the POS display ban has not fully eliminated tobacco as a generic product from the retail environment in Scotland. Cues that tobacco is for sale are still highly visible in many shops. The continuing existence of these cues in the retail environment was observed, particularly in areas of deprivation, where inequalities in storage visibility have widened since the POS ban was implemented. Furthermore, the availability and density of tobacco retailers has remained high across Scotland, with greater availability in more disadvantaged neighbourhoods. This research suggests that regulating the number of tobacco retail outlets and the size, design and position of storage units, and using generic signage to indicate tobacco availability, might contribute to reducing these inequalities.

Tobacco companies are already prohibited from using financial incentives with retailers for product placement, availability and sales and the verbal promotion of products to customers, and this should continue to be emphasised to retailers.

With the reduction in product visibility in shops that young people visit most frequently, the relative influence of parental smoking on young people's smoking susceptibility and tobacco access will increase. This underlines the importance of continuing to focus tobacco control policy on reducing parental smoking, particularly in front of children and in the home, and encouraging parents to keep tobacco products out of sight to minimise the influence of their behaviour on the uptake of smoking by their children.

Although the implementation of the POS legislation was associated with a reduction in perceived smoking prevalence, the young people in our study continued to greatly overestimate smoking prevalence, especially among their peers. Targeting young people with accurate information about the decline in youth smoking prevalence might help to counter the continuing influence of the generic presence of tobacco in the retail environment on the normalisation of smoking behaviour.

It is estimated that about 80% of the world's population continues to be exposed to POS advertising and displays of tobacco products. This study has provided robust evidence about implementing POS legislation and protecting young people from exposure to tobacco products and the subsequent improvement in youth attitudes and reduction in smoking susceptibility and smoking initiation. The methods reported here, including the visibility tool, provide a baseline measure for evaluating the legislation, and an approach that can be replicated in other settings and jurisdictions where similar legislation is planned or has been implemented. The methods reported here could also be modified to assess visibility of tobacco displays in jurisdictions where tobacco products are sold outdoors.

## Unintended consequences

The widening of socioeconomic inequalities in retailer density and tobacco storage visibility is of considerable concern and, as noted above, has the potential to be addressed, but we did not find evidence of other unintended consequences, such as an increase in the availability of black-market tobacco, which had been anticipated by some tobacco retailers. However, in spite of both the POS legislation and the implementation of standardised packaging, tobacco companies have developed new promotional strategies that continue to incentivise retailers to sell and promote particular tobacco brands. This could be prevented by enforcing existing regulations.

Concurrent with the POS tobacco display ban, both the visibility and the experimental use of e-cigarettes among young people has increased. Our study provides evidence that exposure to e-cigarette displays increases the likelihood of future e-cigarette use, while e-cigarette use in never-smokers is associated with smoking initiation 1 and 2 years later. This suggests that e-cigarettes may have disrupted the impact of the POS display ban by adversely influence young people's attitudes towards both tobacco and other nicotine products. The revised EU Tobacco Products Directive prohibits all cross-national e-cigarette advertising and sponsorship but allows individual jurisdictions to regulate domestic advertising. A consultation is planned in Scotland in spring 2020 on what further regulation of e-cigarettes is required. Our findings suggest the need for future policies to consider prioritising the protection of young people by limiting the visibility of and, therefore, young people's access to, e-cigarettes and other nicotine products as they come on to the retail market.

## Further research

The POS legislation is only one element of Scotland's tobacco control policy and, in practice, components of the policy work together to reduce smoking prevalence and tobacco-related harm. Scotland (and the rest of the UK) has one of the strongest and most comprehensive tobacco control policies in Europe,<sup>140</sup> but, as policy continues to be developed to achieve the Scottish target of 5% smoking prevalence by 2034,<sup>141</sup> it is vital to consider how the different components of policy work together. Our research indicates that further research into the following three areas will inform the development of future tobacco control policies:

1. the longitudinal relationships between tobacco outlet availability and visibility and inequalities in perceived ease of access to tobacco products, smoking initiation and smoking prevalence
2. the impact that generic tobacco cues in the retail environment, such as generic tobacco signage and tobacco gantries, have on both non-smokers' and current smokers' attitudes and behaviour
3. the development of pro-smoking attitudes, smoking experimentation and regular smoking among young people after they leave secondary school, including a focus on the development of social norms around e-cigarette use in young people and the use of novel nicotine products such as JUUL and the new heat-not-burn products.



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## Contributions of authors

**Sally Haw** (<https://orcid.org/0000-0001-7844-0362>) (Professor of Public and Population Health) was the principal investigator of the study and took overall responsibility for the study and the writing of the report.

**Dorothy Currie** (<https://orcid.org/0000-0001-7321-9394>) (Senior Statistician) was a co-investigator of the study and a co-lead of the school survey.

**Douglas Eadie** (<https://orcid.org/0000-0001-9969-9162>) (Research Fellow) was a co-investigator of the study and a co-lead of the marketing audit.

**Jamie Pearce** (<https://orcid.org/0000-0002-0994-7140>) (Professor of Health Geography) was a co-investigator of the study and the lead of the mapping and spatial analysis of retail outlets component.

**Andy MacGregor** (<https://orcid.org/0000-0002-7150-7031>) (Head of Policy Research) was a co-investigator of the study and a co-lead of the focus group component.

**Martine Stead** (<https://orcid.org/0000-0002-3066-4604>) (Deputy Director of Institute for Social Marketing) was a co-lead of the marketing audit.

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**Amanda Amos** (<https://orcid.org/0000-0003-1066-5551>) (Professor of Health Promotion) was a co-investigator of the study and a co-lead of the focus group component.

**Catherine Best** (<https://orcid.org/0000-0002-3652-2498>) (Lecturer in Statistics) provided statistical expertise and was responsible for the analysis of data from across the study components.

**Michael Wilson** (<https://orcid.org/0000-0002-0049-208X>) (Research Fellow) contributed to the analysis of data from the school survey.

**Mark Cherrie** (<https://orcid.org/0000-0003-2822-9459>) (Research Fellow) contributed to the mapping and spatial analysis of retail outlets.

**Richard Purves** (<https://orcid.org/0000-0002-6527-0218>) (Research Fellow) contributed to the analysis of the marketing audit.

**Gozde Ozakinci** (<https://orcid.org/0000-0001-5869-3274>) (Senior Lecturer in Health Psychology) was a co-investigator of the study and a co-lead of the school survey.

**Anne Marie MacKintosh** (<https://orcid.org/0000-0003-2998-8203>) (Senior Researcher) was a co-investigator of the study and contributed to the marketing audit.

All authors participated in the interpretation of the findings, contributed ideas and were involved in critically revising this report for important intellectual content. All authors read and agreed the final report.

## Publications

Haw S, Amos A, Eadie D, Frank J, MacDonald L, MacKintosh AM, *et al.* Determining the impact of smoking point of sale legislation among youth (Display) study: a protocol for an evaluation of public health policy. *BMC Public Health* 2014;**14**:251.

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## Data-sharing statement

A linked data set from the school survey will be available via the UK data archive in 2020. All data requests should be submitted to the corresponding author for consideration. Access to anonymised data may be granted following review.



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## Appendix 1 Estimated sample sizes and smoking prevalence

**T**able 24 gives our estimated sample sizes and smoking prevalence and incidence for each of the school survey waves. The numbers of current and ever-smokers were extrapolated from data from the 2008 Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS) National Report,<sup>142</sup> the Health Behaviours of School Children (HBSC) 2010 Scotland National Report<sup>143</sup> and the 2008 Scottish Health Survey data.<sup>144</sup>

TABLE 24 Estimated sample sizes and smoking prevalence and incidence by age and year group

Age group/ grade	Pupils in each class <sup>a</sup> (%)	Pupils per school (n)	Total pupils in four schools (N)	Estimated response rates, <sup>b</sup> % (n)	Prevalence regular smoking, <sup>c</sup> % (n)	Incidence regular smoking (%)	Prevalence ever smoked, % (n)	Incidence ever smoked (%)
<b>School surveys 2013–14</b>								
13/S2	100	188	752	85 (640)				
15/S4	100	188	752	85 (640)				
Total all schools		376	1504	85 (1280)				
Total per school			376	85 (320)				
<b>School surveys 2015–17</b>								
12/S1	18.1	217	866	85 (736)	1.0 (7)	1.0	4 (26)	4
13/S2	18.3	220	878	85 (747)	4.8 (35)	3.8	23 (168)	19
14/S3	18.8	225	902	85 (767)	11.0 (84)	6.3	35 (268)	13
15/S4	18.8	225	901	85 (766)	16.5 (126)	5.5	44 (333)	9
16/S5	15.7	189	754	85 (641)	20.0 (128)	3.5	47 (298)	3
17/S6	10.2	123	491	85 (417)	24.0 (100)	4.0	47 (194)	0
Total all schools		1198	4793	4074	482		1287	
Per school			1198	1018	120		322	

a Distribution of pupils over different age groups is based on most recent school statistics released by the Scottish Government.

b Response rates are based on Health Behaviours of School Children survey experience.

c Regular smoking defined as weekly smoking. Percentage of 13- and 15-year-olds based on Scottish Schools Adolescent Lifestyle and Substance Use Survey;<sup>142</sup> percentages of 12-, 14-, 16- and 17-year-olds based on plotting, making use of Health Behaviours of School Children smoking data for 11-year-olds,<sup>143</sup> Scottish Schools Adolescent Lifestyle and Substance Use Survey 13- and 15-year-olds and 17-year-olds' data from the Scottish Health Survey<sup>144</sup> (16- to 24-year-olds: male, 24%; female, 29%).



## Appendix 2 School survey response rates

TABLE 25 Response rates by school and year

Year	C1, n (%)	C3, n (%)	C4, n (%)	C2, n (%)	Total, N (%)
2013					
S2	207 (91)	187 (87)	199 (93)	182 (91)	775 (91)
S4	183 (82)	176 (82)	196 (88)	152 (84)	707 (84)
Total	390 (87)	363 (84)	395 (90)	334 (88)	1482 (87)
2014					
S2	194 (89)	181 (91)	212 (94)	184 (94)	771 (92)
S4	170 (72)	148 (82)	165 (85)	166 (83)	633 (80)
Total	364 (81)	329 (87)	377 (90)	334 (88)	1403 (86)
2015					
S1	163 (95)	190 (95)	211 (95)	156 (82)	720 (92)
S2	209 (92)	181 (90)	205 (92)	188 (95)	783 (92)
S3	157 (81)	164 (82)	206 (94)	175 (88)	702 (86)
S4	170 (90)	175 (85)	191 (89)	165 (83)	701 (87)
S5	138 (89)	106 (77)	146 (90)	139 (89)	529 (86)
S6	68 (60)	90 (83)	107 (66)	107 (86)	372 (74)
Total	905 (86)	906 (86)	1066 (88)	930 (87)	3807 (87)
2016					
S1	185 (90)	200 (96)	210 (96)	176 (88)	771 (93)
S2	174 (90)	189 (96)	203 (91)	175 (91)	741 (92)
S3	196 (90)	190 (94)	193 (88)	180 (91)	759 (91)
S4	118 (58)	158 (86)	191 (88)	161 (82)	628 (78)
S5	110 (66)	145 (92)	156 (88)	156 (89)	567 (84)
S6	78 (63)	96 (96)	60 (48)	91 (75)	325 (69)
Total	861 (78)	978 (93)	1013 (86)	939 (87)	3791 (86)
2017					
S1	204 (87)	205 (95)	224 (97)	188 (90)	821 (92)
S2	178 (86)	186 (91)	204 (93)	187 (94)	754 (91)
S3	164 (85)	177 (89)	202 (89)	175 (92)	717 (89)
S4	154 (73)	180 (90)	161 (76)	177 (88)	678 (81)
S5	126 (83)	124 (93)	117 (61)	138 (84)	502 (79)
S6	73 (63)	110 (98)	96 (69)	111 (86)	389 (79)
Total	899 (81)	982 (92)	1004 (82)	976 (89)	3861 (86)





## Appendix 3 Tobacco retailers in Scotland

TABLE 26 Number of tobacco retailers in Scotland, by local authority (2012–17)

Local authority	Year					
	2012	2013	2014	2015	2016	2017
Aberdeen City	405	417	331	318	331	350
Aberdeenshire	425	422	336	310	298	291
Angus	215	216	173	165	174	174
Argyll and Bute	269	272	263	227	240	235
City of Edinburgh	986	997	885	906	927	921
Clackmannanshire	84	85	89	84	81	80
Dumfries and Galloway	431	426	345	339	328	325
Dundee City	307	312	271	269	265	257
East Ayrshire	230	232	206	203	212	216
East Dunbartonshire	109	111	104	103	108	111
East Lothian	163	167	149	141	144	140
East Renfrewshire	101	101	98	94	104	107
Eilean Siar	60	59	63	59	66	67
Falkirk	278	280	252	259	274	275
Fife	646	646	556	559	573	591
Glasgow City	1213	1214	1139	1124	1160	1177
Highland	602	596	469	470	508	499
Inverclyde	146	147	131	128	128	127
Midlothian	137	137	121	120	131	135
Moray	203	201	137	138	139	140
North Ayrshire	233	230	213	216	226	223
North Lanarkshire	569	577	531	533	553	572
Orkney Islands	65	65	67	69	67	66
Perth and Kinross	300	297	260	251	233	232
Renfrewshire	292	302	285	261	269	279
Scottish Borders	203	203	169	171	174	171
Shetland Islands	89	89	88	85	81	81
South Ayrshire	247	250	219	201	187	187
South Lanarkshire	500	502	460	461	467	489
Stirling	197	198	183	176	178	171
West Dunbartonshire	165	164	150	136	144	152
West Lothian	290	290	267	271	272	277
Scotland	10,161	10,206	9010	8847	9042	9118



## Appendix 4 Fake-brand recognition

TABLE 27 Fake-brand recognition (cigarettes and rolling tobacco)

School year	Survey year																	
	2013			2014			2015			2016			2017			2013-17		
	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)
S1	N/A	N/A	N/A	N/A	N/A	N/A	677	43	6.0	732	37	4.8	774	45	5.5	213	125	5.4
S2	709	66	8.5	715	56	7.3	746	37	4.7	681	62	8.3	700	55	7.3	3551	276	7.2
S3	N/A	N/A	N/A	N/A	N/A	N/A	627	75	10.7	678	80	10.6	649	68	9.5	1954	223	10.2
S4	636	71	10.0	560	72	11.4	629	72	10.3	558	69	11.0	602	72	10.7	2985	356	10.7
Total	1345	137	9.2	1275	128	9.1	2679	227	7.8	2649	248	8.6	2725	240	8.1	10673	980	8.4
N/A, not applicable.																		

TABLE 28 Fake-brand recognition (cigarette brands only)

School year	Survey year																	
	2013			2014			2015			2016			2017			2013-17		
	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)	No (n)	Yes (n)	Yes (%)
S1	N/A	N/A	N/A	N/A	N/A	N/A	704	16	2.2	751	18	2.3	795	24	2.9	2250	58	2.5
S2	735	40	5.2	741	30	3.9	765	18	2.3	719	24	3.2	725	30	4.0	3685	142	3.7
S3	N/A	N/A	N/A	N/A	N/A	N/A	652	50	7.1	711	47	6.2	679	38	5.3	2042	135	6.2
S4	671	36	5.1	582	50	7.9	648	53	7.6	583	44	7.0	631	43	6.4	3115	226	6.8
Total	1406	76	5.1	1323	80	5.7	2769	137	4.7	2764	133	4.6	2830	135	4.6	11,092	561	4.8
N/A, not applicable.																		



EME  
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HTA  
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