

RESEARCH ARTICLE

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# Smoking behaviours and attitudes towards campus-wide tobacco control policies among staff and students: a cross-sectional survey at the University of Birmingham

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## Abstract

**Background:** Tobacco control policies have potential to be an effective strategy for the reduction of smoking prevalence and secondhand smoke (SHS) exposure in tertiary educational settings worldwide. The aims of this study were to collect baseline data among staff and students, to measure smoking behaviours and attitudes towards introduction of campus-wide tobacco control policies within a UK higher education setting.

**Methods:** Cross-sectional study using data collected by web-based questionnaire administered to employed staff and enrolled students (undergraduate/postgraduate) at the University of Birmingham from May 2016 to April 2017. Information was obtained regarding demographic characteristics, tobacco usage patterns and attitudes towards a revised campus tobacco control policy using a 21-item survey tool. Logistic regression analyses were used to explore associations between participant characteristics and support for smoke-free or tobacco-free campus policy options, evaluated by crude and adjusted Odds Ratios (OR) after controlling for confounding factors (significance level:  $P < 0.05$ ).

**Results:** A total of 934 survey responses were received, of whom 780 participants provided complete information on staff or student status and were included in the present analysis. Current smoking prevalence was 14% ( $N = 109$ ; 95% confidence interval (CI) 11.6–16.6). Overall, 66.3% (95% CI: 62.9–69.7) of participants supported a smoke-free campus; 68.5% (95% CI: 65.2–71.8) endorsed restrictions for tobacco sales and just under half of respondents (47.3%; 95% CI: 43.8–50.9) supported a ban for electronic cigarettes/vaping device use on campus. Smoking status was an independent predictor of support for tobacco control, with the lowest level of support for a smoke-free campus among daily (adjusted OR 0.02; 95% CI: 0.01–0.05) and intermittent smokers (adjusted OR 0.06; 95% CI: 0.02–0.16).

**Conclusions:** Overall, the majority of staff and students participating in this baseline survey supported implementation of a smoke-free or comprehensive tobacco-free campus policy. These findings may inform the development and future implementation of a revised tobacco control policy at the university which reflects contemporary attitudes and considers a broad range of implementation issues, including behaviour change and environmental adaptations.

**Keywords:** Tobacco control, Smoke-free policy, Smoking behaviour, Smoking attitudes, Universities

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## Background

Smoking is a major avoidable cause of preventable disease and premature mortality in the UK responsible for approximately 78,000 premature deaths each year [1]. The harmful effects of involuntary environmental exposure to second-hand smoke (SHS) are well established, with no safe level of exposure for human health [2]. Since ratification of the World Health Organization Framework Convention for Tobacco Control (WHO-FCTC) in 2005, [3] many countries worldwide have introduced smoke-free legislative policies providing protection from exposure to tobacco smoke in indoor workplaces and public places, including educational establishments. There is consistent evidence for a positive impact of smoking bans in public spaces for improved cardiovascular health outcomes, and reduced mortality for associated smoking-related illnesses achieved primarily through reduced SHS exposure [4, 5].

However, existing national UK smoke-free legalisation does not restrict smoking or use of tobacco products in outdoor public spaces or across postsecondary educational settings, where almost 50% of young people aged between 17 and 30 years participate in education and training in the UK [6]. This age cohort coincides with a recognised period of health behaviour transition, including change from intention to regular smoking [7]. Tobacco control policies in such settings have potential to deliver multiple public health benefits through protection of staff, students and visitors from SHS exposure, [8] prevention of smoking initiation and improved uptake of smoking cessation [9]. Furthermore, people who stop smoking before the age of 30 years avoid more than 90% of the lung cancer risk attributable to tobacco compared to those who continue to smoke [10]. Restrictions on outdoor smoking may also provide wider benefits including improved staff and student productivity, litter reduction, decreased fire risk and increased student retention [11]. Finally, influencing university students may be important for modifying social norms relating to smoking as many will become future opinion and thought leaders.

Voluntary campus-wide tobacco control policies may comprise a range of measures, in the United States context these have previously been defined as: (i) *smoke-free*: ban of smoking in all indoor and outdoor areas; (ii) *tobacco-free*: ban of smoking and smokeless tobacco product use in all indoor and outdoor areas, which may also be extended to include prohibition of all activities relating to tobacco promotion, sponsorship and sale, such as institutional disinvestment from tobacco companies and withdrawal of direct/indirect research funding strategies involving the tobacco industry [12]. In addition, smoke or tobacco-free policy measures may include specific provision for, or restrictions upon the use of electronic cigarettes or vaping devices. Such policies have gained

increasing popularity for adoption among university and colleges worldwide, particularly in the United States (US) where in a 2018 national survey, over one third (35.2%) of US postsecondary institutions had adopted comprehensive tobacco-free policies, and 10.1% smoke-free policies respectively, with higher rates of adoption among public institutions [13].

Several studies have observed tobacco control policies implemented in such settings to be associated with significant reductions in smoking prevalence among university students, [14] reduced cigarette butt littering, [15] and a shift in social norms favouring smoke-free environments [16]; with stronger tobacco-free policies associated with reduced intention to smoke on campus [17]. The baseline level of support and engagement among staff and students has been recognised as a predictive factor for effective implementation, influencing both policy adoption [18, 19] and compliance [20]. However, there remains limited information regarding contemporary smoking patterns and levels of support for different tobacco control policies among staff and students at university and college campus settings in the UK.

In this context, we sought to identify smoking behaviours and attitudes among staff and students working or studying at the University of Birmingham. This baseline assessment comprised the first phase of an ongoing programme of research to inform development and future implementation of a revised university campus tobacco control policy. For the purpose of this study: we adopted the following definitions for outdoor campus areas (as a voluntary extension of existing smoke-free legislation for enclosed public spaces and workplaces): (i) *smoke-free campus policy* – ban of smoking, and; (ii) a *comprehensive tobacco-free campus policy* –ban of smoking, use of e-cigarettes and sales of tobacco products on campus. Our research objectives were to: (a) determine baseline patterns of tobacco usage and smoking behaviours; (b) investigate levels of support for smoke-free or comprehensive tobacco-free policy options; (c) identify independent predictive factors associated with support for a smoke-free or comprehensive tobacco-free control policy.

## Methods

### Study design

This was a cross-sectional, population-based study using baseline data obtained by self-administered online questionnaire developed using items adopted from the Global Adult Tobacco Survey [21] and the Health Survey for England (HSE) [22]. The survey instrument was pilot tested among 45 staff and students attending a University Wellbeing Event, to assess acceptability and feasibility, and subsequently modified prior to implementation. Invitations to complete the web-based questionnaire were

disseminated at university events and activities, staff and student electronic newsletters, and through promotion by representative bodies including the University College Union and Guild of Students (Student's Union). Data collection performed from May 2016 to April 2017 when the online survey was closed.

### Participants

Eligible study participants included all directly employed staff and undergraduate/postgraduate students enrolled on courses at the Edgbaston Campus, University of Birmingham during the data collection period (Total  $N = \sim 38,000$  persons).

### Measures

#### Demographic variables

All respondents were invited to provide their age, sex, ethnic group and current university role (staff or student status). University staff were classified by staff employment group (professional services/academic staff) and students by degree level (undergraduate/postgraduate), and fee status (home/EU/international).

#### Tobacco usage, intention for smoking cessation and SHS exposure

Survey respondents were asked to provide their tobacco smoking status (*current smoker/previous smoker/never smoker*) and those who reported current smoking activity were sub-classified into *daily smokers* (tobacco smoking on a daily basis) or *intermittent smokers* (tobacco smoking less than daily). Among *current* and *previous smokers*, information was obtained regarding tobacco smoking or use of e-cigarettes/vaping devices on the university campus and type(s) of tobacco products consumed (manufactured cigarettes, hand-rolled cigarettes, tobacco pipes, cigars, water or shisha pipe, e-cigarettes). Participants who reported being *current* or *previous smokers*, also responded to questions regarding smoking cessation, including current *intention to quit* status, defined as current intention to quit smoking or a quit attempt within the past 12 months.

#### Attitudes and support towards a campus tobacco control policy

Items reported in the study concerning staff and student's attitudes and levels of support for specific policy options were obtained from the 21-item survey questionnaire. Questions related to aspirations for a tobacco or smoke-free campus, provision of smoking cessation services and level of support for no-smoking signage and smoking shelters. A Likert scale was used to assess level of agreement with statements, with response options ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Binary variables were created to measure agreement with selected statements, with values 0 (*strongly disagree*/

*disagree/unsure*) and 1 (*agree/strongly agree*). Two dichotomous variables were created to reflect our selected policy definitions: (i) *smoke-free campus policy support* - coded as '1' for those respondents providing a response of *agree/strongly agree* to the statement concerning *an aspiration for a smoke-free campus*; (ii) *comprehensive tobacco-free campus policy support* - coded as '1' for those respondents who provided a response of *agree/strongly agree* for all three statements concerning: (a) *an aspiration for smoke-free campus*, (b) *restrictions for e-cigarettes/vaping on campus*, (c) *a ban of tobacco sales on campus*.

### Statistical analysis

Descriptive statistics including means, proportions (%) and corresponding 95% confidence intervals (95% CI) were calculated to summarise key demographic variables. Prevalence ratios (PRs) were calculated to evaluate comparisons between smoking status by demographic characteristics (gender, ethnicity) and staff/student status, with differences evaluated by Chi-square tests, with  $P \leq 0.05$  considered statistically significant. Logistic regression analyses was conducted to calculate odds ratios (OR) to report associations between participant characteristics and support for a smoke-free or comprehensive tobacco-free campus policy, after controlling for confounding factors. All statistical analyses were performed in Stata v13 (StataCorp, US).

### Ethical approval

Ethical approval for the study was provided by the University of Birmingham Research Ethics Committee (Ref ERN\_16-0409). Confidentiality was assured for all participants and no identifiable information was collected from respondents. The survey did not include financial or other incentives for participation.

### Results

A total of 934 survey responses were received (estimated response rate 2.5%), of whom 93.6% ( $N = 874$ ) provided consent for information to be used for research purposes. Those respondents who provided information regarding staff or student status ( $N = 780$ ) were included in the present analysis (Table 1). The majority of participants were university staff (69.9%,  $n = 545$ ), most of whom were from professional services (72.4%,  $n = 394$ ) with a lower proportion of academic staff (20.6%,  $n = 112$ ). Just under one third of survey respondents were university students (30.1%,  $n = 235$ ), with most studying at undergraduate level (84.3%  $n = 198$ ). Among participants included in the analysis, 59.6% ( $n = 465$ ) were females and 39.5% ( $n = 308$ ) males, and 86% ( $n = 657$ ) identified themselves as of White British/Irish ethnicity. The mean age was 42 years (SD

**Table 1** Demographic characteristics of survey participants (university staff and students)

Demographic Characteristics	Staff N = 545 n (%)	Students N = 235 n (%)	Total N = 780
<b>Age</b>			
17–24 years	25 (4.8)	198 (85.7)	223 (29.7)
25–34 years	131 (25.2)	22 (9.5)	153 (20.4)
35–44 years	150 (28.9)	9 (3.9)	159 (21.2)
45–54 years	123 (23.7)	2 (0.9)	125 (16.6)
≥ 55 years	91 (17.5)	0 (0.0)	91 (12.1)
<b>Gender</b>			
Male	222 (41.1)	86 (36.9)	308 (39.8)
Female	318 (58.9)	147 (63.1)	465 (60.2)
<b>Ethnic Group</b>			
White British/Irish	493 (92.5)	164 (71.0)	657 (86.0)
Mixed/Multiple	12 (2.3)	14 (6.1)	26 (3.4)
Asian/Asian British	15 (2.8)	27 (11.7)	42 (5.5)
Black African/Caribbean	6 (1.1)	11 (4.8)	17 (2.2)
Other ethnic group	7 (1.3)	15 (6.5)	22 (2.9)
<b>University Role (Staff only)</b>			
Academic Staff	112 (20.6)	–	
Professional Services Staff	394 (72.4)	–	
Other Staff	38 (7.0)	–	
<b>Degree Status (students only)</b>			
Undergraduate Student	–	198 (84.3)	
Postgraduate Student	–	37 (15.7)	
<b>Fee Status (students only)</b>			
Home	–	186 (80.2)	
EU	–	24 (10.3)	
International	–	22 (9.5)	
<b>Smoking Status</b>			
Never Smoker	337 (62.1)	171 (73.7)	511 (65.7)
Previous Smoker	133 (24.5)	25 (10.8)	158 (20.3)
Intermittent Smoker	15 (2.8)	16 (6.9)	31 (4.0)
Daily Smoker	58 (10.7)	25 (10.8)	78 (10.1)

Missing data: age (29), gender (7), ethnic group (16), university role (1), fee status (3), smoking status (2)

11.4) and 22 years (SD 11.4), for staff and students respectively.

### Tobacco smoking and usage patterns

Prevalence of current tobacco smoking (daily or intermittent) was 14.0% ( $n = 109$ ; 95% CI: 11.6–16.6%), with no significant difference between university staff and students (13.4% vs 15.5%,  $P = 0.48$ ). The proportion of current smokers was higher among males compared to females (19.0% vs. 11.0%,  $P = 0.002$ ) (Additional file 1: Table S1). Overall, 34% (95% CI: 30.8–37.6%) of

participants were former smokers, with the highest prevalence among males aged 45–54 years (40.0%). There was a higher prevalence of *previous smoking* among males (PR: 1.25,  $P = 0.037$ ), staff members (PR: 1.44,  $P = 0.003$ ) and those of White British/Irish ethnicity (PR: 1.54,  $P = 0.005$ ). Almost one half (49.5%,  $n = 53$ ) of current tobacco smokers reported they wished to quit smoking and almost one third (31.5%,  $n = 34$ ) had attempted to quit within the previous 12 months. Among current smokers ( $n = 109$ ), the majority (90.8%,  $n = 99$ ) had smoked on campus, and the predominant tobacco product choice was manufactured (45.4%) or hand-rolled cigarettes (38.9%), with 8.3%, reporting ever to have used e-cigarettes on campus and a small number (7.4%,  $n = 8$ ) other tobacco products (e.g. cigars, shisha, hookah) (data not shown).

### Attitudes and support towards a tobacco control policy

Overall, 86.8% (95% CI: 84.2–89.1%) of survey respondents agreed that staff and students should not be exposed to SHS on campus, 66.3% (95% CI: 62.9–69.7%) supported an aspiration for a smoke-free university campus, and 68.5% (95% CI: 65.2–71.8%) endorsed restrictions for tobacco sales. In both staff and student samples, support for a smoke-free campus was strongly associated with smoking status; the highest level of support was among non-smoking students (80.6%; 95% CI: 74.4–85.9%) and staff members (72.6%; 95% CI: 68.3–76.6%) respectively (Table 2). Just under half of respondents (47.3%; 95% CI: 43.8–50.9%) supported a ban for e-cigarettes/vaping device use on campus, with significant differences by smoking status. Support for smoking cessation provision was higher among students (94.9%; 95% CI: 89.6–96.8%) compared to staff members (86.1%; 95% CI: 70.5–95.3), with the majority of respondents in both groups favouring smoking shelter and no-smoking signage provision. The majority of current smokers (90.8%) felt that a comprehensive tobacco-free campus would discriminate against and disadvantage staff and students who smoke, with fewer non-smokers considering it would be a discriminative policy, among both staff (34.6%; 95% CI: 30.3–39.2%) and student (28.3%; 95% CI: 21.9–34.9%) groups respectively. The majority of participants reported that a smoke-free campus policy would improve the health of staff and students (staff 80.6%; students 89.3%) and the University's public image (staff: 67.2%; students 81.3%).

Table 3 displays the regression analyses to identify independent predictors of support for smoke-free and comprehensive tobacco-free university campus policies respectively. The strongest predictive factor was smoking status, with likelihood of support for both a smoke-free or tobacco-free campus significantly lower among daily smokers (Adjusted OR (AOR) 0.02, 95% CI: 0.01–0.05 and AOR 0.02, 95% CI: 0.00–0.10) compared to never

**Table 2** Tobacco control policy support and perceptions among university staff and students

	Staff				Students			
	Current Smokers		Non-Smokers		Current Smokers		Non-Smokers	
	N = 73	% (95% CI)	N = 470	% (95% CI)	N = 36	95% CI	N = 196	95% CI
Support for a campus-wide tobacco control policy								
<i>Staff and students should not be exposed to Second Hand Smoke on campus</i>	43	59.7 (47.5–71.1)	417	88.9 (85.7–91.6)	22	61.1 (43.5–76.9)	189	96.4 (92.8–98.6)
<i>We should aspire to make the university free of tobacco smoking</i>	11	15.3 (7.9–25.7)	342	72.6 (68.3–76.6)	4	11.1 (3.1–26.1)	158	80.6 (74.4–85.9)
<i>Staff and students should not be allowed to smoke e-cigarettes on campus</i>	10	13.7 (6.8–23.8)	248	52.6 (47.9–57.1)	6	16.7 (6.4–32.8)	104	53.1 (45.8–60.2)
<i>Tobacco sales should be banned on campus</i>	12	16.4 (8.8–27.0)	345	73.9 (69.6–77.8)	9	25.0 (12.1–42.2)	165	83.2 (77.2–88.1)
Support for tobacco control policy intervention measures								
<i>Stop smoking support should be provided on campus</i>	49	67.1 (55.1–77.7)	383	82.0 (78.2–85.4)	33	91.7 (77.5–98.2)	180	92.8 (88.2–96.0)
<i>Smoking shelters should be provided on campus</i>	57	78.1 (66.9–86.9)	183	39.3 (34.8–43.9)	29	80.6 (64.0–91.8)	98	50.0 (42.8–57.2)
<i>No-smoking signs should be clearly placed around campus</i>	45	63.4 (51.1–74.5)	408	87.7 (84.4–90.6)	18	51.4 (34.0–68.6)	176	90.3 (85.3–94.0)
Perceptions of a campus-wide tobacco control policy								
<i>A tobacco-free campus would improve the University's public image</i>	11	15.1 (7.7–25.4)	323	69.0 (64.6–73.2)	8	22.2 (10.1–39.1)	165	84.2 (78.2–89.0)
<i>A tobacco-free campus would improve the health of staff and students</i>	23	31.5 (21.1–43.4)	389	83.5 (79.8–86.7)	15	41.7 (25.5–59.2)	182	93.3 (88.9–96.4)

smokers ( $P < 0.001$ ) after adjustment for measured confounding factors. Support was also lower among previous smokers compared to never smokers for both smoke-free (AOR 0.28; 95% CI: 0.18–0.42) or tobacco-free policy (AOR 0.39; 95% CI: 0.26–0.60) policies respectively. Support for a smoke-free campus policy was also significantly more likely among females (AOR 1.45; 95% CI: 1.00–2.11) and those of Asian/Asian British ethnicity (AOR 5.46, 95% CI: 1.49–19.96), who were also more likely to support a comprehensive tobacco-free campus policy (AOR 2.07, 95% CI: 1.02–4.20). There were no significant observed differences in support level by university role (staff/student) or age group in adjusted analyses.

## Discussion

This study provides insights into the contemporary smoking behaviours and attitudes towards smoke and comprehensive tobacco-free policy options, among 780 staff and students attending a large UK University. Overall, smoking prevalence was 14.0% (95% CI 11.6–16.6%) and over two-thirds of respondents (68.5%; 95% CI: 65.2–71.8%) expressed support for a smoke-free campus and just under half (47.3%; 95% CI: 43.8–50.9%) support a ban for e-cigarettes/vaping device use on campus. Smoking status was an independent predictor of support for tobacco control, with the lowest level of support for a smoke-free campus among daily and intermittent

smokers. Our novel findings provide valuable baseline information regarding patterns of smoking within a university campus environment, which may inform development and enable future evaluation of a revised voluntary campus-based tobacco control policy option in the context of a UK higher education institution.

Prevalence of current tobacco smoking (14.0%) was marginally lower than the UK adult population (15.1%), [23] but broadly consistent with smoking rates observed in postsecondary educational settings in the United States and New Zealand [24, 25]. The proportion of current smokers reporting an intention to quit was lower than the national average (49.5% vs 60.8%) [26] potentially reflecting the demographic characteristics of our study population. Further differences were observed in e-cigarette usage patterns, with current usage reported by (8.3%) which is lower than the proportion of UK adult population who have tried an e-cigarette (19.4%), but higher than the proportion of current users in a national context (5.5%) [26].

Support for a campus-wide smoke-free policy was consistently high among both staff and students, with 86% of respondents expressing concern about SHS exposure and two-thirds (66.3%) supportive of an aspiration for a smoke-free campus. Attitudes towards inclusion of e-cigarettes or vaping devices within a smoke-free policy were less consistent; potentially due to mixed public awareness of the health impacts associated with vapour

**Table 3** Logistic regression analyses reporting support for (i) smoke-free and (ii) tobacco-free campus policy options among university staff and students

Predictor variable	Smoke-Free Campus <sup>a</sup>				Tobacco-Free Campus <sup>b</sup>		
	N	Adjusted OR	95% CI	P-value†	Adjusted OR	95% CI	P-value
<b>Age</b>							
17–24 years	223	–	–	–	–	–	–
25–34 years	153	0.73	0.34–1.52	0.394	0.81	0.42–1.56	0.521
35–44 years	159	1.54	0.68–3.48	0.297	1.45	0.72–2.92	0.301
45–54 years	125	0.70	0.31–1.60	0.396	1.26	0.60–2.65	0.547
≥ 55 years	91	0.96	0.40–2.30	0.928	1.41	0.65–3.04	0.382
<b>Gender</b>							
Male	308	–	–	–	–	–	–
Female	465	1.45	1.00–2.11	0.048*	0.99	0.71–1.38	0.932
<b>Ethnic Group</b>							
White British/Irish	657	–	–	–	–	–	–
Mixed/Multiple	26	1.55	0.52–4.55	0.452	1.45	0.59–3.58	0.413
Asian/Asian British	42	5.46	1.49–19.96	0.010*	2.07	1.02–4.20	0.043*
Black African/Caribbean	17	0.88	0.25–3.07	0.800	1.18	0.43–3.24	0.742
Other ethnic group	22	0.98	0.33–2.96	0.974	2.39	0.93–6.11	0.069
<b>University Status</b>							
Student	233	–	–	–	–	–	–
Staff	544	1.11	0.54–2.27	0.810	1.08	0.56–2.02	0.844
<b>Smoking Status</b>							
Never Smoker	508	–	–	–	–	–	–
Previous Smoker	158	0.28	0.18–0.42	< 0.001**	0.39	0.26–0.60	< 0.001**
Intermittent Smoker	31	0.06	0.02–0.16	< 0.001**	0.13	0.04–0.43	0.001**
Daily Smoker	78	0.02	0.01–0.05	< 0.001**	0.02	0.00–0.10	< 0.001**

†P-value for differences between groups \*P ≤ 0.05 \*\*P ≤ 0.001

<sup>a</sup>Agreement/strong agreement with the survey item: 'We should aspire to make the university campus free of tobacco smoking'<sup>b</sup>Agreement/strong agreement with all survey items: (a) We should aspire to make the university campus free of tobacco smoking; and (b) Tobacco sales should be banned on campus; and (c) Staff and students should not be allowed to smoke e-cigarettes on campus

from these sources, or their role in supporting a smoke-free environment. Our findings are notably consistent with those of a meta-analysis of 19 studies performed by Lupton and colleagues, which found 58.9% of students and 68.4% of staff to be supportive of smoke-free campus policies [27]. Similar levels of support were observed within a cross-sectional survey at Curtin University, Western Australia, where 84.1% of respondents were concerned about the harms of SHS exposure and 65.7% supportive of a smoke-free campus policy option, with comparable differences by smoking status [20].

The majority of participants reported that a smoke-free campus policy would have a positive impact upon the health of staff and students, suggesting awareness of the links between smoking and tobacco usage and associated health harms. Although we did not seek specific views on the impact of a revised policy upon quality of life measures, given attitudes towards a smoke-free

campus were broadly positive, such an association suggests potential to achieve wider improvements in staff and student wellbeing. Raising awareness of relevant health messages and reinforcement of the harms of SHS exposure are likely to improve acceptance and policy compliance, as previously observed in bar and restaurant settings [28].

Understanding the factors associated with support among population sub-groups may be beneficial for leveraging relevant support and promotion of positive attitudes towards change. Consistent with other investigators, [29] we observed a gradient across categories of smoking status, with the lowest level of policy endorsement among daily, compared to intermittent and former smokers, and highest among never smokers. These attitudes may be magnified by concern around stigma, reflected in the high proportion of smokers (90.4%), who considered a smoke-free policy to be discriminative [29]. Poland and colleagues

(2012) [30] described the importance of characterisation of discrete types of smokers to inform targeted mitigation measures, identifying that ‘easygoing’ smokers were supportive of smoking restrictions if implemented sensitively and supported with appropriate messages.

In accordance with best practice in health promotion theory, [31] a comprehensive range of strategies including support for current smokers is most likely to achieve optimal outcomes. This assumption is further supported by existing evidence for workplace smoking restrictions as motivators for behaviour change; underpinned by the relatively high proportion of survey participants within the contemplative phase of health behaviour change [32] (intention to quit or quit attempt), suggesting policy implementation is likely to be most effective if integrated with smoking cessation provision.

This study had a number of strengths and limitations. Although the overall survey response rate was relatively low, the large study population comprises a diverse cohort of university staff and students. Males were slightly underrepresented comprising only 39.8% of participants, as were EU (10.3%) and international students (9.5%); however, this response pattern is similar to other campus smoking studies [18]. We did not assess income or composite measures of socio-economic status, which are potential confounding factors; however, information was available for age, sex, ethnic group and staff status. The element of selective non-response bias may have resulted in more positive attitudes towards tobacco control policies than among the total university population; however, with the sample size of 780, our findings provide the most comprehensive information available concerning contemporary smoking behaviours and attitudes in a UK tertiary educational setting.

Use of a self-administered questionnaire provides only a subjective assessment of smoking status, and could be influenced by social acceptability bias; however, we did not collect identifiable information and participants were able to exclude their responses from research purposes. Our survey did not include questions regarding symptoms of smoke related illness or awareness of the harms of SHS or Thirdhand Smoke (THS) exposure, which may be better explored through future qualitative research. We administered the questionnaire at a single time point, yet plan to conduct a repeat cross-sectional survey at a future date to explore changes in prevalence, attitudes and levels of support over time [16].

### Implications for policy and research

The WHO FCTC suggests that national bodies and organisations should protect the population from hazards of SHS ‘wherever the evidence shows that hazard exists’, including quasi-outdoor and outdoor places [3]. Despite gaining popularity worldwide, there remains limited

research regarding attitudes towards and effectiveness of smoke- and tobacco-free campus policies. However, it is widely recognised that achieving effective adoption of smoke-free legislation in any setting requires population support and a high degree of compliance.

Potential challenges in local policy implementation include enforcement difficulties, smoking displacement, self-perceived workplace stress, negative community relations and safety concerns [20]; however, relevant mitigation measures may include phased smoke-free zones or designated shelter provision. These processes will require robust future implementation research, to develop the evidence base concerning policy implementation and organisational change processes, to inform widespread adoption of smoke-free and comprehensive tobacco-free policies across UK higher education institutions.

### Conclusion

Our findings indicate that the majority of staff and students at the University of Birmingham broadly support introduction of a campus-wide smoke-free or comprehensive tobacco-free policy. Provision of a package of supporting measures including smoking cessation support and smoking shelters may improve policy implementation and compliance. Further research to improve our current understanding of social and organisational norms which might influence policy adoption and compliance, including exploration of preferences and priorities among specific population sub-groups, will help inform effective policy implementation.

### Supplementary information

**Supplementary information** accompanies this paper at <https://doi.org/10.1186/s12889-020-8321-9>.

**Additional file 1: Table S1.** Demographic characteristics of study participants by smoking status

### Abbreviations

AOR: Adjusted odds ratio; E-cigarette: Electronic cigarette; HSE: Health survey for England; OR: Odds ratio; PR: Prevalence ratio; SHS: Secondhand smoke; THS: Thirdhand smoke; WHO-FCTC: World Health Organization Framework Convention for Tobacco Control

### Acknowledgements

We would like to thank Lucy Austin for providing support for survey promotion including recruitment of participants and collation of participant responses, Tessa Hewitt for assistance with developing the draft manuscript. Sharon Murphy and Karen Biddle provided administrative support for administration of the survey. We are grateful to Professor KK Cheng for identifying the original research questions and for providing guidance on study conduct.

### Authors' contributions

SEB assisted with development of the survey questionnaire, conducted statistical analyses of the study datasets and wrote the first draft of the manuscript. RW and PH provided guidance regarding content and delivery of the survey questionnaire. AF and LJ provided guidance on the study design, data collection procedures and interpretation of study findings. SH was responsible for the study design, sampling framework and provided

oversight for data analyses and interpretation. All authors critically commented upon the first draft and have reviewed and approved the final draft of the manuscript.

#### Funding

No funding was used to support this research and/or the preparation of the manuscript.

#### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

#### Ethics approval and consent to participate

Ethical approval for the study was provided by the University of Birmingham Research Ethics Committee (Ref ERN\_16–0409). All data presented are from those study participants who provided written informed consent to use of their data for research purposes.

#### Consent for publication

Not applicable.

#### Competing interests

Amanda Farley (AF) is a co-investigator on a researcher led grant from Johnson and Johnson. All other study authors have no conflicts of interest relevant to this publication.

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Received: 28 May 2019 Accepted: 4 February 2020

Published online: 19 February 2020

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