



**Students' attitude and smoking behaviour following the implementation a university smoke-free policy: a cross sectional study**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-002100
Article Type:	Research
Date Submitted by the Author:	04-Oct-2012
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<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Public health, Smoking and tobacco
Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, EPIDEMIOLOGY

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5 **Students' attitude and smoking behaviour following the**  
6 **implementation a university smoke-free policy: a cross sectional study**  
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52 **Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon  
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54  
55 **WordCount : 3,384 words excluding ( title page, abstract, references and tables)**  
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## Article Summary

### Article focus:

- To examine students' attitude and smoking behaviour following the smoking ban at the American University of Beirut campus.

### Key messages and significance of the study:

- Implementing a tobacco control policy in a university campus could be successful.
- Challenges of the implementation of a tobacco cessation policy at a university could be overcome by having a comprehensive national tobacco control policy.

### Strengths and Limitations:

#### Strengths:

- A representative sample of all Faculties
- This study was the first to be conducted regionally.
- This study could lay the ground for implementing smoking ban in other universities in Lebanon and globally.

#### Limitations:

- The cross sectional nature of the study

**Abstract:**

**Objectives:** In view of the high smoking rate among university students in Lebanon and the known adverse effects of second hand smoking, the American University of Beirut (AUB) decided to implement a non-smoking policy on campus. This study sought to examine students' attitude and smoking behaviour following the ban.

**Design:** cross-sectional study

**Setting:** A private university in Beirut, Lebanon.

**Participants:** 535 students from all six faculties of the university were randomly selected. First a random selection of classes offered in the spring semester of the 2008/2009 academic year was conducted. Then a proportional sample of these selected classes was chosen using a stratified cluster design.

**Primary and secondary outcome measures:**

The main outcomes of the study were the attitudes towards and compliance with the ban. Other secondary outcomes are perception of barriers to implementation of the ban and attitudes towards tobacco control in general.

**Results:** Students' attitude towards the ban and the enforcement of a non-smoking policy in public places across Lebanon varied according to their smoking status whereby non-smokers possessed a more favourable attitude and strongly supported such policies compared to smokers. Despite this, smokers were generally compliant with the ban and for some it led to a decrease in their smoking behaviour. Perceived barriers to implementation of the non-smoking policy in AUB included lack of compliance with and strict enforcement of the policy as well as the small number and crowdedness of the smoking areas.

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4 **Conclusions:** An education campaign, smoking cessation services, and strict  
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6 enforcement of the policy might be necessary to boost its effect in further reducing  
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8 students' cigarette use.  
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For peer review only

**Introduction** The University years are an important life phase for every student during which they develop and uphold risky behaviours such as smoking. Smoking represents an important public health problem among university students. An international study showed that overall 34% of male university students and 27% of female university students from 23 different countries were current smokers with large differences across countries and gender.[1] Students from Southern European countries, for example Portugal (47% of males smoke) and Spain (46% of females smoke), exhibited the highest rate of tobacco smoking compared to students from developing countries, for example Thailand (men 14% and women 2%), who displayed the lowest rates[1] Among US college students, Rigotti et al.[2] found that one third of students (32.9%) currently used tobacco, cigarettes being the most common form of tobacco use.[1] The above studies highlight the need for interventions that do not only target university students' smoking behavior but also protect non-smokers from being exposed to high levels of second hand smoke and its associated health effects.

Evidence indicates that second hand smoking is associated with increased incidence of cardiovascular diseases, lung cancers, and respiratory problems such as worsened asthma severity.[3-6] To lessen these effects, non-smoking policies in public places have been implemented and were shown to have positive consequences. For example, a ban on smoking in workplaces and public places in Bowling Green, Ohio led to a significant reduction in hospital admission rates for coronary heart disease.[7] Similarly, a smoke-free legislation in public places in Scotland was associated with a 17% decrease in admissions for acute coronary syndrome.[8] This decrease was greatest among non-smokers whose exposure to second-hand smoke was dramatically reduced; a lower decline in acute coronary syndrome was observed for smokers.[8]

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4 Not only do non-smoking policies protect smokers and non-smokers from the  
5 effects of second-hand smoking, but they also encourage smokers to decrease or even  
6 quit smoking. A review of 26 studies on the effects of smoke-free workplaces in the  
7 United States, Australia, Canada, and Germany showed that smoke-free workplaces are  
8 associated with decreased smoking prevalence and less cigarette consumption among  
9 smokers.[9] Similarly, a nationally representative sample of college students in different  
10 U.S. colleges showed that residents of smoke-free housing had a significantly lower  
11 smoking prevalence than students living in residences which permit smoking.[10]  
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22 Although Lebanon ratified the World Health Organization Framework  
23 Convention on Tobacco Control in 2005 which proposes a complete ban on indoor  
24 smoking, such a policy has not been implemented yet. However, a few workplaces,  
25 hospitality venues, and educational institutions have voluntarily introduced smoking  
26 bans.[11] A study by Chaaya et al.[12] revealed that 28.3% of students in a private  
27 university in Lebanon currently smoked argileh, of whom 38% were regular smokers,  
28 the proportion of ever argileh smokers being 43%.[12] Another study by Tamim et  
29 al.[13] showed that 40% of students in public and private universities in Lebanon  
30 currently smoked tobacco (21.1% narghile, 7.6% cigarettes and 11.3% smoked both  
31 cigarettes and narghile).[13] Concerned about the level of smoking seen among young  
32 people in the country, the American University of Beirut, a private university, decided  
33 to implement a non-smoking policy everywhere on campus in May 2008 encompassing  
34 student residence halls and all campus buildings except for private faculty residences.  
35 Smoking became restricted to designated areas only. This study describes students'  
36 attitudes and opinions regarding the ban, as well as their behaviour after its  
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4 implementation. It also assesses students' attitude towards the enforcement of a non-  
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6 smoking policy in public places across Lebanon.  
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## 10 11 12 **Methods**

### 13 14 15 **Participants**

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18 A cross sectional study was conducted at AUB, the largest private university in  
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20 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
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22 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
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24 and currently enrolls around 7500 students from 69 countries. A random sample of  
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26 classes being offered in the spring semester of academic year 2008/2009 were selected  
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28 to participate in the survey, yielding a total of 535 students who were registered in those  
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30 courses. The selection of classes was based on a stratified cluster design whereby a  
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32 proportionate sample of classes was chosen from all six Faculties based on the size of  
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34 each faculty. All students attending chosen classes were approached and asked to  
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36 complete the survey. Fewer than 2 % refused to participate. The final sample was  
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38 representative of all undergraduate and graduate students from the six Faculties at AUB,  
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40 with an oversampling from the Faculty of Health Sciences. The highest percentage of  
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42 surveyed students was aged between 19 and 24 years (80.8%), Lebanese (75%), female  
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44 (59%), from the Faculty of Arts and Sciences (41%), and not living in dorms (87%).  
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### 50 51 **Questionnaire**

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54 A self-administered survey was designed to collect data on demographic  
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56 variables (age, gender, Faculty, class, nationality and place of residence), personal  
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4 smoking habits, compliance and attitude towards the smoking ban at AUB, in addition  
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6 to students' attitude towards tobacco control policies in Lebanon. Students were asked  
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8 questions such as: to what extent they were satisfied with the smoking ban at AUB,  
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10 whether they felt it was justified, and whether the ban helped in creating a healthier  
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12 environment. Various statements related to their attitude towards some of the FCTC  
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14 measures, specifically policies banning cigarette smoking in public places were  
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16 included. Students expressed their support for or objection towards the enforcement of  
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18 these policies through a likert scale. The survey also included questions on ever and  
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20 current cigarette smoking behavior and perceived change in consumption following the  
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22 ban, as well as their compliance with it (e.g. whether they smoked in designated and  
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24 non-designated areas). Moreover, students were asked about the barriers against the  
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26 implementation of tobacco control policies in AUB.  
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### 31 **Data Collection**

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34 After securing approval from the Institutional Review Board at AUB, instructors  
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36 of the selected courses were contacted to ensure access to their class and set a time for  
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38 data collection. Surveys were administered to students during class time. Questionnaire  
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40 construction and data collection were done as part of the requirements for "Survey  
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42 Methods", a course offered at the Faculty of Health Sciences to undergraduate  
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44 Environmental Health (EH) students. Data collection was completed in June 2009.  
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47 None of the instructors contacted refused to take part in the study.  
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### 51 **Data analysis**

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54 Univariate analysis was performed to examine the distribution of main  
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56 demographic and smoking variables. Bivariate analyses by gender and cigarette  
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4 smoking status were performed. Because occasional smokers and ex-smokers  
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6 constituted only 6.4% and 4.7% of the sample respectively, and their smoking exposure  
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8 is different from regular smokers, status was grouped into 3 categories: never smokers,  
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10 occasional and ex-smokers, and current regular smokers. Answers to attitudes towards  
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12 the ban were also grouped into 3 categories: to a large extent, to some extent and not at  
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14 all/not sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the  
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16 analyses by weighing all data according to the distribution of students in all six  
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18 Faculties. Weighted absolute frequencies and percentages are presented in the tables.  
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## 26 **Results**

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28 Close to one half of the surveyed students reported ever smoking cigarettes.  
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30 Twenty percent have ever smoked cigarettes for at least one month, 51% of whom were  
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32 current regular smokers (11 % of the whole sample), 22 % ex-smokers, and 28%  
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34 occasional smokers. The largest proportion of students started smoking before joining  
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36 the university (75%), and another considerable percentage considered themselves  
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38 addicted to smoking (61% of regular smokers). One third of regular smokers are  
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40 considering quitting in the next 6 months. Differences in smoking status were noted  
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42 across Faculties, year in University and gender. The highest prevalence of regular  
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44 smoking was reported in the School of Business (14%) followed by the Faculty of Arts  
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46 and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences  
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48 (4.5%). Sophomore and male students were more likely to be current regular smokers  
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50 than students from other levels and females respectively.  
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### Students' attitude towards the smoke free policy (Table 1)

Table 1 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were mainly (51.7%) not at all satisfied with it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and non-smokers possessed significantly different views regarding whether the ban helped in creating a healthy environment and whether AUB should become an entirely smoke-free area. While 94% of non-smokers thought that the ban contributed to some or a large extent in creating a healthy environment, only 67% of regular smokers believed so. Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this prospect as opposed to a meager 10.2% of regular smokers.

**Table 1: Students' attitude towards AUB's smoking ban by smoking status**

Attitude	Regular Smokers		Occasional and Ex- Smokers		Non-smokers		Total %
	n= 60	%	n= 59	%	n= 416	%	
<b>Extent students satisfied with the smoking ban*</b>							
Large extent	6	10.3	27	45.0	278	67.5	58.6
Some extent	15	25.9	14	23.3	110	26.6	26.2
Not at all/ Not sure	37	63.8	19	31.6	25	6.0	15.2
<b>Extent students consider the ban justified*</b>							
Large extent	8	13.8	29	49.2	265	64.5	57.2
Some extent	26	44.8	20	33.9	123	29.9	32.0
Not at all/ Not sure	24	41.4	10	17.0	23	5.6	10.8
<b>AUB becoming an entirely</b>							

<b>smoke-free area*</b>							
Agree	6	10.2	19	32.8	185	45.0	39.8
Disagree	50	84.7	29	50.0	151	36.7	43.6
Undecided	3	5.1	10	17.2	75	18.2	16.7
<b>Extent the ban helped in creating a healthy environment*</b>							
Large extent	6	10.3	25	42.4	282	68.4	59.2
Some extent	33	56.9	27	45.8	106	25.7	31.4
Not at all/ Not sure	19	32.8	7	11.9	24	5.8	9.5
<b>Extent the ban helps smokers reduce smoking*</b>							
Large extent	2	3.4	8	13.6	78	18.9	16.7
Some extent	21	36.2	24	40.7	211	51.2	48.4
Not at all/ Not sure	35	60.3	27	45.8	123	29.8	35.0
<b>Extent the ban helps smokers in quitting smoking*</b>							
Large extent	2	3.4	5	8.8	32	7.8	7.4
Some extent	4	6.9	14	24.6	131	31.8	28.3
Not at all/ Not sure	52	89.7	38	66.6	249	60.4	64.3

\*  $p < 0.001$

Regarding the ban's effect on smoking behavior, a sizeable proportion (65%) of respondents agreed that the ban would help smokers decrease smoking; however, a much lower percentage thought the ban would contribute to smoking cessation.

Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy percent of non-smokers as opposed to 40% of smokers considered the ban might lead in some or large extent to a decline in smoking. As to its effect on quitting smoking, a large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the ban would have no effect on cessation.

Occasional and ex-smokers were closer to non-smokers in their opinion/ attitude as depicted in table 1.

### **Compliance and students' smoking behavior following implementation of the smoke free policy (Table 2)**

Students' compliance with the ban was assessed among regular smokers. A little bit less than three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

**Table 2: Smokers' compliance and behaviour following the ban by sex**

Variable	Males		Females		Total %
	n= 39	%	n= 21	%	
<b>Smoking on campus</b>					
Designated areas only	27	75.0	13	68.4	72.7
Designated and non-designated areas	9	25.0	6	31.6	27.3
<b>Received a warning ticket for smoking by an officer on campus</b>					
No	29	78.4	19	90.5	82.8
Yes	8	21.6	2	9.5	17.2
<b>Smoking frequency</b>					
Increased	11	31.4	1	5.0	21.8
Decreased	7	20.0	4	20.0	20.0
Remained the same	17	48.6	15	75.0	58.2

As for students' smoking frequency following the ban, it did not significantly differ between sexes. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before its implementation. However, around one third (31.4 %) and 5% of male and female respondents respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of current smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

### Barriers to implementation of the smoke free policy in AUB (Table 3)

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in table 3.

**Table 3: Barriers to implementation of the smoke free policy by smoking status**

Variable	Regular Smokers		Occasional or Ex-smokers		Non-smokers		Overall % agreement
	n= 60	% (agree)	n= 59	% (agree)	n= 416	% (agree)	
Some students are not willing to abide by the non-smoking policy	43	75.4	38	70.4	268	66.3	65.2
Some faculty and staff are not willing to abide by the non-smoking policy	36	64.3	27	50.9	193	48.0	47.9
Smoking areas are too few*	49	86.0	24	45.3	121	29.9	36.3
Smoking areas are too crowded*	48	85.7	34	63.0	220	54.7	56.4
No strict enforcement of the non-smoking policy*	10	17.9	13	24.5	142	35.3	30.8

\*  $p < 0.01$

#### Students' attitude towards having a non-smoking policy in public places (Table 4)

Students' attitude towards enforcing a non-smoking policy in Lebanon varied according to their smoking status whereby regular smokers were more opposed to it. Ex- and occasional smokers were more similar to non-smokers in their attitude as shown in table 4. Overall, a large majority of students supported banning smoking in most public places except outside universities' buildings, night clubs and coffee shops where less than half of the sample reported favorable attitudes. Regular smokers and non-smokers exhibited significant differences when it came to banning cigarette smoking in the following places: in ministries, public institutions, schools and university buildings, outside university buildings, as well as in public transportation, workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%, 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of regular smokers shared the same opinion. The only 2 locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here all students agreed that they should be smoke-free with percentages exceeding 90%.

**Table 4: Students' attitude towards banning cigarette smoking in public places**

Attitude	Regular Smokers		Occasional or Ex-smokers		Non-smokers		Total %
	n= 60	%	n= 59	%	n= 416	%	
Support banning cigarettes in buildings of ministries and public institutions**	42	75.0	43	79.6	368	90.9	84.7
Support banning cigarettes in health care facilities	54	96.4	52	96.3	393	97.3	93.3
Support banning cigarettes in elevators	53	94.6	49	94.2	391	96.5	92.1
Support banning cigarettes	29	50.9	38	71.7	334	82.9	75.0

inside a school's campus (buildings and playgrounds)**							
Support banning cigarettes	54	94.7	47	87.0	389	96.0	91.6
inside a university's buildings*							
Support banning cigarettes	11	19.6	25	47.2	236	58.6	50.8
outside a university's buildings**							
Support banning cigarettes	44	78.6	48	88.9	373	92.1	86.9
in public transportation*							
Support banning cigarettes	31	55.4	42	79.2	367	91.1	82.2
in work places (offices, shops...)**							
Support banning cigarettes	3	5.4	14	25.9	243	61.1	48.6
in night clubs**							
Support banning cigarettes	5	8.8	27	50.9	265	66.2	55.5
in restaurants**							
Support banning cigarettes	4	7.1	17	31.5	232	57.7	47.3
in coffee shops**							

\*  $p < 0.05$

\*\*  $p < 0.001$

## Discussion

This study has reported on students' attitudes towards the implementation of a non-smoking policy at a private university in Beirut Lebanon. Overall students' attitude towards the ban was favorable, but revealed large differences by smoking status. Non-smokers possessed a more favorable attitude towards the smoke free policy which was evident in their greater satisfaction level, conviction about its need and potential effect in decreasing smoking behavior. This is to be expected as non-smokers do not want to expose themselves to the adverse health effects of second hand smoke. Other studies in the United States have reached similar findings. A nationally representative study encompassing undergraduate students at 119 colleges and universities in the USA revealed that non-smokers were more supportive of different tobacco control policies such as enforcing smoke free policies in all campus buildings, student residences, dining



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4 areas and campus bars and pubs.[14] As well, non-smokers were more approving of  
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6 tobacco marketing restrictions (e.g. prohibiting tobacco advertising on campus and  
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8 sponsorship of social events) as well as forbidding tobacco sales on campus.[14]  
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10 Similarly, a study by Loukas et al.[15]) with students from 5 Texas colleges showed that  
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12 non-smokers and experimental smokers compared to smokers were significantly less  
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14 opposed to implementing a smoking ban in all buildings and having an entirely smoke-  
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16 free campus.[15]  
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21 Barriers to implementation of the smoke free policy at AUB, as identified by  
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23 students, were: lack of compliance of some students, faculty, and staff; having too few  
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25 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
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27 policy. All the above were considered obstacles with varying agreement between  
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29 smokers and non-smokers. We could not find any other published study that looked at  
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31 barriers to the implementation of a non-smoking policy from a student's perspective.  
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33 Although the lack of compliance was viewed as a barrier, in reality the majority of  
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35 regular smokers (73%) abided by it. This may be due to the fact that students risked  
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37 receiving a warning if they were smoking in prohibited areas. In other contexts,  
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39 compliance has been shown to pose a significant threat to the effective implementation  
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41 of non-smoking policies. Harris et al.[16] conducted a study to identify efficient  
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43 strategies that will increase compliance of students to a college campus smoking ban.  
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45 An intervention consisting of moving smoking receptacles, drawing ground markings  
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47 and putting more signs regarding the non-smoking policy, as well as distributing  
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49 reinforcements and reminder cards led to a significant increase in compliance from 33%  
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51 to 74% within the intervention week and remained at 54% during follow-up.[16]  
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4           Regarding students' smoking behavior, although we would have suspected that  
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6 the ban would positively impact all smokers, unfortunately it did not have this intended  
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8 effect. While 20% of regular smokers reported that their smoking decreased, another  
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10 21.8% said that it actually increased following policy enforcement. The reasons for this  
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12 may be multiple: smokers might have intentionally reported that their smoking  
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14 increased to prove that the policy is an inefficient mean to reduce their smoking  
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16 behavior. Although there is a section in the policy on smoking cessation, students are  
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18 generally unaware of the availability of a free smoking cessation program at the  
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20 university's medical center for those wanting help. This might explain why the policy  
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22 did not impact a greater number of students. Consequently, smoking cessation services  
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24 need to be better advertised so that students are aware of the help they can get for their  
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26 tobacco addiction.  
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31           Other reasons could be that the implementation of AUB's smoking ban was not  
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33 reinforced by a national smoke free policy in public places across Lebanon, so as soon  
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35 as students left the campus, they would go back to their usual habits. Moreover, the  
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37 policy was not accompanied by an educational campaign to raise awareness regarding  
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39 the harmful effects of smoking on one's health. A study by Borders et al.[17] covering  
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41 undergraduate students at 12 colleges or universities in Texas, showed that compared to  
42  
43 different college-level policies and programs, only the presence of preventive education  
44  
45 programs on campus was associated with lower odds of current cigarette use.[17] On  
46  
47 the other hand, universities which implemented other tobacco control policies such as  
48  
49 smoking cessation programs and having designated smoking areas were not effective in  
50  
51 curbing students' smoking behavior. For example, the latter two policies / programs  
52  
53 were associated with higher odds of smoking in the study. Thus, as the authors  
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4 concluded, implementing strict policies may not be the best way to decrease students'  
5 smoking rates, prevention and education programs might be just as important if not  
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8 more.  
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10  
11 Finally, students' attitude towards enforcing a non-smoking policy in public  
12 places in Lebanon also differed by smoking status. Regular smokers were more  
13  
14 opposing to banning cigarette smoking in ministries, public institutions, workplaces,  
15  
16 schools and university buildings etc. as mentioned above. The only 2 locations that  
17  
18 smokers and non-smokers agreed on being smoke free are health care facilities and  
19  
20 elevators with percentages over 90%. This can be explained by the fact that health care  
21  
22 facilities provide care for ill patients and smoking would clearly conflict with this  
23  
24 purpose. Moreover, given that elevators are confined spaces and have limited air  
25  
26 circulation, students most likely agreed that they should be smoke free so as to respect  
27  
28 non-smokers' wishes in breathing in clean air. The results of this study go in parallel  
29  
30 with research conducted in 2004 at AUB and funded by Research for International  
31  
32 Tobacco Control (Canada) which showed that in general, there is positive support  
33  
34 among young adults including university students for implementing and enforcing  
35  
36 tobacco control policies (Afifi and Chaaya 2005). The least supported policy, however,  
37  
38 was the ban of smoking in restaurants and entertainment places which parallels our  
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40 findings.  
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48 The AUB is the first university in Lebanon to institute a non-smoking policy on  
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50 campus. This provided the opportunity to assess students' attitudes towards the ban and  
51  
52 its impact on their smoking behavior. Our results showed that the smoking ban was  
53  
54 effective in curbing some of the students' smoking behavior. An education campaign  
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56 accompanying the policy might be more effective in further reducing current cigarette  
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4 use; it will also increase smokers' conviction in its necessity. The university should also  
5  
6 actively advertise its free smoking cessation services and implement more rigid  
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8 enforcement measures as this was one of the barriers identified by students. In addition,  
9  
10 an awareness based approach is important to illuminate the adverse effects of second  
11  
12 hand smoking and to emphasize that non-smoking policies do not infringe on smokers'  
13  
14 rights, rather they aim mostly at protecting non-smokers from breathing in tobacco  
15  
16 toxins. Recently Lebanon has passed a law prohibiting smoking in public places. As of  
17  
18 March 6, 2012 the Lebanese parliamentary premises were declared a smoke free zone,  
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20 with signs prohibiting smoking. This current law was embraced by all public places in  
21  
22 Lebanon, with a fine of 135,000 Lebanese Lira (around 90 US Dollars) for each breach,  
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24 as of September 2012. Within this process, all tobacco-related ads are prohibited on all  
25  
26 media channels.[18] This more universal ban will likely increase the impact of AUB's  
27  
28 policy as evidence has indicated that smoking prevalence and incidence is most  
29  
30 impacted through implementation of comprehensive national policies.  
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### 36 **Acknowledgments**

37  
38 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
39  
40 assistance in data management and analysis. The authors would also like to thank the  
41  
42 students who participated in this study and IDRC for their continuous support.  
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44

### 45 **Ethical approval**

46  
47  
48 This study has been approved by the Institutional Review Board at AUB and students  
49  
50 consented orally to participate in the study.  
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### 53 **Funding**

1  
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4 This research study was funded through a grant from Research for International  
5 Tobacco Control, a secretariat of the International Development Research Center  
6 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
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### 10 11 **Competing interests**

12  
13  
14 None declared  
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### 16 17 **Contributorship:**

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19  
20 Chaaya M., Nakkash R., Afifi R. and Khalil J. worked on the conceptualization of the  
21 study. Chaaya M. and Nahhas G. were responsible for data collection. Alameddine M.  
22 and Nahhas G. conducted the analysis of the data. All the authors contributed / gave  
23 substantive feedback to the writing of the manuscript. And all authors approved the final  
24 manuscript.  
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### 32 33 **Data sharing:**

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35 All data from this study are analyzed in this manuscript. The data will be shared with  
36 students for class exercises  
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**Students' attitude and smoking behaviour following the implementation a university smoke-free policy: a cross sectional study**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-002100.R1
Article Type:	Research
Date Submitted by the Author:	27-Dec-2012
Complete List of Authors:	Chaaya, Monique; American University of Beirut, Afifi, Rima; American University of Beirut, Health Promotion and Community Health Nakkash, Rima; American University of Beirut, Health Promotion and Community Health Alamuddin, Maysam Nahhas, George
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Public health, Smoking and tobacco
Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, EPIDEMIOLOGY

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Manuscripts

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5 Students' attitude and smoking behaviour following the implementation of a university  
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7 smoke-free policy: a cross sectional study  
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9 **Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon  
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11 **WordCount:** 3,496 words excluding (title page, abstract, summary, references and tables)  
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20 Article focus:

- 21  
22 - To examine students' compliance and attitude following the smoking ban at the  
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24 American University of Beirut campus.  
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27 Key messages and significance of the study:

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30 - Students are an important group to consider when discussing tobacco control and  
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32 implementing smoking ban. Yet, in rare instances they are included as stakeholders in  
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34 the analysis of the policy process.  
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36 - Implementing a tobacco control policy in a university campus could be  
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38 successful. Compliance and satisfaction were reasonably high, with some  
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40 differentials according to smoking status.  
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42 - Challenges of the implementation of a tobacco cessation policy at a university  
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44 could be overcome by having a comprehensive national tobacco control policy.  
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48 Strengths and Limitations:  
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54 Strengths:  
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- A representative large sample (n=535) of students from all Faculties
- This study was the first to be conducted regionally.
- It is the first study to document student perceptions of barriers to smoke bans.
- This study could lay the ground for implementing smoking ban in other universities in Lebanon and globally.

Limitations:

- The cross sectional nature of the study. It is difficult to ascertain the impact of the ban on smoking behaviour.

## Abstract

**Objectives:** In view of the high smoking rate among university students in Lebanon and the known adverse effects of second hand smoking, the American University of Beirut (AUB) decided to implement a non-smoking policy on campus. This study sought to examine students' compliance and attitudes following the ban.

**Design:** cross-sectional study

**Setting:** A private university in Lebanon.

- **Participants:** 535 students from all Faculties were randomly selected. A stratified cluster sample of classes offered in the spring semester of the 2008/2009 academic year was selected. A self administered paper and pencil survey was completed by students during class time.

**Primary and secondary outcome measures:**

The main outcomes were compliance with and attitudes towards and the ban.

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4 Other secondary outcomes were perception of barriers to implementation of the  
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6 ban and attitudes towards tobacco control in general.  
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9 **Results:** Smokers were generally compliant with the ban (72.7%) and for some (20%) it  
10 led to a decrease in their smoking behaviour. Students' attitude towards the ban and the  
11 enforcement of a non-smoking policy in public places across Lebanon varied according  
12 to their smoking status whereby non-smokers possessed a more favourable attitude and  
13 strongly supported such policies compared to smokers; Overall, the largest proportions  
14 of students were satisfied to a large extent with the ban and considered it justified (  
15 58.6% and 57.2% respectively). While much smaller percentages reported that the ban  
16 would help reduce smoking to large extent 16.7% or it would help smokers quit (7.4%).  
17 Perceived barriers to implementation of the non-smoking policy in AUB included lack  
18 of compliance with and strict enforcement of the policy as well as the small number and  
19 crowdedness of the smoking areas.  
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34 **Conclusions:** An education campaign, smoking cessation services, and strict  
35 enforcement of the policy might be necessary to boost its effect in further reducing  
36 students' cigarette use.  
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**Introduction** The university years are an important life phase for every student during which they develop and uphold risky behaviours such as smoking. Smoking represents an important public health problem among university students. An international study showed that overall 34% of male university students and 27% of female university students from 23 different countries were current smokers with large differences across countries and gender.[1] Students from Southern European countries, for example Portugal (47% of males smoke) and Spain (46% of females smoke), exhibited the highest rate of tobacco smoking compared to students from developing countries, for example Thailand (men 14% and women 2%), who displayed the lowest rates.[1] Among US college students, the American College Health Association survey results[2] revealed that 14.3% of students currently using tobacco, cigarettes being the most common form of tobacco use.[1] In Lebanon, a study by Chaaya et al.[3] revealed that 28.3% of students in a private university currently smoked nargileh, of whom 38% were regular smokers, the proportion of lifetime nargileh smokers being 43%.[3] Another study by Tamim et al.[4] showed that 40% of students in public and private universities in Lebanon currently smoked tobacco (21.1% narghileh, 7.6% cigarettes and 11.3% smoked both cigarettes and narghileh).[4] The above studies highlight the need for interventions that do not only target university students' smoking behavior but also protect non-smokers from being exposed to high levels of second hand smoke and its associated health effects.

Evidence indicates that second hand smoking is associated with increased incidence of cardiovascular diseases, lung cancers, and respiratory problems such as worsened asthma severity.[5-8] To lessen these effects, non-smoking policies in public places have been implemented and were shown to help reduce smoking among smokers

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4 [9-10] and second hand exposure to non smokers. [11-12]. A review of 26 studies on the  
5 effects of smoke-free workplaces in the United States, Australia, Canada, and Germany  
6 showed that smoke-free workplaces are associated with decreased smoking prevalence  
7 and less cigarette consumption among smokers.[9] Similarly, a nationally representative  
8 sample of college students in different U.S. colleges showed that residents of smoke-  
9 free housing had a significantly lower smoking prevalence than students living in  
10 residences which permit smoking.[10] Not only do non-smoking policies encourage  
11 smokers to decrease or even quit smoking, but they also protect smokers and non  
12 smokers from the effects of secondhand smoking. For example, a ban on smoking in  
13 workplaces and public places in Bowling Green, Ohio led to a significant reduction in  
14 hospital admission rates for coronary heart disease.[11] Similarly, a smoke-free  
15 legislation in public places in Scotland was associated with a 17% decrease in  
16 admissions for acute coronary syndrome.[12] This decrease was greatest among non-  
17 smokers whose exposure to second-hand smoke was dramatically reduced; a lower  
18 decline in acute coronary syndrome was observed for smokers.[12]

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38 The purpose of this paper is to examine the implementation of a smoking ban  
39 on a private university in Lebanon. Although Lebanon ratified the World Health  
40 Organization Framework Convention on Tobacco Control in 2005 which proposes a  
41 complete ban on indoor smoking, such a policy has not been implemented yet.  
42  
43 However, a few workplaces, hospitality venues, and educational institutions have  
44 voluntarily introduced smoking bans. [13] In May 2008, the American University of  
45 Beirut (AUB), a private university, decided to implement a non-smoking policy  
46 everywhere on campus encompassing student residence halls and all campus buildings  
47 except for private Faculty residences. Smoking became restricted to designated areas  
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4 only. Our primary objective was to assess compliance. Our secondary objective was to  
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6 assess student attitudes & opinions towards the campus wide smoking ban and tobacco  
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8 control measures in general. Finally, our third objective was to assess perceptions of  
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10 barriers to implementation of the ban.  
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## 14 15 16 17 **Methods** 18

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21 This study took place between October 2008 and June 2009. IRB approval was  
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23 obtained from AUB for all research procedures.  
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## 25 26 **Participants** 27

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29 A cross sectional study was conducted at AUB, the largest private university in  
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31 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
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33 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
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35 and currently enrolls around 7500 students from 69 countries. Instructors of a random  
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37 sample of classes being offered in the spring semester of academic year 2008/2009 were  
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39 selected to participate in the survey, yielding a total of 535 students who were registered  
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41 in those courses. None of the instructors contacted refused to take part in the study. The  
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43 selection of classes was based on a stratified cluster design whereby a proportionate  
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45 sample of classes was chosen from all six Faculties based on the size of each Faculty.  
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47 All students attending chosen classes were approached and asked to complete the  
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49 survey. Fewer than 2% refused to participate. The final sample included 535  
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51 participants of which 25% were foreigners. The sample was representative of all  
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4 undergraduate and graduate students from the six Faculties at AUB, with an  
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undergraduate and graduate students from the six Faculties at AUB, with an  
oversampling from the Faculty of Health Sciences.

### **Survey and Data Collection**

Survey construction and data collection were done as part of the requirements for “Survey Methods”, a course offered at the Faculty of Health Sciences to undergraduate Environmental Health (EH) students. A self-administered paper and pencil survey in English was designed to collect data on demographic variables (age, gender, Faculty, class, nationality and place of residence), personal smoking habits, compliance and attitude towards the smoking ban at AUB, in addition to students’ attitude towards tobacco control policies in Lebanon. Students were asked questions such as: to what extent they were satisfied with the smoking ban at AUB, whether they felt it was justified, and whether the ban helped in creating a healthier environment. Survey questions related to their attitude towards some of the Framework Convention on Tobacco Control (FCTC) measures, specifically policies banning cigarette smoking in public places were included. Students expressed their support for or objection towards the enforcement of these policies through a likert scale. The survey also included questions on lifetime and regular cigarette smoking behavior and perceived change in consumption following the ban, as well as their compliance with it (e.g. whether they smoked in designated and non-designated areas). Moreover, students were asked about the barriers against the implementation of tobacco control policies in AUB.

Instructors of the selected courses were contacted to ensure access to their class and set a time for data collection. Surveys were administered to students during class time.

## Data analysis

Univariate analysis was performed to examine the distribution of main demographic and smoking variables. Bivariate analyses by gender and cigarette smoking status were performed. Chi square tests and Fishers Exact test were computed to check for significant differences in compliance, and attitudes according to gender and smoking groups. P values were reported as  $< 0.05$ ,  $< 0.01$  or  $< 0.001$ . Because occasional smokers and ex-smokers constituted only 6.4% and 4.7% of the sample respectively, and their smoking exposure is different from regular smokers, smoking status was grouped into 3 categories: never smokers, occasional and ex-smokers, and regular smokers. The response categories of the attitudes questions towards the ban were also classified into 3 groups: to a large extent, to some extent and not at all/not sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the analyses by weighing all data according to the distribution of students in all six Faculties. Weighted absolute frequencies and percentages are presented in the Tables.

## Results

Table 1 presents the basic characteristics of the total sample and according to smoking status. The highest percentage of surveyed students was between 19 and 24 years of age (80.8%), Lebanese (75%), female (59%), from the Faculty of Arts and Sciences (41%), and not living in dorms (87%). Close to one half of the surveyed students reported lifetime smoking cigarettes. Twenty percent smoked in the past one month, 51% of whom were regular smokers (11% of the whole sample), 22% ex-

smokers, and 28% occasional smokers. The largest proportion of students started smoking before joining the university (75%), and another considerable percentage considered themselves addicted to smoking (61% of regular smokers). One third of regular smokers were considering quitting in the next 6 months. Differences in smoking status were noted across Faculties, year in university and gender. The highest prevalence of regular smoking was reported in the School of Business (14%) followed by the Faculty of Arts and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences (4.5%). Sophomore and male students were more likely to be regular smokers than students from other levels and females respectively.

**Table 1: Students' characteristics by smoking status**

Variable	Total		Regular Smokers		Occasional and Ex- Smokers		Non Smokers	
	n=535		n=60		n=59		n=416	
<b>Age group</b>								
< 18 yrs	62	11.6	4	6.5	8	12.9	50	80.6
19-24 yrs	432	80.7	52	12.0	41	9.5	339	78.5
25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
<b>Gender</b>								
Males	217	40.5	39	18.0	29	13.4	149	68.7
Females	318	59.6	21	6.6	30	9.4	267	84.0
<b>Student's level</b>								
Freshman	28	5.2	3	10.7	7	25.0	18	64.3
Sophomore	83	15.5	13	15.7	5	6.0	65	78.3
Junior	110	20.6	11	10.0	14	12.7	85	77.3
Senior	170	31.8	18	10.6	15	8.8	137	80.6
Graduate	143	26.8	15	10.5	18	13.3	109	76.2
<b>Faculty</b>								
Arts & Sciences	223	41.6	29	13.0	29	13.0	165	74.0
Agriculture & Food Sciences	48	8.9	5	10.4	3	6.2	40	83.3
Engineering and Architecture	140	26.2	11	7.9	12	8.6%	117	83.6

School of Business	91	17.0	13	14.3	11	12.1	67	73.6
Health Sciences	22	4.1	1	4.5	2	9.1	19	86.4
School of Nursing	11	2.0	1	9.1	2	18.2	8	72.7
<b>Nationality</b>								
Lebanese	397	74.5	42	10.6	41	10.3%	314	79.1%
Non-Lebanese	72	13.5	10	13.9	8	11.1	54	75.0
Both Nationalities	64	12.0	8	12.5	9	14.1	47	73.4

### Compliance and students' smoking behavior following implementation of the smoke free policy (Table 2)

Students' compliance with the ban was assessed among regular smokers. Almost three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

As for students' smoking frequency following the ban, it did not significantly differ between sexes. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before its implementation. However, 31.4% and 5% of male and female respondents respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of regular smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

**Table 2: Smokers' compliance and behaviour following the ban by sex**

Variable	Total		Males		Females	
	n= 60	%	n= 39	%	n= 21	%

<b>Smoking on campus</b>						
Designated areas only	40	72.7	27	75.0	13	68.4
Designated and non-designated areas	15	27.3	9	25.0	6	31.6
<b>Received a warning ticket for smoking by an officer on campus</b>						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
<b>Smoking frequency</b>						
Increased	12	21.8	11	31.4	1	5.0
Decreased	11	20.0	7	20.0	4	20.0
Remained the same	32	58.2	17	48.6	15	75.0

### Students' attitude towards the smoke free policy (Table 3)

Table 3 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were mainly (63.8%) not at all satisfied with it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and non-smokers possessed significantly different views regarding whether the ban helped in creating a healthy environment and whether AUB should become an entirely smoke-free area. While 94% of non-smokers thought that the ban contributed to some or a large extent in creating a healthy environment, only 67% of regular smokers believed so. Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this prospect as opposed to a meager 10.2% of regular smokers.

Table 3: Students' attitude towards AUB's smoking ban by smoking status

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.001$

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4 Regarding the ban's effect on smoking behavior, a sizeable proportion (65%) of  
5 respondents agreed that the ban would help smokers decrease smoking; however, a  
6 much lower percentage thought the ban would contribute to smoking cessation.  
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10 Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy  
11 percent of non-smokers as opposed to 40% of smokers considered the ban might lead in  
12 some or large extent to a decline in smoking. As to its effect on quitting smoking, a  
13 large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the  
14 ban would have no effect on cessation.  
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22 Occasional and ex-smokers were more similar to non-smokers in their opinion/  
23 attitude as depicted in Table 3.  
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#### 28 **Students' attitude towards having a non-smoking policy in public places (Table 4)**

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31 Students' attitude towards enforcing a non-smoking policy in Lebanon varied  
32 according to their smoking status whereby regular smokers were more opposed to it.  
33 Ex- and occasional smokers were more similar to non-smokers in their attitude as  
34 shown in Table 4. Overall, a large majority of students supported banning smoking in  
35 most public places except outside universities' buildings, night clubs and coffee shops  
36 where less than half of the sample reported favorable attitudes. Regular smokers and  
37 non-smokers exhibited significant differences when it came to banning cigarette  
38 smoking in the following places: in ministries, public institutions, schools and  
39 university buildings, outside university buildings, as well as in public transportation,  
40 workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%,  
41 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public  
42 transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of  
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regular smokers shared the same opinion. The only 2 locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here all students agreed that they should be smoke-free with percentages exceeding 90%.

**Table 4: Students' attitude towards banning cigarette smoking in public places**

<b>Attitude</b>	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps</b>								



<b>smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.05$

\*\*  $p < 0.001$

### **Barriers to implementation of the smoke free policy in AUB (Table 5)**

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, Faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in Table 5.

**Table 5: Barriers to implementation of the smoke free policy by smoking status**

	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
<b>Attitude</b>	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								

Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
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<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
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<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.01$

## Discussion

The AUB is the first university in Lebanon to institute a non-smoking policy on campus. This provided the opportunity to assess students' compliance with and attitudes towards the ban and its impact on their smoking behavior. These results showed that compliance was high and the smoking ban was effective in curbing some of the students' smoking behavior. Because of the cross sectional nature of the study it was not possible to measure whether students reduce their smoking after the ban. Therefore, we

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4 relied on self reported change in smoking behavior. This study has reported also on  
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6 students' attitudes towards the implementation of the non-smoking policy at AUB.  
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8 Overall students' attitude towards the ban was favorable, but revealed large differences  
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10 by smoking status. Non-smokers possessed a more favorable attitude towards the smoke  
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12 free policy which was evident in their greater satisfaction level, conviction about its  
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14 need and potential effect in decreasing smoking behavior. This is to be expected as non-  
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16 smokers do not want to expose themselves to the adverse health effects of second hand  
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18 smoke. Other studies in the United States have reached similar findings. A nationally  
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20 representative study encompassing undergraduate students at 119 colleges and  
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22 universities in the USA revealed that non-smokers were more supportive of different  
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24 tobacco control policies such as enforcing smoke free policies in all campus buildings,  
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26 student residences, dining areas and campus bars and pubs.[14] As well, non-smokers  
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28 were more approving of tobacco marketing restrictions (e.g. prohibiting tobacco  
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30 advertising on campus and sponsorship of social events) as well as forbidding tobacco  
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32 sales on campus.[14] Similarly, a study by Loukas et al.[15] with students from 5 Texas  
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34 colleges showed that non-smokers and experimental smokers compared to smokers  
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36 were significantly less opposed to implementing a smoking ban in all buildings and  
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38 having an entirely smoke-free campus.[15]  
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45 Barriers to implementation of the smoke free policy at AUB, as identified by  
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47 students, were: lack of compliance of some students, Faculty, and staff; having too few  
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49 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
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51 policy. All of the above were considered obstacles with varying agreement between  
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53 smokers and non-smokers. However, no other published study that looked at barriers to  
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55 the implementation of a non-smoking policy from a student's perspective was found.  
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4 Although the lack of compliance was viewed as a barrier, in reality the majority of  
5 regular smokers (73%) abided by it. This may be due to the fact that students risked  
6 receiving a warning if they were smoking in prohibited areas. In other contexts,  
7 compliance has been shown to pose a significant threat to the effective implementation  
8 of non-smoking policies. Harris et al.[16] conducted a study to identify efficient  
9 strategies that will increase compliance of students to a college campus smoking ban.  
10 An intervention consisting of moving smoking receptacles, drawing ground markings  
11 and putting more signs regarding the non-smoking policy, as well as distributing  
12 reinforcements and reminder cards led to a significant increase in compliance from 33%  
13 to 74% within the intervention week and remained at 54% during follow-up.[16]  
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27           Regarding students' smoking behavior, although it was suspected that the ban  
28 would positively impact all smokers, unfortunately it did not have this intended effect.  
29 While 20% of regular smokers reported that their smoking decreased, another 21.8%  
30 said that it actually increased following policy enforcement. There are multiple reasons  
31 for this: First, smokers might have intentionally reported that their smoking increased to  
32 prove that the policy is an inefficient mean to reduce their smoking behavior. Second,  
33 although there is a section in the policy on smoking cessation, students are generally  
34 unaware of the availability of a free smoking cessation program at the university's  
35 medical center for those wanting help. This might explain why the policy did not impact  
36 a greater number of students. Consequently, smoking cessation services need to be  
37 better advertised so that students are aware of the help they can get for their tobacco  
38 addiction. A third reason why the policy did not affect smoking behavior as intended  
39 could be that the implementation of AUB's smoking ban was not reinforced by a  
40 national smoke free policy in public places across Lebanon, so as soon as students left  
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4 the campus, they would go back to their usual habits. Moreover, the policy was not  
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6 accompanied by an educational campaign to raise awareness regarding the harmful  
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8 effects of smoking on one's health. A study by Borders et al.[17] covering  
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10 undergraduate students at 12 colleges or universities in Texas, showed that compared to  
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12 different college-level policies and programs, only the presence of preventive education  
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14 programs on campus was associated with lower odds of current cigarette use.[17] On  
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16 the other hand, universities which implemented other tobacco control policies such as  
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18 smoking cessation programs and having designated smoking areas were not effective in  
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20 curbing students' smoking behavior. For example, the latter two policies / programs  
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22 were associated with higher odds of smoking in the study. Thus, as the authors  
23  
24 concluded, implementing strict policies may not be the best way to decrease students'  
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26 smoking rates, prevention and education programs might be just as important if not  
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28 more.  
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34 Finally, students' attitude towards enforcing a non-smoking policy in public  
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36 places in Lebanon also differed by smoking status. Regular smokers were more  
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38 opposing to banning cigarette smoking in ministries, public institutions, workplaces,  
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40 schools and university buildings etc. as mentioned above. The only 2 locations that  
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42 smokers and non-smokers agreed on being smoke free were health care facilities and  
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44 elevators with percentages over 90%. This can be explained by the fact that health care  
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46 facilities provide care for ill patients and smoking would clearly conflict with this  
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48 purpose. Moreover, given that elevators are confined spaces and have limited air  
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50 circulation, students most likely agreed that they should be smoke free so as to respect  
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52 non-smokers' wishes in breathing in clean air. The results of this study go in parallel  
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54 with research conducted in 2004 at AUB and funded by Research for International  
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4 Tobacco Control (Canada) which showed that in general, there is positive support  
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6 among young adults including university students for implementing and enforcing  
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8 tobacco control policies (Afifi and Chaaya 2005). The least supported policy, however,  
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10 was the ban of smoking in restaurants and entertainment places which parallels the  
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12 research findings.  
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16 An education campaign accompanying the policy might be more effective in  
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18 further reducing current cigarette use; it will also increase smokers' conviction in its  
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20 necessity. The university should also actively advertise its free smoking cessation  
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22 services and implement more rigid enforcement measures as this was one of the barriers  
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24 identified by students. In addition, an awareness based approach is important to  
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26 illuminate the adverse effects of second hand smoking and to emphasize that non-  
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28 smoking policies do not infringe on smokers' rights, rather they aim mostly at  
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30 protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed  
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32 a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese  
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34 parliamentary premises were declared a smoke free zone, with signs prohibiting  
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36 smoking. This current law was embraced by all public places in Lebanon including  
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38 schools and universities as of September 2012. [18] This more universal ban will likely  
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40 increase the impact of AUB's policy as evidence has indicated that smoking prevalence  
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42 and incidence is most impacted through implementation of comprehensive national  
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44 policies.  
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### 53 **Acknowledgments**

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4 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
5  
6 assistance in data management and analysis. The authors would also like to thank the  
7  
8 students who participated in this study and IDRC for their continuous support.  
9

### 10 11 **Ethical approval**

12  
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14 This study has been approved by the Institutional Review Board at AUB and students  
15  
16 consented orally to participate in the study.  
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### 19 20 **Funding**

21  
22 This research study was funded through a grant from Research for International  
23  
24 Tobacco Control, a secretariat of the International Development Research Center  
25  
26 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
27  
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### 29 30 **Competing interests**

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33 None declared  
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8 Students' attitude and smoking behaviour following the implementation a university  
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10 smoke-free policy: a cross sectional study

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11 **Running Title**

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**Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon

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WordCount : 3,384-3,496 words excluding ( title page, abstract, references and tables)

Article focus:

- To examine students' compliance and attitude ~~and smoking behaviour~~ following the smoking ban at the American University of Beirut campus.

Key messages and significance of the study:

- Students are an important group to consider when discussing tobacco control and implementing smoking ban. Yet, in rare instances they are included as stakeholders in the analysis of the policy process.

- Implementing a tobacco control policy in a university campus could be successful. Compliance and satisfaction were reasonably high, with some differentials according to smoking status.

- Challenges of the implementation of a tobacco cessation policy at a university could be overcome by having a comprehensive national tobacco control policy.

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Strengths and Limitations:

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Strengths:

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7 - A representative large sample ([n=535](#)) of students from all Faculties

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11 - This study was the first to be conducted regionally.

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13 - [It is the first study to document student perceptions of barriers to smoke bans.](#)

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17 - This study could lay the ground for implementing smoking ban in other  
18 universities in Lebanon and globally.  
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21 Limitations:

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23 - [The cross sectional nature of the study. It is difficult to ascertain the impact of](#)  
24 [the ban on smoking behaviour.](#)  
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7 **Introduction** The University years are an important life phase for every  
8 student during which they develop and uphold risky behaviours such as smoking.  
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10 Smoking represents an important public health problem among university students. An  
11 international study showed that overall 34% of male university students and 27% of  
12 female university students from 23 different countries were current smokers with large  
13 differences across countries and gender.[1] Students from Southern European countries,  
14 for example Portugal (47% of males smoke) and Spain (46% of females smoke),  
15 exhibited the highest rate of tobacco smoking compared to students from developing  
16 countries, for example Thailand (men 14% and women 2%), who displayed the lowest  
17 rates.[1] Among US college students, Rigotti et al. the American College Health  
18 Association survey results[2] revealed that 14.3% of students ~~one-third of students~~  
19 ~~(32.9%)~~ currently using tobacco, cigarettes being the most common form of tobacco  
20 use.[1] In Lebanon, a study by Chaaya et al.[3-5] revealed that 28.3% of students in a  
21 private university currently smoked nargileh, of whom 38% were regular smokers, the  
22 proportion of lifetime nargileh smokers being 43%.[3-5] Another study by Tamim et  
23 al.[4-6] showed that 40% of students in public and private universities in Lebanon  
24 currently smoked tobacco (21.1% nargileh, 7.6% cigarettes and 11.3% smoked both  
25 cigarettes and nargileh).[4-6] The above studies highlight the need for interventions  
26 that do not only target university students' smoking behavior but also protect non-  
27 smokers from being exposed to high levels of second hand smoke and its associated  
28 health effects.

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Evidence indicates that second hand smoking is associated with increased incidence of cardiovascular diseases, lung cancers, and respiratory problems such as worsened asthma severity.[5-8] To lessen these effects, non-smoking policies in

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7 public places have been implemented and were shown to help reduce smoking among  
8 smokers [9-10] and second hand exposure to non smokers. [117-128] have positive  
9 consequences. Not only do non smoking policies protect smokers and non smokers  
10 from the effects of second hand smoking, but they also encourage smokers to decrease  
11 or even quit smoking. A review of 26 studies on the effects of smoke-free workplaces in  
12 the United States, Australia, Canada, and Germany showed that smoke-free workplaces  
13 are associated with decreased smoking prevalence and less cigarette consumption  
14 among smokers.[9] Similarly, a nationally representative sample of college students in  
15 different U.S. colleges showed that residents of smoke-free housing had a significantly  
16 lower smoking prevalence than students living in residences which permit smoking.[10]  
17 Not only do non smoking policies encourage smokers to decrease or even quit smoking,  
18 but they also protect smokers and non smokers from the effects of secondhand smoking.

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31 For example, a ban on smoking in workplaces and public places in Bowling Green,  
32 Ohio led to a significant reduction in hospital admission rates for coronary heart  
33 disease.[117] Similarly, a smoke-free legislation in public places in Scotland was  
34 associated with a 17% decrease in admissions for acute coronary syndrome.[128] This  
35 decrease was greatest among non-smokers whose exposure to second-hand smoke was  
36 dramatically reduced; a lower decline in acute coronary syndrome was observed for  
37 smokers.[128]

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45 ~~Not only do non smoking policies protect smokers and non smokers from the~~  
46 ~~effects of second hand smoking, but they also encourage smokers to decrease or even~~  
47 ~~quit smoking. A review of 26 studies on the effects of smoke-free workplaces in the~~  
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7 smokers.[9] Similarly, a nationally representative sample of college students in different  
8 U.S. colleges showed that residents of smoke free housing had a significantly lower  
9 smoking prevalence than students living in residences which permit smoking.[10]

11 The purpose of this paper is to examine the implementation of a smoking ban on  
12 a private university in Lebanon. Although Lebanon ratified the World Health

14 Organization Framework Convention on Tobacco Control in 2005 which proposes a  
15 complete ban on indoor smoking, such a policy has not been implemented yet.

17 However, a few workplaces, hospitality venues, and educational institutions have  
18 voluntarily introduced smoking bans.[13] A study by Chaaya et al.[12] revealed that  
19 28.3% of students in a private university in Lebanon currently smoked argilehnargileh,  
20 of whom 38% were regular smokers, the proportion of ever argilehnargileh smokers  
21 being 43%.[12] Another study by Tamim et al.[13] showed that 40% of students in  
22 public and private universities in Lebanon currently smoked tobacco (21.1% narghile,  
23 7.6% cigarettes and 11.3% smoked both cigarettes and narghile).[13] Concerned about  
24 the level of smoking seen among young people in the country In May 2008, the  
25 American University of Beirut (AUB), a private university, decided to implement a non-  
26 smoking policy everywhere on campus in May 2008 encompassing student residence  
27 halls and all campus buildings except for private Ffaculty residences. Smoking became  
28 restricted to designated areas only. This study Our primary objective was to assess  
29 compliance. describes students' attitudes and opinions regarding the ban, as well as their  
30 behaviour after its implementation. It also assesses students' attitude towards the  
31 enforcement of a non-smoking policy in public places across Lebanon. Our secondary  
32 objective was to assess student attitudes & opinions towards the campus wide smoking



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7 ban and tobacco control measures in general. Finally, our third objective was to assess  
8 perceptions of barriers to implementation of the ban.  
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## 11 12 13 14 15 **Methods**

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18 This study took place between October 2008 and June 2009. IRB approval was  
19 obtained from AUB for all research procedures.  
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## 22 23 **Participants**

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25 A cross sectional study was conducted at AUB, the largest private university in  
26 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
27 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
28 and currently enrolls around 7500 students from 69 countries. Instructors of a random  
29 sample of classes being offered in the spring semester of academic year 2008/2009 were  
30 selected to participate in the survey, yielding a total of 535 students who were registered  
31 in those courses. None of the instructors contacted refused to take part in the study.  
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34 The selection of classes was based on a stratified cluster design whereby a proportionate  
35 sample of classes was chosen from all six Faculties based on the size of each Faculty.  
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38 All students attending chosen classes were approached and asked to complete the  
39 survey. Fewer than 2-% refused to participate. The final sample included 535  
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42 participants of which 25% were foreigners. The sample was representative of all  
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45 undergraduate and graduate students from the six Faculties at AUB, with an  
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51 oversampling from the Faculty of Health Sciences. The highest percentage of surveyed  
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~~students was aged between 19 and 24 years (80.8%), Lebanese (75%), female (59%),  
from the Faculty of Arts and Sciences (41%), and not living in dorms (87%).~~

### **Questionnaire Survey and Data Collection**

Survey construction and data collection were done as part of the requirements for “Survey Methods”, a course offered at the Faculty of Health Sciences to undergraduate Environmental Health (EH) students. A self-administered paper and pencil survey in English was designed to collect data on demographic variables (age, gender, Faculty, class, nationality and place of residence), personal smoking habits, compliance and attitude towards the smoking ban at AUB, in addition to students’ attitude towards tobacco control policies in Lebanon. Students were asked questions such as: to what extent they were satisfied with the smoking ban at AUB, whether they felt it was justified, and whether the ban helped in creating a healthier environment.

~~Various statements~~ Survey questions related to their attitude towards some of the Framework Convention on Tobacco Control (FCTC) measures, specifically policies banning cigarette smoking in public places were included. Students expressed their support for or objection towards the enforcement of these policies through a likert scale. The survey also included questions on ever-lifetime and current-regular cigarette smoking behavior and perceived change in consumption following the ban, as well as their compliance with it (e.g. whether they smoked in designated and non-designated areas). Moreover, students were asked about the barriers against the implementation of tobacco control policies in AUB.

### **Data Collection**

~~After securing approval from the Institutional Review Board at AUB,~~

~~I~~Instructors of the selected courses were contacted to ensure access to their class and set a time for data collection. Surveys were administered to students during class time.

~~Questionnaire construction and data collection were done as part of the requirements for “Survey Methods”, a course offered at the Faculty of Health Sciences to undergraduate Environmental Health (EH) students. Data collection was completed in June 2009.~~

~~None of the instructors contacted refused to take part in the study.~~

### Data analysis

Univariate analysis was performed to examine the distribution of main demographic and smoking variables. Bivariate analyses by gender and cigarette smoking status were performed. Chi square tests and Fishers Exact test were computed to check for significant differences in compliance, and attitudes according to gender and smoking groups. P values were reported as < 0.05, < 0.01 or < 0.001. Because occasional smokers and ex-smokers constituted only 6.4% and 4.7% of the sample respectively, and their smoking exposure is different from regular smokers, smoking status was grouped into 3 categories: never smokers, occasional and ex-smokers, and ~~current~~ regular smokers. The response categories of the attitudes questions towards the ban were also classified into 3 groups: to a large extent, to some extent and not at all/not sure. Answers to attitudes towards the ban were also grouped into 3 categories: to a large extent, to some extent and not at all/not sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the analyses by weighing all data according to the distribution of students in all six Faculties. Weighted absolute frequencies and percentages are presented in the ~~€~~Tables.

## Results

Table 1 presents the basic characteristics of the total studied sample and according to smoking status. The highest percentage of surveyed students was between 19 and 24 years of age (80.8%), Lebanese (75%), female (59%), from the Faculty of Arts and Sciences (31.41%), and not living in dorms (87%). Close to one half of the surveyed students reported everlifetime smoking cigarettes. Twenty percent smoked eigarettes in the past one month, 51% of whom were current-regular smokers (11-% of the whole sample), 22-% ex-smokers, and 28% occasional smokers. The largest proportion of students started smoking before joining the university (75%), and another considerable percentage considered themselves addicted to smoking (61% of regular smokers). One third of regular smokers are considering were considering quitting in the next 6 months. Differences in smoking status were noted across Faculties, year in University and gender. The highest prevalence of regular smoking was reported in the School of Business (14%) followed by the Faculty of Arts and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences (4.5%). Sophomore and male students were more likely to be current-regular smokers than students from other levels and females respectively.

**Table 1: Students' characteristics by smoking status**

<u>Variable</u>	<u>Total</u>	<u>Regular Smokers</u>	<u>Occasional and Ex- Smokers</u>	<u>Non Smokers</u>
	<u>n=535</u>	<u>n=60</u>	<u>n=59</u>	<u>n=416</u>
<u>Age group</u>				
<u>&lt; 18 yrs</u>	<u>62</u>	<u>11.6</u>	<u>4</u>	<u>6.5</u>
<u>19-24 yrs</u>	<u>432</u>	<u>80.7</u>	<u>52</u>	<u>12.0</u>
			<u>41</u>	<u>9.5</u>
			<u>339</u>	<u>78.5</u>

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25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
<b>Gender</b>								
Males	217	40.5	39	18.0	29	13.4	149	68.7
Females	318	59.6	21	6.6	30	9.4	267	84.0
<b>Student's level</b>								
Freshman	28	5.2	3	10.7	7	25.0	18	64.3
Sophomore	83	15.5	13	15.7	5	6.0	65	78.3
Junior	110	20.6	11	10.0	14	12.7	85	77.3
Senior	170	31.8	18	10.6	15	8.8	137	80.6
Graduate	143	26.8	15	10.5	18	13.3	109	76.2
<b>Faculty</b>								
Arts & Sciences	223	41.6	29	13.0	29	13.0	165	74.0
Agriculture & Food Sciences	48	8.9	5	10.4	3	6.2	40	83.3
Engineering and Architecture	140	26.2	11	7.9	12	8.6%	117	83.6
School of Business	91	17.0	13	14.3	11	12.1	67	73.6
Health Sciences	22	4.1	1	4.5	2	9.1	19	86.4
School of Nursing	11	2.0	1	9.1	2	18.2	8	72.7
<b>Nationality</b>								
Lebanese	397	74.5	42	10.6	41	10.3%	314	79.1%
Non-Lebanese	72	13.5	10	13.9	8	11.1	54	75.0
Both Nationalities	64	12.0	8	12.5	9	14.1	47	73.4

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### Compliance and students' smoking behavior following implementation of the smoke free policy (Table 42)

Students' compliance with the ban was assessed among regular smokers. A little bit less than Almost three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female

respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

As for students' smoking frequency following the ban, it did not significantly differ between sexes. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before its implementation. However, ~~around one third~~ (31.4%) and 5% of male and female respondents respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of ~~current-regular~~ smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

**Table 12: Smokers' compliance and behaviour following the ban by sex**

Variable	Total		Males		Females	
	n= 60	%	n= 39	%	n= 21	%
<b>Smoking on campus</b>						
Designated areas only	40	72.7	27	75.0	13	68.4
Designated and non-designated areas	15	27.3	9	25.0	6	31.6
<b>Received a warning ticket for smoking by an officer on campus</b>						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
<b>Smoking frequency</b>						
Increased	12	21.8	11	31.4	1	5.0
Decreased	11	20.0	7	20.0	4	20.0
Remained the same	32	58.2	17	48.6	15	75.0

#### Students' attitude towards the smoke free policy (Table 32)

Table 32 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were

satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were mainly (51.7%) not at all satisfied with it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and non-smokers possessed significantly different views regarding whether the ban helped in creating a healthy environment and whether AUB should become an entirely smoke-free area. While 94% of non-smokers thought that the ban contributed to some or a large extent in creating a healthy environment, only 67% of regular smokers believed so. Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this prospect as opposed to a meager 10.2% of regular smokers.

**Table 23:** Students' attitude towards AUB's smoking ban by smoking status

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								

Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.001$

Attitude	Regular Smokers		Occasional and Ex-Smokers		Non-smokers		Total %
	n=60	%	n=59	%	n=416	%	
<b>Extent students satisfied with the smoking ban*</b>							
Large extent	6	10.3	27	45.0	278	67.5	58.6
Some extent	15	25.9	14	23.3	110	26.6	26.2
Not at all/ Not sure	37	63.8	19	31.6	25	6.0	15.2
<b>Extent students consider the ban justified*</b>							
Large extent	8	13.8	29	49.2	265	64.5	57.2
Some extent	26	44.8	20	33.9	123	29.9	32.0
Not at all/ Not sure	24	41.4	10	17.0	23	5.6	10.8
<b>AUB becoming an entirely smoke-free area*</b>							
Agree	6	10.2	19	32.8	185	45.0	39.8
Disagree	50	84.7	29	50.0	151	36.7	43.6
Undecided	3	5.1	10	17.2	75	18.2	16.7
<b>Extent the ban helped in creating a healthy environment*</b>							
Large extent	6	10.3	25	42.4	282	68.4	59.2



Some extent	33	56.9	27	45.8	106	25.7	31.4
Not at all/ Not sure	19	32.8	7	11.9	24	5.8	9.5
<b>Extent the ban helps smokers reduce smoking*</b>							
Large extent	2	3.4	8	13.6	78	18.9	16.7
Some extent	21	36.2	24	40.7	211	51.2	48.4
Not at all/ Not sure	35	60.3	27	45.8	123	29.8	35.0
<b>Extent the ban helps smokers in quitting smoking*</b>							
Large extent	2	3.4	5	8.8	32	7.8	7.4
Some extent	4	6.9	14	24.6	131	31.8	28.3
Not at all/ Not sure	52	89.7	38	66.6	249	60.4	64.3
* $p < 0.001$							

Regarding the ban's effect on smoking behavior, a sizeable proportion (65%) of respondents agreed that the ban would help smokers decrease smoking; however, a much lower percentage thought the ban would contribute to smoking cessation. Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy percent of non-smokers as opposed to 40% of smokers considered the ban might lead in some or large extent to a decline in smoking. As to its effect on quitting smoking, a large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the ban would have no effect on cessation.

Occasional and ex-smokers were ~~closer~~ more similar to non-smokers in their opinion/ attitude as depicted in [Table 23](#).

#### **Students' attitude towards having a non-smoking policy in public places (Table 34)**

Students' attitude towards enforcing a non-smoking policy in Lebanon varied according to their smoking status whereby regular smokers were more opposed to it. Ex- and occasional smokers were more similar to non-smokers in their attitude as shown in [Table 3](#). Overall, a large majority of students supported banning smoking in most public places except outside universities' buildings, night clubs and coffee shops

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7 where less than half of the sample reported favorable attitudes. Regular smokers and  
8 non-smokers exhibited significant differences when it came to banning cigarette  
9 smoking in the following places: in ministries, public institutions, schools and  
10 university buildings, outside university buildings, as well as in public transportation,  
11 workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%,  
12 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public  
13 transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of  
14 regular smokers shared the same opinion. The only 2 locations that exhibited no  
15 significant differences between regular smokers and non-smokers were health care  
16 facilities and elevators. Here all students agreed that they should be smoke-free with  
17 percentages exceeding 90%.  
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29 | **Table 34: Students' attitude towards banning cigarette smoking in public places**  
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	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4
*p<0.05								
**p<0.001								
<b>Males</b>				<b>Females</b>				

Variable	n=39	%	n=21	%	Total %
<b>Smoking on campus</b>					
Designated areas only	27	75.0	13	68.4	72.7
Designated and non-designated areas	9	25.0	6	31.6	27.3
<b>Received a warning ticket for smoking by an officer on campus</b>					
No	29	78.4	19	90.5	82.8
Yes	8	21.6	2	9.5	17.2
<b>Smoking frequency</b>					
Increased	11	31.4	1	5.0	21.8
Decreased	7	20.0	4	20.0	20.0
Remained the same	17	48.6	15	75.0	58.2

### Barriers to implementation of the smoke free policy in AUB (Table 45)

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in Table 45.

**Table 45: Barriers to implementation of the smoke free policy by smoking status**

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								

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Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*p<0.01

Variable	Regular Smokers		Occasional or Ex-smokers		Non-smokers		Overall Total % agreement
	n=60	% (agree)	n=59	% (agree)	n=416	% (agree)	
Some students are not willing to abide by the non-smoking policy	43	75.4	38	70.4	268	66.3	65.2
Some Faculty and staff are not willing to abide by the non-smoking	36	64.3	27	50.9	193	48.0	47.9

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policy							
Smoking areas are too few*	49	86.0	24	45.3	121	29.9	36.3
Smoking areas are too crowded*	48	85.7	34	63.0	220	54.7	56.4
No strict enforcement of the non-smoking policy*	10	17.9	13	24.5	142	35.3	30.8

\*  $p < 0.01$ 

Attitude	Regular Smokers		Occasional or Ex-smokers		Non-smokers		Total %
	n=60	%	n=59	%	n=416	%	
Support banning cigarettes in buildings of ministries and public institutions**	42	75.0	43	79.6	368	90.9	84.7
Support banning cigarettes in health care facilities	54	96.4	52	96.3	393	97.3	93.3
Support banning cigarettes in elevators	53	94.6	49	94.2	391	96.5	92.1
Support banning cigarettes inside a school's campus (buildings and playgrounds)**	29	50.9	38	71.7	334	82.9	75.0
Support banning cigarettes inside a university's buildings*	54	94.7	47	87.0	389	96.0	91.6
Support banning cigarettes outside a university's buildings**	11	19.6	25	47.2	236	58.6	50.8
Support banning cigarettes in public transportation*	44	78.6	48	88.9	373	92.1	86.9
Support banning cigarettes in work places (offices, shops...)**	31	55.4	42	79.2	367	91.1	82.2
Support banning cigarettes in night clubs**	3	5.4	14	25.9	243	61.1	48.6
Support banning cigarettes in restaurants**	5	8.8	27	50.9	265	66.2	55.5
Support banning cigarettes in coffee shops**	4	7.1	17	31.5	232	57.7	47.3

\*  $p < 0.05$ \*\*  $p < 0.001$

## Discussion

The AUB is the first university in Lebanon to institute a non-smoking policy on campus. This provided the opportunity to assess students' compliance with and attitudes towards the ban and its impact on their smoking behavior. These results showed that compliance was high and the smoking ban was effective in curbing some of the students' smoking behavior. Because of the cross sectional nature of the study it was not possible to measure whether students reduce their smoking after the ban. Therefore, we relied on self reported change in smoking behavior. This study has reported also on students' attitudes towards the implementation of a non-smoking policy at a private university in Beirut Lebanon AUB. Overall students' attitude towards the ban was favorable, but revealed large differences by smoking status. Non-smokers possessed a more favorable attitude towards the smoke free policy which was evident in their greater satisfaction level, conviction about its need and potential effect in decreasing smoking behavior. This is to be expected as non-smokers do not want to expose themselves to the adverse health effects of second hand smoke. Other studies in the United States have reached similar findings. A nationally representative study encompassing undergraduate students at 119 colleges and universities in the USA revealed that non-smokers were more supportive of different tobacco control policies such as enforcing smoke free policies in all campus buildings, student residences, dining areas and campus bars and pubs.[14] As well, non-smokers were more approving of tobacco marketing restrictions (e.g. prohibiting tobacco advertising on campus and sponsorship of social events) as well as forbidding tobacco sales on campus.[14] Similarly, a study by Loukas et al.[15] with students from 5 Texas colleges showed that non-smokers and experimental smokers compared to smokers were significantly less

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7 opposed to implementing a smoking ban in all buildings and having an entirely smoke-  
8 free campus.[15]  
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11 Barriers to implementation of the smoke free policy at AUB, as identified by  
12 students, were: lack of compliance of some students, ~~F~~faculty, and staff; having too few  
13 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
14 policy. All of the above were considered obstacles with varying agreement between  
15 smokers and non-smokers. ~~However, no We could not find any~~ other published study  
16 that looked at barriers to the implementation of a non-smoking policy from a student's  
17 perspective was found. Although the lack of compliance was viewed as a barrier, in  
18 reality the majority of regular smokers (73%) abided by it. This may be due to the fact  
19 that students risked receiving a warning if they were smoking in prohibited areas. In  
20 other contexts, compliance has been shown to pose a significant threat to the effective  
21 implementation of non-smoking policies. Harris et al.[16] conducted a study to identify  
22 efficient strategies that will increase compliance of students to a college campus  
23 smoking ban. An intervention consisting of moving smoking receptacles, drawing  
24 ground markings and putting more signs regarding the non-smoking policy, as well as  
25 distributing reinforcements and reminder cards led to a significant increase in  
26 compliance from 33% to 74% within the intervention week and remained at 54% during  
27 follow-up.[16]  
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45 Regarding students' smoking behavior, although ~~it was suspected that we would~~  
46 ~~have suspected that~~ the ban would positively impact all smokers, unfortunately it did not  
47 have this intended effect. While 20% of regular smokers reported that their smoking  
48 decreased, another 21.8% said that it actually increased following policy enforcement.  
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53 There are multiple reasons for this ~~may be multiple~~: First, smokers might have  
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7 intentionally reported that their smoking increased to prove that the policy is an  
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9 inefficient mean to reduce their smoking behavior. [Second, A](#) although there is a section  
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11 in the policy on smoking cessation, students are generally unaware of the availability of  
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13 a free smoking cessation program at the university's medical center for those wanting  
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15 help. This might explain why the policy did not impact a greater number of students.  
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17 Consequently, smoking cessation services need to be better advertised so that students  
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19 are aware of the help they can get for their tobacco addiction. [A third reason why the](#)  
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21 [policy did not affect smoking behavior as intended](#)

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23 ~~Other reasons~~ could be that the implementation of AUB's smoking ban was not  
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25 reinforced by a national smoke free policy in public places across Lebanon, so as soon  
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27 as students left the campus, they would go back to their usual habits. Moreover, the  
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29 policy was not accompanied by an educational campaign to raise awareness regarding  
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31 the harmful effects of smoking on one's health. A study by Borders et al.[17] covering  
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33 undergraduate students at 12 colleges or universities in Texas, showed that compared to  
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35 different college-level policies and programs, only the presence of preventive education  
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37 programs on campus was associated with lower odds of current cigarette use.[17] On  
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39 the other hand, universities which implemented other tobacco control policies such as  
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41 smoking cessation programs and having designated smoking areas were not effective in  
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43 curbing students' smoking behavior. For example, the latter two policies / programs  
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45 were associated with higher odds of smoking in the study. Thus, as the authors  
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47 concluded, implementing strict policies may not be the best way to decrease students'  
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49 smoking rates, prevention and education programs might be just as important if not  
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7 Finally, students' attitude towards enforcing a non-smoking policy in public  
8 places in Lebanon also differed by smoking status. Regular smokers were more  
9 opposing to banning cigarette smoking in ministries, public institutions, workplaces,  
10 schools and university buildings etc. as mentioned above. The only 2 locations that  
11 smokers and non-smokers agreed on being smoke free ~~are~~ were health care facilities and  
12 elevators with percentages over 90%. This can be explained by the fact that health care  
13 facilities provide care for ill patients and smoking would clearly conflict with this  
14 purpose. Moreover, given that elevators are confined spaces and have limited air  
15 circulation, students most likely agreed that they should be smoke free so as to respect  
16 non-smokers' wishes in breathing in clean air. The results of this study go in parallel  
17 with research conducted in 2004 at AUB and funded by Research for International  
18 Tobacco Control (Canada) which showed that in general, there is positive support  
19 among young adults including university students for implementing and enforcing  
20 tobacco control policies (Afifi and Chaaya 2005). The least supported policy, however,  
21 was the ban of smoking in restaurants and entertainment places which parallels the  
22 research our findings.

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39 ~~The AUB is the first university in Lebanon to institute a non-smoking policy on~~  
40 ~~campus. This provided the opportunity to assess students' attitudes towards the ban and~~  
41 ~~its impact on their smoking behavior. Our These results showed that the smoking ban~~  
42 ~~was effective in curbing some of the students' smoking behavior.~~ An education  
43 campaign accompanying the policy might be more effective in further reducing current  
44 cigarette use; it will also increase smokers' conviction in its necessity. The university  
45 should also actively advertise its free smoking cessation services and implement more  
46 rigid enforcement measures as this was one of the barriers identified by students. In  
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7 addition, an awareness based approach is important to illuminate the adverse effects of  
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9 second hand smoking and to emphasize that non-smoking policies do not infringe on  
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11 smokers' rights, rather they aim mostly at protecting non-smokers from breathing in  
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13 tobacco toxins. Recently Lebanon has passed a law prohibiting smoking in public  
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15 places. As of March 6, 2012 the Lebanese parliamentary premises were declared a  
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17 smoke free zone, with signs prohibiting smoking. This current law was embraced by all  
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19 public places in Lebanon, ~~including schools and universities with a fine of 135,000~~  
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21 ~~Lebanese Lira (around 90 US Dollars) for each breach,~~ as of September 2012. ~~Within~~  
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23 ~~this process, all tobacco related ads were are prohibited on all media channels.~~[18] This  
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25 more universal ban will likely increase the impact of AUB's policy as evidence has  
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27 indicated that smoking prevalence and incidence is most impacted through  
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29 implementation of comprehensive national policies.  
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### 34 **Acknowledgments**

35  
36 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
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38 assistance in data management and analysis. The authors would also like to thank the  
39  
40 students who participated in this study and IDRC for their continuous support.  
41

### 42 **Ethical approval**

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45 This study has been approved by the Institutional Review Board at AUB and students  
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47 consented orally to participate in the study.  
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### 49 **Funding**

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7 This research study was funded through a grant from Research for International  
8 Tobacco Control, a secretariat of the International Development Research Center  
9 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
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#### 12 13 **Competing interests**

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16 None declared  
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~~igotti NA, Regan S, Moran SE et al. Students' opinion of tobacco control policies recommended for US colleges: a national survey. *Tob Control* 2003;12(3): 251-256. doi:10.1136/tc.12.3.251~~

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~~arris KJ, Stearns JN, Kovach RG et al. Enforcing an outdoor smoking ban on a college campus: Effects of a multicomponent approach. *J Am Coll Health* 2009;58(2): 121-126.~~

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~~orders TF, Xu KT, Bacchi D et al. College campus smoking policies and programs and students' smoking behaviours. *BMC Public Health* 2005;5: 74. doi:10.1186/1471-2458-5-74~~

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41 ~~26. Ministry of Public Health. The passage of the law: National Tobacco Control~~

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3 **We thank the reviewers for their comments. We addressed them all, made the changes**  
4 **when appropriate and answered all questions.**  
5  
6

7 *Reviewer 1: Dr. Omar Khabour*  
8

9  
10 1- The word argileh and narghileh were used to describe hookah smoking. Please be  
11 consistent and use only one term to describe the same phenomenon. For the study, it is more  
12 relevant to describe the prevalence of cigarette smoking among university students in AUB  
13 rather than describe prevalence of hookah smoking.  
14

15 **R: We substituted all “argileh” with narghileh. The authors feel that a simple description**  
16 **of smoking behavior gives a better idea on students in general.**  
17

18  
19 2- Page 6, line 45: American University of Beirut should be abbreviated.  
20

21 **R: Done**

22  
23 3- Throughout the manuscript, the word "Faculty" was written sometimes with capital letter  
24 and sometimes without. Please be consistent  
25

26 **R: Done. We used “Faculty”**

27  
28 4- Throughout the manuscript description of frequencies are sometimes with a space  
29 between the number and % and sometimes without. Be consistent and consult instruction for  
30 authors.  
31

32 **R: We removed the space**

33  
34 5- Page 8 line 44, you have mentioned that there was oversampling from the Faculty of  
35 Health Sciences and in the following sentence you have mentioned that 41% of the sample was  
36 from the Faculty of Art and Sciences. What remained for other faculties? I suggest that you  
37 information about number of students recruited from each Faculty.

38 **R: The true proportion of FHS students at AUB is around 4 %. However in the sample it**  
39 **was 13 %. Therefore we weighted the data in the analysis according to Faculty, as**  
40 **mentioned in the analysis part.**

41 **All Faculties were represented in the sample. We could add more information in the text**  
42 **about the distribution or leave as such and readers could refer to table 1.**

43 **We added one table to describe the demographic characteristics for the total sample and**  
44 **by smoking status. The results on the sample profile in the text could be presented without**  
45 **the table. We leave it to the editor to decide if the table is necessary**  
46  
47

48  
49 6- The authors mentioned in the manuscript that AUB has students from 69 countries and  
50 thus the authors should mention the language of the questionnaire. Was the questionnaire  
51 distributed in Arabic language or in multi-languages? What was the percentage of foreign  
52 students in the sample?

53 **R: The questionnaire was administered in English. 13 % of the sample were non Lebanese.**  
54 **Another 15 % had dual nationality. They could be Arab non Lebanese or non Arab**  
55  
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3 7- Page 8 line 13: define FCTC

4 **R: Done**  
5  
6

7 8- Page 9 line 47, what is the difference between school and Faculty?

8 **R: No difference. Before separating from the Faculty of Arts and Sciences(FAS), It was**  
9 **named a school. After becoming independent of FAS, it kept its name and they added the**  
10 **name of a major donor named Olayan: Olayan School of Business.**  
11

12 9- Page 10 line 21, the authors mentioned in text that (51.7%) of current smokers were not  
13 at all satisfied with the ban, while the in the table 1, the percentage is 63.8%. Please clarify the  
14 this discrepancy

15 **R: We corrected in the text and replace with 63.8 % as per the table. We reported before**  
16 **those who were not satisfied at all only and these amounted to 51.7 %**  
17  
18

19 10- Page 12, line 45, remove the words around one third and the brackets.

20 **R: Done**  
21  
22

23 11- Page 16 line 11, remove extra bracket

24 **R: Done**  
25  
26

27 12- Page 17: paragraph 1 and 2 should be one paragraph.

28 **R: Done**  
29

30 13- Pages 21-23, check the references style.

31 **R: Done**  
32  
33  
34

35 *Reviewer 2: Libby N Brockman*  
36

37 - Do the results support the "success" (how is this defined?) of a smoking ban? Perhaps more  
38 accurately, one of the key messages of this study is that implementing a smoking ban is a  
39 complex process with numerous stakeholders, including students which are not often included in  
40 such analyses. Their opinions and attitudes are important and varied based on smoking status.

41 **R: The authors consider that the smoke ban was a success at AUB with almost two thirds**  
42 **complying with the ban and a high proportion reporting that ban was justified and that**  
43 **they were satisfied with it. WE totally agree with the reviewer that implementing a**  
44 **smoking ban in the country is very complex.**

45 **We added a statement on the complexity of the process in the key messages as suggested.**  
46  
47

48 - One of the strengths of this study is that it is the first to document student perceptions of  
49 barriers to smoke bans. Would be interesting to hear more from the authors on why the student  
50 perspective is so valued.

51 **R. We added the a statement under "strengths"**

52 **As the authors pointed earlier and rightfully so that students are important stakeholders**  
53 **for the success of a smoke ban in the country. They constitute a significant proportion of**  
54 **the young population whose support of the tobacco control in general is essential**  
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6 Abstract:

7 - Add # of students who completed the survey

8 **R: Done**

9  
10 - Add data collection methods

11 **R: Done**

12  
13  
14 - Provide #s, percentages, p-values for some of your main results to bolster your results section.

15 **R: Done**

16  
17 Limitations of this study are not discussed anywhere. Please add a discussion of them to the  
18 Discussion section.

19  
20 **R: The study does not intend to measure a change or any associations and therefore its**  
21 **cross sectional nature does not entail any limitation. The oversampling from the Faculty of**  
22 **Health Sciences was corrected in the analysis by post weighing the analysis. A statement**  
23 **was added in the discussion about limitations.**  
24

25  
26 It is hard to judge the appropriateness of the statistical methods when the exact tests used aren't  
27 described. The statistical methods are only summarized briefly in the Methods section  
28 (uni/bivariate analyses), however the exact tests used are not named (T-tests? Fischers exact?  
29 Chi- squared tests?). This would be helpful to know, please add to the Methods section.

30 **R: Done**

31  
32  
33 Further, the term "significant" has technical implications. When using this term, readers will  
34 expect to see hypothesis testing results such as p-values and confidence intervals. The authors  
35 often make judgements of significance and compare groups within the text without providing  
36 statistical evidence to back this up. For example:

37 1) Pg 10, line 14: Authors conclude that "Difference in attitude were mainly between regular  
38 smokers and non-smokers" yet do not provide evidence of the comparisons they made to reach  
39 this conclusion. Please provide analyses.

40 2) Pg 11, line 35

41 3) Pg 12, line 39

42 4) Pg 12, Line 52

43  
44 **R. This is not a hypothesis driven study and the authors wanted to describe compliance and**  
45 **attitudes. The authors see that it is legitimate to compare attitudes according to smoking**  
46 **status . these analyses help in highlighting target groups for intervention. To highlight the**  
47 **differences and since the survey was based on probability samples, we performed bivariate**  
48 **analyses and reported statistical differences. When statistical differences were found**  
49 **among the three groups of smokers, the authors examined the observed percentages to**  
50 **describe the patterns and where the differences occur.**  
51  
52

53  
54  
55 USA smoking prevalence rates in this manuscript come from a 2002 paper (pg 5, line 24). The  
56 American College Health Association National College Health Assessment (ACHA-NCHA)  
57  
58  
59  
60

1  
2  
3 provides more current data on risk behaviors among US college students. This may be a good  
4 source for smoking prevalence among USA college students.

5  
6 **R: We changed the reference as per the suggestion of the reviewer and reported the**  
7 **prevalence in the USA of 14.3% according to the American College Health Association**  
8 **2012**  
9

10 Nowhere in the entire manuscript is the # of participants stated. Please provide total N.  
11 Relatedly, the Total columns in Tables 1-4 are missing a total N and should be moved from the  
12 last column to the first column of reported data. Lastly, note that in Table 3, the term Overall is  
13 used instead of Total. Please be consistent.

14  
15 **R: The number is mentioned on page 8, line 30 under the section “participants”( p 7 line**  
16 **31). The total is 535.**

17 **Tables were changed**  
18

19 The Results section is lacking a basic description of the study sample in terms of demographics  
20 and smoking experience (descriptive statistics).

21 **R: Done**  
22  
23

24  
25 This reviewer questions the difference between "large extent" and "some extent". Is there a  
26 quantitative or meaningful difference between "large extent" and "some extent"? If so, please  
27 define.  
28

29  
30 Further, though the tables break these into two separate groups, the authors often combine them  
31 in the text and report them as one [eg, pg 10, lines 10-14, lines 16-21, lines 32-34,]. Perhaps the  
32 survey question and its representation in the tables should be dichotomized (some extent (large +  
33 some) vs not at all/not sure) rather than categorical.  
34

35 **R. Attitudes questions are usually constructed on a likert scale. It shows levels or strength**  
36 **of agreement or support with a particular statement and not a simple yes and no answer.**  
37 **“Large extent” denotes a stronger support “ and “to some extent” a moderate support.**  
38 **Only in one table the authors report the three categories and felt that it reflects better the**  
39 **results and the differences in supporting the ban**  
40  
41

42  
43 Whichever order the authors chose to list their objectives, this should remain consistent when  
44 discussing their findings in the Discussion section.

45 **R: Done. We restructured both results and discussion according to the order of the stated**  
46 **objectives. The reason why the authors chose in the first to present attitudes first is because**  
47 **it includes all the sample of students and not only the smokers(smokers and non smokers)**  
48  
49

50 Please clarify the implications of these study results. For example, the authors suggest smoking  
51 cessation services need to be better advertised on campus, yet none of the results in this study  
52 measured students' awareness of smoking cessation services. Further, the results of this study do  
53 not speak to educational campaigns regarding anti-smoking strategies, as the authors suggest on  
54 page 19. Lastly, it remains unclear whether these results suggest a national tobacco control  
55 policy will strengthen a campus policy. While this may be logically argued, the participants in  
56 this study were not asked whether not having a national smoking ban is a barrier to  
57  
58  
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1  
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3 implementation of a campus smoking ban. Please discuss implications of this study's specific  
4 results.

5 **R: The authors are discussing the results within the broader context. For example if AUB**  
6 **implements a successful ban., If young students go to restaurants or other public venues**  
7 **where smoking is allowed, it will not help them quit .. and therefore, AUB ban would be**  
8 **more successful when a national ban of smoking in public places is implemented.**  
9  
10

11  
12 Statements on Pg 18 lines 7-8 ("if not more") and 57 ("more effective") lead the reader to think  
13 that educational programming may be more important than smoking ban policies. This  
14 conclusion is unrelated to the results presented in this study, nor does this reviewer find evidence  
15 to support this. What does the research say about this?  
16  
17

18  
19 **R: we were referring to the authors of the study (reference 17)we quoted that suggested**  
20 **that sometimes policy are not the best way but education could be as or more effective**  
21

22 Further, on page 19, lines 29-33, the authors seem to contradict the statement made on page 18  
23 by saying policy is the best/most effective approach. Please clarify.  
24  
25

26 **R. The education campaign that we proposed was to reinforce the smoking ban at AUB.**  
27 **AUB ban is prohibiting smoking in all outdoors places except for designated areas. We**  
28 **were specific about the type of campaign we meant. Yes it is true the education is not**  
29 **directly linked to the results on attitudes and compliance but could be a strategy to boost**  
30 **positive attitudes and compliance. The statement saying that policy is the best approach is**  
31 **true and does not contradict what we said earlier that the impact of AUB policy could have**  
32 **been stronger if we had a national tobacco control law**  
33  
34

35 *Reviewer 3*  
36

37 - My major concern regards the # of objectives and their order of presentation which currently  
38 are not consistent. This reviewer questions whether there are perhaps 3-4 objectives rather than  
39 just two as outlined in the Introduction. Further, which ever order the authors chose to list their  
40 objectives in the Intro, the following content in the Methods, Results and Discussion sections  
41 should follow that same order. For example: compliance, attitudes, and barriers. - Per BMJ  
42 policy, remove all mentions of the name of the school where the study took place. See:  
43 <http://bmjopen.bmj.com/site/about/guidelines.xhtml>.  
44  
45

46 **R: This a case study and we need to mention the setting**  
47

48 - Remove first person language (we, our, etc), use past tense, keep words consistent  
49 (questionnaire vs survey, lifetime not ever smokers, current vs regular), provide statistical results  
50 when using the term significant/different.  
51

52 **R: Done**  
53

54 Introduction:  
55  
56  
57  
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1  
2  
3 I enjoyed reading your background section as it set up your paper appropriately. However, I  
4 wonder if reordering this section will provide readers the answers to their questions more  
5 quickly.  
6

7 **R: The introduction was restructured as per the suggestion of the reviewer**  
8

9 Page 6, discusses smoking practices of Lebanese students. Please define and explain the  
10 difference between argileh and narghile; are these the same? Using just one term may be more  
11 consistent and less confusing.  
12

13 **R: Argileh and narghileh are the same. We replaced all arghileh with narghileh**  
14

15 Page 6, line 34: Most literature on smoking prevalence differentiates between current and  
16 lifetime smoking. Is there a difference between "regular" and "current"? If so, please clarify.  
17

18 **R: Regular and current are the same. We replaced all current with regular.**  
19

20 Methods:  
21

22 -Move statements about date of data collection and IRB approval from the Data Collection  
23 subsection to right under the Methods heading. This should be listed before the subsection of  
24 Participants. "This study took place between [Months] 2008- June 2009. IRB approval was  
25 obtained from AUB for all research procedures..."  
26

27 **R: This part was restructured as per the suggestions of the reviewer**  
28

29 - Pg 8, Line 46, sentence "Data collection was completed in June 2009" should be added to the  
30 very beginning of the Methods section, as noted above.  
31

32 **R: This part was restructured as per the suggestions of the reviewer**  
33

34 -pg 7, line 26: please note that INSTRUCTORS of "a random sample of classes offered in the  
35 spring semester..." were asked to invite their students to complete the survey.  
36

37 **R: This part was restructured as per the suggestions of the reviewer**  
38

39 -pg 8, line 48, sentence "None of the instructors contacted..." can be moved to pg 7, line 33  
40 before the sentence "The selection of classes was based...".  
41

42 **R: This part was restructured as per the suggestions of the reviewer**  
43

44 - page 7, line 44: The sentence starting with "The highest percentage of surveyed students..."  
45 should be moved to the first sentence of the Results section.  
46

47 **R: This part was restructured as per the suggestions of the reviewer**  
48

49 - Decide if you will you use the term questionnaire or survey, but be consistent and stick with  
50 just one of those terms.  
51

52 **R: The term survey was used to describe questionnaire and survey for consistency.**  
53

54 - You can combine the Questionnaire and Data collection sections into one "Questionnaire (or  
55 Survey) & Data Collection".  
56

57 **R: Done**  
58  
59  
60



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3 - How was the survey administered? Online, or with paper and pencil?

4 **R: Paper and pencil**

5  
6  
7 - pg 8, line 39: Sentence starting with "Questionnaire construction and data collection were done  
8 as..." should be moved to the first sentence of the Questionnaire & Data Collection section.

9 **R: Done**

10  
11 -pg 8- line 13: "Various statements" should read "Survey questions"

12 **R: Done**

13  
14  
15 -pg 8, line 20: most literature on smoking prevalence differentiates between current and lifetime  
16 smoking. Therefore, "ever" should read "lifetime"

17 **R: Done**

18  
19  
20 - Pg 9, line 11: "Answers to attitudes..." sentence is unclear. "To a larger extent, to some extent,  
21 and not at all/not sure" are not answers to "the ban". Please specify what the questions were so  
22 readers understand what the measures were.

23 Can the authors comment on why "not at all" and "not sure" were grouped together? These seem  
24 like different answers to me.

25  
26  
27 **R. What we meant is that the response categories were regrouped into three groups. We  
28 put not sure and not at all together for two reasons: the small number of observations in  
29 most attitudes items and both denote a negative attitudes towards the ban**

30 **The sentence was changed to "The response categories of the attitudes questions towards the  
31 ban were also classified into 3 groups;"**

32  
33  
34 Results:

35  
36 - pg 9 line 40: keep wording in past tense, "are" should be "were"

37 **R: Done**

38  
39  
40 - pg 9, line 44: university should not be capitalized. Correct this throughout the manuscript -pg  
41 11, line 47: Do you mean "more similar" rather than "closer"? Closer denotes physical proximity.

42 **R: Done. "Closer" was replaced with "more similar".**

43  
44  
45 -pg 12 line 4-5: "a little bit less" should read "almost"

46 **R: Done**

47  
48 - Capitalize Table or Figure when referring to these throughout the manuscript

49 **R: Done**

50  
51 Discussion section

52  
53  
54 - pg 16, line 27: should read "All OF the above..."

55 **R: Done**

1  
2  
3 -pg17 line 11: Should read: "There are multiple reasons for this..."  
4

5 **R: Done.**  
6

7 -pg 17 line 32: Other reasons for what?

8 **R. This statements follows the statement: "There are multiple reasons for this: First,**  
9 **smokers ..." it explains why the ban did not impact students smoking behavior. Some**  
10 **editing was done on the paragraph to remove confusion**  
11

12  
13 -I wonder if the discussion of the 2012 smoking ban in Lebanon could be summarized in fewer  
14 sentences. While this may important to note, signifying advances the country has made in recent  
15 years, I am unsure where it belongs in this manuscript.  
16

17 **R: Done**  
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**Students' attitude and smoking behaviour following the implementation a university smoke-free policy: a cross sectional study**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-002100.R2
Article Type:	Research
Date Submitted by the Author:	01-Mar-2013
Complete List of Authors:	Chaaya, Monique; American University of Beirut, Afifi, Rima; American University of Beirut, Health Promotion and Community Health Nakkash, Rima; American University of Beirut, Health Promotion and Community Health Alamuddin, Maysam Nahhas, George
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Public health, Smoking and tobacco
Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, EPIDEMIOLOGY

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Manuscripts

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5 Students' attitude and smoking behaviour following the implementation of a university  
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7 smoke-free policy: a cross sectional study  
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6 American University of Beirut, Beirut, Lebanon  
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9 **Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon  
10

11 **WordCount:** 3,496 words excluding (title page, abstract, summary, references and tables)  
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20 Article focus:

- 21  
22 - To examine students' compliance and attitude following the smoking ban at the  
23  
24 American University of Beirut campus.  
25  
26

27 Key messages and significance of the study:

- 28  
29  
30 - Students are an important group to consider when discussing tobacco control and  
31  
32 implementing a university wide smoking ban. They should be included as stakeholders  
33  
34 in the analysis of the policy process.  
35  
36 - Implementing a tobacco control policy in a university campus could be  
37  
38 successful. Compliance and satisfaction were reasonably high, with some  
39  
40 differentials according to smoking status.  
41  
42 - Challenges of the implementation of a tobacco cessation policy at a university  
43  
44 could be overcome by having a comprehensive national tobacco control policy.  
45  
46  
47

48 Strengths and Limitations:  
49  
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51  
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53

54 Strengths:  
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- A representative large sample (n=535) of students from all Faculties
- This study was the first to be conducted regionally.
- It is the first study to document student perceptions of barriers to smoke bans.
- This study could lay the ground for implementing smoking ban in other universities in Lebanon and globally.

Limitations:

- The cross sectional nature of the study makes it difficult to ascertain the causal association between the smoking ban and smoking behaviour.

**Introduction** The university years are an important life phase for every student during which they develop and engage in risky behaviours such as smoking. Smoking therefore is an important public health problem among university students. An international study showed that overall 34% of male university students and 27% of female university students from 23 different countries were current smokers with large differences between countries and gender.[1] Students from Southern European countries, for example Portugal (47% of males smoke) and Spain (46% of females smoke), exhibited the highest rate of tobacco smoking compared to students from developing countries, for example Thailand (men 14% and women 2%), who displayed the lowest rates.[1] Among US college students, the American College Health Association survey results[2] revealed that 14.3% of students currently using tobacco, cigarettes being the most common form of tobacco use.[1] In Lebanon, a study [3] revealed that 28.3% of students in a private university currently smoked nargileh, of whom 38% were regular smokers, the proportion of lifetime nargileh smokers being 43%.[3] Another study by Tamim et al.[4] showed that 40% of students in public and private universities in Lebanon currently smoked tobacco (21.1% narghileh, 7.6% cigarettes and 11.3% smoked both cigarettes and narghileh).[4] The above studies highlight the need for interventions that do not only target university students' smoking behavior but also protect non-smokers from exposure to high levels of second hand smoke and its associated health effects.

Evidence indicates that second hand smoking is associated with increased incidence of cardiovascular diseases, lung cancers, and respiratory problems such as worsened asthma severity.[5-8] To lessen these effects, non-smoking policies in public places have been implemented and were shown to help reduce smoking among smokers

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4 [9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on  
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6 the effects of smoke-free workplaces in the United States, Australia, Canada, and  
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8 Germany showed that smoke-free workplaces are associated with decreased smoking  
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10 prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally  
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12 representative sample of college students in different U.S. colleges showed that  
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14 residents of smoke-free housing had a significantly lower smoking prevalence than  
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16 students living in residences which permit smoking.[10] Not only do non-smoking  
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18 policies encourage smokers to decrease or even quit smoking, but they also protect  
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20 smokers and non-smokers from the effects of secondhand smoking. For example, a ban  
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22 on smoking in workplaces and public places in Bowling Green, Ohio led to a significant  
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24 reduction in hospital admission rates for coronary heart disease.[11] Similarly, a smoke-  
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26 free legislation in public places in Scotland was associated with a 17% decrease in  
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28 admissions for acute coronary syndrome.[12] This decrease was greatest among non-  
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30 smokers whose exposure to second-hand smoke was dramatically reduced; a lower  
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32 decline in acute coronary syndrome was observed for smokers.[12]  
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38 The purpose of this paper is to examine the implementation of a smoking ban  
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40 on a private university in Lebanon. Although Lebanon ratified the World Health  
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42 Organization Framework Convention on Tobacco Control in 2005 which proposes a  
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44 complete ban on indoor smoking, such a policy has only been implemented in 2012. In  
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46 2008,, a few workplaces, hospitality venues, and educational institutions have  
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48 voluntarily introduced smoking bans. [13] In May 2008, the American University of  
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50 Beirut (AUB), a private university, decided to implement a non-smoking policy  
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52 everywhere on campus encompassing student residence halls and all campus buildings  
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54 except for private Faculty residences. Smoking became restricted to designated areas  
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4 only. The specific objectives of the study were to: 1) assess compliance with the ban; 2)  
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6 assess changes in smoking behaviour after the ban; 3) examine student attitude and  
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8 opinion towards the campus wide smoking ban and tobacco control measures in general;  
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10 and 4) assess perceptions of barriers to implementation of the ban.  
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## 14 15 16 17 **Methods** 18 19

20  
21 This study took place between October 2008 and June 2009. IRB approval was  
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23 obtained from AUB for all research procedures.  
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## 25 26 **Participants** 27 28

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30 A cross sectional study was conducted at AUB, the largest private university in  
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32 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
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34 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
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36 and currently enrolls around 7500 students from 69 countries. A random sample of  
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38 classes being offered in the spring semester of academic year 2008/2009 was selected to  
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40 recruit participants; a total of 545 students were registered in those classes. None of the  
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42 instructors refused to allow recruitment in their classrooms. The selection of classes  
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44 was based on a stratified cluster design whereby a proportionate sample of classes was  
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46 chosen from all six Faculties based on the size of each Faculty. All students attending  
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48 chosen classes were approached and asked to complete the survey. Fewer than 2%  
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50 refused to participate. The final sample included 535 participants of which 25% were  
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52 foreigners. The sample was representative of all undergraduate and graduate students  
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4 from the six Faculties at AUB, with an oversampling from the Faculty of Health  
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6 Sciences.

### 9 **Survey and Data Collection**

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12 Survey construction and data collection were done as part of the requirements  
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14 for “Survey Methods”, a course offered at the Faculty of Health Sciences to  
15  
16 undergraduate Environmental Health (EH) students. A self-administered paper and  
17  
18 pencil survey in English was designed to collect data on demographic variables (age,  
19  
20 gender, Faculty, class, nationality and place of residence), personal smoking habits,  
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22 compliance and attitude towards the smoking ban at AUB, in addition to students’  
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24 attitude towards tobacco control policies in Lebanon. Students were asked questions  
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26 such as: to what extent were they satisfied with the smoking ban at AUB, whether they  
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28 felt it was justified, and whether the ban helped in creating a healthier environment.  
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30 Survey questions related to their attitude towards some of the Framework Convention  
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32 on Tobacco Control (FCTC) measures, specifically policies banning cigarette smoking  
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34 in public places were included. Students expressed their support for or objection  
35  
36 towards the enforcement of these policies using a likert scale. The survey also included  
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38 questions on lifetime and regular cigarette smoking behavior and perceived change in  
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40 consumption following the ban, as well as their compliance with it (e.g. whether they  
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42 smoked in designated and non-designated areas). Moreover, students were asked about  
43  
44 the barriers against the implementation of tobacco control policies in AUB.  
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50 Instructors of the selected courses were contacted to ensure access to their class  
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52 and set a time for data collection. Surveys were administered to students during class  
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54 time.  
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## Data analysis

Univariate analyses were performed to examine the distribution of main demographic and smoking variables. Bivariate analyses by gender and cigarette smoking status were performed. Chi square tests and Fishers Exact test were computed to check for significant differences in compliance and attitudes according to gender and smoking groups. P values were reported as  $< 0.05$ ,  $< 0.01$  or  $< 0.001$ . Because occasional smokers and ex-smokers constituted only 6.4% and 4.7% of the sample respectively, and their smoking exposure is different from regular smokers, smoking status was grouped into 3 categories: never smokers, occasional and ex-smokers, and regular smokers. The response categories of the attitudes questions towards the ban were also classified into 3 groups: to a large extent, to some extent and not at all/not sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the analyses by weighing all data according to the distribution of students in all six Faculties. Weighted absolute frequencies and percentages are presented in the Tables.

## Results

Table 1 presents the basic characteristics of the total sample and according to smoking status. Participants tended to be between 19-24 years of age (80.8%), Lebanese (75%), female (59%), from the Faculty of Arts and Sciences (41%), and not living in dorms (87%). Almost one half of the surveyed students reported lifetime smoking cigarettes. Twenty percent smoked in the past 30 days, 51% of whom were regular smokers (11% of the whole sample), 22% ex-smokers, and 28% occasional

smokers. The largest proportion of students started smoking before joining the university (75%), and another considerable percentage considered themselves addicted to smoking (61% of regular smokers). One third of regular smokers considered quitting in the next 6 months. Differences in smoking status were noted across Faculties, year in university and gender. The highest prevalence of regular smoking was reported in the School of Business (14%) followed by the Faculty of Arts and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences (4.5%). Sophomore and male students were more likely to be regular smokers than students from other levels and females respectively.

**Table 1: Students' characteristics by smoking status**

Variable	Total		Regular Smokers		Occasional and Ex- Smokers		Non Smokers	
	n=535	%	n=60	%	n=59	%	n=416	%
<b>Age group</b>								
< 18 yrs	62	11.6	4	6.5	8	12.9	50	80.6
19-24 yrs	432	80.7	52	12.0	41	9.5	339	78.5
25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
<b>Gender</b>								
Males	217	40.5	39	18.0	29	13.4	149	68.7
Females	318	59.6	21	6.6	30	9.4	267	84.0
<b>Student's level</b>								
Freshman	28	5.2	3	10.7	7	25.0	18	64.3
Sophomore	83	15.5	13	15.7	5	6.0	65	78.3
Junior	110	20.6	11	10.0	14	12.7	85	77.3
Senior	170	31.8	18	10.6	15	8.8	137	80.6
Graduate	143	26.8	15	10.5	18	13.3	109	76.2
<b>Faculty</b>								
Arts & Sciences	223	41.6	29	13.0	29	13.0	165	74.0
Agriculture & Food Sciences	48	8.9	5	10.4	3	6.2	40	83.3
Engineering and Architecture	140	26.2	11	7.9	12	8.6	117	83.6

School of Business	91	17.0	13	14.3	11	12.1	67	73.6
Health Sciences	22	4.1	1	4.5	2	9.1	19	86.4
School of Nursing	11	2.0	1	9.1	2	18.2	8	72.7
<b>Nationality</b>								
Lebanese	397	74.5	42	10.6	41	10.3	314	79.1
Non-Lebanese	72	13.5	10	13.9	8	11.1	54	75.0
Both Nationalities	64	12.0	8	12.5	9	14.1	47	73.4

### Compliance and students' smoking behavior following implementation of the smoke free policy (Table 2)

Students' compliance with the ban was assessed among regular smokers. Almost three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

As for students' smoking frequency following the ban, it did not significantly differ between genders. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before its implementation. However, 31.4% and 5% of male and female respondents respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of regular smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

**Table 2: Smokers' compliance and behaviour following the ban by gender**

Variable	Total		Males		Females	
	n= 60	%	n= 39	%	n= 21	%

<b>Smoking on campus</b>						
Designated areas only	40	72.7	27	75.0	13	68.4
Designated and non-designated areas	15	27.3	9	25.0	6	31.6
<b>Received a warning ticket for smoking by an officer on campus</b>						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
<b>Smoking frequency</b>						
Increased	12	21.8	11	31.4	1	5.0
Decreased	11	20.0	7	20.0	4	20.0
Remained the same	32	58.2	17	48.6	15	75.0

### Students' attitude towards the smoke free policy (Table 3)

Table 3 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were majority (63.8%) not at all satisfied with it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and non-smokers possessed significantly different views regarding whether the ban helped in creating a healthy environment and whether AUB should become an entirely smoke-free area. While 94% of non-smokers thought that the ban contributed to some or a large extent in creating a healthy environment, only 67% of regular smokers believed so. Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this prospect as opposed to only 10.2% of regular smokers.

Table 3: Students' attitude towards AUB's smoking ban by smoking status

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.001$

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4           Regarding the ban's effect on smoking behavior, the majority (65%) of  
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6 respondents agreed that the ban would help smokers decrease smoking; however, a  
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8 much lower percentage thought the ban would contribute to smoking cessation.  
9  
10 Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy  
11  
12 percent of non-smokers as opposed to 40% of smokers considered the ban might lead in  
13  
14 some or large extent to a decline in smoking. As to its effect on quitting smoking, a  
15  
16 large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the  
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18 ban would have no effect on cessation.  
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22           Occasional and ex-smokers were more similar to non-smokers in their opinion/  
23  
24 attitude as depicted in Table 3.  
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#### 27 28 **Students' attitude towards having a non-smoking policy in public places (Table 4)** 29 30

31           Students' attitude towards enforcing a non-smoking policy in Lebanon varied  
32  
33 according to their smoking status whereby regular smokers were more opposed to it.  
34  
35 Ex- and occasional smokers were more similar to non-smokers in their attitude as  
36  
37 shown in Table 4. Overall, a large majority of students supported banning smoking in  
38  
39 most public places except outside universities' buildings, night clubs and coffee shops  
40  
41 where less than half of the sample reported favorable attitudes. Regular smokers and  
42  
43 non-smokers exhibited significant differences when it came to banning cigarette  
44  
45 smoking in the following places: in ministries, public institutions, schools and  
46  
47 university buildings, outside university buildings, as well as in public transportation,  
48  
49 workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%,  
50  
51 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public  
52  
53 transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of  
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regular smokers shared the same opinion. The only two locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here most students agreed that they should be smoke-free with percentages exceeding 90%.

**Table 4: Students' attitude towards banning cigarette smoking in public places**

	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
<b>Attitude</b>	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps</b>								

<b>smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.05$

\*\*  $p < 0.001$

### **Barriers to implementation of the smoke free policy in AUB (Table 5)**

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, Faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in Table 5.

**Table 5: Barriers to implementation of the smoke free policy by smoking status**

	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
<b>Attitude</b>	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								



Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.01$

## Discussion

The AUB is the first university in Lebanon to institute a non-smoking policy on campus. This provided the opportunity to assess students' compliance with and attitude towards the ban and its impact on their smoking behavior. These results showed that compliance was high and the smoking ban was effective in curbing some of the students' smoking behavior. Because of the cross sectional nature of the study it was not possible to measure whether students reduce their smoking in direct response to the ban.

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4 Therefore, we relied on self-reported change in smoking behavior. Although it was  
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6 suspected that the ban would positively impact all smokers, unfortunately it did not have  
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8 this intended effect. Only one in five smokers reported decreased smoking. This could  
9  
10 be explained by the fact that although there is a section in the policy on smoking  
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12 cessation, students are generally unaware of the availability of a free smoking cessation  
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14 program at the university's medical center for those wanting help. This might explain  
15  
16 why the policy did not impact a greater number of students. Consequently, smoking  
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18 cessation services need to be better advertised so that students are aware of the help they  
19  
20 can get for their tobacco addiction. Another reason why the policy may have not  
21  
22 affected smoking behavior as intended could be that the implementation of AUB's  
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24 smoking ban was not reinforced by a national smoke free policy in public places across  
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26 Lebanon, so as soon as students left the campus, they would go back to their usual  
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28 habits. Moreover, the policy was not accompanied by an educational campaign to raise  
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30 awareness regarding the harmful effects of smoking on one's health. A study by Borders  
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32 et al.[14] covering undergraduate students at 12 colleges or universities in Texas,  
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34 showed that compared to different college-level policies and programs, only the  
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36 presence of preventive education programs on campus was associated with lower odds  
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38 of current cigarette use.[14] On the other hand, universities which implemented other  
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40 tobacco control policies such as smoking cessation programs and having designated  
41  
42 smoking areas were not effective in curbing students' smoking behavior. For example,  
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44 the latter two policies / programs were associated with higher odds of smoking in the  
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46 study. Thus, as the authors concluded, implementing strict policies may not be the best  
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48 way to decrease students' smoking rates, prevention and education programs might be  
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50 just as important if not more. While 20% of regular smokers reported that their  
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4 smoking decreased, another 21.8% said that it actually increased following policy  
5 enforcement. The increase could be explained by two reasons: First, smokers might  
6 have intentionally reported an increase in their smoking frequency to deceive the  
7 researchers and to prove the inefficiency of the policy in reducing their smoking  
8 behavior. Second, smoking might have actually increased because since it is viewed as a  
9 “cool” and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]  
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12  
13 This study has reported also on students’ attitude towards the implementation of the  
14 non-smoking policy at AUB. Overall students’ attitude towards the ban was favorable,  
15 but revealed large differences by smoking status. Non-smokers possessed a more  
16 favorable attitude towards the smoke free policy which was evident in their greater  
17 satisfaction level, conviction about its need and potential effect in decreasing smoking  
18 behavior. This is to be expected as non-smokers do not want to expose themselves to the  
19 adverse health effects of second hand smoke. Other studies in the United States have  
20 reached similar findings. A nationally representative study encompassing undergraduate  
21 students at 119 colleges and universities in the USA revealed that non-smokers were  
22 more supportive of different tobacco control policies such as enforcing smoke free  
23 policies in all campus buildings, student residences, dining areas and campus bars and  
24 pubs.[16] As well, non-smokers were more approving of tobacco marketing restrictions  
25 (e.g. prohibiting tobacco advertising on campus and sponsorship of social events) as  
26 well as forbidding tobacco sales on campus.[16] Similarly, a study by Loukas et al.[17]  
27 with students from 5 Texas colleges showed that non-smokers and experimental  
28 smokers compared to smokers were significantly less opposed to implementing a  
29 smoking ban in all buildings and having an entirely smoke-free campus.[17]  
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4 Students' attitude towards enforcing a non-smoking policy in public places in Lebanon  
5  
6 also differed by smoking status. Regular smokers were more opposing to banning  
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8 cigarette smoking in ministries, public institutions, workplaces, schools and university  
9  
10 buildings etc. as mentioned above. The only two locations that smokers and non-  
11  
12 smokers agreed on being smoke free were health care facilities and elevators with  
13  
14 percentages over 90%. This can be explained by the fact that health care facilities  
15  
16 provide care for ill patients and smoking would clearly conflict with this purpose.  
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18 Moreover, given that elevators are confined spaces and have limited air circulation,  
19  
20 students most likely agreed that they should be smoke free so as to respect non-  
21  
22 smokers' wishes in breathing in clean air. The results of this study are supported by  
23  
24 research conducted in 2004 at AUB and funded by Research for International Tobacco  
25  
26 Control (Canada) which showed that in general, there is positive support among young  
27  
28 adults including university students for implementing and enforcing tobacco control  
29  
30 policies (unpublished report). The least supported policy, however, was the ban of  
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32 smoking in restaurants and entertainment places which parallels the research findings.  
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38 Barriers to implementation of the smoke free policy at AUB, as identified by  
39  
40 students, were: lack of compliance of some students, Faculty, and staff; having too few  
41  
42 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
43  
44 policy. All of the above were considered obstacles with varying agreement between  
45  
46 smokers and non-smokers. However, no other published study that looked at barriers to  
47  
48 the implementation of a non-smoking policy from a student's perspective was found.  
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50 Although the lack of compliance was viewed as a barrier, in reality the majority of  
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52 regular smokers (73%) abided by it. This may be due to the fact that students risked  
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54 receiving a warning if they were smoking in prohibited areas. In other contexts,  
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4 compliance has been shown to pose a significant threat to the effective implementation  
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6 of non-smoking policies. Harris et al.[18] conducted a study to identify efficient  
7  
8 strategies that will increase compliance of students to a college campus smoking ban.  
9  
10 An intervention consisting of moving smoking receptacles, drawing ground markings  
11  
12 and putting more signs regarding the non-smoking policy, as well as distributing  
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14 reinforcements and reminder cards led to a significant increase in compliance from 33%  
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16 to 74% within the intervention week and remained at 54% during follow-up.[18]  
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## 27 **Conclusion**

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30 An education campaign accompanying the policy might be more effective in  
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32 further reducing current cigarette use; it will also increase smokers' conviction in its  
33  
34 necessity. The university should also actively advertise its free smoking cessation  
35  
36 services and implement more rigid enforcement measures as this was one of the barriers  
37  
38 identified by students. In addition, an awareness based approach is important to  
39  
40 illuminate the adverse effects of second hand smoking and to emphasize that non-  
41  
42 smoking policies do not infringe on smokers' rights, rather they aim mostly at  
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44 protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed  
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46 a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese  
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48 parliamentary premises were declared a smoke free zone, with signs prohibiting  
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50 smoking. This current law was embraced by all public places in Lebanon including  
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52 schools and universities as of September 2012. [19] This more universal ban will likely  
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54 increase the impact of AUB's policy as evidence has indicated that smoking prevalence  
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4 and incidence is most impacted through implementation of comprehensive national  
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6 policies.  
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### 11 12 **Acknowledgments**

13  
14 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
15  
16 assistance in data management and analysis. The authors would also like to thank the  
17  
18 students who participated in this study and IDRC for their continuous support.  
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### 21 22 **Ethical approval**

23  
24 This study has been approved by the Institutional Review Board at AUB and students  
25  
26 consented orally to participate in the study.  
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### 30 31 **Funding**

32  
33 This research study was funded through a grant from Research for International  
34  
35 Tobacco Control, a secretariat of the International Development Research Center  
36  
37 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
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### 41 42 **Competing interests**

43  
44 None declared  
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8 Students' attitude and smoking behaviour following the implementation of a university  
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10 smoke-free policy: a cross sectional study  
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11 **Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon

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14 **WordCount:** 3,496 words excluding (title page, abstract, summary, references and tables)

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21 Article focus:

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23 | - To examine students' compliance and attitude following the smoking ban at the  
24 American University of Beirut campus.

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28 Key messages and significance of the study:

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30 | - Students are an important group to consider when discussing tobacco control and  
31 implementing a university wide smoking ban. They should be ~~Yet, in rare instances~~  
32 ~~they are~~ included as stakeholders in the analysis of the policy process.  
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34 | - Implementing a tobacco control policy in a university campus could be  
35 successful. Compliance and satisfaction were reasonably high, with some  
36 differentials according to smoking status.  
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38 | - Challenges of the implementation of a tobacco cessation policy at a university  
39 could be overcome by having a comprehensive national tobacco control policy.  
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46 Strengths and Limitations:

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51 Strengths:

- A representative large sample (n=535) of students from all Faculties
- This study was the first to be conducted regionally.
- It is the first study to document student perceptions of barriers to smoke bans.
- This study could lay the ground for implementing smoking ban in other universities in Lebanon and globally.

Limitations:

- The cross sectional nature of the study makes it ~~It is~~ difficult to ascertain the causal association between ~~impact of the~~ smoking ban and on ~~on~~ smoking behaviour.

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7 **Introduction** The university years are an important life phase for every student  
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9 during which they develop and engage in risky behaviours such as smoking.  
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11 Smoking therefore is an important public health problem among university  
12 students. An international study showed that overall 34% of male university students  
13 and 27% of female university students from 23 different countries were current smokers  
14 with large differences between countries and gender.[1] Students from Southern  
15 European countries, for example Portugal (47% of males smoke) and Spain (46% of  
16 females smoke), exhibited the highest rate of tobacco smoking compared to students  
17 from developing countries, for example Thailand (men 14% and women 2%), who  
18 displayed the lowest rates.[1] Among US college students, the American College  
19 Health Association survey results[2] revealed that 14.3% of students currently using  
20 tobacco, cigarettes being the most common form of tobacco use.[1] In Lebanon, a study  
21 by Chaaya et al.[3] revealed that 28.3% of students in a private university currently  
22 smoked nargileh, of whom 38% were regular smokers, the proportion of lifetime  
23 nargileh smokers being 43%.[3] Another study by Tamim et al.[4] showed that 40% of  
24 students in public and private universities in Lebanon currently smoked tobacco (21.1%  
25 narghileh, 7.6% cigarettes and 11.3% smoked both cigarettes and narghileh).[4] The  
26 above studies highlight the need for interventions that do not only target university  
27 students' smoking behavior but also protect non-smokers from exposure  
28 to high levels of second hand smoke and its associated health effects.  
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47 Evidence indicates that second hand smoking is associated with increased  
48 incidence of cardiovascular diseases, lung cancers, and respiratory problems such as  
49 worsened asthma severity.[5-8] To lessen these effects, non-smoking policies in public  
50 places have been implemented and were shown to help reduce smoking among smokers  
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7 [9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on  
8 the effects of smoke-free workplaces in the United States, Australia, Canada, and  
9 Germany showed that smoke-free workplaces are associated with decreased smoking  
10 prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally  
11 representative sample of college students in different U.S. colleges showed that  
12 residents of smoke-free housing had a significantly lower smoking prevalence than  
13 students living in residences which permit smoking.[10] Not only do non-smoking  
14 policies encourage smokers to decrease or even quit smoking, but they also protect  
15 smokers and non-smokers from the effects of secondhand smoking. For example, a ban  
16 on smoking in workplaces and public places in Bowling Green, Ohio led to a significant  
17 reduction in hospital admission rates for coronary heart disease.[11] Similarly, a smoke-  
18 free legislation in public places in Scotland was associated with a 17% decrease in  
19 admissions for acute coronary syndrome.[12] This decrease was greatest among non-  
20 smokers whose exposure to second-hand smoke was dramatically reduced; a lower  
21 decline in acute coronary syndrome was observed for smokers.[12]

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37 The purpose of this paper is to examine the implementation of a smoking ban  
38 on a private university in Lebanon. Although Lebanon ratified the World Health  
39 Organization Framework Convention on Tobacco Control in 2005 which proposes a  
40 complete ban on indoor smoking, such a policy has ~~not only been implemented in~~  
41 ~~2012~~[been implemented yet. In 2008, However](#), a few workplaces, hospitality venues,  
42 and educational institutions have voluntarily introduced smoking bans. [13]- In May  
43 2008, the American University of Beirut (AUB), a private university, decided to  
44 implement a non-smoking policy everywhere on campus encompassing student  
45 residence halls and all campus buildings except for private Faculty residences. Smoking  
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7 became restricted to designated areas only. The specific objectives of the study were to:  
8 1) assess compliance with the ban; 2) assess changes in smoking behaviour after the  
9 ban; 3) examine student attitude and opinion towards the campus wide smoking ban and  
10 tobacco control measures in general; and 4) assess perceptions of barriers to  
11 implementation of the ban. Our primary objective was to assess compliance and change  
12 in smoking behaviour after the ban. Our secondary objective was to assess student  
13 attitudes & opinions towards the campus wide smoking ban and tobacco control  
14 measures in general. Finally, our third objective was to assess perceptions of barriers to  
15 implementation of the ban.

## 26 27 28 **Methods**

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31 This study took place between October 2008 and June 2009. IRB approval was  
32 obtained from AUB for all research procedures.

## 33 34 35 **Participants**

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37 A cross sectional study was conducted at AUB, the largest private university in  
38 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
39 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
40 and currently enrolls around 7500 students from 69 countries. A random  
41 sample of classes being offered in the spring semester of academic year 2008/2009 were  
42 selected to recruit participants to participate in the survey, yielding a total of 535  
43 545 students who were registered in those classes/courses. None of the instructors  
44 contacted refused to allow recruitment in their classroom stake part in the study. The

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7 selection of classes was based on a stratified cluster design whereby a proportionate  
8 sample of classes was chosen from all six Faculties based on the size of each Faculty.  
9 All students attending chosen classes were approached and asked to complete the  
10 survey. Fewer than 2% refused to participate. The final sample included 535  
11 participants of which 25% were foreigners. The sample was representative of all  
12 undergraduate and graduate students from the six Faculties at AUB, with an  
13 oversampling from the Faculty of Health Sciences.  
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### 20 21 **Survey and Data Collection** 22

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24 Survey construction and data collection were done as part of the requirements  
25 for “Survey Methods”, a course offered at the Faculty of Health Sciences to  
26 undergraduate Environmental Health (EH) students. A self-administered paper and  
27 pencil survey in English was designed to collect data on demographic variables (age,  
28 gender, Faculty, class, nationality and place of residence), personal smoking habits,  
29 compliance and attitude towards the smoking ban at AUB, in addition to students’  
30 attitude towards tobacco control policies in Lebanon. Students were asked questions  
31 such as: to what extent ~~they~~ were they satisfied with the smoking ban at AUB, whether  
32 they felt it was justified, and whether the ban helped in creating a healthier environment.  
33 Survey questions related to their attitude towards some of the Framework Convention  
34 on Tobacco Control (FCTC) measures, specifically policies banning cigarette smoking  
35 in public places were included. Students expressed their support for or objection  
36 towards the enforcement of these policies ~~usingthrough~~ a likert scale. The survey also  
37 included questions on lifetime and regular cigarette smoking behavior and perceived  
38 change in consumption following the ban, as well as their compliance with it (e.g.  
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7 whether they smoked in designated and non-designated areas). Moreover, students were  
8 asked about the barriers against the implementation of tobacco control policies in AUB.  
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11 Instructors of the selected courses were contacted to ensure access to their class  
12 and set a time for data collection. Surveys were administered to students during class  
13 time.  
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### 15 16 17 **Data analysis** 18

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20 Univariate ~~analyses were~~ analysis was performed to examine the distribution of  
21 main demographic and smoking variables. Bivariate analyses by gender and cigarette  
22 smoking status were performed. Chi square tests and Fishers Exact test were computed  
23 to check for significant differences in compliance, and attitudes according to gender and  
24 smoking groups. P values were reported as  $< 0.05$ ,  $< 0.01$  or  $< 0.001$ . Because  
25 occasional smokers and ex-smokers constituted only 6.4% and 4.7% of the sample  
26 respectively, and their smoking exposure is different from regular smokers, smoking  
27 status was grouped into 3 categories: never smokers, occasional and ex-smokers, and  
28 regular smokers. The response categories of the attitudes questions towards the ban  
29 were also classified into 3 groups: to a large extent, to some extent and not at all/not  
30 sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the  
31 analyses by weighing all data according to the distribution of students in all six  
32 Faculties. Weighted absolute frequencies and percentages are presented in the Tables.  
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### 49 **Results** 50 51 52 53 54 55 56 57 58 59 60

Table 1 presents the basic characteristics of the total sample and according to smoking status. ~~The highest percentage of surveyed students was~~ Participants tended to be between 19-~~and~~ 24 years of age (80.8%), Lebanese (75%), female (59%), from the Faculty of Arts and Sciences (41%), and not living in dorms (87%). ~~Almost~~Close to one half of the surveyed students reported lifetime smoking cigarettes. Twenty percent smoked in the past ~~30 days~~one month, 51% of whom were regular smokers (11% of the whole sample), 22% ex-smokers, and 28% occasional smokers. The largest proportion of students started smoking before joining the university (75%), and another considerable percentage considered themselves addicted to smoking (61% of regular smokers). One third of regular smokers ~~considered~~were considering quitting in the next 6 months. Differences in smoking status were noted across Faculties, year in university and gender. The highest prevalence of regular smoking was reported in the School of Business (14%) followed by the Faculty of Arts and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences (4.5%). Sophomore and male students were more likely to be regular smokers than students from other levels and females respectively.

**Table 1: Students' characteristics by smoking status**

Variable	Total		Regular Smokers		Occasional and Ex- Smokers		Non Smokers	
	n=535		n=60		n=59		n=416	
	n=535	%	n=60	%	n=59	%	n=416	%
<b>Age group</b>								
< 18 yrs	62	11.6	4	6.5	8	12.9	50	80.6
19-24 yrs	432	80.7	52	12.0	41	9.5	339	78.5
25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
<b>Gender</b>								
Males	217	40.5	39	18.0	29	13.4	149	68.7
Females	318	59.6	21	6.6	30	9.4	267	84.0
<b>Student's</b>								

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level								
Freshman	28	5.2	3	10.7	7	25.0	18	64.3
Sophomore	83	15.5	13	15.7	5	6.0	65	78.3
Junior	110	20.6	11	10.0	14	12.7	85	77.3
Senior	170	31.8	18	10.6	15	8.8	137	80.6
Graduate	143	26.8	15	10.5	18	13.3	109	76.2
<b>Faculty</b>								
Arts & Sciences	223	41.6	29	13.0	29	13.0	165	74.0
Agriculture & Food Sciences	48	8.9	5	10.4	3	6.2	40	83.3
Engineering and Architecture	140	26.2	11	7.9	12	8.6%	117	83.6
School of Business	91	17.0	13	14.3	11	12.1	67	73.6
Health Sciences	22	4.1	1	4.5	2	9.1	19	86.4
School of Nursing	11	2.0	1	9.1	2	18.2	8	72.7
<b>Nationality</b>								
Lebanese	397	74.5	42	10.6	41	10.3%	314	79.1%
Non-Lebanese	72	13.5	10	13.9	8	11.1	54	75.0
Both Nationalities	64	12.0	8	12.5	9	14.1	47	73.4

### Compliance and students' smoking behavior following implementation of the smoke free policy (Table 2)

Students' compliance with the ban was assessed among regular smokers. Almost three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

As for students' smoking frequency following the ban, it did not significantly differ between genderssexes. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before

its implementation. However, 31.4% and 5% of male and female respondents respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of regular smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

**Table 2: Smokers' compliance and behaviour following the ban by gender sex**

Variable	Total		Males		Females	
	n= 60	%	n= 39	%	n= 21	%
<b>Smoking on campus</b>						
Designated areas only	40	72.7	27	75.0	13	68.4
Designated and non-designated areas	15	27.3	9	25.0	6	31.6
<b>Received a warning ticket for smoking by an officer on campus</b>						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
<b>Smoking frequency</b>						
Increased	12	21.8	11	31.4	1	5.0
Decreased	11	20.0	7	20.0	4	20.0
Remained the same	32	58.2	17	48.6	15	75.0

### Students' attitude towards the smoke free policy (Table 3)

Table 3 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were mainly majority (63.8%) not at all satisfied with

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7 it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly  
8 justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and  
9 non-smokers possessed significantly different views regarding whether the ban helped  
10 in creating a healthy environment and whether AUB should become an entirely smoke-  
11 free area. While 94% of non-smokers thought that the ban contributed to some or a large  
12 extent in creating a healthy environment, only 67% of regular smokers believed so.  
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17 Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this  
18 prospect as opposed to [a meager only](#) -10.2% of regular smokers.  
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24 **Table 3: Students' attitude towards AUB's smoking ban by smoking status**

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7

Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.001$

Regarding the ban's effect on smoking behavior, ~~a sizeable proportion the~~ majority (65%) of respondents agreed that the ban would help smokers decrease smoking; however, a much lower percentage thought the ban would contribute to smoking cessation. Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy percent of non-smokers as opposed to 40% of smokers considered the ban might lead in some or large extent to a decline in smoking. As to its effect on quitting smoking, a large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the ban would have no effect on cessation.

Occasional and ex-smokers were more similar to non-smokers in their opinion/attitude as depicted in Table 3.

#### **Students' attitude towards having a non-smoking policy in public places (Table 4)**

Students' attitude towards enforcing a non-smoking policy in Lebanon varied according to their smoking status whereby regular smokers were more opposed to it. Ex- and occasional smokers were more similar to non-smokers in their attitude as shown in Table 4. Overall, a large majority of students supported banning smoking in

most public places except outside universities' buildings, night clubs and coffee shops where less than half of the sample reported favorable attitudes. Regular smokers and non-smokers exhibited significant differences when it came to banning cigarette smoking in the following places: in ministries, public institutions, schools and university buildings, outside university buildings, as well as in public transportation, workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%, 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of regular smokers shared the same opinion. The only two locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here most students agreed that they should be smoke-free with percentages exceeding 90%.

**Table 4: Students' attitude towards banning cigarette smoking in public places**

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7

Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
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Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.05$

\*\*  $p < 0.001$

#### Barriers to implementation of the smoke free policy in AUB (Table 5)

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, Faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in Table 5.



Table 5: Barriers to implementation of the smoke free policy by smoking status

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
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Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
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Large extent	88	16.7	2	3.4	8	13.6	78	18.9
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Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.01$ 

## Discussion

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7 The AUB is the first university in Lebanon to institute a non-smoking policy on  
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9 campus. This provided the opportunity to assess students' compliance with and attitudes  
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11 towards the ban and its impact on their smoking behavior. These results showed that  
12  
13 compliance was high and the smoking ban was effective in curbing some of the  
14  
15 students' smoking behavior. Because of the cross sectional nature of the study it was not  
16  
17 possible to measure whether students reduce their smoking in direct response to the  
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19 ban after the ban. Therefore, we relied on ~~self-reported~~self-reported change in smoking  
20  
21 behavior. Although it was suspected that the ban would positively impact all smokers,  
22  
23 unfortunately it did not have this intended effect. Only one in five smokers reported  
24  
25 decreased smoking. This could be explained by the fact that although there is a section  
26  
27 in the policy on smoking cessation, students are generally unaware of the availability of  
28  
29 a free smoking cessation program at the university's medical center for those wanting  
30  
31 help. This might explain why the policy did not impact a greater number of students.  
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33 Consequently, smoking cessation services need to be better advertised so that students  
34  
35 are aware of the help they can get for their tobacco addiction. Another reason why the  
36  
37 policy may have not affected smoking behavior as intended could be that the  
38  
39 implementation of AUB's smoking ban was not reinforced by a national smoke free  
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41 policy in public places across Lebanon, so as soon as students left the campus, they  
42  
43 would go back to their usual habits. Moreover, the policy was not accompanied by an  
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45 educational campaign to raise awareness regarding the harmful effects of smoking on  
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47 one's health. A study by Borders et al.[14] covering undergraduate students at 12  
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49 colleges or universities in Texas, showed that compared to different college-level  
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51 policies and programs, only the presence of preventive education programs on campus  
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53 was associated with lower odds of current cigarette use.[14] On the other hand,  
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7 universities which implemented other tobacco control policies such as smoking  
8 cessation programs and having designated smoking areas were not effective in curbing  
9 students' smoking behavior. For example, the latter two policies / programs were  
10 associated with higher odds of smoking in the study. Thus, as the authors concluded,  
11 implementing strict policies may not be the best way to decrease students' smoking  
12 rates, prevention and education programs might be just as important if not more. While  
13 20% of regular smokers reported that their smoking decreased, another 21.8% said that  
14 it actually increased following policy enforcement. The increase could be explained by  
15 two reasons: First, smokers might have intentionally reported an increase in their  
16 smoking frequency to deceive the researchers and to prove the inefficiency of the policy  
17 in reducing their smoking behavior. Second, smoking might have actually increased  
18 because since it is viewed as a "cool" and rebellious behavior, the more it is prohibited,  
19 the cooler smokers look.[15]  
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33 This study has reported also on students' attitudes towards the implementation of the  
34 non-smoking policy at AUB. Overall students' attitude towards the ban was favorable,  
35 but revealed large differences by smoking status. Non-smokers possessed a more  
36 favorable attitude towards the smoke free policy which was evident in their greater  
37 satisfaction level, conviction about its need and potential effect in decreasing smoking  
38 behavior. This is to be expected as non-smokers do not want to expose themselves to the  
39 adverse health effects of second hand smoke. Other studies in the United States have  
40 reached similar findings. A nationally representative study encompassing undergraduate  
41 students at 119 colleges and universities in the USA revealed that non-smokers were  
42 more supportive of different tobacco control policies such as enforcing smoke free  
43 policies in all campus buildings, student residences, dining areas and campus bars and  
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7 | pubs.[164] As well, non-smokers were more approving of tobacco marketing  
8 | restrictions (e.g. prohibiting tobacco advertising on campus and sponsorship of social  
9 | events) as well as forbidding tobacco sales on campus.[164] Similarly, a study by  
10 | Loukas et al.[175] with students from 5 Texas colleges showed that non-smokers and  
11 | experimental smokers compared to smokers were significantly less opposed to  
12 | implementing a smoking ban in all buildings and having an entirely smoke-free  
13 | campus.[175]

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21 | [Students' attitude towards enforcing a non-smoking policy in public places in Lebanon](#)  
22 | [also differed by smoking status. Regular smokers were more opposing to banning](#)  
23 | [cigarette smoking in ministries, public institutions, workplaces, schools and university](#)  
24 | [buildings etc. as mentioned above. The only two locations that smokers and non-](#)  
25 | [smokers agreed on being smoke free were health care facilities and elevators with](#)  
26 | [percentages over 90%. This can be explained by the fact that health care facilities](#)  
27 | [provide care for ill patients and smoking would clearly conflict with this purpose.](#)  
28 | [Moreover, given that elevators are confined spaces and have limited air circulation,](#)  
29 | [students most likely agreed that they should be smoke free so as to respect non-](#)  
30 | [smokers' wishes in breathing in clean air. The results of this study are supported by](#)  
31 | [research conducted in 2004 at AUB and funded by Research for International Tobacco](#)  
32 | [Control \(Canada\) which showed that in general, there is positive support among young](#)  
33 | [adults including university students for implementing and enforcing tobacco control](#)  
34 | [policies \(unpublished report Afifi and Chaaya 2005\). The least supported policy,](#)  
35 | [however, was the ban of smoking in restaurants and entertainment places which](#)  
36 | [parallels the research findings.](#)  
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7 Barriers to implementation of the smoke free policy at AUB, as identified by  
8 students, were: lack of compliance of some students, Faculty, and staff; having too few  
9 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
10 policy. All of the above were considered obstacles with varying agreement between  
11 smokers and non-smokers. However, no other published study that looked at barriers to  
12 the implementation of a non-smoking policy from a student's perspective was found.  
13 Although the lack of compliance was viewed as a barrier, in reality the majority of  
14 regular smokers (73%) abided by it. This may be due to the fact that students risked  
15 receiving a warning if they were smoking in prohibited areas. In other contexts,  
16 compliance has been shown to pose a significant threat to the effective implementation  
17 of non-smoking policies. Harris et al.[186] conducted a study to identify efficient  
18 strategies that will increase compliance of students to a college campus smoking ban.  
19 An intervention consisting of moving smoking receptacles, drawing ground markings  
20 and putting more signs regarding the non-smoking policy, as well as distributing  
21 reinforcements and reminder cards led to a significant increase in compliance from 33%  
22 to 74% within the intervention week and remained at 54% during follow-up.[186]

~~Regarding students' smoking behavior, although it was suspected that the ban would positively impact all smokers, unfortunately it did not have this intended effect. Only one in five smokers reported decreased smoking. This could be explained by the fact that although there is a section in the policy on smoking cessation, students are generally unaware of the availability of a free smoking cessation program at the university's medical center for those wanting help. This might explain why the policy did not impact a greater number of students. Consequently, smoking cessation services need to be better advertised so that students are aware of the help they can get for their~~

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7 tobacco addiction. A third reason why the policy may have not affected smoking  
8 behavior as intended could be that the implementation of AUB's smoking ban was not  
9 reinforced by a national smoke free policy in public places across Lebanon, so as soon  
10 as students left the campus, they would go back to their usual habits. Moreover, the  
11 policy was not accompanied by an educational campaign to raise awareness regarding  
12 the harmful effects of smoking on one's health. A study by Borders et al.[17] covering  
13 undergraduate students at 12 colleges or universities in Texas, showed that compared to  
14 different college level policies and programs, only the presence of preventive education  
15 programs on campus was associated with lower odds of current cigarette use.[17] On  
16 the other hand, universities which implemented other tobacco control policies such as  
17 smoking cessation programs and having designated smoking areas were not effective in  
18 curbing students' smoking behavior. For example, the latter two policies / programs  
19 were associated with higher odds of smoking in the study. Thus, as the authors  
20 concluded, implementing strict policies may not be the best way to decrease students'  
21 smoking rates, prevention and education programs might be just as important if not  
22 more.

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42 While 20% of regular smokers reported that their smoking decreased, another 21.8%  
43 said that it actually increased following policy enforcement. There are multiple reasons  
44 for this:

45 First, smokers might have intentionally reported that their smoking increased to  
46 prove that the policy is an inefficient mean to reduce their smoking behavior and to  
47 deceive the researcher. Second, although there is a section in the policy on smoking  
48 cessation, students are generally unaware of the availability of a free smoking cessation  
49 program at the university's medical center for those wanting help. This might explain  
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37 study. Thus, as the authors concluded, implementing strict policies may not be the best  
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39 way to decrease students' smoking rates, prevention and education programs might be  
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41 just as important if not more.

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43 Finally, students' attitude towards enforcing a non smoking policy in public  
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45 places in Lebanon also differed by smoking status. Regular smokers were more  
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47 opposing to banning cigarette smoking in ministries, public institutions, workplaces,  
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49 schools and university buildings etc. as mentioned above. The only 2 locations that  
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51 smokers and non smokers agreed on being smoke free were health care facilities and  
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53 elevators with percentages over 90%. This can be explained by the fact that health care  
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7 facilities provide care for ill patients and smoking would clearly conflict with this  
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9 purpose. Moreover, given that elevators are confined spaces and have limited air  
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11 circulation, students most likely agreed that they should be smoke free so as to respect  
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13 non smokers' wishes in breathing in clean air. The results of this study go in parallel  
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15 with are supported by research conducted in 2004 at AUB and funded by Research for  
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17 International Tobacco Control (Canada) which showed that in general, there is positive  
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19 support among young adults including university students for implementing and  
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21 enforcing tobacco control policies (Afifi and Chaaya 2005). The least supported policy,  
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23 however, was the ban of smoking in restaurants and entertainment places which  
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25 parallels the research findings.  
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## 27 **Conclusion**

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31 An education campaign accompanying the policy might be more effective in  
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33 further reducing current cigarette use; it will also increase smokers' conviction in its  
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35 necessity. The university should also actively advertise its free smoking cessation  
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37 services and implement more rigid enforcement measures as this was one of the barriers  
38  
39 identified by students. In addition, an awareness based approach is important to  
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41 illuminate the adverse effects of second hand smoking and to emphasize that non-  
42  
43 smoking policies do not infringe on smokers' rights, rather they aim mostly at  
44  
45 protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed  
46  
47 a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese  
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49 parliamentary premises were declared a smoke free zone, with signs prohibiting  
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51 smoking. This current law was embraced by all public places in Lebanon including  
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53 schools and universities as of September 2012. [198] This more universal ban will likely  
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7 increase the impact of AUB's policy as evidence has indicated that smoking prevalence  
8 and incidence is most impacted through implementation of comprehensive national  
9 policies.  
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### 12 13 14 15 16 17 **Acknowledgments**

18 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
19 assistance in data management and analysis. The authors would also like to thank the  
20 students who participated in this study and IDRC for their continuous support.  
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### 24 25 **Ethical approval**

26 This study has been approved by the Institutional Review Board at AUB and students  
27 consented orally to participate in the study.  
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30

### 31 32 **Funding**

33 This research study was funded through a grant from Research for International  
34 Tobacco Control, a secretariat of the International Development Research Center  
35 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
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### 40 41 **Competing interests**

42 None declared  
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3 We would like to thank the reviewer again for her valuable comments. Kindly see below our response  
4 to each raised point.  
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9 I appreciate the layout of aims and reorganization of objectives in  
10 this new draft. It is much cleaner and clearer. I think it would be  
11 even easier for readers to process this information if the objectives  
12 were always listed in the same order in the Intro, Methods, Results  
13 and Discussion sections. Please consider.  
14

15  
16 Further, I wonder if perhaps there are really 5 objectives: 1)  
17 compliance with the university ban, 2) students attitudes towards the  
18 ban, 3) the ban's impact on smoking behavior among students, 4)  
19 students attitudes toward tobacco control/a general ban on smoking  
20 (off campus), and 5) perceived barriers to implementation of a campus  
21 ban at the university.  
22  
23

24 Text amended. WE stated 4 objectives: we put 3 and 4 together  
25

26  
27 "The specific objectives of the study were to: 1) assess compliance with the ban; 2) assess  
28 changes in smoking behaviour after the ban; 3) examine student attitude and opinion towards the  
29 campus wide smoking ban and tobacco control measures in general; and 4) assess perceptions of  
30 barriers to implementation of the ban. "  
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32

33 ABSTRACT & INTRO SECTIONS:

34 The abstract lacks results of the 4th objective (students'  
35 perceptions/opstaterpinions of a general, off campus ban).  
36  
37

38 This is mentioned in the abstract lines 12-18.  
39

40 Thanks for adding study dates and IRB approval information to the  
41 Methods section.  
42

43  
44 Unclear whether your response rate was 100% or 98%. Page 7, line 40  
45 states that 535 students were in the selected classes. Then it is  
46 mentioned that fewer than 2% declined to participate, which makes the  
47 reader assume at least SOME did not participate...yet on pg 7, line 52,  
48 the authors still report that 535 students were included in the final  
49 sample. Please clarify whether any declined to participate and what  
50 the response rate was.  
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53  
54 535 students is the final sample size. We approached 545 (535 in  
55 addition to the 2% who refused to participate). Methods were edited to  
56 increase clarity.  
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3 Even a 98% response rate is unbelievably high. Please include if these  
4 students were paid or given credit for their participation.

5 Students were not paid nor given credit for their participation. This  
6 high response rate was expected given the setup of the data collection  
7 (classroom). In fact, other studies done at the American University of  
8 Beirut in the same context yielded similar high response rates.  
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11  
12 METHODS SECTION:

13 Thanks for adding information regarding survey format (paper/pencil).  
14

15  
16 What is the difference between "current" (pg 9 line 25) and "regular"  
17 (pg 5 line 13) smokers? Please be consistent throughout the  
18 manuscript.  
19

20  
21 Page 9 line 25 "regular" means people who smoke currently on a regular  
22 basis. It is like we categorized current smokers into "regular" and  
23 "occasional" smokers. And in the study that we referred to in the  
24 introduction they reported the prevalence of regular smokers.  
25  
26

27 Double check the smoking literature- I believe the term "past 30 days"  
28 is the term more commonly used than "past one month" when discussing  
29 tobacco use prevalence (pg 9, lines 53-54).  
30

31 That's correct. This has been changed to "past 30 days".  
32  
33

34 RESULTS SECTION: Tables are hard to interpret. Are the columns counts  
35 (n) or percentages? Even though in some of the tables you say n=#, it  
36 is unclear if that column has counts in it. Please put the total  
37 sample size elsewhere (perhaps in the footnote of a table) and just  
38 include n and % as column headings.  
39

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41 Done  
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43 In Table 1, the Lebanese and 'Engineering & Architecture' columns are  
44 the only 2 columns that have % signs in them. Please be consistent.  
45 Table 1 also says n=416 in the Non Smokers column but I think it  
46 should be n=416 instead.  
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48

49 This has been fixed  
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51  
52 Pg 11, line 35: Its best practice to use "sex" or "gender" but not  
53 both (unless writing gender identity manuscripts). Please be  
54 consistent.  
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56 Gender was used throughout the paper  
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3 I wonder why there was a large difference between males (31.4%) and  
4 females (5%) regarding self reported increases in smoking after the  
5 ban (pg 11, lines 42-43). This was contrary to your expectations, but  
6 I don't find a discussion or analysis of these findings in the  
7 discussion section. Please include why you think that might be.  
8

9  
10 I don't have an explanation for the difference between males and  
11 females. However, the increase in general might be due to students  
12 wanting to deceive researchers and show them that the smoking ban is  
13 not effective. In fact an article states that:" attempting to use  
14 smoking bans to influence social norms may not represent wise policy.  
15 Sweeping smoking bans may actually increase the incidence of smoking.  
16 A large percentage of smokers acquire the habit at a young age, and  
17 they frequently do so because smoking is "cool." Smoking is cool, of  
18 course, because it is rebellious. The harder anti-smoking forces work  
19 to coerce people into quitting smoking, and the more they engage the  
20 government and other establishment institutions in their efforts, the  
21 more rebellious - and thus the "cooler" - smoking becomes". (Lambert,  
22 regulation winter 2006-2007).  
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25 We added a discussion on the reasons for increase in smoking in the  
26 discussion section.  
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28 Please organize the Discussion section to reflect the objectives in  
29 the same order as described previously. I felt the Discussion section  
30 was a bit chaotic and could benefit from discussing the 4-5 objectives  
31 in the same order as they were initially presented in the  
32 abstract/intro.  
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35 DONE . Now discussed is organized in the same order s the stated  
36 objectives  
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**Students' attitude and smoking behaviour following the implementation a university smoke-free policy: a cross sectional study**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-002100.R3
Article Type:	Research
Date Submitted by the Author:	05-Mar-2013
Complete List of Authors:	Chaaya, Monique; American University of Beirut, Afifi, Rima; American University of Beirut, Health Promotion and Community Health Nakkash, Rima; American University of Beirut, Health Promotion and Community Health Alamuddin, Maysam Nahhas, George
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Public health, Smoking and tobacco
Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, EPIDEMIOLOGY

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Manuscripts

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5 Students' attitude and smoking behaviour following the implementation of a university  
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7 smoke-free policy: a cross sectional study  
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6 American University of Beirut, Beirut, Lebanon  
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9 **Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon  
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11 **WordCount:** 3,496 words excluding (title page, abstract, summary, references and tables)  
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20 Article focus:

- 21  
22 - To examine students' compliance and attitude following the smoking ban at the  
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24 American University of Beirut campus.  
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27 Key messages and significance of the study:

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30 - Students are an important group to consider when discussing tobacco control and  
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32 implementing a university wide smoking ban. They should be included as stakeholders  
33  
34 in the analysis of the policy process.  
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36 - Implementing a tobacco control policy in a university campus could be  
37  
38 successful. Compliance and satisfaction were reasonably high, with some  
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40 differentials according to smoking status.  
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42 - Challenges of the implementation of a tobacco cessation policy at a university  
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44 could be overcome by having a comprehensive national tobacco control policy.  
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48 Strengths and Limitations:  
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54 Strengths:  
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- A representative large sample (n=535) of students from all Faculties
- This study was the first to be conducted regionally.
- It is the first study to document student perceptions of barriers to smoke bans.
- This study could lay the ground for implementing smoking ban in other universities in Lebanon and globally.

Limitations:

- The cross sectional nature of the study makes it difficult to ascertain the causal association between the smoking ban and smoking behaviour.

**Introduction** The university years are an important life phase for every student during which they develop and engage in risky behaviours such as smoking. Smoking therefore is an important public health problem among university students. An international study showed that overall 34% of male university students and 27% of female university students from 23 different countries were current smokers with large differences between countries and gender.[1] Students from Southern European countries, for example Portugal (47% of males smoke) and Spain (46% of females smoke), exhibited the highest rate of tobacco smoking compared to students from developing countries, for example Thailand (men 14% and women 2%), who displayed the lowest rates.[1] Among US college students, the American College Health Association survey results[2] revealed that 14.3% of students currently using tobacco, cigarettes being the most common form of tobacco use.[1] In Lebanon, a study [3] revealed that 28.3% of students in a private university currently smoked nargileh, of whom 38% were regular smokers, the proportion of lifetime nargileh smokers being 43%.[3] Another study by Tamim et al.[4] showed that 40% of students in public and private universities in Lebanon currently smoked tobacco (21.1% narghileh, 7.6% cigarettes and 11.3% smoked both cigarettes and narghileh).[4] The above studies highlight the need for interventions that do not only target university students' smoking behavior but also protect non-smokers from exposure to high levels of second hand smoke and its associated health effects.

Evidence indicates that second hand smoking is associated with increased incidence of cardiovascular diseases, lung cancers, and respiratory problems such as worsened asthma severity.[5-8] To lessen these effects, non-smoking policies in public places have been implemented and were shown to help reduce smoking among smokers

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4 [9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on  
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6 the effects of smoke-free workplaces in the United States, Australia, Canada, and  
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8 Germany showed that smoke-free workplaces are associated with decreased smoking  
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10 prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally  
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12 representative sample of college students in different U.S. colleges showed that  
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14 residents of smoke-free housing had a significantly lower smoking prevalence than  
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16 students living in residences which permit smoking.[10] Not only do non-smoking  
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18 policies encourage smokers to decrease or even quit smoking, but they also protect  
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20 smokers and non-smokers from the effects of secondhand smoking. For example, a ban  
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22 on smoking in workplaces and public places in Bowling Green, Ohio led to a significant  
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24 reduction in hospital admission rates for coronary heart disease.[11] Similarly, a smoke-  
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26 free legislation in public places in Scotland was associated with a 17% decrease in  
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28 admissions for acute coronary syndrome.[12] This decrease was greatest among non-  
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30 smokers whose exposure to second-hand smoke was dramatically reduced; a lower  
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32 decline in acute coronary syndrome was observed for smokers.[12]  
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38 The purpose of this paper is to examine the implementation of a smoking ban  
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40 on a private university in Lebanon. Although Lebanon ratified the World Health  
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42 Organization Framework Convention on Tobacco Control in 2005 which proposes a  
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44 complete ban on indoor smoking, such a policy has only been implemented in 2012. In  
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46 2008,, a few workplaces, hospitality venues, and educational institutions have  
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48 voluntarily introduced smoking bans. [13] In May 2008, the American University of  
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50 Beirut (AUB), a private university, decided to implement a non-smoking policy  
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52 everywhere on campus encompassing student residence halls and all campus buildings  
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54 except for private Faculty residences. Smoking became restricted to designated areas  
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4 only. The specific objectives of the study were to: 1) assess compliance with the ban; 2)  
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6 assess changes in smoking behaviour after the ban; 3) examine student attitude and  
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8 opinion towards the campus wide smoking ban and tobacco control measures in general;  
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10 and 4) assess perceptions of barriers to implementation of the ban.  
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## 14 15 16 17 **Methods** 18 19

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21 This study took place between October 2008 and June 2009. IRB approval was  
22  
23 obtained from AUB for all research procedures.  
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## 26 **Participants** 27 28

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30 A cross sectional study was conducted at AUB, the largest private university in  
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32 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
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34 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
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36 and currently enrolls around 7500 students from 69 countries. A random sample of  
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38 classes being offered in the spring semester of academic year 2008/2009 was selected to  
39  
40 recruit participants; a total of 545 students were registered in those classes. None of the  
41  
42 instructors refused to allow recruitment in their classrooms. The selection of classes was  
43  
44 based on a stratified cluster design whereby a proportionate sample of classes was  
45  
46 chosen from all six Faculties based on the size of each Faculty. All students attending  
47  
48 chosen classes were approached and asked to complete the survey.  
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## 51 52 **Survey and Data Collection** 53 54 55 56 57 58 59 60

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4 Survey construction and data collection were done as part of the requirements  
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6 for “Survey Methods”, a course offered at the Faculty of Health Sciences to  
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8 undergraduate Environmental Health (EH) students. A self-administered paper and  
9  
10 pencil survey in English was designed to collect data on demographic variables (age,  
11  
12 gender, Faculty, class, nationality and place of residence), personal smoking habits,  
13  
14 compliance and attitude towards the smoking ban at AUB, in addition to students’  
15  
16 attitude towards tobacco control policies in Lebanon. Students were asked questions  
17  
18 such as: to what extent were they satisfied with the smoking ban at AUB, whether they  
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20 felt it was justified, and whether the ban helped in creating a healthier environment.  
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22 Survey questions related to their attitude towards some of the Framework Convention  
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24 on Tobacco Control (FCTC) measures, specifically policies banning cigarette smoking  
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26 in public places were included. Students expressed their support for or objection  
27  
28 towards the enforcement of these policies using a likert scale. The survey also included  
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30 questions on lifetime and regular cigarette smoking behavior and perceived change in  
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32 consumption following the ban, as well as their compliance with it (e.g. whether they  
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34 smoked in designated and non-designated areas). Moreover, students were asked about  
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36 the barriers against the implementation of tobacco control policies in AUB.  
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42 Instructors of the selected courses were contacted to ensure access to their class  
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44 and set a time for data collection. Surveys were administered to students during class  
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46 time.  
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### 49 **Data analysis**

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52 Univariate analyses were performed to examine the distribution of main  
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54 demographic and smoking variables. Bivariate analyses by gender and cigarette  
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56 smoking status were performed. Chi square tests and Fishers Exact test were computed  
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4 to check for significant differences in compliance and attitudes according to gender and  
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6 smoking groups. P values were reported as  $< 0.05$ ,  $< 0.01$  or  $< 0.001$ . Because  
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8 occasional smokers and ex-smokers constituted only 6.4% and 4.7% of the sample  
9  
10 respectively, and their smoking exposure is different from regular smokers, smoking  
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12 status was grouped into 3 categories: never smokers, occasional and ex-smokers, and  
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14 regular smokers. The response categories of the attitudes questions towards the ban  
15  
16 were also classified into 3 groups: to a large extent, to some extent and not at all/not  
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18 sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the  
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20 analyses by weighing all data according to the distribution of students in all six  
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22 Faculties. Weighted absolute frequencies and percentages are presented in the Tables.  
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## 30 **Results**

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34 Out of the 545 students approached, fewer than 2% refused to participate. The  
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36 final sample included 535 participants of which 25% were foreigners. The sample was  
37  
38 representative of all undergraduate and graduate students from the six Faculties at AUB,  
39  
40 with an oversampling from the Faculty of Health Sciences.  
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43  
44 Table 1 presents the basic characteristics of the total sample and according to  
45  
46 smoking status. Participants tended to be between 19-24 years of age (80.8%),  
47  
48 Lebanese (75%), female (59%), from the Faculty of Arts and Sciences (41%), and not  
49  
50 living in dorms (87%). Almost one half of the surveyed students reported lifetime  
51  
52 smoking cigarettes. Twenty percent smoked in the past 30 days, 51% of whom were  
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54 regular smokers (11% of the whole sample), 22% ex-smokers, and 28% occasional  
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smokers. The largest proportion of students started smoking before joining the university (75%), and another considerable percentage considered themselves addicted to smoking (61% of regular smokers). One third of regular smokers considered quitting in the next 6 months. Differences in smoking status were noted across Faculties, year in university and gender. The highest prevalence of regular smoking was reported in the School of Business (14%) followed by the Faculty of Arts and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences (4.5%). Sophomore and male students were more likely to be regular smokers than students from other levels and females respectively.

**Table 1: Students' characteristics by smoking status**

Variable	Total		Regular Smokers		Occasional and Ex- Smokers		Non Smokers	
	n=535	%	n=60	%	n=59	%	n=416	%
<b>Age group</b>								
< 18 yrs	62	11.6	4	6.5	8	12.9	50	80.6
19-24 yrs	432	80.7	52	12.0	41	9.5	339	78.5
25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
<b>Gender</b>								
Males	217	40.5	39	18.0	29	13.4	149	68.7
Females	318	59.6	21	6.6	30	9.4	267	84.0
<b>Student's level</b>								
Freshman	28	5.2	3	10.7	7	25.0	18	64.3
Sophomore	83	15.5	13	15.7	5	6.0	65	78.3
Junior	110	20.6	11	10.0	14	12.7	85	77.3
Senior	170	31.8	18	10.6	15	8.8	137	80.6
Graduate	143	26.8	15	10.5	18	13.3	109	76.2
<b>Faculty</b>								
Arts & Sciences	223	41.6	29	13.0	29	13.0	165	74.0
Agriculture & Food Sciences	48	8.9	5	10.4	3	6.2	40	83.3
Engineering and Architecture	140	26.2	11	7.9	12	8.6	117	83.6

School of Business	91	17.0	13	14.3	11	12.1	67	73.6
Health Sciences	22	4.1	1	4.5	2	9.1	19	86.4
School of Nursing	11	2.0	1	9.1	2	18.2	8	72.7
<b>Nationality</b>								
Lebanese	397	74.5	42	10.6	41	10.3	314	79.1
Non-Lebanese	72	13.5	10	13.9	8	11.1	54	75.0
Both Nationalities	64	12.0	8	12.5	9	14.1	47	73.4

### Compliance and students' smoking behavior following implementation of the smoke free policy (Table 2)

Students' compliance with the ban was assessed among regular smokers. Almost three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

As for students' smoking frequency following the ban, it did not significantly differ between genders. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before its implementation. However, 31.4% and 5% of male and female respondents respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of regular smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

**Table 2: Smokers' compliance and behaviour following the ban by gender**

Variable	Total		Males		Females	
	n= 60	%	n= 39	%	n= 21	%

<b>Smoking on campus</b>						
Designated areas only	40	72.7	27	75.0	13	68.4
Designated and non-designated areas	15	27.3	9	25.0	6	31.6
<b>Received a warning ticket for smoking by an officer on campus</b>						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
<b>Smoking frequency</b>						
Increased	12	21.8	11	31.4	1	5.0
Decreased	11	20.0	7	20.0	4	20.0
Remained the same	32	58.2	17	48.6	15	75.0

### Students' attitude towards the smoke free policy (Table 3)

Table 3 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were majority (63.8%) not at all satisfied with it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and non-smokers possessed significantly different views regarding whether the ban helped in creating a healthy environment and whether AUB should become an entirely smoke-free area. While 94% of non-smokers thought that the ban contributed to some or a large extent in creating a healthy environment, only 67% of regular smokers believed so. Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this prospect as opposed to only 10.2% of regular smokers.

Table 3: Students' attitude towards AUB's smoking ban by smoking status

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.001$

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4 Regarding the ban's effect on smoking behavior, the majority (65%) of  
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6 respondents agreed that the ban would help smokers decrease smoking; however, a  
7  
8 much lower percentage thought the ban would contribute to smoking cessation.  
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10 Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy  
11  
12 percent of non-smokers as opposed to 40% of smokers considered the ban might lead in  
13  
14 some or large extent to a decline in smoking. As to its effect on quitting smoking, a  
15  
16 large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the  
17  
18 ban would have no effect on cessation.  
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22 Occasional and ex-smokers were more similar to non-smokers in their opinion/  
23  
24 attitude as depicted in Table 3.  
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#### 27 28 **Students' attitude towards having a non-smoking policy in public places (Table 4)** 29 30

31 Students' attitude towards enforcing a non-smoking policy in Lebanon varied  
32  
33 according to their smoking status whereby regular smokers were more opposed to it.  
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35 Ex- and occasional smokers were more similar to non-smokers in their attitude as  
36  
37 shown in Table 4. Overall, a large majority of students supported banning smoking in  
38  
39 most public places except outside universities' buildings, night clubs and coffee shops  
40  
41 where less than half of the sample reported favorable attitudes. Regular smokers and  
42  
43 non-smokers exhibited significant differences when it came to banning cigarette  
44  
45 smoking in the following places: in ministries, public institutions, schools and  
46  
47 university buildings, outside university buildings, as well as in public transportation,  
48  
49 workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%,  
50  
51 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public  
52  
53 transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of  
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regular smokers shared the same opinion. The only two locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here most students agreed that they should be smoke-free with percentages exceeding 90%.

**Table 4: Students' attitude towards banning cigarette smoking in public places**

<b>Attitude</b>	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps</b>								

<b>smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.05$

\*\*  $p < 0.001$

### **Barriers to implementation of the smoke free policy in AUB (Table 5)**

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, Faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in Table 5.

**Table 5: Barriers to implementation of the smoke free policy by smoking status**

	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
<b>Attitude</b>	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								



Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.01$

## Discussion

The AUB is the first university in Lebanon to institute a non-smoking policy on campus. This provided the opportunity to assess students' compliance with and attitude towards the ban and its impact on their smoking behavior. These results showed that compliance was high and the smoking ban was effective in curbing some of the students' smoking behavior. Because of the cross sectional nature of the study it was not possible to measure whether students reduce their smoking in direct response to the ban.

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4 Therefore, we relied on self-reported change in smoking behavior. Although it was  
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6 suspected that the ban would positively impact all smokers, unfortunately it did not have  
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8 this intended effect. Only one in five smokers reported decreased smoking. This could  
9  
10 be explained by the fact that although there is a section in the policy on smoking  
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12 cessation, students are generally unaware of the availability of a free smoking cessation  
13  
14 program at the university's medical center for those wanting help. This might explain  
15  
16 why the policy did not impact a greater number of students. Consequently, smoking  
17  
18 cessation services need to be better advertised so that students are aware of the help they  
19  
20 can get for their tobacco addiction. Another reason why the policy may have not  
21  
22 affected smoking behavior as intended could be that the implementation of AUB's  
23  
24 smoking ban was not reinforced by a national smoke free policy in public places across  
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26 Lebanon, so as soon as students left the campus, they would go back to their usual  
27  
28 habits. Moreover, the policy was not accompanied by an educational campaign to raise  
29  
30 awareness regarding the harmful effects of smoking on one's health. A study by Borders  
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32 et al.[14] covering undergraduate students at 12 colleges or universities in Texas,  
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34 showed that compared to different college-level policies and programs, only the  
35  
36 presence of preventive education programs on campus was associated with lower odds  
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38 of current cigarette use.[14] On the other hand, universities which implemented other  
39  
40 tobacco control policies such as smoking cessation programs and having designated  
41  
42 smoking areas were not effective in curbing students' smoking behavior. For example,  
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44 the latter two policies / programs were associated with higher odds of smoking in the  
45  
46 study. Thus, as the authors concluded, implementing strict policies may not be the best  
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48 way to decrease students' smoking rates, prevention and education programs might be  
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50 just as important if not more. While 20% of regular smokers reported that their  
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4 smoking decreased, another 21.8% said that it actually increased following policy  
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6 enforcement. The increase could be explained by two reasons: First, smokers might  
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8 have intentionally reported an increase in their smoking frequency to deceive the  
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10 researchers and to prove the inefficiency of the policy in reducing their smoking  
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12 behavior. Second, smoking might have actually increased because since it is viewed as a  
13  
14 “cool” and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]  
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18 This study has reported also on students’ attitude towards the implementation of the  
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20 non-smoking policy at AUB. Overall students’ attitude towards the ban was favorable,  
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22 but revealed large differences by smoking status. Non-smokers possessed a more  
23  
24 favorable attitude towards the smoke free policy which was evident in their greater  
25  
26 satisfaction level, conviction about its need and potential effect in decreasing smoking  
27  
28 behavior. This is to be expected as non-smokers do not want to expose themselves to the  
29  
30 adverse health effects of second hand smoke. Other studies in the United States have  
31  
32 reached similar findings. A nationally representative study encompassing undergraduate  
33  
34 students at 119 colleges and universities in the USA revealed that non-smokers were  
35  
36 more supportive of different tobacco control policies such as enforcing smoke free  
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38 policies in all campus buildings, student residences, dining areas and campus bars and  
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40 pubs.[16] As well, non-smokers were more approving of tobacco marketing restrictions  
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42 (e.g. prohibiting tobacco advertising on campus and sponsorship of social events) as  
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44 well as forbidding tobacco sales on campus.[16] Similarly, a study by Loukas et al.[17]  
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46 with students from 5 Texas colleges showed that non-smokers and experimental  
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48 smokers compared to smokers were significantly less opposed to implementing a  
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50 smoking ban in all buildings and having an entirely smoke-free campus.[17]  
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4 Students' attitude towards enforcing a non-smoking policy in public places in Lebanon  
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6 also differed by smoking status. Regular smokers were more opposing to banning  
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8 cigarette smoking in ministries, public institutions, workplaces, schools and university  
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10 buildings etc. as mentioned above. The only two locations that smokers and non-  
11  
12 smokers agreed on being smoke free were health care facilities and elevators with  
13  
14 percentages over 90%. This can be explained by the fact that health care facilities  
15  
16 provide care for ill patients and smoking would clearly conflict with this purpose.  
17  
18 Moreover, given that elevators are confined spaces and have limited air circulation,  
19  
20 students most likely agreed that they should be smoke free so as to respect non-  
21  
22 smokers' wishes in breathing in clean air. The results of this study are supported by  
23  
24 research conducted in 2004 at AUB and funded by Research for International Tobacco  
25  
26 Control (Canada) which showed that in general, there is positive support among young  
27  
28 adults including university students for implementing and enforcing tobacco control  
29  
30 policies (unpublished report). The least supported policy, however, was the ban of  
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32 smoking in restaurants and entertainment places which parallels the research findings.  
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38 Barriers to implementation of the smoke free policy at AUB, as identified by  
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40 students, were: lack of compliance of some students, Faculty, and staff; having too few  
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42 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
43  
44 policy. All of the above were considered obstacles with varying agreement between  
45  
46 smokers and non-smokers. However, no other published study that looked at barriers to  
47  
48 the implementation of a non-smoking policy from a student's perspective was found.  
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50 Although the lack of compliance was viewed as a barrier, in reality the majority of  
51  
52 regular smokers (73%) abided by it. This may be due to the fact that students risked  
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54 receiving a warning if they were smoking in prohibited areas. In other contexts,  
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4 compliance has been shown to pose a significant threat to the effective implementation  
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6 of non-smoking policies. Harris et al.[18] conducted a study to identify efficient  
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8 strategies that will increase compliance of students to a college campus smoking ban.  
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10 An intervention consisting of moving smoking receptacles, drawing ground markings  
11  
12 and putting more signs regarding the non-smoking policy, as well as distributing  
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14 reinforcements and reminder cards led to a significant increase in compliance from 33%  
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16 to 74% within the intervention week and remained at 54% during follow-up.[18]  
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## 27 **Conclusion**

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30 An education campaign accompanying the policy might be more effective in  
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32 further reducing current cigarette use; it will also increase smokers' conviction in its  
33  
34 necessity. The university should also actively advertise its free smoking cessation  
35  
36 services and implement more rigid enforcement measures as this was one of the barriers  
37  
38 identified by students. In addition, an awareness based approach is important to  
39  
40 illuminate the adverse effects of second hand smoking and to emphasize that non-  
41  
42 smoking policies do not infringe on smokers' rights, rather they aim mostly at  
43  
44 protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed  
45  
46 a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese  
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48 parliamentary premises were declared a smoke free zone, with signs prohibiting  
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50 smoking. This current law was embraced by all public places in Lebanon including  
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52 schools and universities as of September 2012. [19] This more universal ban will likely  
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54 increase the impact of AUB's policy as evidence has indicated that smoking prevalence  
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4 and incidence is most impacted through implementation of comprehensive national  
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6 policies.  
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### 11 12 **Acknowledgments**

13  
14 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
15  
16 assistance in data management and analysis. The authors would also like to thank the  
17  
18 students who participated in this study and IDRC for their continuous support.  
19  
20

### 21 22 **Ethical approval**

23  
24 This study has been approved by the Institutional Review Board at AUB and students  
25  
26 consented orally to participate in the study.  
27  
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29

### 30 31 **Funding**

32  
33 This research study was funded through a grant from Research for International  
34  
35 Tobacco Control, a secretariat of the International Development Research Center  
36  
37 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
38  
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### 41 42 **Competing interests**

43  
44 None declared  
45  
46

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5 Students' attitude and smoking behaviour following the implementation of a university  
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7 smoke-free policy: a cross sectional study  
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9 **Keywords:** campus smoke free policy, university students, cigarette smoking, Lebanon  
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11 **WordCount:** 3,496 words excluding (title page, abstract, summary, references and tables)  
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20 Article focus:

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22 - To examine students' compliance and attitude following the smoking ban at the  
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24 American University of Beirut campus.  
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27 Key messages and significance of the study:

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30 - Students are an important group to consider when discussing tobacco control and  
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32 implementing a university wide smoking ban. They should be included as stakeholders  
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34 in the analysis of the policy process.  
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36 - Implementing a tobacco control policy in a university campus could be  
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38 successful. Compliance and satisfaction were reasonably high, with some  
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40 differentials according to smoking status.  
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42 - Challenges of the implementation of a tobacco cessation policy at a university  
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44 could be overcome by having a comprehensive national tobacco control policy.  
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48 Strengths and Limitations:  
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54 Strengths:  
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- A representative large sample (n=535) of students from all Faculties
- This study was the first to be conducted regionally.
- It is the first study to document student perceptions of barriers to smoke bans.
- This study could lay the ground for implementing smoking ban in other universities in Lebanon and globally.

Limitations:

- The cross sectional nature of the study makes it difficult to ascertain the causal association between the smoking ban and smoking behaviour.

**Introduction** The university years are an important life phase for every student during which they develop and engage in risky behaviours such as smoking. Smoking therefore is an important public health problem among university students. An international study showed that overall 34% of male university students and 27% of female university students from 23 different countries were current smokers with large differences between countries and gender.[1] Students from Southern European countries, for example Portugal (47% of males smoke) and Spain (46% of females smoke), exhibited the highest rate of tobacco smoking compared to students from developing countries, for example Thailand (men 14% and women 2%), who displayed the lowest rates.[1] Among US college students, the American College Health Association survey results[2] revealed that 14.3% of students currently using tobacco, cigarettes being the most common form of tobacco use.[1] In Lebanon, a study [3] revealed that 28.3% of students in a private university currently smoked nargileh, of whom 38% were regular smokers, the proportion of lifetime nargileh smokers being 43%.[3] Another study by Tamim et al.[4] showed that 40% of students in public and private universities in Lebanon currently smoked tobacco (21.1% narghileh, 7.6% cigarettes and 11.3% smoked both cigarettes and narghileh).[4] The above studies highlight the need for interventions that do not only target university students' smoking behavior but also protect non-smokers from exposure to high levels of second hand smoke and its associated health effects.

Evidence indicates that second hand smoking is associated with increased incidence of cardiovascular diseases, lung cancers, and respiratory problems such as worsened asthma severity.[5-8] To lessen these effects, non-smoking policies in public places have been implemented and were shown to help reduce smoking among smokers

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4 [9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on  
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6 the effects of smoke-free workplaces in the United States, Australia, Canada, and  
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8 Germany showed that smoke-free workplaces are associated with decreased smoking  
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10 prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally  
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12 representative sample of college students in different U.S. colleges showed that  
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14 residents of smoke-free housing had a significantly lower smoking prevalence than  
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16 students living in residences which permit smoking.[10] Not only do non-smoking  
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18 policies encourage smokers to decrease or even quit smoking, but they also protect  
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20 smokers and non-smokers from the effects of secondhand smoking. For example, a ban  
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22 on smoking in workplaces and public places in Bowling Green, Ohio led to a significant  
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24 reduction in hospital admission rates for coronary heart disease.[11] Similarly, a smoke-  
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26 free legislation in public places in Scotland was associated with a 17% decrease in  
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28 admissions for acute coronary syndrome.[12] This decrease was greatest among non-  
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30 smokers whose exposure to second-hand smoke was dramatically reduced; a lower  
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32 decline in acute coronary syndrome was observed for smokers.[12]  
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38 The purpose of this paper is to examine the implementation of a smoking ban  
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40 on a private university in Lebanon. Although Lebanon ratified the World Health  
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42 Organization Framework Convention on Tobacco Control in 2005 which proposes a  
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44 complete ban on indoor smoking, such a policy has only been implemented in 2012. In  
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46 2008,, a few workplaces, hospitality venues, and educational institutions have  
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48 voluntarily introduced smoking bans. [13] In May 2008, the American University of  
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50 Beirut (AUB), a private university, decided to implement a non-smoking policy  
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52 everywhere on campus encompassing student residence halls and all campus buildings  
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54 except for private Faculty residences. Smoking became restricted to designated areas  
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4 only. The specific objectives of the study were to: 1) assess compliance with the ban; 2)  
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6 assess changes in smoking behaviour after the ban; 3) examine student attitude and  
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8 opinion towards the campus wide smoking ban and tobacco control measures in general;  
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10 and 4) assess perceptions of barriers to implementation of the ban.  
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## 14 15 16 17 **Methods** 18

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20 This study took place between October 2008 and June 2009. IRB approval was  
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22 obtained from AUB for all research procedures.  
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## 25 26 **Participants** 27

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29 A cross sectional study was conducted at AUB, the largest private university in  
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31 Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American  
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33 missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs,  
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35 and currently enrolls around 7500 students from 69 countries. A random sample of  
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37 classes being offered in the spring semester of academic year 2008/2009 was selected to  
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39 recruit participants; a total of 545 students were registered in those classes. None of the  
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41 instructors refused to allow recruitment in their classrooms. The selection of classes  
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43 was based on a stratified cluster design whereby a proportionate sample of classes was  
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45 chosen from all six Faculties based on the size of each Faculty. All students attending  
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47 chosen classes were approached and asked to complete the survey. Fewer than 2%  
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49 refused to participate. The final sample included 535 participants of which 25% were  
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51 foreigners. The sample was representative of all undergraduate and graduate students  
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~~from the six Faculties at AUB, with an oversampling from the Faculty of Health Sciences.~~

### Survey and Data Collection

Survey construction and data collection were done as part of the requirements for “Survey Methods”, a course offered at the Faculty of Health Sciences to undergraduate Environmental Health (EH) students. A self-administered paper and pencil survey in English was designed to collect data on demographic variables (age, gender, Faculty, class, nationality and place of residence), personal smoking habits, compliance and attitude towards the smoking ban at AUB, in addition to students’ attitude towards tobacco control policies in Lebanon. Students were asked questions such as: to what extent were they satisfied with the smoking ban at AUB, whether they felt it was justified, and whether the ban helped in creating a healthier environment. Survey questions related to their attitude towards some of the Framework Convention on Tobacco Control (FCTC) measures, specifically policies banning cigarette smoking in public places were included. Students expressed their support for or objection towards the enforcement of these policies using a likert scale. The survey also included questions on lifetime and regular cigarette smoking behavior and perceived change in consumption following the ban, as well as their compliance with it (e.g. whether they smoked in designated and non-designated areas). Moreover, students were asked about the barriers against the implementation of tobacco control policies in AUB.

Instructors of the selected courses were contacted to ensure access to their class and set a time for data collection. Surveys were administered to students during class time.



## Data analysis

Univariate analyses were performed to examine the distribution of main demographic and smoking variables. Bivariate analyses by gender and cigarette smoking status were performed. Chi square tests and Fishers Exact test were computed to check for significant differences in compliance and attitudes according to gender and smoking groups. P values were reported as  $< 0.05$ ,  $< 0.01$  or  $< 0.001$ . Because occasional smokers and ex-smokers constituted only 6.4% and 4.7% of the sample respectively, and their smoking exposure is different from regular smokers, smoking status was grouped into 3 categories: never smokers, occasional and ex-smokers, and regular smokers. The response categories of the attitudes questions towards the ban were also classified into 3 groups: to a large extent, to some extent and not at all/not sure. Over-sampling from the Faculty of Health Sciences was adjusted for in the analyses by weighing all data according to the distribution of students in all six Faculties. Weighted absolute frequencies and percentages are presented in the Tables.

## Results

Out of the 545 students approached, fewer than 2% refused to participate. The final sample included 535 participants of which 25% were foreigners. The sample was representative of all undergraduate and graduate students from the six Faculties at AUB, with an oversampling from the Faculty of Health Sciences.

Table 1 presents the basic characteristics of the total sample and according to smoking status. Participants tended to be between 19-24 years of age (80.8%), Lebanese (75%), female (59%), from the Faculty of Arts and Sciences (41%), and not living in dorms (87%). Almost one half of the surveyed students reported lifetime smoking cigarettes. Twenty percent smoked in the past 30 days, 51% of whom were regular smokers (11% of the whole sample), 22% ex-smokers, and 28% occasional smokers. The largest proportion of students started smoking before joining the university (75%), and another considerable percentage considered themselves addicted to smoking (61% of regular smokers). One third of regular smokers considered quitting in the next 6 months. Differences in smoking status were noted across Faculties, year in university and gender. The highest prevalence of regular smoking was reported in the School of Business (14%) followed by the Faculty of Arts and Sciences (13%). The lowest prevalence was in the Faculty of Health Sciences (4.5%). Sophomore and male students were more likely to be regular smokers than students from other levels and females respectively.

**Table 1: Students' characteristics by smoking status**

Variable	Total		Regular Smokers		Occasional and Ex- Smokers		Non Smokers	
	n=535	%	n=60	%	n=59	%	n=416	%
<b>Age group</b>								
< 18 yrs	62	11.6	4	6.5	8	12.9	50	80.6
19-24 yrs	432	80.7	52	12.0	41	9.5	339	78.5
25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
<b>Gender</b>								
Males	217	40.5	39	18.0	29	13.4	149	68.7
Females	318	59.6	21	6.6	30	9.4	267	84.0
<b>Student's level</b>								
Freshman	28	5.2	3	10.7	7	25.0	18	64.3
Sophomore	83	15.5	13	15.7	5	6.0	65	78.3

Junior	110	20.6	11	10.0	14	12.7	85	77.3
Senior	170	31.8	18	10.6	15	8.8	137	80.6
Graduate	143	26.8	15	10.5	18	13.3	109	76.2
<b>Faculty</b>								
Arts & Sciences	223	41.6	29	13.0	29	13.0	165	74.0
Agriculture & Food Sciences	48	8.9	5	10.4	3	6.2	40	83.3
Engineering and Architecture	140	26.2	11	7.9	12	8.6	117	83.6
School of Business	91	17.0	13	14.3	11	12.1	67	73.6
Health Sciences	22	4.1	1	4.5	2	9.1	19	86.4
School of Nursing	11	2.0	1	9.1	2	18.2	8	72.7
<b>Nationality</b>								
Lebanese	397	74.5	42	10.6	41	10.3	314	79.1
Non-Lebanese	72	13.5	10	13.9	8	11.1	54	75.0
Both Nationalities	64	12.0	8	12.5	9	14.1	47	73.4

### **Compliance and students' smoking behavior following implementation of the smoke free policy (Table 2)**

Students' compliance with the ban was assessed among regular smokers. Almost three fourth of smokers abided by the policy and no significant difference was observed between males and females. In particular, 75% of male respondents reported only smoking in designated areas compared to 68.4% of female respondents. Further, 17% of smokers reported receiving a warning ticket for smoking in a non-designated area.

As for students' smoking frequency following the ban, it did not significantly differ between genders. An equal proportion of male and female students (20.0%) reported that their overall smoking decreased following the ban as compared to before its implementation. However, 31.4% and 5% of male and female respondents

respectively indicated that their smoking increased, contrary to our expectations. On the other hand, the proportion of regular smokers reporting spending less time at AUB was significantly higher than that of non-smokers (37.3% vs. 2.0%) after the implementation of the smoke free policy.

**Table 2: Smokers' compliance and behaviour following the ban by gender**

Variable	n= 60	Total		Males		Females	
			%	n= 39	%	n= 21	%
<b>Smoking on campus</b>							
Designated areas only	40	72.7	27	75.0	13	68.4	
Designated and non-designated areas	15	27.3	9	25.0	6	31.6	
<b>Received a warning ticket for smoking by an officer on campus</b>							
No	48	82.8	29	78.4	19	90.5	
Yes	10	17.2	8	21.6	2	9.5	
<b>Smoking frequency</b>							
Increased	12	21.8	11	31.4	1	5.0	
Decreased	11	20.0	7	20.0	4	20.0	
Remained the same	32	58.2	17	48.6	15	75.0	

### **Students' attitude towards the smoke free policy (Table 3)**

Table 3 reports the attitudes of students towards the smoking ban at AUB for the total sample and by smoking status. Overall, the largest proportion of students were satisfied to a great or some extent with the ban, considered it justified and viewed it as contributing to a healthy environment. Differences in attitude were mainly between regular smokers and non-smokers. For example, more than 90% of non-smokers were satisfied to some or a large extent with the policy compared to just 36% of regular smokers. As expected, the latter were majority (63.8%) not at all satisfied with it. Similarly, the majority of non-smokers (64.5%) considered the ban to be highly

justified, while only 13.8% of smokers shared the same opinion. Moreover, smokers and non-smokers possessed significantly different views regarding whether the ban helped in creating a healthy environment and whether AUB should become an entirely smoke-free area. While 94% of non-smokers thought that the ban contributed to some or a large extent in creating a healthy environment, only 67% of regular smokers believed so. Concerning AUB becoming entirely smoke-free, 45% of non-smokers supported this prospect as opposed to only 10.2% of regular smokers.

**Table 3: Students' attitude towards AUB's smoking ban by smoking status**

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8

<b>Extent the ban helps smokers reduce smoking*</b>									
Large extent	88	16.7	2	3.4	8	13.6	78	18.9	
Some extent	256	48.4	21	36.2	24	40.7	211	51.2	
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8	
<b>Extent the ban helps smokers in quitting smoking*</b>									
Large extent	39	7.4	2	3.4	5	8.8	32	7.8	
Some extent	149	28.3	4	6.9	14	24.6	131	31.8	
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4	

\*  $p < 0.001$

Regarding the ban's effect on smoking behavior, the majority (65%) of respondents agreed that the ban would help smokers decrease smoking; however, a much lower percentage thought the ban would contribute to smoking cessation. Smokers and non-smokers exhibited significant differences in their viewpoints. Seventy percent of non-smokers as opposed to 40% of smokers considered the ban might lead in some or large extent to a decline in smoking. As to its effect on quitting smoking, a large proportion of regular smokers (84.5%) and 41.7% of non-smokers reckoned the ban would have no effect on cessation.

Occasional and ex-smokers were more similar to non-smokers in their opinion/attitude as depicted in Table 3.

#### **Students' attitude towards having a non-smoking policy in public places (Table 4)**

Students' attitude towards enforcing a non-smoking policy in Lebanon varied according to their smoking status whereby regular smokers were more opposed to it. Ex- and occasional smokers were more similar to non-smokers in their attitude as shown in Table 4. Overall, a large majority of students supported banning smoking in

most public places except outside universities' buildings, night clubs and coffee shops where less than half of the sample reported favorable attitudes. Regular smokers and non-smokers exhibited significant differences when it came to banning cigarette smoking in the following places: in ministries, public institutions, schools and university buildings, outside university buildings, as well as in public transportation, workplaces, restaurants, night clubs, and coffee shops. For example, while 91.1%, 61.1%, and 92.1% of non-smokers believed that workplaces, nightclubs, and public transportation should be smoke-free respectively, only 55.4%, 5.4%, and 78.6% of regular smokers shared the same opinion. The only two locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here most students agreed that they should be smoke-free with percentages exceeding 90%.

**Table 4: Students' attitude towards banning cigarette smoking in public places**

Attitude	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7

Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.05$

\*\*  $p < 0.001$

### Barriers to implementation of the smoke free policy in AUB (Table 5)

Students were asked what they thought barriers were against the implementation of the non-smoking policy at AUB. The lack of compliance of some students, Faculty, and staff to the policy was considered a barrier by nearly half the students. Having too few or too crowded smoking areas were viewed as barriers by the majority of regular smokers (86% and 85.7% respectively); whereas, only 29.9% and 54.7% of non-smokers thought the same thing. Furthermore, 35.3% of non-smokers and 17.9% of regular smokers considered the lack of strict enforcement of the non-smoking policy as a barrier to tobacco control policies in AUB. Here again, occasional and ex-smokers were more inclined to non-smokers than regular smokers in their opinion/ attitude as depicted in Table 5.



**Table 5: Barriers to implementation of the smoke free policy by smoking status**

	<b>Total</b>		<b>Regular Smokers</b>		<b>Occasional and Ex-Smokers</b>		<b>Non-smokers</b>	
<b>Attitude</b>	n= 535	%	n= 60	%	n= 59	%	n= 416	%
<b>Extent students satisfied with the smoking ban*</b>								
Large extent	311	58.6	6	10.3	27	45.0	278	67.5
Some extent	139	26.2	15	25.9	14	23.3	110	26.6
Not at all/ Not sure	81	15.2	37	63.8	19	31.6	25	6.0
<b>Extent students consider the ban justified*</b>								
Large extent	302	57.2	8	13.8	29	49.2	265	64.5
Some extent	169	32.0	26	44.8	20	33.9	123	29.9
Not at all/ Not sure	57	10.8	24	41.4	10	17.0	23	5.6
<b>AUB becoming an entirely smoke-free area*</b>								
Agree	210	39.8	6	10.2	19	32.8	185	45.0
Disagree	230	43.6	50	84.7	29	50.0	151	36.7
Undecided	88	16.7	3	5.1	10	17.2	75	18.2
<b>Extent the ban helped in creating a healthy environment*</b>								
Large extent	313	9.2	6	10.3	25	42.4	282	68.4
Some extent	166	31.4	33	56.9	27	45.8	106	25.7
Not at all/ Not sure	50	9.5	19	32.8	7	11.9	24	5.8
<b>Extent the ban helps smokers reduce smoking*</b>								
Large extent	88	16.7	2	3.4	8	13.6	78	18.9
Some extent	256	48.4	21	36.2	24	40.7	211	51.2
Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
<b>Extent the ban helps smokers in quitting smoking*</b>								
Large extent	39	7.4	2	3.4	5	8.8	32	7.8
Some extent	149	28.3	4	6.9	14	24.6	131	31.8
Not at all/ Not sure	339	64.3	52	89.7	38	66.6	249	60.4

\*  $p < 0.01$ **Discussion**

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4 The AUB is the first university in Lebanon to institute a non-smoking policy on  
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6 campus. This provided the opportunity to assess students' compliance with and attitude  
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8 towards the ban and its impact on their smoking behavior. These results showed that  
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10 compliance was high and the smoking ban was effective in curbing some of the  
11  
12 students' smoking behavior. Because of the cross sectional nature of the study it was not  
13  
14 possible to measure whether students reduce their smoking in direct response to the ban.  
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16 Therefore, we relied on self-reported change in smoking behavior. Although it was  
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18 suspected that the ban would positively impact all smokers, unfortunately it did not have  
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20 this intended effect. Only one in five smokers reported decreased smoking. This could  
21  
22 be explained by the fact that although there is a section in the policy on smoking  
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24 cessation, students are generally unaware of the availability of a free smoking cessation  
25  
26 program at the university's medical center for those wanting help. This might explain  
27  
28 why the policy did not impact a greater number of students. Consequently, smoking  
29  
30 cessation services need to be better advertised so that students are aware of the help they  
31  
32 can get for their tobacco addiction. Another reason why the policy may have not  
33  
34 affected smoking behavior as intended could be that the implementation of AUB's  
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36 smoking ban was not reinforced by a national smoke free policy in public places across  
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38 Lebanon, so as soon as students left the campus, they would go back to their usual  
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40 habits. Moreover, the policy was not accompanied by an educational campaign to raise  
41  
42 awareness regarding the harmful effects of smoking on one's health. A study by Borders  
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44 et al.[14] covering undergraduate students at 12 colleges or universities in Texas,  
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46 showed that compared to different college-level policies and programs, only the  
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48 presence of preventive education programs on campus was associated with lower odds  
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50 of current cigarette use.[14] On the other hand, universities which implemented other  
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4 tobacco control policies such as smoking cessation programs and having designated  
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6 smoking areas were not effective in curbing students' smoking behavior. For example,  
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8 the latter two policies / programs were associated with higher odds of smoking in the  
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10 study. Thus, as the authors concluded, implementing strict policies may not be the best  
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12 way to decrease students' smoking rates, prevention and education programs might be  
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14 just as important if not more. While 20% of regular smokers reported that their  
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16 smoking decreased, another 21.8% said that it actually increased following policy  
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18 enforcement. The increase could be explained by two reasons: First, smokers might  
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20 have intentionally reported an increase in their smoking frequency to deceive the  
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22 researchers and to prove the inefficiency of the policy in reducing their smoking  
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24 behavior. Second, smoking might have actually increased because since it is viewed as a  
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26 "cool" and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]  
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32 This study has reported also on students' attitude towards the implementation of the  
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34 non-smoking policy at AUB. Overall students' attitude towards the ban was favorable,  
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36 but revealed large differences by smoking status. Non-smokers possessed a more  
37  
38 favorable attitude towards the smoke free policy which was evident in their greater  
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40 satisfaction level, conviction about its need and potential effect in decreasing smoking  
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42 behavior. This is to be expected as non-smokers do not want to expose themselves to the  
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44 adverse health effects of second hand smoke. Other studies in the United States have  
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46 reached similar findings. A nationally representative study encompassing undergraduate  
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48 students at 119 colleges and universities in the USA revealed that non-smokers were  
49  
50 more supportive of different tobacco control policies such as enforcing smoke free  
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52 policies in all campus buildings, student residences, dining areas and campus bars and  
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54 pubs.[16] As well, non-smokers were more approving of tobacco marketing restrictions  
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4 (e.g. prohibiting tobacco advertising on campus and sponsorship of social events) as  
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6 well as forbidding tobacco sales on campus.[16] Similarly, a study by Loukas et al.[17]  
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8 with students from 5 Texas colleges showed that non-smokers and experimental  
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10 smokers compared to smokers were significantly less opposed to implementing a  
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12 smoking ban in all buildings and having an entirely smoke-free campus.[17]  
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16 Students' attitude towards enforcing a non-smoking policy in public places in Lebanon  
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18 also differed by smoking status. Regular smokers were more opposing to banning  
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20 cigarette smoking in ministries, public institutions, workplaces, schools and university  
21  
22 buildings etc. as mentioned above. The only two locations that smokers and non-  
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24 smokers agreed on being smoke free were health care facilities and elevators with  
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26 percentages over 90%. This can be explained by the fact that health care facilities  
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28 provide care for ill patients and smoking would clearly conflict with this purpose.  
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30 Moreover, given that elevators are confined spaces and have limited air circulation,  
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32 students most likely agreed that they should be smoke free so as to respect non-  
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34 smokers' wishes in breathing in clean air. The results of this study are supported by  
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36 research conducted in 2004 at AUB and funded by Research for International Tobacco  
37  
38 Control (Canada) which showed that in general, there is positive support among young  
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40 adults including university students for implementing and enforcing tobacco control  
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42 policies (unpublished report). The least supported policy, however, was the ban of  
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44 smoking in restaurants and entertainment places which parallels the research findings.  
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50 Barriers to implementation of the smoke free policy at AUB, as identified by  
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52 students, were: lack of compliance of some students, Faculty, and staff; having too few  
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54 or too crowded smoking areas; and the lack of strict enforcement of the non-smoking  
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56 policy. All of the above were considered obstacles with varying agreement between  
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4 smokers and non-smokers. However, no other published study that looked at barriers to  
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6 the implementation of a non-smoking policy from a student's perspective was found.  
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8 Although the lack of compliance was viewed as a barrier, in reality the majority of  
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10 regular smokers (73%) abided by it. This may be due to the fact that students risked  
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12 receiving a warning if they were smoking in prohibited areas. In other contexts,  
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14 compliance has been shown to pose a significant threat to the effective implementation  
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16 of non-smoking policies. Harris et al.[18] conducted a study to identify efficient  
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18 strategies that will increase compliance of students to a college campus smoking ban.  
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20 An intervention consisting of moving smoking receptacles, drawing ground markings  
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22 and putting more signs regarding the non-smoking policy, as well as distributing  
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24 reinforcements and reminder cards led to a significant increase in compliance from 33%  
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26 to 74% within the intervention week and remained at 54% during follow-up.[18]  
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## 39 Conclusion

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41 An education campaign accompanying the policy might be more effective in  
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43 further reducing current cigarette use; it will also increase smokers' conviction in its  
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45 necessity. The university should also actively advertise its free smoking cessation  
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47 services and implement more rigid enforcement measures as this was one of the barriers  
48  
49 identified by students. In addition, an awareness based approach is important to  
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51 illuminate the adverse effects of second hand smoking and to emphasize that non-  
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53 smoking policies do not infringe on smokers' rights, rather they aim mostly at  
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55 protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed  
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4 a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese  
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6 parliamentary premises were declared a smoke free zone, with signs prohibiting  
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8 smoking. This current law was embraced by all public places in Lebanon including  
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10 schools and universities as of September 2012. [19] This more universal ban will likely  
11  
12 increase the impact of AUB's policy as evidence has indicated that smoking prevalence  
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14 and incidence is most impacted through implementation of comprehensive national  
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16 policies.  
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### 24 **Acknowledgments**

25  
26 The authors would like to thank Ms. Zeina Farah and Mr. Nabil El Ayoubi for their  
27  
28 assistance in data management and analysis. The authors would also like to thank the  
29  
30 students who participated in this study and IDRC for their continuous support.  
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### 33 **Ethical approval**

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36 This study has been approved by the Institutional Review Board at AUB and students  
37  
38 consented orally to participate in the study.  
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40

### 41 **Funding**

42  
43  
44 This research study was funded through a grant from Research for International  
45  
46 Tobacco Control, a secretariat of the International Development Research Center  
47  
48 (RITC-IDRC). RITC had no involvement in any stage of the study or its publication.  
49  
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### 51 **Competing interests**

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55 None declared  
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