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

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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.

Conclusions: An education campaign, smoking cessation services, and strict enforcement of the policy might be necessary to boost its effect in further reducing students' cigarette use.

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]

Not only do non-smoking policies protect smokers and non-smokers from the effects of second-hand smoking, but they also encourage smokers to decrease or even quit smoking. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10]

Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has not been implemented yet. However, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans.[11] A study by Chaaya et al.[12] revealed that 28.3% of students in a private university in Lebanon currently smoked argileh, of whom 38% were regular smokers, the proportion of ever argileh smokers being 43%.[12] Another study by Tamim et al.[13] showed that 40% of students in public and private universities in Lebanon currently smoked tobacco (21.1% narghile, 7.6% cigarettes and 11.3% smoked both cigarettes and narghile).[13] Concerned about the level of smoking seen among young people in the country, the American University of Beirut, a private university, decided to implement a non-smoking policy everywhere on campus in May 2008 encompassing student residence halls and all campus buildings except for private faculty residences. Smoking became restricted to designated areas only. This study describes students' attitudes and opinions regarding the ban, as well as their behaviour after its

implementation. It also assesses students' attitude towards the enforcement of a non-smoking policy in public places across Lebanon.

Methods

Participants

A cross sectional study was conducted at AUB, the largest private university in Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs, and currently enrols around 7500 students from 69 countries. A random sample of classes being offered in the spring semester of academic year 2008/2009 were selected to participate in the survey, yielding a total of 535 students who were registered in those courses. The selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each faculty. All students attending chosen classes were approached and asked to complete the survey. Fewer than 2 % refused to participate. The final sample was representative of all undergraduate and graduate students from the six Faculties at AUB, with an oversampling from the Faculty of Health Sciences. The highest percentage of surveyed 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

A self-administered survey 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 related to their attitude towards some of the 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 and current 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, 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. 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, status was grouped into 3 categories: never smokers, occasional and ex-smokers, and current regular smokers. 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

Close to one half of the surveyed students reported ever smoking cigarettes. Twenty percent have ever smoked cigarettes for at least 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 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.

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

	Regular Smokers		Occasional and Ex- Smokers		Non-smokers		
Attitude	n= 60	%	n= 59	%	n= 416	%	Total %
Extent students satisfied with the smoking ban*							
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
Extent students consider the ban justified*							
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
AUB becoming an entirely							

smoke-free area*							
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
Extent the ban helped in creating a healthy environment*							
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
Extent the ban helps smokers reduce smoking*							
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
Extent the ban helps smokers in quitting smoking*							
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

	Males		Females		
Variable	n= 39	%	n= 21	%	Total %
Smoking on campus					
Designated areas only	27	75.0	13	68.4	72.7
Designated and non-designated areas	9	25.0	6	31.6	27.3
Received a warning ticket for smoking by an officer on campus					
No	29	78.4	19	90.5	82.8
Yes	8	21.6	2	9.5	17.2
Smoking frequency					
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

	Regular Smokers		**Occasional or Ex-smokers**		**Non-smokers**		
Variable	n= 60	% **(agree)**	n= 59	% **(agree)**	n= 416	% **(agree)**	Overall % agreement
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

	Regular Smokers		Occasional or Ex-smokers		Non-smokers		
Attitude	n= 60	%	n= 59	%	n= 416	%	Total %
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 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

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

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 opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[15]

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, faculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All the above were considered obstacles with varying agreement between smokers and non-smokers. We could not find any other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective. Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts, compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[16] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[16]

Regarding students' smoking behavior, although we would have suspected that the ban would positively impact all smokers, unfortunately it did not have this intended effect. While 20% of regular smokers reported that their smoking decreased, another 21.8% said that it actually increased following policy enforcement. The reasons for this may be multiple: smokers might have intentionally reported that their smoking increased to prove that the policy is an inefficient mean to reduce their smoking behavior. 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 tobacco addiction.

Other reasons could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[17] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[17] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors

concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more.

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

The AUB is the first university in Lebanon to institute a non-smoking policy on campus. This provided the opportunity to assess students' attitudes towards the ban and its impact on their smoking behavior. Our results showed that the smoking ban was effective in curbing some of the students' smoking behavior. An education campaign accompanying the policy might be more effective in further reducing current cigarette

use; it will also increase smokers' conviction in its necessity. The university should also actively advertise its free smoking cessation services and implement more rigid enforcement measures as this was one of the barriers identified by students. In addition, an awareness based approach is important to illuminate the adverse effects of second hand smoking and to emphasize that non-smoking policies do not infringe on smokers' rights, rather they aim mostly at protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese parliamentary premises were declared a smoke free zone, with signs prohibiting smoking. This current law was embraced by all public places in Lebanon, with a fine of 135,000 Lebanese Lira (around 90 US Dollars) for each breach, as of September 2012. Within this process, all tobacco–related ads are prohibited on all media channels.[18] This more universal ban will likely increase the impact of AUB's policy as evidence has indicated that smoking prevalence and incidence is most impacted through implementation of comprehensive national policies.

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Ethical approval

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

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Competing interests

None declared

Contributorship:

Chaaya M., Nakkash R., Afifi R. and Khalil J. worked on the conceptualization of the study. Chaaya M. and Nahhas G. were responsible for data collection. Alameddine M. and Nahhas G. conducted the analysis of the data. All the authors contributed / gave substantive feedback to the writing of the manuscript. And all authors approved the final manuscript.

Data sharing:

All data from this study are analyzed in this manuscript. The data will be shared with students for class exercises

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

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Article focus:

- To examine students' compliance and attitude 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.

Strengths and Limitations:

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. 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.

Other secondary outcomes were perception of barriers to implementation of the ban and attitudes towards tobacco control in general.

Results: Smokers were generally compliant with the ban (72.7%) and for some (20%) it led to a decrease in their smoking behaviour. 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; Overall, the largest proportions of students were satisfied to a large extent with the ban and considered it justified (58.6% and 57.2% respectively). While much smaller percentages reported that the ban would help reduce smoking to large extent 16.7% or it would help smokers quit (7.4%). 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.

Conclusions: An education campaign, smoking cessation services, and strict enforcement of the policy might be necessary to boost its effect in further reducing students' cigarette use.

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

[9-10] and second hand exposure to non smokers. [11-12]. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10] Not only do non-smoking policies encourage smokers to decrease or even quit smoking, but they also protect smokers and non smokers from the effects of secondhand smoking. 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.[11] Similarly, a smoke-free legislation in public places in Scotland was associated with a 17% decrease in admissions for acute coronary syndrome.[12] 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.[12]

The purpose of this paper is to examine the implementation of a smoking ban on a private university in Lebanon. Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has not been implemented yet. However, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans. [13] In May 2008, the American University of Beirut (AUB), a private university, decided to implement a non-smoking policy everywhere on campus encompassing student residence halls and all campus buildings except for private Faculty residences. Smoking became restricted to designated areas

only. Our primary objective was to assess compliance. Our secondary objective was to assess student attitudes & opinions towards the campus wide smoking ban and tobacco control measures in general. Finally, our third objective was to assess perceptions of barriers to implementation of the ban.

Methods

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

Participants

A cross sectional study was conducted at AUB, the largest private university in Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs, and currently enrols around 7500 students from 69 countries. Instructors of a random sample of classes being offered in the spring semester of academic year 2008/2009 were selected to participate in the survey, yielding a total of 535 students who were registered in those courses. None of the instructors contacted refused to take part in the study. The selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each Faculty. All students attending chosen classes were approached and asked to complete the survey. 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.

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	
Age group								
< 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
Gender								
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
Student's 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
Faculty								
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
Nationality								
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

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

Smoking on campus						
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
Received a warning ticket for smoking by an officer on campus						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
Smoking frequency						
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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 (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 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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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Extent the ban helps								

smokers in quitting smoking*								
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	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								

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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
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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
Extent the ban helps smokers in quitting smoking*								
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

relied on self reported change in smoking behavior. This study has reported also on students' attitudes towards the implementation of the non-smoking policy at 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 opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[15]

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, Faculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All of the above were considered obstacles with varying agreement between smokers and non-smokers. However, no other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective was found.

Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts, compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[16] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[16]

Regarding students' smoking behavior, although it was suspected that the ban would positively impact all smokers, unfortunately it did not have this intended effect. While 20% of regular smokers reported that their smoking decreased, another 21.8% said that it actually increased following policy enforcement. There are multiple reasons for this: First, smokers might have intentionally reported that their smoking increased to prove that the policy is an inefficient mean to reduce their smoking behavior. Second, 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 tobacco addiction. A third reason why the policy did not affect smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left

the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[17] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[17] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more.

Finally, students' attitude towards enforcing a non-smoking policy in public places in Lebanon also differed by smoking status. Regular smokers were more opposing to banning cigarette smoking in ministries, public institutions, workplaces, schools and university buildings etc. as mentioned above. The only 2 locations that smokers and non-smokers agreed on being smoke free were health care facilities and elevators with percentages over 90%. This can be explained by the fact that health care facilities provide care for ill patients and smoking would clearly conflict with this purpose. Moreover, given that elevators are confined spaces and have limited air circulation, students most likely agreed that they should be smoke free so as to respect non-smokers' wishes in breathing in clean air. The results of this study go in parallel with research conducted in 2004 at AUB and funded by Research for International

Tobacco Control (Canada) which showed that in general, there is positive support among young adults including university students for implementing and enforcing tobacco control policies (Afifi and Chaaya 2005). The least supported policy, however, was the ban of smoking in restaurants and entertainment places which parallels the research findings.

An education campaign accompanying the policy might be more effective in further reducing current cigarette use; it will also increase smokers' conviction in its necessity. The university should also actively advertise its free smoking cessation services and implement more rigid enforcement measures as this was one of the barriers identified by students. In addition, an awareness based approach is important to illuminate the adverse effects of second hand smoking and to emphasize that non-smoking policies do not infringe on smokers' rights, rather they aim mostly at protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese parliamentary premises were declared a smoke free zone, with signs prohibiting smoking. This current law was embraced by all public places in Lebanon including schools and universities as of September 2012. [18] This more universal ban will likely increase the impact of AUB's policy as evidence has indicated that smoking prevalence and incidence is most impacted through implementation of comprehensive national policies.

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Ethical approval

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

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Competing interests

None declared

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

Running Title

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

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.

Strengths and Limitations:

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.

Introduction The ~~U~~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.~~ the American College Health Association survey results[2] revealed that 14.3% of students ~~one third of students (32.9%)~~ currently using tobacco, cigarettes being the most common form of tobacco use.[1] In Lebanon, a study by Chaaya et al.[3~~12~~] 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~~12~~] Another study by Tamim et al.[4~~13~~] 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~~13~~] 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~~3~~-8~~6~~] To lessen these effects, non-smoking policies in

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

~~Not only do non-smoking policies protect smokers and non-smokers from the effects of second-hand smoking, but they also encourage smokers to decrease or even quit smoking. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among~~

~~smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10]~~

The purpose of this paper is to examine the implementation of a smoking ban on a private university in Lebanon. Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has not been implemented yet. However, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans.[13~~1~~] ~~A study by Chaaya et al.[12] revealed that 28.3% of students in a private university in Lebanon currently smoked argilehnargileh, of whom 38% were regular smokers, the proportion of ever argilehnargileh smokers being 43%.[12] Another study by Tamim et al.[13] showed that 40% of students in public and private universities in Lebanon currently smoked tobacco (21.1% narghile, 7.6% cigarettes and 11.3% smoked both cigarettes and narghile).[13] Concerned about the level of smoking seen among young people in the country~~ In May 2008, the American University of Beirut (AUB), a private university, decided to implement a non-smoking policy everywhere on campus ~~in May 2008~~ encompassing student residence halls and all campus buildings except for private F~~f~~aculty residences. Smoking became restricted to designated areas only. ~~This study~~ Our primary objective was to assess compliance. ~~describes students' attitudes and opinions regarding the ban, as well as their behaviour after its implementation. It also assesses students' attitude towards the enforcement of a non-smoking policy in public places across Lebanon~~. Our secondary objective was to assess student attitudes & opinions towards the campus wide smoking

ban and tobacco control measures in general. Finally, our third objective was to assess perceptions of barriers to implementation of the ban.

Methods

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

Participants

A cross sectional study was conducted at AUB, the largest private university in Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs, and currently enrols around 7500 students from 69 countries. ~~A~~Instructors of a random sample of classes being offered in the spring semester of academic year 2008/2009 were selected to participate in the survey, yielding a total of 535 students who were registered in those courses. None of the instructors contacted refused to take part in the study. The selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each F~~f~~aculty. All students attending chosen classes were approached and asked to complete the survey. 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. ~~The highest percentage of surveyed~~

~~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 ~~t~~Tables.

Results

Table 1 presents the basic characteristics of the totalstudied 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 (31141%), and not living in dorms (87%). Close to one half of the surveyed students reported everlifetime smoking cigarettes. Twenty percent smokedd cigarettes 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 Uuniversity 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

Variable	Total		Regular Smokers		Occasional and Ex- Smokers		Non Smokers	
	n=535		n=60		n=59		n-416	
Age group								
< 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

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25+ yrs	41	7.7	4	9.8	10	24.4	27	65.9
Gender								
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
Student's 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
Faculty								
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
Nationality								
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 ~~1~~2)

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 ~~1~~2: Smokers' compliance and behaviour following the ban by sex

	Total		Males		Females	
Variable	n= 60	%	n= 39	%	n= 21	%
Smoking on campus						
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
Received a warning ticket for smoking by an officer on campus						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
Smoking frequency						
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~~2)

Table ~~3~~2 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~~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 ~~2~~3: Students' attitude towards AUB's smoking ban by smoking status

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smoke	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								

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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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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

* $p < 0.001$

	~~Regular Smokers~~		~~Occasional and Ex-Smokers~~		~~Non-smokers~~		
~~Attitude~~	~~n= 60~~	~~%~~	~~n= 59~~	~~%~~	~~n= 416~~	~~%~~	~~Total %~~
~~**Extent students satisfied with the smoking ban***~~							
~~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~~
~~**Extent students consider the ban justified***~~							
~~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~~
~~**AUB becoming an entirely smoke-free area***~~							
~~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~~
~~**Extent the ban helped in creating a healthy environment***~~							
~~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
Extent the ban helps smokers reduce smoking*							
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
Extent the ban helps smokers in quitting smoking*							
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 ~~t~~Table ~~2~~3.

Students' attitude towards having a non-smoking policy in public places (Table ~~3~~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 ~~t~~Table 3. 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 ~~3~~4: Students' attitude towards banning cigarette smoking in public places

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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

	~~Males~~	~~Females~~

Variable	n= 39	%	n= 21	%	Total %
Smoking on campus					
Designated areas only	27	75.0	13	68.4	72.7
Designated and non-designated areas	9	25.0	6	31.6	27.3
Received a warning ticket for smoking by an officer on campus					
No	29	78.4	19	90.5	82.8
Yes	8	21.6	2	9.5	17.2
Smoking frequency					
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, Ff~~f~~aculty, 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 ~~t~~Table 45.

Table 45: 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	%
Extent students satisfied with the smoking ban*								

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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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

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

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

* $p < 0.01$

	Regular Smokers		Occasional or Ex-smokers		Non-smokers		
Attitude	n= 60	%	n= 59	%	n= 416	%	Total %
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~~the 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

opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[15]

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, Ff~~f~~aculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All of the above were considered obstacles with varying agreement between smokers and non-smokers. However, no ~~We could not find any~~ other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective was found. Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts, compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[16] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[16]

Regarding students' smoking behavior, although it was suspected that ~~we would have suspected that~~ the ban would positively impact all smokers, unfortunately it did not have this intended effect. While 20% of regular smokers reported that their smoking decreased, another 21.8% said that it actually increased following policy enforcement. There are multiple reasons for this ~~may be multiple~~: First, smokers might have

intentionally reported that their smoking increased to prove that the policy is an inefficient mean to reduce their smoking behavior. Second, ~~A~~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 tobacco addiction. A third reason why the policy did not affect smoking behavior as intended

~~Other reasons~~ could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[17] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[17] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more.

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

~~The AUB is the first university in Lebanon to institute a non-smoking policy on campus. This provided the opportunity to assess students' attitudes towards the ban and its impact on their smoking behavior. Our~~ These ~~results showed that the smoking ban was effective in curbing some of the students' smoking behavior~~. An education campaign accompanying the policy might be more effective in further reducing current cigarette use; it will also increase smokers' conviction in its necessity. The university should also actively advertise its free smoking cessation services and implement more rigid enforcement measures as this was one of the barriers identified by students. In

addition, an awareness based approach is important to illuminate the adverse effects of second hand smoking and to emphasize that non-smoking policies do not infringe on smokers' rights, rather they aim mostly at protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese parliamentary premises were declared a smoke free zone, with signs prohibiting smoking. This current law was embraced by all public places in Lebanon, including schools and universities ~~with a fine of 135,000 Lebanese Lira (around 90 US Dollars) for each breach,~~ as of September 2012. ~~Within this process, all tobacco- related ads were are prohibited on all media channels.~~ [18] This more universal ban will likely increase the impact of AUB's policy as evidence has indicated that smoking prevalence and incidence is most impacted through implementation of comprehensive national policies.

Acknowledgments

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

Ethical approval

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

Funding

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Competing interests

None declared

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We thank the reviewers for their comments. We addressed them all, made the changes when appropriate and answered all questions.

Reviewer 1: Dr. Omar Khabour

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

R: We substituted all "argileh" with narghileh. The authors feel that a simple description of smoking behavior gives a better idea on students in general.

2- Page 6, line 45: American University of Beirut should be abbreviated.
R: Done

3- Throughout the manuscript, the world "Faculty" was written sometimes with capital letter and sometimes without. Please be consistent
R: Done. We used "Faculty"

4- Throughout the manuscript description of frequencies are sometimes with a space between the number and % and sometimes without. Be consistent and consult instruction for authors.
R: We removed the space

5- Page 8 line 44, you have mentioned that there was oversampling from the Faculty of Health Sciences and in the following sentence you have mentioned that 41% of the sample was from the Faculty of Art and Sciences. What remained for other faculties? I suggest that you information about number of students recruited from each Faculty.
R: The true proportion of FHS students at AUB is around 4 %. However in the sample it was 13 %. Therefore we weighted the data in the analysis according to Faculty, as mentioned in the analysis part.
All Faculties were represented in the sample. We could add more information in the text about the distribution or leave as such and readers could refer to table 1.
We added one table to describe the demographic characteristics for the total sample and by smoking status. The results on the sample profile in the text could be presented without the table. We leave it to the editor to decide if the table is necessary

6- The authors mentioned in the manuscript that AUB has students from 69 countries and thus the authors should mention the language of the questionnaire. Was the questionnaire distributed in Arabic language or in multi-languages? What was the percentage of foreign students in the sample?
R: The questionnaire was administered in English. 13 % of the sample were non Lebanese. Another 15 % had dual nationality. They could be Arab non Lebanese or non Arab

7- Page 8 line 13: define FCTC
R: Done

8- Page 9 line 47, what is the difference between school and Faculty?
R: No difference. Before separating from the Faculty of Arts and Sciences(FAS), It was named a school. After becoming independent of FAS, it kept its name and they added the name of a major donor named Olayan: Olayan School of Business.

9- Page 10 line 21, the authors mentioned in text that (51.7%) of current smokers were not at all satisfied with the ban, while the in the table 1, the percentage is 63.8%. Please clarify the this discrepancy
R: We corrected in the text and replace with 63.8 % as per the table. We reported before those who were not satisfied at all only and these amounted to 51.7 %

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

11- Page 16 line 11, remove extra bracket
R: Done

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

13- Pages 21-23, check the references style.
R: Done

Reviewer 2: Libby N Brockman

- Do the results support the "success" (how is this defined?) of a smoking ban? Perhaps more accurately, one of the key messages of this study is that implementing a smoking ban is a complex process with numerous stakeholders, including students which are not often included in such analyses. Their opinions and attitudes are important and varied based on smoking status.
R: The authors consider that the smoke ban was a success at AUB with almost two thirds complying with the ban and a high proportion reporting that ban was justified and that they were satisfied with it. WE totally agree with the reviewer that implementing a smoking ban in the country is very complex.
We added a statement on the complexity of the process in the key messages as suggested.

- One of the strengths of this study is that it is the first to document student perceptions of barriers to smoke bans. Would be interesting to hear more from the authors on why the student perspective is so valued.
R. We added the a statement under "strengths"
As the authors pointed earlier and rightfully so that students are important stakeholders for the success of a smoke ban in the country. They constitute a significant proportion of the young population whose support of the tobacco control in general is essential

Abstract:
- Add # of students who completed the survey
R: Done

- Add data collection methods
R: Done

- Provide #s, percentages, p-values for some of your main results to bolster your results section.
R: Done

Limitations of this study are not discussed anywhere. Please add a discussion of them to the Discussion section.
R: The study does not intend to measure a change or any associations and therefore its cross sectional nature does not entail any limitation. The oversampling from the Faculty of Health Sciences was corrected in the analysis by post weighing the analysis. A statement was added in the discussion about limitations.

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

Further, the term "significant" has technical implications. When using this term, readers will expect to see hypothesis testing results such as p-values and confidence intervals. The authors often make judgements of significance and compare groups within the text without providing statistical evidence to back this up. For example:
1) Pg 10, line 14: Authors conclude that "Difference in attitude were mainly between regular smokers and non-smokers" yet do not provide evidence of the comparisons they made to reach this conclusion. Please provide analyses.
2) Pg 11, line 35
3) Pg 12, line 39
4) Pg 12, Line 52
R. This is not a hypothesis driven study and the authors wanted to describe compliance and attitudes. The authors see that it is legitimate to compare attitudes according to smoking status . these analyses help in highlighting target groups for intervention. To highlight the differences and since the survey was based on probability samples, we performed bivariate analyses and reported statistical differences. When statistical differences were found among the three groups of smokers, the authors examined the observed percentages to describe the patterns and where the differences occur.

USA smoking prevalence rates in this manuscript come from a 2002 paper (pg 5, line 24). The American College Health Association National College Health Assessment (ACHA-NCHA)

provides more current data on risk behaviors among US college students. This may be a good source for smoking prevalence among USA college students.
R: We changed the reference as per the suggestion of the reviewer and reported the prevalence in the USA of 14.3% according to the American College Health Association 2012

Nowhere in the entire manuscript is the # of participants stated. Please provide total N. Relatedly, the Total columns in Tables 1-4 are missing a total N and should be moved from the last column to the first column of reported data. Lastly, note that in Table 3, the term Overall is used instead of Total. Please be consistent.
R: The number is mentioned on page 8, line 30 under the section "participants"(p 7 line 31). The total is 535.
Tables were changed

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

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

Further, though the tables break these into two separate groups, the authors often combine them in the text and report them as one [eg, pg 10, lines 10-14, lines 16-21, lines 32-34,]. Perhaps the survey question and its representation in the tables should be dichotomized (some extent (large + some) vs not at all/not sure) rather than categorical.
R. **Attitudes questions are usually constructed on a likert scale. It shows levels or strength of agreement or support with a particular statement and not a simple yes and no answer. "Large extent" denotes a stronger support " and "to some extent" a moderate support. Only in one table the authors report the three categories and felt that it reflects better the results and the differences in supporting the ban**

Whichever order the authors chose to list their objectives, this should remain consistent when discussing their findings in the Discussion section.
R: Done. We restructured both results and discussion according to the order of the stated objectives. The reason why the authors chose in the first to present attitudes first is because it includes all the sample of students and not only the smokers(smokers and non smokers)

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

implementation of a campus smoking ban. Please discuss implications of this study's specific results.
R: The authors are discussing the results within the broader context. For example if AUB implements a successful ban., If young students go to restaurants or other public venues where smoking is allowed, it will not help them quit .. and therefore, AUB ban would be more successful when a national ban of smoking in public places is implemented.

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

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

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

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

Reviewer 3

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

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

Introduction:

I enjoyed reading your background section as it set up your paper appropriately. However, I wonder if reordering this section will provide readers the answers to their questions more quickly.
R: The introduction was restructured as per the suggestion of the reviewer

Page 6, discusses smoking practices of Lebanese students. Please define and explain the difference between argileh and narghile; are these the same? Using just one term may be more consistent and less confusing.
R: Argileh and narghileh are the same. We replaced all arghileh with narghileh

Page 6, line 34: Most literature on smoking prevalence differentiates between current and lifetime smoking. Is there a difference between "regular" and "current"? If so, please clarify.
R: Regular and current are the same. We replaced all current with regular.

Methods:

-Move statements about date of data collection and IRB approval from the Data Collection subsection to right under the Methods heading. This should be listed before the subsection of Participants. "This study took place between [Months] 2008- June 2009. IRB approval was obtained from AUB for all research procedures..."
R: This part was restructured as per the suggestions of the reviewer

- Pg 8, Line 46, sentence "Data collection was completed in June 2009" should be added to the very beginning of the Methods section, as noted above.
R: This part was restructured as per the suggestions of the reviewer

-pg 7, line 26: please note that INSTRUCTORS of "a random sample of classes offered in the spring semester..." were asked to invite their students to complete the survey.
R: This part was restructured as per the suggestions of the reviewer

-pg 8, line 48, sentence "None of the instructors contacted..." can be moved to pg 7, line 33 before the sentence "The selection of classes was based...".
R: This part was restructured as per the suggestions of the reviewer

- page 7, line 44: The sentence starting with "The highest percentage of surveyed students..." should be moved to the first sentence of the Results section.
R: This part was restructured as per the suggestions of the reviewer

- Decide if you will you use the term questionnaire or survey, but be consistent and stick with just one of those terms.
R: The term survey was used to describe questionnaire and survey for consistency.

- You can combine the Questionnaire and Data collection sections into one "Questionnaire (or Survey) & Data Collection".
R: Done

- How was the survey administered? Online, or with paper and pencil?
R: Paper and pencil

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

-pg 8- line 13: "Various statements" should read "Survey questions"
R: Done

-pg 8, line 20: most literature on smoking prevalence differentiates between current and lifetime smoking. Therefore, "ever" should read "lifetime"
R: Done

- Pg 9, line 11: "Answers to attitudes..." sentence is unclear."To a larger extent, to some extent, and not at all/not sure" are not answers to "the ban". Please specify what the questions were so readers understand what the measures were.
Can the authors comment on why "not at all" and "not sure" were grouped together? These seem like different answers to me.

R. **What we meant is that the response categories were regrouped into three groups. We put not sure and not at all together for two reasons: the small number of observations in most attitudes items and both denote a negative attitudes towards the ban**
The sentence was changed to "The response categories of the attitudes questions towards the ban were also classified into 3 groups;"

Results:

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

- pg 9, line 44: university should not be capitalized. Correct this throughout the manuscript -pg 11, line 47: Do you mean "more similar" rather than "closer"? Closer denotes physical proximity.
R: Done. "Closer" was replaced with "more similar".

-pg 12 line 4-5: "a little bit less" should read "almost"
R: Done

- Capitalize Table or Figure when referring to these throughout the manuscript
R: Done

Discussion section

- pg 16, line 27: should read "All OF the above..."
R: Done

-pg17 line 11: Should read: "There are multiple reasons for this..."
R: Done.

-pg 17 line 32: Other reasons for what?
R. **This statements follows the statement: "There are multiple reasons for this: First, smokers …" it explains why the ban did not impact students smoking behavior. Some editing was done on the paragraph to remove confusion**

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

R: Done

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

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

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

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Article focus:

- To examine students' compliance and attitude 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 a university wide smoking ban. They should be 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.

Strengths and Limitations:

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 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

[9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10] Not only do non-smoking policies encourage smokers to decrease or even quit smoking, but they also protect smokers and non-smokers from the effects of secondhand smoking. 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.[11] Similarly, a smoke-free legislation in public places in Scotland was associated with a 17% decrease in admissions for acute coronary syndrome.[12] 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.[12]

The purpose of this paper is to examine the implementation of a smoking ban on a private university in Lebanon. Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has only been implemented in 2012. In 2008,, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans. [13] In May 2008, the American University of Beirut (AUB), a private university, decided to implement a non-smoking policy everywhere on campus encompassing student residence halls and all campus buildings except for private Faculty residences. Smoking became restricted to designated areas

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

Methods

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

Participants

A cross sectional study was conducted at AUB, the largest private university in Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs, and currently enrols around 7500 students from 69 countries. A random sample of classes being offered in the spring semester of academic year 2008/2009 was selected to recruit participants; a total of 545 students were registered in those classes. None of the instructors refused to allow recruitment in their classrooms. The selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each Faculty. All students attending chosen classes were approached and asked to complete the survey. 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.

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

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	%
Age group								
< 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
Gender								
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
Student's 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
Faculty								
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
Nationality								
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

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

Smoking on campus						
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
Received a warning ticket for smoking by an officer on campus						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
Smoking frequency						
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps								

smokers in quitting smoking*								
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	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								

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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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.

Therefore, we relied on self-reported change in 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 tobacco addiction. Another reason why the policy may have not affected smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[14] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[14] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more. While 20% of regular smokers reported that their

smoking decreased, another 21.8% said that it actually increased following policy enforcement. The increase could be explained by two reasons: First, smokers might have intentionally reported an increase in their smoking frequency to deceive the researchers and to prove the inefficiency of the policy in reducing their smoking behavior. Second, smoking might have actually increased because since it is viewed as a "cool" and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]

This study has reported also on students' attitude towards the implementation of the non-smoking policy at 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.[16] 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.[16] Similarly, a study by Loukas et al.[17] with students from 5 Texas colleges showed that non-smokers and experimental smokers compared to smokers were significantly less opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[17]

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

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, Faculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All of the above were considered obstacles with varying agreement between smokers and non-smokers. However, no other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective was found. Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts,

compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[18] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[18]

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Conclusion

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

and incidence is most impacted through implementation of comprehensive national policies.

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Ethical approval

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

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Competing interests

None declared

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

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Article focus:

- To examine students' compliance and attitude -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 a university wide smoking ban. They should be ~~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.

Strengths and Limitations:

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~~ smoking behaviour.

Introduction The university years are an important life phase for every student during which they develop and engage in~~uphold~~ risky behaviours such as smoking. Smoking therefore is ~~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 between~~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 exposure ~~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

[9-10] and second hand exposure to non--smokers. [11-12]. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10] Not only do non-smoking policies encourage smokers to decrease or even quit smoking, but they also protect smokers and non--smokers from the effects of secondhand smoking. 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.[11] Similarly, a smoke-free legislation in public places in Scotland was associated with a 17% decrease in admissions for acute coronary syndrome.[12] 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.[12]

The purpose of this paper is to examine the implementation of a smoking ban on a private university in Lebanon. Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has ~~not~~ only been implemented in 2012~~been implemented yet~~. In 2008, ~~However~~, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans. [13]- In May 2008, the American University of Beirut (AUB), a private university, decided to implement a non-smoking policy everywhere on campus encompassing student residence halls and all campus buildings except for private Faculty residences. Smoking

became restricted to designated areas only. The specific objectives of the study were to: 1) assess compliance with the ban; 2) assess changes in smoking behaviour after the ban; 3) examine student attitude and opinion towards the campus wide smoking ban and tobacco control measures in general; and 4) assess perceptions of barriers to implementation of the ban. ~~Our primary objective was to assess compliance and change in smoking behaviour after the ban. Our secondary objective was to assess student attitudes & opinions towards the campus wide smoking ban and tobacco control measures in general. Finally, our third objective was to assess perceptions of barriers to implementation of the ban.~~

Methods

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

Participants

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

selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each Faculty. All students attending chosen classes were approached and asked to complete the survey. 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.

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 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~~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 analyses were~~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~~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	%
Age group								
< 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
Gender								
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
Student's								

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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
Faculty								
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
Nationality								
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~~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 gender ~~sex~~

	Total		Males		Females	
Variable	n= 60	%	n= 39	%	n= 21	%
Smoking on campus						
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
Received a warning ticket for smoking by an officer on campus						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
Smoking frequency						
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

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~~only ~~-~~10.2% of regular smokers.

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	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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~~2~~ locations that exhibited no significant differences between regular smokers and non-smokers were health care facilities and elevators. Here most~~all~~ students agreed that they should be smoke-free with percentages exceeding 90%.

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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
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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	%
Extent students satisfied with the smoking ban*								
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
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AUB becoming an entirely smoke-free area*								
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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 in direct response to the banafter the ban. Therefore, we relied on self reportedself-reported change in 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 tobacco addiction. Another reason why the policy may have not affected smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[14] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[14] On the other hand,

universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more. While 20% of regular smokers reported that their smoking decreased, another 21.8% said that it actually increased following policy enforcement. The increase could be explained by two reasons: First, smokers might have intentionally reported an increase in their smoking frequency to deceive the researchers and to prove the inefficiency of the policy in reducing their smoking behavior. Second, smoking might have actually increased because since it is viewed as a "cool" and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]

This study has reported also on students' attitudes towards the implementation of the non-smoking policy at 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.[164] 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.[164] Similarly, a study by Loukas et al.[175] with students from 5 Texas colleges showed that non-smokers and experimental smokers compared to smokers were significantly less opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[175]

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

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, Faculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All of the above were considered obstacles with varying agreement between smokers and non-smokers. However, no other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective was found. Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts, compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[18~~6~~] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[18~~6~~]

~~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~~

tobacco addiction. A third reason why the policy may have not affected smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke-free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[17] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[17] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more.

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

First, smokers might have intentionally reported that their smoking increased to prove that the policy is an inefficient mean to reduce their smoking behavior and to deceive the researcher. Second, 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 tobacco addiction. A third reason why the policy may havedid not affected smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke-free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[17] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[17] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more.

Finally, students' attitude towards enforcing a non-smoking policy in public places in Lebanon also differed by smoking status. Regular smokers were more opposing to banning cigarette smoking in ministries, public institutions, workplaces, schools and university buildings etc. as mentioned above. The only 2 locations that smokers and non-smokers agreed on being smoke-free were health care facilities and elevators with percentages over 90%. This can be explained by the fact that health care

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~~facilities provide care for ill patients and smoking would clearly conflict with this purpose. Moreover, given that elevators are confined spaces and have limited air circulation, students most likely agreed that they should be smoke free so as to respect non-smokers' wishes in breathing in clean air. The results of this study go in parallel with are supported by research conducted in 2004 at AUB and funded by Research for International Tobacco Control (Canada) which showed that in general, there is positive support among young adults including university students for implementing and enforcing tobacco control policies (Afifi and Chaaya 2005). The least supported policy, however, was the ban of smoking in restaurants and entertainment places which parallels the research findings.~~

Conclusion

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An education campaign accompanying the policy might be more effective in further reducing current cigarette use; it will also increase smokers' conviction in its necessity. The university should also actively advertise its free smoking cessation services and implement more rigid enforcement measures as this was one of the barriers identified by students. In addition, an awareness based approach is important to illuminate the adverse effects of second hand smoking and to emphasize that non-smoking policies do not infringe on smokers' rights, rather they aim mostly at protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese parliamentary premises were declared a smoke free zone, with signs prohibiting smoking. This current law was embraced by all public places in Lebanon including schools and universities as of September 2012. [19~~8~~] This more universal ban will likely

increase the impact of AUB's policy as evidence has indicated that smoking prevalence and incidence is most impacted through implementation of comprehensive national policies.

Acknowledgments

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

Ethical approval

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

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Competing interests

None declared

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We would like to thank the reviewer again for her valuable comments. Kindly see below our response to each raised point.

I appreciate the layout of aims and reorganization of objectives in this new draft. It is much cleaner and clearer. I think it would be even easier for readers to process this information if the objectives were always listed in the same order in the Intro, Methods, Results and Discussion sections. Please consider.

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

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

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

ABSTRACT & INTRO SECTIONS:
The abstract lacks results of the 4th objective (students' perceptions/ostaterpinions of a general, off campus ban).

This is mentioned in the abstract lines 12-18.

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

Unclear whether your response rate was 100% or 98%. Page 7, line 40 states that 535 students were in the selected classes. Then it is mentioned that fewer than 2% declined to participate, which makes the reader assume at least SOME did not participate…yet on pg 7, line 52, the authors still report that 535 students were included in the final sample. Please clarify whether any declined to participate and what the response rate was.

535 students is the final sample size. We approached 545 (535 in addition to the 2% who refused to participate). Methods were edited to increase clarity.

Even a 98% response rate is unbelievably high. Please include if these students were paid or given credit for their participation.
Students were not paid nor given credit for their participation. This high response rate was expected given the setup of the data collection (classroom). In fact, other studies done at the American University of Beirut in the same context yielded similar high response rates.

METHODS SECTION:
Thanks for adding information regarding survey format (paper/pencil).

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

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

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

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

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

Done

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

This has been fixed

Pg 11, line 35: Its best practice to use "sex" or "gender" but not both (unless writing gender identity manuscripts). Please be consistent.

Gender was used throughout the paper

I wonder why there was a large difference between males (31.4%) and females (5%) regarding self reported increases in smoking after the ban (pg 11, lines 42-43). This was contrary to your expectations, but I don't find a discussion or analysis of these findings in the discussion section. Please include why you think that might be.

I don't have an explanation for the difference between males and females. However, the increase in general might be due to students wanting to deceive researchers and show them that the smoking ban is not effective. In fact an article states that:" attempting to use smoking bans to influence social norms may not represent wise policy. Sweeping smoking bans may actually increase the incidence of smoking. A large percentage of smokers acquire the habit at a young age, and they frequently do so because smoking is "cool." Smoking is cool, of course, because it is rebellious. The harder anti-smoking forces work to coerce people into quitting smoking, and the more they engage the government and other establishment institutions in their efforts, the more rebellious — and thus the "cooler" — smoking becomes". (Lambert, regulation winter 2006-2007).

We added a discussion on the reasons for increase in smoking in the discussion section.

Please organize the Discussion section to reflect the objectives in the same order as described previously. I felt the Discussion section was a bit chaotic and could benefit from discussing the 4-5 objectives in the same order as they were initially presented in the abstract/intro.

DONE . Now discussed is organized in the same order s the stated objectives

BMJ open

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

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Manuscript ID:	bmjopen-2012-002100.R3
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Date Submitted by the Author:	05-Mar-2013
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Primary Subject Heading:	Smoking and tobacco
Secondary Subject Heading:	Public health, Smoking and tobacco
Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, EPIDEMIOLOGY

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

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Article focus:

- To examine students' compliance and attitude 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 a university wide smoking ban. They should be 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.

Strengths and Limitations:

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 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

[9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10] Not only do non-smoking policies encourage smokers to decrease or even quit smoking, but they also protect smokers and non-smokers from the effects of secondhand smoking. 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.[11] Similarly, a smoke-free legislation in public places in Scotland was associated with a 17% decrease in admissions for acute coronary syndrome.[12] 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.[12]

The purpose of this paper is to examine the implementation of a smoking ban on a private university in Lebanon. Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has only been implemented in 2012. In 2008,, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans. [13] In May 2008, the American University of Beirut (AUB), a private university, decided to implement a non-smoking policy everywhere on campus encompassing student residence halls and all campus buildings except for private Faculty residences. Smoking became restricted to designated areas

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

Methods

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

Participants

A cross sectional study was conducted at AUB, the largest private university in Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs, and currently enrols around 7500 students from 69 countries. A random sample of classes being offered in the spring semester of academic year 2008/2009 was selected to recruit participants; a total of 545 students were registered in those classes. None of the instructors refused to allow recruitment in their classrooms. The selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each Faculty. All students attending chosen classes were approached and asked to complete the survey.

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	%
Age group								
< 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
Gender								
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
Student's 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
Faculty								
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
Nationality								
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

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

Smoking on campus						
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
Received a warning ticket for smoking by an officer on campus						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
Smoking frequency						
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
Extent the ban helps smokers reduce smoking*								
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Extent the ban helps								

smokers in quitting smoking*								
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	%
Extent students satisfied with the smoking ban*								
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
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Extent students consider the ban justified*								

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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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
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Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
Extent the ban helps smokers in quitting smoking*								
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.

Therefore, we relied on self-reported change in 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 tobacco addiction. Another reason why the policy may have not affected smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[14] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[14] On the other hand, universities which implemented other tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more. While 20% of regular smokers reported that their

smoking decreased, another 21.8% said that it actually increased following policy enforcement. The increase could be explained by two reasons: First, smokers might have intentionally reported an increase in their smoking frequency to deceive the researchers and to prove the inefficiency of the policy in reducing their smoking behavior. Second, smoking might have actually increased because since it is viewed as a "cool" and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]

This study has reported also on students' attitude towards the implementation of the non-smoking policy at 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.[16] 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.[16] Similarly, a study by Loukas et al.[17] with students from 5 Texas colleges showed that non-smokers and experimental smokers compared to smokers were significantly less opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[17]

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

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, Faculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All of the above were considered obstacles with varying agreement between smokers and non-smokers. However, no other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective was found. Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts,

compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[18] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[18]

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Conclusion

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

and incidence is most impacted through implementation of comprehensive national policies.

Acknowledgments

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Ethical approval

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

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Competing interests

None declared

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

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Article focus:

- To examine students' compliance and attitude 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 a university wide smoking ban. They should be 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.

Strengths and Limitations:

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 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

[9-10] and second hand exposure to non-smokers. [11-12]. A review of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany showed that smoke-free workplaces are associated with decreased smoking prevalence and less cigarette consumption among smokers.[9] Similarly, a nationally representative sample of college students in different U.S. colleges showed that residents of smoke-free housing had a significantly lower smoking prevalence than students living in residences which permit smoking.[10] Not only do non-smoking policies encourage smokers to decrease or even quit smoking, but they also protect smokers and non-smokers from the effects of secondhand smoking. 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.[11] Similarly, a smoke-free legislation in public places in Scotland was associated with a 17% decrease in admissions for acute coronary syndrome.[12] 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.[12]

The purpose of this paper is to examine the implementation of a smoking ban on a private university in Lebanon. Although Lebanon ratified the World Health Organization Framework Convention on Tobacco Control in 2005 which proposes a complete ban on indoor smoking, such a policy has only been implemented in 2012. In 2008,, a few workplaces, hospitality venues, and educational institutions have voluntarily introduced smoking bans. [13] In May 2008, the American University of Beirut (AUB), a private university, decided to implement a non-smoking policy everywhere on campus encompassing student residence halls and all campus buildings except for private Faculty residences. Smoking became restricted to designated areas

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

Methods

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

Participants

A cross sectional study was conducted at AUB, the largest private university in Lebanon and extending over 73 acres in the capital city. Founded in 1866 by American missionaries, AUB comprises six Faculties, over 100 undergraduate/graduate programs, and currently enrols around 7500 students from 69 countries. A random sample of classes being offered in the spring semester of academic year 2008/2009 was selected to recruit participants; -a total of 545 students were registered in those classes. None of the instructors- refused to allow recruitment in their classrooms. The selection of classes was based on a stratified cluster design whereby a proportionate sample of classes was chosen from all six Faculties based on the size of each Faculty. All students attending chosen classes were approached and asked to complete the survey. ~~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.~~

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, ~~F~~ 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	%
Age group								
< 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
Gender								
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
Student's 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
Faculty								
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
Nationality								
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

	Total		Males		Females	
Variable	n= 60	%	n= 39	%	n= 21	%
Smoking on campus						
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
Received a warning ticket for smoking by an officer on campus						
No	48	82.8	29	78.4	19	90.5
Yes	10	17.2	8	21.6	2	9.5
Smoking frequency						
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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

Extent the ban helps smokers reduce smoking*								
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
Extent the ban helps smokers in quitting smoking*								
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

	Total		Regular Smokers		Occasional and Ex-Smokers		Non-smokers	
Attitude	n= 535	%	n= 60	%	n= 59	%	n= 416	%
Extent students satisfied with the smoking ban*								
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
Extent students consider the ban justified*								
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
AUB becoming an entirely smoke-free area*								
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
Extent the ban helped in creating a healthy environment*								
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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
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Not at all/ Not sure	185	35.0	35	60.3	27	45.8	123	29.8
Extent the ban helps smokers in quitting smoking*								
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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	%
Extent students satisfied with the smoking ban*								
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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AUB becoming an entirely smoke-free area*								
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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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. Therefore, we relied on self-reported change in 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 tobacco addiction. Another reason why the policy may have not affected smoking behavior as intended could be that the implementation of AUB's smoking ban was not reinforced by a national smoke free policy in public places across Lebanon, so as soon as students left the campus, they would go back to their usual habits. Moreover, the policy was not accompanied by an educational campaign to raise awareness regarding the harmful effects of smoking on one's health. A study by Borders et al.[14] covering undergraduate students at12 colleges or universities in Texas, showed that compared to different college-level policies and programs, only the presence of preventive education programs on campus was associated with lower odds of current cigarette use.[14] On the other hand, universities which implemented other

tobacco control policies such as smoking cessation programs and having designated smoking areas were not effective in curbing students' smoking behavior. For example, the latter two policies / programs were associated with higher odds of smoking in the study. Thus, as the authors concluded, implementing strict policies may not be the best way to decrease students' smoking rates, prevention and education programs might be just as important if not more. While 20% of regular smokers reported that their smoking decreased, another 21.8% said that it actually increased following policy enforcement. The increase could be explained by two reasons: First, smokers might have intentionally reported an increase in their smoking frequency to deceive the researchers and to prove the inefficiency of the policy in reducing their smoking behavior. Second, smoking might have actually increased because since it is viewed as a "cool" and rebellious behavior, the more it is prohibited, the cooler smokers look.[15]

This study has reported also on students' attitude towards the implementation of the non-smoking policy at 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.[16] 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.[16] Similarly, a study by Loukas et al.[17] with students from 5 Texas colleges showed that non-smokers and experimental smokers compared to smokers were significantly less opposed to implementing a smoking ban in all buildings and having an entirely smoke-free campus.[17]

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

Barriers to implementation of the smoke free policy at AUB, as identified by students, were: lack of compliance of some students, Faculty, and staff; having too few or too crowded smoking areas; and the lack of strict enforcement of the non-smoking policy. All of the above were considered obstacles with varying agreement between

smokers and non-smokers. However, no other published study that looked at barriers to the implementation of a non-smoking policy from a student's perspective was found. Although the lack of compliance was viewed as a barrier, in reality the majority of regular smokers (73%) abided by it. This may be due to the fact that students risked receiving a warning if they were smoking in prohibited areas. In other contexts, compliance has been shown to pose a significant threat to the effective implementation of non-smoking policies. Harris et al.[18] conducted a study to identify efficient strategies that will increase compliance of students to a college campus smoking ban. An intervention consisting of moving smoking receptacles, drawing ground markings and putting more signs regarding the non-smoking policy, as well as distributing reinforcements and reminder cards led to a significant increase in compliance from 33% to 74% within the intervention week and remained at 54% during follow-up.[18]

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Conclusion

An education campaign accompanying the policy might be more effective in further reducing current cigarette use; it will also increase smokers' conviction in its necessity. The university should also actively advertise its free smoking cessation services and implement more rigid enforcement measures as this was one of the barriers identified by students. In addition, an awareness based approach is important to illuminate the adverse effects of second hand smoking and to emphasize that non-smoking policies do not infringe on smokers' rights, rather they aim mostly at protecting non-smokers from breathing in tobacco toxins. Recently Lebanon has passed

a law prohibiting smoking in public places. As of March 6, 2012 the Lebanese parliamentary premises were declared a smoke free zone, with signs prohibiting smoking. This current law was embraced by all public places in Lebanon including schools and universities as of September 2012. [19] This more universal ban will likely increase the impact of AUB's policy as evidence has indicated that smoking prevalence and incidence is most impacted through implementation of comprehensive national policies.

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Ethical approval

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

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Competing interests

None declared

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