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Source: Environmental Health Insights, 14(1)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/1178630220972957

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# Change in Compliance of Staff at 4 Vietnam Universities after the Enactment of Smoke-free Environment Decree

Environmental Health Insights
Volume 14: 1–8
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DOI: 10.1177/1178630220972957

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## ABSTRACT

**BACKGROUND:** The Tobacco Control Law in Vietnam was adopted in 2012 and came into force from May 2013, followed by a number of guiding sub-law legal documents. Smoke-free campus policy in university is considered an important measure to protect people from secondhand smoking as well as staffs and students will be in favour of the policy. Furthermore, there has been evidence suggested that smoke-free policy had positive impact on active smoking as well as anti-smoking attitude.

**METHODS:** A cross-sectional self-administered study of staff at 4 universities were conducted in 2 phases, Phase 1 as early introduction of the Law (n = 900) and Phase 2 as 1-year post (n = 885). Demographics, tobacco consumption, compliance status and compliance with awareness towards the campus smoking regulations were assessed in both phases.

**RESULTS:** Daily smoking prevalence decreased significantly ($P < .05$) 1 year after implementing the smoke-free policy, while a significant increase in occasional smoking ($P < .01$). Compliance of staff to the regulation the campus should be indoor smoke-free was significantly increase at Phase 2 compared to Phase 1, however participants reported there would be places on campus that smokers frequently violated the smoke-free regulations.

**CONCLUSIONS:** The study indicated a significant positive change in compliance of staff at the 4 universities after the implementation of the Tobacco Control Law, included the smoke-free policy. Although the prevalence of tobacco smoking in this study was low, the proportion of respondents who reported to reduce infringement the smoke-free policy suggests support for staff smokers would be beneficial. Raising awareness and enforcement is likely to enhance the long-term outcomes of the implementation of smoke-free environment.

**KEYWORDS:** Smokefree, compliance, staff, university, Viet Nam

**RECEIVED:** February 22, 2020. **ACCEPTED:** October 13, 2020.

**TYPE:** Environmental Health Research and Practice in Vietnam – Original Research

**FUNDING:** The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study received partially finance support of University of Queensland.

**DECLARATION OF CONFLICTING INTERESTS:** The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Introduction

It is claimed that smoke-free policy is among the important measures to protect population health, especially non-smokers, from harmful effects of tobacco consumption.[1] Worldwide, total ban of smoking in workplaces and public places was estimated to prevent 1.5 billion people in 55 countries from exposure with tobacco smoke in 2017.[2] Recently, there has been a growing body of evidence on the effects of smoke-free regulations on both active and second-hand smoking (SHS). Callinan et al,[3] in a systematic review, claimed that evidence of smoke-free policies' impact on reducing SHS exposure in workplaces and public places was consistent. In the update version of the review, it was indicated that smoking related deaths and cardiovascular conditions has been cut down by the introduction of the smoke-free regulations.[4] Available evidence led to the conclusion that population health would be improved by enforcing the smoke-free regulations which reduce SHS and related morbidities. Nevertheless, evidence of the association between introduction of smoke-free legislation and mortality, or with the change in active smoking was weak and inconsistent.[4]

Smoking is affecting various vulnerable groups in Vietnam. Young Vietnamese living in a family with smokers were more likely to be exposed to passive smoking[5] and affect their physical health[6] and mental health.[7] There was a high proportion of second-hand smoking (SHS) exposure among non-smoking pregnant women in Vietnam.[8] In Vietnam, being male and having hazardous drinking habits and a poor quality of life were all factors that were significantly associated with smoking status.[9] The primary reason for smoking relapse was surrounding smoking environments.[10]

Vietnam signed the Framework Convention on Tobacco Control in 2004 and its government later issued a number of smoke-free policies in different sectors including education, health and transportation. The Tobacco Control Law was adopted in 2012 and came into force from May 2013, followed by a number of guiding sub-law legal documents including the Decree 176/ND-CP/2013 to instruct the implementation of

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the Law. Findings from the 2 Global Adult Tobacco Surveys (GATS) in Vietnam in 2010 and 2015 indicated that there had been significant improvement in controlling secondhand smoking in indoor workplaces and public places in 5 years. Similarly, smoke-free campus policy in university is considered an important measure to protect people from SHS and become more popular. Recent literature indicated both faculties, staffs and students were in favour of the policy.[11,12] Furthermore, there has been evidence suggested that smoke-free policy had positive impact on active smoking as well as anti-smoking attitude.[13] Evidence, however, is currently limited in developing countries including Vietnam in the context that the current Law regulates university campuses to be partial, not complete, smoke-free areas.

As the matter of fact, there are a wide range of challenges in implementing and enforcing smoke-free regulations in university campus in Vietnam and over the world. According to WHO statistics, only 27% of smoking ban in university at national level was rated at the highest level of compliance, which implied implementation of smoking ban in university is among the most challenging sector.[2] In Vietnam, exposure to SHS in university reduced significantly between 2010 and 2015, which were reported by 54.3% and 37.9% of the respondents, respectively.[14,15]

There are several enablers to ensure the success of smoke-free legislation rather than introduction of the policy itself. The World Health Organization (WHO) address mass media campaign, enforcement agency, adequate funding, penalties and regular monitoring as the most important factors that determine the enforcement of smoke-free policy.[2] Specifically, raising awareness and collecting of signature in favour of the policy, appointing enforcers, issuing fines for infringements were among the most successful enforcement strategies.[16] Nevertheless, little is known about those factors in Vietnam. This survey sought to examine improvement in compliance of staff regarding smoke-free environments 1 year after the Tobacco Control Law and Guiding Decree 176/ND-CP/2013 enactment and identify the factors affecting smoke-free policy implementation and changes in compliance of staff.

## Methods

### *Study design*

The study applied a mixed method approach. In essence, the study was based on case study methodology,[17,18] in which a series of case studies undertaken in 4 universities in Vietnam involving multi-actor involvement was used to collect data on the factors affecting the implementation of smoke-free environments

In order to assess changes in employees' conformity to the smoke-free regulation before and after the introduction of the TC law and the decree 176/ND-CP/2013, a quasi-experimental designed survey was implemented in 2 main phases: Phase 1, early introduction of the Law and its legal guideline, from December 2013 when Decree 176/ND-CP/2013 was issued (notionally before the intervention); and Phase 2, conducted 1 year after Phase 1.

### *Study location*

The study included 4 universities which located across 3 major geographic regions of Vietnam (the University of Thai Nguyen and Foreign Trade University (FTU) in the North; the University of Hue in the Centre and the University of Dong Thap in the South). Those universities were chosen to represent different scales of university: regional and multisectoral university (university of Hue), provincial multisectoral university (university of Dong Thap) and sectoral university (FTU and HUPH).

### *Sample and sampling procedure*

Respondents were current staff at the universities (lecturer or administration staff and others such as technical staff, security) and could be either smokers or nonsmokers.

Sample size was calculated for each university to compare prevalences before and after the regulation. The convenient sampling was used and samples were collected by staff of the Department of Students Affairs at the 4 universities, due to limited resources in terms of personnel and time. Staff were selected for participation on the basis of their availability. Totally 900 and 885 respondents were recruited based on their working department in phase 1 and 2, respectively. The respondents at 2 phases of the study were similar in characteristics. Regarding the qualitative survey, staff were selected and invited for in-depth interview based on their working positions at the universities.

### *Study measures*

Compliance of staff was assessed by main variables as following: current smoking situation, attitude regarding SHS together with compliance with policy and compliance together with recognition of violations in the university setting.

Quantitative data was collected in both Phase 1 and Phase 2 by staff of Department of Students Affairs at the 4 universities, while qualitative data was gathered to enrich the quantitative data. Previous questionnaires on SHS exposure, and support and compliance for smoke-free policies from previous studies were used to develop self – administered quantitative questionnaires for the study.[13,14] Regarding qualitative questionnaires, the basis of the main aforementioned variables were principles to develop guidelines for in-depth interviews with staff as well as the key points for the assessment of the development and implementation of smoke-free policy were involved.[19-22]

### *Analytical approach*

Data was analysed using SPSS 18.0 software. The main indicators were explored through descriptive statistics. Chi-square tests were used to examine differences between proportions for

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**Table 1.** Demographics at phase 1 and phase 2 among the 4 universities.

| | UNIVERSITY OF HUE | | FOREIGN TRADE UNIVERSITY | | UNIVERSITY OF DONG THAP | | UNIVERSITY OF THAI NGUYEN | |
|---|---|---|---|---|---|---|---|---|
| | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 |
| Gender | | | | | | | | |
| °Male | 90 | 126 | 70 | 50 | 148 | 109 | 107 | 89 |
| | 52.3%* | 42.6%* | 35.7%* | 24.9%* | 49.2% | 55.1% | 53.8% | 46.8% |
| °Female | 82 | 170 | 126 | 151 | 153 | 89 | 92 | 101 |
| | 47.7%* | 57.4%* | 64.3%* | 75.1%* | 50.8% | 44.9% | 46.2% | 53.2% |
| Occupation | | | | | | | | |
| °Lecturer | 110 | 146 | 113 | 139 | 195 | 103 | 104 | 80 |
| | 63.6%* | 50.7%* | 57.4%* | 73.2%* | 61.7% | 52.8% | 52.8% | 43.7% |
| °Administrative staff | 47 | 101 | 64 | 47 | 108 | 85 | 83 | 93 |
| | 27.2% | 35.1% | 32.5% | 24.7% | 34.2%* | 43.6%* | 42.1% | 50.8% |
| °Technical staff | 8 | 33 | 10 | 3 | 6 | 3 | 9 | 2 |
| | 4.6% | 11.5%* | 5.1% | 1.6% | 1.9% | 1.5% | 4.6%* | 1.1%* |
| °Security | 7 | 6 | 8 | 1 | 2 | 0 | 0 | 7 |
| | 4.0% | 2.1% | 4.1%* | 0.5%* | 0.6% | 0% | 0%* | 3.8%* |
| °Others | 1 | 2 | 2 | 0 | 5 | 4 | 1 | 1 |
| | 0.6% | 0.7% | 1.0% | 0% | 1.6% | 2.1% | 0.5% | 0.5% |
| Age | | | | | | | | |
| °Mean (SD) | 30.9 (6.9) | 33.4 (6.9) | 33.1 (6.4) | 32.6 (5.7) | 34.6 (8.6) | 34.5 (7.7) | 32.9 (8.8) | 34.0 (8.2) |

*$P < .05$.

the phase to phase changes. The P values less than 0.05 were considered significant.

Qualitative data was analysed manually. Major themes and subthemes were identified through examination, comparison, and arrangement of data. The qualitative data were used to enrich the quantitative data.

## Ethical Clearance

All respondents were adults and voluntarily participating in the study. Participants were given an information sheet about the research and their rights to voluntarily participate or refuse. The consent was included in the questionnaire on the first page. All personal information is accessible only to the principal investigator and supervisors. Data are secured in safe storage that is only accessed by principal investigator. All transcripts are kept separately and only accessed by the study team. The information was coded and entered into a computer. All computerised data and transcripts are kept confidential, and only the study team had access to them. Ethical clearance requests were submitted to the Hanoi School of Public Health Ethics Committee and the University of Queensland Ethics Committee, and approvals obtained: from HSPH (No 127/2013/YTCC – HD3 on 26 April 2013) and UQ (Approval number 2013000614 on 14 May 2013).

## Results

### *General characteristics*

Table 1 describes the characteristics of respondents (gender, occupation and age) who were current staff at the time of each phase. There was no systematic evidence that demographic trends across the study phases changed differently.

At the University of Hue, in total 474 staff completed the questionnaire with 178 staff in Phase 1 and 296 in Phase 2 respectively. The number of staff from the Foreign Trade University who completed the survey for Phase 1 was 200 and for Phase 2 was 201. The total number of staff at the University of Dong Thap who completed the questionnaire for Phase 1 was 322, while the number for Phase 2 was 198. In total, there were 200 staff from the University of Thai Nguyen who completed the questionnaire in Phase 1 and 190 in Phase 2. The proportions of male and female staff between Phase 1 and Phase 2 were significantly different ($P < .05$) at the University of Hue and FTU, while these values were equal at the University

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of Dong Thap and the University of Thai Nguyen. At all 4 universities and for both phases, lecturers were the most common group of respondents. The mean age of respondents was above 30.

### *Smoking among staff*

Use of tobacco was significantly different between Phase 1 and Phase 2 regarding daily smoking and occasional smoking. Combined smoking data at the 4 universities shows a significant reduction in daily smoking ($P < .05$) and a significant increase in occasional smoking ($P < .01$). Daily smoking reduced from 8.9% to 6%, while occasional smoking increased from 1.9% to 7.3%. The Universities of Hue and Thai Nguyen had the highest prevalence smokers among staff in Phase 1. In Phase 2, at both universities there was a reduction in daily smoking and an increase in occasional smoking (see Table 2).

### *Change in compliance after the enaction of Tobacco Control Law and implementation of the university's policy*

This study showed reductions in the percentage of staff smokers who reported smoking at their universities during the 30 days prior to data collection at all 4 universities over the 2 time periods (see Table 3). Although, a significant decrease ($P < .05$) was only found at the University of Dong Thap (88.9% in Phase 1 and 60.9% in Phase 2, respectively). The combined results from all 4 universities found a significant reduction ($P < .05$) in the percentage of staff smokers who reported smoking at the universities during the 30 days prior to data collection.

Table 4 lists where staff smokers reported smoking during the 30 days prior to data collection for the 2 study phases. Among all the places included in the questionnaires, the corridors and cafeterias/canteens were common areas where the highest rates of non-compliant indoor smoking reported. Very few staff smokers reported smoking in staff offices, dormitories and meeting rooms.

The combined results illustrated a significant decrease in the percentage of smokers who reported smoking in corridors and cafeterias/canteens over Phase 1 to Phase 2. Especially at corridors, the reduction at the University of Hue was significant ($P < .01$), while there were non-significant decreases at the FTU and Dong Thap.

At the University of Hue, the percentage of staff smokers who reported that they smoked on the roofs of buildings increased from 14.3% in Phase 1 to 23.7% in Phase 2; the increase appears large, but was not significant. The reported percentage of smoking in restrooms decreased at the FTU, and increased at the universities of Dong Thap, Thai Nguyen and Hue; but no statistical changes were explored. Smoking was rare in meeting rooms in both Phase 1 and Phase 2.

Table 5 shows significant evidence ($P < .001$) that there was association between acknowledge of staff smokers that indoor

**Table 2.** Smoking status at phase 1 and phase 2 among the 4 universities.

| LOCATION | UNIVERSITY OF HUE | | FOREIGN TRADE UNIVERSITY | | UNIVERSITY OF DONG THAP | | UNIVERSITY OF THAI NGUYEN | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 |
| Daily smoker | 24 | 18 | 10 | 7 | 24 | 15 | 22 | 13 | 80 | 53 |
| | 13.5%* | 6.1%* | 5.0% | 3.5% | 7.5% | 7.6% | 11.0% | 6.8% | 8.9%* | 6.0%* |
| Occasional smoker | 4 | 41 | 2 | 6 | 3 | 8 | 8 | 10 | 17 | 65 |
| | 2.2%* | 13.9%* | 1.0% | 3.0% | 0.9%* | 4.0%* | 4.0% | 5.3% | 1.9%** | 7.3%** |
| Nonsmoker | 127 | 215 | 173 | 184 | 276 | 163 | 165 | 160 | 741 | 722 |
| | 71.3% | 72.6% | 86.5% | 91.5% | 85.7% | 82.3% | 82.5% | 84.2% | 82.3% | 81.6% |
| Do not know | 23 | 22 | 15 | 4 | 19 | 12 | 5 | 7 | 62 | 45 |
| | 12.9% | 7.4% | 7.5% | 2.0% | 5.9% | 6.1% | 2.5% | 3.7% | 6.9% | 5.1% |

*$P < .05$. **$P < .01$.

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**Table 3.** Staff smokers who reported that they smoked at the university during the 30 days prior to data collection.

| UNIVERSITY | PHASE 1 | PHASE 2 |
|---|---|---|
| University of Hue | 20 | 36 |
| | 71.4 | 61.0 |
| Foreign Trade University | 6 | 6 |
| | 50.0 | 46.2 |
| University of Dong Thap | 24 | 14 |
| | 88.9* | 60.9* |
| University of Thai Nguyen | 25 | 19 |
| | 83.3 | 82.6 |
| Total | 75 | 75 |
| | 77.3* | 63.6* |

*$P < .05$.

smoking never allowed in the university and compliance by staff. The number of staff smokers who smoked at the university in the last 30 days was significantly lower among staff who have knowledge regarding the university's smoke-free regulation.

Results from qualitative data supported the quantitative data about smoking behaviour and compliance of staff at universities. Results from qualitative study also show improvement of compliance at University of Hue, Dong Thap, but violation at University of Thai Nguyen.

*In the past after finishing each lecture, the lecturers went to lecturers' rooms and smoked there. Now I can see no one smoke in lecturers' rooms. If they miss smoking cigarettes, then they go out and smoke under a tree, outdoors, so I think they [staff smokers] have changed.*

**Staff, Student Affairs Committee, University of Hue**

*In the past if they [staff smokers] have lectures for 3 hours, then they will have a short break and smoke outside of class, or they even stopped lecturing and smoked a cigarette. But now they need to go to lecturers' rooms, but they cannot smoke there, just have some drink, so they need to go out, so the number of cigarettes smoked per day has reduced.*

**Smokers, University of Hue**

*According to my opinion, students comply with the regulation very well, but there are still some staff smoking at the university, even though the Dean reminded them several times during meetings. But the Trade Union and the Department of Justice still do not have punishment mechanisms because it was sensitive. . . they normally smoked in the restrooms.*

**Staff, University of Dong Thap**

*I saw them [staff] leave their room and smoke outside in the corridors.*

**Security, University of Dong Thap**

*We can say they still smoke, because we have not implemented [the regulation] strictly. You can go to visit some of the offices in here and you can smell cigarette smoke easily.*

**Staff, Justice and Competition Committee, University of Thai Nguyen**

## Discussion

Using the classification of the smoke-free policy types outlined in a Californian study by Fallin et al,[23] the 4 universities involved in this study had adopted the following types of policy: smoke-free policy (University of Dong Thap); outdoor-designated-smoking-areas policy (universities of Hue and Thai Nguyen); and no policy (just the Tobacco Control Law) (the FTU). Fallin et al[23] found that the more comprehensive the policy, the higher the level of compliance.

In terms of smoke-free policy development, the University of Dong Thap is at the routinisation stage, with a smoke-free policy issued in 2006 as part of an intervention project. The smoke-free policy was widely disseminated through various means of communication, but it had no enforcement mechanism. The University of Hue, which is in a 'smoke-free tourism city', is moving from the adoption stage to the planning stage, and currently has an outdoor-designated-areas smoking policy. While the university has assigned taskforces for policy implementation, it has provided no guidance to the taskforces and no enforcement of penalties. Compared to the universities of Dong Thap and Hue, the University of Thai Nguyen has the weakest prior exposure to nonsmoking policy (the 'Organisational Culture' code of conduct issued by the provincial government). The University of Thai Nguyen is at the policy adoption stage, with university smoke-free policy only issued in early 2015. This policy has provision for taskforce development that is, as yet, not operationalised. The FTU is not yet at the adoption stage, and relies only on the national Tobacco Control Law.

### *Change in prevalence of tobacco smoking*

Prevalence of tobacco smoking among staff in this study was much lower than for the general adult population in Vietnam (daily smoking 28.5% in 2010).[19] The lower prevalence is due to the fact that comorbid substance abuse is less common in university lecturers than other populations in Vietnam.[24,25] Nonetheless, these findings are consistent with previous studies conducted at university sectors, as the prevalence of smoking is lower among people with higher levels of education. Whereas, most of the study population had higher levels of education than the general population.[19]

A shift from daily to occasional smoking among staff smokers were reported in this study. Occasional smoking has been viewed as a condition between daily smoking and quitting. This finding could be explained as a number of daily smokers reduced the frequency of smoking during the study period.

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**Table 4.** Locations where staff smokers smoked during the 30 days prior to data collection.

| LOCATION | UNIVERSITY OF HUE | | FOREIGN TRADE UNIVERSITY | | UNIVERSITY OF DONG THAP | | UNIVERSITY OF THAI NGUYEN | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 | PHASE 1 | PHASE 2 |
| Corridor | 14 | 12 | 4 | 4 | 13 | 5 | 15 | 14 | 46 | 35 |
| | 50.0** | 20.3** | 33.3 | 30.8 | 48.1 | 21.7 | 50.0 | 63.6 | 47.4* | 29.9* |
| Cafeteria/canteen | 17 | 25 | 2 | 2 | 17 | 12 | 14 | 6 | 50 | 45 |
| | 60.7 | 42.4 | 16.7 | 15.4 | 63.0 | 52.2 | 46.7 | 26.1 | 51.5* | 38.1* |
| Roof of building | 4 | 14 | 0 | 0 | 0 | 0 | 2 | 1 | 6 | 15 |
| | 14.3 | 23.7 | 0 | 0 | 0 | 0 | 6.7 | 4.3 | 6.2 | 12.7 |
| Restroom | 4 | 8 | 1 | 0 | 2 | 5 | 2 | 3 | 9 | 16 |
| | 14.3 | 13.6 | 8.3 | 0 | 7.4 | 21.7 | 6.7 | 13.0 | 9.3 | 13.6 |
| Meeting room | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| | 3.6 | 3.4 | 0 | 0 | 0 | 0 | 0 | 0 | 1.0 | 1.7 |
| Staff office | 4 | 1 | 0 | 1 | 1 | 1 | 2 | 5 | 7 | 8 |
| | 14.3 | 1.7 | 0 | 7.7 | 3.7 | 4.3 | 6.7 | 21.7 | 7.2 | 6.8 |
| Dormitory | 2 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 4 | 3 |
| | 7.1 | 5.1 | 8.3 | 0 | 0 | 0 | 3.3 | 0 | 4.1 | 2.3 |

*$P < .05$. **$P < .01$.

**Table 5.** Association between staff smokers' compliance and their knowledge of the university's smoke-free regulation, phase 2.

| SMOKED AT THE UNIVERSITY IN THE LAST 30 DAYS | ACKNOWLEDGE THAT INDOOR SMOKING NEVER ALLOWED IN THE UNIVERSITY | | TOTAL |
|---|---|---|---|
| | YES | NO | |
| Yes | 45 | 30 | 75 |
| | 51.1*** | 90.9*** | 62.0 |
| No | 43 | 3 | 46 |
| | 48.9 | 9.1 | 38.0 |
| Total | 33 | 88 | 121 |
| | 100 | 100 | 100 |

***$P < .001$.

That made the percentage of daily smoking decreased, and spontaneously increased the percentage of occasional smokers.

### *Change in compliance*

In general, the percentage of staff who reported smoking indoors on the campus decreased in all 4 universities over the 2 time periods. The University of Thai Nguyen had the highest percentage of smokers who infringed the Law or the internal policy, followed by the universities of Dong Thap, Hue, and the FTU. The university of Dong Thap was the only university recorded with a significant decrease in the number of staff smokers who smoked at the university during the 30 days prior to data collection. This finding is consistent with the comprehensive policy of the university of Dong Thap.[23]

Staff reported smoking most frequently in cafeterias/canteens, corridors, and restrooms (in order of decreasing frequency). The Vietnamese Tobacco Control Law prohibits indoor smoking at universities. 'Indoor' is defined in the legislation as all areas with a roof, or any wall. Hence corridors and cafeterias/canteens are indoor areas; however, these areas are generally considered as places for social contact, and were not considered as 'indoor' by smokers.

Changes in policy awareness were positive between Phase 1 and Phase 2, which has statistical association with positive changes in compliance of staff. This finding suggests that a comprehensive range of strategies is important for the successful implementation of smoke-free policy, such as raising awareness and consistent enforcement. Marsh et al[26] suggested that compliance with the smoke-free policy should not be voluntary. Their study raised that the regulations should be enforced, potentially by campus security.[26]

The university is a challenging yet important setting for the implementation of smoke-free environment. Whereas, universities also provide a range of social experiences which have the potential to influence smoking initiation and maintenance as well as providing an ideal setting to positively affect health behaviours, specially tobacco consumption.[27]

### *Limitations*

The proportion of smokers who participated in this study was low, while similar to other studies is a limitation, may be due to under-reporting. The authors did not have direct control of the sampling process and relied on staff in the Departments of Student Affairs to use the sampling protocols provided by the authors. Therefore, the sample was selected from conveniently available subjects. Additionally, pair sampling of identified individuals in both Phase 1 and Phase 2 would have allowed the measurement of individual change and the use of multiple regression for data analysis. However, the logistics of administering the questionnaires by the Departments of Student Affairs did not permit this method of sampling.

## Conclusion

The study indicated a significant positive change in compliance of staff at the 4 universities after the implementation of the Tobacco Control Law, included the smoke-free policy. Additionally, this study found a significant reduction in daily smoking among staff smokers. Although the prevalence of tobacco smoking in this study was low, the proportion of respondents who reported to reduce infringement the smoke-free policy suggests support for staff smokers would be beneficial. Raising awareness and enforcement is likely to enhance the long-term outcomes of the implementation of smoke-free environment.

## Recommendations

Universities should maintain their awareness raising, education and enforcement activities.

## Author Contribution

NBN, MC, MC, KJ and HLV conceived and designed the study, agreed with the results, conclusions and came up with arguments for this manuscript. NBN, VT and MTN analysed the data and wrote the first draft of the paper. All the authors

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made critical revision and agreed on the final version of the manuscript. NBN, MTN and MC reviewed the final manuscript and approved it for submission.

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