

Factors Influencing Chinese Students' Smoking: The Role of Overseas Study and Social Networks

Xin Li¹, Yixiao Wang[#] and Wei Yang[#]

¹King's College London, United Kingdom

[#]Advisor

ABSTRACT

This study explores how the smoking behaviours of UK-based Chinese students are influenced by their social networks, particularly their friends and family members. It addresses an empirical gap by testing the validity of three social network mechanisms: person-to-person contact, social support, and social stress. Additionally, it examines how studying abroad affects smoking behaviours by comparing these behaviours with those of Chinese students in China. The analysis is based on original survey data from 224 Chinese undergraduate students. The results show significant positive associations between the likelihood of a student smoking and the prevalence of tobacco use among their friends and family members. Students whose friends disapproved of smoking were significantly less likely to be smokers. Among current non-smokers, family members' approval of smoking increased the likelihood of non-smokers intending to start smoking. This study contributes to identifying the social factors that require the most attention to mitigate university students' exposure to tobacco consumption.

Introduction

The tobacco epidemic remains one of the world's gravest public-health threats (IHME, 2019). As the world's largest producer and consumer of tobacco, China is especially affected by the tobacco epidemic (WHO, 2022). The average age of smoking initiation has fallen, and many students adopt smoking habits while attending university (Cronk and Piasecki, 2010). These students' health choices occur during an important transition between adolescence and adulthood, where behaviours are more likely to consolidate as lifetime patterns with long-term consequences (Sa et al., 2013).

Previous research finds that approximately 10% of Chinese international students are smokers, as opposed to just 5% of Chinese domestic students (CRCS, 2018). While studying abroad, students experience difficult social and environmental changes, located far from friends, family members, and more-familiar culture—all of which shape university students' smoking behaviours (Coleman, 2004). For Chinese international students, the UK is now the destination of choice, even surpassing the US (Textor, 2022). Against this background, the objective of this research is to explain the exceptionally high smoking prevalence of Chinese international students in the UK, as compared with Chinese domestic students, by assessing the influence of social networks and living abroad.

Social Networks, Living Abroad, and Smoking

“Social networks” are collections of nodes connected by one or more kinds of relations, such as friendship and kinship (Marin and Wellman, 2011). Previous literature identifies three main mechanisms through which social networks influence health behaviours: 1. person-to-person contact; 2. social support; 3. social stress (Berkman et al., 2000; Nichter et al., 2007; Thomeer et al., 2019). These three mechanisms are vital in the initiation, maintenance, and cessation of smoking behaviours (Burgess-Hull et al., 2018).

Regarding the first mechanism, person-to-person contact, social networks can generate a process of smoking “contagion”, explaining why people surrounded by smokers (such as friends) are more likely to begin smoking or, if they already smoke, are less likely to cease smoking (Burgess-Hull et al., 2018; Margolis and Wright, 2016). For example, friends influence students’ smoking behaviours: Males with a friend who smokes are themselves 7.1 times more likely to smoke, while females are 4.7 times more likely to smoke given the same circumstances (Saari et al., 2014). Families’ effects on smoking behaviours are also visible through the person-to-person contact mechanism (Thomeer et al., 2019; Mao et al., 2009). Children routinely have prolonged contact with their family members, and any family member who smokes increases the child’s odds of smoking by 1.92 times on average (Leonardi-Bee et al., 2011). While living abroad, international students tend to develop social networks with more connections to British and other international students (Ye, 2007). Smoking prevalence among UK university students (15.8%) is almost double the rate of university students in China (7.8%) (Zhang, 2022; Ansari and Stock, 2012). Chinese international students’ social networks develop under these circumstances, increasing their exposure to smoking. This study considers the smoking behaviour of students’ friends and family members to identify the effect of exposure to tobacco through person-to-person contact. This supplies the first hypothesis (H_1):

H_1 : Students are more likely to smoke if their friends or family members have used tobacco.

Concerning the second mechanism, “social support” takes three forms: informational, emotional, and instrumental (Rose and Campbell, 2000). The second, emotional support, is the most influential: Emotional support from friends and family members is associated with strong positive consequences on international students’ mental and physical well-being (Bovier et al., 2004; Ye, 2017). This emotional support refers to verbal or nonverbal expressions of care and concern for a student’s well-being, which communicates esteem-enhancing sentiment and provides a basis of support for an individual’s efforts to accomplish difficult tasks, like quitting smoking (Ye, 2007). Statistically, there is a strong, positive association between Chinese students’ smoking behaviours and the degree of emotional support they receive for smoking from friends and family members (Mao et al., 2009). For example, previous research on Chinese students finds that having more friends or family members who approve of smoking, raises one’s own pro-smoking attitudes (Mao et al., 2009; Li et al., 2009). As such, friends’ and family members’ influences provide a key avenue for examining social-network mechanisms’ influence on smoking behaviours. Additionally, previous research exploring the influence of the social support mechanism among Chinese international students in Korea shows that higher perceived emotional support is associated with smoking fewer cigarettes (Oh et al., 2013). This mechanism is understudied with respect to its influence on UK-based Chinese international students, which this study addresses empirically. This study focuses on emotional support within the social-support mechanism by assessing students’ perceptions of their friends’ and family members’ attitudes towards their smoking behaviours (Berkman et al., 2000).

H_2 : Students are more likely to smoke if their friends or family members approve of smoking.

Regarding the third mechanism, social networks can generate interpersonal stresses, for which smoking is a common stress-reduction outlet (Umberson et al., 2008). Competitiveness and interpersonal conflict among student peers in a university environment increase the probability of initiating smoking for stress reduction (Li et al., 2022). This is because the influence of friend networks derives from one’s natural desires to be accepted by others and for one’s attitudes to shape and be shaped by the attitudes of others (Wu et al., 2018). Therefore, through this mechanism, friendship stress influenced university students’ smoking choice for ensuring social solidarity with smoker friends (Thomeer et al., 2019). Additionally, international students experience the generic stresses of adaptation to a new environment and non-native culture, impinging on one’s identity, friendships, and everyday lifestyle (Ye, 2007). That is, social stress arises from the tension between maintaining ties to one’s home country and establishing new ties in the host country. For example, Chinese international students internalised cultural norms from Confucianism and collectivism that validated their imitation of peers’ smoking behaviours to integrate socially (Wang, 2009). Smoking became a bonding tool for new relationships in a new living environment (Li et al., 2022). As such, Chinese international students’ high smoking prevalence may reflect an interaction between cultural norms and social stresses. It is important to proceed with closer research into how these mechanisms affected students’ smoking behaviours. This

research studies social stress by assessing students' perceptions of their friends' and family members' attitudes to smoking.

H₃: Students are more likely to conform with their friends' or family members' attitudes to smoking in accordance with the degree to which they care about these attitudes.

In summary, four main research gaps persist from previous research. First, previous literature on the relationship between social networks and smoking on the Chinese international students is fixated in the US and South Korea (Counsell, 2011; Oh et al., 2013). Second, previous research focuses on person-to-person mechanisms, whereas two further mechanisms' influence on students' smoking behaviours also require assessment. Third, previous research did not demonstrate the validity of findings among the Chinese population, instead being based on the Western population. For example, Western student populations were used to reach existing positive correlations between students' smoking behaviour and their friends' smoking behaviour (Wu et al., 2018). Fourth, previous research studying the influence of the social-stress mechanism focuses on friendship-related stresses, whereas the influence of family members also deserves study as an important element of emotional support. In particular, previous research supports international students who are emotionally closer to their family members during studying abroad, therefore they may face kinship-related stresses on making smoking choices compared with students who do not experience studying abroad (Ye, 2007). As such, this study aims to address each of these four research gaps.

Method

Data

The survey data was collected online, using multiple-choice and open-ended questions to test for correlations between students' social networks and smoking behaviours. The statement regarding informed consent is in Appendix 1. The survey was conducted in Chinese, the students' native language, which was a more reliable way of communicating meaning accurately in the questions and students' responses (Smith et al., 2008). Participant recruitment used three criteria (see Appendix 1 Section 1). Survey participants were recruited through snowball sampling. The survey URL was shared on social media, inviting anyone to share the link further. As the majority of students were studying at home during the COVID-19 pandemic, and in particular most Chinese international students were studying remotely overseas, reaching the target group was difficult (Leighton et al., 2021). This research relied on snowball sampling through social media to find suitable participants during the pandemic (Leighton et al., 2021). Ethical clearance was provided by the King's College London Ethics Committee (see Appendix 2).

The survey was open from 29 July 2022 until 12 October 2022, during which 238 responses were collected, of which 224 were valid, 101 were from UK-based students, and 123 were from China-based students. Survey questions were organised across five sections (see Appendix 1). This survey questions emulated previous research, especially the University of Tsinghua's Personal Survey on Smoking (2020) and the Electronic Cigarette Regulatory Questionnaire of the People's Government of Beijing Municipality (2020). Appendix 3 provides descriptive statistics for the sample.

Dependent Variable

The sample was first analysed with both current smokers and non-smokers, and then focused just on current non-smokers to examine their smoking intention. Two dependent variables were measured: (a) Whether the respondent currently smokes or not, coded dichotomously (1=YES; 2=NO); and (b) "Intention to Remain a Non-smoker", scored from 1 ("strongly disagree") to 5 ("strongly agree"). Appendix 4 describes how the study's variables were measured.

Independent Variables

Both the logistic and linear regression models included eight independent variables: gender, country of education, year of university, previous smoking status, friends' smoking status, family members' smoking status, friends' approval of the participant's smoking behaviour, and family members' approval of the participant's smoking behaviour (see Appendix 4 for coding details).

Empirical Strategy

Chi-square and regression models were used to measure social networks' influence on students' smoking behaviours. Chi-square analysis was used to compare smoking behaviours between the UK-based and China-based groups—the UK group's smoking behaviours were measured at the beginning and after their arrival in the UK to test how studying abroad influenced students' smoking habits. Furthermore, logistic and linear regression models were used to analyse how students' smoking behaviours associated with indicators for social networks and living abroad. These models were first used to analyse the responses separately for UK-based and China-based students, and then to analyse these groups' responses jointly (see Appendix 5 for equations).

Results

The respondents' demographic characteristics are contained in Appendix 3. Participants' average age was 21. Of the 224 participants, 114 were male (51%) and 110 were female (49%); 101 were studying at UK universities and 123 were studying in China. 61 participants (27%) reported previously using tobacco since beginning their undergraduate studies, while the sample's current smoking prevalence was 24%, amounting to 54 participants. This means that students' current smoking prevalence was slightly lower than the prevalence as dated to the beginning of their undergraduate studies. Additionally, 61% of participants reported having at least one family member who used tobacco. Regarding friend networks, 52% of respondents reported having friends who smoked. Next, 74% of participants' initial smoking experience was reportedly influenced by friends or family. Furthermore, 123 participants (55%) reported their family members disapproved of their tobacco use. However, the opposite held for friends' attitudes: 159 (71%) participants reported that their friends held accepting attitudes toward their tobacco use.

Figure 1 visualises the distribution of participants' tobacco use, grouped by the country of study. Smoking prevalence declined among both groups. Among Chinese international students in the UK, smoking prevalence decreased by approximately 4% after they began studying abroad, from 34.65% to 30.69%. For students in China, this was a lesser decrease of 2.44%, from 21.14% to 18.70%. However, smoking prevalence remained higher among UK-based students. The previous smoking rate reports a 13.5% gap between the groups, whereas the current smoking prevalence reduced to 11.99%. Thus, UK-based students maintained higher smoking rates, previously and currently. Chi-square and regression analysis will allow further confirmation of how students' smoking behaviours are affected by social networks.

[Figure 1]

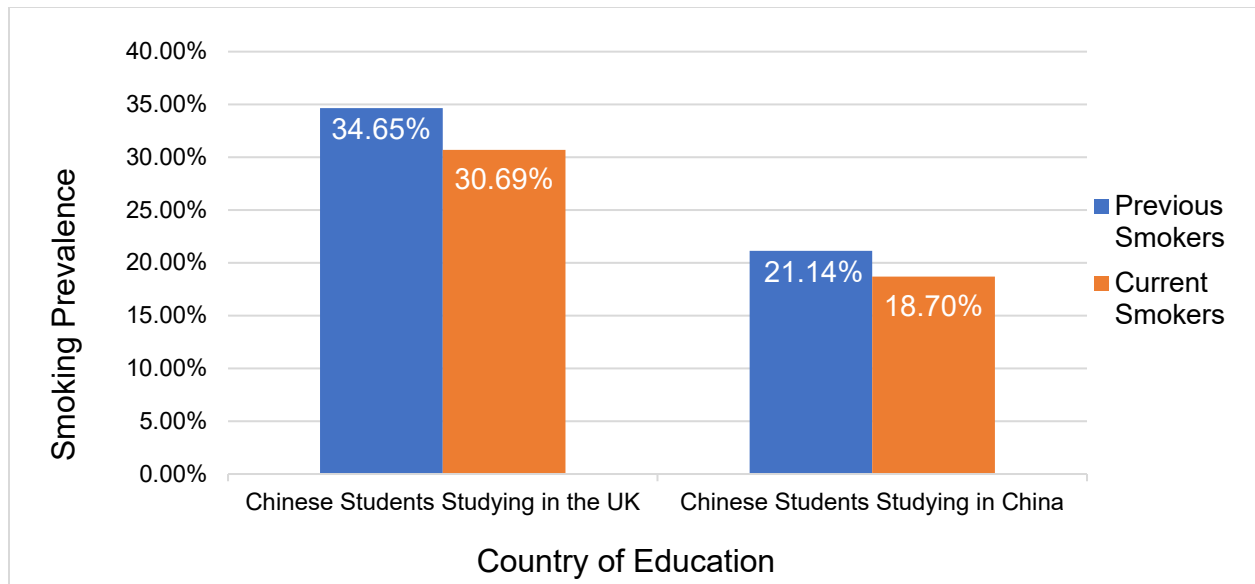


Figure 1. Participants' Smoking Behaviours Grouped by Country (N=224)

Table 1 reports how a student's smoking behaviour is affected by their family members' or friends' smoking behaviours and attitudes toward the student's smoking behaviour. A Pearson's chi-squared test of independence returned a significant association between parents' smoking status and a student's current smoking status, at $\chi^2(1) = 5.077, p < 0.05$. These significant results indicate that if a student's parents have used tobacco, the student is more likely to be a current smoker. This association was statistically significant for both student groups. The significant finding from students' previous status also shows students were more likely to smoke when they began attending university if their parents smoked, at $\chi^2(1) = 7.091, p < 0.05$.

The testing also returned a significant association between students' current smoking status and the smoking status of their grandparents and siblings, at $\chi^2(1) = 3.135, p < 0.1$. This finding illustrates how smoking among the participant's other family members also increases the likelihood of the student being a current smoker. However, no significant association existed between grandparents' and siblings' smoking status and the previous or current smoking status of China-based students, at $\chi^2(1) = 1.324, p = 0.250 > 0.1$ and $\chi^2(1) = 0.786, p = 0.375 > 0.1$. Lastly, family members' attitudes towards the student's smoking behaviour were significantly associated with the students' current smoking status in both the UK and China, plus UK-based students' previous smoking status. However, this association did not hold for China-based students' previous smoking status, at $\chi^2(1) = 1.823, p = 0.177 > 0.01$. These significant findings indicate that students were more likely to be current smokers if their family members held approving attitudes of their smoking behaviour, at $\chi^2(1) = 8.613, p < 0.01$.

Beyond family members, Table 1 then illustrates how friends influenced students' smoking behaviours, including the effect of friends' attitudes towards participants' smoking behaviours. First, Pearson's chi-squared test returns a significant correlation between friends' smoking status and students' current smoking status, at $\chi^2(1) = 39.231, p < 0.01$. This means that if any of a student's friends smoked, the student is more likely to be a current smoker. Grouping the students by country, a significant correlation holds for both UK-based and Chinese-based students. For students' previous smoking status, if any friends used tobacco, students were significantly more likely to smoke when they began attending university, at $\chi^2(1) = 35.287, p < 0.01$.

Table 1. Family Members' Influence on Students' Smoking Status

	UK		China		Combined	
	Previous Smoker	Current Smoker	Previous Smoker	Current Smoker	Previous Smoker	Current Smoker
Parents' Smoking Status	4.513**	2.827*	3.289*	2.763*	7.091***	5.077**
Grandparents' & Siblings' Smoking Status	4.650**	2.752*	1.324	0.786	5.279**	3.135*
Family Members' Approval of the Participant's Smoking Status	3.209*	3.842**	1.823	4.667**	5.124**	8.613***
N	101	101	123	123	224	224

Note: ***p<0.01, **p<0.05, *p<0.1

Table 2 shows that friends' attitudes towards participants' smoking behaviours are significantly associated with students' smoking behaviours. The combined group results indicate that students are more likely to be current smokers if their friends hold approving attitudes towards such smoking behaviour, at $\chi^2(1) = 3.808, p < 0.1$. This remains statistically significant for UK-based students' current smoking status and their previous smoking status when they began studying abroad. However, China-based students' previous and current smoking status was not associated with their friends' attitudes towards their smoking behaviours, at $\chi^2(1) = 1.797, p = 0.180 > 0.1$ and $\chi^2(1) = 0.005, p = 0.943 > 0.1$. Generally, though, a student's smoking behaviour was significantly affected by the smoking behaviour and attitudes of their friends. However, proceeding with regression analysis will allow testing whether these relationships hold once other factors are controlled by the models.

Table 2. Friends' Influence on Students' Smoking Status

	UK		China		Combined	
	Previous Smoker	Current Smoker	Previous Smoker	Current Smoker	Previous Smoker	Current Smoker
Friends' Smoking Status	21.564***	16.748** *	58.261***	21.419** *	35.287***	39.231** *
Friends' Approval of the Participant's Smoking Status	3.919**	6.775***	1.797	0.005	6.486**	3.808*
N	101	101	123	123	224	224

Note: ***p<0.01, **p<0.05, *p<0.1

Table 3 reports the results of a logistic regression testing participants' current smoking behaviours against multiple variables. When holding all other variables constant, previous non-smokers in both countries are less likely to be current smokers ($p < 0.01$). For UK-based students, having a family member who smokes led to a 0.006 increase in the log-odds for being a current smoker ($p < 0.1$). If their friends approved of smoking, the log-odds for being a current smoker increased by 113.5 ($p < 0.1$). However, when family members approved of UK-based students' smoking, they were less likely to be current smokers ($OR = 0.030, p < 0.1$). There were no significant associations among the China-based students. However, upon combining these two groups, the results show that when family members approve of students' smoking, the students are significantly less likely to be current smokers ($OR = 0.200, p < 0.05$). Further, for previous non-smokers, the odds of being current smokers are 0.003 times as large as those for previous smokers ($p < 0.01$).

Table 3. Logistic Regressions Related to Current Smoking Status

Variables	Current Smoking Status (Odds Ratio/Standard Errors)		
	UK	China	Combined
Gender (Ref: Male)			
Female	1.700 (2.610)	0.949 (0.766)	0.914 (0.558)
Country of Education (Ref: UK)			
China	Omitted	Omitted	1.025 (0.628)
Year of University (Ref: Year 1)			
Year 2	0.747 (2.403)	0.129 (0.219)	0.113 (0.189)
Year 3	41.884 (150.176)	1.193 (1.965)	2.265 (3.235)
4 or more	0.284 (0.987)	0.607 (0.975)	0.664 (0.990)
Previous Smoking Status (Ref: Yes)			
No	0.000 (0.000)***	0.008 (0.008)***	0.003 (0.003)***
Friends' Smoking Status (Ref: Yes)			
No	0.825 (1.725)	0.539 (0.609)	0.579 (0.502)
Family Members' Smoking Status (Ref: Yes)			
No	0.006 (0.017)*	0.549 (0.467)	0.346 (0.240)
Friends' Approval of the Participant's Smoking Status (Ref: Disapprove)			
Approve	113.485 (280.451)*	0.632 (0.662)	1.657 (1.257)
Family Members' Approval of the Participant's Smoking Status (Ref: Disapprove)			
Approve	0.030 (0.054)*	0.308 (0.291)	0.200 (0.139)**
Constant	11.554 (33.630)	26.865 (52.286)	22.664 (36.511)
N	101	123	224

Note: Ref = Reference; ***p<0.01, **p<0.05, *p<0.1

Table 4 then presents a regression model testing the relationship between multiple variables and current non-smokers' intentions of remaining as non-smokers. In the combined student groups, if students are previous non-smokers, their intention to remain non-smokers increases by 2.135 ($p < 0.05$). Unlike China-based students, if family members approve of UK-based students' smoking, those students' intention to remain non-smokers decreases by 1.704 ($p < 0.05$).

Table 4 . Regression Modelling Related to Factors Influencing Non-smokers' Future Smoking Intention to Remain a Non-Smoker

Variables	Intention to Remain a Non-smoker (Coefficient/Standard Error)		
	UK	China	Combined
Gender (Ref: Male)			
Female	0.662 (0.716)	-0.791 (0.754)	-0.175 (0.514)
Country of Education (Ref: UK)			
China	Omitted	Omitted	0.886 (0.546)
Year of University (Ref: Year 1)			
Year 2	0.734 (2.230)	1.904 (1.674)	1.864 (1.242)
Year 3	-0.041 (2.230)	1.800 (1.474)	1.380 (1.162)
4 or more	0.642 (2.518)	1.148 (1.506)	0.990 (1.217)
Previous Smoking Status (Ref: Yes)			
No	1.996 (1.412)	2.591 (1.609)	2.135 (1.066)**

Friends' Smoking Status (Ref: Yes)			
No	-0.232 (0.738)	-0.724(0.952)	-0.704 (0.568)
Family Members' Smoking Status (Ref: Yes)			
No	0.360 (0.732)	-0.567 (0.774)	-0.280 (0.529)
Friends' Approval of the Participant's Smoking Status (Ref: Disapprove)			
Approve	-0.996 (0.851)	0.379 (1.014)	-0.144 (0.643)
Family Members' Approval of the Participant's Smoking Status (Ref: Disapprove)			
Approve	-1.704 (0.760)**	-1.177(0.948)	-1.423 (0.590)**
Constant	13.839 (2.573)	13.109(2.384)	12.708 (1.762)
<i>N</i>	70	100	170

Note: Ref = Reference; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Robustness Check

We performed two robustness checks (Appendices 6 and 7). The first robustness check includes living arrangements in the regression models. This is measured as a binary variable: living alone or residing with others. The second robustness check changes the dependent variable, “Intention to Remain a Non-smoker”, from a five-category variable to a three-category variable: ‘1’ represents “disagree”, ‘2’ represents “neither agree nor disagree”, and ‘3’ represents “agree”. We observe similar results in both robustness checks as found in our main results.

Discussion

This study explored how Chinese international students' social networks affected their smoking behaviour. Given the influence of person-to-person contact on smoking behaviour, we first studied the correlation between friends' and family members' smoking behaviours and students' smoking behaviours. The results of chi-square tests show that the students whose friends and family members have used tobacco were more likely to smoke. Concerning the other two social-network mechanisms—social support and social stress—this study explored the relationship between attitudes and behaviours, namely regarding the shaping influence of parents' and friends' attitudes towards students' smoking behaviours. Parents' and friends' approving attitudes towards students' smoking, they were more likely to be current smokers.

The regression results broadly supported the previous academic literature's findings, showing that family members' smoking increases the probability of students initiating smoking in adulthood, although this was only significant among the UK-based group. UK-based non-smokers were less likely to intend to remain non-smokers if their family members approved of their decision to start smoking. This finding supports Li et al.'s (2009) argument, where parental responsiveness's effect on their children's smoking behaviours was also found here among UK-based Chinese students. That is, students were less likely to be smokers given higher parental responsiveness to smoking.

The findings of regression models support the research of Wu et al. (2018), as there was no significant result showing Chinese students would be more likely to become smokers if their friends have used tobacco. The regression results differed from the chi-square results, which may reflect the influence of factors controlled in the regression models. Furthermore, the significant correlation between friends' smoking behaviours and students' smoking behaviours found by previous studies was based on Western student populations. Yet Chinese students appeared to adapt their attitudes through long-term person-to-person contact with friends earlier than Western students, decreasing friends' influence on students' smoking behaviours during undergraduate studies (Wu et al., 2018).

However, the smoking behaviours of UK-based students did relate significantly to their friends' attitudes towards their smoking behaviours. Friends' approving attitudes towards UK-based students' smoking entailed a significantly higher likelihood of being a current smoker. This relationship between students' smoking behaviours and

their friends' attitudes toward those smoking behaviours was only statistically significant among the UK-based group. Thomas et al. (2020) explain this difference with reference to what respondents described variously as a sense of loneliness, homesickness, or insufficient social support while studying abroad. Friendship became their primary social support, causing international students to depend heavily on each other (Thomas et al., 2020). Therefore, the challenging experience of studying abroad induced UK-based students to care more about their friends' attitudes towards their smoking behaviours. When students' friends either were smokers or approved of their smoking, this entailed high exposure to smoking and friendship stresses caused by smoking.

There are four main limitations to this study's findings. First, this study admits some limitations in its sampling. Snowball samples are unlikely to be representative of the broader Chinese university population because the method is a non-random selection (Sharma, 2017). However, snowball sampling was the most appropriate method of recruitment during the COVID-19 pandemic (Leighton et al., 2021). Our future research will conduct random sampling to verify this study's results. Second, this research attained a sample size that may have been too small to capture empirical associations precisely (Gumpili and Das, 2022). For example, compared to previous research, an opposite relationship was found between UK-based students' smoking behaviours and their family members' attitudes and behaviours (Li et al., 2009). Future research will gain from achieving a larger sample size with a more credibly representative sampling method (Andrade, 2020). Third, logistic and linear regression models establish compelling correlations between independent and dependent variables, but not irrefutable causation (Agresti and Finlay, 2018). There may be a simultaneity bias: Family and friends influence Chinese students' smoking behaviour, but endogenously, Chinese students' smoking behaviour will also influence family and friends. More advanced statistical methods would be necessary to fully parse the causal effects each holds on students' smoking behaviours. Fourth, although this research explains a portion of Chinese international students' smoking behaviours, the findings would benefit from qualitative interviews to gain a richer understanding of the results acquired in the statistical analysis (Punch, 2014). As an example, although this study identified the influence of social stress on students' smoking choices, interviews could provide a deeper exploration of its influence on reluctant or peer-pressured smoking and the reasons for tobacco use. Therefore, more comprehensive future research could conduct interviews to further explain international students' smoking behaviours.

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