

**Waterpipe tobacco smoking among university students in the
Western Cape Province of South Africa:
Differences and similarities to cigarette smoking**

Dissertation for a Master of Commerce in Applied Economics

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Abstract

Objectives: The aim of this study was to determine the prevalence rates of current and ever waterpipe use and investigate the associated correlates, paying particular attention to the perceptions and beliefs about waterpipe's adverse health effects as well as its social acceptability. In addition the study aimed to compare the results with the prevalence rates of current and ever cigarette use among the same study group.

Method: An online, anonymous, cross-sectional survey was administered via email to all students at the four universities within the Western Cape Province of South Africa during September 2013. 4578 students completed the survey (4.3% response rate).

Results: 10.6% [$n= 484$] of the sample were current waterpipe users while 67.1% [$n= 3101$] were ever users of waterpipe. 61.1% of current smokers smoked waterpipe to socialise with less than 1% of smokers smoking alone. The majority of waterpipe smokers thought waterpipe use was less harmful, less addictive and more accessible than cigarette smoking. 96.1% [$n= 465$] of current users felt waterpipe was socially acceptable compared to only 69.9% [$n= 1862$] of non-smokers. Factors significantly associated with increased odds of being a current smoker were: Coloured race, increased quantity of alcoholic drinks drunk per drinking day, increased frequency of binge drinking and the perception that waterpipe was not difficult to quit. Alcohol consumption patterns apart from problem drinking were associated with waterpipe use. More than half of current waterpipe smokers were not current cigarette smokers [$n= 273/484$].

Conclusion: Waterpipe smoking is more socially acceptable and therefore more widespread among students in all faculties, genders, ages, physical activity levels and economic brackets than cigarette smoking. This is likely a result of the lack of knowledge about the health risks of waterpipe, the taste of the flavoured sweetened tobacco, and the perception that waterpipe is socially acceptable. While there is overlap between current cigarette and waterpipe users, waterpipe users are distinct from cigarette users. Therefore policy aimed at cessation needs to be targeted towards all students, using a two-pronged approach focusing on the knowledge and beliefs of students and the legislative aspect of waterpipe tobacco.

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1. Introduction

If current trends continue, mortality as a result of tobacco use is expected to exceed 8 million in the year 2030 with the current death toll as a result of tobacco use standing at over 5 million a year (WHO, 2008). Most of the research in tobacco control and cessation efforts has been focused on cigarette consumption as it is currently the most common form of tobacco use (Poyrazoglu et al., 2010). There are, however, other forms of smoking, such as the waterpipe. In 2007 the American Lung Association described waterpipe smoking as an “emerging deadly trend” and as a result called for more research on the patterns and behaviours of waterpipe smokers and suggested its inclusion in national surveys that evaluate tobacco use.

Waterpipe is the general term given to a smoking device that uses a pipe to inhale smoke after it has passed through water. Depending on the region, waterpipes are called by many different names, such as narghile, argihle, shisha, hookah, goza, ghalyan, hubble-bubble (or hubbly bubbly) (Sutfin et al., 2001; Al-nagger et al., 2011; El-Roueiheb et al., 2008; Aljarrah et al., 2009) and, in South Africa specifically, okka pyp (Senkubuge et al., 2012). Despite the different names, they all make use of the same smoking principle. Tobacco is heated using coals and the smoke then passes through water and is inhaled through a connected pipe (Eissenberg et al., 2008; Primack et al., 2008).

Waterpipe smoking has been around since the fifteenth century when it was practised in India and then spread throughout Persia, Egypt and the Mediterranean regions (Aljarrah et al., 2009). While its popularity had been decreasing over time and its use was limited by the 1980s, the last two decades have seen a significant increase in popularity both inside and outside the Middle East (Poyrazoglu et al., 2010; Knishkowsky et al., 2005; Ward et al., 2005; Mohammed et al., 2010; Smith et al., 2011; WHO, 2005).

Maassel is a flavoured sweetened form of tobacco that is now most commonly used with the waterpipe (Maziak et al., 2004b). It was introduced early in the 1990s and its sweetness relative to cigarette tobacco is thought to have been one of the factors responsible for the increase in popularity of waterpipe (Roohafza et al., 2011) (Hammal et al., 2013). Waterpipe is predominantly used for tobacco smoking; however herbal (non-tobacco) alternatives do exist. In addition, marijuana has also been linked to waterpipe use (Sutfin et al., 2001; Grekin et al., 2008).

Studies of university students in the United States report prevalence rates for those who have smoked waterpipe at any time (ever smokers)¹ of 12.7% - 48.4% and current waterpipe prevalence rates of 9.5% - 20.4% (Sutfin et al., 2001) and, while the range is large, even the lower boundary represents a significant proportion of waterpipe smokers, which is cause for concern. Traditionally, smoking waterpipe was mostly done by older adult males as a social activity (Neergaard et al., 2007;

¹ Ever use of a product is a standard expression in tobacco literature and is defined as everyone who has at least tried the product once in their lifetime, even one or two puffs.

Knishkowsky et al., 2005). More recently, it appears to have transformed into a trendy and fashionable activity among both male and female youth (Primack et al., 2008).

Akl et al. (2011) conducted a systematic review of the medical literature on the prevalence of waterpipe use among general and specific populations. Although only four of their reviewed studies were national surveys and therefore the results provide more information about specific populations, it was evident that across countries the highest prevalence rates of waterpipe smoking were in the student groups. Two surveys conducted in specific groups in Pakistan, for example, showed a prevalence rate of 6% among adults, but 33% among university students. In Lebanon also, the adult rate was 15% while the prevalence rate among university students was 28%.

Determining the prevalence of, and factors associated with, waterpipe smoking among young adults is important for understanding the growth of this trend. Bad habits and risky behaviours are known to be formed at this age, and, as prospective role models in society, young adults need to be aware of the risks and harm of waterpipe smoking (Sabhay et al., 2011).

Despite the common perception that waterpipe is less harmful than cigarettes because the smoke is purified as it passes through the water (Jawaid et al., 2008; Maziak et al., 2004a; Al-Nagger et al., 2011), current evidence refutes this. While the medical assessments of the health impacts of waterpipe smoking are still in an early form, the literature to date agrees in considering waterpipe smoking to be at least as dangerous as cigarette smoking (Dar-Odeh et al., 2010; Sutfin et al., 2001).

Tobacco smoking in general is associated with a large number of dangerous chemicals and toxins, not the least of which are carbon monoxide (CO) and nicotine. (Knishkowsky et al., 2005) Cigarette and waterpipe smoking therefore share the same toxins and waterpipe smokers are likely to be exposed to higher levels because the average length of time spent smoking is longer than for cigarettes (Eissenberg et al., 2008).

Waterpipe sessions are commonly 30 - 60 minutes and involve roughly 100 inhalations of 500ml of smoke each (Shihadeh et al., 2004), resulting in 50 000ml of smoke inhalations in total compared to 500ml – 600ml per cigarette (Djordjevic et al., 2000). The study conducted in 2003 by Shihadeh et al. specifically looked at the chemical composition of waterpipe smoke and found that while nicotine levels in a single waterpipe session were similar to those of a single cigarette, the tar content was almost 20 times greater than that of a low tar cigarette. In addition, they found higher levels of arsenic, chromium and lead and higher levels of carboxyhemoglobin in the blood than with cigarette smoking (Shihadeh, 2003).

Many forms of cancer, cardiovascular disease, reduced pulmonary functioning, offspring with low birth weight and nicotine dependence have been linked to waterpipe smoking (Maziak et al., 2004b; Al-nagger et al., 2011; Primack et al., 2013; Grekin et al., 2008; Sutfin et al., 2001) as well as the spreading of infectious diseases through the common practice of sharing the mouthpiece among friends (Dar-Odeh et al., 2010; Poyrazoglu et al., 2010).

While the average CO levels and other toxins among waterpipe users varies according to puff motion (Jackson et al., 2008), frequency of inhalation, depth of inhalation, time spent smoking, size of the waterpipe, the type of charcoal and type

of tobacco, waterpipe use has, in all studies to date, been shown to be, at best, similar in harm to cigarette smoking (Maziak et al., 2004b; Morten et al., 2013; Senkubuge et al., 2012).

In South Africa, tobacco use is classified as the number one cause of preventable death. In 2000, the death of 45 000 South Africans was attributed to tobacco use, and cigarette smoking specifically was ranked third highest on the list of mortality risk factors (Senkubuge et al., 2012). Many in-depth studies to do with cigarette smoking have been conducted in South Africa (Peltzer et al., 2001) and there is a clear picture of the cigarette smoking environment. Studies focusing on waterpipe, however, are limited to two (Combrink et al., 2010; Senkubuge et al., 2012) with only one focusing on university students.

The university study by Senkubuge et al. in 2012, which focuses on 2nd and 6th year medical students, was conducted at two universities in the Pretoria area of South Africa in 2011. Among the survey participants the prevalence rate was 18.6% (defined as smoked in the last 30 days). This figure differs marginally from other global surveys conducted on university students (Sabahy et al., 2011; Azab et al., 2010; Sutfin et al., 2001) and suggests South Africa is not excluded from the emerging trend of waterpipe smoking. More research as to the prevalence rates of, and the socio-demographic and behavioural factors associated with, waterpipe smoking in South Africa is needed in order to inform public policy.

The literature suggests three main reasons for the increase in the popularity of waterpipe. These are: the belief that it is less harmful and less addictive than cigarettes, the sweetness and pleasing taste and aroma of the Maassel tobacco, and the perception that waterpipe smoking is a socially acceptable practice that facilitates relaxation and social interaction (Akl et al., 2011; Grekin et al., 2008; Morton et al., 2013; Al-Naggar et al., 2011; Jawaid et al., 2008; Maziak et al., 2008). Research therefore needs to incorporate beliefs and perceptions of waterpipe smoking into models involving determinants of, and associations with, waterpipe smoking.

In line with the international need for research on waterpipe smoking and the disturbingly high prevalence rates among students globally, this study aims to take a snap shot of the waterpipe smoking behaviours of university students in one province of South Africa. The target group is students from the four major universities in the Western Cape Province of South Africa. The purpose is to estimate the prevalence rates of waterpipe smoking among multiple institutions and to determine the associated socio-demographic and behavioural factors, as well as the general perceptions of waterpipe smoking among the students.

This paper consists of a comprehensive literature review that describes the major findings related to waterpipe, including prevalence rates and commonly associated factors. The method and data used are discussed fully, followed by an in depth results analysis and discussion leading to the conclusion.

2. Literature Review

2.1 Method

Waterpipe goes by many different names and therefore, in order to conduct a comprehensive literature review, an electronic search using the keywords “hookah” “waterpipe” “youth” “hubbly” “shisha” “narghile” “arghile” and “okka” was done using the EBSCOHost, Google Scholar and Science Direct database platforms. After this, the results were further filtered using the keyword “university” in order to highlight only those studies relevant to university students. The search returned many results, three of which were themselves systematic or comprehensive reviews. The three reviews and their results are discussed in detail in the following sections.

2.2 Summary of previous literature reviews

The first comprehensive review found was by Maziak et al. (2004b), published in *Tobacco Control* in 2004. The objective of their review was to consolidate the research relating to waterpipe use globally, in order to create a knowledge base of current research that could help direct future research and inform public policy. Their study base therefore included all published papers that related to waterpipe use across the globe. They found 64 papers that covered over 18 different countries, with the majority of papers coming from the Middle East Region (MER). While their review covered all aspects of waterpipe, the two main areas relevant to this study were the sections on changes in prevalence rates over time and the attitudes towards and the beliefs about waterpipe.

As acknowledged by Maziak et al. (2004b), determining exact changes in waterpipe prevalence over time is difficult because of insufficient data, as studies from before 1990, except for one from Lebanon, do not include waterpipe smoking among methods of tobacco use. However, looking at more recent studies where waterpipe has been a focus, for example in Beirut, one can see an increase of 7.2% in the prevalence rate of waterpipe use (21.1% to 28.3%) over the period 2001 to 2002, and an increase of 13% (30% to 43%) over four years from 1998 in ever use of waterpipe.

A second approach to determining waterpipe prevalence over time, as suggested by Maziak et al. (2004b), is to look at the time period of waterpipe use relative to birth cohort. Unlike cigarette smoking, which has defined differences, with older smokers initiating before 1990, waterpipe initiation appears to have happened in the 1990s for all birth cohorts. Coincidentally, the 1990s saw the introduction of Maassel which is a form of tobacco that has been flavoured and sweetened. This form of waterpipe tobacco also requires little to no preparation in comparison to its predecessor Ajami. In Syria, Ajami used to be the most commonly used form of waterpipe tobacco, whereas now it is only used by 3% of waterpipe tobacco smokers, the rest choosing Maassel instead. This trend does not appear to be limited to Syria: Maassel sales in Bahrain, a non-tobacco producing country, increased by 36% in 1996 and total revenue from sales reached \$12 million (Kandela, 1997).

With regard to attitudes and beliefs, Maziak et al. (2004b) found very few empirical studies. This highlighted the need for research in this area, as Canadian and US experiences have shown that the tobacco market is dominated by products perceived to be healthier or less risky. At the time of the review, only anecdotal reports on

beliefs about the dangers of waterpipe tobacco were available, but those seemed to indicate a general belief that waterpipe was, at most, as harmful as cigarettes, with many believing it to be less harmful.

Other issues covered in the literature review by Maziak et al. were the health effects and long term consequences of waterpipe smoking and its impact on foetal development among pregnant woman and on those exposed to secondary smoke. While there is limited research to do with the health effects of waterpipe use, early work has found that, relative to a single cigarette, after one 45 minute session of waterpipe, the CO levels and nicotine exposure double and triple respectively while the cardiovascular effect is roughly the same. Heavy metal toxins were also observed in waterpipe users. In addition, waterpipe smoking is known as a social activity and therefore the mouthpieces, which are shared, can also be transmitters of various diseases such as tuberculosis, herpes and other communicable diseases.

The long term health effects of waterpipe use have not been well researched. Although there were many long term health effects mentioned, including cardiovascular diseases, cancer, eczema of the hand, tuberculosis, increased plasma concentration, and lung tissue injury, among others, a main concern was the decrease in pulmonary functions, where waterpipe users showed worse results than cigarette smokers. The review acknowledges that the samples used in these studies are small and they are therefore limited and require further investigation, but the preliminary findings are such that waterpipe use is associated with increased risk of addiction, disease and death.

The review highlights the success that tobacco control polices have had in curbing cigarette smoking and acknowledges the important role that public policy can play in promoting healthy behaviour. Public policy applying to waterpipe however has not been implemented to the same extent and there is much room for its development. As noted by Maziak et al. (2004b), policy needs to be based on accurate documentation, analysis and prescription. While research into the prevalence and health effects of waterpipe is slowly increasing, there is much more work to be done. The current preliminary evidence of the growing popularity of waterpipe, combined with its potential health effects, is motivation enough to pursue such efforts. Thorough analysis thereof could provide the basis for prescription and sound public health policy.

Another literature review was done in 2011 by Akl et al. This review included cohort and cross-sectional studies of waterpipe prevalence, although the studies varied as to how waterpipe prevalence was reported. The review reports on 38 studies (64 were identified but 26 were discarded for various reasons) of which four were nationally representative and the remainder concerned specific populations, most of which were centred on the MER.

Of the 38 studies, seven related to waterpipe use among male and female university students; of these, four were from the MER, and one from each of South Asia, America and Europe. Three of the studies from MER were published in the early 2000s. were published 2007/2008. Included in the review were prevalence rates among high school students and adults of specific population groups but are not included here as the focus is on university students.

The commentary on waterpipe prevalence among university students cited mixed results, as the rates were reported differently. Waterpipe smoking was slightly higher than cigarette smoking in Saudi Arabia, and slightly lower in the United Arab Emirates (UAE). Current waterpipe smoking was reported to be 28% and 21% in the two Lebanese studies, where cigarette prevalence was one-third that of waterpipe. The prevalence of current waterpipe smoking was only 6% in the UAE, and cigarette smoking had a 9% prevalence. In Syria waterpipe smoking was 15%, and the prevalence of cigarette smoking was higher than that of waterpipe. In Pakistan, current waterpipe smoking was recorded as 33%, compared to 10% in the United States of America (USA) and 8% in Britain.

The risk factors associated with waterpipe smoking in these seven studies were identified as a combination of being male, alcohol use (>7pints beer per day), currently smoking cigarettes, having friends who smoked only waterpipe, having friends who smoked waterpipe and cigarettes and the number of people who smoked waterpipe in the home.

The third and latest review found was by Grekin et al. (2012) and focuses on literature relating to waterpipe use specifically among college students in the US. Although their focus is not global it is still has international relevance to the overall picture of waterpipe prevalence and they do include studies from the MER for comparison.

The aim of their paper was fourfold: to examine the prevalence rates among college students, to determine the demographic correlates of waterpipe smoking, to examine the beliefs about waterpipe smoking and to look at the relationship between waterpipe smoking and cigarette smoking. They found 16 papers that related to waterpipe smoking among university students that had been published since 2001, of which seven were conducted in the USA or Europe and nine were from the MER, with two studies making use of the same sample. In the American and European studies, prevalence rates for current waterpipe smokers ranged from 21.2% to 7.2% (mean 14.6%; SD 6.2%) while those done in the MER ranged from 43.3% to 5.6% (mean 26.6%; SD 14.2%). They conclude that, while cigarette smoking in the USA is still the preferred form of tobacco consumption, waterpipe is not far behind.

The studies examined in this review, apart from one, identified males to be more likely to be current waterpipe smokers, and that the gender difference was more pronounced when looking at ever waterpipe smokers. With regard to race, two studies focusing on students of Arab and Non-Arab descent in the US found the former to be more likely to be waterpipe smokers while all studies of the USA found African students to be less likely to smoke waterpipe than other races.

The five studies that looked at students' perceptions of waterpipe found that the majority of university students believe that waterpipe is less harmful and less addictive than cigarettes, and also more socially acceptable. Students admitted to being influenced by their friends and felt people looked "cooler" smoking waterpipe than cigarettes. In addition, the belief that waterpipe is less harmful than cigarettes, less addictive than cigarettes and socially acceptable was positively correlated with current waterpipe smokers.

With regard to the associations between waterpipe smoking and cigarette smoking, the four studies that discussed this topic found significant associations between the

two forms of tobacco use. The limited longitudinal data makes it difficult to ascertain whether there is causality one way or the other, or if one precedes the other.

The studies examined in the review show that there are a significant number of waterpipe users who have never smoked cigarettes, and point out that for the different forms of smoking there are different risk factors (such as gender and athletic involvement) associated with each type of smoking. These two forms of tobacco use are possibly regarded as different and therefore appeal to different groups of people. Grekin et al. (2012) acknowledge that further investigation of this area is needed in order to determine if one form usually precedes the other, or if frequency of use of one product affects likelihood of using the other.

2.3 Additional papers

In addition to the studies covered in the three literature reviews, the online search returned seven additional published studies concerning waterpipe use among university students. The seven studies were: a US study of university students in North Carolina using 2008 data from an online survey of 3770 students; an analysis of 645 students from a single university in Turkey which was published in 2010; a study of 1454 students in Jordan from three universities, also published in 2010; a Malaysian study of 200 students from a single university; a study of 1024 students from two universities in Iran and a study of 2nd and 6th year undergraduate medical students from two universities in South Africa, all published in 2011, and most recently a study by Primack et al., published in 2013, of 105 012 university students across 152 American institutions.

Lastly, an unpublished study was conducted at the University of Cape Town in 2013 by Banoobhai et al., and the summary report published in the university newspaper. This study was initiated by the Cancer Association of South Africa (CANSA) who approached a group of honours students to conduct a study on waterpipe use among students in the Health Sciences Faculty. The sample used consisted of the 3582 registered students and the response rate was 6% (n=223). The current waterpipe smoking prevalence rate was found to be almost 18% of the sample, while the ever smoked rate was close to 66% of the sample. The results of this study are expanded on in the discussion section of this paper because of its value in comparison.

2.4 Summary of the results from all relevant studies

Table 1 summarises the results for all published studies relating to waterpipe use among university students mentioned in the three literature reviews, as well as the results from the additional papers. These include the 13 studies specifically mentioned in Grekin et al., 2012,² the paper by Jawaid et al., 2008 on Pakistan mentioned in the review by Akl et al., 2011, and the 7 additional papers found in the search that were not covered in the three literature reviews.

The table highlights the country of analysis, the year of both the publication and the data collection, details of the sample as well as ever and current prevalence rates for

² Of the 16 papers reviewed in Grekin et al., 2012, two made use of the same sample and therefore had the same results. In addition, the paper by Labib et al., 2007, "Comparison of Cigarette and Water Pipe Smoking Among Female University Students in Egypt", was omitted because of its use of convenience sampling. These papers were also covered in the review by Maziak et al. (2004b) but are more easily identifiable in Grekin et al., 2012, owing to the structure of the paper.

waterpipe and cigarette smoking (where applicable). Table 2 focuses on the correlates that are associated with waterpipe use as found in each of the studies identified in Table 1, where applicable.

2.5 Prevalence of waterpipe use

In the MER, prevalence rates of ever use of waterpipe were reported to be in the 40% - 50% range, except for the most recent study, using data collected in 2008 which suggested a rise to 61.1% (Azab et al., 2010). Prevalence rates for current waterpipe use vary more widely, from 5.6% to 43.3%. Studies from American universities that make use of random (as opposed to convenience) sampling reported ever use of waterpipe in the range of 28.0% to 40.8% and current use of waterpipe of 7.2% to 17.5%. Although the study by Primack et al. (2013) published in 2013 appears to be the only study throughout all regions that has a large sample (n = 105 012), it reflects prevalence rates similar to those found in the other USA studies.

Europe and Africa have only one published study each that cite prevalence rates of waterpipe with university students. The study done at a university in Birmingham (Jackson et al., 2008) reported an almost 40% prevalence rate for ever use of waterpipe and an 8% prevalence rate for current waterpipe use. Although ever use of cigarettes was not reported, it would appear that the prevalence rate for current waterpipe and cigarette smokers are similar. The South African study (Senkubuge et al., 2012) showed that, among students in South Africa, ever use of waterpipe was 43.5% while current use was 18.6%.

The three studies from Asia are all from different regions in Asia, yet their prevalence rates for current waterpipe smoking are all within the early thirty percents (Al-Naggar et al., 2011; Poyrazoglu et al., 2010; Jawaid et al., 2008). Ever waterpipe use was only reported for two of the studies, at 45.1% and 53.6% (Poyrazoglu et al., 2010; Jawaid et al., 2008).

In comparison to waterpipe smoking, the MER had mixed results, with studies from Syria (Maziak et al., 2004a), the UAE (Hussein et al., 2005) and Jordan (Dar-Odeh et al., 2010) reporting higher current use of cigarettes than waterpipe, whereas Iran (Roohafza et al., 2011) and Lebanon (Tamim et al., 2001; Tamim et al., 2003) had higher rates of current waterpipe use compared to cigarette use.

In the USA, ever cigarette use averaged at roughly 38% while current use averaged at roughly 19%, suggesting that ever waterpipe use is similar to ever cigarette use, but current waterpipe use is lower than current cigarette use. Similarly, in the British study, while ever use of cigarettes was not reported, current cigarette use was 9%, marginally higher than current waterpipe use. In contrast, the South African study found that while ever cigarette use (52.9%) was higher than ever waterpipe use (43.5%), current cigarette use (17.3%) was less than current waterpipe use (18.6%).

Prevalence rates of ever use of waterpipe in the MER and Asia have a lower bound of 42% while prevalence rates in the US, Europe and South Africa have a lower bound of 28%. This is expected as waterpipe is culturally associated with the MER and Asia, but illustrates that its popularity is extending globally. The variation in current waterpipe use makes it hard to compare regions, although it is clear that in all regions, waterpipe use is a significant form of tobacco smoking chosen by university students.

2.6 Current cigarette smoking differences in waterpipe use

While many studies show limited overlap between current cigarette and waterpipe users, the impact of being a current cigarette smoker on the odds of being a waterpipe user are conclusive. In all studies that considered a current cigarette smoker in the logistic regression analysis, current cigarette smoking was found to be a significantly associated factor for current waterpipe use. In certain studies it was one of only two variables found to be significantly correlated.

2.7 Gender differences in waterpipe use

Thirteen of the twenty-one studies reported that the male gender was associated with a higher likelihood of being a current waterpipe smoker. The gender difference is more evident in the studies from the MER and Asia than in the United States, Europe and Africa. A possible explanation for this is that the perception of woman smoking in the MER differs culturally from western societies (Hamadeh et al., 1992; Maziak et al., 2004a). Relevant to this study it is worth noting that the single published study on South African university students found no significant gender difference in the probability of current waterpipe smokers and neither did the CANSA study.

2.8 Ethnic/Racial differences in waterpipe use

Racial and ethnic classifications differ over the regions which the studies have looked at. Two studies report that use among students of Arab origin is higher in comparison to non-Arabs and two studies report a higher likelihood of Whites being current waterpipe smokers than Africans.

2.9 Perceptions and beliefs about waterpipe

Almost all studies that looked at perceptions and attitudes towards waterpipe found similar results. Among university students, the majority believed that waterpipe is less harmful (or at most as harmful as) than cigarettes. A greater majority think that it is less addictive (or at most as addictive as) than cigarettes. Two exceptions were found in Azab et al. (2010) and Chaaya et al. (2004), who found respectively that 62% and 48% of students thought waterpipe was more harmful. It is interesting to note that these two studies had the highest prevalence rates for current use of waterpipe in the MER, at 42.7% and 28% respectively. Nevertheless, the conclusion in all papers was that the belief that waterpipe is less harmful and less addictive than cigarettes is positively correlated with current waterpipe use. The belief that waterpipe is socially acceptable on some level was also noted as a finding throughout the literature. In those studies that included it in logistic regression analysis, it was found to be a significant factor associated with current waterpipe use. Roohafza et al. (2011), whose study focused specifically on psychological perceptions do to with waterpipe, found that the perceived entertainment value of waterpipe was a significant factor in waterpipe initiation among boys.

The social aspect may also explain why regular drinkers and alcohol users were found to be more likely to be current waterpipe users, as were those who had friends who smoked waterpipe.

Table 1: Summary of studies on waterpipe use among university students

Authors	Year of publication	Year of data collection	Country	Details of the sample (i.e. survey participants)	Type of survey/study	Waterpipe smokers		Cigarette smokers	
						Ever (%)	Current (%)	Ever (%)	Current (%)
REGION: MIDDLE EAST									
Roohafza et al	2011	2007	Iran	223 students from 2 universities	Interview	-	11.5% (F), 28.7% (M)	-	2.5% (F) , 18.3% (M)
Sabahy et al	2011	Not reported	Iran	1024 students from 2 universities	Pen and Paper	42.5	18.7	-	11.8
Dar-Odeh et al	2010	2008	Jordan	1454 students from 3 universities	Pen and Paper	-	27.43 (waterpipe only)	-	35.7% (cigarette only)
Azab et al	2010	2008	Jordan	548 students at 4 universities	Interview	61.1	42.7	56.6	-
Tamin et al	2001	2000	Lebanon	533 students from 4 universities	Pen and Paper	-	43.3% (waterpipe only)	-	28.8% (cigarette only)
Tamim et al	2003	2001	Lebanon	1964 students from 4 universities	Pen and Paper	-	21% (waterpipe only)	-	7.6% (cigarette only)
Chaaya et al	2004	Not reported	Lebanon	416 student at 1 university	Interview	42.5	28	-	-
Maziak et al	2004	2003	Syria	587 students from 1 university	Interview	45.3	14.7	-	18.57
Mandil et al	2007	2005	UAE	1057 students at 1 university	Pen and Paper	-	5.6	-	9.4
REGION: AMERICA									
Smith-Simone et al	2008	2004	USA	411 freshman from 1 private university	Pen and Paper	28	15.3	39.6	21.5
Eissenberg et al	2008	2006	USA	744 first year students taking an introductory psychology course at 1 university	Pen and Paper	48.8	20	-	-
Primack et al	2008	2007	USA	647 students from 1 university	Online	41	9.5	-	-
Primack et al	2009	2008	USA	8745 students from 8 universities	Online	29.5	7.2	34.1	16.4
Sutfi et al	2011	2008	USA	3770 students from 8 universities	Online	40.8	17.5	46.3	25
Primack et al	2013	2009	USA	105 012 students from 152 institutions	Pen and Paper	30.5	8.4	34.6	16.8
Grekin and Ayna	2008	Not reported	USA	602 undergraduate students taking psychology courses at 1 university	Online	15.1	4.7% (>10 per year)	-	-
REGION: EUROPE									
Jackson and Aveyarc	2008	Not reported	Britain	937 students from 1 university	Pen and Paper	37.9	8	-	9.4
REGION: AFRICA									
Senkubuge et al	2011	2008	South Africa	722 medical students (2nd year and 6th year) from 2 universities	Pen and Paper	43.5	18.6	52.9	17.3
REGION: ASIA									
Al-Naggar et al	2011	2011	Malaysia	200 students from 1 university	Pen and Paper	-	30	-	-
Jawaid et al	2008	2007	Pakistan	450 students from 4 universities	Pen and Paper	53.6	33.1	-	-
Poyrazoglu et al	2010	2009	Turkey	645 students from the engineering and medical faculty (1st to 3rd years) at 1 university	Pen and Paper	45.1	32.7	-	-

Table 2: Summary of correlates associated with waterpipe use among university students found in literature

Authors	Year of data collection (publication)	Country	Sample size	Significant factors positively associated with current waterpipe use
REGION: MIDDLE EAST				
Roohafza et al	2007 (2011)	Iran	223	Perceived entertainment factors
Sabahy et al	Not reported (2011)	Iran	1024	Male; current cigarette smoker; friends who smoke waterpipe; siblings who smoke waterpipe; parents who smoke waterpipe
Dar-Odeh et al	2008 (2010)	Jordan	1454	None: descriptive study only
Azab et al	2008 (2010)	Jordan	548	Male; waterpipe less harmful than cigarettes; waterpipe less addictive than cigarettes; income
Tamin et al	2000 (2001)	Lebanon	533	Male
Tamim et al	2001 (2003)	Lebanon	1964	Male; excess alcohol; mothers education level
Chaaya et al	Not reported (2004)	Lebanon	416	Males; bias toward waterpipe acceptability; low knowledge of waterpipe
Maziak et al	2003 (2004)	Syria	587	Male; older; current cigarette smoker; friends who smoke waterpipe; waterpipe smoked in the house
Mandil et al	2005 (2007)	UAE	1057	Male; having a friend who smokes waterpipe; having a family member that smokes waterpipe; older age;
REGION: AMERICA				
Smith-Simone et al	2004 (2008)	USA	411	Male; it "looks cool"; overestimating popularity of waterpipe
Eissenberg et al	2006 (2008)	USA	744	Male; White (ref African); younger age; social acceptability of waterpipe; current cigarette smoker; waterpipe less harmful than cigarettes; waterpipe less addictive than cigarettes; belief that it "looks cool"
Primack et al	2007 (2008)	USA	647	waterpipe less harmful than cigarettes; waterpipe less addictive than cigarettes; socially acceptable; overestimate of popularity of waterpipe
Primack et al	2008 (2009)	USA	8745	non-varsity sports ; no sport
Sutfi et al	2008 (2011)	USA	3770	Male; 1st year; waterpipe less harmful than cigarettes; past 30 day drinking
Primack et al	2009 (2013)	USA	105 012	Male; older age; White (ref African); non-religious institution attendance; fraternity membership; low grades; age less than 31; unmarried
Grekin and Ayna	Not reported	USA	602	Arab race (ref non-Arab) ; current cigarette smoker
REGION: EUROPE				
Jackson and Aveyard	Not reported (2008)	Britain	937	Male; Arab (ref African); current cigarette smoker; higher year
REGION: AFRICA				
Senkubuge et al	2008 (2011)	South Africa	722	Current cigarette smoker; problem drinker; exposure to waterpipe smoke outside of home
REGION: ASIA				
Al-Naggar et al	2011 (2011)	Malaysia	200	Male; family income
Jawaid et al	2007 (2008)	Pakistan	450	None: descriptive study only
Poyrazoglu et al	2009 (2010)	Turkey	645	Male; current cigarette smoker; friends who smoke waterpipe; family member smokes waterpipe

2.10 Other

Another factor found to be correlated with current waterpipe use in more than one study was age, with one study finding younger students to be more likely to be current waterpipe users and the remainder finding older students, or more senior students, to be more likely to be current waterpipe users. A few studies found the economic condition of the household to be an insignificant factor associated with waterpipe use, although monthly spending or income was significant in at least two studies. Factors that were mentioned as associated with higher odds of being a current waterpipe smoker in one or two studies were: the mother's education, not being in a relationship, having siblings or family who smoked waterpipe, belonging to a nonreligious institution, low grades, fraternity membership and a belief that waterpipe use was higher than it was in reality.

2.11 Overall

It is evident from the literature that ever use and current use of waterpipe is on the rise internationally. Knowledge about waterpipe's health risks is poor and the myth that the smoke is purified through the water is widely believed. The belief of most students that waterpipe smoking is socially acceptable, along with incorrect knowledge and beliefs about the harm and addictiveness of waterpipe, results in those who otherwise may not have experimented with or been exposed to any form of tobacco being exposed to the health risks of tobacco smoking through waterpipe use. Several studies report that between 20% and 60% of waterpipe smokers do not currently smoke cigarettes. It is evident that university students view waterpipe smoking differently than they do cigarette smoking, and therefore policy will need to be tailored to this emerging trend of tobacco smoking.

3. Method

3.1 Sample

The target population for this study was the four resident universities in the Western Cape Province, namely the University of Cape Town (UCT), Stellenbosch University (SUN), the University of the Western Cape (UWC) and the Cape Peninsula University of Technology (CPUT). The universities each had between 19 000 and 34 000 students enrolled at the time of the survey.

3.2 Procedures

The survey was distributed online through the email systems of each university in August/September 2013. Three universities - The University of Cape Town, Stellenbosch University and The University of the Western Cape - all sent the link to the online questionnaire directly in a once-off email to all registered students. The Cape Peninsula University of Technology posted the link on their online news page and sent their regular email directing students to look at the news page website.³

³ At the time of distribution, the University of the Western Cape was changing their email server to make it more accessible to students. This may be why the response rates for UWC and CPUT are less than the 10% expected from online surveys (Primack et al., 2008). See Table 3 in results section.

The questionnaire, which is shown in the Appendix, was an anonymous self-administered online questionnaire created using Qualtrics software. It consisted of four sections and 70 questions, although in some circumstances participants were only shown questions relevant to their previous answers. All questions viewed by the participant forced a response before continuing.

There were 14 non-cash incentives offered to encourage students to respond, ranging from a R500 mall voucher to R100 airtime. Winners were selected at random using numbers generated from Stata's random number selection function which were matched to the participant's email entry number. Competition entry was voluntary as email addresses were required and the competition data was separated from the survey responses to maintain anonymity.

Ethics approval was obtained from the Ethics Review Board of each university and consent obtained from each student before the questionnaire was presented. Respondents were able to go back to previous questions and change their answers until they had completed the survey.

3.3 Survey Construction

The survey was constructed on the basis of a number of different surveys that have already been used to assess tobacco use and related behaviours.

The majority of questions were based on the two surveys used in the South African studies so as to have comparable data and to aid in assessing the validity of the results. These were the surveys used by Senkubuge et al. (2012) and Banoobhai et al. in the CANSA study (2013).

Additional surveys consulted for reference specifically with regard to assessing tobacco use were: The Global Youth Tobacco Survey (GYTS); The Global Adults Tobacco Survey (GATS) and The Action on Smoking and Health (ASH)⁴ Survey.

Questions relating to alcohol behaviour were based on the recommendations of the National Institute of Alcohol Abuse and Alcoholism (NIAAA), who form part of the National Institutes of Health based in the USA and are one of the biggest funders of alcohol research in the world. Also included to assess alcohol use were the four yes/no questions captured in the CAGE acronym, which are commonly accepted as a method of screening for alcoholism. This method of screening has previously been validated in the South African context (Claassen, 1999).

The questions relating to the physical activity levels of respondents were based on two sources: The International Physical Activity Questionnaires (IPAQ)⁵ and the Global Physical Activity Questionnaire (GPAQ) developed by the WHO.

⁴ The ASH census-style survey of high school students that has been conducted annually in New Zealand, since 1999.

The first section of the survey aims to establish the descriptors such as behaviour patterns, socio-demographic characteristics and background of the respondent, and includes questions relating to religion, race and home language among others, in order to account for cultural differences. Cape Town, and South Africa generally, is known for its cultural diversity and these questions were specifically to control for such differences, as well as to remain comparable to the two prior waterpipe studies done in the country and evaluate the representivity of the sample compared to the overall population.

The second section focuses on tobacco use, specifically with regard to cigarette use, while the third section pursues the respondent's experience of waterpipe smoking. The last section concerns the beliefs and attitudes of respondents towards waterpipe, often in comparison to cigarettes.

The survey consists of 70 questions in total and aims to cover all variables mentioned in the literature that have shown correlation with waterpipe smoking, paying particular attention to the South African context. A copy is included in the Appendix to this thesis.

3.4 Measures

The survey was cross-sectional in nature and aimed at studying smoking behaviours and perceptions among students using a four section questionnaire.

a. Section 1: Demographic and university characteristics and health risk behaviours

The demographics and university characteristics of the study included age, gender, race, religion, home language, nationality, year, university, faculty, average weekly spend, asset base and the source of funding for fees.

The health risk behaviours included the number of days of three levels of physical activity per week (walking, moderate and vigorous), time spent on each activity in an average session, the frequency of alcohol drinking in the past year, the quantity of alcohol drunk on average drinking day, the frequency of binge drinking in the past year and whether or not the respondent was a problem drinker or not.

Note problem drinkers were identified using the international CAGE indicator. This indicator is constructed based on four questions: have you ever felt you needed to **C**ut down on your drinking; have people **A**nnoyed you by criticizing your drinking; have you ever felt **G**uilty about drinking and have you ever felt you needed a drink first thing in the morning (**E**ye-opener) to steady your nerves or to get rid of a hangover? Two or more positive responses indicate a problem drinker at risk of alcoholism (Gache, 1999). This measure was also used in the South African study on waterpipe by Senkubuge et al. (2012).

⁵ IPAQ was developed in Geneva in 1998 and was tested for reliability and validity in 2000 in 12 countries spread over 6 continents. It involves self-administered questions that relate to the last 7 days.

b. *Section 2: General tobacco experience and cigarette experience*

In this section the respondents were asked about their general *tobacco* experience with the questions: have you ever used tobacco, what form of tobacco did you first experiment with and what forms of tobacco do you currently use.

Next, respondents were asked questions relating specifically to *cigarette* smoking. The options were: I have never tried a cigarette, I have tried it once or twice but never started smoking, I used to smoke but have subsequently quit, I smoke infrequently on a social level, I smoke regularly (more than once a week but not daily) and I smoke daily. Follow-up questions inquired about age of initiation, attempts to quit, on how many of the last 30 days did they smoke, how many cigarettes are typically smoked in a week, quantity normally purchased and cost thereof.

All respondents were also asked on how many of the last 30 days they were exposed to someone else's cigarette smoke and if their parents or guardians smoked cigarettes while they were growing up.

c. *Section 3: Waterpipe experience*

Similarly to section 2, respondents were asked about their waterpipe experience using the same six options. Follow-up questions included age of initiation, number of attempts to quit, how many people they smoke with normally, who they normally smoke with (friends, family, strangers, alone, other), duration of average smoking session, location of smoking session, reason for smoking, brand purchased, cost of tobacco, experience of any health problems directly from waterpipe smoking, on how many days of the last 30 did they smoke and whether they had used marijuana concurrently with waterpipe. Additionally all respondents were asked on how many days they were exposed to other people's waterpipe smoke and whether their parents or guardians smoked waterpipe. Those who had smoked waterpipe were also asked if their parents or guardians knew they smoked and if they knew, whether or not they approved of the behaviour.

d. *Section 4: Perceptions and beliefs about waterpipe smoking (relative to cigarettes)*

All respondents were asked the following: whether they noticed health warnings on cigarettes packs or waterpipe tobacco packaging, whether they think waterpipe smoking is dangerous, addictive or accessible relative to cigarettes, whether waterpipe makes people feel more comfortable at social gatherings, whether it is socially acceptable, whether they have been to a bar, café or restaurant in the last 30 days where waterpipe was being smoked and whether they feel laws applying to cigarette smoking should also apply to waterpipe smoking.

In addition, all respondents were asked whether they would consider smoking cigarettes within the next year. If they did not choose the 'I already smoke' selection the question was asked again but with a three-year time period. The same question was then asked relating to waterpipe.

3.5 Methods of analysis and created variables

The survey was created and administered online with the link sent in a once-off email and therefore low response rates were predicted. While response rates have, in the past, been an indicator of the representativeness of the sample, later research has suggested that this is not always the case and does not automatically imply sample bias (Sutfin et al., 2001).

The variance in response rates from the different institutions could be owing to the fact that UCT and Stellenbosch distributed the survey via a direct link in an individual email whereas CPUT advertised the survey link via a newsflash email. This means that while the link was available to all students, the section explaining the survey and advertising the competition was not immediately visible and the link itself was among a list of other announcements. UWC did distribute the link via an individual email, but, at the time their email server was being upgraded resulting in the email being sent later, closer to the end of term, when some students may not check their email. In addition, online research surveys are more common at UCT and Stellenbosch and therefore students may be more familiar with the process.

Although the response rate was only 4.3%, there were a significant number of people who responded ($n = 4578$). In addition, this data set is larger than those in almost all studies mentioned in the literature review apart from the two by Primack et al., in 2009 and 2011. There is also sufficient data to check the representivity of the sample against the population. This suggests that the data set is sufficiently large for meaningful data analysis.

Where appropriate, the variables used in the bivariate analysis and multivariate regressions were taken from a single question with the options as specified in the question. However, certain variables were created based on combined questions or combined answers to questions and are discussed below.

a. Race, religion and nationality

Although Indian and Asian race groups are often combined in smoking analysis, in this case the Indian race group was kept separate, as the literature supports a strong Indian association with waterpipe. As there were very few Asian participants, those respondents who selected 'Asian', 'Other', or 'I prefer not to say' were classified as missing in the race category.⁶ Respondents who selected 'Buddhist', 'Bahai', 'Other' or 'I prefer not to say' were classified as missing in the religion category.⁷ A dummy variable was created to indicate whether or not a respondent was a South African National or not.

b. Year of study and Faculty

A dichotomous variable was created from the year of study question and a respondent was classified as either an undergraduate or a postgraduate.

⁶ Asian and Other were less than 1% of the sample and 3.4% of the sample chose not to disclose their race.

⁷ 'Buddhist' and 'Bahai' were less than 1% of the sample, Other was 1.7% of the sample and 2.6% of the sample chose not to disclose their religion.

Similarly, using the information from the faculty question, a respondent was classified as either a student from the health faculty or from any other faculty.

c. Weekly spend

Respondents were asked to indicate their weekly spend on a sliding scale from R0 to R1000. Because of the distribution of the data, it made sense to create four categories: less than R100; R100 or more but less than R200, R200 or more but less than R300 and more than R300.

d. Asset indexes

The purpose of the asset base questions was to provide a possible indicator for economic status. There are numerous ways to create asset bases discussed in the economic literature. As this was not the focus of the study, the standard simple asset base measure was created. This measure allocates one unit per asset indicated in the responses. Those within the interquartile range were considered middle income. The second asset index was created to evaluate the validity of the first measure. It was far more complex, dividing the assets into three categories, electronics, transport and home appliances, weighting each asset on a scale of 1 to 4 based on its average price, then determining low, middle, and high asset bases within each category and finally combining the statuses within each category to achieve an overall asset base status. Both indexes returned similar results, suggesting the simple asset base measure was sufficient.

e. Physical activity

The physical activity variables, days active and time active, were constructed based on two three-part questions from the survey. Respondents were asked to identify how many days of the week do they do a) vigorous physical activity, b) moderate physical activity, and c) walking for more than ten minutes and then asked how long on average they spend doing each of those activities per day. The days-active variable was calculated weighting the days of walking by 0.5, and the days of vigorous activity by 1.5, and then taking the average of the three activities and dividing the values into 4 levels (quartiles). Likewise the time variable was calculated by weighting the walking time by 0.5 and the vigorous activity time by 1.5, summing the minutes, dividing by 3 to calculate the average per activity, dividing by 7 to determine average per activity per day and converting into hours. As used in analysis by Grekin et al. (2012), a dummy variable was then created to determine if they spent more or less than three hours doing physical activity per week.

f. Alcohol behaviour

In addition to the detailed alcohol questions, three simplified variables were created. A dummy variable “binger” was created for those respondents who binged more than once a month. Likewise, a dummy variable “problem drinker” was created for those respondents who scored 2 and above for the CAGE questions. The third variable separated the non-drinkers from the “non-problem drinkers” and hence this was a three-category variable.

g. Ever, current and non-smokers

A dummy variable was created to separate ever smokers of cigarettes from never smokers of cigarettes, where ever smokers were defined as those who had tried smoking cigarettes at least once in their lifetime. Similarly a dummy variable was created to identify current cigarette users from non-current users with current cigarette users defined as those who had smoked cigarettes in the last 30 days. The same method was used to establish dummy variables for ever and current users of waterpipe.

The process of analysing the variables involved two types of regressions. Each of the variables obtained in the survey was first run in a bivariate regression against the dependent variable of being a current smoker for both waterpipe and cigarette smoking. Those variables that were significant in the bivariate analysis were then selected to be part of the multivariate models.

Because of the number of significant variables, the final multivariate models for waterpipe and cigarettes were created after six and seven incremental rounds of multivariate regressions respectively. Each round introduced a set of variables in order to see the change in impact of certain types of variables when other types were introduced. The seven types of variables were broken down into the following sets: the basic variables that describe a respondent (age, gender, race, religion, nationality, home language); the university-related variables (institution, faculty, year); money-related variables (weekly spend, asset base, source of fee funding); health-related variables (physical activity); alcohol-related variables (drinking behaviour); products-related variables (first use, exposure, parents habits) and perception variables (personal opinion and knowledge).

While the final multivariate regression results are the most important, it is interesting to note the change in both degree and significance of the coefficients as the different types of variables are added to the model. Hence the results of all incremental models are included in the results section. This is helpful for comparative purposes within the multivariate regression incremental stages, as well as for the original bivariate regression results which motivated each variable's inclusion.

4. Results

4.1 Sample

6 111 people responded to the survey invitation. 1 534 responses were dropped either because they were incomplete ($n= 1522$) or they were from other tertiary institutions not included in the survey ($n= 12$) leaving a total of 4578 completed responses. Table 3 shows the percentage breakdown of the overall university population of the four universities by university, gender, race and year compared to the sample breakdown.⁸

Stellenbosch respondents were overrepresented, making up 46% of the sample compared to 26% of the population. However, the breakdown by race, gender and year within the Stellenbosch sample is fairly close to the Stellenbosch population,

⁸ The number of students enrolled in each institution in 2013 is all-inclusive and shows the breakdown per university. However, because foreign students are not classified by race or year, the categorical split is only based on South African enrolment at each university,

Table 4: Socio-demographic characteristics of the study group

Groups	n	%
Age (years) (mean \pm SD)	22.6 \pm 4.2	
Gender		
Male	2018	(44.1%)
Female	2560	(55.9%)
Race		
Black	1163	(25.4%)
Coloured	689	(15.1%)
White	2263	(49.4%)
Indian	223	(4.9%)
Other/Prefer not to say	240	(5.2%)
Religion		
No Affiliation	813	(17.8%)
Christian	3148	(68.8%)
Hindu	80	(1.8%)
Muslim	270	(5.9%)
Jewish	53	(1.2%)
Other	95	(2.1%)
Prefer not to say	119	(2.6%)
Nationality		
South African	3993	(87.2%)
Zimbabwe	142	(3.1%)
Namibia	71	(1.6%)
Other	372	(8.1%)
Home Language		
Afrikaans	1229	(26.9%)
English	2221	(48.5%)
isiXhosa	459	(14.4%)
Other/missing	669	(10.3%)
University		
CPUT	323	(7.1%)
SUN	2090	(45.7%)
UCT	1583	(34.6%)
UWC	582	(12.7%)
Year of study		
First year	764	(16.7%)
Second year	1011	(22.1%)
Third year	949	(20.7%)
Four+ undergrad	633	(13.8%)
Postgrad	1221	(26.7%)
Weekly spending		
R0 - R99	1484	(32.4%)
R100 - R199	1310	(28.6%)
R200 - R299	711	(15.5%)
R300+	1073	(23.4%)
How are fees funded		
Parents	1945	(42.5%)
Academic bursary	1068	(23.3%)
Financial bursary	479	(10.5%)
Student loan	607	(13.3%)
Self-funded	375	(8.2%)
Other	104	(2.3%)
Total	4578	(100.0%)

Christianity appears to be the dominant religion with 69% of the sample identifying as Christian. Almost one-fifth of the sample indicate they have no religious affiliation. Islam was the only other religion that had more than 5% of the sample. For ethical reasons, “I prefer not to say” was included and both this response and “Other” were coded as missing for analytical purposes.

The majority of the sample were South African (87%) with the remainder divided into 68 other countries. The next largest country represented was Zimbabwe at 3% of the sample.

The home language was English for 49% percent of the sample while Afrikaans was the home language for 27%. isiXhosa was the home language of 14% of the sample.

The distribution of respondents according to university and year was mentioned above; however, additional information is that undergraduates were fairly evenly distributed from first year to fourth year and higher.

Weekly spending on entertainment ranged from R0 to R1000, with 85% of the sample spending below R400 per week. Four categories for weekly spending were created (<R100; R100-R199; R200 – R299, >R300). Those who spent less than R100 per week were the highest proportion of the sample (32%), with 29%, 16% and 23% in the following three categories respectively.

The highest proportion of the sample had their fees funded by their parents (43%). Those on an academic bursary constituted 23% of the sample. 8.2% of the sample were self-funded and 13% were on a student loan. Financial needs bursary students made up 11% of the sample.

With regard to health risk behaviours, such as inactivity, most respondents (93%) were active for more than 1 day a week. 29% of the respondents claimed to engage in 30-60 minutes of activity per day.

Alcohol use was high among the students in the sample. 38% of the sample drank more than once a week and the modal category (24%) had 3-4 drinks per drinking day. Monthly or more regular binge drinking, defined as 5 drinks for males and 4 for females within a 2 hour period, was normal for 29% of the sample.¹¹

Of the 2509 respondents who scored zero on the CAGE test, 522 (42.7%) were never drinkers. A CAGE score of one reflects cause for concern, but a CAGE score of two or more classifies the individual as a problem or excessive drinker at high risk of alcoholism. Over 20% of the sample scored two or more and therefore are at high risk of alcoholism. For the multivariate analysis the CAGE data was simplified to three groups: non-drinkers, non-problem drinkers whose score was 0 or 1, and problem drinkers whose score was 2 or more.

¹¹ The three questions asked, as well the scale of answers available, were as suggested by the National Institute on Alcohol Abuse and Alcoholism and are in line with the International Guide for Monitoring Alcohol Consumption and Related Harm (WHO, 2005, pg57). They can be found at the web address: <http://www.niaaa.nih.gov/research/guidelines-and-resources/recommended-alcohol-questions>.

Table 5: Health characteristics of the study group

	Groups	n	%
Average days active per week	Less than 1 day	311	(6.8%)
	1 day	1265	(27.6%)
	2 days	1228	(26.8%)
	3 -4 days	1285	(28.1%)
	5 - 7 days	489	(10.7%)
Average time active per day	less than 3 minutes	375	(8.2%)
	less than 15 minutes but more than 3 minutes	1196	(26.1%)
	15 mins or more but less than half an hour	1144	(25.0%)
	30 minutes or more but less than 1 hour	1320	(28.8%)
	an hour or more	543	(11.9%)
Number of days drinking in past year	Never	552	(12.1%)
	Not in past year	266	(5.8%)
	1 or 2 times per year	353	(7.7%)
	3-11 times per year	520	(11.4%)
	Once a month	414	(9.0%)
	2-3 times a month	730	(16.0%)
	Once a week	638	(13.9%)
	Twice a week	698	(15.3%)
	3-4 times a week	294	(6.4%)
	5-6 times a week	78	(1.7%)
	Everyday	35	(0.8%)
Quantity drunk per drinking day	Did not drink in past year/ever	818	(17.9%)
	1 drink	715	(15.6%)
	2 drinks	952	(20.8%)
	3 - 4 drinks	1104	(24.1%)
	5 - 6 drinks	559	(12.2%)
	7 - 8 drinks	218	(4.8%)
	9 or more drinks	212	(4.6%)
How often do you binge drink	Did not drink in past year/ever	818	(17.9%)
	Not in past year	873	(19.1%)
	Less than once a month	1561	(34.1%)
	Monthly	766	(16.7%)
	Once a week	285	(6.2%)
	Twice a week	194	(4.2%)
	3 - 4 times a week	60	(1.3%)
	5 or more times a week	21	(0.5%)
CAGE	All no	2509	(54.8%)
	One yes	1019	(22.3%)
	Two yes	648	(14.2%)
	Three yes	313	(6.8%)
	Four yes	89	(1.9%)
Total		4578	(100.0%)

4.2 General use of tobacco products

Two-thirds of respondents ($n= 3066$) have tried some form of tobacco even if they do not smoke it now. Those who first experimented with manufactured cigarettes, roll-your-own cigarettes and waterpipe were 56%, 4% and 36% of the sample respectively.

Table 6: The form of tobacco first experimented with by race

Product/Race	African	Coloured	Indian	White	Total
Cigars	22 (3.6%)	6 (1.1%)	4 (2.5%)	93 (5.8%)	125 (4.3%)
Waterpipe	132 (21.6%)	194 (35.7%)	80 (50.6%)	632 (39.4%)	1,038 (35.6%)
Manufactured Cigarettes	402 (65.9%)	336 (61.8%)	72 (45.6%)	813 (50.6%)	1,623 (55.6%)
Roll-your-own cigarettes	43 (7.1%)	8 (1.5%)	2 (1.3%)	61 (3.8%)	114 (3.9%)
Snuff	11 (1.8%)	0 (0.0%)	0 (0.0%)	7 (0.4%)	18 (0.6%)
Total	610 (100%)	544 (100%)	158 (100%)	1,606 (100%)	2,918 ¹² (100%)

Within each race group, the majority first experimented with manufactured cigarettes, except Indians, for whom the majority first experimented with waterpipe. Whites were the next highest population group to have experimented with waterpipe, at roughly 40%, followed by Coloureds at 36% and Africans at 22%. Africans had the highest proportion of first time experimenters with roll-your-own cigarettes.

Respondents who said they had experimented with tobacco were asked to identify which of certain tobacco products they currently used. Alternatively, they could select “I no longer smoke any form of tobacco”. Of those who said they have experimented with tobacco [$n= 3066$], 1936 claimed they no longer use any form of tobacco which leaves roughly 25% of the sample as current tobacco users of some form.

Figure 1 shows the percentage of current users [$n= 1130$] who identified making current use of the tobacco products. 65% of tobacco smokers currently use manufactured cigarettes and 43% of tobacco users currently smoke waterpipe.

¹² Those respondents whose race is unidentifiable (i.e. “other” or “prefer not to say” were selected when asked to classify race) are not included in this table ($n=148$).

Figure 1: The percentage of current users that use of each type of tobacco product

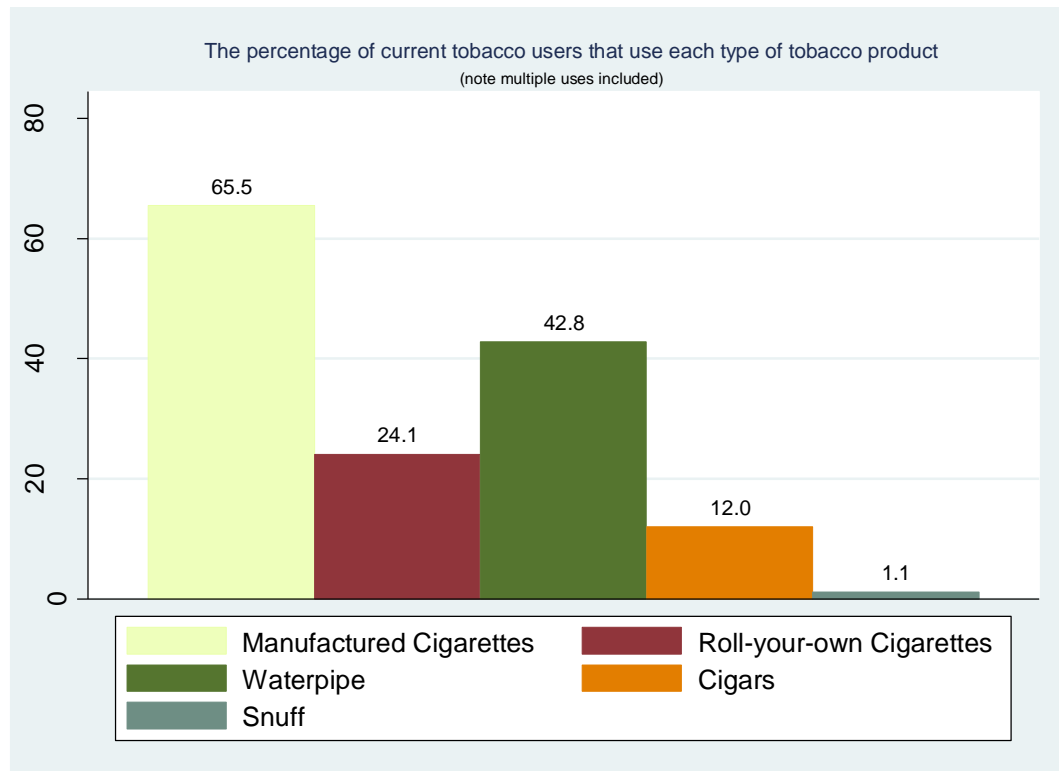


Figure 2a: A Venn diagram illustrating the use distribution of manufactured and roll-your-own cigarettes

Figure 2b: A Venn diagram illustrating the use distribution of cigarettes (as determined in Figure 2a), waterpipe and cigars

Figure 2a:

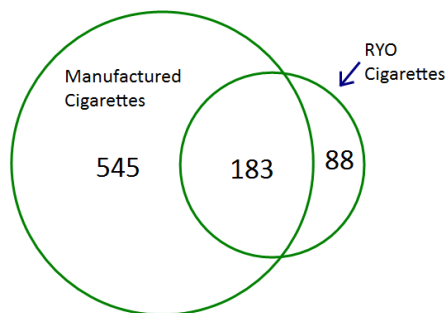
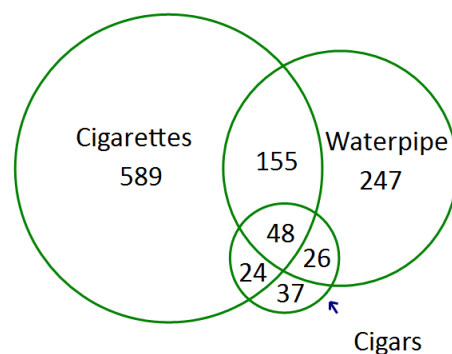


Figure 2b:



Using the information in Figure 1, Venn diagrams were constructed proportionately to illustrate the overlap on use. Figure 2a shows that the total prevalence of self-reported current use of all cigarettes is 17.8% [$n = 545 + 183 + 88 = 816$]. 11% of those current smokers are exclusive roll-your-own cigarette users [$88/816$].

Figure 2b shows that the total prevalence of self-reported current use of waterpipe is 10.4% [$n = 247 + 155 + 48 + 26 = 476$]. The figure also highlights the small number of current tobacco users who currently smoke cigars compared to those who smoke

cigarettes (manufactured and roll-your-own combined). It also shows that while cigarette use is the most common form of tobacco use, waterpipe use is not far behind. 52% of waterpipe smokers did not smoke either cigarettes or cigars [247/476] while 72% of cigarette smokers did not smoke either waterpipe or cigars [589/816].

Table 7: Current tobacco products used by race groups

Population group	African		Coloured		Indian		White		Missing/Other		Total users	
	n	%	n	%	n	%	n	%	n	%	n	%
Manufactured Cigarettes	127	(67.2%)	160	(65.0%)	30	(44.8%)	375	(65.5%)	36	(65.5%)	728	(64.4%)
Roll-your-own cigarettes	27	(14.3%)	40	(16.3%)	12	(17.9%)	175	(30.5%)	17	(30.9%)	271	(24.0%)
Cigarettes (Manu/RYO)	133	(70.4%)	172	(69.9%)	34	(50.8%)	433	(75.6%)	44	(80.0%)	816	(72.2%)
Waterpipe	72	(38.1%)	123	(50.0%)	49	(73.1%)	206	(36.0%)	26	(47.3%)	476	(42.1%)
Cigars	17	(9.0%)	10	(4.1%)	11	(16.4%)	90	(15.7%)	7	(12.7%)	135	(12.0%)
Snuff	4	(2.1%)	1	(0.4%)	0	(0.0%)	7	(1.2%)	1	(1.8%)	13	(1.2%)
Total users by race	189	(100%)	246	(100%)	67	(100%)	573	(100%)	55	(100%)	1130	(100%)

Among all race groups current cigarette smoking is the most common form of tobacco smoking, except among Indians who have a higher rate of waterpipe smoking. Indians have the highest proportion of waterpipe smokers, with 73.1% of Indian tobacco users smoking waterpipe. Half of all tobacco smoking Coloureds use waterpipe. Snuff was virtually an unused form of tobacco consumption, even among Africans.¹³

4.3 Classifying smokers

The main purpose of this study is to determine the prevalence of waterpipe use and the associated sociodemographic, health risk and perception factors of waterpipe smokers, particularly in comparison to those of cigarette smokers. It is therefore of utmost importance that the classification of ‘waterpipe smoker’ and ‘cigarette smoker’ is accurate.

In line with other literature (Sabahy et al., 2011; Primack et al., 2008; Eissenberg, 2008; Primack et al., 2010) ever smokers were defined as those who had tried smoking at least once in their lifetime and current users were defined as those who had smoked in the last 30 days. Using this definition of current smoking, as opposed to the previous measure of self-classification as a smoker by current product use, the prevalence rate for current cigarette use is 17.3% [$n= 794/4578$] and current waterpipe use is 10.6% [$n= 484/4578$].¹⁴ The prevalence rate for ever cigarette use was 62.0% [$n= 2838/4578$] and the prevalence rate for ever waterpipe use was 67.7% [$n= 3101/4578$].

As the focus of the questionnaire was specifically on waterpipe and cigarette use and because of the in-depth nature of the study, the detailed questions allow for current smokers to be calculated from multiple sources. The prevalence rates vary depending on the classification used. In order to ascertain the validity of the standard measure

¹³ Traditionally snuff in South Africa is associated with African race (Senkubuge et al., 2012) however it is more commonly used in rural settings.

¹⁴ These figures can be found in Table 8.

(past 30 days of smoking) a thorough analysis of the different classifications was conducted.

The following figure and discussion explain the other classification methods, mentioning the prevalence rates and elaborating on the discrepancies and the impact thereof on the results. Possible explanations are given for the inconsistency of students' answers. This section is not essential to the understanding or application of the rest of the paper. Rather it is an added for those to whom different classifications may be of interest or relevance.

The questionnaire was designed in such a way that, according to display logic, certain questions were not displayed, based on previous answers. A design flaw in the survey was to assume consistency of respondents' answers in their self-classification of smoking status and self-selection of current products used. Dar-Odeh et al. (2010) who conducted a study of university students in Jordan experienced the same issues of inconsistency in their pen and paper survey of 1545 students across three universities.

The three potential classifications of current waterpipe use arose from questions in the three different sections of the questionnaire. A similar pattern applies to cigarettes. Figure 3 gives a clear graphical representation of the logical flow of questioning and the resultant classification in each case.

The first method of classification depends on whether or not respondents selected waterpipe as a product they currently use (and similarly for cigarettes). In order for that question to be displayed, they had to have selected that they have experimented with tobacco at some point in their lifetime.

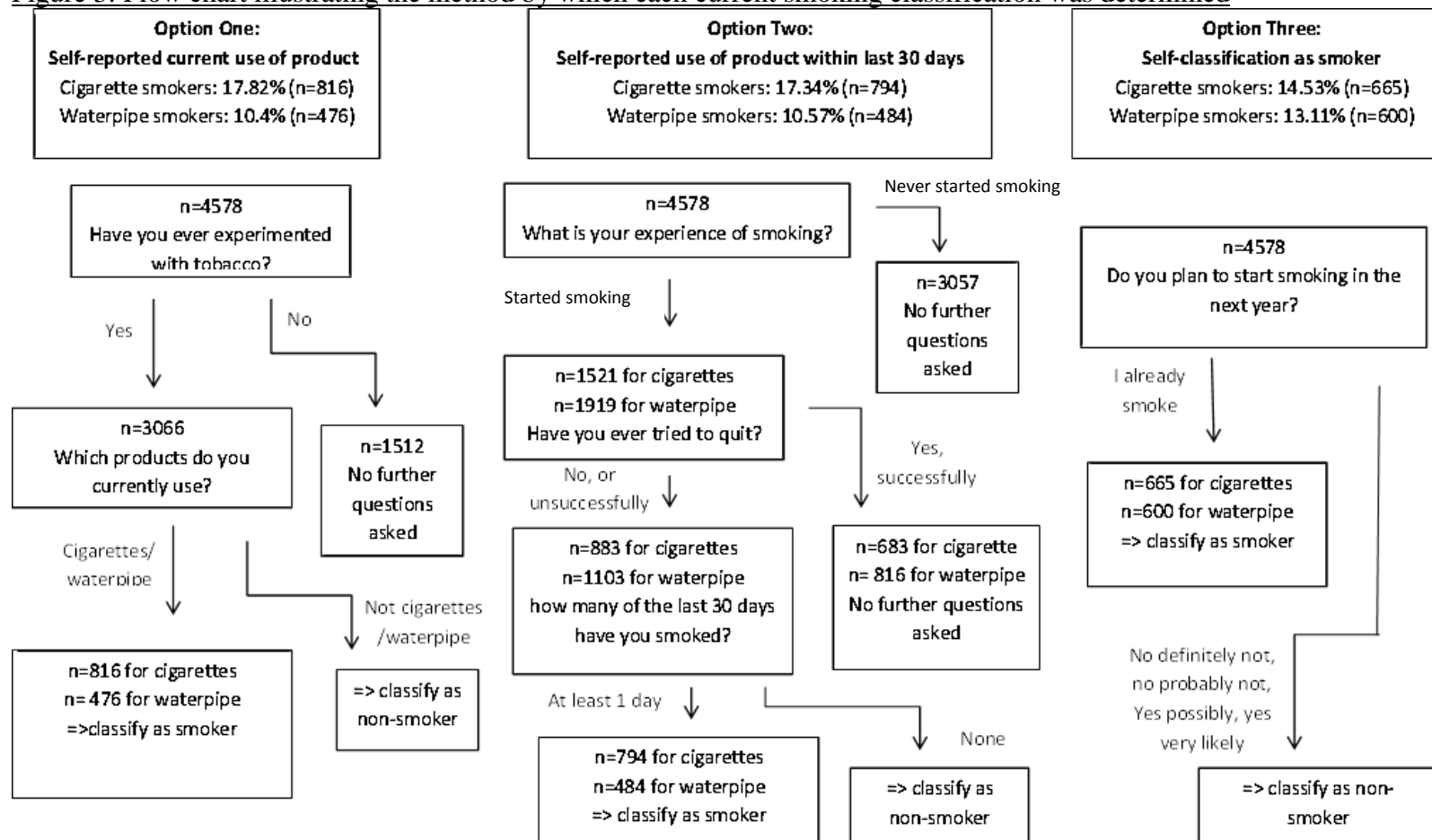
3066 respondents (67.0%) claim to have experimented with tobacco, whereas ever use of waterpipe is 3101 (just over 67.7%). It is possible that 35 people could have used an herbal substitute but a closer look at the data reveals that not everyone who has experimented with tobacco is an ever user of waterpipe. 12.6% of those who have experimented with tobacco [$n= 385/3066$] are never users of waterpipe and 13.5% [$n= 420/3101$] of ever waterpipe users claim to have never experimented with tobacco. This discrepancy is most likely due to ignorance or naivety about the fact that waterpipe uses tobacco, and that it is not filtered out through the water. The misperception among the surveyed populace, that the water removes the harm and toxins, is frequently noted in the literature (Maziak et al., 2004b; Jawaid et al., 2008; Morton et al., 2013)

The second method is the standard measure used in the literature on the subject to infer current waterpipe status and involves asking the participant on how many of the last 30 days the respondent has smoked waterpipe.

The prevalence rates that result from option one and option two, as shown in Figure 3, for both current waterpipe and current cigarette are similar. In order to address this potential problem in future studies and avoid inconsistencies, it is recommended that all questions relevant to prevalence are asked of all participants and none are omitted because of previous answers.

The third classification of smokers is those who, when asked if they would start smoking waterpipe (or cigarettes) within the next year, state that they already use it.

Figure 3: Flow chart illustrating the method by which each current smoking classification was determined



The prevalence rates in this case differ in opposite directions. The prevalence rate for current cigarette use decreases to 14.5% [n = 665/4578] while the prevalence rate for current waterpipe use increases to 13.1% [n = 600/4578].

The literature suggests that cigarette smoking has become less socially acceptable as a result of intentional efforts on a global scale to reduce the prevalence of cigarette smoking. A potential explanation therefore for the decrease in reported smoking prevalence could be that those who are social smokers do not see themselves as “smokers” due to the negative connotations associated with the cigarette smoker label.

For the increase in the prevalence rate for current waterpipe use there are two possible explanations. The first possibility is that although cigarette smoking is not socially acceptable, waterpipe smoking appears to be considered so by the majority of waterpipe smokers, and therefore social waterpipe smokers may feel comfortable identifying themselves waterpipe smokers. The second explanation of the difference in waterpipe prevalence rates is based on literature from two studies, one in Pakistan (Jawaid et al., 2008) and one in Jordan (Azab et al., 2010), in which they assess smoking of waterpipe in both the past 30 days and the past year. 84 of the students in Pakistan who had smoked in the past 30 days (56.4%) said they smoked on average less than once a month (Jawaid et al., 2008). Similarly, in the study from Jordan, 25.6% of current waterpipe smokers stated they smoked on average less than once a month (Azab et al., 2010). This suggests that any measure that only includes the past 30 days is likely to underreport the true prevalence rate of current waterpipe smoking.

In addition, this survey was released two to three weeks before the closing of the institutions for the third term, at a time when most assignments and tests are scheduled. It is likely that, because of the social nature of waterpipe smoking, many social smokers did not go out as much as they may have done during the middle of term or the holidays. Thus the prevalence rate reflected could be lower than the number of those who actually are current users. This is strongly suggested in our study as 964 respondents classified themselves as social waterpipe smokers (21%), but of that number only 371 (38% of social smokers) had smoked in the last 30 days. Of those who had smoked in the last 30 days, 40% said they had smoked only once a month. Waterpipe smokers who smoke infrequently have a high chance of being excluded from the calculations.

Clever thinking is required in order to assess the true prevalence rates of current waterpipe use. Unlike cigarettes, it would appear that assessing use within the last 30 days is insufficient (especially when reporting on students) and the prevalence rate is likely to vary substantially depending on the time of year and academic requirements. As cigarette smoking is a less social activity, the standard measure of use as ‘within the last 30 days’ is likely to return more consistent results. This is confirmed in the present study where only 8% [n = 397] of the sample classified themselves as social smokers, and of that number 60% [n = 235] had smoked in the last 30 days.

A final possible method for classifying current smokers that is not displayed in Figure 3 is to include all those who say they are social, regular or daily smokers of waterpipe or cigarettes respectively. This classification was not included in the

diagram as it increases both the rate of current cigarette use and current waterpipe use to levels that are inconsistent with the other three classifications. The prevalence rates for current cigarette and waterpipe use would be 21.0% [$n = 962/4578$] and 23.0% [$n = 1055/4578$] respectively.

Although these latter rates are high compared to the other three measures, they could be classified as an upper bound. Again, this reveals the need for more clarity on the best method of ascertaining whether someone is a current waterpipe user or not. If self-classification is included, then the prevalence rate for waterpipe smoking exceeds that of cigarette smoking among university students in this study.

Included in the Appendix are the results from the multiple logistic regressions that were run on each of the four current smoking classifications. Irrespective of the definition of the measure of use, there is a high degree of similarity within the correlates that appear significant in the results. Therefore, for the purposes of this study, a current smoker is defined as someone who has smoked in the past 30 days.

4.4 Further descriptives evaluated by smoking status

Table 8 summarises the socio-demographics and behavioural characteristics of ever smokers and current smokers for both waterpipe and cigarettes. The chi-squared test was used to determine significant difference between the smoking prevalence within each category.

Of the respondents, 67.1% [$n = 3101/4578$] reported having ever used waterpipe, compared to 62% [$n = 2838/4578$] who reported having ever used cigarettes. 10.6% [$n = 484/4578$] of the respondents reported having used waterpipe at least once in the last month and 17.3% [$n = 794/4578$] reported having used cigarettes at least once in the last month.

Males were more likely to be ever and current users of cigarettes and ever users of waterpipe but there was no significant difference between male and female current waterpipe smokers. As the prevalence rate for current cigarette smoking among males is 20.6% and 14.8% for females, but the sample is 55% female, the overall prevalence rate of cigarette smoking could be biased downward.

Current cigarette smokers and current waterpipe smokers were most likely to be Coloured (23.5% prevalence rate) and all race groups were more likely to be current cigarette smokers than waterpipe smokers, except for the Indian population group where it was equally likely (14.4%). Even though there are 32 Indian current smokers of cigarettes and waterpipe, these are not the same 32 respondents (only 9 users smoke both).

Current waterpipe users did not differ significantly by religion ($p = 0.101$) whereas those with no religious affiliation were significantly more likely to be current cigarette users ($p < 0.0001$) with a prevalence rate of 30.4%. Muslims were next highest with a cigarette smoking prevalence rate of 19.6%.

There was no significant difference between current cigarette users at the different universities; however, Stellenbosch University students were more likely to be ever and current users of waterpipe as well as ever users of cigarettes than students from other universities. Stellenbosch students have a waterpipe smoking prevalence rate of 12% compared to the 9.9% rate of students from the University of Cape Town,

which had the second highest prevalence rate. As Stellenbosch University students account for 46% of the sample, the overall prevalence rate of waterpipe smoking could be biased upward.

Postgraduates were almost half as likely to be current smokers of waterpipe (5.6%) as undergraduates, who ranged from 9.2% to 13.6%; however, there was no significant difference with current cigarette smokers. As expected, respondents from the Health Faculty had lower prevalence rates across all measures that were significantly different. For current users of both cigarettes and waterpipe, the prevalence rates for Health Faculty students were less than two-thirds of the rates of other faculties.

The more respondents spent on themselves for entertainment in a week, the more likely they were to be current cigarette and waterpipe users, although the probability increase with current cigarette smokers was much larger per category increase. The range for cigarette smokers was 9% to 29.3% whereas it was 6.5% to 13.8% for waterpipe smokers.

Those who had their fees paid by their parents had the highest prevalence rates for ever users of waterpipe, current users of waterpipe and current users of cigarettes, with prevalence rates of 75.9%, 13.5% and 19.6% respectively. However, those who were self-funded had the highest prevalence rate of ever cigarette use of 67.7%.

The average number of days that the respondent was active per week was only significant for current cigarette users, with the least active respondents having the highest prevalence rate and the most active having the lowest prevalence rate. This suggests that physical activity is only related to current cigarette smoking behaviour and that current waterpipe smoking behaviour is unrelated to physical activity levels.

With regard to alcohol use (CAGE), waterpipe and cigarette prevalence rates for problem drinkers were significantly higher. Likewise, for those whose parents smoked cigarettes prevalence rates across all categories were significantly higher.

Overall, for most characteristics, ever users of waterpipe had a higher prevalence rate than ever users of cigarettes. The exceptions were African students in the population group, UWC and CPUT in the university group, students with financial needs bursaries, student loan and self-funded students in the funding group and problem drinkers in the CAGE group, all of whom had a higher ever use of cigarettes prevalence rate.

Table 9 summarises the smoking behaviours for current waterpipe smokers.

The mean age of initiation for ever waterpipe smokers 16.03 years while the mean age for those who are current waterpipe smokers is lower, at 15.6 years.

The majority of current waterpipe smokers classify themselves as social smokers (76.7%) with only 3.7% of current users smoking daily.

Of the current waterpipe smokers, 33 (6.8%) classify themselves as having quit, yet have smoked waterpipe in the last 30 days. Most current waterpipe users, however, claim never to have tried to quit (88.4%).

Table 8: Socio-demographic and behavioural characteristics by current waterpipe and cigarette users

Characteristics (n)	Waterpipe smoking		Cigarette smoking	
	Ever % n	Current % n	Ever % n	Current % n
Gender				
Male (2018)	70.0 (1413)	11.6 (233)	64.9 (1310)	20.6 (416)
Female (2560)	65.9 (1688)	9.8 (251)	59.7 (1528)	14.8 (378)
<i>p</i> -value	0.003	0.057	<0.001	<0.001
Race				
African (1163)	42.1 (490)	6.9 (80)	48.6 (565)	11.3 (131)
Coloured (689)	79.7 (549)	16.8 (116)	74.2 (511)	23.5 (162)
White (2263)	77.0 (1742)	10.2 (132)	65.6 (1484)	19.0 (429)
Indian (223)	76.2 (170)	14.4 (32)	61.9 (138)	14.4 (32)
Other/prefer not to say (240)	62.5 (150)	10.4 (25)	58.3 (140)	16.7 (40)
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001
University				
UCT (1583)	68.9 (1090)	9.9 (157)	60.7 (961)	15.9 (252)
SUN (2090)	73.2 (1529)	12.0 (251)	63.6 (1329)	18.8 (392)
UWC (582)	58.1 (338)	9.6 (56)	63.2 (368)	16.8 (98)
CPUT (323)	44.6 (144)	6.2 (20)	55.7 (180)	16.1 (52)
<i>p</i> -value	<0.001	0.006	0.028	0.133
Religion				
No Affiliation (813)	83.8 (681)	10.8 (88)	76.8 (624)	30.4 (247)
Christian (3148)	61.9 (1949)	9.9 (311)	57.0 (1793)	13.5 (426)
Hindu (80)	76.3 (61)	15 (12)	67.5 (54)	17.5 (14)
Muslim (270)	81.9 (221)	14.8 (40)	70.7 (191)	19.6 (53)
Jewish (53)	79.3 (42)	13.2 (7)	64.2 (34)	11.3 (6)
Other/prefer not to say (214)	68.7 (147)	12.2 (26)	66.4 142/214	22.4 (48)
<i>p</i> -value	<0.001	0.101	<0.001	<0.001
Year of study				
First (764)	66.4 (507)	13.5 (103)	56.9 (435)	17.2 (131)
Second (1011)	63.8 (645)	12.5 (126)	59.1 (597)	17.6 (178)
Third (949)	69.3 (658)	13.6 (129)	62.5 (593)	18.9 (179)
Four + undergrad (633)	75.4 (477)	9.2 (58)	66.4 (420)	17.5 (111)
Postgrad (1221)	66.7 (814)	5.6 (68)	65.0 (793)	15.7 (195)
<i>p</i> -value	<0.001	<0.001	<0.001	0.522
Faculty				
Health faculty (3973)	63.0 (381)	6.8 (41)	54.9 (332)	11.4 (69)
Other (605)	68.5 (2720)	11.2 (443)	63.8 (2506)	18.3 (725)
<i>p</i> -value	0.007	0.001	<0.001	<0.001
Weekly spend				
<R100 (1484)	54.3 (805)	6.5 (97)	49.9 (733)	9.0 (134)
R100-R199 (1310)	67.3 (881)	10.5 (138)	59.6 (781)	15.0 (196)
R200 - R299 (711)	77.8 (553)	14.2 (101)	68.4 (486)	21.1 (150)
>R300 (1073)	80.3 (862)	13.8 (148)	78.1 (838)	29.3 (314)
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001
Fees funded by				
Parents (1945)	75.8 (1475)	13.5 (263)	64.1 (1246)	19.6 (382)
Academic bursary (1068)	64.0 (683)	8.8 (94)	56.4 (602)	14.1 (151)
Financial Bursary (479)	57.2 (274)	7.3 (35)	60.5 (290)	14.8 (71)
Student Loan (607)	62.3 (378)	11.2 (68)	63.1 (383)	17.8 (108)
Self-funded (375)	60.5 (227)	4.8 (18)	67.7 (254)	18.1 (68)
Other (104)	61.5 (64)	5.8 (6)	60.6 (63)	13.5 (14)
<i>p</i> -value	<0.001	<0.001	<0.001	0.003
Days active				
No days (311)	65.3 (203)	11.3 (35)	65.0 (202)	20.9 (65)
1 day (1265)	67.0 (848)	11.7 (148)	61.6 (779)	19.1 (242)
2 days (1228)	67.5 (829)	9.8 (120)	61.0 (749)	17.1 (210)
3 to 4 days (1258)	68.3 (878)	9.8 (126)	62.1 (798)	16.1 (207)
5 to 7 day (489)	70.1 (343)	11.3 (55)	63.4 (310)	14.3 (70)
<i>p</i> -value	0.613	0.445	0.702	0.039
CAGE				
Non-drinker (current/ever) (502)	37.9 (190)	6.0 (30)	33.5 (168)	6.6 (33)
Non-problem drinker (3026)	69.6 (2107)	10.0 (303)	61.5 (1860)	15.1 (457)
Problem drinker (1050)	76.6 (804)	14.4 (151)	77.1 (810)	29.0 (304)
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001
Parents smoke cigarettes				
Yes (1737)	73.2 (1271)	12.7 (221)	70.6 (1227)	22.3 (387)
No (2841)	64.1 (1830)	9.3 (263)	56.7 (1611)	14.3 (407)
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001
Total	67.7 (3101)	10.6 (484)	62.0 (2838)	17.3 (794)

Table 9: Consumption behaviours of waterpipe smokers

	Groups	n	%
Age at the beginning of smoking waterpipe (years) (mean ± SD)		15.6 ± 3.11	
How do you classify yourself	Used to but quit	33	(6.8%)
	Social	371	(76.7%)
	Regular	62	(12.8%)
	Daily	18	(3.7%)
Have you ever tried to quit	No, never	428	(88.4%)
	Yes	56	(11.6%)
How many people do you smoke with in one session?	Alone	3	(0.6%)
	1 or 2	128	(26.5%)
	3 or 4	243	(50.2%)
	5+	77	(15.9%)
	Missing	33	(6.8%)
Who do you normally smoke waterpipe with?	Family	17	(3.5%)
	Friends	426	(88.0%)
	Other	5	(1.0%)
	Missing	36	(7.4%)
How long do you usually smoke waterpipe for?	<30 mins	140	(28.9%)
	30 to 60 mins	253	(52.3%)
	>60 mins	91	(18.8%)
Where do you usually smoke waterpipe?	Home	118	(24.4%)
	Friends	279	(57.6%)
	Bars/cafes	59	(12.2%)
	Public areas	19	(3.9%)
	Campus	9	(1.9%)
What is the main reason you smoke waterpipe?	Socialise	295	(61.0%)
	Relax	157	(32.4%)
	Influenced by family/friends	11	(2.3%)
	Healthier than cigarettes	8	(1.7%)
	Looks cool	13	(2.7%)
On how many of the last 30 days have you smoked	1	194	(40.1%)
	2 to 3	152	(31.4%)
	4 to 7	71	(14.7%)
	8 to 11	26	(5.4%)
	12 to 15	17	(3.5%)
	16 to 19	6	(1.2%)
	20 to 23	3	(0.6%)
	24 to 30	15	(3.1%)
Where do you usually purchase your waterpipe tobacco?	I do not purchase my own	193	(39.9%)
	Local cafe/corner shop	233	(48.1%)
	Supermarket/tobacconist/other	58	(12.0%)
How much do you normally pay for waterpipe tobacco?	Less than R15,00	13	(2.7%)
	R15,00 - R17,49	39	(8.1%)
	R17,50 - R19,99	59	(12.2%)
	R20,00 - R22,49	102	(21.1%)
	R22,50 - R24,99	44	(9.1%)
	R25,00 - R27,49	15	(3.1%)
	R27,50 - R29,99	6	(1.2%)
	R30,00 - R32,49	4	(0.8%)
	R32,50 - R34,99	2	(0.4%)
	R35,00 or more	7	(1.5%)
	I do not purchase my own	193	(39.9%)
What brand do you usually buy?	Al fakher	136	(28.1%)
	Afzal	98	(20.3%)
	Herbal	10	(2.1%)
	Other/Can't remember	240	(49.6%)
Do you experience health problems from waterpipe smoking?	No	372	(76.9%)
	Yes	112	(23.1%)
Have you ever used marijuana with waterpipe?	No	222	(45.9%)
	Yes (<50% of the time)	238	(49.2%)
	Yes (>50% of the time)	24	(5.0%)
Do your parents smoke waterpipe?	No	457	(94.4%)
	Yes	27	(5.6%)
Do your parents know you smoke waterpipe?	No	215	(44.4%)
	Yes	269	(55.6%)
Do your parents accept that you smoke waterpipe?	No	71	(14.7%)
	Yes	198	(40.9%)
	They don't know	215	(44.4%)
Total		484	(100.0%)

The social nature of waterpipe smoking is evident again as three of the current waterpipe smokers (0.6%) smoke alone compared to over 65% who smoke with three or more people. Most waterpipe smoking (88%) is done with friends, while a smaller group smoked mainly with family (3.5%). In addition, the venue for waterpipe activity is mostly friends' houses (58%) or at home (24%), while 12% of current waterpipe smokers smoked at bars or cafés. Socialising and relaxing account for 93.4% of current waterpipe smokers' reason for smoking, with 61% saying that they do it to socialise and 32.4% saying it is to relax.

The most common length of a waterpipe session was 30 minutes to an hour (52%), with over 70% of current waterpipe smokers smoking for more than half an hour at a time. The frequency with which waterpipe is smoked is not high, with 95.1% of current smokers smoking fewer than half the days in the past month and 28.5% smoking it more than once a week on average.

The majority of waterpipe current smokers buy their waterpipe tobacco from a local corner shop or café (48%) although 40% do not buy their own tobacco. As a result, most current smokers cannot remember or do not know what brand of tobacco they use (49.6%), although 2.1% ($n = 10$) of the current smokers reported substituting tobacco for herbal or non-tobacco based brands. Of those who did buy their own waterpipe tobacco, the modal cost was between R20,00 and R22,50.

Of current waterpipe smokers, 23.1% admitted that they have experienced health problems as a result of their waterpipe smoking. More than half of current waterpipe smokers have used marijuana with waterpipe (54%), of which 5% use it more than 50% of the time.

The majority of parents (55.6%) are aware that their children smoke waterpipe and of those that know, 73.6% accept it. Interestingly 5.6% of current users had parents who smoked waterpipe [$n = 27/484$]. However, 78.6% [$n = 99/126$] of parents who smoke have children who are not current users.

4.4 Age of initiation

For both cigarettes and waterpipe, all respondents, except those who indicated they had never started smoking or only tried once or twice, were asked to identify their age of initiation by sliding a line on a scale from 0 to 30. A small percentage (4.9% in the case of cigarettes and 2.9% in the case of waterpipe) of respondents indicated ages below 10 years old. Those entries were excluded for the purposes of this analysis owing to their questionable validity.¹⁵

¹⁵ For cigarette smoking those excluded were: 3 of 0 years, 4 of 2 years, 5 of 3 years, 1 of 4 years, 6 of 5 years, 9 of 6 years, 14 of 7 years, 10 of 8 years and 22 of 9 years. For waterpipe smoking those excluded were: 1 of 0 years, 3 of 2 years, 6 of 3 years, 3 of 4 years, 6 of 5 years, 6 of 6 years, 11 of 7 years, 10 of 8 years and 10 of 9 years.

Figures 4a and 4b illustrate the distribution of initiation ages of cigarette smoking and waterpipe smoking respectively. The mean age of initiation is 15.82 years (SD 2.9) for cigarette use and 16.03 (SD 2.8) years for waterpipe use and the median is 16 years for both types of smoking. If the analysis is restricted to only current users, the mean age of initiation for cigarettes stays the same, whereas it drops to 15.88 for current waterpipe users.

Figure 4a

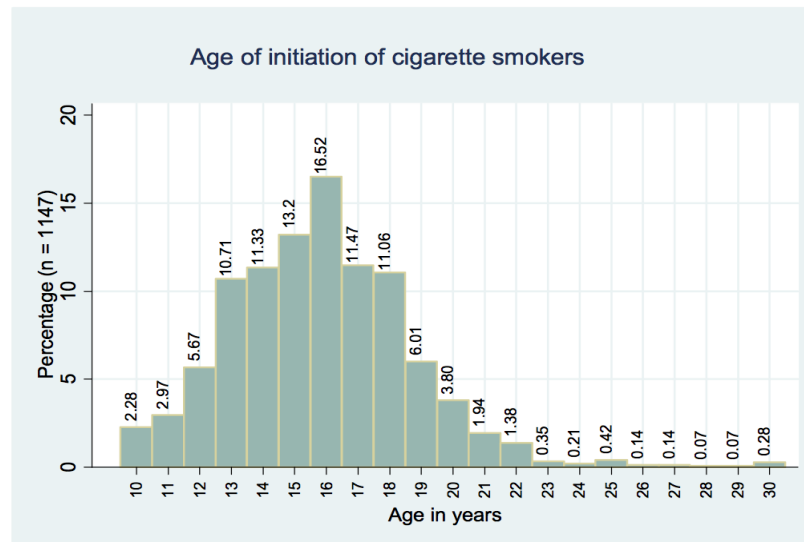
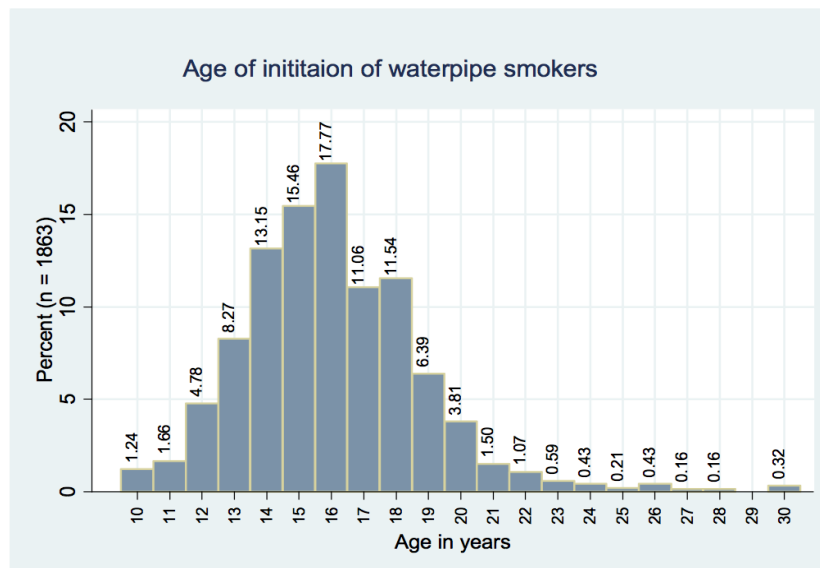


Figure 4b



The youngest age of cigarette smoking initiation by race group is 14.89 years (SD 2.48) for Coloureds and the oldest is 16.78 years (SD 3.31) for Africans. The mean male and female ages for cigarette smoking initiation were both 15.82 years (SD 2.96 and 2.83 respectively). Similarly, regardless of whether the parents of the respondents smoked cigarettes or not, the mean ages for smoking initiation were very similar at 15.89 years (SD 2.86) and 15.73 years (SD 2.94) respectively.

For waterpipe smoking, the youngest age of initiation was found among Coloureds at 15.47 years (SD 2.94) and the oldest among Africans at 17.89 years (SD 2.86). The mean male age for waterpipe smoking initiation is 15.88 years (SD 2.88) which is slightly younger than the corresponding mean female age of initiation of 16.16 (SD 2.71). Unlike cigarette smoking, the mean age of waterpipe initiation differed depending on whether or not the parents of the respondent smoked cigarettes. The mean age of initiation for those whose parents smoked cigarettes was 15.81 years (SD 2.94) and was 0.4 years less than those whose parents did not smoke cigarettes (16.20 years, SD 2.66).

4.5 Perceptions of waterpipe

The fourth section of the questionnaire dealt with respondents' perceptions about waterpipe smoking and, where appropriate, users' perceptions about cigarette smoking as a base for comparison. The chi-squared test was performed on all variables and showed that the groups differ significantly in their perceptions, depending on whether or not they are classified as non-smokers or smokers of waterpipe. The differences were more strongly pronounced between ever and never smokers of waterpipe. Table 10 summarises the results of these questions.

Of those respondents who do not currently smoke waterpipe, 44% believe waterpipe smoking is at least as dangerous to one's health as cigarettes, compared to 26.3% of current waterpipe smokers. The difference is more evident with never and ever smokers of waterpipe, with 57% of never waterpipe smokers believing it to be at least as dangerous as cigarettes, compared to 35% of ever waterpipe smokers. A larger percentage of current smokers (21.5%) feel that waterpipe is not at all dangerous to one's health, compared to 12.2% of non-smokers.

Irrespective of smoking status, the belief that waterpipe was at least as accessible as cigarettes was held by roughly 40% of each smoking group. Overall, only 4.6% felt waterpipe was not at all accessible.

The belief that waterpipe was at least as difficult to quit as cigarettes differed substantially depending on smoking status. Of current non-smokers, 22.7% felt waterpipe was at least as difficult to quit as cigarettes, compared to 7.2% of current smokers. Never smokers and ever smokers showed similar results of 37.9% and 13.1% respectively. The group with the highest percentage who believed that waterpipe was not at all difficult to quit was current waterpipe smokers.

All smoking and non-smoking groups agreed that waterpipe smoking does make people feel more comfortable at social events. Both non-current waterpipe smokers and never waterpipe smokers, however, were more likely to believe that waterpipe smoking had no influence on feeling comfortable than their respective counterparts (25.7% > 11.6% and 32.7% > 20.2%).

Of current waterpipe smokers, 96.1% felt that waterpipe smoking was socially acceptable, compared to 69.9% of current non-smokers, and a similar difference was found between ever and never waterpipe smokers (84.9% and 46.9% respectively).

Eighty percent of current non-smokers of waterpipe felt that laws applying to cigarettes should apply to waterpipe, while only 53.1% of current smokers and

89.9% of never smokers felt the same way. Overall, 77.2% agreed that the laws should be the same.

4.6 Bivariate analysis

In order to determine the demographic and behavioural characteristics associated with waterpipe and cigarette smoking, simple logistic regression analysis was conducted individually on all potentially relevant variables. The dependent variable is binary, where one represents a current smoker.

The full analyses of all results, whether significant or not, are reported in Table 11 for waterpipe smoking and Table 12 for cigarette smoking. The stars indicate the level of significance, with 3 stars, 2 stars and 1 star representing significance at the 1%, 5% and 10% level respectively.

a. Waterpipe

With regard to the socio-demographic variables, age was a highly significant factor. The odds ratio reported for age was 0.87 which means that with every one year increase in age there is a 13% lower probability of being a waterpipe smoker. Gender did not appear to have any significant correlation with current waterpipe smoker status.

All races differed significantly from Africans, and odds ratios of greater than 1.5 were reported. Coloureds had the highest odds ratio of 2.74, suggesting they are almost three times more likely to be current waterpipe smokers than Africans.

Compared to Afrikaans, isiXhosa and languages other than English (other languages) had odds ratios less than one that were significant at the 5% level while English returned an insignificant coefficient. This means that relative to Afrikaans speakers, speakers of isiXhosa and other languages are less likely to be current waterpipe smokers. Nationality was not a significant factor in determining waterpipe smoking status.

Only Stellenbosch University students differed significantly from CPUT in their likelihood of being a current waterpipe smoker; they were roughly twice as likely as CPUT students to smoke waterpipe. A student belonging to the Health Faculty was about 40% less likely to be a current waterpipe smoker than a student registered in another faculty. Similarly, 4th year and above students and postgraduates were 35% and 71% less likely to be current waterpipe smokers than first years. There was no significant difference between 1st years and other undergraduate years.

Table 10: Perceptions of waterpipe according to ever and current waterpipe users

Groups		Current waterpipe smoking status				Ever waterpipe smoking status				Total			
		Non-smoker		Smoker		Non-smoker		Smoker				Chi-square	
		n	%	n	%	n	%	n	%				
Do you think waterpipe smoke from others is dangerous to your health?	Not at all	498	(12.2%)	104	(21.5%)	63.8	116	(7.9%)	486	(15.7%)	222.11	602	(13.2%)
	Less than cigarette	1797	(43.9%)	249	(51.5%)	<0.001	517	(35.0%)	1529	(49.3%)	<0.001	2046	(44.7%)
	Equal to cigarette	1460	(35.7%)	110	(22.7%)		657	(44.8%)	913	(29.4%)		1570	(34.3%)
	More than cigarette	339	(8.3%)	21	(4.3%)		187	(12.7%)	173	(5.6%)		360	(7.9%)
Do you think waterpipe (the pipe, tobacco and coal) is easily accessible?	Not at all	202	(4.9%)	7	(1.5%)	16.16	125	(8.5%)	84	(2.7%)	79.36	209	(4.6%)
	Less than cigarette	2053	(50.2%)	274	(56.6%)	0.001	692	(46.9%)	1635	(52.7%)	0.001	2327	(50.8%)
	Equal to cigarette	1488	(36.4%)	167	(34.5%)		535	(36.2%)	1120	(36.1%)		1655	(36.2%)
	More than cigarette	351	(8.6%)	36	(7.4%)		125	(8.5%)	262	(8.5%)		387	(8.5%)
Once someone has started smoking waterpipe regularly do you think it would be difficult to quit?	Not at all	1271	(31.1%)	280	(57.9%)	153.57	240	(16.3%)	1311	(42.3%)	516.52	1551	(33.9%)
	Less than cigarette	1892	(46.2%)	169	(34.9%)	<0.001	677	(45.8%)	1384	(44.6%)	<0.001	2061	(45.0%)
	Equal to cigarette	808	(19.7%)	29	(6.0%)		461	(31.2%)	376	(12.1%)		837	(18.3%)
	More than cigarette	123	(3.0%)	6	(1.2%)		99	(6.7%)	30	(1.0%)		129	(2.8%)
Do you think waterpipe makes people feel comfortable at parties?	Not at all	1054	(25.7%)	56	(11.6%)	48.47	483	(32.7%)	627	(20.2%)	109.01	1110	(24.3%)
	Yes, a little bit	2015	(49.2%)	294	(60.7%)	<0.001	598	(40.5%)	1711	(55.2%)	<0.001	2309	(50.4%)
	Yes, a lot	1025	(25.0%)	134	(27.7%)		396	(26.8%)	763	(24.6%)		1159	(25.3%)
Do you think waterpipe smoking is socially acceptable?	No	1232	(30.1%)	19	(3.9%)	149.24	784	(53.1%)	467	(15.1%)	728.27	1251	(27.3%)
	Yes	2862	(69.9%)	465	(96.1%)	<0.001	693	(46.9%)	2634	(84.9%)	<0.001	3327	(72.7%)
Do you think laws applying to cigarettes should apply to waterpipe?	No	816	(19.9%)	227	(46.9%)	178.95	149	(10.1%)	894	(28.8%)	199.75	1043	(22.8%)
	Yes	3278	(80.1%)	257	(53.1%)	<0.001	1328	(89.9%)	2207	(71.2%)	<0.001	3535	(77.2%)
Total		4094	(89.43%)	484	(10.57%)		1477	(32.26%)	3101	(67.74%)		4578	(100%)

Other than Muslims, who were more likely (at the 5% level) to be current waterpipe smokers than Christians, (OR 1.59) no religious affiliation differed significantly from Christians in their behaviour.

The variable called weekly spend refers to the question that asked respondents to estimate how much they spent on themselves for entertainment (such as movies, entrance fees, eating out and parties). Respondents who had spent more than R100 per week were more likely to be current waterpipe smokers than those who spent less than R100¹⁶ per week. Those who spent over R200 were at least twice as likely to be waterpipe smokers than those who spent less than R100.

Both asset indexes were included in the analysis and reported similar results. The middle income group was more likely to be current waterpipe smokers than the low income group, although the relationship was weakly significant. Another variable relating to monetary characteristics concerned students' main source of funding. Those who had their fees funded by their parents were 1.62 times as likely to be current waterpipe smokers as those whose fees were funded by academic bursaries. The only other category that showed a significant difference to academic bursaries was those who were self-funded. They were half as likely to be current waterpipe smokers (OR = 0.52) but the relationship was only significant at the 10% level.

None of the variables indicating levels of physical activity, neither the average number of days nor the average number of hours per week,¹⁷ appeared to have a significant association with being a waterpipe smoker.

Alcohol consumption behaviour was a differentiating factor for all tested variables. The questions related to how often respondents had drunk in the past year on average, how many drinks they had on an average drinking day, how many times in the past year they had had more than five (males) and four (females) drinks in a two hour sitting and then a four-part yes/no question defined in the CAGE test. Those who drank between bimonthly and 3 to 4 times a week reported similar odds ratios (2.14-3.41) and differed significantly from never drinkers. Those who drank more than 4 times a week did not differ significantly from those who had never drunk alcohol. The odds ratio estimates associated with quantity drunk per drinking day were all significant and had the most variation. Those who had two drinks were 4.46 times more likely to be current smokers of waterpipe than those who had one drink, whereas those who had more than 9 drinks are 18.23 times more likely.

As expected from the above, the likelihood of being a current waterpipe smoker had odds ratios that increased as the frequency of binge drinking increased. Those who were classified as binge drinkers (respondents who had binged on average once a month or more) were 3.8 times more likely to be current waterpipe smokers than those who did not classify as regular binge drinkers.

When problem drinkers were compared against both non-drinkers and non-problem drinkers, non-problem drinkers were 1.8 times more likely be current waterpipe smokers than never drinkers and problem drinkers were 2.6 times more likely to be current waterpipe smokers than never drinkers. The summarised CAGE dummy

¹⁶ R100 ≈ \$12 US at the time of the survey and according to Purchasing Power Parity (PPP), R100 would be around \$15-\$20 US.

¹⁷ The dummy variable as used by Grekin et al. (2012) for more than 3hrs of activity per week.

variable, which considered non-drinkers as non-problem drinkers in order to distinguish only between problem drinkers and everyone else, reported that problem drinkers were 1.6 times more likely to be current waterpipe smokers than anyone else (non-drinkers and non-problem drinkers).

Respondents who first experimented with waterpipe were more than twice as likely to be current waterpipe smokers as those who first experimented with manufactured cigarettes. Those who experimented with roll-your-own cigarettes, cigars or snuff as their first product were not significantly different in their association with current waterpipe smokers than those who first experimented with manufactured cigarettes.

Those who had been exposed to cigarette smoke and waterpipe smoke that is not their own in the past month differed significantly from those who had not, and were 3 times more likely to be current waterpipe smokers. In addition, those who had been exposed to bars or restaurants where people other than themselves were smoking waterpipe were 4 times more likely to be current smokers themselves.

Respondents whose parents smoked cigarettes were 1.4 times as likely to be current waterpipe smokers as those whose parents did not smoke cigarettes, while the odds ratio for the comparable question relating to waterpipe was 2.38. If respondents themselves are current cigarette smokers, they are almost 3 times more likely to be waterpipe smokers than those who are not.

Perceptions about waterpipe smoking are all significantly associated with current waterpipe smokers. The more dangerous one believes waterpipe to be, the less likely one is to be a current waterpipe smoker. Those who believed waterpipe smoking is more dangerous than cigarette smoking were 70% less likely to be current waterpipe smokers than those who thought it is not at all dangerous. The opinion that waterpipe was accessible at any level compared to cigarettes resulted in roughly a 3 times higher chance of an individual being a current waterpipe smoker. Respondents who believed that waterpipe is difficult to quit were less than half as likely to be current smokers as those who did not think it is at all difficult to quit. When asked whether waterpipe smoking makes people feel more comfortable at social events, those who agreed were more than twice as likely to be current smokers.

Holding the belief that waterpipe smoking is socially acceptable makes a student 10 times as likely to be a current waterpipe smoker as those who think it is not socially acceptable. Those students who felt that the laws applying to cigarettes should apply to waterpipe are 71% as likely to be current waterpipe smokers as those who felt that the laws for cigarettes should not apply to waterpipe.

Table 11: Results from bivariate analysis of relationship between current waterpipe smokers and all relevant variables

Sociodemographic		Sociodemographic (cont.)		Physical activity		Alcohol behaviours		Product related		Perceptions	
Age	0.869*** (-7.68)	Religion (Christian)		Days active (Level 1)		Frequency (Never had)		First tobacco product (Cigarettes)		Danger of waterpipe (Not at all)	
Gender (Male)	0.833	No Affiliation	1.107	Level 2	1.045	Not in past year	0.375*	Waterpipe	2.129*** (7.17)	wp < cig	0.664** (-3.22)
Female	(-1.90)	Muslim	1.586* (2.54)	Level 3	0.854 (-0.78)	1-2 times a year	0.474* (-2.03)	Roll-your-own cigarettes	0.618 (-1.36)	wp = cig	0.361*** (-6.97)
Race (African)		Hindu	1.610 (1.49)	Level 4	0.857 (-0.76)	3-11 times a month	0.995 (-0.02)	Cigars	0.554 (-1.67)	wp > cig	0.297*** (-4.87)
Coloured	2.741*** (6.54)	Jewish	1.388 (0.80)	Level 5	0.999 (-0.00)	Once a month	1.224 (0.76)	Snuff	0.897 (-0.14)	Accessibility of waterpipe (Not at all)	
Indian	2.268*** (3.67)	Weekly spend (<R100)		Time active (<3hrs p/w)		2-3 times a month	2.141*** (3.53)	Cigarette exposure in last month (No)		wp < cig	3.851*** (3.46)
White	1.539** (3.19)	R100-R199	1.684*** (3.77)	>3hrs per week	1.061 (0.46)	Once a week	2.843*** (4.90)	Yes	3.159*** (4.81)	wp = cig	3.239** (2.99)
Language (Afrikaans)		R200-R399	2.368*** (5.74)			Twice a week	3.861*** (6.56)	Waterpipe exposure in last month (No)		wp > cig	2.960* (2.57)
English	0.997 (-0.02)	R300+	2.288*** (6.03)			3-4 times	3.410*** (5.14)	Yes	3.827*** (13.59)	Difficulty of quitting waterpipe (Not at all)	
Other	0.669* (-2.38)	Simple Asset (Low)				5-6 times a week	1.602 (1.08)	Exposed to bars with waterpipe in last month (No)		wp < cig	0.405*** (-8.68)
Xhosa	0.593** (-2.59)	Middle	1.321* (2.10)			Everyday	2.708 (1.93)	Yes	4.394*** (14.84)	wp = cig	0.163*** (-9.06)
Nationality (non-SA)		High	1.135 (0.74)			Quantity (1 drink)		Parents smoke cigarettes (No)		wp > cig	0.221*** (-3.56)
SA	1.337 (1.84)	Complex Asset (Low)				2 drinks	4.458*** (4.52)	Yes	1.429*** (3.69)	Waterpipe = social comfort (Not at all)	
University (CPUT)		Middle	1.332* (2.25)			3-4 drinks	11.01*** (7.60)	Parents smoke waterpipe (No)		Yes, slightly	2.746*** (6.70)
SUN	2.068** (3.02)	High	1.029 (0.16)			5-6 drinks	17.49*** (8.92)	Yes	2.384*** (3.90)	Yes, a lot	2.461*** (5.45)
UCT	1.668* (2.08)	Fees (Academic bursary)				7-8 drinks	16.18*** (8.01)	Current cigarette smoker (No)		Waterpipe socially acceptable (No)	
UWC	1.613 (1.77)	Financial needs bursary	0.817 (-0.98)			9 drinks	18.23*** (8.39)	Yes	2.913*** (10.18)	Yes	10.54*** (9.96)
Faculty (non-Medical)		Other	0.634 (-1.05)			Binge frequency (Never in past year)				Should cig laws apply to waterpipe (No)	
Med	0.579** (-3.22)	Parents	1.620*** (3.81)			Less than once	4.427*** (6.56)			Yes	0.282*** (-12.78)
Year (1st year)		Self-funded	0.522* (-2.45)			Monthly	7.484*** (8.66)				
2nd Year	0.914 (-0.63)					Once a week	10.49*** (9.22)				
3rd Year	1.010 (0.07)	Student Loan	1.307 (1.59)			Twice a week	12.49*** (9.41)				
4th year + undergrad	0.647* (-2.50)					3-4 times a week	11.25*** (6.52)				
Postgrad	0.378*** (-5.94)					5 or more times	1.848 (0.59)				
						Binged (less than once a month)					
						Binger	3.800*** (11.21)				
						CAGE (Never drinker)					
						Non-problem drinker	1.751** (2.83)				
						Problem drinker	2.643*** (4.68)				
						CAGE (Never/non-problem drinker)	1.612*** (4.54)				
						Problem drinker					

b. Cigarettes

The bivariate analysis results relating to current cigarette smokers, as reported in Table 12, report results that show significant differences from those in Table 11, which relate to current waterpipe users.

The age of a student showed no correlation to their smoking status, but gender did, with females being one-third less likely to be current cigarette smokers than males. White and Coloured race groups differed significantly from Africans, with Whites being 1.4 times as likely and Coloured 2.4 times as likely as Africans to be current cigarette smokers.

All language groups were significantly less likely to be current cigarette smokers than the Afrikaans-speaking students, although difference between English and Afrikaans speakers was only significant at the 10% level. Also significant only at the 10% level was a student's nationality, with South Africans being 1.4 times more likely to be currently smoking cigarettes than non-South Africans.

Neither the university attended nor the year of study was significantly associated with cigarette smoking status. The only variable linked to the study environment was that of faculty, in that students registered with the Health Faculty were almost half as likely as non-Health Faculty students to be current cigarette smokers.

Those who had no religious affiliation were almost 3 times as likely to be current cigarette smokers as those who identified themselves as Christian, while those who identified themselves as Muslims were 1.6 times as likely to be current cigarette smokers. No other religious group differs significantly.

Income and monetary variables show some associations, with those who spend over R300 a week being 4 times as likely to be current smokers. Those with middle or high asset bases according to the simple asset index were slightly more likely to be current cigarette smokers, as were those whose fees were funded by their parents.

The amount of time spent per day exercising had no significant correlation with current cigarettes smokers. However, those respondents who were in the highest two levels of the 'days active' variable were less likely to be current smokers than inactive respondents, by 27% and 37% respectively.

All alcohol-related variables showed significant differences in their association with cigarette smoking status, as with waterpipe smokers, but the estimates have different variation patterns. Those who drink once a month or more are more likely to be cigarette smokers than non-drinkers. Those who drink twice a week or 3-4 times a week are 7 and 9 times more likely to be cigarette smokers than those who do not drink. Those who drink 2 drinks per drinking day are 3 times as likely to be cigarette smokers as those who have one drink, and those who drink 3 drinks per drinking day are almost 7 times as likely.

Table 12: Results from bivariate analysis of relationship between current cigarette smokers and all relevant variables

Sociodemographic		Sociodemographic (cont.)		Physical Activity		Alcohol behaviours		Product related		Perceptions	
Age	1.002 (0.25)	Religion (Christian)		Days active (Level 1)		Frequency (Never had)		First tobacco product (Cigarettes)		Waterpipe socially acceptable (No)	
Gender (Male)		No Affiliation	2.788*** (11.10)	Level 2	0.895 (-0.71)	Not in past year	0.883 (-0.39)	Waterpipe	0.590*** (-5.75)	Yes	3.610*** (10.79)
Female	0.667*** (-5.17)	Muslim	1.561*** (2.75)	Level 3	0.781 (-1.56)	1-2 times a year	0.840 (-0.59)	Roll-your-own cigarettes	0.867 (-0.68)	Should cig laws apply to waterp	
Race (African)		Hindu	1.355 (1.02)	Level 4	0.727* (-2.01)	3-11 times a month	0.904 (-0.39)	Cigars	0.290*** (-4.43)	Yes	0.544*** (-7.11)
Coloured	2.422*** (6.85)	Jewish	0.816 (-0.47)	Level 5	0.632* (-2.41)	Once a month	2.216*** (3.50)	Snuff	0.428 (-1.34)		
Indian	1.320 (1.31)	Weekly spend (<R100)		Time active (<3hrs p/w)		2-3 times a month	2.819*** (5.14)	Cigarette exposure in last month (No)			
White	1.843*** (5.71)	R100-R199	1.773*** (4.80)	>3hrs per w	0.970 (-0.29)	Once a week	4.620*** (7.74)	Yes	5.757*** (7.37)		
Language (Afrikaans)		R200-R399	2.694*** (7.68)			Twice a week	6.981*** (10.09)	Waterpipe exposure in last month (No)			
English	0.823* (-2.18)	R300+	4.168*** (12.66)			3-4 times	8.831*** (10.26)	Yes	1.415*** (4.23)		
Other	0.457*** (-5.45)	Simple Asset (Low)				5-6 times a week	7.820*** (6.97)	Parents smoke cigarettes (No)			
Xhosa	0.669** (-2.71)	Middle	1.482*** (3.55)			Everyday	6.770*** (4.74)	Yes	1.714*** (6.85)		
Nationality (non-SA)		High	1.516** (3.03)			Quantity (1 drink)		Parents smoke waterpipe (No)			
SA	1.375* (2.50)	Complex Asset (Low)				2 drinks	3.009*** (5.03)	Yes	1.125 (0.51)		
University (CPUT)		Middle	1.488*** (3.77)			3-4 drinks	7.750*** (9.98)	Current waterpipe smoker (No)			
SUN	1.203 (1.15)	High	1.301 (1.81)			5-6 drinks	10.72*** (11.11)	Yes	2.913*** (10.18)		
UCT	0.987 (-0.08)	Fees (Academic bursary)				7-8 drinks	16.93*** (11.94)				
UWC	1.055 (0.29)	Financial needs bursary	1.057 (0.35)			9 drinks	17.41*** (12.01)				
Faculty (non-Medical)		Other	0.945 (-0.19)			Binge frequency (Never in past year)					
Med	0.577*** (-4.10)	Parents	1.484*** (3.77)			Less than once	2.601*** (6.21)				
Year (1st year)		Self-funded	1.345 (1.85)			Monthly	5.695*** (10.96)				
2nd Year	1.033 (0.25)	Student Loan	1.314* (1.98)			Once a week	8.866*** (11.90)				
3rd Year	1.123 (0.92)					Twice a week	9.626*** (11.29)				
4th year + undergrad	1.028 (0.19)					3-4 times a week	20.04*** (10.14)				
Postgrad	0.918 (-0.69)					5 or more times	7.158*** (4.08)				
						Binged (less than once a month)					
						Binger	3.592*** (13.84)				
						CAGE (Never drinker)					
						Non-problem drinker	2.528*** (4.96)				
						Problem drinker	5.792*** (9.12)				
						CAGE (Never/non-problem drinker)					
						Problem drinker	2.527*** (11.08)				

Those who binge drink frequently are more likely to be cigarette smokers than those who binge infrequently. The odds ratio for the dummy variable for those who classify as binge drinkers is 3.6, suggesting binge drinkers are more than 3 times as likely to be current cigarette smokers as those who binge less than once a month. When problem drinkers were compared against both non-drinkers and non-problem drinkers, non-problem drinkers were 2.5 times more likely to be current cigarette smokers than never drinkers and problem drinkers were 5.8 times more likely to be current cigarette smokers than never drinkers. The summarised CAGE dummy variable suggests that problem drinkers are more than twice as likely to be current cigarette smokers as those who do not drink or are not problem drinkers.

Those students who experimented with roll-your-own cigarettes and snuff as their first form of tobacco experimentation did not differ significantly from those who first experimented with manufactured cigarettes. Those who first experimented with waterpipe were roughly half as likely to be current cigarette smokers as those who first experimented with manufactured cigarettes. Cigarette exposure as a result of other people smoking within the past month increased the likelihood of being a current cigarette smoker, with an odds ratio of 5.8. While similar exposure to waterpipe also increased the likelihood of being a cigarette smoker, the odds ratio was a lot lower, at 1.4.

Students whose parents smoked cigarettes were 1.7 times as likely to be current cigarette smokers as those whose parents did not. Students whose parents smoked waterpipe at home did not differ significantly from those students whose parents did not smoke waterpipe. Being a current waterpipe smoker increased one's odds of being a current cigarette smoker by 2.9.

Those who believed waterpipe to be socially acceptable were 3 times as likely to be current cigarette smokers as those who did not. Students who thought cigarette laws should apply to waterpipe were half as likely to be current cigarette smokers as those who disagreed.

4.7 Multivariate analysis

a. Variable selection

In order to create the main models, variables were grouped by characteristic within the categories: basic, university, monetary, physical activity, alcohol, product related and perceptions. Within each category, those variables that were significant in the bivariate analysis of each smoking type were selected for the main models. Each category was then added to the model incrementally. There were seven categories used in the cigarette models, but only six in the waterpipe models, as no variables for physical activity were found to be significant in the bivariate analysis for waterpipe.

b. Waterpipe

Table 13 reports all the estimates used in the 6 multivariate logistic regressions in order to compare the results with the bivariate analysis and to see the effects of the additional variables as each model incorporated more explanatory variables.

Table 13:

Variable list added	Dependent variable (current waterpipe smoker)					
	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (alcohol)	Model 5 (product)	Model 6 (perceptions)
Age	0.869*** (-7.22)	0.876*** (-4.90)	0.869*** (-4.84)	0.872*** (-4.27)	0.915** (-2.65)	0.936 (-1.86)
Race (African)						
Coloured	3.246*** (4.56)	3.291*** (4.56)	3.322*** (4.65)	2.466** (3.27)	2.017* (2.26)	3.006*** (3.32)
Indian	2.569** (2.66)	2.544** (2.61)	2.480* (2.55)	1.813 (1.26)	1.689 (0.97)	2.108 (1.35)
White	1.608 (1.93)	1.325 (1.12)	1.096 (0.36)	0.782 (-0.93)	0.778 (-0.85)	0.995 (-0.02)
Language (Afrikaans)						
English	0.790 (-1.82)	0.933 (-0.50)	0.892 (-0.81)	0.815 (-1.38)	0.992 (-0.05)	1.003 (0.02)
Other	1.096 (0.36)	1.290 (0.97)	1.333 (1.11)	1.326 (1.04)	1.421 (1.16)	1.787 (1.83)
Xhosa	0.991 (-0.03)	1.315 (0.83)	1.444 (1.11)	1.126 (0.34)	1.249 (0.58)	1.505 (1.01)
Religion (Christian)						
No Affiliation	1.232 (1.48)	1.259 (1.61)	1.180 (1.14)	0.955 (-0.31)	0.872 (-0.84)	0.825 (-1.15)
Muslim	1.088 (0.36)	1.162 (0.64)	1.150 (0.59)	2.182 (1.62)	1.321 (0.55)	1.148 (0.25)
Hindu	1.148 (0.34)	1.174 (0.39)	0.994 (-0.01)	1.294 (0.50)	1.557 (0.79)	1.667 (0.90)
Jewish	1.686 (1.23)	2.036 (1.65)	1.964 (1.55)	1.986 (1.52)	2.995* (2.21)	3.728* (2.56)
University (CPUT)						
SUN		2.455** (3.14)	2.275** (2.84)	2.825** (3.20)	1.714 (1.55)	1.595 (1.28)
UCT		1.522 (1.49)	1.439 (1.27)	1.662 (1.58)	1.616 (1.41)	1.368 (0.88)
UWC		1.365 (1.06)	1.275 (0.82)	1.349 (0.90)	1.151 (0.40)	1.145 (0.37)
Faculty (non-Medical)						
Med		0.491*** (-3.80)	0.522*** (-3.45)	0.646* (-2.10)	0.755 (-1.27)	0.830 (-0.82)
Year (1st year)						
2nd Year		1.409* (2.14)	1.408* (2.11)	1.416* (2.00)	1.441 (1.91)	1.373 (1.60)
3rd Year		1.589** (2.75)	1.592** (2.72)	1.624** (2.64)	1.592* (2.31)	1.422 (1.68)

Variable list added	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (alcohol)	Model 5 (product)	Model 6 (perceptions)
4th year + undergrad		1.270 (1.14)	1.232 (0.98)	1.218 (0.85)	1.079 (0.30)	1.082 (0.30)
Postgrad		1.080 (0.33)	1.080 (0.32)	1.223 (0.79)	1.447 (1.36)	1.383 (1.15)
Weekly spend (<R100)						
R100-R199			1.696*** (3.54)	1.147 (0.82)	0.884 (-0.67)	0.854 (-0.83)
R200-R399			2.109*** (4.48)	1.136 (0.68)	0.882 (-0.62)	0.850 (-0.77)
R300+			2.587*** (6.17)	1.169 (0.87)	0.771 (-1.32)	0.689 (-1.84)
Simple Asset (Low)						
Middle			1.183 (1.08)	1.141 (0.76)	1.043 (0.22)	1.046 (0.23)
High			1.107 (0.49)	1.183 (0.74)	1.057 (0.22)	0.936 (-0.26)
Fees (Academic bursary)						
Financial needs bursary			0.755 (-1.24)	0.810 (-0.83)	0.907 (-0.35)	0.886 (-0.42)
Other			0.719 (-0.62)	0.845 (-0.30)	0.996 (-0.01)	0.888 (-0.19)
Parents			1.161 (1.00)	1.092 (0.52)	1.214 (1.04)	1.184 (0.87)
Self-funded			1.014 (0.04)	0.963 (-0.11)	1.053 (0.14)	0.993 (-0.02)
Student Loan			1.119 (0.59)	1.109 (0.50)	1.296 (1.14)	1.207 (0.79)
Quantity (1 drink)						
2 drinks				3.295*** (3.34)	2.571* (2.32)	2.218 (1.92)
3-4 drinks				5.426*** (4.84)	4.068*** (3.53)	3.727** (3.25)
5-6 drinks				7.352*** (5.50)	5.010*** (3.94)	4.309*** (3.50)
7-8 drinks				5.269*** (4.20)	3.523** (2.84)	3.032* (2.44)
9 drinks				6.390*** (4.67)	5.159*** (3.68)	4.453** (3.27)
Binge frequency (Never in past year)						
Less than once				2.495*** (3.55)	2.134* (2.55)	2.294** (2.70)
Monthly				3.172*** (4.20)	2.392** (2.79)	2.378** (2.69)

Variable list added	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (alcohol)	Model 5 (product)	Model 6 (perceptions)
Once a week				3.969*** (4.49)	2.622** (2.77)	2.491* (2.54)
Twice a week				4.656*** (4.70)	2.958** (2.98)	2.991** (2.92)
3-4 times a week				3.903** (3.06)	1.855 (1.24)	1.750 (1.08)
5 or more times				0.974 (-0.02)	0.932 (-0.06)	1.151 (0.12)
CAGE (Never/non-problem drinker)						
Problem drinker				1.109 (0.80)	0.935 (-0.48)	0.947 (-0.37)
First tobacco product (Cigarettes)						
Waterpipe					1.753*** (4.20)	1.610*** (3.44)
Roll-your-own cigarettes					0.874 (-0.35)	1.058 (0.15)
Cigars					0.837 (-0.44)	0.869 (-0.33)
Snuff					2.645 (1.14)	2.672 (1.12)
Cigarette exposure in last month (No)						
Yes					1.351 (0.88)	1.357 (0.87)
Waterpipe exposure in last month (No)						
Yes					2.097*** (5.55)	2.243*** (5.83)
Exposed to bars with waterpipe in last month (No)						
Yes					2.465*** (6.37)	2.281*** (5.65)
Parents smoke cigarettes (No)						
Yes					1.095 (0.70)	1.147 (1.01)
Parents smoke waterpipe (No)						
Yes					2.175* (2.36)	2.247* (2.38)
Current cigarette smoker (No)						
Yes					1.209 (1.35)	1.160 (1.01)
Danger of waterpipe (Not at all)						
wp < cig						0.884 (-0.71)

Variable list added	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (alcohol)	Model 5 (product)	Model 6 (perceptions)
wp = cig						0.740 (-1.45)
wp > cig						0.675 (-1.20)
Accessibility of waterpipe (Not at all)						
wp < cig						4.148* (2.56)
wp = cig						3.284* (2.12)
wp > cig						2.738 (1.69)
Difficulty of quitting waterpipe (Not at all)						
wp < cig						0.585*** (-3.83)
wp = cig						0.418** (-3.21)
wp > cig						1.104 (0.16)
Waterpipe = social comfort (Not at all)						
Yes, slightly						1.932** (3.19)
Yes, a lot						2.236*** (3.55)
Waterpipe socially acceptable (No)						
Yes						2.803*** (3.44)
Should cig laws apply to waterpipe (No)						
Yes						0.558*** (-4.16)
N	4085	4085	4085	3350	2440	2440
Pseudo R ²	0.0451	0.0594	0.08	0.1427	0.1797	0.2261
[Exponentiated coefficients reported]						
Stars indication:	* p<0.05	** p<0.01	*** p<0.001			

As with the bivariate analysis, age was significant, with an odds ratio of less than one, except for the final model which included the variables relating to the perceptions of waterpipe, but even then the coefficient is less than one.

Coloured were more likely to be current smokers than other race groups, with the odds ratio being close to 3 in all models, including the bivariate analysis. Indians, however, were only significantly different from Africans until alcohol behaviour was

accounted for. Unlike the bivariate analysis, language and religion showed no significant differences when incorporated into the multivariable models.¹⁸

When respondents' product experience had been accounted for, such as the first tobacco product used, exposure to other people smoking waterpipe in the 30 days, including at bars and cafés, and parent's waterpipe smoking behaviours, Stellenbosch was no longer significantly different from CPUT as was suggested by the bivariate analysis. This also applies to the faculty and year variables which, although significant in the initial models, were no longer significantly different from the referent groups when product experience was accounted for.

Each subgroup within the variable indicating the amount spent on weekly entertainment was significantly different in the bivariate analysis, as well as the first model into which it was incorporated, suggesting that the more one spends, the more likely one is to be a current waterpipe smoker. However, when the additional variables describing alcohol consumption and behaviour pattern were included, the amount spent on weekly entertainment was no longer significantly differently correlated with current waterpipe smokers.

The variables relating to the students' asset bases and main source of funding for fees did not appear significant in the multivariable analysis despite being so in the bivariate analysis.

The quantity drunk per drinking day was only significantly different from those who had just one drink per drinking day if the student had 3 or more drinks per drinking day. The odds of being a current waterpipe smoker increase from 3.7 to 4.5 as the quantity of drinks drunk per drinking day increases from 3 drinks to 9 or more drinks. If a student binge drinks, from even once or twice a year to twice a week, they are roughly 2 to 3 times as likely to be current waterpipe smokers as those who have never binged. Problem drinkers are also not significantly different from other respondents in their current waterpipe smoking behaviour.

Those respondents whose first experience of tobacco was with waterpipe are 1.6 times as likely to be current waterpipe smokers as those who experimented with manufactured cigarettes first. Although both cigarette and waterpipe exposure in the last 30 days was significant in the bivariate analysis, in the multivariate analysis only waterpipe exposure in the last 30 days was still significant. Those who had been exposed to waterpipe smoke other than their own, as well as those who had visited bars or cafés that had waterpipe within the last month, were twice as likely to be current waterpipe smokers as those who had not.

Respondents whose parents smoked waterpipe were twice as likely to be current waterpipe smokers themselves, while those whose parents smoked cigarettes were not significantly different from those whose parents did not. In addition, current cigarette smoking status was not significantly correlated with current waterpipe smoking status, despite being so in the bivariate analysis.

With regard to the perception variables, belief about the dangers of waterpipe was not significantly different, but belief about its accessibility and belief about a

¹⁸ Jewish religion did appear significant at the 5% level in the last two models, but the sample size is very small, with only 7 respondents being both Jewish and current smokers, and hence the result must be interpreted with caution.

person's ability to quit waterpipe were. Those who felt that waterpipe was accessible, even if it was less so than cigarettes, were more likely to be current waterpipe smokers than those who felt it was not at all accessible. Those who thought waterpipe was difficult to quit in any way were almost half as likely to be current waterpipe smokers as those who thought it was not at all difficult to quit.

Those who felt that waterpipe makes people feel much more comfortable at social events were more than twice as likely to be current waterpipe smokers as those who thought it makes no difference. Even those who felt it made people feel slightly comfortable were associated with an odds ratio of 1.9.

Although the coefficient was reduced in size from the bivariate analysis, a respondent's perception of the social acceptability of waterpipe was still a significant factor correlated with current waterpipe smoking status. In the multivariate model, those who felt waterpipe is socially acceptable were almost 3 times as likely to be current waterpipe smokers as those who did not think so. Those who thought that laws that apply to cigarettes should apply to waterpipe were almost half as likely to be current waterpipe smokers as those who thought the laws applying to the two tobacco products should not be the same.

c. Cigarettes

Table 14 reports all the estimates used in the 7 multivariate logistic regressions related to current cigarette smoking, in order to compare the results with the bivariate analysis and to see the effects of the additional variables as each model incorporated more explanatory variables.

Variable list added	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (health)	Model 5 (alcohol)	Model 6 (product)	Model 7 (perceptions)
Gender (Male)							
Female	0.629*** (-5.43)	0.649*** (-5.04)	0.706*** (-3.93)	0.662*** (-4.57)	0.896 (-1.08)	0.855 (-1.47)	0.827 (-1.77)
Race (African)							
Coloured	2.850*** (4.74)	2.877*** (4.77)	2.856*** (4.70)	2.807*** (4.59)	2.399*** (3.55)	1.600 (1.79)	1.650 (1.91)
Indian	1.063 (0.19)	1.118 (0.35)	1.090 (0.27)	1.058 (0.17)	1.674 (1.26)	1.613 (1.10)	1.585 (1.06)
White	1.565* (2.17)	1.573* (2.20)	1.277 (1.15)	1.368 (1.47)	1.281 (1.09)	1.202 (0.76)	1.225 (0.84)
Language (Afrikaans)							
English	0.694*** (-3.46)	0.698*** (-3.40)	0.650*** (-3.95)	0.666*** (-3.70)	0.591*** (-4.47)	0.672** (-3.21)	0.670** (-3.22)
Other	0.630* (-2.09)	0.637* (-2.03)	0.663 (-1.84)	0.691 (-1.64)	0.700 (-1.48)	0.708 (-1.35)	0.723 (-1.27)
Xhosa	1.174 (0.63)	1.170 (0.61)	1.206 (0.71)	1.287 (0.96)	1.011 (0.04)	1.052 (0.17)	1.096 (0.30)

Variable list added	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (health)	Model 5 (alcohol)	Model 6 (product)	Model 7 (perceptions)
Religion (Christian)							
No Affiliation	3.122*** (10.96)	3.085*** (10.83)	3.021*** (10.30)	2.980*** (10.12)	2.426*** (7.73)	2.054*** (5.99)	1.977*** (5.64)
Muslim	1.543* (2.17)	1.556* (2.20)	1.559* (2.17)	1.513* (2.02)	4.121*** (3.45)	3.001** (2.67)	2.915** (2.61)
Hindu	2.235* (2.15)	2.177* (2.08)	1.774 (1.51)	1.789 (1.52)	1.424 (0.79)	1.099 (0.20)	1.101 (0.20)
Jewish	0.975 (-0.06)	0.975 (-0.06)	0.910 (-0.21)	0.884 (-0.27)	0.803 (-0.47)	0.717 (-0.68)	0.705 (-0.71)
Nationality (non-SA)							
SA	1.035 (0.21)	1.047 (0.28)	1.155 (0.85)	1.166 (0.90)	1.087 (0.46)	1.084 (0.42)	1.087 (0.43)
Faculty (non-Medical)							
Med		0.667** (-2.81)	0.682** (-2.60)	0.684* (-2.57)	0.819 (-1.22)	0.834 (-1.06)	0.852 (-0.94)
Weekly spend (<R100)							
R100-R199			1.772*** (4.39)	1.830*** (4.62)	1.305 (1.81)	1.300 (1.70)	1.278 (1.58)
R200-R399			2.367*** (5.98)	2.433*** (6.15)	1.430* (2.19)	1.401* (1.97)	1.364 (1.81)
R300+			4.029*** (10.79)	4.215*** (11.05)	2.039*** (4.74)	1.754*** (3.59)	1.685*** (3.31)
Simple Asset (Low)							
Middle			1.123 (0.88)	1.118 (0.84)	1.072 (0.47)	1.034 (0.22)	1.040 (0.25)
High			0.946 (-0.33)	0.928 (-0.44)	1.007 (0.04)	0.939 (-0.32)	0.931 (-0.36)
Fees (Academic bursary)							
Financial needs bursary			1.283 (1.40)	1.291 (1.43)	1.244 (1.09)	1.110 (0.50)	1.088 (0.40)
Other			0.794 (-0.64)	0.770 (-0.72)	0.757 (-0.68)	0.732 (-0.71)	0.740 (-0.69)
Parents			1.561*** (3.74)	1.573*** (3.78)	1.235 (1.59)	1.225 (1.46)	1.209 (1.35)
Self-funded			1.096 (0.50)	1.051 (0.27)	1.034 (0.16)	0.920 (-0.39)	0.950 (-0.24)
Student Loan			1.526** (2.69)	1.524** (2.67)	1.120 (0.65)	1.031 (0.16)	1.015 (0.08)
Days active (Level 1)							
Level 2				0.910 (-0.53)	1.045 (0.21)	1.045 (0.21)	1.049 (0.22)
Level 3				0.748 (-1.60)	0.884 (-0.59)	0.933 (-0.32)	0.930 (-0.33)
Level 4				0.627* (-2.57)	0.733 (-1.50)	0.799 (-1.03)	0.796 (-1.04)
Level 5				0.508** (-3.10)	0.566* (-2.35)	0.575* (-2.18)	0.578* (-2.15)
Quantity (1 drink)							
2 drinks					2.307*** (3.36)	1.638 (1.91)	1.578 (1.76)
3-4 drinks					4.105*** (5.78)	2.934*** (4.27)	2.826*** (4.11)

Variable list added	Model 1 (basic)	Model 2 (uni)	Model 3 (monetary)	Model 4 (health)	Model 5 (alcohol)	Model 6 (product)	Model 7 (perceptions)
5-6 drinks					4.448*** (5.73)	2.992*** (4.08)	2.822*** (3.85)
7-8 drinks					5.686*** (6.03)	3.843*** (4.51)	3.705*** (4.37)
9 drinks					5.348*** (5.69)	3.297*** (3.91)	3.147*** (3.75)
Binge frequency (Never in past year)							
Less than once					1.601* (2.56)	1.315 (1.43)	1.299 (1.36)
Monthly					2.440*** (4.49)	1.830** (2.92)	1.776** (2.78)
Once a week					2.986*** (4.75)	2.344*** (3.52)	2.256*** (3.36)
Twice a week					2.968*** (4.29)	2.081** (2.78)	1.987** (2.60)
3-4 times a week					6.367*** (5.21)	5.820*** (4.60)	5.516*** (4.46)
5 or more times					3.878* (2.53)	4.009* (2.39)	4.602** (2.60)
CAGE (Never/non-problem drinker)							
Problem drinker					1.523*** (3.96)	1.331** (2.58)	1.333** (2.58)
First tobacco product (Cigarettes)							
Waterpipe						0.522*** (-5.68)	0.508*** (-5.89)
Roll-your-own cigarettes						0.935 (-0.27)	0.968 (-0.13)
Cigars						0.302*** (-3.61)	0.300*** (-3.60)
Snuff						0.660 (-0.57)	0.632 (-0.63)
Cigarette exposure in last month (No)							
Yes						2.398** (3.04)	2.438** (3.08)
Waterpipe exposure in last month (No)							
Yes						0.990 (-0.09)	0.990 (-0.09)
Parents smoke cigarettes (No)							
Yes						1.285* (2.42)	1.302* (2.54)
Current waterpipe smoker (No)							
Yes						1.251 (1.65)	1.150 (1.01)
Waterpipe socially acceptable (No)							
Yes							1.607** (2.97)
Should cig laws apply to waterpipe (No)							
Yes							0.808 (-1.88)
N	4154	4154	4154	4154	3403	2473	2473
Pseudo R ²	0.0593	0.0615	0.1033	0.1085	0.1718	0.1458	0.1508

The bivariate analysis suggested that current cigarette smoking status was correlated with gender; however, in the multivariate analysis when alcohol behaviour was accounted for, gender was no longer a significant correlate.

Coloureds were significantly different from Africans in their current cigarette smoking status in both the bivariate analysis and the multivariate analysis models until the product experience variable were included. Similarly, White current cigarette smokers also differed significantly from Africans in the bivariate analysis and multivariate analysis, but the significance was eliminated when the monetary related variables, such as how much is spent per week on entertainment, the asset base indicator and how the majority of fees are funded were included. White students were generally more affluent than African students, so the racial effect was transferred to a “monetary” or economic effect, once the economic effect is accounted for.

Those respondents who had no religious affiliation or who identified themselves as Muslim were, as the bivariate analysis suggested, more likely than Christians to be smokers. The odds ratios were decreased, however, for those with no religious affiliation and increased for Muslims. Those with no religious affiliation were twice, and Muslims 3 times, as more likely than Christians to be current smokers.

Each category range within the ‘amount spent on weekly entertainment’ variable was significant in the bivariate analysis and the multivariate analysis until the alcohol variables were added, at which point only those who spent over R200 were significantly different from those who spent less than R100. After the addition of the perceptions variables, only those who spent over R300 were significantly different from those who spent less than R100, being 1.6 times as likely to be current smokers.

The variable that gives an indication of the asset base of an individual was no longer significant in any of the models, while the source of funding for fees became insignificant with the addition of the alcohol consumption and behaviour variables.

Those who were extremely active, and had the highest category of number of days active per week, were half as likely to be current smokers from those who were virtually inactive.

As in the case of waterpipe smoking, only those who drank 3 or more drinks per drinking day were significantly different in their cigarette smoking behaviour from those who drank one drink per drinking day.

Current cigarette smokers differed significantly in their binge drinking behaviour from those who had never binged. As binge drinking increased in frequency, the odds of being a cigarette smoker increased; the highest odds were 5.5 for those who binge drank 3-4 times a week. Those who binge drank 5 times or more a week were more than 4 times as likely to be current cigarette smokers as those who have never binged. Problem drinkers were significantly associated with current cigarette smokers, the former being 1.3 times as likely to currently smoke cigarettes as non-problem and never drinkers.

Respondents whose first experience of tobacco was waterpipe or cigars were less likely to be current cigarette smokers than those whose first experience was with manufactured cigarettes, with an odds ratios of 0.5 and 0.3 respectively. Cigarette exposure in the last 30 days and whether one's parents smoked cigarettes were both positively correlated with current cigarette smoking status.

Unlike the bivariate analysis, the multivariate analysis showed waterpipe exposure and current waterpipe smoking to be uncorrelated with current cigarette smoking, as was the belief that cigarette smoking laws should apply to waterpipe. The only variable related to waterpipe that remained statistically significant in the multivariate analysis was the belief that waterpipe smoking is socially acceptable. Those who agreed with the statement were 1.6 times more likely to be current cigarette smokers than those who disagree.

5. Discussion

A number of issues that stood out in the research, and this discussion aims to address four of the most prominent: the number of people who have ever tried waterpipe; the perceptions of waterpipe among university students; the social dimension of waterpipe smoking and the apparent correlates of waterpipe smoking as compared to those of cigarette smoking.

If one looks only at the sales of Maasel tobacco, one may be tempted to say that it is a non-issue. However, when one looks at the number of tertiary students who are smoking this tobacco, the problem is greater than it initially appears.

This study has found that two-thirds of the respondents had ever used waterpipe. This prevalence rate for ever use of waterpipe is the highest among all studies of ever use of waterpipe among university students globally. The two other studies conducted in South Africa reported similar ever use prevalence rates of 65.8% (Banoobhai et al., 2013) and 43.5% (Senkubuge et al., 2012), even though these studies were done only on Health Science students.

A possible explanation for the high rate of ever use of waterpipe may have something to do with the liberal and diverse society in which Cape Town is situated, which encourages experimentation and involvement in other cultures (including the Middle Eastern culture from which waterpipe originates), as well as the fact that this survey uses up-to-date data, suggesting that the waterpipe trend is growing in popularity. In addition, Stellenbosch University is situated in a university town which has easy access to hookah bars and cafes.

15% of ever waterpipe users in the sample are still current waterpipe smokers, resulting in a prevalence rate for current waterpipe smoking among university students in the Western Cape Province of 10.6%. This prevalence rate was closest to those reported for university students in Iran of 11% (Roohafza et al., 2011). It is slightly higher than those reported in Western countries such as the USA (9% and 7%) (Primack et al., 2010; Primack et al., 2013) and Britain (8%) (Jackson et al., 2008) but substantially less than those prevalence rates reported in some Middle Eastern and Asian countries such as Lebanon (43.3%) (Tamim et al., 2001), Pakistan (33%) (Jawaid et al., 2008) and Turkey (33%) (Poyrazoglu et al., 2010). Most interesting was the comparison with the two other South African studies, which

found rates of current waterpipe use to be 18.0% (Banoobhai et al., 2013) and 18.6% (Senkubuge et al., 2012).

A possible explanation for the prevalence rate being found to be lower than in other comparable South African studies could be that waterpipe use has only gained popularity within the last two decades and therefore research is limited. Smoking is predominantly a social activity, which means the frequency of use depends on the amount of social activity at the time and hence is not necessarily reflective of waterpipe smoking throughout the year.

This infrequent behaviour results in difficulties in measuring waterpipe smoking prevalence accurately. The standard measure of current use is to ask how many times over the past month a person has used waterpipe. However, as most users from the study sample (70%) smoke less than 3 times a month, it is very possible that waterpipe smokers get excluded when measuring prevalence.

Studies by Azab et al. (2010), who looked at university students in Jordan, and Jawaid et al. (2008), who looked at university students from Pakistan, confirm this. The studies asked waterpipe smokers (who were self-identified and therefore not classified according to the standard measure) about the frequency with which they smoked. In Jordan, 26% of waterpipe smokers smoked less than once a month and in Pakistan 56% of current smokers smoked less than once a month. This is an area of concern for prevalence analysis as it suggests that current estimates may be underreported. Future studies of waterpipe prevalence should therefore be aware of such limitations and perhaps include additional questions to clarify whether someone who has not used waterpipe in the past 30 days would consider themselves to be a current waterpipe user.

The survey was released near the end of the third term in the academic calendar, which is traditionally associated with many work deadlines and assessments. As a result it is very likely that the time period to which the survey questions relate included fewer social activities and free time than other months. Therefore it is very possible that those who would classify themselves as current waterpipe smokers were not included as current waterpipe smokers in the sample as they had not smoked in last 30 days. This suggests that this study's current waterpipe smoking rates may be underreported owing to the sensitive measurement of current waterpipe smokers, which is largely influenced by the extent of social activity occurring in a given month.

Irrespective of country comparison and excluding the potential for underreporting due to the infrequent consumption patterns of waterpipe smokers, the prevalence rate reflects that a significant number of students are currently using waterpipe.

Literature to date suggests that perceptions about waterpipe are significantly correlated with current waterpipe use. Smith-Simone et al. (2008) highlights the fact that many users incorrectly think that the toxins from the smoke are filtered through the water and so consider it less harmful than cigarette smoke (Jawaid et al., 2008; Labib et al., 2007). This study is no exception.

Over half of the sample felt that waterpipe smoking was less dangerous or harmful to one's health than cigarette smoking. In addition, more than half of current smokers felt that waterpipe was not at all difficult to quit, despite the fact that 11% admitted

to trying to quit. It is principally these perceptions that were found to be positively correlated with being a current waterpipe smoker, and yet they are worryingly inaccurate.

While it is true that much research still needs to be done on the long-term effects of waterpipe smoking, the preliminary research has shown that there is much to be concerned about and waterpipe smoking is at least as bad for one's health as cigarette smoking. The reality is that few waterpipe users in this study are aware of the true harmful effects of waterpipe and these misinformed perceptions influence smoking behaviour. These results are confirmed in the many of the studies over the last decade (Smith-Simone et al., 2008; Eissenberg et al., 2008; Roohafza et al., 2011; Jawaid et al., 2008); WHO, 2005).

It is these perceptions, along with misperceptions such as the belief that the water filters out the tar and other toxins (Al-Naggar et al., 2011), that reinforce the social acceptability of waterpipe smoking and perhaps help it attract a different target market. While almost 90% of current smokers in this study admitted that waterpipe smoking makes them feel more comfortable at social events, there are also a large percentage of non-smokers that feel that it is socially acceptable.

The extent to which waterpipe smoking has infiltrated the social sphere is also evident in the fact that the majority of smokers identified socialising as the main reason for smoking waterpipe, with relaxation also a popular motivation. Less than 1% smoke alone, and the majority of current waterpipe smokers mostly smoke with 3 or 4 other people.

In addition, 86% of current waterpipe smokers smoke 7 or fewer times a month, compared to only 35% of current cigarette smokers who smoke 7 or fewer cigarettes a month. It is worth noting that although the frequency of waterpipe smoking is much less than of cigarette smoking, the duration is much longer. The majority of waterpipe smokers spend between 30 minutes and an hour in one session (52%) and a large percentage (19%) spend more than an hour per waterpipe session. Compared to a standard cigarette, which takes about 5 minutes on average to finish, the duration is substantially longer (Maziak et al., 2004b).

Preliminary research has been done with regard to the impact the difference in smoking patterns has on health. Early studies have found that smokers have higher levels of both nicotine and CO after a waterpipe session than after a cigarette (cited in Jackson et al., 2008; Mohammed et al., 2010) and that the volume of smoke inhaled from one waterpipe session is from 50 to 100 times the amount inhaled in one cigarette (cited in Primack et al., 2008; Primack et al., 2013) because of the duration of the smoking session.

Another health concern arising from the social nature of waterpipe is the sharing of the mouthpiece. Irrespective of tobacco related diseases, this behaviour encourages the spread of many other diseases such as tuberculosis (Knishkowsky et al., 2013). It is in fact because of the social aspect of waterpipe smoking, not despite it, that the health issues are of great concern. It is also clear that more research needs to be done into the impact of infrequent waterpipe smoking, the kind that appears most prevalent, that is, smoking mostly on weekends with possible long breaks in between, which is a very different situation from that of the average cigarette smoker.

Interestingly, the majority of the sample felt that laws applying to cigarette smoking should apply to waterpipe smoking, despite the apparent social acceptance of the behaviour. It would seem therefore, that students view legislation separately from societal norms. This suggests that legislation would not necessarily have much impact in reducing waterpipe smoking prevalence and suggests that instead education that alters perceptions and beliefs about the dangers is likely to be the major driver in attempts to reduce prevalence rates.

Another result worth noting is the difference between cigarette smokers and waterpipe smoking. From the outset it was apparent that the overlap of smoking behaviours was not large, with 78% of current cigarette smokers who do not smoke waterpipe, and 66% of current waterpipe smokers who do not smoke cigarettes. These observations point to the finding, expressed in many papers, that while there is a correlation between waterpipe and cigarette users, they appear to be two distinct groups correlated with different demographics (Primack et al., 2013; Jackson et al., 2008; Azab et al., 2010; Sabahy et al., 2011 and Sutfin et al., 2011). This hypothesis is further confirmed when looking at the correlates of current waterpipe smoking compared to current cigarette smoking.

Studies of waterpipe smoking in the Eastern Mediterranean Region have found substantial differences between the prevalence rates of current waterpipe smoking of males and females, yet those studies from the USA suggest differences are minimal. This study suggests, similarly to Eissenberg et al. (2008) and Primack et al. (2010), that there is no significant difference in the prevalence rates of waterpipe smoking between genders. There was also no significant difference between religious groupings.

In comparison and with regard to current cigarette smoking, there were significant differences between male and female prevalence rates, with males having almost a 6% higher prevalence rate. The prevalence rates also differed significantly by religion with those who identified as having no religious affiliation having the highest prevalence rate of 30%, and Muslims the second highest with a prevalence rate of 20%.

Other differences between current waterpipe smokers and current cigarette smokers include how their fees are funded, their activity levels and their problem drinking status. The majority of waterpipe smokers had their fees funded by their parents and very few were self-funded. The majority of cigarette smokers also had their fees funded by their parents, but a almost as high a proportion of cigarette smokers were self-funded, or had student loans.

Physical activity appeared to be a discriminatory factor with regard to being a current cigarette smoker, yet had no bearing on waterpipe smoking. The same percentage of those who were inactive as those who were extremely active were current waterpipe smokers.

While waterpipe smoking was not free from the positive correlation with alcohol consumption, there were major differences in the size of the coefficients as well as with the categories that appeared significant. In summary, the alcohol behaviours that were positively correlated with waterpipe smoking were those that indicated a weekend-based social lifestyle, while those with cigarette smoking suggested a more high-risk lifestyle with higher levels of frequent and excessive use of alcohol.

One of the few similarities between current cigarette smokers and waterpipe smokers that appeared in the results was the ages of initiation. This study points to ages of initiation that are virtually identical between the two different groups of smokers, at about 15 to 16 years of age, irrespective of whether someone classified themselves as a regular or social smoker. The implications of this are twofold. The first implication is that, contrary to the suggestions of some, one smoking behaviour does not appear to lead to another; rather there appears to be age at which people are exposed to smoking behaviours and it is at that point that they chose whether to engage or not. The second implication is that any intervention aimed at educating the youth and altering perceptions and societal norms needs to take place before the age of 15.

Only one other published study that looks at waterpipe smoking among university students has been conducted in South Africa, but it was restricted to the Health Faculties of two universities and only to 2nd and 6th years. This study was also done in a different province of South Africa, which has a different economic, social and racial composition to that of the Western Cape. The published study considered very few variables in its analysis. In addition, most likely due to the racial demographics of the province, Coloured and Indian race groups were combined with other races, which does not allow for a direct comparison of results in terms of racial split.

Similarly to this study, Senkubuge et al., (2012) found gender to be insignificantly correlated with current waterpipe smoking, as was year of study and university, although 6th years were more likely to be current cigarette smokers. In contrast to the results found in this study, waterpipe users were more likely to be White, to have been exposed to smoking outside the home and to be problem drinkers. Overall, the prevalence rates for ever use and current use of waterpipe were 43.5% and 18.6% respectively.

The CANSA study mentioned in the literature review used a sample of 3582 students registered with the Health Faculty at the beginning of 2013 and the completed responses were 223, a response rate of 6%, only marginally higher than this study. The questionnaire used in this study incorporated a limited number of questions used in the CANSA study in order to see comparable results and check the credibility of the new data.

The sample collected in the CANSA study was 31% African, 29% White, 25% Coloured, 10% Indian and 5% Other and 63% of the sample was female. Despite a difference in the racial composition of the two samples, the results were very similar and give credibility to the sample used in this study. The only exception was the overall prevalence rate, which the CANSA study reported to be around 17%, closer to the earlier study by Senkubuge et al. (2012). This only major difference, the lower prevalence rate of the current study, is likely a downward bias caused by the sensitivity of the classification condition to timing and when in the academic year 'the last 30 days' occur.

With regard to the perceptions of waterpipe, the percentage of those who thought waterpipe was accessible, who wanted to quit, whose parents knew they smoked and accepted they smoked, and those who thought it was socially acceptable were within 1% of this study's results.

Therefore, while this study is limited in its cross-sectional nature, with a low response rate, the similarity of results to two other studies done in the same country over a similar time period, provides a strong motivation for the reliability of the data.

Overall, these studies suggest that waterpipe smoking is prevalent among university students in South Africa, with the smokers having misconceptions as to the true dangers of waterpipe smoking. They illustrate the need for education intervention before the mid-teens, the age of initiation found to be consistent for both cigarette and waterpipe smoking, most likely due to the social environments they find themselves in in the new phase of adolescence.

6. Conclusion

This study captures information on the prevalence rates of ever and current users of both waterpipe and cigarette smoking, among a host of other variables. It includes potentially correlated factors, such as basic individual demographics, university-related characteristics, and monetary-related descriptives, as well as information on the health behaviours and concurrent risk behaviours (physical activity and alcohol use). It incorporates variables relating to the tobacco products such as exposure, first use, age of initiation and most importantly it covers the perceptions of waterpipe smoking.

The results in all areas are similar to those found in studies of other countries, with the behaviour closer to that of smokers in western countries, such as the USA and Britain, than of the MER and Asia. Prevalence rates were on average slightly higher than those in the USA and Britain and slightly lower than those elsewhere, including in two other South African studies.

As found in other studies, waterpipe smokers, although there exists some correlation, are a group distinct from current cigarette smokers. The majority of waterpipe smokers do not smoke cigarettes and hence policies targeting waterpipe behaviour need to have specific focus.

The results from the multivariate analysis, when all related variables are accounted for, show the sociodemographic and health variables that have significant correlates with current waterpipe use and increase the odds of being a waterpipe smoker are: Coloured race, the quantity drunk per drinking day and binge drinking twice a week or less.

The comparative results for current cigarette use included reduced odds for English speakers and increased odds for Muslims and those with no religious affiliation. Other sociodemographic and health variables positively correlated were: spending more than R300 on entertainment per week, increasing the quantity of alcoholic drinks drunk per drinking day, frequent binge drinking and being a problem drinker. In addition, those who had higher levels of physical activity had reduced odds of being a current cigarette smoker.

The above illustrates the point that while current cigarette smoking seems to be correlated with other lifestyle choices (such as activity levels) and other risk behaviours (such as excessive drinking), waterpipe use is not. This confirms the impression that waterpipe use among students is widespread, irrespective of healthy

or unhealthy lifestyles, and independent of other concurrent risky behaviours such as excessive drinking.

While an overlap of smoking behaviours does exist, the fact that the groups are fairly distinct in nature is an important consideration when forming policy, as policies created to encourage cigarette cessation may not impact waterpipe smokers.

Our findings confirm that waterpipe is a predominantly social activity. Again this emphasises the need to develop an accurate definition and measurement for current waterpipe smokers. Of those who said they were social smokers, which was the experience of the majority of those ever smoking waterpipe, 62% were not included as current waterpipe smokers as they had not smoked waterpipe within the last 30 days. In contrast, only 41% of social cigarette smokers were not included as current cigarette smokers.

As 77.2% of the sample would support policy that applied the same laws to waterpipe use as exist for cigarette use, policy suggestion would include the implementation of such laws as results indicate there would be little opposition. Although legislation may not change the immediate landscape of social acceptance of waterpipe, it may have a long-term effect, filtering through to future generations.

Implications for further research include the need for further investigation into the specific health effects resulting from waterpipe smoking in order to inform the public better as to the real dangers of waterpipe smoking. Current research has shown that, at best, waterpipe smoking is at least as harmful as cigarette smoking, and this research should therefore be used in the meantime to inform waterpipe policy. Policy needs to focus specifically on the health effects of infrequent waterpipe smoking, as the majority of smokers smoke on a social level, up to 7 times a month. It also needs to look at the effects of second hand smoke, as most waterpipe smokers smoke in groups of 3 to 4 people and for over half an hour, which suggests prolonged exposure even if one is not the primary smoker.

The major finding of this paper that impacts policy is the effect that perceptions have on a person's likelihood of being a smoker. While there is much research to be done, as mentioned above, there is enough preliminary research to use to educate and inform the public.

There is no single type of person who smokes waterpipe and therefore education in this area need not be targeted to one specific group; rather it needs to be widespread advertisement of the fact that waterpipe is also tobacco, and that the water does not purify the toxins or tar contained in the tobacco. This needs to happen well before the age of 15, the age of initiation for the majority of current smokers in this sample, and should be proactive, educating people before they are exposed to social environments where smoking is accessible and evident.

In conclusion, waterpipe smoking appears to be very prevalent within the student communities of the universities situated in the Western Province. This is of concern, as there are many waterpipe smokers who would otherwise be tobacco-naïve,¹⁹ and the prevalence is likely a result of the misconceptions surrounding the health effects

¹⁹ A common expression in tobacco literature describing a person who has never been exposed to tobacco.

of waterpipe smoking, as well as the social aspect of waterpipe smoking. Waterpipe smokers and cigarette smokers are fundamentally different, in that waterpipe smoking is not limited to individuals that engage in other high-risk activities, but appears to infiltrate all areas of society.

The current prevalence rate has the potential to be harmful to the country's efforts to reduce tobacco-related deaths and diseases by reducing cigarette smoking, and intervention is needed, mostly in the form of education. This also drives the need for further research into the health effects of first-hand and second-hand waterpipe smoke, specifically in the context of infrequent, but lengthy, smoking sessions.

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APPENDIX A

Online Questionnaire

Dear Participant,

Thank you for participating in this study which is being conducted as part of my Master's dissertation at the University of Cape Town. The aim of this research is to provide insight into the behaviour, preferences and perceptions of smokers *and* non-smokers in our society and has been approved by the relevant Ethics Committees at the various institutions. Please note that your participation is voluntary and that you may withdraw from participation at any time. Your responses will be anonymous and will be treated with strict confidentiality. All responses will be used for research purposes *only*.

On completion of the questionnaire you will have the option to enter a competition to win of any of the following PRIZES:

- One R500 Adidas gift voucher
- One of five R100 airtime vouchers
- Five of ten Sterkinekor movie tickets
- One R500 TAKEALOT voucher
- One R500 Shopping Mall voucher
- One of two R200 Shopping Mall vouchers
- One of two yearlong magazine subscriptions to SA Rugby, Elle, Fair Lady and others

To enter the competition you will need to provide an email address at which to be contacted. Please note this information is captured separately from all your other responses and will only be used for the competition draw and to contact you in the event that you win a prize. The draw will be done in mid-September and you will receive a notification by the end of September should you be a prize winner. The email address from which you will receive the notification is uct.tobacco.research@gmail.com.

Please answer the questionnaire that follows, which consists of four official sections. The first section relates to your demographic information which will be used for statistical purposes only, followed by some questions about lifestyle (physical activity, alcohol use etc.). Next there is a section on general tobacco use, a section on hubbly-bubbly use and a section on your perceptions and attitudes concerning tobacco issues. Lastly there is an additional voluntary section that requires a contact email and your preferences about the prizes.

If you have any questions, concerns or comments about the research or questionnaire itself, please feel free to contact me.

Thank you in advance for your participation.

Yours sincerely,

Lara Kruger

lara.kruger@uct.ac.za

Please check the box in order to proceed to the questionnaire.

- I have read and understood that above information and consent to participating in this study.

SECTION A: Background Information

1. What is your date of birth?

Day

Month

Year

(drop down menu with year from 1972)

2. What is your gender?

- Male
- Female

3. What is your population group?

- African
- White
- Coloured
- Indian
- Asian
- Other
- I prefer not to say

4. What is your home language?

- English
- Afrikaans
- isiXhosa
- Other, please specify _____

5. What is your nationality?

Country

(Drop down menu)

6. At which institution are you currently registered?

- University of Cape Town
- Stellenbosch University
- University of the Western Cape
- Cape Peninsula University of Technology
- Other, please specify _____

7. What faculty are you in?

- Agriculture/AgriScience

- Commerce/Business/Economic and Management Science
- Engineering and/or the Built Environment
- Community/Health Sciences/Medicine/Dentistry
- Humanities/Arts/Social Sciences/Education/Theology
- Informatics and Design
- Law
- Military Science
- Science and Applied Science

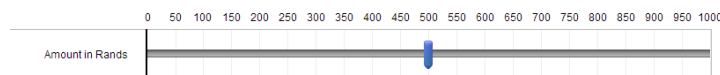
8. What level of study are you currently in?

- Undergraduate year 1
- Undergraduate year 2
- Undergraduate year 3
- Undergraduate year 4
- Undergraduate year 5
- Undergraduate year 6
- Honours
- Masters
- PhD

9. What is your religion?

- Jewish
- Muslim
- Christian
- Hindu
- Buddhist
- Bahá'í
- Other
- No religious affiliation
- I prefer not to say

10. During an average 7 day week, roughly how much money do you spend on yourself for entertainment for the following events: movies, clubs (including entrance), sporting and cultural events, concerts, parties and eating out?



(Sliding scale from R0 to R1000)

11. Which of the following do you own? Select ALL that apply

- Basic cellphone (i.e. not a smartphone)
- Smartphone
- Tablet
- Laptop
- Bicycle

- Scooter
- Motorbike
- Car
- Microwave
- Fridge
- Regular TV
- Flat screen TV
- I own none of the above

12. How are the majority of your fees funded?

- Parent(s)
- Student Loan
- Academic bursary/Scholarship
- Financial needs bursary/Scholarship
- Self-funded
- Other

13. This question relates to the number of days spent doing physical activity in the last week.

	None	1 - 2 days	3 - 4 days	5 - 6 days	Every day
During the last 7 days, on how many days did you do vigorous physical activities?					
During the last 7 days, on how many days did you do moderate physical activities (exclude walking)?					
During the last 7 days, on how many days did you walk for at least 10 minutes at a time?					

14. This question relates to the average time spent doing each type of physical activity.

	Less than 30 mins	30 minutes to an hour	An hour to 2 hours	More than 2 hours
During the last 7 days, how much time on average did you spend doing vigorous physical activity in one day?				

During the last 7 days, how much time on average did you spend doing moderate physical activity in one day (exclude walking)?				
During the last 7 days, how much time on average did you spend walking for more than 10 minutes in one day?				

15. During the last 12 months, how often did you usually have any kind of drink containing alcohol? By a drink we mean a can or glass of beer or cooler, a glass of wine, or a drink containing 1 shot of liquor. Choose only one.

- I have never drunk any alcohol in my life
- I did not drink any alcohol in the past year, but I did drink before then
- 1 or 2 times in the past year
- 3 to 11 times in the past year
- once a month, on average
- 2 to 3 times a month, on average
- once a week, on average
- twice a week, on average
- 3 to 4 times a week
- 5 to 6 times a week
- every day

16. During the last 12 months, how many alcoholic drinks did you have on a typical day when you drank alcohol?²⁰

- 1 drink
- 2 drinks
- 3 to 4 drinks
- 5 to 6 drinks
- 7 to 8 drinks
- 9 or more drinks

17. During the last 12 months, how often did you have 5 or more (males) or 4 or more (females) drinks containing any kind of alcohol in within a two-hour period?²¹

- 1 or 2 days in the past year

²⁰ Answer If During the last 12 months, how often did you usually have... I have never drunk any alcohol in my life Is Not Selected And During the last 12 months, how often did you usually have... I did not drink any alcohol in the past year, but I did drink in the past Is Not Selected

²¹ Answer If During the last 12 months, how often did you usually have... I have never drunk any alcohol in my life Is Not Selected And During the last 12 months, how often did you usually have... I did not drink any alcohol in the past year, but I did drink in the past Is Not Selected

- 3 to 11 days in the past year
- one day a month, on average
- 2 to 3 days a month, on average
- one day a week, on average
- two days a week, on average
- 3 to 4 days a week
- 5 to 6 days a week
- every day
- never in the past year

18. These questions relate to your alcohol use, please answer yes or no.

	Yes	No
Have you ever felt you needed to cut down on your drinking?		
Have people annoyed you by criticizing your drinking?		
Have you ever felt guilty about drinking?		
Have you ever felt you needed a drink first thing in the morning (eye-opener) to steady your nerves or to get rid of a hangover?		

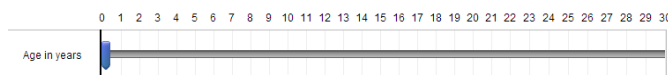
SECTION B: This section relates to the use of general tobacco products, mainly the smoking of cigarettes

19. Have you ever tried any form of tobacco, even if you do not smoke it now?
- Yes
 - No
20. What form of tobacco did you first experiment with?²²
- Manufactured cigarettes
 - Roll-your-own cigarettes
 - Hubbly bubbly (otherwise known as hookah/shisha/okka pipe/narghile/water-pipe)
 - Cigars or other forms of smoked tobacco
 - Smokeless tobacco (e.g. snuff or chewing tobacco)
21. What forms of tobacco do you currently use?²³
- Manufactured cigarettes
 - Roll-your-own cigarettes
 - Hubbly bubbly (otherwise known as hookah/shisha/okka pipe/narghile/water-pipe)
 - Cigars or other forms of smoked tobacco

²² Answer If Have you ever tried any form of tobacco, even if you do n... Yes Is Selected

²³ Answer If Have you ever tried any form of tobacco, even if you do n... Yes Is Selected

- Smokeless tobacco (e.g. snuff or chewing tobacco)
 - I do not currently use any form of tobacco
22. What is your experience of smoking cigarettes?²⁴
- I have never smoked cigarettes²⁵
 - I have tried cigarettes once or twice before but did not smoke them subsequently
 - I used to smoke cigarettes (infrequently or regularly) but do not smoke at all currently
 - I smoke cigarettes infrequently on a social level
 - I smoke cigarettes regularly (more than once a week but not daily)
 - I smoke cigarettes daily
23. How old were you when you first experimented with cigarettes?²⁶



(Sliding scale from 0 years to 30 years)

24. Have you ever tried to quit smoking cigarettes?²⁷
- I have tried to quit and succeeded
 - I have tried to quit and succeeded temporarily
 - I have tried to quit and been unsuccessful
 - I have never tried to quit
25. How long ago did you quit?²⁸
- A week ago
 - A month ago
 - Several months ago
 - A year ago
 - More than a year ago
26. How many times did you try and quit before you were successful?²⁹
- I was successful the first time I tried to quit
 - 1 - 2 times

²⁴ Answer If Have you ever tried any form of tobacco, even if you do n... Yes Is Selected

²⁵ If What form of tobacco did you first experiment with? Manufactured cigarettes Is Not Selected And What form of tobacco did you first experiment with? Roll your own cigarettes Is Not Selected

²⁶ Answer If What is your experience of smoking cigarettes? I have never smoked cigarettes Is Not Selected And What is your experience of smoking cigarettes? I have tried cigarettes once or twice before but did not smoke them subsequently Is Not Selected And Have you ever tried any form of tobacco, even if you do n... Yes Is Selected

²⁷ Answer If What is your experience of smoking cigarettes? I have never smoked cigarettes Is Not Selected And What is your experience of smoking cigarettes? I have tried cigarettes once or twice before but did not smoke them subsequently Is Not Selected And Have you ever tried any form of tobacco, even if you do n... Yes Is Selected

²⁸ Answer If Have you ever tried to quit smoking cigarettes? I have tried to quit and succeeded Is Selected

²⁹ Answer If Have you ever tried to quit smoking cigarettes? I have tried to quit and succeeded Is Selected

- 3 - 4 times
- 5 - 6 times
- 7 - 8 times
- 9 - 10 times
- More than 10 times

27. How many times have you tried to quit in the past?³⁰

- 1 - 2 times
- 3 - 4 times
- 5 - 6 times
- 7 - 8 times
- 9 - 10 times
- More than 10 times

28. During the past 30 days, on how many days did you smoke cigarettes?³¹

- None
- Less than 4 days
- 4 - 7 days
- 8 - 11 days
- 12 - 15 days
- 16 - 19 days
- 20 -23 days
- 24 - 30 days

29. How many cigarettes do you smoke in a typical week (including weekend)?³²

- 1 - 7 (i.e. 1 or less per day)
- 8 - 21 (i.e. 3 or less per day, but more than 1 per day)
- 22 - 42 (i.e. 6 or less per day, but more than 3 per day)
- 43 - 70 (i.e. 10 or less per day but more than 6 per day)
- 70+ (i.e. more than 10 a day)

30. What quantity of cigarettes do you usually purchase?³³

³⁰ Answer If Have you ever tried to quit smoking cigarettes? I have tried to quit and succeeded temporarily Is Selected Or Have you ever tried to quit smoking cigarettes? I have tried to quit and been unsuccessful Is Selected

³¹ Answer If Have you ever tried to quit smoking? I have tried to quit and succeeded temporarily Is Selected Or Have you ever tried to quit smoking? I have tried to quit and been unsuccessful Is Selected Or Have you ever tried to quit smoking? I have never tried to quit Is Selected And Have you ever tried any form of tobacco, even if you do n... Yes Is Selected

³² Answer If Have you ever tried to quit smoking? I have tried to quit and succeeded temporarily Is Selected Or Have you ever tried to quit smoking? I have tried to quit and been unsuccessful Is Selected Or Have you ever tried to quit smoking? I have never tried to quit Is Selected And During the past 30 days, on how many days did you smoke c... None Is Not Selected

³³ Answer If Have you ever tried to quit smoking? I have tried to quit and succeeded temporarily Is Selected Or Have you ever tried to quit smoking? I have tried to quit and been unsuccessful Is Selected Or Have you ever tried to quit smoking? I have never tried to quit Is Selected And During the past 30 days, on how many days did you smoke c... None Is Not Selected

- I do not purchase my own cigarettes
- Singles
- Pack of 10's
- Pack of 20's
- Cartons

31. How much do you pay for a single cigarette?³⁴

- Less than R1,00
- R1,00 – R1,24
- R1,25 – R1,49
- R1,50 – R1,74
- R1,75 – R1,99
- R2,00 – R2,24
- R2,25 – R2,49
- R2,50 – R2,74
- R2,75 or more

32. How much do you pay for a pack of 10 cigarettes?³⁵

- Less than R10,00
- R10,00 – R12,49
- R12,50 – R14,99
- R15,00 – R17,49
- R17,50 – R19,99
- R20,00 – R22,49
- R22,50 – R24,99
- R25,00 or more

33. How much do you pay for a pack of 20 cigarettes?³⁶

- Less than R20,00
- R20,00 – R22,49
- R22,50 – R24,99
- R25,00 – R27,49
- R27,50 – R29,99
- R30,00 – R32,49
- R32,50 – R34,99
- R35,00 or more

34. How much do you pay for a carton of cigarettes?³⁷

³⁴ Answer If What quantity of cigarettes do you usually purchase? Singles Is Selected

³⁵ Answer If What quantity of cigarettes do you usually purchase? Pack of 10's Is Selected

³⁶ Answer If What quantity of cigarettes do you usually purchase? Pack of 20's Is Selected

³⁷ Answer If What quantity of cigarettes do you usually purchase? Cartons Is Selected

- Less than R125,00
- R125,00 – R149,99
- R150,00 – R174,99
- R175,00 – R199,99
- R200,00 – R249,99
- R250,00 – R274,99
- R275,00– R299,99
- R300,00 – R324,99
- R325,00 - R349,99
- R350 or more

35. During the past 30 days, on how many days were you exposed to anyone smoking cigarettes in your presence (with you not smoking cigarettes)?

- I have not been exposed to cigarettes smoking in the last 30 days
- 1 - 4 days
- 5 - 8 days
- 9 - 15 days
- 16 - 24 days
- 25 - 30 days

36. Did either of your parents (or those responsible for looking after to you in their place) smoke cigarettes while you were growing up?

- Yes
- No

SECTION C: This section relates to the smoking of hubbly bubbly, which is otherwise known as hookah, okka, shisha, narghile and water-pipe among other names.

37. What is your experience of hubbly bubbly

(hookah/okka/shisha/narghile/water-pipe) smoking?

- If What form of tobacco did you first experiment with? Water-pipe (otherwise known hookah/hubbly bubbly/shisha/okka pipe) Is Not Selected
- I have never smoked hubbly bubbly
- I have tried hubbly bubbly once or twice before but did not use it subsequently
- I used to smoke it (infrequently or regularly) but do not smoke it currently
- I smoke it infrequently on a social level
- I smoke it regularly (more than once a week but not daily)
- I smoke it daily

38. How old were you when you first experimented with smoking hubbly bubbly?³⁸

(sliding scale from 0 years to 30 years)

39. Have you ever tried to quit smoking hubbly bubbly?³⁹

- I have tried to quit and succeeded
- I have tried to quit and succeeded temporarily
- I have tried to quit and been unsuccessful
- I have never tried to quit

40. How long ago did you quit?⁴⁰

- A week ago
- A month ago
- Several months ago
- A year ago
- More than a year ago

41. How many times did you try and quit before you were successful?⁴¹

- I was successful the first time I tried to quit
- 1 - 2 times
- 3 - 4 times
- 5 - 6 times
- 7 - 8 times
- 9 - 10 times
- More than 10 times

42. How many times have you tried to quit in the past?⁴²

- 1 - 2 times
- 3 - 4 times
- 5 - 6 times
- 7 - 8 times
- 9 - 10 times

³⁸ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected
And What is your experience of water-pipe smoking? I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected

³⁹ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected
And What is your experience of water-pipe smoking? I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected

⁴⁰ Answer If Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Selected

⁴¹ Answer If Have you ever tried to quit smoking water-pipe? I have tried to quit and succeeded Is Selected

⁴² Answer If Have you ever tried to quit smoking water-pipe? I have tried to quit and succeeded temporarily Is Selected Or Have you ever tried to quit smoking water-pipe? I have tried to quit and been unsuccessful Is Selected

- More than 10 times
43. How many people do you usually smoke hubbly bubbly with in one session?⁴³
- Alone
 - With 1 or 2 others
 - With 3 or 4 others
 - With 5 or more others
44. Who do you normally smoke hubbly bubbly with?⁴⁴
- Family
 - Friends
 - Colleagues
 - Strangers
 - Other (please specify) _____
45. How long do you smoke hubbly bubbly on one occasion?⁴⁵
- Less than 30 minutes
 - 30 minutes - 1 hour
 - More than 1 hour
46. Where do you usually smoke hubbly bubbly?⁴⁶
- At the place where I live
 - At my friends' places of residence
 - In bars/cafes/clubs that offer hubbly bubbly
 - In public areas (e.g. car parks, open buildings, roads, parks etc.)
 - On campus
47. What is the main reason you smoke hookah pipe?⁴⁷

⁴³ Answer If What is your experience of hubbly bubbly (hookah/okka/shi... I have never smoked hubbly bubbly Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I used to smoke it (infrequently or regularly) but do not smoke it currently Is Not Selected

⁴⁴ Answer If How many people do you usually smoke hubbly bubbly with i... With 1 or 2 others Is Selected Or How many people do you usually smoke hubbly bubbly with i... With 3 or 4 others Is Selected Or How many people do you usually smoke hubbly bubbly with i... With 5 or more others Is Selected

⁴⁵ Answer If What is your experience of hubbly bubbly (hookah/okka/shi... I have never smoked hubbly bubbly Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Not Selected

⁴⁶ Answer If What is your experience of hubbly bubbly (hookah/okka/shi... I have never smoked hubbly bubbly Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Not Selected

⁴⁷ Answer If What is your experience of hubbly bubbly (hookah/okka/shi... I have never smoked hubbly bubbly Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I have tried water-pipe once

- Relaxing
- To socialise/build relationships
- Looks "cool"
- Influenced by friends/family
- Healthier than cigarettes

48. During the past 30 days, on how many days did you smoke hubbly bubbly?⁴⁸

- None
- 1 day
- 2 – 3 days
- 4 – 7 days
- 8 – 11 days
- 12 – 15 days
- 16 – 19 days
- 20 – 23 days
- 24 – 30 days

49. What brand of hubbly bubbly tobacco do you most commonly use?⁴⁹

- Al Fakher
- Nakhla
- Afzal
- Amaren
- Herbal (non-tobacco based) brands
- Other (specify) _____
- I can't remember

50. Where do you usually purchase your hubbly bubbly tobacco?⁵⁰

- I do not purchase my own hubbly bubbly tobacco
- Local cafe/corner shop
- Supermarket (or side store inside supermarket)
- Tobacconist
- Other (Specify) _____

or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Not Selected

⁴⁸ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected And What is your experience of water-pipe smoking? I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking water-pipe? I have tried to quit and succeeded Is Not Selected

⁴⁹ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected And What is your experience of water-pipe smoking? I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking water-pipe? I have tried to quit and succeeded Is Not Selected

⁵⁰ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected And What is your experience of water-pipe smoking? I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking water-pipe? I have tried to quit and succeeded Is Not Selected

51. On average, how much do you pay for a pack of hubbly bubbly tobacco?⁵¹
- Less than R15,00
 - R15,00 – R17,49
 - R17,50 – R19,99
 - R20,00 – R22,49
 - R22,50 – R24,99
 - R25,00 – R27,49
 - R27,50 – R29,99
 - R30,00 – R32,49
 - R32,50 – R34,99
 - R35,00 or more
52. Do you experience any health problems (e.g. cough, shortness of breath, loss of taste, headaches etc.) as a result of hubbly bubbly smoking?⁵²
- Yes
 - No
53. Have you ever used dagga (marijuana or weed) with hubbly bubbly smoking?⁵³
- No, I have never used these substances with hubbly bubbly
 - Yes, only once or twice
 - Yes, less than 50% of the time
 - Yes, more than 50% of the time
54. During the past 30 days, on how many days were you exposed to anyone smoking hubbly bubbly in your presence (with you not smoking hubbly bubbly)?
- None
 - 1 day
 - 2 – 3 days
 - 4 – 7 days
 - 8 – 11 days
 - 12 – 15 days
 - 16 – 19 days
 - 20 – 23 days

⁵¹ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected And What is your experience of water-pipe smoking? I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking water-pipe? I have tried to quit and succeeded Is Not Selected And Where do you usually purchase your water-pipe tobacco? I do not purchase my own water-pipe tobacco Is Not Selected

⁵² Answer If What is your experience of hubbly bubbly (hookah/okka/shi... I have never smoked hubbly bubbly Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Not Selected

⁵³ Answer If What is your experience of water-pipe smoking? I have never smoked water-pipe Is Not Selected

- 24 – 30 days
55. Did either of your parents (or those responsible for looking after to you in their place) smoke hubbly bubbly while you were growing up?
- Yes
 - No
56. Do your parents (or those responsible for looking after to you in their place) know that you smoke hubbly bubbly?⁵⁴
- Yes
 - No
57. Do your parents (or those responsible for looking after to you in their place) accept that you smoke hubbly bubbly?⁵⁵
- Yes
 - No

SECTION D: This section deals with perceptions and attitudes toward tobacco use

58. Have you ever noticed health warnings on the packaging of cigarette packs?
- Yes
 - No
 - I am not sure
59. Have you ever noticed health warnings on the packaging of hubbly bubbly tobacco?
- Yes
 - No
 - I am not sure
 - I have never seen a packet of hubbly bubbly tobacco
60. Do you think the smoke from other people's hubbly bubbly smoking is dangerous to your health?
- No, not at all
 - Yes, but less dangerous than the smoke from other people's cigarettes
 - Yes, equally dangerous as the smoke from other people's cigarettes
 - Yes, but more dangerous than the smoke from other people's cigarettes

⁵⁴ Answer If What is your experience of hubbly bubbly (hookah/okka/shi... I have never smoked hubbly bubbly Is Not Selected And What is your experience of hubbly bubbly (hookah/okka/shi... I have tried water-pipe once or twice before but did not use it subsequently Is Not Selected And Have you ever tried to quit smoking hubbly bubbly? I have tried to quit and succeeded Is Not Selected

⁵⁵ Answer If Do your parents or those responsible for look... Yes Is Selected

61. Do you think hubbly bubbly smoking (the pipe, flavoured tobacco and coal) is easily accessible?
- No, not at all
 - Yes, but less accessible than cigarette smoking
 - Yes, equally accessible as cigarette smoking
 - Yes, but more accessible than cigarette smoking
62. Once someone has started smoking hubbly bubbly fairly regularly do you think it would be difficult to quit?
- No, not at all
 - Yes, but less difficult than quitting smoking cigarettes
 - Yes, but equally difficult as quitting smoking cigarettes
 - Yes, but more difficult than quitting smoking cigarettes
63. Do you think smoking hubbly bubbly helps people feel more comfortable at events such as celebrations, parties, or other social gatherings?
- No
 - Yes, but only slightly
 - Yes, a lot
64. Do you think hubbly bubbly smoking is socially acceptable?
- Yes
 - No
65. In the past 30 days have you been in a bar/restaurant/café where anyone has smoked hubbly bubbly?
- Yes
 - No
66. Do you feel laws regarding cigarette smoking (age restrictions and designated areas for smoking) should apply to hubbly bubbly smoking?
- Yes
 - No
67. Do you think in the next 12 months you will start smoking cigarettes?
- I already smoke cigarettes
 - Yes, very likely
 - Yes, there is a possibility
 - No, very unlikely
 - No, I will definitely not
68. Do you think in the next 3 years you will start smoking cigarettes?⁵⁶

⁵⁶ Answer If Do you think in the next 12 months you will start smoking... I already smoke cigarettes Is Not Selected

- Yes, very likely
- Yes, there is a possibility
- No, very unlikely
- No, I will definitely not

69. Do you think in the next 12 months you will start smoking hubbly bubbly (hookah/okka/shisha/narghile/water-pipe)?

- I already smoke water-pipe
- Yes, very likely
- Yes, there is a possibility
- No, very unlikely
- No, I will definitely not

70. Do you think in the next 3 years you will start smoking hubbly bubbly (hookah/okka/shisha/narghile/water-pipe)?⁵⁷

- Yes, very likely
- Yes, there is a possibility
- No, very unlikely
- No, I will definitely not

⁵⁷ Answer If Do you think in the next 12 months you will start smoking... I already smoke water-pipe Is Not Selected

Appendix B

Results from multivariable logistic regressions comparing all 4 smoking classifications for both cigarettes and waterpipe. (Note cigopt4 is the standard measure in this case).

	Cig Opt 1	Cig Opt 2	Cig Opt 3	Cig Opt 4	WP Opt 1	Wp Opt 2	Wp Opt 3	WP Opt 4
Age	1.016 -1.27	1.008 -0.64	1.018 -1.39	0.995 (-0.45)	0.910*** (-4.86)	0.864*** (-6.76)	0.899*** (-6.01)	0.927*** (-5.84)
Female	0.672*** (-4.55)	0.685*** (-4.31)	0.693*** (-3.90)	0.676*** (-4.80)	0.997 (-0.03)	0.833 (-1.75)	0.958 (-0.45)	1.062 (-0.77)
Coloured	2.956*** (-4.94)	2.710*** (-4.47)	2.737*** (-4.21)	2.478*** (-4.45)	2.942*** (-4.19)	3.159*** (-4.43)	1.964** (-2.96)	2.617*** (-5.14)
Indian	1.076 (-0.23)	1.007 (-0.02)	0.976 (-0.07)	0.968 (-0.11)	2.598** (-2.87)	2.322* (-2.37)	2.173* (-2.53)	2.107** (-2.88)
White	1.31 (-1.30)	1.253 (-1.07)	1.28 (-1.09)	1.338 (-1.53)	1.138 (-0.52)	1.303 (-1.06)	1.06 (-0.27)	1.311 (-1.54)
English	0.653*** (-3.94)	0.647*** (-4.01)	0.581*** (-4.68)	0.693*** (-3.63)	0.79 (-1.77)	0.767* (-2.04)	0.799 (-1.88)	0.832 (-1.90)
Other	0.71 (-1.57)	0.664 (-1.84)	0.623* (-2.00)	0.703 (-1.74)	0.842 (-0.65)	1.116 -0.42	0.983 (-0.07)	1.023 -0.12
isiXhosa	1.064 (-0.24)	1.166 (-0.59)	1.094 (-0.32)	1.113 (-0.45)	0.909 (-0.29)	1.084 (-0.25)	0.687 (-1.29)	0.934 (-0.30)
No religion	2.843*** (-9.67)	2.995*** (-10.17)	3.217*** (-10.23)	2.590*** (-9.32)	1.254 (-1.57)	1.133 (-0.87)	1.422** (-2.81)	1.597*** (-4.62)
Muslim	1.572* (-2.23)	1.530* (-2.06)	1.975** (-3.19)	1.489* (-2.02)	1.809** (-2.82)	1.094 (-0.39)	1.37 (-1.49)	1.765** (-3.21)
Hindy	1.885 (-1.70)	1.886 (-1.67)	1.697 (-1.25)	2.273* (-2.37)	1.477 (-1.08)	1.006 (-0.01)	0.79 (-0.62)	1.645 (-1.64)
Jewish	0.924 (-0.17)	0.792 (-0.48)	0.827 (-0.35)	0.663 (-0.91)	1.217 (-0.40)	1.634 (-1.14)	1.298 (-0.61)	1.125 (-0.33)
Other	2.188** (-2.86)	2.604*** (-3.62)	2.738*** (-3.63)	1.858* (-2.36)	1.376 (-0.90)	1.765 (-1.78)	1.694 (-1.76)	1.765* (-2.25)
SA	1.09 (-0.53)	1.151 (-0.84)	1.011 (-0.06)	1.052 (-0.33)	0.864 (-0.75)	1.098 (-0.47)	0.993 (-0.04)	1.027 (-0.19)
R100-R199	1.767*** (-4.41)	1.792*** (-4.52)	1.605*** (-3.36)	1.790*** (-4.94)	1.406* (-2.35)	1.684*** (-3.54)	1.740*** (-4.20)	1.440*** (-3.52)
R200-R299	2.338*** (-5.94)	2.423*** (-6.21)	2.231*** (-5.21)	2.412*** (-6.72)	1.702** (-3.22)	2.146*** (-4.66)	1.986*** (-4.57)	1.964*** (-5.73)
R300+	4.513*** (-11.78)	3.987*** (-10.72)	4.105*** (-10.29)	3.941*** (-11.52)	2.198*** (-5.26)	2.596*** (-6.27)	2.433*** (-6.42)	2.047*** (-6.50)
Middle asset	1.071 (-0.53)	1.11 (-0.79)	1.006 (-0.04)	1.238 (-1.73)	1.580** (-2.82)	1.226 (-1.32)	1.183 (-1.20)	1.216 (-1.74)
High asset	0.801 (-1.30)	0.859 (-0.89)	0.802 (-1.21)	0.971 (-0.18)	1.668* (-2.46)	1.168 (-0.76)	1.247 (-1.21)	1.209 (-1.28)
Financial need	1.481* (-2.26)	1.291 (-1.44)	1.279 (-1.31)	1.303 (-1.58)	1.216 (-0.94)	0.731 (-1.41)	0.941 (-0.32)	0.843 (-1.11)
Other funding	0.615 (-1.28)	0.814 (-0.59)	0.911 (-0.26)	1.052 (-0.16)	0.664 (-0.77)	0.773 (-0.53)	0.788 (-0.58)	0.8 (-0.72)
Parent funding	1.580*** (-3.69)	1.564*** (-3.61)	1.409** (-2.60)	1.662*** (-4.37)	1.337* (-1.96)	1.209 (-1.32)	1.133 (-0.96)	1.169 (-1.50)
Self fund	1.076 (-0.37)	1.008 (-0.04)	1.052 (-0.25)	1.212 (-1.04)	1.076 (-0.26)	0.94 (-0.20)	0.969 (-0.13)	0.908 (-0.50)
Student loan	1.686*** (-3.35)	1.565** (-2.86)	1.410* (-2.05)	1.757*** (-3.85)	1.469* (-2.07)	1.124 (-0.64)	1.098 (-0.55)	1.043 (-0.31)
N	4157	4157	4157	4157	4157	4157	4157	4157

* p<0.05 ** p<0.01 *** p<0.001"

	<u>Cig Opt 1</u>	<u>Cig Opt 2</u>	<u>Cig Opt 3</u>	<u>Cig Opt 4</u>	<u>WP Opt 1</u>	<u>Wp Opt 2</u>	<u>Wp Opt 3</u>	<u>WP Opt 4</u>
Level 2	0.743*	0.781*	0.836	0.761*	0.971	1.048	0.995	0.953
	(-2.39)	(-1.97)	(-1.36)	(-2.30)	(-0.19)	(-0.31)	(-0.04)	(-0.42)
Level 3	0.691**	0.763*	0.721*	0.723**	1.158	0.872	0.856	0.957
	(-3.01)	(-2.20)	(-2.49)	(-2.78)	(-0.98)	(-0.90)	(-1.13)	(-0.39)
Level 4	0.575***	0.580***	0.599***	0.581***	0.78	0.841	0.768	0.816
	(-4.52)	(-4.39)	(-3.90)	(-4.66)	(-1.60)	(-1.17)	(-1.94)	(-1.82)
2 drinks	2.594***	2.484***	2.531***	2.510***	2.630***	3.350***	2.644***	2.200***
	(-4.25)	(-4.05)	(-3.83)	(-4.54)	(-3.37)	(-3.59)	(-3.90)	(-4.84)
3-4 drinks	5.314***	5.180***	5.074***	5.367***	3.593***	6.727***	4.633***	2.815***
	(-7.63)	(-7.51)	(-6.86)	(-8.50)	(-4.53)	(-5.81)	(-6.27)	(-6.37)
5-6 drink	6.027***	5.689***	5.866***	6.185***	4.918***	9.239***	6.002***	3.559***
	(-7.72)	(-7.45)	(-7.04)	(-8.60)	(-5.39)	(-6.56)	(-6.94)	(-7.12)
7-8 drinks	8.356***	8.810***	7.803***	8.925***	4.896***	8.147***	6.029***	3.306***
	(-8.21)	(-8.43)	(-7.41)	(-9.15)	(-4.85)	(-5.70)	(-6.21)	(-5.62)
9+ drinks	8.730***	8.229***	9.579***	8.519***	5.179***	8.901***	5.774***	2.905***
	(-8.30)	(-8.06)	(-8.14)	(-8.83)	(-4.99)	(-5.93)	(-5.98)	(-4.88)
< once a month	1.477*	1.519*	1.308	1.653***	2.960***	2.465***	1.843***	2.470***
	(-2.40)	(-2.54)	(-1.55)	(-3.33)	(-4.50)	(-3.81)	(-3.30)	(-6.44)
monthly	2.232***	2.363***	1.832**	2.454***	3.714***	2.969***	2.272***	3.325***
	(-4.55)	(-4.83)	(-3.22)	(-5.45)	(-5.10)	(-4.34)	(-4.07)	(-7.64)
once a week	3.615***	3.483***	2.837***	3.802***	4.515***	3.898***	2.763***	4.144***
	(-6.34)	(-6.09)	(-4.87)	(-6.93)	(-5.28)	(-4.92)	(-4.38)	(-7.60)
twice a week	3.543***	3.253***	2.635***	3.173***	5.205***	4.312***	2.738***	3.133***
	(-5.69)	(-5.24)	(-4.13)	(-5.40)	(-5.47)	(-4.99)	(-3.98)	(-5.39)
3-4 times a week	7.165***	7.029***	6.010***	6.359***	4.798***	3.857***	2.609**	4.312***
	(-6.30)	(-6.24)	(-5.70)	(-5.99)	(-3.93)	(-3.47)	(-2.71)	(-4.88)
5+ times a week	2.829*	3.017*	1.849	2.970*	2.173	0.737	1.537	1.537
	(-2.04)	(-2.17)	(-1.10)	(-2.20)	(-0.99)	(-0.29)	(-0.65)	(-0.74)
N	3760	3760	3760	3760	3760	3760	3760	3760

* p<0.05 ** p<0.01 *** p<0.001"

	<u>Cig Opt 1</u>	<u>Cig Opt 2</u>	<u>Cig Opt 3</u>	<u>Cig Opt 4</u>	<u>WP Opt 1</u>	<u>Wp Opt 2</u>	<u>Wp Opt 3</u>	<u>WP Opt 4</u>
SUN	1.17	1.366	1.191	1.392*	1.765*	2.819***	2.530***	2.528***
	(-0.98)	(-1.88)	(-1.00)	(-2.14)	(-2.45)	(-4.24)	(-4.20)	(-5.30)
UCT	0.938	1.086	0.984	1.151	1.814*	2.082**	2.127***	2.327***
	(-0.39)	-0.49	(-0.09)	-0.9	-2.55	-2.96	-3.38	-4.8
UWC	1.136	1.149	1.083	1.129	1.717*	1.988*	1.645*	1.834**
	(-0.70)	(-0.73)	(-0.40)	(-0.69)	(-2.11)	(-2.53)	(-2.00)	(-3.12)
2nd Year	1.018	1.075	1.07	1.043	0.914	1.029	1.054	1.107
	(-0.14)	(-0.56)	(-0.48)	(-0.35)	(-0.59)	(-0.19)	(-0.38)	(-0.89)
3rd Year	1.222	1.166	1.172	1.196	0.925	1.117	1.024	1.169
	(-1.56)	(-1.19)	(-1.13)	(-1.50)	(-0.52)	(-0.76)	(-0.17)	(-1.36)
4+Undergrad	1.2	1.133	1.175	1.145	0.98	0.737	1.018	1.096
	(-1.28)	(-0.86)	(-1.04)	(-1.02)	(-0.12)	(-1.73)	(-0.12)	(-0.72)
Postgrad	0.964	0.906	1.03	0.858	0.471***	0.371***	0.504***	0.692**
	(-0.29)	(-0.79)	-0.22	(-1.33)	(-4.71)	(-6.03)	(-4.77)	(-3.27)
Med student	0.599***	0.559***	0.637**	0.607***	0.844	0.548***	0.660**	0.761*
	(-3.90)	(-4.28)	(-3.18)	(-4.10)	(-1.13)	(-3.50)	(-2.86)	(-2.49)
N	4578	4578	4578	4578	4578	4578	4578	4578

* p<0.05 ** p<0.01 *** p<0.001"