An Examination of Smoking-Related Behaviours and Self-Perceptions, and the Role of School Connectedness in Predicting Cigarette Use Among Students at an Ontario University

by

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AUTHOR'S DECLARATION

FOR ELECTRONIC SUBMISSION OF A THESIS

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Background. Post-secondary institutions account for more smokers than any other occupational setting in Canada (Hammond, 2005). Unfortunately, little is known about tobacco use among this distinct population of students. The purpose of this study was to identify the prevalence of smoking and patterns of cigarette use among undergraduates at the University of Waterloo. The current study also sought to investigate the role of school connectedness in predicting students' smoking behaviours, and to explore the relation of student smoking status as determined by a behavioural measure and self-reported smoking status.

Methods. A secondary analysis of data collected using the University of Waterloo Tobacco Use Survey (2004) was employed for this research. Data were analyzed using descriptive statistics (frequencies, means, and percentages), non-parametric statistics (chi-square and Cohen's kappa), principle components factor analysis and logistic regression in order to serve the exploratory purposes of the study.

Results. Overall, 17.55% of the respondents reported current cigarette use (3.37% daily; 14.18% non-daily). Although most (85.5%) students' self-perceptions remained as 'nonsmokers who never smoke' from university entrance to the study date, a greater proportion of students made a negative change in their self-perceived smoking status over this time period than a positive change (10.13% vs. 4.38%, respectively). Among students who perceived themselves as 'nonsmokers who never smoke' or 'ex-smokers' at university entrance, being more academically engaged predicted making a negative change in ones' self-perceived smoking status (OR= 1.924, CI_{95}= 1.064-3.480). Finally, the proportion of non-daily smokers differed between the two measures of smoking status. Many students classified as 'occasional smokers' using the behavioural measure actually perceived themselves as 'nonsmokers who smoke sometimes'.

Discussion. The results of this study provide valuable new insights into smoking among Canadian university students. Students who are more academically engaged may be at risk of initiating smoking, perhaps as a means of stress reduction. Furthermore, the adult measure of occasional smoking typically used in tobacco research may be insufficient to inform tobacco control efforts for this population as it results in different proportions of non-daily smokers when compared against students' self-perceived smoking status. The findings of this exploratory research await replication with larger samples and different measures. Implications of the results for practice and further research are discussed.

Conclusions. This strategy of assessing connectedness to school shows promise in predicting post-secondary students' cigarette smoking behaviours. The results also provide support for continued investigation into the best ways to measure and assess current cigarette use in this unique population.

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DEDICATION

This thesis is dedicated to my parents, Jim and Susan Giesler, who have always supported my dreams and goals. It is also dedicated to my grandma, Jacqueline Heit, who exemplifies a lifelong love for learning.

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CHAPTER 1: INTRODUCTION AND OVERVIEW

1.1 Statement of the Problem

Tobacco use is the leading cause of preventable death in Canada (Makomaski, Illing & Kaiserman, 2004). According to the Canadian Tobacco Use Monitoring Survey (CTUMS), emerging adults (aged 18-24) have the highest smoking rate among all age groups; in 2004, 26% of 18-19 year olds and 28% of 20-24 year olds reported current tobacco use (Health Canada, 2005). In contrast, the average smoking rate among the Canadian population aged 15+ was 20%. Although post-secondary students are somewhat less likely to smoke than their same-aged non-school peers, almost half of 18-29 year olds in Canada attend university or college, and as a result, post-secondary institutions account for more smokers than any other occupational setting (Hammond, in press). Combined, university and college students comprise 30% of all 18-29 year old smokers and 7% of all smokers in Canada (Hammond, in press).

Also of great concern is U.S. data indicating that daily smoking by full-time post-secondary students rose approximately 60% over the period 1990-1999 in comparison to a rise of 25% for same-aged peers not in school (Lantz, 2003). Although much of this rise has been attributed to earlier increases in smoking among high school students (Lantz, 2003), there is evidence that argues against a pure cohort effect. For example, data suggests that approximately 11% of American student smokers initiate after they arrive on campus (Wechsler, Rigotti, Gledhill-Hoyt & Lee, 1998; Everett, Husten, Kan, Warren, Sharp & Crossett, 1999; Wetter, Kenford, Welsch, Smith, Fouladi, Fiore & Baker, 2004) and 28% advance from occasional to daily smoking during their post-secondary years (Wechsler et al, 1998). Whether a similar increase in daily smoking occurred among Canadian post-secondary students is unknown due to the dearth of prevalence research focused upon this specific subpopulation.

The variable patterns of smoking among post-secondary students may partly be explained by the significant life changes experienced by this group. For emerging adults, the transition to post-secondary education often includes dramatics changes in social networks and living arrangements (Arthur & Hiebert, 1996), which may increase susceptibility to smoking. While U.S. researchers have provided valuable insight on these and other psychological and socio-environmental risk factors of smoking among American college students, there remain many important issues and areas of inquiry that have yet to be explored. For example, studies show that having a high degree of social support and belonging within school (henceforth school connectedness) is associated with lower involvement in smoking among adolescents (Lloyd-Richardson, Papandonatos, Kazura, Stanton & Niaura, 2002; McNeely & Falci, 2004; Karcher & Finn, 2005). Much less is known, however, about the influence of school connectedness on post-secondary student smoking behaviours. Furthermore, the fundamental understanding of smoking behaviours in this emerging adult subpopulation is limited by a lack of consensus in operational definitions (Delnevo, Lewis, Kaufman & Abatemarco, 2004). Finally, this field of research is limited in scope with a relative paucity of literature using Canadian data. While there may be some similarities between post-secondary students in Canada and those in the U.S., there are differences that make the study of Canadian students important. For example, Canadian students have lower rates of daily smoking than their U.S. counterparts (Adlaf, Gliksman, Demers & Newton-Taylor, 2003), and it appears that a much larger proportion of Canadian students initiate smoking during their post-secondary years (Cairney & Lawrance, 2002). Clearly, post-secondary students are an emerging priority for tobacco control; however in Canada, this is a group for which we lack a solid foundation of research to guide and support tobacco prevention and cessation programming.

1.2 Study Aims and Overview

This thesis is based on the premise that a broader understanding of the behaviours and self-perceptions of Canadian university students with respect to tobacco use is warranted. It is also based on the premise that investigation into the role of school connectedness in predicting student smoking behaviours is necessary to help inform campus-based tobacco control programming. Finally, this thesis is based on the argument that conventional measures of smoking status may not be appropriate for the emerging adult population and alternative measures need to be explored. Therefore, the primary aims of this study were to: (1) determine the prevalence, weekly frequency, and frequency pattern (i.e. work vs. leisure days) of students' cigarette use, (2) examine retrospectively, changes (between university entrance and the study date) in students' self-perceived smoking status, (3) determine if factors of school connectedness can predict smoking status (i.e. smoker vs. nonsmoker) as well as changes (i.e. negative vs. positive) in self-perceived smoking status, and (4) explore the relation between two operational definitions of smoking status (behavioural measure vs. self-perceived smoking status). In order to achieve these objectives, data from the University of Waterloo Tobacco Use Survey (2004) was analyzed.

This thesis will begin with a detailed review of the current literature pertaining to cigarette use among post-secondary students. Next, the research questions and hypotheses derived based upon the discussion of the literature will be presented. This will be followed by the study methods, statistical analyses, results, discussion, implications and conclusions.

CHAPTER 2: LITERATURE REVIEW

2.1 Search Methods and Relevance Testing

A thorough and systematic literature search was conducted to locate published academic articles addressing cigarette use among post-secondary students. First, searches were carried out on two electronic databases: Pub Med and PsycINFO, for the years 1995-2005. Keywords in the search included "college students," "university students," "undergraduates," and "young adults" in combination with "smoking," and "tobacco use". In total, 519 articles were initially identified. Next, the reference lists of all relevant articles were examined for additional articles not cited in the databases. These were also retrieved and screened for relevance.

All articles identified from the comprehensive search strategy were assessed for relevance using the following criteria: a) it was a peer-reviewed article; b) the topic of the article was relevant to cigarette use among North American post-secondary students; c) it was published after 1995. A total of 34 articles were judged to be relevant and included in the review. An additional 8 articles were also included in the review to help provide further insight into some of the major findings. These articles did not need to meet the relevance criteria.

2.2 Smoking Patterns Among Post-Secondary Students

Although it is difficult to determine Canadian trends with the statistics that are currently available, evidence from large-scale epidemiological studies in the U.S. reveal that post-secondary students experienced a significant upsurge in cigarette smoking during the 1990s. Both the Harvard College Alcohol Survey (CAS) and the Monitoring the Future Survey (MTF) found increases in the 30-day prevalence of cigarette smoking by post-secondary students between 1993 and 2000, from 22.3% to 28.5% and from 24.5% to 28.2%, respectively (Lantz, 2003; Patterson, Lerman, Kaufmann, Neuner & Audrian-McGovern, 2004). Several factors

account for students' increased tobacco use including the aging of the cohort of adolescents whose smoking rates increased in the early-to-mid 1990s (Lantz, 2003). In addition, however, it also appears that there have been real changes in smoking patterns among this population including more students initiating and advancing to regular cigarette use after their arrival on campus (Wechsler et al, 1998; Lantz, 2003).

In comparison to the U.S., our current understanding of smoking prevalence among Canadian post-secondary students is relatively sparse. From of the small body of literature that has investigated cigarette use among this group, only three studies were designed using nationally representative samples. For example, Cairney and Lawrance (2002) manipulated data from the 1994-1995 National Population Health Survey to ascertain post-secondary school student respondents (n= 973). In this study, smoking status was determined by assessing current cigarette use (i.e. "Do you currently smoke cigarettes?" Response options: daily, occasional, and not at all). Among the sample, 26.4% reported current cigarette use (17.9% daily; 8.5% occasionally). Among current daily smokers, an alarming 27.2% reported that they began smoking when they were 18 years or older and their average consumption was 13.5 cigarettes per day. Finally, over half (57.3%) of the former daily smokers reported that they quit smoking in their 20s. These trends indicate that cigarette use among post-secondary students remains a transitional behaviour for many.

A more direct study of Canadian post-secondary student smoking behaviours was performed by Adlaf and his colleagues (2003). These investigators examined data from a sample of 7,800 full-time students enrolled in one of 16 nationally representative universities during the 1998-1999 academic year. By employing a measure of present cigarette use to assess smoking status (i.e. "At the present time, do you smoke cigarettes daily, occasionally, or not at all?"), it

was found that among the sample, 27.5% reported present cigarette use (17.1% daily; 10.4% occasionally) with regional differences similar to those found in the general population. For example, rates of daily smoking were above average among those attending university in the Atlantic (OR= 1.22) and below average among those attending university in British Columbia (OR= 0.71) and the Prairies (OR= 0.83) ($p<0.05$). To assess trends over time, the investigators compared their data to surveys of Ontario undergraduates conducted in 1993 and 1988. Although the findings suggested an upward trend in the prevalence of daily smoking, the differences were not statistically significant between 1993 and 1998, the years for which they were able to calculate an appropriate test. Still, Adlaf and colleagues concluded that this upward movement warranted public health monitoring, especially given the increasing trend in smoking among American students.

More recently, Hammond (2005) used the 2003 Canadian Tobacco Use Monitoring Survey (CTUMS) data to explore smoking behaviours among Canadians aged 18-29 (n= 3,812). In this study, current smokers were defined as respondents who reported smoking more than 100 cigarettes in their lifetime and at least once in the past 30-days. Among those in the sample, approximately 32.8% reported being a student in the past year and of these students, 21.6% reported current tobacco use. Given that approximately one third of all young adults in this sample were students, students accounted for one quarter of all young adult smokers, far more than any other single workplace category. Hammond also found that, among smokers, students smoked fewer cigarettes per day than those who worked (8.1 vs. 10.8, $t= 5.3$, $p<0.001$).

In summary, CAS and MTF data provide clear and credible evidence that there was a significant and alarming rise in cigarette smoking among U.S. post-secondary students during the 1990s. Unfortunately, our knowledge of smoking prevalence among Canadian post-secondary

students is much more limited. Much of what we do know is based on cross-sectional studies or manipulation of general purpose data sets collected in the mid-to-late 1990s. Since this time the number of post-secondary students has increased, and especially in Ontario, their age entering the post-secondary system has decreased substantially. Both these factors may impact upon smoking uptake and escalation. Clearly there is a need for ongoing surveillance of tobacco use among this group. This is necessary both to understand the scope of the problem and to monitor changes in behaviours over time.

Also evident in this review is the lack of consistency in the measures used to assess current cigarette smoking across the literature. While some studies (i.e. Hammond, 2005) have used the accepted adult measure which incorporates lifetime and past 30-day use, others (i.e. CAS; MTF; Cairney & Lawrance, 2002; Adlaf et al, 2003) have utilized the more lenient adolescent-based measure which does not incorporate lifetime use (see Appendix A). Of further concern is that the questions that form the basis for the adolescent-based measures vary considerably across the surveys. For example, the CAS and MTF share a common operational definition of current smoking that is based on cigarette use in the past 30-days. On the other hand, large Canadian studies (Cairney & Lawrance, 2002; Adlaf et al, 2003) have utilized a measure of current smoking based on current/present use (i.e. "Do you currently smoke cigarettes?"). This inconsistency is problematic in that these different measures are likely to produce different estimates of smoking prevalence.

2.3 Correlates of Cigarette Use Among Post-Secondary Students

Most of the research to date in the area of post-secondary student tobacco use has focused on identifying individual risk factors for cigarette smoking among this group. Based on the articles found, correlates of cigarette use among post-secondary students appear to fall under three main

categories: demographic, psychological, and socio-environmental (see Appendix B). The following sub-sections will discuss each of these factors in greater detail.

2.3.1 Demographic Factors

Tobacco use research among the post-secondary student population shows an unstable trend in sex differences over the past decade. According to the CAS, current smoking (past 30-days) increased considerably between 1993 and 1997 for both sexes but more so among females. For example, although male and female students had similar rates of current smoking in 1993 (22.3%), smoking among male students rose to 27.5% in 1997; a 23.4% increase, while smoking among female students rose to 29.2%; a 31.0% increase (Wechsler et al, 1998). The most recent available CAS data (1999) indicated that current smoking continued to increase among males and slightly decreased among females such that sex differences were once again nonsignificant (men, 28.4%; women, 28.5%) (Rigotti, Lee & Wechsler, 2000). Similar marginal differences in current smoking behaviour between male and female post-secondary students have been found in other large scale North American studies (Gliksman, Newton-Taylor, Adlaf & Giesbrecht, 1997; DeBernardo & Aldinger, 1999; Everett et al, 1999; Cairney & Lawrance, 2002; Choi, Harris, Okuyemi & Ahluwalia, 2003; Adlaf et al, 2003).

There is however, consistent evidence suggestive of significant ethnic variations in smoking behaviours among this population. According to the 1999 CAS, prevalence of cigarette smoking in the past 30-days was reported by 31.3% of White, 21.9% of Hispanic, 21.7% of Asian, and 11.2% of African American post-secondary students ($p<0.001$) (Rigotti et al, 2000). Higher prevalence rates of smoking among White students than among African American and Hispanic students have been found in other studies (Moskal, Dziuban & West, 1999; Everett et al, 1999; Choi et al, 2003). To assess longitudinal trends, Wechsler and colleagues (1998) used

CAS data to report on the change in smoking prevalence rates between 1993 and 1997. They found that although African American students had the lowest rates of smoking in both years (9.6% and 13.7%, respectively), these students had the greatest percentage increase in smoking rates over this time period (42.7%) as compared with White (31.2% increase), Hispanic (12.0% increase), and Asian-Pacific Islander (22.5% increase) students.

Student status (i.e. year and programme of study) has also been shown to be associated with smoking behaviour among this population. Data from the 1993 and 1997 CAS reveal that first-year students had the highest rates of smoking in both years (24.3% and 31.2%, respectively), and fourth-year students had the lowest rates in the same years (20.8% and 25.3%, respectively) (Wechsler et al, 1998). Interestingly, the 1993 and 1997 CAS data indicated that third-year students had the greatest percentage increase in smoking rates over this time period (32.4%) as compared with first-year (28.4% increase), second-year (20.7% increase), and fourth-year (21.6% increase) students (Wechsler et al, 1998). Higher rates of smoking among those in the earlier years of study have also been found in Canadian student samples. For example, Adlaf and colleagues (2003) reported that in 1998, first- and second-year students had the highest rates of daily smoking (17.0% and 19.2%, respectively), significantly more than students in the final year of study (14.2%) ($p < 0.05$).

The one study that has examined inter-faculty differences in smoking behaviours among North American students suggests that a significant relationship may exist. In a study of 5,926 students enrolled in an undergraduate programme at one of six Ontario universities during the 1992-93 academic year, Gliksman and colleagues (1997) found that students in arts and social sciences programmes were 2-3 times more likely to be current daily smokers than were students enrolled in a science programme ($p<0.001$). Explanations for these differences cannot be

determined due to the cross-sectional design of the study. Further longitudinal research is needed in order to clarify the role of faculty of study in determining student smoking.

Combined, the data on student smoking demographics indicates that smoking prevalence does not differ by gender but there are significant ethnic differences. In the U.S., White students are more likely to smoke than are African American or Hispanic students, although African American students appear to be the fastest growing subpopulation of post-secondary student smokers. With respect to student status, those in the early years of study appear to have higher rates of smoking than those in later years, and students enrolled in arts and social science programmes appear to smoke more than those enrolled in other faculties. Clearly evident from this review is the relative lack of research with Canadian data. Indeed, a few studies were conducted with Canadian samples (i.e. Gliksman et al, 1997; Cairney & Lawrance, 2002; Adlaf et al, 2003), however not all of the demographic correlates of smoking identified in the review have been explored with Canadian data (e.g. ethnicity).

2.3.2 Psychological Factors

The post-secondary years can be particularly stressful for students due to financial obligations, parental expectations, academic pressures, and changes in social relationships and living arrangements (Arthur & Hiebert, 1996), which may put students at risk for tobacco use. In 1996, Naquin and Gilbert (1996) examined the effects of smoking behaviour on perceived levels of stress and coping among a sample (n= 1,330) of students enrolled in four different post-secondary institutions in the U.S. Participants completed the Perceived Stress Scale, the Coping Inventory for Stressful Situations, and a smoking questionnaire. Results showed that current smokers were significantly more likely to have higher levels of perceived stress than nonsmokers ($p<0.05$) and that smokers had higher levels of emotion-focused coping skills than both former

smokers and nonsmokers ($p<0.05$). Other studies with post-secondary student samples have found that stress is among the most frequently cited reason for nonsmokers to start smoking (DeBernardo & Aldinger, 1999) and is a motivational factor of continued smoking for many current smokers (DeBernardo & Aldinger, 1999; Morrison, Banas & Burke, 2003)

In addition to stress, a number of studies have demonstrated a link between negative affect and smoking among this population. Among 18–19 year old post-secondary student respondents to the 2001 College Health Survey, those who had been diagnosed or treated for depression were 7.5 times more likely than other students to be tobacco users ($p<0.05$) (Lenz, 2004). Furthermore, Emmons and colleagues (1998) found that among U.S. post-secondary students, dissatisfaction with one's education and overall unhappiness with life was negatively related to smoking status. Similar associations between negative affect and smoking among post-secondary students has been supported by other research (Kear, 2002; Vickers, Patten, Lane, Clark, Croghan, Schroeder & Hurt, 2003), although due to methodological limitations the directionality of the association is not entirely clear. Empirical support for both the distress-to-use and use-to-distress hypotheses can be found in both the adolescent and emerging adult tobacco use literature (Escobedo, Reddy & Giovino, 1998; Stein, Newcomb & Bentler, 1996). However, more recent evidence suggests that smoking and emotional distress have a reciprocal relationship over time such that emotional distress may lead to initial smoking and more regular smoking may lead to increased distress (Orlando, Ellickson & Jinnett, 2001). For example, individuals who experience stress in their lives may initiate or add to their early tobacco use to counteract their anxiety or depressed mood. These individuals may increase their level of smoking involvement as the stress continues, becoming further dependent on the self-medicating aspects of nicotine. Over time, however, the calming effects of nicotine no longer occur, and

instead of relieving depression, habitual use may either mask or exacerbate its symptoms (Orlando et al, 2001). Clearly the relationship between depression and smoking among the post-secondary student population is an important area that warrants further longitudinal research.

Students' attitudes and beliefs towards smoking is an area that has received much research attention. In 1998, Hines, Fretz and Nolen compared personal attributions of smoking among a sample of 433 post-secondary students enrolled at a single institution. In this study, regular smokers reported that being a smoker made them feel less healthy and less desirable as a date. They also reported smoking helped reduce anxiety and some, primarily women, found smoking helpful for weight control. Occasional smokers also reported feeling less healthy but also associated smoking with positive self-characteristics such as being more daring and more adventurous. Finally, nonsmokers reported more negative self-characteristics associated with smoking (e.g. smokers are less healthy, less desirable as a date, less attractive while smoking, less sexy and less feminine compared to nonsmokers) than either of the smoking groups. Similar conclusions regarding nonsmokers' perception of smokers as unattractive or less desirable for close relationships have been found in other studies (Hines, 1996; Biasco & Hartnett, 2002). Interestingly, Biasco and Hartnett (2002) further found that among all students at the University of West Florida (n= 810), many (44%) agreed there should be stricter laws against smoking (34% disagreed & 22% were uncertain), yet over half (51%) disagreed that people should tell a smoker to stop smoking (30% agreed & 19 were uncertain). In questions concerning the modeling effects of smoking, 46% disagreed that smoking advertisements influence nonsmokers to begin smoking (32% agreed & 22% were uncertain). Whether these attitudes and beliefs differed by smoking status was not examined in the research. Finally, research by Choi and colleagues (2003) showed that among experimental adolescent smokers, those who believed it

was safe to experiment with cigarettes at baseline were almost twice as likely to progress in their smoking four years later in college than other students (OR= 1.94).

Examinations of adolescent girls indicate that for many, smoking is correlated with the belief that cigarette use will assist in weight control (Boles & Johnson, 2001). There is, however, mixed findings that this relationship exists among the post-secondary student population. For example, among females who attended the University of Michigan between the years 1991-1995, elevated dieting concerns were found to be a significant risk factor for smoking onset for both baseline smokers and nonsmokers (Saules, Pomerleau, Snedecor, Mehringer, Shadle, Kurth & Krahn, 2004). In another study, Psujek, Martz, Curtin, Michael and Aeschleman (2004) examined whether poor body image and other eating disorder variables were predictive of nicotine dependence in a sample of 478 post-secondary students. After controlling for symptoms of anxiety and depression, the results revealed that none of the predictor variables were positively associated with nicotine dependence for either females or males. Further research is required in this area in order to gain a better understanding of the role of weight concerns and dieting in post-secondary student smoking behaviours.

Thus, psychological factors such as depression, stress, and perhaps weight concerns appear to be heightened among post-secondary student smokers. Evidence shows that students who smoke are less likely to hold negative attitudes towards cigarette use than nonsmokers, although regular smokers do report that smoking makes them feel less healthy and less desirable. In addition, students who believe that experimenting with cigarettes is safe are more likely to progress in their smoking than students who do not believe it is safe. Unfortunately, there were no studies conducted with Canadian student samples to inform this particular area of research.

2.3.3 Socio-environmental Factors

In social learning models it is posited that peers and family influence smoking behaviour (Petraitis, Flay & Miller, 1995). Studies that have addressed this issue among post-secondary students show mixed results. For example, a cross-sectional analysis of undergraduates in a 4-year, predominantly African American university (n= 614) revealed parental and peer smoking were significant predictors of trial smoking among the sample ($p<0.001$) (Hestick, Perrion, Rhodes & Sydnor, 2001). In a more recent study, it was found that students who used tobacco were significantly more likely to be exposed to smoke than students who did not use tobacco ($p<0.001$) (Lenz, 2004). Interestingly, students who reported tobacco use experienced more exposure to smoke on weekends compared to weekdays. Conversely, Choi et al (2003) found that exposure to peer and parental smoking did not predict progression of smoking among baseline never smokers four years later in college. However, peer approval of smoking predicted smoking progression among baseline experimental smokers (OR= 2.02). Finally, Wetter and colleagues (2004) examined changes in smoking behaviour and predictors of those changes over a 4-year period among a longitudinal cohort of students at the University of Wisconsin-Madison. They found that peer smoking did not predict follow-up smoking behaviours regardless of baseline smoking status.

Perceptions of peer norms, regardless of the actual campus norm, may also contribute significantly to student smoking as some students may act in accordance with what they believe to be the norm. Perkins, Meilman, Leichliter, Cashin and Presley (1999) used data from surveys of students representing 100 diverse post-secondary campuses to examine the difference between the actual and perceived frequency of alcohol and drug use, including tobacco (n= 48,168). At schools where no use of tobacco was the most common behaviour among students (a pattern that

existed at 80% of the schools), only 6.6% accurately perceived that the average student did not smoke or use other tobacco. More than three quarters of students in this environment erroneously believed that the typical student used tobacco weekly (34%), and almost half (44.6%) believed that the typical student used tobacco everyday. In a smaller study of 775 students at a single post-secondary institution, Page (1998) found that both male and female students overestimated the prevalence of cigarette smoking on campus. Among all subjects, 13.4% of men and 17.8% of women reported smoking cigarettes daily. However, men estimated that 36.9% of men and 33.9% of women on campus were daily smokers. Women's estimates of 42.3% of men and 42.2% of women were even higher.

A growing body of research suggests that living arrangements are associated with smoking behaviour among post-secondary students. In the National Household Survey on Drug Abuse data for 1991-1993, Gfroerer, Greenblatt and Wright (1997) showed that among a sample of almost 5,000 college students, those who lived with their parents were less likely to have smoked in the past month compared to students who did not (19.4% vs. 24%, respectively). In a similar fashion, students who lived in a residence hall were less likely to have smoked in the past month than other students (18.9% vs. 27.8%, respectively). Data from the 1999 CAS indicate that students living in restricted housing (i.e. smoking not permitted) had a significantly ($p<0.001$) lower prevalence of current smoking (21.0%) than among students living in unrestricted housing (i.e. smoking permitted; 30.6%) (Wechsler, Lee & Rigotti, 2001). This finding was consistent among all types of students except those who were regular smokers before age 19. These findings are further supported by Adlaf and colleagues (2003) who found that post-secondary students in Canada who resided off campus without family had the highest rate of daily smoking (20.4%), significantly ($p<0.001$) more than those living in university housing

(15.6%), and those living with their parents (15.2%). Thus, it would appear that the additional rules and parameters inherent in restricted living (i.e. home or residence hall) may deter smoking initiation and progression among post-secondary students.

Post-secondary students who smoke are also likely to participate in other risky behaviors that pose some of the greatest health threats to 18-24 year olds. Analysis of the 1997 CAS data lead Emmons et al (1998) to conclude that student tobacco users were 6.78 times more likely to use marijuana currently and 4.89 times more likely to engage in binge drinking compared with nonsmokers. Sex differences were noted, particularly in terms of marijuana use (OR= 8.61, males; OR= 6.78, females). In addition, having multiple sex partners in the previous month increased the likelihood of smoking among men (OR= 1.65) and almost tripled the likelihood of smoking among women (OR= 2.80). Current marijuana use and binge drinking remained the strongest predictors of smoking in the final multivariate analysis ($p<0.001$); this finding persisted in a study that analyzed the 1999 CAS data (Rigotti, Lee & Wechsler, 2000). Others have also reported associations between smoking and use of other substances such as alcohol and illicit drugs (Budd & Preston, 2001; Lenz, 2004). Of great concern is the fact that while most types of substance use tends to decline after the emerging adult years (due partially to young people 'maturing out' of these behaviours and beginning to assume adult responsibilities), cigarette smoking tends to persist, with the prevalence of smoking declining only slightly after the mid-20s (Chassin, Presson, Rose & Sherman, 1996).

Recent research by Lenz (2004) suggests that other lifestyle factors are also associated with smoking among this population. Among a sample of 203 students from the 2001 College Health Survey, small associations were found for tobacco use during the past year and level of fitness since high school (OR= 1.5, $p<0.05$) and for tobacco use during the past month and

decreasing current level of fitness (OR= 1.6, $p<0.05$). According to the 1999 CAS data, students who smoke cigarettes were less likely than nonsmokers to rate both athletics (OR= 0.57, $p<0.001$) and religion (OR= 0.76, $p<0.001$) as important or to participate in intercollegiate sports (OR= 0.53, $p<0.001$) (Rigotti et al, 2000). In addition, Rigotti et al, (2000) reported that believing parties are an important part of college life (OR= 1.29, $p<0.001$) was also positively related to smoking. A similar pattern was observed in an analysis of predictors of cigarette use in the 1997 version of this survey (Emmons et al, 1998). The negative association between cigarette smoking and involvement in athletics has been supported by other research (Nattiv, Puffer & Green, 1997; Wechsler, Davenport, Dowdall, Grossman & Zanakos, 1997).

Finally, it has been hypothesized by many researchers that the tobacco industry's targeted marketing strategies have contributed to the observed increase in post-secondary student cigarette use. A recent study of 35 Canadian universities and colleges found that every university and half of all colleges surveyed had participated in some form of tobacco marketing in the past year (Hammond, Tremblay, Chaiton, Lessard & Callard, 2005). For example, among universities, 80% had run a tobacco advertisement in their paper and 18% had hosted a tobacco sponsored nightclub event. According to Ling and Glantz (2002), promotional events at bars and nightclubs both on and off campus reinforce brand visibility, allow the industry to reach specific target groups, and generate names for future marketing efforts. To add to this body of evidence, Rigotti, Moran and Wechsler (2005) examined a sub-set of students from the 2001 CAS (n= 10,904) to assess the relationship between exposure to tobacco promotions (defined as attending a tobacco-sponsored social event where free cigarettes were distributed) and tobacco use. The results indicate that during the first six months of the 2000-2001 academic year, 8.5% of respondents attended a bar, nightclub, or campus social event where free cigarettes were

distributed. Surprisingly, these events were reported by students attending 118 of 119 schools (99.2%). Furthermore, attendance at tobacco sponsored events was strongly associated with current smoking after adjusting for demographic factors, alcohol use, and recent bar/nightclub attendance (OR= 1.75, $p<0.001$). This association remained for students who did not smoke regularly before 19 years of age (OR= 1.73, $p<0.001$), but not for students who smoked regularly by 19 years of age (OR= 1.10, $p= 0.61$). These findings suggest that the tobacco industry sponsorship of social events may be encouraging the initiation or the progression of smoking among post-secondary students who are not smoking regularly when they enter college or university.

In summary, although mixed results have been found regarding the influence of peer and parental smoking on post-secondary student smoking behaviours, peer approval of smoking has been related to increased smoking rates among post-secondary students. Research has demonstrated that students tend to overestimate the prevalence of cigarette use on campus; however whether this false perception leads to increased smoking remains unknown. The literature also shows that smoking rates are heightened among post-secondary students who live on their own or in unrestricted housing, although the direction of the association is not entirely understood. Certain lifestyle factors are associated with being a smoker among this group (e.g. alcohol and drug use, having multiple sex partners, poor level of fitness, and believing parties are important). Finally, tobacco marketing has been prevalent among both Canadian and American post-secondary institutions and exposure to tobacco promotions has been associated with a higher smoking prevalence among students. The studies presented in the above subsection are limited in scope with a lack of literature using Canadian data. Clearly, further research is needed to address this and other methodological research concerns.

2.4 Limitations of Current Research

A review of the current literature suggests that there are a limited number of studies that explore cigarette use among Canadian post-secondary students. In fact, out of the 34 studies reviewed, only four were performed with Canadian student samples (Gliksman, et al, 1997; Cairney & Lawrance, 2003; Adlaf et al, 2003; Hammond, 2005). Most of these studies were based on manipulation of general purpose data sets or surveys collected in the mid-to-late 1990s. Clearly, a more current and direct examination of cigarette smoking among Canadian post-secondary students is needed in order to gain a better understanding of the present scope of this health problem. This information will also help determine if the U.S. experience is mirrored in Canada or if any significant differences exist between the two populations.

This review also revealed that over the past decade there has been a large focus on the identification of individual risk factors for smoking among post-secondary students. Although the information these studies yield has contributed meaningfully to our knowledge of post-secondary student smoking, there remain many other important areas of inquiry that have yet to be explored. Understanding the reasons for student smoking can be further enhanced by looking at the extent to which students are connected to their school both academically and socially. In the educational research, three dimensions of school connectedness are emphasized: social support, belonging and engagement (Connell & Wellborn, 1991). According to Connell and Wellborn (1991), when young people receive empathy, praise and attention in a clear and consistent fashion, they experience social support. The experience of social support generates a sense of belonging which, in turn, leads to increased engagement and academic motivation. Although this theoretical model has been empirically supported for smoking outcomes among youth (Lloyd-Richardson et al, 2002; McNeely & Falci, 2004; Karcher & Finn, 2005), this work

has not been extended to test for smoking outcomes among post-secondary students. Such knowledge would contribute to the monitoring of factors that may impact upon post-secondary student smoking behaviours and could help improve campus-based tobacco prevention and cessation programming.

Another methodological limitation evident in the current review is the large variation in the survey items used to assess smoking status across the literature. Many of the large studies of North American post-secondary students (i.e. CAS; MTF; Cairney & Lawrance, 2003; Adlaf et al, 2003) have utilized an adolescent-based measure of current smoking based on cigarette use in the past 30-days or current use. Others (Hammond, 2005) have used the accepted adult measure which incorporates both lifetime and past 30-day use. According to Delnevo and colleagues (2005), the adolescent-based definition is likely to generate a higher estimate of current cigarette smoking than the adult definition when used in populations in which late initiation is suspected. Furthermore, the adolescent measure by itself is insufficient to document progression to regular smoking in emerging adults as it fails to document 'established' smoking, often defined as 100 cigarettes in a lifetime. On the other hand, the adult measure misses those 18-24 years olds whose smoking may be increasing but who have not yet reached 100 cigarettes, thus failing to identify these 'at-risk' smokers (Delnevo et al, 2005). Clearly, further research is needed to determine how to best measure current cigarette smoking in this unique population.

Although the ability to appropriately and adequately address all the weaknesses revealed by this literature review is beyond the scope of the current research, the limitations inherent in these studies and the items assessed in the available data set, lead us to pose the following research questions.

2.5 Research Questions and Hypotheses

Research Question #1: What is the prevalence of cigarette use among students at the University of Waterloo? Does the prevalence of cigarette use differ significantly by key socio-demographic factors? Based on previous literature it is expected that approximately one quarter of all students sampled will report some type of cigarette use. Differences in smoking status may not be significant across gender but it is likely that significant differences will occur in terms of year, faculty of study, ethnicity, and living arrangement. Specifically, based on the literature review, it is hypothesized that those in the earlier years of study will have a higher prevalence of cigarette use than those in the later years, and that those enrolled in the faculty of Arts will have a higher prevalence of cigarette use than those enrolled in other faculties. Furthermore, it is hypothesized that smoking will be more prevalent among European students than among students of other ethnicities and also more prevalent among students who live off-campus without family than those who live off-campus with family or in residence halls.

Research Question #2: What is the weekly frequency of cigarette use among non-daily student smokers at the University of Waterloo? What is the work-day and leisure-day frequency of cigarette use among daily student smokers at the University of Waterloo? Does the frequency pattern of daily smoking differ significantly by work and leisure day? There is currently little information in the available published literature regarding the weekly frequency of cigarette use among non-daily smokers in this population. We do know, however, that daily student smokers tend to consume approximately 10 cigarettes per day and it is expected that the frequency of cigarette use among daily smokers in the current study will be similar. It is also hypothesized that daily smokers will report smoking more cigarettes on leisure days than on work days

because leisure days may offer students more opportunities to be in situations that predispose and enable the behaviour (i.e. relaxing, socializing with friends, or going to a bar).

Research Question #3: Among students at the University of Waterloo, is there a significant agreement between students' perception of themselves as a smoker at university entrance and the study date? How do these perceptions change over time? These questions will also be examined with only respondents in their first year of study. This will allow for an exploration of changes in self-perceived smoking status over the initial four months of the university transition. Based on the literature, it is hypothesized that a large proportion of students will have made both positive (i.e. smoker to nonsmoker) and negative (i.e. nonsmoker to smoker) changes in their self-perceived smoking status over the time period in question.

Research Question #4: Does principal components factor analysis of the school experience items of the University of Waterloo Tobacco Use Survey reveal meaningful school connectedness factors? If so, can these factors of school connectedness be used to predict students' smoking status (i.e. smokers vs. nonsmokers)? Can these factors of school connectedness also be used to predict changes (i.e. negative vs. positive) in students' self-perceived smoking status? Drawing on the theoretical framework of Connell and Wellborn (1991), it is hypothesized that factors such as social support, belonging and engagement will emerge from the data and that these factors will be negatively associated with being a smoker and also negatively associated with making a negative change in students' self-perceived smoking status.

Research Question #5: Among students at the University of Waterloo, is there a significant agreement between those who are defined as smokers using a behavioural measure (which is a hybrid of the standard adult and adolescent measures of smoking status), and

students' actual perception of themselves as a smoker? If the data reveals a weak agreement between these two measures, where do the differences lie? This area of inquiry has yet to be explored empirically; however it is conceivable that students who are defined as 'occasional' smokers according to the behavioural measure may perceive themselves and thus report themselves as 'nonsmokers who smoke sometimes' instead of the expected 'light smoker' because the label 'nonsmoker' may be more reflective of their self-perception, or it may be viewed as a more socially acceptable label.

This study was an exploratory, preliminary one examining many relationships that have yet to be investigated among this population specifically with Canadian data. This study also served the purpose of testing the utility of a new survey instrument. As such, many of the preliminary research questions outlined above were more fully explored to completely exploit the data.

CHAPTER 3: Methods

3.1 Study Design

The study consisted of a secondary analysis of data from the University of Waterloo Tobacco Use Survey (2004), a cross-sectional, self-report questionnaire.

3.2 The University of Waterloo Tobacco Use Survey

Development of the University of Waterloo Tobacco Use Survey (Appendix C) was guided by a comprehensive review of previous empirical and theoretical work in this area as well as by previously developed instruments [i.e. Youth in Transition Survey (Health Canada, 2000), National Population Health Survey (Health Canada, 1999), and The Brock University First Year Health Study (Sadava & DeCourville, 2003)]. The primary objectives of this survey were to explore the relations of tobacco initiation, maintenance, and cessation with developmental transitions and the socio-cultural milieu of university life. This survey also served as a baseline questionnaire to a longitudinal research study that aimed to assess the impact of a tobacco prevention and cessation program (Leave The Pack Behind) at the University of Waterloo. The 65-item questionnaire assessed many variables including socio-demographics (i.e. age, gender, ethnicity, marital status, living arrangement, and number of children), student status (i.e. faculty, year of study, and full or part-time), overall school experience (both secondary and university), social smoking influences (i.e. friends, family and roommates), personal smoking behaviours (amount and frequency), perception of smoking as a norm at school (both secondary and university), perceptions of self as a smoker, intentions to quit, and past quit attempts.

Ideally, a longitudinal analysis would have allowed for the greatest understanding of the of post-secondary student smoking behaviours. Although the potential existed to use the longitudinal data set associated with the instrument to perform such analyses, data from the

preliminary survey was more appropriate for the current study for a number of reasons. First, there was a large reduction in the sample size at follow-up that may have limited the ability to explore some of the variables of interest. Second, using the preliminary data set allowed for the analysis of smoking behaviours among students at the University of Waterloo before the introduction of a campus-wide smoking intervention. Finally, the primary aim of the current research was not to investigate changes in many of the study variables over time; rather this study intended to explore nuances in cigarette use among the university population in order to fuel and guide subsequent longitudinal research. As such, the preliminary University of Waterloo Tobacco Use Survey was the best available data for the research objectives at hand.

3.3 Data Collection Procedures

Ethics approval for research involving human participants was obtained from the Office of Research Ethics at the University of Waterloo in the autumn of 2003. The sample of students invited to participate in the research were drawn from randomly selected classes stratified to be representative of the six major faculties at the University of Waterloo by year. First year students were purposefully over-sampled in order to serve the purposes of the primary study using this data set. Professors of selected classes were approached via email memo in December 2003 to request permission to recruit in-class during the first week of the 2004 winter term. Professors for 66 classes were originally approached for this survey, and 42 agreed to participate**.** However, due to constraints of scheduling, time and materials only 23 classes were used for recruitment.

The primary researcher, another research assistant, and the author recruited both smoking and nonsmoking students via classroom presentations, usually at the beginning or end of a lecture, using a standardized recruitment script. During the presentations a questionnaire

package was distributed to each student in attendance. This package contained an information/consent letter, the four-page questionnaire, a contact card, and a small envelope, all in a stamped self-addressed envelope. The study personnel then left the classroom and waited outside the classroom doors. When the class was dismissed, those students not interested in participating returned their unused package to the study personnel. Students interested in participating were asked to read the information/consent letter after class. Those who did not wish to continue with the study were asked to return the blank materials using the stamped, addressed envelope. Those interested in full participation were asked to sign the consent form and complete the contact card, then seal both of these in the small envelope. They were then instructed to complete the questionnaire and use the stamped self-addressed envelope to return the questionnaire and the sealed envelope, all within a two-week period. With this method of data collection, the purpose of the investigation could be explained, queries could be answered, students would not feel coerced to participate, and many students could be reached with minimal infringement on class time.

To maximize the response rate, students were informed that full participation would grant them one ticket in draws for ten $25.00 coupons for University of Waterloo Retail Services. Once packages were returned the questionnaire and small sealed envelope were separated. To ensure anonymity, questionnaires and contact cards were identified and linked by participant number only. The contact cards, consent letters, and completed questionnaires were all stored separately in a secure file in a locked room.

3.4 Selection Criteria

Individuals were deemed eligible for inclusion in the study if they were between the ages of 18-24 at the time of the survey and provided complete data on the items used to assess smoking

status. The 18-24 year age range was selected because it would allow for a more representative sample of the larger University of Waterloo student population. The data was also screened for 'unreliable respondents' by examining the following two items: (1) Among your closest friends what percentage would be smokers? (2) How often do they smoke? (never, rarely, occasionally, fairly often, very often). Those who reported having no closest friends who smoked (0%), but reported a frequency of smoking other than 'never,' or those who reported having a percentage of closest friends who smoked, but reported their smoking frequency as 'never' were deemed to have inconsistent data and excluded from the study.

3.5 Measures

3.5.1 Demographics

Demographic information included sex, age, ethnicity, marital status, living arrangement, year of study, current faculty, and enrollment status (full- or part-time). Because the survey did not ask students to report their current age, this variable was assessed by subtracting 'year of birth' from year of the study (2004). Although this method produced only an approximation of the respondents' ages, this was not a large concern for the present study because the variable 'age' was not used for any further analyses.

3.5.2 Smoking Status

According to Delnevo and colleagues (2005), studies of populations in which late initiation is suspected should incorporate all three measures of current cigarette smoking (e.g. lifetime use, 30-day use, and "now"). The University of Waterloo Tobacco Use Survey contains the necessary questions used to calculate both lifetime and past 30-day use, and as such, both these items were used in the present study. Specifically, students were asked: (a) Have you smoked 100 or more cigarettes in your life? (*response options*: yes, no, don't know); and (b) Think of

the past month. How often did you smoke a cigarette, even a puff? (*response options*: I did not smoke at all, once or twice all together, on some days each week, almost every day, every day). For the purposes of this research, the following behavioural definitions of smoking status were used to categorize the participants:

- ***Current smokers*** were defined as respondents who reported that during the past month they had smoked either every day, almost every day, on some days each week, or once or twice all together. This definition encompasses both those who had or had not smoked a lifetime minimum of 100 or more cigarettes.

For the purposes of some analyses, current smokers were further sub-divided into the following categories:

  - ***Daily smokers*** were defined as respondents who reported smoking a lifetime minimum of 100 or more cigarettes and reported smoking every day over the past month.
  - ***Occasional smokers*** were defined as respondents who reported smoking a lifetime minimum of 100 or more cigarettes and reported smoking almost every day, on some days each week, or once or twice all together over the past month.
  - ***Experimental smokers*** were defined as respondents who reported not smoking a lifetime minimum of 100 or more cigarettes and reported that during the past month they had smoked either every day, almost every day, on some days each week, or once or twice all together.

- ***Nonsmokers*** were defined as respondents who reported not smoking a lifetime minimum of 100 or more cigarettes and reported not smoking at all over the past month.
- ***Ex-smokers*** were defined as respondents who reported smoking a lifetime minimum of 100 or more cigarettes and reported not smoking at all over the past month.

These behavioural definitions are a hybrid of both the standard adult and adolescent measures typically used in tobacco control research. These behavioural definitions were also more finely drawn than those typically used in tobacco use literature in order to allow an exploration of the relations of increasingly frequent tobacco use with the other variables of interest.

3.5.3 Smoking Frequency and Frequency Patterns

Weekly frequency of cigarette use among non-daily smokers was assessed by the item: In the past week how many cigarettes did you smoke? (*response options*: A few puffs or less, OR # of whole cigarettes___, OR # of packs ___of ___ cigarettes).

Among daily smokers, frequency of cigarette use each work day and leisure day was assessed by the items: How many cigarettes do you usually smoke: Each work day? Each leisure day? Response options were the same as those listed above for non-daily smokers.

3.5.4 Self-Perceived Smoking Status

Students' were asked to report on their self-perceived smoking status at university entrance and also at this time (study date). Response options for both university entrance and study date included: nonsmoker who never smokes, nonsmoker who smokes sometimes, light smoker, regular smoker, or ex-smoker who has totally quit smoking.

3.5.5 School connectedness

The University of Waterloo Tobacco Use Survey contains 11 questions that tap aspects of connection to school. These questions were derived directly from the Youth in Transition Survey (2000), a nation-wide longitudinal survey administered by Health Canada designed to collect a broad range of information on the education and labour market experiences of 18-24 year olds. Four questions addressed issues surrounding academic engagement. These included:

"I do as little as possible; I just want to get by," "I pay attention to the professors," "I am interested in what I am learning in class," and "I have trouble keeping up with the workload." Responses to the statements were given on a six-point Likert scale where 1= never, 2= rarely, 3= some of the time, 4= most of the time, 5= all of the time, and 6=don't know. Another seven items addressed issues surrounding social belonging and support. The first four questions were: "I get along well with my professors," "I feel like I am an outsider or like I am left out of things at school," "I have become good friends with other students at school," "I feel like I am just a number to the school." Response categories ranged from 'never' to 'all of the time' and also included a 'don't know' category. For the final three questions students were asked to report how much they agreed or disagreed with the statements: "I have friends I can talk to about personal things," "I like to participate in many university activities e.g. clubs, sports, drama," and "People are interested in what I have to say."

3.6 Analyses

All analyses for this study were conducted using SAS Version 9.1.3 (SAS Inc., 2005).

3.6.1 Descriptive Statistics

Descriptive statistics (frequencies, percentages, and means) in this study were calculated for variables in research questions 1, 2, 3, and 5. Summary statistics for the distribution of the socio-demographic characteristics of the sample were also calculated.

3.6.2 Weighting

The data set was weighted on gender and year of study in order adjust the sample to better represent the larger University of Waterloo's student population. This was necessary because the data set had a much higher proportion of both female respondents and respondents in their first year of study than in the total campus population. Gender and year of study are key

demographic variables that may influence smoking behaviours. Although it was attempted to further weight the data by faculty of study, there was insufficient representation by gender and year of study within some faculties to perform this calculation.

3.6.3 Chi-square

Chi-square is a non-parametric test of statistical significance for bivariate tabular analysis. It measures the strength of association between variables and provides a probability value of the likelihood that the association occurred by chance. The statistic tests the null hypothesis that there is no association between variables (Kleinbaum, Kupper & Morgenster, 1982; Motulsky, 1995).

In the present study, chi-square analysis was used to determine the significance of the relationship between smoking status (i.e. current smokers vs. nonsmokers) and key socio-demographic variables (i.e. gender, year of study, faculty, ethnicity and living arrangement). This statistic was also used to assess the relationship between work-day and leisure-day frequency of cigarette use among daily smokers (research question #2), as well as to assess the relationship between smoking status (i.e. current smokers vs. nonsmokers) and various smoking-related behaviours and self-perceptions among a particular sub-group of experimental and occasional smokers (research question #5). A probability of error thresold for these analyses was set at $p<0.05$.

3.6.4 Cohen's kappa

Research questions 3 and 5 were partly examined through the use of Cohen's kappa statistic. Originally devised as a measure of inter-rater agreement for assessments using psychometric scales (Bakeman & Gottman, 1986), this statistic served well for the exploratory purposes of this study as it established a starting point for further data exploration. Generally, this chance-

corrected, non-parametric statistic is used to assess the extent to which two measures agree with each other (Bakeman & Gottman, 1986). The output produced is a cross-tabs matrix in which agreements between the two measures are placed in the diagonal cells and disagreements between the measures are placed in the off-diagonal cells. The Cohen's kappa statistic has a range from 0-1.00, with larger values indicating better agreement. Generally, a kappa of 0.00-0.39 is considered weak, 0.40 to 0.59 is considered moderate, 0.60 to 0.75 is considered good, and over 0.75 is considered excellent (Bakeman & Gottman, 1986). These guidelines were used in the current research.

It is important to note that in order to run the kappa analysis in research question 5, it was first necessary to match the two different rating scales of smoking status (i.e. the behavioural measure and the self-perception measure). These definitions were matched using the investigator's intuitively derived interpretations of the response options for students' self-perceived smoking status (see Figure 1).

Figure 1. Mapping of smoking status rating scales.

Self-Perception		Behavioural Measure
Nonsmoker, who never smokes	→	Nonsmoker
Nonsmoker, who smokes sometimes	→	Experimenter
Light smoker	→	Occasional
Regular smoker	→	Daily
Ex-smoker, who has totally quit smoking	→	Ex-smoker

3.6.5 Principal Components Analysis

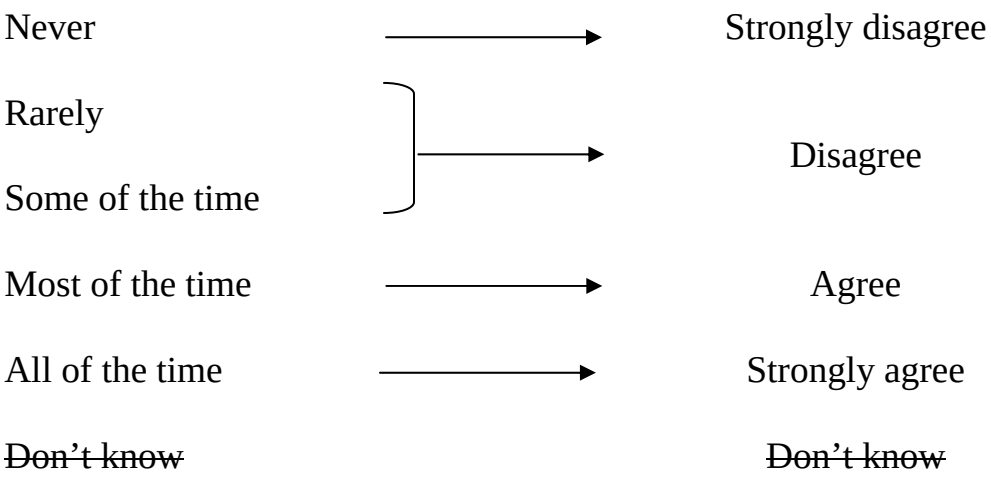
Principal components analysis (PCA), a form of exploratory factor analysis, is a statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables (Norusis, 1985). In the present study we investigated whether or not PCA of the academic engagement and social belonging and support items revealed meaningful school connectedness factors in this university student population.

In this research, the PCA proceeded in four steps as outlined by Norusis (1985). First, the correlation matrix for all variables was computed with each variable given one full unit of variance. This approach assumed that each variable was equally as important as the others and had the same amount of interrelatedness with the other variables. For the present study, this was a fairly reasonable assumption. In the second step, factor extraction (i.e. the number of factors necessary to represent the data) was determined. This decision was based on eigenvalues and percentage of the total variance accounted for by different numbers of factors. According to Norusis (1985), factors that account for variances greater than one (the eigenvalue is greater than one) should be included. This criterion of factor extraction was employed for the present research. The third step was rotation which transforms the factors to make them more interpretable. In the present study, the varimax method for orthogonal rotation was used. This technique preserves the orthogonal (uncorrelated) nature of the factors and tries to get the original variables to load high on one of the factors and low on the rest (Norusis, 1985). In the final step, exact scores for each factor were computed for each case. In the current research, the factor scores were used in subsequent analyses to represent the values of the factors.

It is important to note the data manipulations that needed to occur before this analysis could be performed (see Figure 2). First, all ‘don’t know’ responses on the Likert rating scale

were re-coded as missing data and subsequently excluded from the analysis in a case-wise fashion. Second, responses of 'rarely' and 'some of the time' on the Likert rating scale were collapsed into a single response category. The response categories for the first eight questions were then re-coded to reflect the remaining response categories of the final three questions, where 1= strongly disagree, 2= disagree, 3=agree, and 4=strongly agree. These adjustments were required so that the 11 statements could be analyzed together.

Figure 2. Mapping of Likert rating scales.



3.5.6 Logistic Regression

Logistic regression is a method used to investigate the relationship between discrete response variables and continuous explanatory variables (Cody & Smith, 1997). Generally, the goal of logistic regression is to correctly predict the category of outcome for individual cases using the most parsimonious model.

In the present study, logistic regression modeling was used to assess the independent role of the factor scores derived from the PCA on smoking status (i.e. smoker vs. nonsmoker). Logistic regression was also used to assess the independent role of the factor scores on changes (i.e. positive vs. negative change) in self-perceived smoking status from university entrance to the study date. Smoking-related socio-demographic variables particular to the current research were included in all models to control for their potential confounding effects. Additionally, interactions among all variables were tested. To determine the models, backward elimination for variable selection was used. Statistical significance of logistic regression coefficients was tested using likelihood ratio chi-square tests, and p-values less than 0.1 were considered to indicate statistical significance. The advantage of this criteria value was that it retained factors with borderline significance.

Chapter 4: Results

4.1 Selection of Eligible Participants

A total of 358 undergraduate student respondents were sampled in the preliminary University of Waterloo Tobacco Use Survey (response rate= 26%). Of the original sample, 31 respondents were deemed ineligible for inclusion in the current study and excluded from the analysis. Of these respondents, 13 were outside the age range of 18-24 years at the time of the survey, six respondents had missing data on the items used to ascertain smoking status, and 12 respondents were deemed to have unreliable reports. Thus, the resulting sample for analysis included 327 participants.

4.2 Socio-demographic Characteristics of the Sample

Table 1 contains details on all socio-demographic descriptors of the sample. Due to the varying probabilities of selection and response rate, these percentages did not parallel estimates of the larger University of Waterloo student population. As such, the data was weighted to reflect the University of Waterloo's actual distribution of gender and year of study. Appendix D displays the calculation used to determine the weight for to each 'type' of student. Two respondents from the original resulting sample did not provide information on gender or year of study and were excluded from the weighted analyses. All results reported herein reflect the weighted data.

Table 2 displays the proportions of the socio-demographic descriptors of the weighted sample (n= 332.16). Not surprisingly, participants ranged in age from 18-24 years (mean= 21 years, S.D.= 1.72). The sample was predominantly European (68.79%), with 18.01% Asian, 1.58% Central/South American, 1.11% Canadian First Nations, 1.05% Middle Eastern, 0.44% Caribbean, and 9.02% reporting 'other'. The gender distribution was relatively even, with males (51.83%) slightly outnumbering females, and most participants reported being single (90.94%).

In regards to student status, the sample consisted of 29.13% first year, 20.44% second year, 26.38% third year, and 24.05% fourth year students. Many participants were enrolled in the faculty of Arts (24.62%) and Engineering (23.69%), with 19.43% in Applied Health Sciences, 14.56% in Science, 12.38% in Math and 5.32% in Environmental Studies. The majority of the participants lived off-campus with other students (38.96%) or in a campus residence (33.08%). Nearly all of the participants were registered as full-time students (97.42%).

Table 1. Characteristics of the sample (n= 327).

Characteristic	N	%
Sex (1 missing)		
Male	106	32.52
Female	220	67.48
Age (2 missing)		
18-19	77	23.69
20-24	248	76.30
Ethnicity (6 missing)		
European	216	67.29
Canadian First Nations	4	1.25
Asian	66	20.56
Caribbean	2	0.62
Middle Eastern	4	0.25
Central/South American	3	0.93
Other	26	8.10
Marital status (17 missing)		
Single	287	92.58
Married	6	1.94
Common-law	2	0.65
Cohabiting	9	2.90
Engaged	6	1.94
Living Arrangement		
Campus residence	136	41.59
Family home	51	15.60
Relative's home	8	2.45
With another family (boarding)	1	0.31
Off campus – alone	3	0.92
Off campus – with other students	104	31.80
Off campus – with non students	5	1.53
Off campus – with students and non students	4	1.22
Off campus – with romantic partner or spouse	15	4.59
Year of Study (1 missing)		
1	139	42.64
2	68	20.86
3	74	22.70
4*	45	13.80
Current Faculty (2 missing)		
Applied Health Sciences	67	20.62
Arts	94	28.92
Engineering	21	6.46
Environmental Studies	56	17.23
Math	27	8.31
Science	60	18.46
Enrollment status (8 missing)		
Part-time	6	1.88
Full-time	313	98.12

Note: Percentages within categories may not total 100 because of missing data.
* Also includes 5 respondents who reported being in their 5th year of study.

Table 2. Characteristics of the weighted sample (adjusted n= 332.16).

Characteristic	N	%
Sex		
Male	172.17	48.17
Female	159.99	51.83
Age (missing 1.97)		
18-19	75.35	22.82
20-24	254.84	77.18
Ethnicity (missing 4.22)		
European	225.59	68.79
Canadian First Nations	3.64	1.11
Asian	59.06	18.01
Caribbean	1.45	0.44
Middle Eastern	3.45	1.05
Central/South American	5.17	1.58
Other	29.58	9.02
Marital status (18.32 missing)		
Single	285.42	90.94
Married	7.97	2.54
Common-law	2.19	0.70
Cohabiting	9.47	3.02
Engaged	8.79	2.80
Living Arrangement		
Campus residence	109.87	33.08
Family home	54.41	16.38
Relative's home	6.37	1.92
With another family (boarding)	1.00	0.30
Off campus – alone	2.28	0.69
Off campus – with other students	129.4	38.96
Off campus – with non students	4.70	1.41
Off campus – with students and non students	5.21	1.57
Off campus – with romantic partner or spouse	18.92	5.70
Year of Study		
1	96.45	29.13
2	67.88	20.44
3	87.64	26.38
4*	79.89	24.05
Current Faculty (0.69 missing)		
Applied Health Sciences	64.42	19.43
Arts	81.62	24.62
Engineering	78.51	23.69
Environmental Studies	17.64	5.32
Math	41.03	12.38
Science	48.25	14.56
Enrollment status (5.61 missing)		
Part-time	8.42	2.58
Full-time	318.13	97.42

Note: Frequencies may not total N because of missing data.

* Also includes 5 respondents who reported being in their 5th year of study.

4.3 Smoking Status

According to the behavioural measure, an estimated 17.55% students were current smokers (Figure 3). When divided into distinct smoking groups, the data revealed that among the total sample, 3.37% students were daily smokers, 8.52% students were occasional smokers and 5.66% students were experimental smokers (Figure 4).

Table 3 indicates that there were no statistically significant differences between current smokers and nonsmokers/ex-smokers in terms of gender, (χ^2= 0.4356, *df*= 1, p= 0.5092), marital status (χ^2= 0.7053, *df*= 1, p= 0.4010), living arrangement (χ^2= 2.3218, *df*= 5, p= 0.8031), or year of study (χ^2= 0.7123, *df*= 3, p= 0.8703). Smoking status did however vary significantly across ethnic groups with 5.98% Asians, 18.63% Europeans and 28.18% 'Others' reporting current cigarette use (χ^2= 8.6143, *df*= 2, p<0.05). Smoking status also varied significantly across faculty groups. Current smoking was reported by 27.52% students of Arts, 22.82% students of Science, 21.52% students of Math, 12.08% students of Applied Health Science, 9.77% students of Engineering, and 3.06% students of Environmental Studies (χ^2= 14.1316, *df*= 5, p<0.05).

Figures 5 and 6 present a comparison of the distribution of smoking status using the behavioural measure and the self-perception measure. From these charts we can see that the proportion non-daily smokers differ between the two measures. For example, more students view themselves as 'nonsmokers who smoke sometimes' than are classified as 'experimental smokers' using the behavioural measure (13.36% vs. 5.66%, respectively)

Figure 3. Estimated percentage of students at the University of Waterloo who are current smokers versus nonsmokers/ex-smokers.

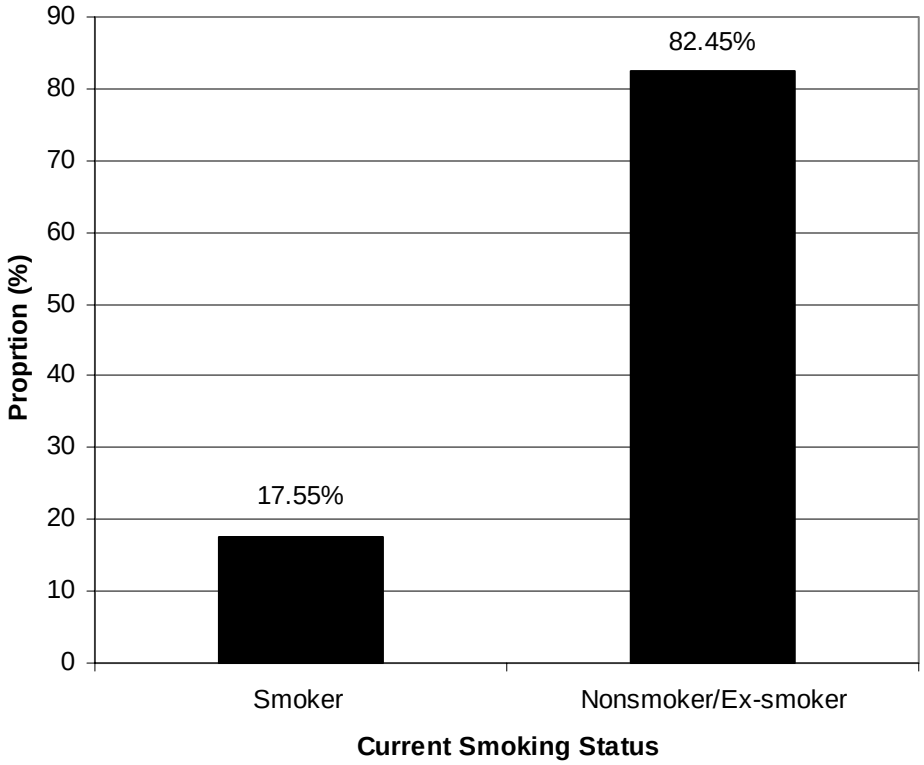


Figure 4. Estimated Percentage of students who smoke daily, occasionally and experimentally.

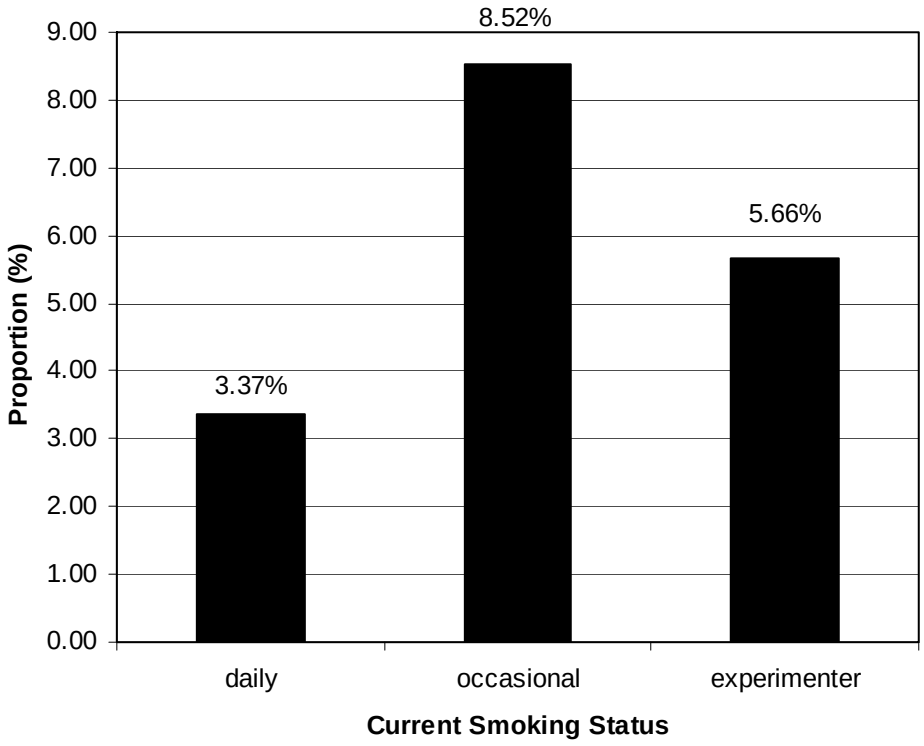


Figure 5. Estimated distribution of smoking status using the behavioural measure.

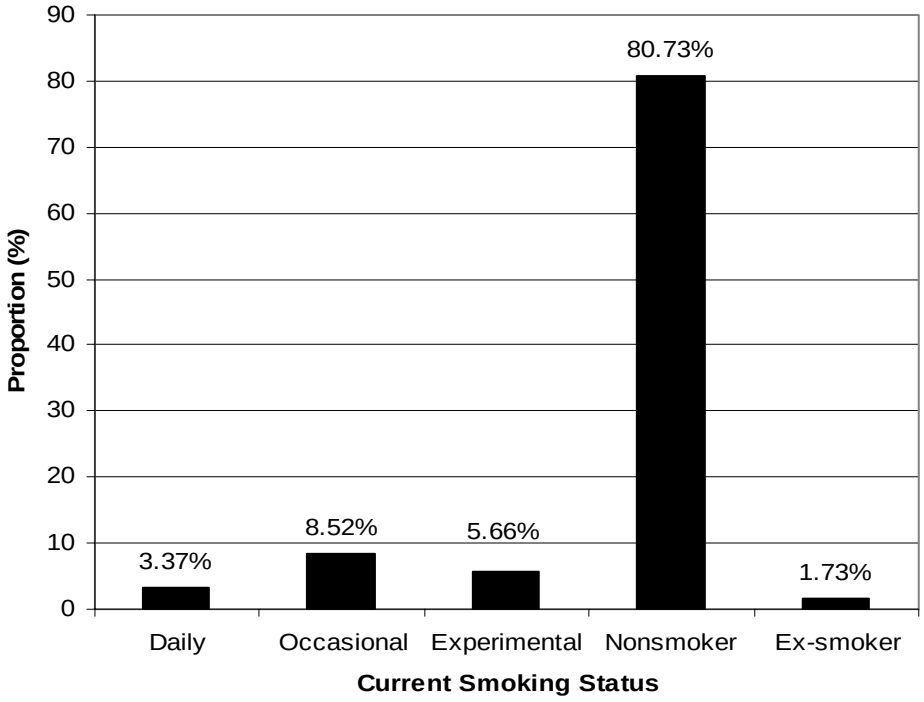


Figure 6. Estimated distribution of smoking status using the self-perception measure.

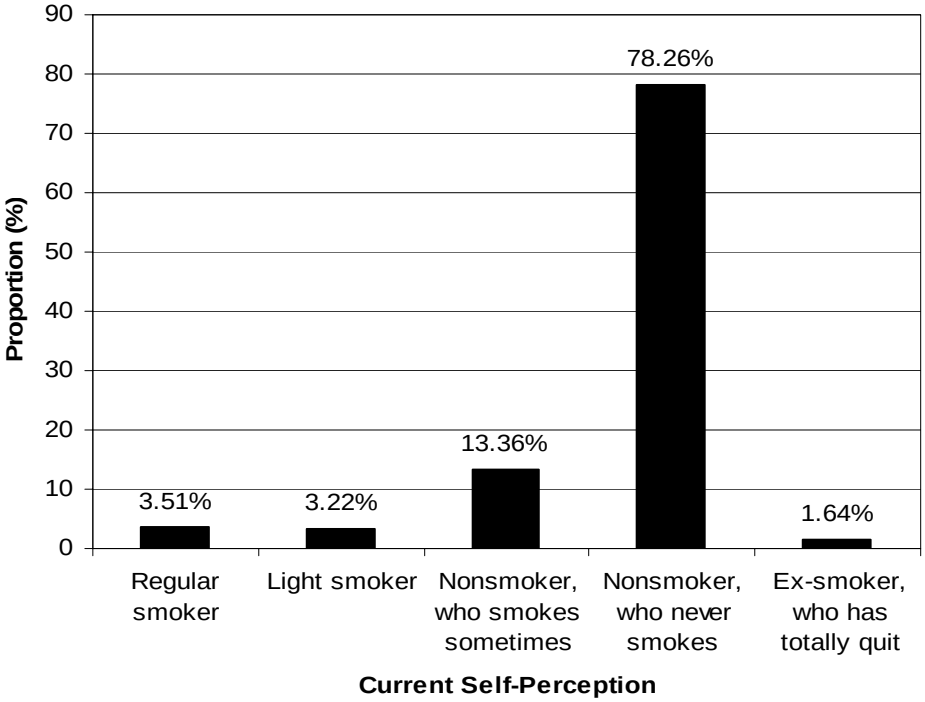


Table 3. A comparison of descriptive statistics among current smokers versus nonsmokers.

Variable	Smokers (adjusted n= 58.29)		Nonsmokers (adjusted n= 273.87)		Chi-square	
	N	%	N	%	value	*p*
Sex						
Male	25.79	16.12	134.20	83.88	0.4356	0.5092
Female	32.50	18.88	139.67	81.12		
Ethnicity						
European	42.02	18.63	183.57	81.38	8.6143	<0.05
Asian	3.53	5.98	54.77	92.74		
Other*	12.20	28.18	31.85	73.57		
Marital status						
Single	48.10	16.85	237.32	83.15	0.7053	0.4010
Other**	6.57	23.12	21.85	76.88		
Living Arrangement						
Campus residence	16.20	14.74	93.67	85.26	2.3218	0.8031
Family home	9.80	18.01	44.61	81.99		
Relative's home or With another family	1.54	20.90	5.83	79.10		
Off campus – alone	0.00	0.00	2.28	100.00		
Off campus – exclusively with other students	23.51	18.17	105.89	81.83		
Other***	7.24	25.11	21.59	74.89		
Year of Study						
1	14.64	15.18	82.11	85.13	0.7123	0.8703
2	12.97	19.11	54.91	80.89		
3	16.97	19.36	70.67	80.64		
4****	13.71	17.16	66.18	82.84		
Current Faculty						
Applied Health Sciences	7.78	12.08	56.64	87.92	14.1316	<0.05
Arts	22.46	27.52	59.16	72.48		
Engineering	7.67	9.77	70.84	90.23		
Environmental Studies	0.54	3.06	17.1	96.94		
Math	8.83	21.52	32.2	78.48		
Science	11.01	22.82	37.24	77.18		

Note: Frequencies within categories may not total N because of missing data.

* 'Other' includes, but is not limited to, Canadian First Nations, Caribbean, Middle Eastern, and Central/South American.

** 'Other' includes married, common-law, cohabiting, and engaged.

*** 'Other' includes off campus– with non students, off campus– with students and non students, and off campus– with romantic partner or spouse.

**** Also includes 5 respondents who reported being in their 5th year of study.

4.4 Smoking Frequency and Frequency Patterns

All participants prompted to answer questions regarding frequency of cigarette use reported in number of whole cigarettes. According to the data, the average number of cigarettes smoked per week among non-daily smokers (i.e. occasional and experimental; n= 42) was 1.6 (S.D.= 0.73). Among daily smokers (n= 10), the average number of cigarettes smoked per work day was 8.9 (S.D.= 6.26) and the average number of cigarettes smoked per leisure day was 9.0 (S.D.= 7.06). In contrast to the hypothesis, the rate of smoking among daily smokers did not differ significantly between work and leisure days (χ^2= 8.2880, *df*= 7, p= 0.2540).

4.5 Changes in Self-Perceived Smoking Status

The kappa coefficient statistic was used to determine agreement between self-perceived smoking status at university entrance and the study date (January 2004). The total adjusted sample size for this analysis was 323.7 respondents. Appendix E displays the results of this cross-tabulation. Overall, the kappa statistic was 0.5673 (CI_{95}= 0.4766-0.6580) suggesting a moderate agreement between the two measures.

Among all cases, an estimated 85.5% were concordant (Table 4a). This suggests that most respondents did not change their self-perceived smoking status during their time on campus. The largest group whose self-perceptions did not change were those students who remained as 'nonsmokers who never smoke' from university entrance to the study date.

In contrast there were an estimated total of 14.51% discordant cases. Among these discordant cases, an estimated 70.21% made a negative change in their self-perceived smoking status (Table 4b), and 29.79% made a positive change in their self-perceived smoking status (Table 4c). The largest group of students whose self-perceptions made a negative change were

those who reported ‘nonsmoker who never smokes’ at university entrance, and ‘nonsmoker who smokes sometimes’ at the study date.

When only students in their first year of study were examined, a moderate agreement between students’ self-perceived smoking status at university entrance and the study date was also found (kappa= 0.5138; CI_{95}= 0.2883-0.7393). Appendix F displays the results of the cross-tabulation.

Among all cases, an estimated 88.59% were concordant (Table 5a). This suggests that most respondents did not change their self-perceived smoking status during their first four months on campus. Similar to the results from the total sample, the largest group whose self-perceptions did not change were those students who remained as ‘nonsmokers who never smoke’ from university entrance to the study date.

In contrast there were an estimated total of 11.43% discordant cases. Among these discordant cases, an estimated 69.38% made a negative change in their self-perceived smoking status (Table 5b), and 30.62% made a positive change in their self-perceived smoking status (Table 5c). The largest group of students whose self-perceptions made a negative change were those who reported ‘nonsmoker who never smokes’ at university entrance, and ‘nonsmoker who smokes sometimes’ at the study date.

Table 4a. Frequencies of students whose self-perceived smoking status remained the same from university entrance to the study date.

	University Entrance	Study Date	Adjusted N
	Nonsmoker, who never smokes	Nonsmoker, who never smokes	248.91
	Nonsmoker, who smokes sometimes	Nonsmoker, who smokes sometimes	15.31
	Light smoker	Light smoker	3.87
	Regular smoker	Regular smoker	6.62
	Ex-smoker, who has totally quit	Ex-smoker, who has totally quit	2
Overall			**276.74** (85.5% total sample)

Table 4b. Frequencies of students whose self-perceived smoking status made a negative change from university entrance to the study date.

	University Entrance	Study Date	Adjusted N
	Nonsmoker, who never smokes	Nonsmoker, who smokes sometimes	17
		Light smoker	4.66
	Nonsmoker, who smokes sometimes	Light smoker	1.99
		Regular smoker	2.12
	Light smoker	Regular smoker	2.71
	Ex-smoker, who has totally quit	Nonsmoker, who smokes sometimes	4.33
Overall			**32.81** (10.13% of total sample)

Table 4c. Frequencies of students whose self-perceived smoking status made a positive change from university entrance to the study date.

	University Entrance	Study Date	Adjusted N
	Nonsmoker, who smokes sometimes	Nonsmoker, who never smokes	2.52
	Light smoker	Nonsmoker, who smokes sometimes	4.16
		Ex-smoker, who has totally quit	0.54
	Regular smoker	Nonsmoker, who smokes sometimes	2.81
		Ex-smoker, who has totally quit	2.82
	Ex-smoker, who has totally quit	Nonsmoker, who never smokes	1.3
Overall			**14.15** (4.38% of total sample)

Table 5a. Frequencies of first year students whose self-perceived smoking status remained the same from university entrance to the study date.

	University Entrance	Study Date	Adjusted N
	Nonsmoker, who never smokes	Nonsmoker, who never smokes	74.95
	Nonsmoker, who smokes sometimes	Nonsmoker, who smokes sometimes	3.62
	Light smoker	Light smoker	1.54
Overall			**80.11** (88.59% of total 1st year sample)

Table 5b. Frequencies of first year students whose self-perceived smoking status made a negative change from university entrance to the study date.

	University Entrance	Study Date	Adjusted N
	Nonsmoker, who never smokes	Nonsmoker, who smokes sometimes	6.08
	Nonsmoker, who smokes sometimes	Light smoker	0.54
	Light smoker	Regular smoker	0.54
Overall			**7.16** (7.92 of total 1st year sample)

Table 5c. Frequencies of first year students whose self-perceived smoking status made a positive change from university entrance to the study date.

	University Entrance	Study Date	Adjusted N
	Nonsmoker, who smokes sometimes	Nonsmoker, who never smokes	1
	Light smoker	Nonsmoker, who smokes sometimes	0.54
		Ex-smoker, who has totally quit	0.54
	Regular smoker	Ex-smoker, who has totally quit	0.54
	Ex-smoker, who has totally quit	Nonsmoker, who never smokes	0.54
Overall			**3.16** (3.51% of total 1st year sample)

4.6 "School Connectedness" Scale

PCA was used to explore the underlying relationships among the 11 items related to school connectedness drawn from the Youth in Transition Survey (2000). This analysis was conducted with data from 233 respondents. The correlation matrix of the PCA indicated three factors with eigenvalues greater than one (Factor 1= 2.80, Factor 2= 1.85 and Factor 3= 1.31). Based upon these values and the factor scree test, a three factor solution encompassing Factors 1 through 3 was chosen. This solution explained an acceptable amount of the total variance (54.11%).

The result of the final PCA is shown in Table 6. The first factor that we have, called *Socially Connected,* is made up of items indicating a sense of social support and social belonging with other students on campus, as well as a sense of social engagement at school. These include *"I have friends at school I can talk to about personal things."* and *"I have become good friends with other students at school."* (items that loaded highest and second highest on the factor). The item *"I like to participate in many university activities e.g. clubs, sports, drama."* also loaded on this factor.

The second factor that we have, called *Isolated,* contains items that denote a general negative perception of one's importance at school and relations with professors, as well as a sense of academic struggle. These include, not agreeing with the statement *"I get along well with my professors."* and agreeing with the statement *"I feel like I am just a number to the school*."; these were the two highest loading items. The work-related item, *"I have trouble keeping up with the workload."* also loaded on this factor.

Three items comprise the third factor that we have called *Academically Engaged.* The items, *I pay attention to the professors."*, *"I am interested in what I am learning in class."*, and not agreeing with the item *"I do as little as possible; I just want to get by."* reflect an interest in

school and a sense of academic engagement/motivation. Appendix G displays the loadings on all factors.

Table 6. Factor Structure for School Connectedness.

Load	Variable
Factor 1	***Socially Connected***
0.39	I have become good friends with other students at school.
0.40	I have friends at school I can talk to about personal things.
0.35	I like to participate in many university activities e.g. clubs, sports, drama.
Factor 2	***Isolated***
-0.39	I get along well with my professors.
0.23	I feel like I am an outsider or like I am left out of things at school.
0.27	I have trouble keeping up with the workload.
0.38	I feel like I am just a number to the school.
-0.26	People at school are interested in what I have to say.
Factor 3	***Academically Engaged***
-0.44	I do as little as possible; I just want to get by.
0.44	I pay attention to the professors.
0.35	I am interested in what I am learning in class.

4.7 Relationships between Factors of School Connectedness and Smoking Behaviours

The individual factor scores computed during the PCA were employed as the independent variables in the logistic regression analysis to determine if the identified factors of school connectedness could predict current smoking status (i.e. whether or not a students was a current smoker). This analysis was conducted with data from 229 respondents. The initial modeling assessed the main effects of *Socially Connected, Isolated,* and *Academically Engaged,* and controlled for potential confounding effects of ethnicity and faculty of study (variables found to be significantly related to smoking among the current study sample). The effects of ethnicity, faculty of study, *Isolation* and *Academically Engaged* all failed to reach significance and were deleted to produce a more parsimonious, better fitting model. The revised model contained only the factor *Socially Connected* (χ^2= 2.9866, *df*= 1, p<0.1). However, because the CI_{95} contained 1, the odds ratio was not statistically significant (OR= 0.736, CI_{95}= 0.520-1.041). The results of subsequent logistic regression modeling to test for the combined effects of the variables on the likelihood that a student would be a current smoker indicated that none of the main effects, or interactions, were significant.

Further analyses were conducted to determine if the identified factors of school connectedness could predict changes (negative vs. positive) in students' self-perceived smoking status from university entrance to the study date. This analysis was conducted with data from 33 respondents. Again, the initial modeling assessed the main effects of the three identified factors of school connectedness (*Socially Connected, Isolated,* and *Academically Engaged*) controlling for the effects of ethnicity and faculty. The final model included only the factor *Socially Connected* (χ^2= 3.7740, *df*= 1, p<0.1). However, the CI_{95} for the odds ratio in this model contained 1, indicating that the odds ratio was not statistically significant (OR= 0.1997,

CI_{95}= 0.944-4.225). The results of subsequent logistic regression modeling to test for the combined effects of the variables on the likelihood that a student made a negative change in their self-perceived smoking status were not significant.

Further analyses were also conducted to determine if the identified factors of school connectedness could predict whether or not students who perceived themselves as 'nonsmokers who never smoke' or 'ex-smokers who have totally quit' at university entrance, made a negative change in their self-perceived smoking status by the study date. This analysis was conducted with data from 190 respondents. Similar to the previous logistic regression analyses, the initial modeling assessed the main effects of *Socially Connected, Isolated,* and *Academically Engaged,* while controlling for the potential confounding effects of ethnicity and faculty. The final model consisted only of the factor *Academically Engaged* (χ^2= 4.7821, *df*= 1, p<0.1). In this model, being more academically engaged predicted making a negative change in ones' self-perceived smoking status from university entrance to the study date (OR= 1.924, CI_{95}= 1.064-3.480). In other words, among students who perceived themselves as 'nonsmokers who never smoke' or 'ex-smokers' at university entrance, those who paid more attention to their professors, were more interested in what they were learning, and more strongly disagreed with the statement "*I do as little as possible; I just want to get by,"* were 1.9 times more likely to have made a negative change in their self-perceived smoking status at the study date than those who were less academically engaged. Subsequent logistic regression modeling to test for the combined effects of the variables also resulted in only the main effect of the factor *Academically Engaged*.

4.8 Agreement between Measures of Smoking Status

The kappa coefficient statistic was used to determine agreement between student smoking status as determined by our behavioural measure for this research and students' self-perceived smoking

status. The total adjusted sample size for this analysis was 326.32 respondents. The findings of this analysis are presented in Table 7. Overall, the kappa statistic was 0.5391 (CI_{95} = 0.4551-0.6231) suggesting a moderate agreement between the two measures. Among all cases, an estimated 83.91% were concordant, and 16.09% were discordant. Among the concordant cases, an estimated 91.11% were classified as 'nonsmokers' according to the behavioural measure, and 'nonsmokers who never smoke' according to the self-perception measure. Clearly this cell had the greatest influence on the resulting kappa statistic.

A second analysis was performed that included only those respondents who were defined as current smokers according to the behavioural measure and who considered themselves to be either non-smokers who smoke sometimes, light smokers, or regular smokers (see Table 8). The total adjusted sample size for this analysis was 48.21 respondents. When the analysis was limited to these specific categories the kappa coefficient dropped to 0.2045 (CI_{95} = 0.0156-0.3933) suggesting a weak agreement between the two measures. Among all cases, en estimated 44.75% were concordant, and 55.25% were discordant. The largest discordant group was respondents who were classified as 'occasional smokers' using the behavioural measure, but who perceived themselves as 'nonsmokers who smoke sometimes', instead of the expected 'light smoker'.

Subsequent analyses were performed in order to further explore the subset of students in the largest discordant group (occasional smokers who perceived themselves to be nonsmoker who smoke sometimes). Specifically, this group of students was compared on a variety of smoking-related psychological and behavioural measures to those students who also perceived themselves as 'nonsmokers who smoke sometimes', but were classified as 'experimental smokers' using the behavioural measure. An examination of Table 9 indicates that no

statistically significant differences were found among these two groups in regards to the number of cigarettes smoked per week (χ^2 = 0.0425, *df*= 1, p= 0.8367), pressure from friends to smoke (χ^2 = 1.0783, *df*= 1, p= 0.2991), perception of smoking as a norm on campus (χ^2 = 4.8319, *df*= 2, p= 0.0893), and certain situations when they smoke (i.e. with friends, χ^2 = 0.3516, *df*= 1, p= 0.5532; in times of stress, χ^2 = 2.9081, *df*= 1, p= 0.0881; and alone, χ^2 = 0.0144, *df*= 1, p= 0.9043).[1]

There were however, significant differences between these two groups in their plans to quit in the next 6 months (χ^2 = 9.3301, *df*= 2, p<0.01). Among the experimental smokers, none reported that they planned to quit and most (n= 7.69) reported that they did not smoke. In comparison, 5 occasional smokers planned to quit, 6.29 did not plan to quit, and only 4.1 reported that they did not smoke. Significant differences between these two groups were also found in regards to ever having intentionally tried to quit (χ^2 = 17.1427, *df*= 2, p<0.001). The data shows that 11.99 occasional smokers reported that they had tried to quit whereas only 1.69 experimenters had tried to quit. These two groups also differed significantly when asked if there was ever an occasion during the past month when they were about to smoke but resisted the urge. In total, 14.22 occasional smokers compared to 4 experimental smokers reported that they had resisted an urge to smoke during the past month. Finally, smoking status varied significantly according to certain situations where students smoke. More occasional smokers than experimental smokers reported that they smoke at parties (12.52 vs. 3.69, respectively; χ^2 = 4.6477, *df*= 1, p<0.05) and at the bar (13.06 occasional smokers vs. 3.84 experimental smokers; χ^2 = 5.2028, *df*= 1, p<0.05).[1]

1 Results may not be statistically meaningful due to small sample sizes.

Table 7. Agreement between measures of smoking status (adjusted n= 326.32).

		Self Perception Measure				
		Nonsmoker, who never smokes	**Nonsmoker, who smokes sometimes**	**Light smoker**	**Regular smoker**	**Ex-smoker, who has totally quit smoking**
Behavioural Measure	**Nonsmoker**	249.47 93.49%	16.61 6.22%	0.76 0.28%	0 0.00%	0 0.00%
	Experimental smoker	3.63 21.91%	10.61 64.03%	2.33 14.06%	0 0.00%	0 0.00%
	Occasional smoker	0 0.00%	16.39 57.92%	4.41 15.58%	4.9 17.31%	2.6 9.12%
	Daily smoker	0 0.00%	0 0.00%	3.02 31.57%	6.55 68.44%	0 0.00%
	Ex-smoker	2.28 45.24%	0 0.00%	0 0.00%	0 0.00%	2.76 54.76%

Kappa Statistics

Kappa Value	95% Confidence Limits
0.5391	0.4551-0.6231

Table 8. Agreement between measures of smoking status – current smokers only (by behavioural measure) (adjusted n= 48.21).

		Self Perception Measure		
		Nonsmoker, who smokes sometimes	**Light smoker**	**Regular smoker**
Behavioural Measure	**Experimental smoker**	10.61 81.99%	2.33 18.01%	0 0.00%
	Occasional smoker	16.39 63.77%	4.41 17.16%	4.9 19.01%
	Daily smoker	0 0.00%	3.02 31.56%	6.55 68.44%

Kappa Statistics

Kappa Value	95% Confidence Limits
0.2045	0.0156-0.3933

Table 9. A comparison of smoking-related behaviours and perceptions among experimental & occasional smokers who report a 'nonsmoker, who smokes sometimes' smoking status.

Variable	Experimental Smokers (n= 10.61)		Occasional Smokers (n= 16.39)		Chi-square	
	N	%	N	%	value	p
Cigarettes per week						
1	6.23	64.83	9.96	60.77	0.0425	0.8367
2	3.38	35.17	6.43	39.23		
Plan to quit in next 6 months						
No	0.69	8.23	6.29	40.87	9.3301	<0.01
Yes	0	0.00	5	32.49		
I don't smoke	7.69	91.77	4.1	26.64		
Tried to quit smoking						
Never	8.38	83.22	0.54	3.51	17.1427	<0.001
Ever	1.69	16.78	11.99	77.91		
I don't smoke	0	0.00	2.86	18.58		
Pressure from friends to smoke						
Never	6.92	65.22	13.56	82.73	1.0783	0.2991
Rarely/Occasionally	3.69	34.78	2.83	17.27		
Resist urge during past month						
Yes	4	37.70	14.22	86.76	7.0643	<0.01
No	6.61	62.30	2.17	13.24		
Perception of norm on campus						
Minority	0	0.00	4.3	26.24	4.8319	0.0893
About half	6.46	60.89	10.09	61.56		
Don't know	4.15	39.11	2	12.20		
In what situations do you smoke?						
At a party						
Yes	3.69	34.78	12.52	76.39	4.6477	<0.05
No	6.92	65.22	3.87	23.61		
At a bar						
Yes	3.84	36.19	13.06	79.68	5.2028	<0.05
No	6.77	63.81	3.33	20.32		
With friends who smoke						
Yes	7	65.98	8.93	54.48	0.3516	0.5532
No	3.61	34.02	7	45.52		
In times of stress						
Yes	1.77	16.68	8.03	48.99	2.9081	0.0881
No	8.84	83.32	8.36	51.01		
Alone						
Yes	2	18.85	3.4	20.74	0.0144	0.9043
No	8.61	81.15	12.99	79.26		

Note: Frequencies may not total N because of missing data.

Chapter 5: Discussion

This research was undertaken to gain a better understanding of smoking behaviours among a sample of students at the University of Waterloo, as well as to explore factors of school connectedness that may impact upon student smoking behaviours, and finally, to investigate agreement between two measures of smoking status. Several key findings merit discussion.

5.1 Smoking Behaviours

The prevalence of smoking among students at the University of Waterloo was substantially lower than prior national estimates for Canadian undergraduates. Current smoking among students in the present study was 17.55% versus 27.50% among undergraduates nation-wide in 1998 (Adlaf et al, 2003). Particularly surprising was the extremely low prevalence of daily smoking found in the current study sample. This finding may partly be explained due to the use of the standard adult measure of daily smoking. This measure of daily smoking fails to identify those students who have smoked every day over the past month but who have not yet reached 100 cigarettes. Overall, these findings suggest that cigarette use by undergraduates may have experienced a decline since the late 1990s. Indeed, results from the Canadian Tobacco Use Monitoring Survey indicate this decreasing trend in smoking to be true among all emerging adults over the past few years (Health Canada, 2005). However, without longitudinal data particular to Canadian post-secondary students, this explanation cannot be confirmed. The relatively low smoking prevalence found in the present study may also be due to the fact that only one university institution was examined. The inclusion of multiple post-secondary institutions is likely to produce higher estimates of cigarette use due to a more diverse sample which would include institutions with a higher smoking prevalence (e.g. inclusion of northern schools known to have a higher prevalence of smoking). Despite the encouraging finding of the

relatively low smoking prevalence among students at the University of Waterloo, almost 18% of the respondents reported current smoking. Thus, cigarette use is still a significant health problem on this campus, and warrants attention from the campus health and administrative communities.

The findings also demonstrate considerable heterogeneity in current smoking prevalence among diverse student groups. In contrast to prior research, smoking status did not vary significantly by living arrangement or year of study. Gender or marital status also did not influence student smoking status. On the other hand, smoking status differed significantly by ethnicity and faculty of study. For example, European students smoked more than students of other ethnicities. With regards to faculty of study, students enrolled in the Faculty of Arts smoked more than students enrolled in other disciplines. This finding is consistent with previous Canadian-based research (Gliksman et al, 1997). Explanations for these differences cannot be determined due to the cross-sectional design of the present study. It is possible that the apparent protective effect of some programs of study may be due to self-selection of more determined nonsmokers into these programs. On the other hand, it is also conceivable that different lifestyle attitudes may develop within different groups of students, favouring certain behaviours (e.g. cigarette use) in some faculties that are less accepted in others.

Previous research suggests that Canadian post-secondary students smoke fewer cigarettes than emerging adults who work (Hammond, 2005). Studies also show that post-secondary student daily smokers smoke just over 10 cigarettes per day (Cairney & Lawrance, 2002). This research extends that work to show that among daily smokers, the average number of cigarettes smoked per day does not significantly differ by work or leisure day. Among the current sample, the average number of cigarettes smoked on both these days was 9. These findings suggest that

daily student smokers have stable smoking patterns throughout the week, despite the variable daily schedule of student life.

Finally, the data yield several valuable insights about changes in students' self-perceived smoking status over time. First, the self-perception of the majority (85.5%) of students at the University of Waterloo remained as 'nonsmokers who never smoke' from university entrance to the study date (January, 2004). Of those students who did make a change in their self-perceived smoking status, a greater proportion of students in this group made a negative change rather than a positive change (10.13% vs. 4.38%, respectively). Similar results were found when only students in their first year of study were examined. Considering that most smoking assessment questionnaires for this age group collect data on smoking status using self-reports, it is safe to assume that in this study, a change in self-perception reflects an actual change in behaviour. Thus, these findings lend support to previous studies that show post-secondary students have variable patterns of smoking behaviour. These findings also challenge the widespread assumption within the public health community that smoking behaviour is largely fixed by the age of 18 years. Of particular concern in the current study is that only a small proportion of students who perceived themselves as smokers upon university entrance, made a positive change in their self-perceived smoking status (i.e. quit smoking or decreased their cigarette consumption) while on campus. Perhaps these students lack the desire to quit smoking or do not have the necessary resources to help them achieve a smoke-free lifestyle.

5.2 Role of School Connectedness in Predicting Smoking Behaviours

For students whose self-perceptions indicated a 'nonsmoker who never smokes' or an 'ex-smoker who has totally quit' at university entrance, the factor *Academically Engaged* emerged as an important predictor of making a negative change in ones' self-perceived smoking status. In

this study, it is reasonable to assume that these students made an actual change in their smoking behaviours, such that that being academically engaged (i.e. paying attention to professors, having interest in what they are learning, and doing more than what is required just to get by) increased the odds of a student initiating cigarette smoking while on campus. This finding is somewhat surprising and inconsistent with the hypothesis that engagement, as a dimension of school connectedness, is negatively associated with making a negative change in students' self-perceived smoking status. Unfortunately, existing adolescent literature related to school connectedness and smoking has focused on social engagement rather than academic engagement, and as such, these studies cannot shed light on the current results.

One explanation for this finding might be that students who are more academically engaged may place greater importance on their academic achievements, and in turn, experience greater stress than other students. Cigarette smoking may be a way of dealing with this stress. The link between stress and smoking among post-secondary students has been well supported by previous studies. For example, in an investigation of 513 randomly selected undergraduates at an American university, DeBernardo and colleagues (1999) found that stress, particularly academic stress, was a source of motivation to smoke for almost half (49.3%) of student smokers. Moreover, among nonsmokers who were contemplating smoking, stress was one of the most frequently cited reasons to start. In a more recent study of 206 American undergraduates, Morrison and colleagues (2003) found that among current smokers (n= 58) and ex-smokers (n= 34), 10% and 20%, respectively, reported that the initial reasons they began smoking was to reduce stress. Furthermore, approximately 44% of the smokers and 38% of the ex-smokers reported stress reduction as the 'best thing' about smoking cigarettes. Whether this stress was

academically related was not determined. Unfortunately, the current study lacks data on perceived stress, thus this explanation cannot be confirmed.

It is notable that none of the factors had an association with current smoking or an association with making a negative change in ones' self-perceived smoking status (among all of those who changed the self-perceptions). These findings are inconsistent with the existing adolescent literature showing connectedness to peers promotes smoking initiation and escalation, while connectedness to teachers protects against smoking (McNeely & Falci, 2004; Karcher & Finn, 2005). It is unclear whether the relative lack of predictors of smoking and making a negative change in ones' self-perceived smoking status, found in this study, is due to a general difficulty in predicting smoking behaviour across this major life transition, poor or distal measurement, a lack of power attributable to small group sizes, a restriction of range among predictor variables, or to some other factor. Overall, these results suggest that as students mature, the degree to which they are academically engaged may play a more important role in determining their smoking choices than the degree to which they are connected to their peers and/or teachers/professors.

5.3 Differences in Measures of Smoking Status

When all students were examined, agreement between the two measures of current smoking status was high, but by no means ideal. The most common concordance related to students classified as 'nonsmokers' by the behavioural measure, and 'nonsmokers who never smoke' by the self-perception measure. Moreover, agreement between the two measures of current smoking status was weak when examined among students defined as current smokers according to the behavioural measure, and who perceived themselves as 'nonsmokers who smoke sometimes', 'light smokers' or 'regular smokers' at the study date. The most common

discordance related to students classified as ‘occasional smokers’ by the behavioural measure (which reflects the standard adult measure of non-daily smoking), and ‘nonsmokers who smoke sometimes’ by the self-perception measure. These finding suggests that the adult measure of smoking may be insufficient to inform tobacco control efforts for this subpopulation of emerging adults as it results in different proportions of non-daily smokers when compared against students’ self-perceived smoking status.

Of particular interest in this study was that students who perceived themselves as ‘nonsmokers who smoke sometimes’ but were classified as an ‘experimental’ versus ‘occasional smokers’ using the behavioural measure, reported a similar smoking frequency but differed significantly on other psychological and behavioural characteristics. For example, more experimental smokers than occasional smokers reported that they do not smoke when asked if they plan to quit in the next six months. In addition, more occasional smokers than experimental smokers reported that they plan to quit, have tried to quit, and have resisted the urge to smoke in the past month. These findings suggest that among those self-classified as ‘nonsmokers who smoke sometimes’, those we call ‘experimental smokers’ by the behavioural measure relate more to nonsmokers (by denying that they smoke), whereas those defined as occasional smokers by the behavioural measure relate more to smokers (i.e. they acknowledge that they smoke and have made attempts to quit or plan to quit).

5.4 Limitations

Before drawing firm conclusions, it is important to consider the limitations of the present study. First, this study, like many others mentioned in the literature review, was cross-sectional in nature and, as such, captures only a snapshot of the study population at a given point in time. Although the data set did allow for the exploration of self-reported smoking status over time, this

was done in a retrospective manner. Therefore the results may have been influenced by recall bias, particularly among respondents in the later years of study.

Secondly, the relatively low identified smoking prevalence found in this study might be a result of response bias (proportionately more nonsmokers than smokers responded to the survey). Indeed, it is likely that the results are not representative of the entire University of Waterloo student population at the time of the study because the sample was voluntary and non-random. Attempts were made, however, to make the sample representative of the larger student population by weighting the data by gender and year of study. Further weighting of the data (i.e. by ethnicity and faculty of study) and the inclusion of a more random sample would likely have produced results more reflective of the larger study body. It is also conceivable that the relatively low smoking prevalence may be a result of a population bias (this university may not be representative of all universities in Canada). The University of Waterloo is a unique campus in that it is affected by an established municipal smoking by-law that bans smoking inside any closed public building. This restriction may have an effect on the smoking behaviours of students at the university. Indeed, anecdotal evidence has indicated that students may actually select the University of Waterloo because of the city's well known smoking by-law (Dr. Linda Jessup, personal communication, October 24, 2004).

Other limitations of concern are related to constraints due to the use of a secondary instrument and data set. A clear constraint of performing secondary analysis is not having control over what questions are asked, or, how they are posed. Since the University of Waterloo Tobacco Use Survey was not designed to answer the specific research questions proposed for this study, some variables were not available for the analyses. For example, in the current study it was not possible to determine when (i.e. age and year of study) students started to smoke or

their reasons/motivations for taking up the habit. Such data would be helpful in clarifying the results concerning school connectedness.

Finally, some of the analyses in the present research did not produce large enough sample sizes typically required for data disclosure (e.g. cell sizes greater than 5). For many of the chi-square analyses the data was aggregated as much as possible to avoid this. Still, in some cases, small cell sizes remained. As such, Type II error is a possibility whereby an effect may exist, but was too modest to detect with the sample sizes available. These results may not be statistically meaningful, but were important to include in the report because they contributed to the exploratory purposes of the study.

5.5 Implications

5.5.1 Practice Implications

This investigation has identified new information regarding smoking among university students, as well as potential insight into important components for smoking prevention and cessation interventions appropriate to this group. First, the findings of this study provide an opportunity to convey to students through media campaigns, orientation programs, and other techniques the message that smoking is not a normative behaviour among students on campus. This may help decrease the social acceptability of smoking and may prevent students from taking up the habit just to 'fit in'. Secondly, the fact that more students made a negative change in their self-perceived smoking status rather than a positive change, suggests the need for more comprehensive interventions designed to prevent and reduce cigarette use among this group. Information in the published literature on programs/interventions that have targeted tobacco use among post-secondary students is limited, but the outcomes of the available studies are encouraging. Both individual-level interventions (such as on campus cessation programs), and

institutional-level programs (such as smoke-free policies, indoor and outdoor smoking restrictions, and anti-tobacco messaging/advertisements) indicate a positive impact on student attitudes and knowledge of tobacco use, increased awareness, motivation to quit smoking, and reduced tobacco use (Murphy-Hoefer, Griffith, Pederson, Crossett, Iyler & Hiller, 2005).

There are several other intervention implications of the findings. First, among students who did not smoke upon university entrance, those who were more academically engaged were more likely to make a negative change in their self-perceived smoking status (i.e. initiate smoking) while on campus than students who were less academically engaged. It is conceivable that the link between smoking and academic engagement may be mediated by stress wherein students may feel the need to deal with the pressures of school work by smoking. Efforts to engage these students in more healthy stress-reducing activities may be an important part of helping them to maintain smoke-free lifestyles (e.g. expand the number and reach of Warrior Weekends, residence prevention programs, campus athletic/social/academic groups, etc.).

Finally, many students in the current study sample who were defined as 'occasional smokers' according to the standard adult measure, actually perceived themselves as 'nonsmokers who smoke sometimes'. Additionally, this group of students reported acting more like smokers than nonsmokers (i.e. many of them planned to quit in the next 6 months, most of them had tried to quit in the past, and the majority had resisted the urge to smoke some time during the past month). These findings suggest that students defined by programmers as 'occasional smokers' may see themselves as nonsmokers and, although they may have intentions to quit, they may not respond to messages tailored to more established/heavy smokers. Therefore, tobacco control campaigning and smoking intervention efforts should consider tailoring their messages to all types of student smokers including nonsmokers who smoke sometimes. These messages should

emphasize methods of quitting appropriate for social smokers (i.e. cutting back, replacing smoking with healthier activities, etc.) without using the label ‘smoker’.

5.5.2 Future Research

The results of this study may also be useful to fuel subsequent research. Indeed, the findings demonstrate the need for ongoing research into the smoking prevalence and patterns of cigarette use among Canadian post-secondary students. These studies should mimic the designs of the large scale U.S studies in this area (i.e. the CAS and the MTF) that use samples drawn from a variety of institutions (i.e. public, private, 2year, and 4-year institutions) and randomly selected students from a variety of classes and years. Furthermore, the re-administration of the same smoking behaviour assessment instrument permits the reliable examination of smoking trends across time. Incorporating these methodological techniques into future research will increase the chances that study findings can be more broadly applied to the post-secondary population and will provide a better understanding of the current situation of tobacco use in this unique Canadian subpopulation.

The data also encourage greater research attention directed at the role of school connectedness in determining student smoking behaviours. Future research might consider exploring more diverse measures of school connectedness, such as the extent to which students are invested in and committed to their relationships with peers and professors (i.e. social engagement). This could be assessed by determining the amount of time they spend with their peers/professors. In addition, future research should incorporate more objective measures of school connectedness such as university size, program size or class size. Given the unexpected finding surrounding academic engagement and smoking initiation in the present research, it is also important to explore the relation between smoking and measures of academic performance,

aspirations, and commitment. These measures might be assessed by examining grade point averages, future academic plans, and time spent on school work. This information will contribute to the monitoring of factors that may impact upon post-secondary student smoking behaviours.

Finally, the findings also raise important considerations for future research concerning how to best measure cigarette smoking in emerging adults, especially those who may still be progressing to regular smoking. The pattern of disagreement among the two measures presented in this study provides a starting point for possible ways to focus efforts to improve the operational definitions upon which the ratings are based. For example, students defined by researchers as 'occasional smokers' using the standard adult measure, may see themselves as nonsmokers and will not answer 'yes' when asked if they smoke. Therefore, when using the adult measure to examine smoking in this population, it is necessary to include multiple categories of non-daily smoking. This information will produce a more detailed and accurate description of increasingly frequent tobacco use among this group. The addition of a 'nonsmoker, who smokes sometimes' smoking status category may help capture those students who smoke, but not as frequently as light or occasional smokers. Determining alternate ways to measure increasingly frequent cigarette use in this population is a matter for future research. Overall, the data from this study support further research with larger samples and more diverse student groups.

Chapter 5: Conclusions

This research reports an exploratory study designed to uncover new issues surrounding post-secondary student smoking. Overall, the strategy of assessing connectedness to school shows promise in predicting post-secondary students' cigarette smoking behaviours. The results also provide support for continued investigation into the best ways to measure and assess smoking status in this unique population. Considering that post-secondary students are likely to be the next visible leaders and future decision makers who will dictate tobacco control policy and social norms for the next generation, it is essential that researchers continue to address smoking in this population and that findings be used to assist in the development, refinement and targeting of campus-based tobacco prevention and treatment interventions.

Since this study, new initiatives have been instituted to help smokers at the University of Waterloo quit smoking and reinforce the efforts of nonsmokers to resist the habit. A large-scale kick-off during National Non-Smoking Week, 2004, introduced the Leave The Pack Behind (LTPB) initiative. This program provides the opportunity for trained students to run sustained and comprehensive tobacco control campaigns on campus. Throughout each year LTPB team members distribute student-tailored self-help kits, run educational displays with different messages monthly, and organize a motivational contest for students designed to help them quit, decrease their cigarette consumption, or remain smoke-free. Articles in the student health newsletter have also been published to increase awareness and support those students who need help with quitting. In addition, Student Health Services staff members receive clinical tobacco intervention training to help support the overall efforts of the program. With this initiative in place, the ultimate goal of reducing smoking rates on this campus may be realized.

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APPENDIX A: SURVEY ITEMS FOR ASSESSING CURRENT CIGARETTE SMOKING IN ADULTS AND ADOLESCENTS

Table 1. Survey Items for Assessing Current Cigarette Smoking in Adults

Adult Questions and Measure				
Questions	Q1. Have you smoked more than 100 cigarettes in your lifetime?	Q2. Have you smoked at least once in the past 30 days?	Q3. At the present time do you smoke cigarettes every day, occasionally, or not at all?	Q4. If you've smoked in the past 30 days, have you smoked daily, weekly, or less than weekly?
Response format	Yes No	Yes No	Every day Occasionally Not at all	Daily Weekly Less than weekly
Examples of relevant surveys	Hammond, 2005 (CTUMS survey)			
Measure*	If Q1= "Yes" and Q2= "Yes", individual is a *current smoker*. If Q1= "Yes" and Q2= "Yes" and Q4= "Daily", individual is a *daily smoker*. If Q1= "Yes" and Q2= "Yes" and Q3= "Occasionally." If Q1= "Yes" and Q2= "No", individual is a *former smoker* and currently a *nonsmoker*. If Q1= "Yes" and Q2= "Yes" or "No", individual is an *ever smoker*.			

*Constructing the measure requires all questions

Table 2. Survey Items for Assessing Current Cigarette Smoking in Adolescents

Adolescent/Post-Secondary Student Questions and Measure					
Questions	Q1. How frequently have you smoked cigarettes during the past 30 days?	Q2. When, if ever, have you used cigarettes?	Q3. Do you currently smoke cigarettes?	Q4. How many cigarettes do you smoke each day now?	Q5. At the present time, do you smoke cigarettes daily, occasionally, or not at all?
Response format	None <1 Cigarette per day 1-5 Cigarettes per day ½ pack per day 1 pack per day 1.5 packs per day 2+ packs per day	Never used Used, but not in past 12 months Used, but not in past 30 days Used in the past 30 days	Daily Occasionally Not at all	Actual number of cigarettes	Daily Occasionally Not at all
Examples of relevant surveys	MTF	CAS	Cairney & Lawrance, 2002 (NPHS)	Adlaf et al, 2003 (Canadian Campus Survey)	
Measure	If Q1= "None" individual is a *nonsmoker*/ else individual is a *current smoker*. If Q2= "Used in the past 30 days" individual is a *current smoker*/ else individual is a *nonsmoker*. If Q3= "Daily" individual is a *daily smoker*/ If Q3= "Occasionally" individual is an *occasional smoker*/ If Q3= "Not at all" individual is a *nonsmoker*. If Q4 >0 cigarettes and Q5= "Daily" individual is a *daily smoker*/ If Q5= "Occasionally" individual is an *occasional smoker*/ If Q5= "Not at all" individual is a *nonsmoker*.				

APPENDIX B: LITERATURE SUMMARY CHARTS: CORREALTES OF CIGARETTE USE AMONG POST-SECONDARY STUDENTS

Table 1. Literature Summary Chart: Demographic correlates of cigarette use among post-secondary students.

Reference	Data Instrument	N	Related Findings
Gender			
Adlaf EM, Gliksman L, Demers A & Newton-Taylor B. (2003).	1998 Canadian Campus Survey	7,800	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers), (males, 16%; females 18%, p= 0.265).
Cairney J & Lawrance KA. (2002).	The 1994-1995 National Population Health Survey	973	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers), (males, OR= 0.80, CI_{95}= 0.59-1.06; females, OR= 1.00).
Choi W, Okuyemi K & Ahluwalia J. (2003).	Teenage Attitudes and Practices Survey I (1989) & II (1993)	1,479 (1993)	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers) in 1993, (males, 21.6%; females 19.7%, p= 0.366). • Insignificant sex differences in progression of smoking at follow-up among never smokers at baseline (males, OR= 0.86, CI_{95}= 0.62-1.18; females, OR= 1.00). • Insignificant sex differences in progression of smoking at follow-up among experimenters at baseline (males, OR= 1.29, CI_{95}= 0.84-1.99; females, OR= 1.00).
DeBernardo, RL, Aldinger CE, Dawood OR, Hanson RE, Lee S & Rinaldi SR. (1999).	Modified version of the 1992 National Health Interview Survey	513	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers), (males, 13.7%; females 13.3%).
Everett, SA, Husten CG, Kann L, Warren CH, Sharp D & Crosset L. (1999).	1995 National College Health Risk Behaviour Survey	2,857	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers), (males, 17.4%; females 21.2%).
Gliksman L, Newton-Taylor B, Adlaf E & Giesbrecht N. (1997).	Composed own survey	5,926	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers), (males, OR= 1.1; females, OR= 1.00).
Rigotti N, Lee J & Wechsler H. (2000).	1999 CAS	14,138	• Insignificant sex differences in current smoking status (smokers vs. nonsmokers), (males, 28.4%; females, 28.5%, p= 0.94).
Wechsler H, Rigotti NA, Gledhill-Hoyt J & Lee H. (1998).	1993-1997 CAS	15, 103 (1993) 14,251 (1997)	• Male and female students had similar rates of current smoking in 1993 (22.3%). • Smoking among males rose to 27.5% in 1997; a 23.4% increase. • Smoking among females rose to 29.2% in 1997; a 31.0% increase.

Ethnicity

Choi W, Okuyemi K & Ahluwalia J. (2003).	Teenage Attitudes and Practices Survey I (1989) & II (1993)	1,479 (1993)	• Significant ethnic differences in current smoking status (smokers vs. nonsmokers) in 1993, (White, 22.7%; Non-White 11.4%, $p<0.001$). • White students who were never smokers at baseline were more likely to progress in their smoking at follow-up than Non-White students (White, OR= 1.50, CI_{95}= 1.02-2.22; Non-White, OR= 1.00). • Insignificant sex differences in progression of smoking at follow-up among experimenters at baseline (White, OR= 1.50, CI_{95}= 1.02-2.22; Non-White, OR= 1.00).
Everett, SA, Husten CG, Kann L, Warren CH, Sharp D & Crosset L. (1999).	1995 National College Health Risk Behaviour Survey	2,857	• White students were significantly more likely than Black students ($t= 11.2$, $p<0.001$) and Hispanic students ($t= 4.5$, $p<0.001$) to have ever smoked daily; whereas Hispanic students were significantly more likely than Black students ($t= 3.8$, $p<0.001$) to have ever smoked daily.
Moskal PD, Dziuban CD & West GB. (1999).	1993 Health Risk Behaviour Survey for University Students	1,150	• White students (81%) were significantly more likely than minority students (72%) to have tried cigarettes ($\chi^2= 10.04$, $p=0.00$). • White students (28%) were significantly more likely than minority students (17%) to have ever smoked regularly ($\chi^2= 13.47$, $p=0.00$).
Rigotti N, Lee J & Wechsler H. (2000).	1999 CAS	14,138	• Significant ethnic differences in current smoking status (smokers vs. nonsmokers), (White, 31.3%; Hispanic, 21.9%, Asian, 21.7%; African American, 11.2%, $p<0.001$).
Wechsler H, Rigotti NA, Gledhill-Hoyt J & Lee H. (1998).	1993-1997 CAS	15,103 (1993) 14,251 (1997)	• African American students had the lowest rates of smoking in both years (9.6% and 13.7%, respectively). • African American students had the greatest percentage increase in smoking rates (42.7%) as compared with White (31.2% increase), Hispanic (12.0% increase), and Asian-Pacific Islander (22.5% increase) students.

Year of Study

Adlaf EM, Gliksman L, Demers A & Newton-Taylor B. (2003).	1998 Canadian Campus Survey	7,800	• First- and second-year students had the highest rates of daily smoking (17.0% and 19.2%, respectively), significantly more than students in the final year of study (14.2%) ($p< 0.05$).

Wechsler H, Rigotti NA, Gledhill-Hoyt J & Lee H. (1998).	1993-1997 CAS	15,103 (1993) 14,251 (1997)	• First-year students had the highest rates of smoking in both years (24.3% and 31.2%, respectively). • Fourth-year students had the lowest rates of smoking in both years (20.8% and 25.3%, respectively). • Third-year students had the greatest percentage increase in smoking rates (32.4%) as compared with first-year (28.4% increase), second-year (20.7% increase), and fourth-year (21.6% increase) students.

Faculty of Study

Gliksman L, Newton-Taylor B, Adlaf E & Giesbrecht N. (1997).	Composed own survey	5,926	• Students in arts and social sciences programmes were 2-3 times more likely to be current daily smokers than were students enrolled in a science programme ($p<0.001$).

Table 2. Literature Summary Chart: Psychological correlates of cigarette use among post-secondary students.

Reference	Data Instrument	N	Related Findings
Stress			
DeBernardo, RL, Aldinger CE, Dawood OR, Hanson RE, Lee S & Rinaldi SR. (1999).	Modified version of the 1992 National Health Interview Survey	513	• Stress was a motivational factor for 49.3% of the current smokers. • Stress was the second most frequently cited reasons for nonsmokers to start smoking (#1= friends smoked).
Morrison K, Banas J & Burke M. (2003).	Composed own survey	206	• 10.3% of current smokers and 20.6% of ex-smokers cited reducing stress as their reason for starting smoking. • Stress was the second most frequently cited (31%) reason for smokers to continue smoking (#1= addicted).
Naquin MR & Gilbert GG. (1996).	Composed own survey which included the Inventory of Sensation Seeking, the Center for Epidemiologic Studies Depression Scale, the Lawrance Self-Efficacy Scale, a smoking-related items	1330	• Current smokers significantly more likely to have higher levels of perceived stress than nonsmokers ($p<0.05$). • Current smokers significantly more likely to have higher levels of emotion-focused coping skills than both former smokers and nonsmokers ($p<0.05$).
Negative Affect			
Emmons K, Wechsler H, Dowdall G & Abraham M. (1998).	1997 CAS	17,592	• Students with low life satisfaction or unhappiness with life were more likely to be current smokers than other students (OR= 1.37, CI_{95}= 1.23-1.54). • Students who were dissatisfied with their education were more likely to be current smokers than other students (OR= 1.52, CI_{95}= 1.35-1.72).
Kear ME. (2002).	Composed own survey which included the Perceived Stress Scale, the Coping Inventory for Stressful Situations, and a smoking-related items	209	• High scores on the depression inventory correlated with higher reports of smoking; this link was mediated by resistance self-efficacy.

Lenz BK. (2004).	2001 College Health Survey	203	• Students with a lifetime diagnosis of depression or treatment for depression were 7.5 times more likely than other students to be tobacco users ($p<0.05$).
Vickers KS, Patten CA, Lane K, Clark MM, Croghan IT, Schroeder DR & Hurt RD. (2003).	Composed own survey which included the Center for Epidemiologic Studies Depression Scale, the Response Styles Questionnaire, the Aerobics Center Longitudinal Study Physical Activity Questionnaire, a change-of-change for exercise measure, the Stanford Weight Concerns Scale, and smoking-related items	656	• Compared to never tobacco users, current tobacco users had a higher frequency of depression (32% vs. 40%, $p= 0.05$). • Association of depression with tobacco use was dependent on gender (ORs= 2.7, 0.8 and 3.0 for men, women and missing gender). • Depressed smokers were more likely to use tobacco to try to improve mood than nondepressed tobacco users ($p= 0.01$).
Attitudes and Beliefs			
Biasco F & Hartnett JP. (2002).	Composed own survey	810	• 69% agreed smoking is unattractive (21% disagreed & 10% were uncertain). • 41% agreed they would not date or marry a smoker (39% disagreed & 20% were uncertain). • 44% agreed there should be stricter laws against smoking (34% disagreed & 22% were uncertain). • 51% disagreed that people should tell a smoker to stop smoking (30% agreed & 19 were uncertain). • 46% disagreed that smoking advertisements influence nonsmokers to begin smoking (32% agreed & 22% were uncertain).
Choi W, Okuyemi K & Ahluwalia J. (2003).	Teenage Attitudes and Practices Survey I (1989) & II (1993)	1,479 (1993)	• Among experimental adolescent smokers, those who believed it was safe to experiment with cigarettes at baseline were almost twice as likely to progress in their smoking at follow-up as other students (OR= 1.94, CI_{95}= 1.06-3.57).

Hines D. (1996).	Composed own survey	547	• Nonsmokers were less likely than smokers to want a smoker for a roommate, date, or potential spouse.
Hines D, Fretz A & Nollen N. (1998).	Composed own survey which included the Personal Attribute Measure and smoking-related items	433	• Regular smokers reported that smoking made them feel less healthy and less desirable as a date, but that smoking helped reduce anxiety and was helpful for weight control. • Occasional smokers reported that smoking made them feel less healthy, more daring and more adventurous. • Nonsmokers more likely than either of the smoking groups to report that smokers (compared to nonsmokers) are less healthy, less desirable as a date, less attractive while smoking, less sexy and less feminine.

Weight Control

Psujek JK, Martz DM, Curtin L, Michael KD & Aeschleman SR. (2004).		478	• Poor body image and other eating disorder variables were not associated with nicotine dependence.
Saules KK, Pomerleau CS, Snedecor SM, Mehringer AM, Shadle MB, Kurth C & Krahn DD. (2004).		490	• Elevated dieting concerns was a significant risk factor for smoking onset during college (p=0.05).

Table 3. Literature Summary Chart: Socio-environmental correlates of cigarette use among post-secondary students.

Reference	Data Instrument	N	Related Findings
Family and Peers			
Choi W, Okuyemi K & Ahluwalia J. (2003).	Teenage Attitudes and Practices Survey I (1989) & II (1993)	1,479 (1993)	• Exposure to peer and parental smoking at baseline did not predict smoking at follow-up among baseline nonsmokers. • Peer approval of smoking predicted smoking progression among baseline experimental smokers (OR= 2.02, CI_{95}= 1.26-3.23).
Hestick H, Perrion SC, Rhodes WA & Sydnor KD. (2001).	Composed own survey	614	• Parental and peer smoking were significant predictors of trial smoking ($p<0.001$).
Lenz BK. (2004).	2001 College Health Survey	203	• Tobacco users were significantly more likely to be exposed to smoke than students who did not use tobacco ($p<0.001$). • Tobacco users experienced more exposure to smoke on weekends compared to weekdays.
Wetter DW, Kenford SL, Welsch SK, Smith SS, Fouladi RT, Fiore MC & Baker TB. (2004).	Composed own survey	647 (baseline) 548 (follow-up)	• Peer smoking did not predict follow-up smoking behaviours regardless of baseline smoking status
Perception of Norm			
Page RM. (1998).	Composed own survey	775	• 13.4% of men and 17.8% of women reported smoking cigarettes daily. • Men estimated that 36.9% of men and 33.9% of women on campus were daily smokers. • Women estimated 42.3% of men and 42.2% of women on campus were daily smokers.
Perkins HW, Meilman PW, Leichliter JS, Cashin J & Presley CA. (1999).	1994 Core Alcohol and Drug Survey	48,168	• Respondents typically overestimated smoking as a normative behaviour among peers on campus.

Living Arrangement

Adlaf EM, Gliksman L, Demers A & Newton-Taylor B. (2003).	1998 Canadian Campus Survey	7,800	• Students who resided off campus without family had the highest rate of daily smoking (20.4%), significantly ($p<0.001$) more than those living in university housing (15.6%), and those living with their parents (15.2%).
Gfroerer JC, Greenblatt JC & Wright DA. (1997).	1991-1993 National Household Survey on Drug Abuse	9,960	• Students who lived with their parents were less likely to have smoked in the past month compared to students who did not (19.4% vs. 24%, respectively). • Students who lived in a residence hall were less likely to have smoked in the past month than other students (18.9% vs. 27.8%, respectively).
Wechsler H, Lee JE & Rigotti NA. (2001).	1999 CAS	4,495	• Students living in housing where smoking was not permitted had a significantly lower prevalence of current smoking than among students living in housing where smoking was permitted (21% vs. 30.6%, respectively, $p<0.001$).

Risky Behaviour

Budd GM. & Preston DB. (2001).	Composed own survey which included the Attitudes and Beliefs about Perceived Consequences of Smoking Scale and the Smoking Assessment Form	172	• Over 64% of smokers drank more than 3 drinks per week compared to 27.8% of nonsmokers ($p<0.0001$). • Drug use was significantly ($p<0.0001$) more likely to occur in smokers (41.2%) than nonsmokers (4.9%).
Emmons K, Wechsler H, Dowdall G & Abraham M. (1998).	1997 CAS	17,592	• Tobacco users were more likely (OR= 6.78, CI_{95}=6.17-7.46) to use marijuana currently and more likely (OR= 4.89, CI_{95}= 4.51-5.29) to engage in binge drinking than with nonsmokers. • Having multiple sex partners in the previous month increased the likelihood of smoking among men (OR= 1.65, CI_{95}= 1.34-2.02) and almost tripled the likelihood of smoking among women (OR= 2.80, CI_{95}= 2.25-3.49). • Current marijuana use and binge drinking remained the strongest predictors of smoking in the final multivariate analysis.

Lenz BK. (2004).	2001 College Health Survey	203	• Marijuana use was among the strongest associations with tobacco use during the past year (OR= 2.0, p<0.001). • Marijuana use (OR= 1.6, P<0.001) and alcohol use (OR= 1.3, p<0.05) were significantly associated with tobacco use during the past month.
Rigotti NA, Lee J & Wechsler H. (2000).	1999 CAS	8,483	• Tobacco use was significantly higher among alcohol and marijuana users (p<0.001).

Lifestyle Choices

Emmons K, Wechsler H, Dowdall G & Abraham M. (1998).	1997 CAS	17,592	• Believing parties are an important part of college life (OR= 2.12, CI_{95}= 1.97-2.29) was predictive of smoking.
Lenz BK. (2004).	2001 College Health Survey	203	• Significant associations found for tobacco use during the past year and level of fitness since high school (OR= 1.5, p<0.05) and for tobacco use during the past month and decreasing current level of fitness (OR= 1.6, p<0.05).
Nattiv A, Puffer JC & Green GA. (1997).	Composed own survey	2,981	• Athletes less likely than non-athletic peers to use tobacco (including smoke cigarettes) (p<0.05).
Rigotti N, Lee J & Wechsler H. (2000).	1999 CAS	8,483	• Smokers were less likely than nonsmokers to rate both athletics (OR= 0.57, p<0.001) and religion (OR= 0.76, p<0.001) as important or to participate in intercollegiate sports (OR= 0.53, p<0.001). • Believing parties are an important part of college life (OR= 1.29, p<0.001) was significantly related to smoking.
Wechsler H, Davenport AE, Dowdall GW, Grossman SJ & Zanakos SI. (1997).	1993 CAS	17,251	• Among men, 15% of those who were involved in athletics had smoked cigarettes in the last 30 days, in contrast to 20% of those partly involved and 26% of the students who were not involved in athletics. • Among women, with one fifth (20%) of those involved in athletics having used cigarettes in the last 30 days, compared with 23% of those not involved.

Tobacco Industry Marketing

Hammond D, Tremblay I, Chaiton, M, Lessard E, & Callard C. (2005).	Composed own survey and conducted an environmental scan	22 universities 13 colleges	• Every university and half of all colleges participated in some form of tobacco marketing in the past year.
Rigotti NA, Moran SE, & Wechsler H. (2005).	2001 CAS	10,904	• 8.5% of respondents attended a bar, nightclub, or campus social event where free cigarettes were distributed. • Tobacco sponsored events was reported by students attending 99.2% of the schools surveyed. • Attendance at tobacco sponsored events was strongly associated with current smoking (OR= 1.75, $p<0.001$).

APPENDIX C: UNIVERSITY OF WATERLOO TOBACCO USE SURVEY (2004)

Let's begin with some information about you and your education experiences. Place a ✓ in the box next to the answer that comes closest to describing you.

Gender ☐ *1. female* ☐ *2. male*

Date of birth __ __/__ __/__ __ __ __
day month year

If you weren't born in Canada, when did you arrive in Canada? __ __/__ __/__ __ __ __
day month year

Citizenship status:

☐ *1.Canadian*
☐ *2.Landed Immigrant*
☐ *3.Visitor Visa*
☐ *4.Other (specify)* _____

Which of the following categories best describes your ethnic/racial background? Check all applicable:

☐ *1. European*
☐ *2. African*
☐ *3. Canadian First Nations*
☐ *4. Asian*
☐ *5. Caribbean*
☐ *6. Middle Eastern*
☐ *7. Central/South America*
☐ *8. Other (describe)* _____

Marital status:

☐ *1. Single*
☐ *2. Married*
☐ *3. Common-law*
☐ *4. Separated*
☐ *5. Widowed*
☐ *6. Divorced*
☐ *7. Cohabiting*
☐ *8. Engaged*

If other than single: since

__ __ / __ __ __ __
month year

Partner's primary occupation:

☐ *1. university student*
☐ *2. student other than university*
☐ *3. employed full-time*
☐ *4. employed part-time*
☐ *5. homemaker*
☐ *6. unemployed*

Do you consider yourself to have moved out permanently from the home of your parent(s) or guardian(s)?

☐ *1. Yes*
☐ *2. No*
☐ *3. Don't know*

What option *best* describes where you live?

☐ *1. in campus residence*
☐ *2. at my family home*
☐ *3. at a relative's home*
☐ *4. with another family (boarding)*
☐ *5. off campus – alone*
☐ *6. off campus – with other students*
☐ *7. off campus – with non students*
☐ *8. off campus – with students and non students*
☐ *9. off campus – with romantic partner or spouse*

Is your living arrangement smoke-free?

☐ *1. Yes* ☐ *2. No* ☐ *3. Don't know*

How many people besides you smoke in your home every day or almost every day? _____
(*fill in number*)

How many children do you have?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more

Do your children live with you?

☐ *1. Yes* ☐ *2. No* ☐ *3. No children*

How many sisters and brothers do you have (or would have, if any are deceased)?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more

In general, *compared to other people your age*, would you say your health is:

☐ *5. Excellent*
☐ *4. Very good*
☐ *3. Good*
☐ *2. Fair*
☐ *1. Poor*

Do you consider yourself to be (choose one)?
Very overweight somewhat overweight normal weight somewhat underweight very underweight

☐ 5. ☐ 4. ☐ 3. ☐ 2. ☐ 1.

What is your present weight? _____ kg. **OR** _____ lbs.

How tall are you? _____ cm **OR** _____ ft. _____ in.

Education:

- ☐ *1. Grade 11 – Quebec, Nfld*
- ☐ *2. Grade 12 – Ontario*
- ☐ *3. Grade 12 – Province other than Ontario, Quebec, Nfld.*
- ☐ *4. OAC – Ontario*
- ☐ *5. Community College*
- ☐ *6. CEGEP – Quebec*
- ☐ *7. Completed specialized training (e.g. hairdressing, welding, massage therapy, trade apprenticeship, etc.)*
- ☐ *8. Other (specify)* _____

When did you finish secondary school? (e.g. high school) __ __ / __ __ __ __
(month / year)

My secondary (e.g. high school) was located in:
_____/_____
(town or city or county / province)

Did you take time off school before beginning your current program? ☐ *1. Yes* ☐ *2. No*

If yes, how long? _____ months / years

Current Faculty: _____

Year of study: _____ **Major:** _____

☐ *1. Part-time* ☐ *2. Full-time*

Degree Anticipated: _____

Indicate how well each of these statements describes your *overall* secondary (e.g. high school) experience.

	Never	Rarely	Some of the time	Most of the time	All of the time	Don't know
I got along well with my teachers.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I did as little as possible; I just wanted to get by.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I paid attention to the teachers.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I was interested in what I was learning in class.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I felt like an outsider or like I was left out of things at school.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
I had friends at school to whom I could talk about personal things.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.
I liked to participate in many school activities e.g. clubs, sports, drama.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.
People at school were interested in what I had to say.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.

Indicate how well each of these statements describes your *overall* university experience to date.

	Never	Rarely	Some of the time	Most of the time	All of the time	Don't know
I get along well with my professors.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I do as little as possible; I just want to get by.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I pay attention to the professors.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I am interested in what I am learning in class.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I feel like an outsider or like I am left out of things at school.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I have trouble keeping up with the workload.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I have become good friends with other students at school.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.
I feel like I am just a number to the school.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.	☐ 6.

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
I have friends at school that I can talk to about personal things.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.
I like to participate in many university activities e.g. clubs, sports, drama.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.
People at school are interested in what I have to say.	☐ 1.	☐ 2.	☐ 3.	☐ 4.	☐ 5.

We would like to finish off with some questions about smoking. Place a ✓ in the box next to the answer that comes closest to describing you, or to describing your opinion.

Among your immediate family what percentage would be smokers? _____%

Among your closest friends what percentage would be smokers? _____%

How often do they smoke?

☐ *0. Never* ☐ *1. Rarely* ☐ *2. Occasionally*

☐ *3. Fairly often* ☐ *4. Very often*

Among your room-mates what percentage would be smokers? _____%

1. Have you smoked 100 or more cigarettes in your life?

☐ *1. Yes* ☐ *2. No* ☐ *3. Don't know*

2. Think of the past month. How often did you smoke a cigarette, even a puff?

☐ *4. every day* ***(go to # 3)***

☐ *3. almost every day* ***(go to # 5)***

☐ *2. on some days each week* ***(go to # 5)***

☐ *1. once or twice all together* ***(go to # 5)***

☐ *0. I did not smoke at all* ***(go to # 7)***

3. How many cigarettes do you usually smoke: each work day?

# of cigarettes_____ **OR**

# of packs _____ of _____ cigarettes

each leisure day?

# of cigarettes_____ **OR**

# of packs _____ of _____ cigarettes

4. When I can, I smoke my first cigarette after waking:

☐ *1. Within 5 minutes* ☐ *4. Within 1- 2 hrs*

☐ *2. Within 6 to 30 minutes* ☐ *5. Over 2 hours*

☐ *3. Within 31 to 60 minutes* ***(go to # 6)***

5. In the past week how many cigarettes did you smoke?

☐ A few puffs or less

OR

# of whole cigarettes_____

OR

# of packs _____ of _____ cigarettes

6. Do you plan to quit smoking in the next 6 months?

☐ *1. No* ☐ *2. Yes* ☐ *3. I don't smoke*

If you chose "yes", when do you plan to quit?

☐ *1. within the next week*

☐ *2. within the next 2 to 4 weeks*

☐ *3. longer than 4 weeks from now*

7. Have you intentionally tried to quit smoking?

☐ *1. I don't smoke* ☐ *4. twice*

☐ *2. never* ☐ *5. three to four times*

☐ *3. once* ☐ *6. more than 4 times*

8. At university entrance, and at this time, would you consider yourself a:

	university entrance	**now**
1. non-smoker, who never smokes	☐	☐
2. non-smoker, who smokes sometimes	☐	☐
3. light smoker	☐	☐
4. regular smoker	☐	☐
5. ex-smoker who has totally quit smoking	☐	☐

Do you ever feel that your friends are putting pressure on you to smoke, or to smoke more often, even when you don't feel like smoking?

☐ *0. Never* ☐ *1. Rarely* ☐ *2. Occasionally*

☐ *3. Fairly often* ☐ *4. Very often*

Would a non-smoker joining you feel out of place?

☐ *4. Never* ☐ *3. Rarely* ☐ *2. Occasionally*

☐ *1. Fairly often* ☐ *0. Very often*

Among all students at your previous school (e.g. high school) how many do you believe smoked?

☐ *1.* None or almost none ☐ *4.* Majority

☐ *2.* Minority ☐ *5.* Nearly all or all

☐ *3.* About half ☐ *0.* Don't know

Among all students at this university, about how many do you believe smoke?

☐ *1.* None or almost none ☐ *4.* Majority

☐ *2.* Minority ☐ *5.* Nearly all or all

☐ *3.* About half ☐ *0.* Don't know

During the past month was there an occasion when you were about to smoke a cigarette but resisted the urge?

☐ *1. Yes* ☐ *2. No*

In what situations do you think *most* students at this university smoke? (check all that apply)

☐ *1. At a party* ☐ *4. In times of stress*

☐ *2. At a bar* ☐ *5. Alone*

☐ *3. With friends who smoke*

In what situations do you smoke? (check all that apply)

☐ *1. At a party* ☐ *4. In times of stress*

☐ *2. At a bar* ☐ *5. Alone*

☐ *3. With friends who smoke* ☐ *6. I do not smoke*

Should people be allowed to smoke at a bar?

☐ *1. Yes* ☐ *2. No* ☐ *3. unsure*

Should people be allowed to smoke at a private party?

☐ *1. Yes* ☐ *2. No* ☐ *3. unsure*

APPENDIX D: CALCULATION OF WEIGHTS

Equation:

Cell $\text{Total}_{\text{population}}$ ÷ Total Population = x

Cell $\text{Total}_{\text{sample}}$ ÷ Total sample = y

Weight = x ÷ y

Table 1. Weights applied to the data.

Sex	Year of Study	Population* Jan-01-2004 (n= 14,917)	Sample (n=325)	Equation (x ÷ y)	Weight
Female	1	2,236	90	0.15 ÷ 0.28	0.54
	2	1,612	52	0.11 ÷ 0.16	0.69
	3	1,928	54	0.13 ÷ 0.17	0.76
	4	1,500	24	0.10 ÷ 0.07	1.43
Male	1	2,187	48	0.15 ÷ 0.15	1
	2	1,535	16	0.10 ÷ 0.05	2
	3	2,018	20	0.14 ÷ 0.06	2.33
	4	1,901	21	0.13 ÷ 0.06	2.17

*Excludes students on co-op work term, in non-degree programs, registered at affiliated colleges, in 5th year levels and cross-registered. Students registered in Independent Studies and Interdisciplinary Studies were placed in the Faculty of Arts. Students registered in Software Engineering were placed in the Faculty of Engineering.

APPENDIX E: CROSS-TABUATION FOR SELF-PERCEIVED SMOKING STATUS AT UNIVERSITY ENTRANCE VS. THE STUDY DATE

Table 1. Agreement between students perception of themselves as a smoker at university entrance and the study date (adjusted n= 323.7).

		Study Date (January 2004)				
		Nonsmoker, who never smokes	**Nonsmoker, who smokes sometimes**	**Light smoker**	**Regular smoker**	**Ex-smoker, who has totally quit smoking**
University Entrance	**Nonsmoker, who never smokes**	248.94 92.00%	17 6.28%	4.66 1.72%	0 0.00%	0 0.00%
	Nonsmoker, who smokes sometimes	2.52 11.49%	15.31 69.78%	1.99 9.07%	2.12 9.66%	0 0.00%
	Light smoker	0 0.00%	4.16 36.88%	3.87 34.31%	2.71 24.02%	0.54 4.79%
	Regular smoker	0 0.00%	2.81 22.94%	0 0.00%	6.62 54.04%	2.82 23.02%
	Ex-smoker, who has totally quit smoking	1.3 17.04%	4.33 56.75%	0 0.00%	0 0.00%	2 26.21%

Kappa Statistics

Kappa Value	95% Confidence Limits
0.5673	0.4766-0.6580

APPENDIX F: CROSS-TABUATION FOR SELF-PERCEIVED SMOKING STATUS AT UNIVERSITY ENTRANCE VS. THE STUDY DATE – FIRST YEAR STUDENTS ONLY

Table 1. Agreement between first year students' perception of themselves as a smoker at university entrance and the study date (adjusted n = 90.43).

		Study Date (January 2004)				
		Nonsmoker, who never smokes	**Nonsmoker, who smokes sometimes**	**Light smoker**	**Regular smoker**	**Ex-smoker, who has totally quit smoking**
University Entrance	**Nonsmoker, who never smokes**	74.95 92.50%	6.08 7.50%	0 0.00%	0 0.00%	0 0.00%
	Nonsmoker, who smokes sometimes	1 19.38%	3.62 70.16%	0.54 10.47%	0 0.00%	0 0.00%
	Light smoker	0 0.00%	0.54 17.09%	1.54 48.73%	0.54 17.09%	0.54 17.09%
	Regular smoker	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0.54 100%
	Ex-smoker, who has totally quit smoking	0.54 100%	0 0.00%	0 0.00%	0 0.00%	0 0.00%

Kappa Statistics

Kappa Value	95% Confidence Limits
0.5138	0.2883-0.7393

APPENDIX G: PRINCIPAL COMPONENTS ANALYSIS: LOADINGS ON ALL FACTORS

Table 1. Squared Multiple Correlations of the Variables With Each Factor.

	Factor 1	Factor 2	Factor 3
Q1: I get along well with my professors.	-0.16934	-0.38562	-0.06481
Q2: I do as little as possible; I just want to get by.	-0.06751	-0.15239	-0.43764
Q3: I pay attention to the professors.	-0.03140	0.04636	0.44226
Q4: I am interested in what I am learning in class.	-0.04932	-0.13174	0.35252
Q5: I feel like an outsider or like I am left out of things at school.	-0.13068	0.22707	-0.01383
Q6: I have trouble keeping up with the workload.	0.01640	0.27133	-0.05701
Q7: I have become good friends with other students at school.	0.38534	0.05114	0.08054
Q8: I feel like I am just a number to the school.	0.09566	0.38381	0.07605
Q9: I have friends at school I can talk to about personal things.	0.40390	0.08174	0.02608
Q10: I like to participate in many university activities e.g. clubs, sports, drama.	0.34841	0.14180	-0.03261
Q11: People at school are interested in what I have to say.	0.16336	-0.26472	-0.21110