Cannabis Use: Insights from Social Control Theory and

the Canadian Alcohol and Drug Use Monitoring Survey

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Abstract

Social control theory focuses on why some people do not commit deviant behaviours, such as illicit drug use. It proposes that bonding to conventional society constrains deviant conduct. In the book *Causes of Delinquency*, Hirschi distinguished four elements of social bonds: attachment, commitment, involvement, and belief. This study draws upon data from the 2012 Canadian Alcohol and Drug Monitor Survey to examine the effect of social control theory, specifically the element of attachment, on controlling cannabis use. This study also uses the element of attachment to interpret gender and rural/non-rural area differences in cannabis use. Two hypotheses are offered: (1) females are less likely to use cannabis than males because females have greater attachment to others; (2) rural residents are less likely to use cannabis than non-rural residents because rural residents have greater attachment to others. The research methods in the study are cross-tabulation analysis and binary logistic regression. The statistical analysis results support both hypotheses: females have a significantly lower rate of cannabis use than males and rural residents have a significantly lower rate of cannabis use than non-rural residents. Having greater attachment to others may be associated with a decreased rate of cannabis use. Policy and further research recommendations are made.

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1. CHAPTER 1
INTRODUCTION

Cannabis, also known as marijuana, is the most prevalent illicit drug in the world (Room, *et al*., 2010). A 2014 report published by the United Nations Office of Drugs and Crime (UNODC) showed that in 2012, among the world population aged 15–64 years old, between 125 million and 227 million people (2.7 and 4.9 percent of the population) were estimated to have used cannabis (UNODC, 2014). Cannabis is also the most prevalent illicit drug used in Canada (Canadian Centre on Substance Abuse, 2014). In 2012, 10.8 percent of Canadians reported that they used cannabis in the past year (Canadian Centre on Substance Abuse, 2014a). Among all users, adolescents and young adults have the highest rate of past-year cannabis use. Evidence also shows that, in comparison to young people in other developed countries, Canadian youth had the highest rate of past-year cannabis use in 2009–2010 (28%) (Canadian Centre on Substance Abuse, 2014a).

The prevalence of cannabis has generated a great number of studies, from various perspectives, on its use. Biological and pharmacological studies focus on the effects of cannabis. On the one hand, the pharmacologically active elements in cannabis can be used for medical purposes. Scientific research on cannabis shows that the plant contains more than 460 known chemicals, and more than 60 of these are considered cannabinoids[1] (Room, *et al*., 2010; Kalant & Porath-Waller, 2014). Among all the chemicals, Δ9-tetrahydrocannabinol (THC) is the most psycho-active cannabinoid (Kalant & Porath-Waller, 2014). Cannabinoids may have therapeutic potential; medical use of cannabis has a long history in some countries such as India and China (Hawdon, 2005; Pedersen & Sandberg, 2013), and increasingly in Western countries since the 19th century (Iversen, 2007). Cannabinoids have been found to stimulate appetite in Acquired Immune Deficiency Syndrome (AIDS) patients and relieve nausea caused by anticancer chemotherapy (Pedersen & Sandberg, 2013; Kalant & Porath-Waller, 2014). Also, cannabinoids

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[1] "Cannabinoids are a group of compounds that share a common chemical structure that was first found in the cannabis plants" (Kalant & Porath-Waller, 2014, p.2).

can be used to relieve pain caused by diseases of the nervous system such as multiple sclerosis as well as advanced cancer (Kalant & Porath-Waller, 2014). However, researchers also point out that cannabis might not be the best drug to address these symptoms and the medical value of cannabis is not well studied (Room, *et al.*, 2010, Kalant & Porath-Waller, 2014). One empirical study focused on medical cannabis users found that the boundaries between medical cannabis use and recreational cannabis use were often blurred (Pedersen & Sandberg, 2013).

On the other hand, studies have shown that cannabis can have a number of negative effects. For instance, cannabis can cause short-term memory problems, poorer cognitive performance, longer reaction time, and impairment in complex tasks requiring divided attention (Ashton, 2001; Sewell et al., 2009; Beirness & Porath-Waller, 2010; Hartman & Huestis, 2013). Thus cannabis can have a negative influence on driving skills and put drivers and others at risk. Chronic cannabis use may have negative influence on mental health and cause psychosis, depression, and anxiety (Nolin & Kenny, 2003; Room, *et al.*, 2010; Porath-Waller, Brown, Frigon, & Clark, 2013). Adolescents are more vulnerable to these harms because their brains are still developing, thus making them more susceptible to the harmful effects of cannabis. This is also the reason why adolescents are considered to be a high-risk group (Porath-Waller et al., 2013).

There have been numerous studies investigating reasons for cannabis use (Smith & Paternoster, 1987; Hawdon, 2005; Room, *et al.*, 2010; Bahr, 2011; Forster & Spencer, 2013). Findings indicate some people use cannabis for pleasure and to get "high" (Bahr, 2011); others use cannabis to relieve stress and escape from negative emotions like anxiety and disappointment (Room, *et al.*, 2010); some people use cannabis simply because of curiosity (Bahr, 2011); and there are also some who use cannabis for physical or mental problems (e.g., using cannabis to block pain) (Hawdon, 2005). Research also suggests bonding with peers or parents who use cannabis may facilitate the use of cannabis (Smith & Paternoster, 1987; Forster & Spencer, 2013). Also, there have been several studies aimed at identifying the characteristics of cannabis

users, with the most frequently identified demographics being young people and males (Fischer et al., 2006; Beirness & Porath-Waller, 2010).

Important is that some researchers have pointed out that most studies on cannabis use are not theoretically driven (Murray, 1986; Nagasawa, *et al.* 2000). One method to solve this problem is to treat cannabis use as a type of deviant behaviour and adopt a sociology of deviance perspective to explain questions related to cannabis use (Becker, 1973; Murray, 1986; Jarvinen & Ravn, 2014). Although cannabis use is very widespread, and legal purchase is allowed in some places (for instance, Colorado and Washington in the United States) (Weedmaps, 2014), some researchers still categorize cannabis use as a deviant behaviour (Ritzer & Guppy, 2014) and treat illicit drug use as "a familiar, yet disturbing, feature of late modern life" (Shiner & Winstock, 2015, p.248). The fact remains, however, that recreational cannabis use in many countries remains illegal. Some researchers also argue that other deviant or even criminal behaviours can be generated by cannabis use (Hawdon, 1996; Mosher & Akins, 2014). With the recent election of a new federal government in Canada, the potential for the legalization of cannabis is gathering significant discussion.

In Canada, "cannabis is a Schedule II drug under the Canadian Controlled Drugs and Substances Act" (Canadian Centre on Substance Abuse, 2015a, p. 2), meaning that cannabis has medical value and is acceptable for medical prescription (Mosher & Akins, 2014). However, "growing, possessing, distributing and selling cannabis are illegal…A cannabis-related conviction results in a criminal record, which can affect education acceptance, employment and travel" (Canadian Centre on Substance Abuse, 2015a, p. 2). "Driving while impaired by a drug, including cannabis, is an offence under the Criminal Code of Canada. Drivers who are impaired by drugs are subject to the same penalties as those impaired by alcohol" (Canadian Centre on Substance Abuse, 2015a, p. 2). As for medical purposes, "individuals must receive a prescription from a medical practitioner to be able to use cannabis for medical reasons. All cannabis for medical use must be obtained from a licensed producer authorized by Health Canada" (Canadian

Centre on Substance Abuse, 2015a, p. 2). According to Health Canada, in 2014 there were 37,884 Canadians authorized to use cannabis for medical purposes (Canadian Centre on Substance Abuse, 2015, p. 2). Based on 2011 Census data, the general population (age 15+) was estimated at 27.9 million (Statistics Canada, 2015a). Therefore, about 0.12 percent of Canadians were authorized to possess marijuana for medical purposes. The 2012 Canadian Alcohol and Drug Use Monitoring Survey reported that the prevalence of lifetime cannabis use among the general population was 39.6 percent, and the prevalence of past-year cannabis use was 10.8 percent (Health Canada, 2013). In this regard, cannabis use for medical purposes represents a small proportion of overall cannabis use in Canada, meaning most of the use is illegal (Pedersen & Sandberg, 2013). Hence, given the legal status of cannabis and the small proportion of medical cannabis use, it is possible to theoretically apply the sociology of deviance to investigate questions about cannabis use.

Sociology of deviance is able to provide various perspectives to explain cannabis use. There are several key theories of deviance in sociology, including strain theory, social learning theory, social control theory, and social development model. Strain theory argues that there is a discrepancy between what is valued by society and the means available to people to achieve socially valued goals. In other words, "strain exists when the culture values one thing, but the structure of society is such that not everyone can realize that value in a socially acceptable way" (Ritzer & Guppy, 2014, p.239). Agnew (2006) developed general strain theory (GST) to explain broader deviant behaviours. According to GST, strains increase negative emotions experienced by individuals such as anger, depression, and disappointment. These negative emotions may reduce social control and lead to deviant behaviours. In this regard, strain theory explains how strains can influence one's decision to use cannabis (Bahr, 2011).

Social learning theory argues that deviance is learned in intimate groups (Jennings & Akers, 2011). The core concepts of social learning theory are "definitions (attitudes about the acceptability of specific behaviours), differential association (with whom one associates),

imitation, and differential reinforcement (rewards and punishment)" (Bekeska, 2011, p.63). During the learning process, one is able to develop favourable or unfavourable attitudes to certain behaviours. Social learning theory is widely used to explain peer influence on cannabis use. In general, an individual can learn to use cannabis in small groups and he or she is taught to hold favourable attitudes toward cannabis use or not (Bahr, 2011). Becker (1953) argued that marijuana use was a learning process. To be more specific, a novice needs to learn to smoke marijuana in the proper way in order to experience the real effects; he or she needs to learn to recognize the effects and to enjoy the effects (Becker, 1953). During the learning process, the novice's concept of smoking marijuana is changed. The novice also has to bond with other users and get involved in a subcultural group in order to learn how to smoke marijuana effectively (Becker, 1953).

Social control theory is distinguished from these other theories by asking the question: why do some people avoid deviant behaviours despite various temptations (Hirschi, 1969)? Social control theory is unique because it tries to explain why people do not violate social rules in spite of the lure of the apparent rewards of drugs, alcohol, petty theft, and other temptations (Nagasawa, *et al.* 2000). The basic hypothesis of social control theory is that conventional bonds to others and to activities can dissuade people from undertaking deviant behaviours. In the book *Causes of Delinquency,* Hirschi (1969) distinguishes four elements in social control theory: attachment, commitment, involvement, and belief. This theoretical perspective will be described in detail in the next chapter.

Some researchers have criticized social control theory for overlooking the influence of bonding to deviant others and to unconventional activities (Murray, 1986; Özbay & Özcan, 2008). To address this, Hawkins and Weis (1985) created the social development model (SDM) to integrate social learning theory and social control theory. According to SDM, strong attachment and commitment to conventional others and institutions can constrain cannabis use, while attachment and commitment to antisocial others and institutions can facilitate the

development of attitudes favourable to cannabis use. Empirical studies have since found that bonding with conventional society can constrain cannabis use, while bonding with deviant peers can facilitate use (Hawdon, 1996; Nagasawa, Qian, & Wong, 2000). SDM may be the most comprehensive perspective to interpret questions about cannabis use. However, because the dataset used in the present study does not provide information about bonding with deviant peers, this study cannot examine the influence of deviant peers on cannabis use, which can be a potential research limitation.

This study uses the data from Canadian Alcohol Drug Use Monitoring Survey 2012 (CADUMS 2012) and quantitative methods to test the relationships of specific element of social control theory to cannabis use. Other theoretical perspectives can also provide useful insights on cannabis use, but in order to make the best use of the data, this study is guided by Hirschi's social control theory and is aimed to test whether social control theory, especially the variables related to the element of attachment, can constrain cannabis use. This study assumes, based on available sociological literature, that females and residents in rural Canada have greater attachment to others, so are less likely to use cannabis compared with males and urban residents (Jarvinen & Demant, 2011; Pirie & Simmons, 2014; Gfroerer, Larson, & Colliver, 2007; Martino, Ellickson, & McCaffrey, 2008; Mosher & Akins, 2014). Therefore, this study addresses two research questions: (1) are there different cannabis use rates between females and males; (2) are there different cannabis use rates between rural and non-rural areas? The results will be interpreted using social control theory, and especially through use of the concept of attachment. By using bivariate analysis and binary logistic regression, the relationships between predictive variables and cannabis use will be tested. Attention is placed only on attachment because of the existing data set limitations.

There are six chapters in this thesis. Following this introductory chapter, the theoretical framework employed in the study will be introduced in the second chapter. In this part, social control theory and Hirschi's four elements will be explained in detail. The third chapter is a

literature review, presenting several studies testing social control theory with regard to cannabis and other illicit substance use. This chapter also introduces studies that are not guided by social control theory directly, but nevertheless offer findings consistent with the basic hypothesis of the theory. Other concerns needing further examination, including gender and geographic differences in cannabis use, are explored. The fourth chapter introduces the data, methodology, and variables used in this study. This study uses data from the 2012 Canadian Alcohol and Drug Use Monitoring Survey and applies both bivariate analysis and binary logistic regression as research methods. Chapter 5 presents the research findings and results of the statistical analyses are presented. . Finally, interpretations of the findings are shared in chapter 6. This chapter also considers the policy, practice and research implications and potential limitations of the study.

2. CHAPTER 2
THEORETICAL FRAMEWORK

This chapter will review the theoretical framework of the present study. To be more specific, this study adopts social control theory and uses the theory to interpret Canadians' use of annabis. The main ideas of social control theory, Hirschi's four elements of social bonds, and the main weakness of the theory will be introduced in this chapter.

Social control theory is one of the leading and most widely used theories in the sociology of deviance (Huebner & Betts, 2002; Özbay and Özcan, 2008; Agnew, 2011). Rather than investigating the motivations for deviance, social control theory asks why some people do not engage in deviant behaviours. For instance, compared with strain theory, "social control theory…focus[es] on the absence of significant relationships with conventional others and institutions" (Agnew, 1992, p. 48). By contrast, strain theory emphasizes "negative relationships with others: relationships in which the individual is not treated as he or she wants to be treated" (Agnew, 1992, p. 49).

To be more specific, social control theory states that deviant behaviours such as illicit drug use is a natural tendency of human beings which will be realized if individuals have inadequate bonds to conformity (Mosher & Akins, 2014). Social controls stem "from the relations among people" (Agnew, 2011, p. 114). In other words, social bonds to conventional others and activities can promote informal social controls (Dull, 1984) and lead to conformity (Nagasawa, Qian, & Wong, 2000). The social bond reflects an individual's integration into conventional society, including relationships to family, spouses, children, conventional friends, employment, education, religion, community organizations, and other institutions in society (Mosher & Akins, 2014). Deviance may disappoint these conventional others—those with a higher level of conformity—and also damage educational and occupational achievements and the reputation of those engaged in deviant behaviours (Agnew, 2011). Therefore, conformity can potentially restrain and control deviant behaviours.

In the book *Causes of Delinquency* (1969), Hirschi advanced social control theory and used the degree of one's social bonds to explain deviant behaviours. The core idea of social control theory is similar to what Durkheim stated in his book, *Suicide*. Hirschi quoted Durkheim:

> The more weakened the groups to which (the individual) belongs, the less he depends on them, the more he consequently depends only on himself and recognizes no other rules of conduct than what are founded on his private interests (Durkheim as quoted by Hirshci, 1969, p.16).

By extending this quotation, Hirschi hypothesized that the weaker an individual's ties (bonds) were to the conventional order, the less likely that they would be constrained and would be more likely to conduct deviant behaviours (Hirschi, 1969). Hirschi also pointed out that lack of bonds to conventional society did not necessarily lead to delinquent acts. However, he proposed that people who have limited bonds to conventional society, for the most part, are more likely to commit deviant acts than those who are strongly tied to conventional society.

Hirschi distinguished four elements of bonds to society in *Causes of Delinquency*: attachment (to others), commitment (to social institutions), involvement (in conventional activities), and belief (in conventional values and norms) (Hirschi, 1969). Each of these factors is positively related to conformity. The four elements are explained here and Table 2-1 presents brief definitions of these.

First, attachment refers to feelings of sentiment and affection for others. According to Hirschi, humans are moral beings because we have the capacity to internalize widely shared norms of society. Hirschi (1969) argued that "the essence of internalization of norms, conscience, or superego lies in the attachment of the individual to others" (p.18). Thus, to violate a social norm is to act contrary to the expectations of others. Lack of attachment to others can cause a lack of conscience, and consequently, violation of norms. In other words, if an individual is insensitive to the expectations of others, they are free to deviate. Because Hirschi focused on teenagers in particular, he believed that attachment to parents, conventional friends, and schools could

Table 2-1. Four elements in social control theory[2]

Element	Description
Attachment	Emotional closeness to others, for instance, family and peers
Commitment	Rational calculation of the costs of law breaking for future goals
Involvement	Time spent in conventional activities
Belief	Ideas that support conventional norms and values

prevent juvenile delinquency. Other researchers extended the concept of attachment by suggesting that the type of person to whom one is attached is not important. Instead, it is having an emotional attachment itself that restrains people from deviance (Bekeska, 2011). In general, the element of attachment to others is important in understanding the use of cannabis and other illicit substances. The concept assists us in understanding how much a person cares about others' opinions of him or her, and thus how constraining these opinions might be (Mosher & Akins, 2014).

The second element in Hirschi's theory of social control is commitment. Howard Becker (1960) pointed out that commitment was a widely used concept in empirical studies at the time. He stated that "commitments come into being when a person, by making a side bet, links extraneous interest with a consistent line of activities" (Becker, 1960, p.32). He defined side bets as a consequence of an individual's participation in social organizations; the side bets could be reputation, financial loss, and so forth (Becker, 1960). Therefore, the fear of loss keeps an individual from engaging in deviant behaviour. For Hirschi, commitment means an individual

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[2] Source: Chriss, J. (2007). The function of the social bond. *The Sociological Quarterly,* 48(4),689-712.

invests time, energy, and themselves, in a certain line of activity, for instance, getting an education or building a business. "The concept of commitment assumes that the organization of society is such that the interests of most persons would be endangered if they were to engage in criminal acts" (Hirschi, 1969, p. 21). Commitment emphasizes the process of calculation. An individual must be rational and consider the costs of deviant behaviours. He wrote: "One is committed to conformity not only by what one has but also by what one hopes to obtain. Thus 'ambition' and/or 'aspiration' play an important role in producing conformity" (1969, p. 21). To be more exact, when someone considers doing deviant behaviour, he or she must consider the costs of these actions, for instance, the risk of losing the investment in conventional activities. Hirschi pointed out that the clearest examples of commitment to institutions were educational and occupational careers. Because the risk of jeopardizing one's reputation was highest, deviant actions in these areas are presumably avoided. In contrast, people who have little commitment to conventional activities are likely to engage in deviant behaviours simply because they have less to lose.

Involvement or engrossment in conventional activities is the third element in Hirschi's social control theory. It assumes that if a person is highly involved in conventional activities, he or she may simply be too busy doing conventional educational, occupational, and religious activities, for instance, to find time to engage in deviant behaviours (Hirschi, 1969, p. 22). The person engrossed in conventional activities is tied to appointments, deadlines, working hours, plans, and the like, so the opportunity to commit deviant acts is likely to arise.

Lastly, belief, the fourth element, refers to one's attitude to conventions. As Hirschi stated, "there is a variation in the extent to which people believe they should obey the rules of society, and, furthermore, that the less a person believes he should obey the rules, the more likely he is to violate them" (p. 26). People who have internalized conventional beliefs, values, and norms are less likely to conduct deviant behaviours (Agnew, 2011).

Hirshi also pointed out that the four elements were not independent of one another and interact to control an individual's behaviour. In other words, he believed that "the more closely a person is tied to conventional society in any one of these ways, the more closely he is likely to be tied in the other way" (Hirschi, 1969, p. 27). For instance, commitment in the form of a new job will result in involvement in the form of more time spent at work (Mosher & Akins, 2014). He also described three major combinations of elements. The first combination is attachment and commitment. Here a lack of ties to parents and peers may result in inadequate time and energy to devote to educational and occupational achievements. The second combination is commitment and involvement. Hirschi suggested that there was a link between educational and occupational aspirations (also known as commitment) and involvement in conventional activities (p. 29). The last major combination is attachment and belief. Hirschi stated that the connection between attachment to others and belief in moral rules was straightforward (p. 29). For instance, if someone respects others, especially family members and conventional friends, he or she will accept their rules; in contrast, the rules tend to lose their effectiveness when a person lacks respect for others.

In order to test social control theory, Hirschi conducted a survey among 5,545 public junior and senior high students. Based on the data, the major findings of Hirschi's social control theory were as follows. For the element of attachment, strong supervision by mothers and communication with fathers was related to low involvement with delinquency. Obtaining high standardized test scores and positive self-rating of school abilities was related to low self-reporting of delinquency. Involvement with noncriminal friends and respect of peers' opinions could reduce delinquency. For the element of commitment to conventional institutions and involvement in conventional activities, Hirschi found that college aspirations and high achievement orientation could decrease the possibility of involvement in delinquency. Finally, for the element of belief, respect for police and belief in individual responsibility was associated with low self-reported delinquency (Hirschi, 1969). As mentioned above, Hirschi also

emphasized that lack of bonds to conventional society does not necessarily lead to delinquent acts. However, if someone has limited bonds to conventional society, he or she may be more likely to commit deviant acts than those who are strongly tied to conventional society.

However, some researchers pointed out that social control theory overlooked the effects of unconventional others and activities, and argued that this was the main weakness of social control theory (Murray, 1984; Özbay & Özcan, 2008). Hirschi himself admitted that "most delinquent acts are committed with companions; most delinquents have delinquent friends" (Hirschi, 1969, p. 135). This means that attachment to deviant peers may increase delinquency. Hirschi's data suggested that "delinquents are very likely to have delinquent friends; non-delinquents are very unlikely to have delinquent friends" (1969, p. 136). Using social control theory to interpret these findings, Hirshci explained that "the child with little stake in conformity is susceptible to pro-delinquent influences in his environment; the child with a large stake in conformity is relatively immune to these influences" (1969, p. 161). In this regard, Hirschi seems to treat having delinquent friends as a kind of deviance too. He suggested higher conformity can prevent bonding to deviant friends in the first place and is able to constrain one's deviant behaviours even if an individual is bonded to deviant others. This explanation is different from the core idea of social learning theory which states that deviance can be learned in intimate groups and one's attitudes towards certain behaviours are changed during the learning process (Jennings & Akers, 2011; Bekeska, 2011). Later empirical studies testing social control theory also had this concern. Those researchers added bonding to deviant others and activities to refine Hirschi's original theory, and found that variables related to social control theory could reduce deviance, while bonding to deviant others and activities has the potential to increase deviant behaviours (Murray, 1986; Nagasawa, Qian, & Wong, 2000). These studies will be reviewed in detail in the following chapter.

From the descriptions above, it can be deduced that social control theory helps to explain deviance at the individual level. There are several empirical studies examining the relationship

between social control theory and substance and other illicit drug use, and these studies are introduced in next chapter.

3. CHAPTER 3
LITURATURE REVIEW

In this chapter, several studies testing social control theory with regards to cannabis and other illicit substance use will be reviewed. This chapter also introduces studies that are not guided by social control theory directly, but offer findings consistent with the basic hypothesis of the theory. As well, concerns needing further examination, including gender and geographic differences in cannabis use, will be identified.

3.1 Cannabis Use within the Framework of Social Control Theory

Social control theory has inspired a number of empirical studies to test the ability of the theory to control cannabis use and use of other illicit drugs. Some empirical studies found that stronger ties to others and conventional activities contributed to decreased rates of cannabis use (Krohn & Massy, 1980; Defronzo & Pawlak, 1993; Dull, 1984). Other researchers considered the weaknesses of the original theory and attempted to refine the theory by adopting other theoretical perspectives or considering the effects of bonding to unconventional others and activities. They found that variables related to social control theory could control deviance, while bonding to deviant others and activities were associated with an increase in deviant behaviours (Murray, 1986; Hawdon, 1996; Nagasawa, Qian, & Wong, 2000).

Krohn and Massy (1980) argued that the element of involvement should be interpreted as a part of commitment, so they investigated the overall impact of three elements (attachment, commitment, and belief) on deviance and categorized various deviant behaviours according to their degree of seriousness. Based on a survey on 3,065 adolescents in grades 7 to 12, they found that the three elements in social control theory were associated with a reduction in serious deviant behaviours like alcohol and marijuana use. Compared with attachment and belief, they found that commitment was more powerfully associated with reduction of serious deviant behaviours.

Defronzo and Pawlak (1993) used the 1988 General Social Survey in the United States to test the impacts of social bonds, childhood characteristics, gender, and several other social

variables on alcohol abuse and tobacco smoking. The four elements in social control theory were operationalized to several items. Belief items included two aspects: religious belief and moral conformity. The questions in the survey concerned the following issues: whether an individual should abide by personal moral views when these conflicted with social norms or official religious teachings; a person's views regarding the importance of following behavioural guides emanating from religious teachings; whether the interviewee believed in God; whether an individual finds believing in God and attending religious services important; and whether the respondent felt that the concepts of right and wrong were clearly differentiated regarding most social behaviours. Attachment items included level of satisfaction with family and friends. Commitment items concerned the respondent's satisfaction with his or her financial situation and perception of how his or her financial status compared with that of others. Involvement items included a respondent's reported membership in service and political organizations. A path analysis showed that religious belief, attachment, commitment, age, and education have significantly negative effects on rates of tobacco smoking, and religious belief, moral conformity, attachment, commitment, gender, age, and race have significantly negative effects on rates of alcohol abuse (Defronzo & Pawlak, 1993). The results of this study suggested that bonding to others and conventional activities can control substance use. For gender difference, the authors found that being female was positively associated with belief and attachment bonds that inhibit tobacco smoking and alcohol abuse (Defronzo & Pawlak, 1993).

These two studies focused on teenagers and young adults. Another study gathered data from the adult population in Texas. Dull (1984) used mailed questionnaires to test the relationship between social bonds and drug use among the adult population. He focused on the elements of belief, involvement, and commitment, and used self-reported drug use (including alcohol, marijuana, tobacco, amphetamines, and barbiturates) as the dependent variable. In general, the correlation analysis results showed that reduced social bonding could result in higher drug use. However, he also pointed out that although the correlations were significant, they were

relatively weak. For gender difference, he found that women were more strongly affected by reduced social bonds (Dull, 1984). In other words, Dull's results suggested that with decreased bonds to society, women's marijuana use increased. Dull's findings regarding the correlation between education level and drug use did not fully support Hirschi's original theory that suggested there was a positive association between loss of commitment to education and the activities of smoking and drinking. Dull, in contrast, found that people with college degrees also had relatively high marijuana use. With respect to marital status, Dull suggested separation or divorce means the breaking of a conventional commitment, and the statistical analysis results showed that respondents who were divorced had higher consumption of marijuana compared with married respondents. For age difference, Dull argued that young people have relatively limited social bonds because they have not yet developed commitments to various social institutions. Therefore, young people as a group tended to have a higher rate of cannabis use (Dull, 1984).

Sampson and Laub (1993) also sought to understand different cannabis use rates in different age groups. They used social control theory to explain why some people reduce their deviant behaviours when they move from adolescence to adulthood, while others continue to conduct deviance. They argued that the sources of social control change over the life course. In childhood, one's bonds to family and schools are most important, while ties to spouse and work are crucial during adulthood. Sampson and Laub contended that people who become involved in good marriages and form strong commitments to work are less likely to get involved in deviance. Previous research also found that cannabis use declined as individuals moved from their early and mid-20s to their early 30s, reflecting major role transitions in early adulthood, including entering tertiary education, entering full-time employment, marrying, and having children (Room et al., 2010). These role transitions are associated with the conventional activities outlined in social control theory. Therefore, cannabis use tends to decrease as people age and develop more social bonds.

Ford (2005), in his research, found that there were bidirectional relationships between social bonds and illicit drug use. He hypothesized that marijuana and other illicit drug use had a negative impact on social bonds, and the weakening of social bonds would increase illicit drug use. To be more exact, two kinds of social bonds were distinguished: family bonds and school bonds. The two kinds of social bonds were also divided into three elements: commitment to family/school, attachment to family/school, and family/school honesty. Scores were varied from 1 to 5 and factor analysis was used to create combined scores. Statistical findings showed that substance use was a significant predictor of weakening social bonds, but only the family bonding measure was a significant predictor of substance use (Ford, 2005).

Han, Kim, and Ma (2015) tested the relationship between social control theory and the initiation of alcohol drinking and cigarette smoking. They focused on the school setting and operationalized the four elements of Hirschi's theory into teacher attachment, educational aspiration, extracurricular activities, and rule internalization. By conducting discrete-time logistic regression, they found that greater attachment to teachers, higher educational aspiration, and higher rule internalization could contribute to delayed initiation of drinking and smoking. Involvement in extracurricular activities was linked with an early initiation of drinking, but was not significantly related to the initiation of smoking. They also found that adolescents from single-parent families had an earlier onset of drinking and smoking compared with youth from two-parent families (Han, Kim, & Ma, 2015).

To respond to the weakness of social control theory, some researchers considered the effect of bonding to deviant peers or involvement in unconventional activities (Murray, 1986; Hawdon, 1996; Novak & Crawford, 2010). Others used different theoretical perspectives together with social control theory to interpret substance use (Downs et al., 1997; Nagasawa, Qian, & Wong, 2000). For example, Murray (1986) focused on the elements of commitment, involvement, and belief. The respondents in this study were students in grade 7, 9, 11, and 13 in Ontario, with an average age of 17. He used one's commitment to (or involvement in) religion

and school to refer to the elements of commitment and involvement, and used students' attitudes to cannabis to measure belief in conventional values and norms. He pointed out that the lack of concern with the relationship between deviant behaviours and unconventional activities was a weakness of social control theory. In order to refine the original theory, Murray (1986) used delinquent involvement (including property crime, violent crime, drug selling, and other illicit drug use) to see whether commitment to unconventional activities can increase cannabis use. The statistical results showed that commitment to conventional activities and belief in conventional norms could explain reduced cannabis use (Murray, 1986). In this regard, social control theory can explain cannabis use effectively. On the other hand, he also found that involvement in drug-related unconventional activities could significantly increase the use of cannabis (Murray, 1986).

Hawdon (1996) focused on the element of involvement. He argued that Hirschi's concept of involvement was too broad. Some activities could reduce the likelihood of deviance, while others might facilitate deviant behaviour, which was caused by the visibility and instrumentality of certain activities[3]. To be more specific, people involved in activities which were highly visible and instrumental were less likely to engage in delinquency than those involved in invisible and non-instrumental activities. To test the hypothesis, Hawdon (1996) conducted an empirical survey among 3,140 high school seniors within the United States. The outcome variable was annual marijuana use, and the answers to the question ranged from 1 (0 times) to 7 (more than 40 times). By factor analysis, 23 activities were divided into 7 factors: recreational activities, athletically oriented activities, academically oriented activities, performing arts-oriented activities, literary-oriented activities, non-socially oriented activities, and automotive activities. In order to make the study more exact, the elements of attachment, commitment, and belief, and the variable of peer use, were also added to the multiple regression model. The analysis results

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[3] The visibility of an activity "refers to the degree to which activities are likely to occur in the presence of authority figures" (Hawdon, 1996, p. 167), for instance, parents, teachers, and so forth. Participants of an activity with high visibility receive direct controls from authority figures. The instrumentality of an activity "is the extent to which activities are goal oriented" (Hawdon, 1996, p. 167). Participants of an activity with high instrumentality are monitored by authority figures and other participants.

showed that peer use was the best predictor of an individual's marijuana use. Within the seven kinds of activities, recreational activities could predict increased use of marijuana significantly, while academic activities and automotive activities had significantly negative associations with annual marijuana use. Using the concept of involvement refined by Hawdon, other research found that involvement in academic, religious, and non-social activities was able to reduce deviance, while social activities could increase deviant behaviours (Novak & Crawford, 2010). Therefore, the empirical findings also suggest that involvement in conventional activities is able to constrain cannabis use, while bonding with deviant peers and involvement in unconventional activities can increase cannabis use.

Downs *et al.* (1997) tested both social control theory and labeling theory. They assumed that the factors of social control theory could restrain drug use, while the variables of labeling theory were related to increased drug use. The empirical findings supported the hypotheses. A higher level of involvement in conventional activities resulted in decreased drug use. On the other hand, respondents who had participated in a Juvenile Justice Diversion Program reported more deviant labels, lower involvement in conventional activities, and greater drug use. The researchers concluded that "deviant labels and weaker bonds to society" could affect the likelihood of drug use (Downs et al., 1997, p.21).

Nagasawa, Qian, and Wong (2000) used social control theory and peer cluster theory to explain the different drug use patterns among different ethnic groups. Their study focused on two elements in Hirschi's theory: attachment and belief. Attachment referred to bonds to parents, school (teachers), and peers, and belief was operationalized as the adoption of society's values and morality. The statistical analysis results were consistent with social control theory, but the effects were different among ethnic groups. The findings showed that the factors related to social control theory could constrain cannabis use among Chinese, Asian Indians, and Southeast Asians. However, bonding to friends who used alcohol and drugs could increase the likelihood of respondents' substance use. Belief in moral values did not vary from ethnic groups, and youth

who adopted higher moral values and related positively to school were less likely to use drugs and alcohol.

There are other studies investigating constraints to cannabis use. Although they do not adopt social control theory directly, the findings support the basic hypotheses of the theory. For instance, based on the date from students in the University of Hawaii, Takuechi (1974) found that women were less likely to use marijuana than men, Asian students were less likely to smoke marijuana than non-Asians, and students living at home were less likely to smoke marijuana than those living on their own. To interpret the findings, Takuechi argued that American society was more permissive and tolerant of men's deviant behaviour than women's. Women, Takuechi argued, had 'more to lose' if they were caught smoking marijuana. Secondly, students living at home had more attachment to their parents, so they might receive more punishment if they smoked marijuana. Finally, Asian students had stronger beliefs in traditions and had higher obedience to the law than non-Asians. Hence, Takuechi concluded that the more constraints a student had, the less likely they were to use marijuana (Takuechi, 1979). This study supports the basic hypothesis of social control theory, that is, that bonding to conventions is able to control cannabis use.

A recent investigation also showed that greater attachment to parents could be a protective factor in controlling cannabis use among young people. The investigation among Canadian youth found that non-users "worry about being caught and getting in trouble with their parents" (Porath-Waller et al., 2013, p. 34). On the other hand, youth who used cannabis reported that it was associated with the absence of parents in their lives (Porath-Waller et al., 2013).

Biological studies have provided evidence that lack of attachment to parents in early childhood can cause an imbalance in brain systems (Mate, 2008). To be more specific, there are four dominant brain systems related to substance use: the opioid attachment-reward system, the dopamine-based incentive-motivation apparatus, the self-regulation areas of the prefrontal cortex, and the stress-response mechanism (Mate, 2008). During the early development of

infants, lack of attachment to parents, and lack of attuned, emotional interactions with parents can disrupt the development of the brain's neurotransmitters and the four systems mentioned above. These dysfunctions can increase the risk for substance use and even addiction (Mate, 2008). From these findings, we can assume that attachment to significant others, especially parents, in one's early years, may decrease rates of illicit substance use in the future.

Another empirical study identified six kinds of motivations to give up cannabis use among adults who did not receive formal treatment (Chauchard, et al., 2013). The six motivations were "self-control, health concerns, interpersonal relationship concerns, legal concerns, social acceptability concerns, and self-efficacy" (Chauchard, et al., 2013, p.2424). They found that the factors of self-control, health concerns, interpersonal relationship concerns, and social acceptability concerns were related to successful quitting. They also pointed out that social acceptability concerns had a significant influence on lowering the risk of relapse (Chauchard, et al., 2013). Interpersonal relationship and social acceptability concerns can be interpreted through social control theory as the elements of attachment, commitment, and involvement. The study results indicated that bonding to others and social events could constrain cannabis use among former cannabis users.

Howard Becker (1953; 1956; 1973) also made significant contributions to explaining cannabis use, and some of his insights reflect the key points in social control theories. Becker (1956) argued that the extent of an individual's use of cannabis was dependent on the degree to which conventional social controls failed to prevent him or her from engaging in the activity. He suggested there were three stages of marijuana use. The first stage was represented by the beginner smoking marijuana for the first time; the second was the occasional user, whose use is sporadic and dependent on chance factors; and the third was the regular user, whose use becomes a systematic daily routine (Becker, 1956). He also elaborated on three kinds of social controls for cannabis use: (a) control through limiting of supply and access to the drug; (b) control through the necessity of keeping non-users from discovering that one was a user; and (c) control through

definition of the act as immoral (Becker, 1956). In order to become a regular user, an individual must avoid each of these controls.

To revise Becker's theory some researchers have argued that as cannabis has become much more prevalent in recent society, it is not difficult for people to get it. Therefore, the first social control mentioned by Becker is not effective (Hallstone, 2006; Jarvinen & Ravn, 2014). For the second kind of social control, the interviews conducted in Becker's research showed that users were under pressure for keeping secrets from their families and other non-users. This pressure helped to prevent these people from becoming regular users. His analysis also indicated that the degree of communication and interaction with others could be a way to prevent cannabis use (Becker, 1956). This point of view reflects the insights of social control theory.

Later studies also showed that being associated to conventional life, or as Becker said "conventional contacts" (Becker, 1956, p.41), could be an effective way to limit cannabis use (Hallstone, 2006; Hathaway, 1997). To be more specific, Hallstone (2006) found that in order to become a cannabis smoker, a user had to overcome some social obstacles due to the deviant status of cannabis. In his analysis, most teens sought to hide their marijuana use from parents and other authority figures, but that both "finding a supply of the drug" and "peers to use with" were not significant obstacles (2006, p.68). Respondents felt that the notions of fear, availability, rebellion, and the nature of the marijuana high affected the process of becoming a cannabis user. He also distinguished different kinds of regular users. For instance, "Weekend Warriors" had a "stake in conventional life" that kept them from entering into a lifestyle monopolized by drug use (p.71). Whether it was a good job, school, a career, personal relationships with family or a romantic partner, or even a hobby or athletic pursuit, this investment in something that bonded them to a conventional lifestyle significantly altered their cannabis use. A dramatic decrease in cannabis use was related to more adult-like roles and responsibilities of grown-ups (Hallstone, 2006). In this regard, conventional activities, such as getting a job, involvement in school, and getting married, can control cannabis use.

Marriage is another factor associated with reduced cannabis use. An interviewee in Becker's study stated that he controlled his marijuana use because of his wife (Becker, 1956). Later research found being married to a nonuser or occasional user could be a barrier to more frequent use (Hathaway, 1997). The researcher also found that being married to regular users could increase cannabis use, especially for women. Of particular mention was that because men had "always played the larger role in actually buying the drug," women's use could increase significantly after getting married (Hathaway, 1997, p.114).

3.2 Other Concerns

From the literature review, we can see that most of the previous studies focused on adolescents, so it is difficult to estimate whether conventional activities like getting married or being employed have a role in controlling cannabis use. For gender differences regarding illicit substance use, focusing solely on adolescents or young adults may also have limitations, because gender role orientations may still be forming and behaviours may be less predictable during adolescence or young adulthood (van Gundy et al., 2005, p. 3). This current study uses national data gathered from respondents who were 15 years of age and older (general population) to test whether social control theory can be effective in understanding cannabis use[4]. Also, this research is mainly concerned with the questions of whether there are gender differences in cannabis use and whether residents in rural or urban areas have different rates of cannabis use. The element of attachment in social control theory is used to interpret the use rates.

3.2.1 Gender Differences in Cannabis Use

The first concern in this study is gender difference in cannabis use. Gender is a socially constructed concept. Gender refers to cultural values and expectations for women and men, and it is important to consider gender influences on substance use (Dell & Poole, 2009). Previous studies have shown that men are more likely to smoke cannabis than women (Defronzo & Pawlak, 1993; Jarvinen & Demant, 2011; Pirie & Simmons, 2014), and men are also more likely

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[4] CADUMS is based on general population (Health Canada, 2013), but this present study only focused on respondents between 15 and 64 years old.

to engage in other deviant behaviours (Cheung & Cheung, 2010). The 2013 Canadian Tobacco, Alcohol and Drugs Survey (CTADS) showed that 14 percent (or 2.1 million) of males used cannabis in the past year, while 7 percent (or 1.0 million) of females did (Statistic Canada, 2015b). Past-year cannabis use among males was double that of females.

Sociological theories provide different perspectives to explain this. From the perspective of sex-role theory, in general, men are expected to be aggressive, assertive, and dominant, while women are to be submissive, dependent, and caring. Behavioural norms are derived from these different sex roles and expectations. According to these norms, men can be headstrong and individualistic; women, on the other hand, should be obedient and behave properly (Willemsen & Schie, 1989). Women are also more closely supervised than males, more likely to be sanctioned for deviant acts, and more likely to condemn deviance (Agnew, 2011).

From the perspective of social control theory, females are less likely to be deviant than males because women are more likely to internalize social norms and be influenced by social bonds. Some researchers have pointed out that there are different pathways for girls and boys to adulthood: women are encouraged to have more close relationships with others, while men are encouraged to be more independent, value autonomy, and develop skills instead of intimate relationships (Bardwick & Douran, 1972; Smith, 1987; Huebner & Betts, 2002). Empirical studies have indicated that social bonds, especially factors associated with the element of attachment to others, impact more powerfully on women than men. Some studies showed that attachment to others was more protective for females than males (Huebner & Betts, 2002). Other studies pointed out that broken attachment bonds more greatly influenced females than males. For instance, Morris (1964) argued that deviant girls more often came from broken families or homes with family tensions. In other words, Morris (1964) suggested that girls who came from broken families or homes with more family tensions had less attachment to their parents resulting in more deviant behaviours. This finding is similar to Dull's argument: broken social bonds have a stronger influence on women (Dull, 1984). In this regard, women have more emotional

attachment to others, so they are more likely to be constrained by others and have less deviant behaviour, such as illicit drug use.

There are also some recent studies focusing on gender and deviance. For instance, Thijs, van Dijk, and Stoof (2015) collected data from 24 European countries and found that boys are more likely to have problem behaviours than girls, and they found that adolescents from single-parent families are more likely to have problem behaviours. Another study found that family disruption had a greater influence on girls' deviant behaviours than boys', which indicates that parental separation affects girls more than boys (Steketee, Junger, & Junger-Tas, 2013). Starting with the attachment to parents in Hirschi's theory, Svensson (2003) found that female adolescents received more monitoring supervision from parents which could be a protective factor against drug use. Heidensohn (2010) also presented the idea that females have a greater sense of conformity and thus have a lower rate of deviance.

3.2.2 Residing in Rural or Urban Areas and Cannabis Use

The urban-rural dichotomy in sociological theories refers to different cultures and lifestyles. These different social contexts may generate different cannabis use patterns. Some researchers believe that highlighting the contrasts between rural and urban settings is a good and meaningful first step in beginning to understand the influence of place on substance use problems (Conger, 1997, p.16; Dew, Elifson, & Dozier, 2007).

The urban-rural dichotomy has been described in classical sociology. One of the most influential statements is Ferdinand Tönnies's (1960) distinction of Gemeinschaft and Gesellschaft. According to Tönnies, Gemeinschaft refers to a social order "which—being based on a consensus of wills—rests on harmony and is developed and enabled by pathways, mores and religion" (Tönnies, 1960, p. 169). Social relations in Gemeinschaft are warm, personal, face-to-face, and close. These relations always take place in small social organizations and small communities. On the other hand, Gesellschaft "derives from the conventional order of trade" (Tönnies, 1960, p.223). In contrast with Gemeinschaft, social relations are indifferent,

impersonal, and dominated by rationality. Furthermore, Tönnies argues that rural life shows the features of Gemeinschaft, while cities tend to nurture Gesellschaft. In this regard, rural life is more associated with traditional societies, while city life revolves around modernity and rationality (Bonner, 1998).

Durkheim, on the other hand, distinguished primitive societies from modern societies by using the two types of solidarity—mechanical solidarity and organic solidarity. Within mechanical solidarity, people are bonded together because they are engaged in similar activities and have similar responsibilities. However, organic solidarity is held together by people who have different responsibilities and increasingly specialized tasks. The increasing division of labour and differentiation in modern societies make social structures more complex. Durkheim also argued that the transformation from mechanical to organic solidarity was accompanied by a change in what he called the collective consciousness. He also argued that organic solidarity had a negative aspect—anomie caused by the mismatch between personal standards and social standards. In other words, anomie is a sense of being adrift in society without clear direction and security (Ritzer, 2003). Compared with rural communities, urban areas show more features of organic solidarity, such as a greater division of labour and less collective consciousness. Those features may result in more deviant behaviours in urbanized society.

Following Tönnies and Durkheim, Redfield (1947) also believed that folk society was different from modern urbanized society. For him, folk society is small, isolated, non-literate, and homogeneous, with a strong sense of group solidarity. Combining the three sociologists' core ideas, we can assume that the small size of community, lower population density, stronger sense of collective consciousness, and homogeneity in rural areas result in greater attachment to others and more commitment to conventions, which can also provide social constraints to deviant behaviours. In this regard, cannabis use is less likely to happen in rural communities.

Moving forward to more recent theory, social disorganization theory, which absorbs the core concepts of social control theory, can be used to explain different rates of deviance in

different communities. Social disorganization theory states that low economic status, ethnic heterogeneity, residential mobility, and family disruption lead to community social disorganization, which, in turn, increases crime and delinquency rates (Sampson and Groves, 1989). Social disorganization theory, like social control theory, highlights informal social controls that can constrain deviant behaviours. When network density is high, as it is in many rural settings, the capacity to control deviance is increased because one needs to consider others' reactions, which shows the core ideas of the element of attachment (Agnew, 2011). However, higher residential mobility and ethnic heterogeneity, both characteristics of urban settings, may break local friendship networks leading to more deviant behaviours (Sampson, 1989; Agnew, 2011). Therefore, because of higher mobility and weaker ties to neighbours and the wider community, urban settings often have weaker social controls compared with rural areas. In the case of cannabis, stronger social constraints would be hypothesized to contribute to less use in rural areas.

More recent studies have pointed out that the issue of illicit substance use should be interpreted in local contexts, and they described several social factors in rural communities that are associated with reduced illicit substance use (Dew et al., 2007; Conger, 1997; National Center on Addiction and Substance Abuse, 2012). Mosher and Akins's (2014) work offers two reasons for the relatively lower rate of illicit drug use in rural areas. The first is that access to drugs may be limited in rural areas because they lack sufficient numbers of people interested in certain drugs. The second reason is the more prominent role of social institutions such as religion and family; these conventional institutions can be protective factors for illegal drug use. Some researchers have argued that it is social ties to community members and organizations that truly matter (Sampson, 1992; Conger, 1997; Dew et al., 2007). According to various researchers, there are three social factors which can constrain substance use in rural communities. First of all, compared with urban communities, family members from rural communities have more frequency of contact, which can provide greater interpersonal support and more opportunities for

sharing. "In rural areas, the idea of family often extends beyond the nuclear and extended family and into the community at large. Smaller communities often exhibit greater solidarity and network support than is typical in larger metropolitan centers" (Dew et al., 2007, p.19). In other words, residents in rural areas have more attachment to others, which contributes to lower rates of cannabis use. Second, because of low population density and the smaller size of communities, people living in rural areas are well known to each other. Often this leads to the development of greater friendship and support networks, which act as a kind of informal social control of deviant behaviours. What is more, because adults in rural communities know each other, they can work together to supervise young people and constrain substance use (Conger, 1997; Sampson, 1992). Finally, greater religious involvement and school involvement is also associated with less cannabis use (Dew et al., 2007). In summary, stronger belief in conventional values and more involvement in conventional activities are associated with lower levels of cannabis use.

The statements above support the hypothesis that cannabis use in rural areas is lower than in urban areas. However, empirical studies examining differences in cannabis use between urban and rural populations are equivocal. To be more exact, some studies have indicated lower cannabis use rates among rural populations compared to urban (Gfroerer, Larson, & Colliver, 2007; Martino, Ellickson, & McCaffrey, 2008), while others have suggested higher rates (Coomber et al., 2011). The National Center on Addiction and Substance Abuse in the United States (2002) found that the rate of marijuana use among young teens in rural America was higher than in the nation's large urban centres, but the rate of cannabis use among urban adults was higher than rural towns and mid-size cities. Statistics indicate that eighth graders in rural America were 34 percent likelier to smoke marijuana than those in urban areas. The investigation suggested that rural America was not immune to drug problems (National Center on Addiction and Substance Abuse, 2012). Similarly, another study in the United States found that high school students living on farms were more likely to use alcohol, tobacco, and illicit drugs compared with those residing in towns (Rhew, Hawkins, & Oesterle, 2011). By contrast, other studies

found there was no significant difference in cannabis use between urban and rural populations (Cronk & Sarvela, 1997; Scheer, Borden, & Donnermeyer, 2000; Pirie & Simmons, 2014). The data from the 2011 Ontario Student Drug Use and Health Survey (OSDUHS) showed that 29.1 percent of urban or suburban high school students reported they had used cannabis in the past year, while 24.8 percent of high school students in rural areas reported past-year cannabis use (Centre for Addiction and Mental Health, 2012). Although the percentage of urban students reporting past-year cannabis use was higher than rural students, the difference was not statistically significant.

Most of these investigations were not guided by theory. To address this, this present study, guided by social control theory, hypothesizes that cannabis use in rural areas is lower than in urban areas because residents in rural areas are more familiar with each other and they have stronger attachment to others. Each of these factors has been shown to constrain cannabis use. The present study aims to examine whether social control theory could contribute to an understanding of reduced rates of cannabis use. The study focused specifically on gender and geographic differences on cannabis use and used the element of attachment mainly to interpret the differences. Based on the research presented above, females were hypothesized to have greater attachment to others. Thus, the first research hypothesis of this present study was that females are less likely to use cannabis in their lifetime because they have greater bonds to others and are subject to more social control by others. The second hypothesis in this study was that rural residents are less likely to use cannabis in their lifetime because they have greater attachment to family members, neighbours, and communities in comparison to non-rural residents.

4. CHAPTER 4
DATA AND METHODOLOGY

This chapter will introduce the dataset, research methods, and variables used in the present study.

4.1 Data

The data used in the present study are from the 2012 Canadian Alcohol Drug Use Monitoring Survey (CADUMS 2012). CADUMS is a random, telephone-based, general population survey about issues of alcohol and other illicit drug use, including prescription drug use, and the harms related to the use of any of these substances (Health Canada, 2013). This survey was started in 2008 and was conducted annually up to and including 2012 (Health Canada, 2013). The sampling frame was based on an electronic inventory (ASDE Survey Sampler, Inc.) of all active telephone area codes and exchanges in Canada and a random sample of telephone numbers was selected with equal probability. As mentioned in the CADUMS guidebook, "the CADUMS sampling approach was designed to produce maximum precision of estimates when reporting at the provincial level by sex and at the national level by sex and major age groups" (Health Canada, 2013, p5). CADUMS 2012 surveyed 11,090 Canadians randomly selected across 10 provinces, with a minimum of 1,008 respondents per province (Health Canada, 2013). Although CADUMS is based on general population, the present study only focused on respondents between 15 and 64 years old[5].

4.2 Methodology

This present study conducted quantitative analyses. Cross-tabulation analysis was used to test bivariate relationships and logistic regression provided more information regarding the relationships between independent variables and the dependent variable. SPSS 22.0 was used in

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[5] Because the survey was conducted in 2012, the respondents who are in the age group of 65 and older were born before 1947. Evidence shows that cannabis was not so popular before the 1950s. For instance, a research study pointed out that "there are no reliable accounts of the non-medical use of cannabis in Canada which predate the 1930's" (Green & Miller, 1975, p. 498). Another study showed that there were only 25 convictions for cannabis possession in Canada during 1930-1946 and cannabis was widespread in the late 1960's (Spicer, 2002). For the respondents in the age group of 65 years and older, they were more than twenty years old in the late 1960's. Main bonds to society might be formed in those ages, so the rate of cannabis use might remain lower for those respondents.

this study to do all the statistical analyses. The use of cross-tabulation analysis and binary logistic regression are introduced below.

First, cross-tabulation is used to examine the bivariate relationship when both variables are categorical. It shows the numbers of cases within each group (Warner, 2013, p.158). Chi-square test of association can examine the statistical significance of the association between two nominal variables (Warner, 2013, p. 318). Therefore, bivariate analysis can show the basic relationships between each predictive variable and the dependent variable.

Next, logistic regression is a technique more appropriate for analyzing data where the dependent variable is qualitative (Cramer, 2003). The logistic regression model is able to show whether each predictor variable (independent variable) is significantly associated with the outcome variable (dependent variable) (Warner, 2013, p.1008). Compared with the linear regression model, binary logistic regression does not have restrictive assumptions. The basic assumptions for binary logistic regression include:

1. The dependent variable is dichotomous, and the scores are usually coded 1 and 0.

2. The scores of the dependent variable must be statistically independent of each other.

3. The two categories of the outcome variable are exhaustive and mutually exclusive. In other words, each case should be in one group or the other but not both (Warner, 2013, p.1008).

Independent variables in binary logistic regression can be quantitative variables and categorical variables. If an independent variable is dichotomous, the scores should be dummy-coded (Cramer, 2003; Warner, 2013). Binary logistic regression may also include a categorical independent variable which has more than two categories. For instance, there could be an independent variable containing three categories. SPSS is able to identify the first group as the reference group. In the regression model, the odds ratios can show how much higher or lower the odds are for group 2 and 3 compared with group 1 (Warner, 2013, p.1037).

4.3 Variables

As mentioned above, the present study addressed the element of attachment in Hirschi's social control theory. Based on the dataset, the element of attachment to others was operationalized into three variables: gender, rural and urban areas, and marital status. Another predictive variable used in this present study was highest education level and the dependent variable was lifetime cannabis use. Researchers pointed out that social control theory overlooked the effects of unconventional others and activities (Murray, 1986; Özbay & Özcan, 2008). Previous studies have suggested that having friends who used illicit substances or were involved in unconventional activities could facilitate cannabis use (Hawdon, 1996; Nagasawa, Qian, & Wong, 2000). Murray (1986) found that involvement in drug-related activities (drug selling and other illicit drug use) was significantly associated with increased use of cannabis. However, because the dataset did not provide these variables, such as knowing other users, the relationship between bonding to unconventional society and cannabis use could not be tested, noting this is a potential limitation of the study. Each element is operationalized below in turn.

4.3.1 Predictor Variables

The first variable referring to the element of attachment is gender. As mentioned above, during the process of socialization, it is theorized that females are expected to have stronger emotional bonds to others, while males are expected to be more independent (Bardwick & Douran, 1972; Smith, 1987; Huebner & Betts, 2002). Previous empirical studies also show that variables related to attachment to others are associated with lower rates of deviance among women (Huebner & Betts, 2002; Smith & Paternoster, 1987). In the case of cannabis use, this study hypothesized that females are less likely to use cannabis compared with males, because females have greater and stronger ties to others and therefore are more subject to constraints from others. The variable of gender was coded to dummy variables (0=male, 1=female). As presented in Table 4-1, after excluding senior citizens, of the 8,159 individuals in the dataset,

3,251 were men and 4,908 were women, accounting for 39.8 percent and 60.2 percent

respectively[6].

Table 4-1. The basic descriptions of the variables

Variable	Frequency	Valid percentage(%)
Gender		
Male	3251	39.8
Female	4908	60.2
Area		
Non-rural	6205	76.1
Rural	1954	23.9
Marital status		
Never married		
&divorced&separated	2542	31.4
Widowed	215	2.7
Married&living with partner	5331	65.9
Missing	71	
Highest education level		
High school and lower	2767	34.1
Some post-secondary		
&university	5336	65.9
Missing	56	
Lifetime cannabis use		
Never used	4204	51.7
Used	3920	48.3
Missing	35	
N	8159	

The second variable representing attachment is rural/non-rural area. According to social control theory, because of the nature of rural lives and the lower population density and lower rate of mobility compared with urban areas, residents in rural places are more familiar with each other. It follows that residents in rural areas have stronger attachment to their families and neighbours, which can be a protective factor against cannabis use. In the present study, non-rural residents have been defined as individuals who reside in an area of Canada with a population of at least 1,000 and no fewer than 400 persons per square kilometre. Those areas that do not meet this standard have been defined as rural areas (Statistics Canada, 2007). According to the dataset, non-rural and rural areas in the survey were determined by postal codes. By using the software GeoSuite 2011[7], each of the postal codes was checked and categorized into rural and non-rural groups. The variable of area was coded to dummy variables (0=non-rural areas, 1=rural areas) in order to meet the basic requirement of binary logistic regression (Warner, 2013). As Table 4-1 shows, within the 8,159 sample in CADUMS 2012, there were 6,205 respondents living in urban areas and 1,954 residing in rural areas, accounting for 76.1 percent and 23.9 percent respectively.

The element of attachment was also operationalized to the variable of marital status. According to social control theory, people who are married or living with partners have greater attachment to their partners compared to single respondents and so they are less likely to use cannabis than single people. The dataset provided two variables for marital status: marital status with three categories (never married, previously married including divorced and widowed, and married/living with partner) and marital status with four categories (never married, divorced/separated, widowed, married/living with partner). One concern was that although people who never married, those that are divorced/separated, and those who are widowed can all be included in the "single" category, there are some differences among each group. Consider the grouping of divorced/separated as an example. Previous studies investigating the reasons for

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[7] "GeoSuite is a tool used for data retrieval, query and tabular output. GeoSuite allows users to explore the links between all standard levels of geography and to identify geographic codes, names, unique identifiers, and, where applicable, types, as well as land area and population and dwelling counts" (Statistics Canada, 2015c).

divorce show that infidelity, incompatibility (Amato & Previti, 2003), growing apart, and lack of communication (Hawkins, Willoughby, & Doherty, 2012) are the main reasons for divorce. In other words, former husbands and wives may have reduced attachment to their partners before they get divorced. The lack of attachment to partners may result in a higher rate of cannabis use. Researchers also pointed out that people who were involved in healthy marriages were less likely to get involved in deviance (Sampson & Laub, 1993). This study used the variable of marital status with three categories and recoded never married and divorced/separated as one category (0=never married/divorced/separated, 1=widowed, 2=married/living with partner). Excluding missing cases, there were 2,542 respondents in the group of never married/divorced/separated, 215 in the widowed group, and 5,331 in the married/living with partner group. The valid percentages of the three groups were 31.4%, 2.7%, and 65.9% respectively as presented in Table 4-1.

Another predictive variable in the present study was highest education level. Hirschi (1969) pointed out that the clearest examples of commitment were having educational and occupational careers. According to him, an individual with a higher commitment to institutions may be less likely to be deviant, because deviance may have a negative influence on one's future goals (Hirschi, 1969). Based on these statements, people with higher level of education may have a lower rate of cannabis use. However, previous studies which examined the relationship between education level and substance use found that higher education level was not associated with decreased cannabis use (Dull, 1984; Fleming, White, Haggerty, Abbott, & Catalano, 2012; Thompson, Homel, & Leadbeater, 2015). This study also tested the relationship between education level and cannabis use. CADUMS provided the variable of highest education level with four categories: less than high school, completed high school, some post-secondary, and university degree (Health Canada, 2013). The present study recoded highest education level into dummy variable (0=high school and lower, 1=some post-secondary/university degrees). Excluding 56 missing cases, 34.1 percent of the respondents were in the group of high school

and lower; 65.9 percent of the respondents had some post-secondary training or university degrees (table 4-1).

4.3.2 Dependent Variable

The dependent variable in the present study is lifetime cannabis use. The survey question in the dataset asked whether the respondent had used cannabis or not in his or her lifetime. The answers to the question were "never used" and "used in lifetime," and were coded as 0 = never used and 1= used in lifetime (Health Canada, 2013). After excluding respondents who were more than 65 years old, the basic frequency analysis results in Table 4-1 showed that 48.3 percent of the respondents reported they used cannabis in their lifetime and 51.7 percent had never used the substance (35 missing cases were excluded).

Because the present study used lifetime cannabis use as the dependent variable, the relationship between age and cannabis use could not be fully tested. People may use cannabis in their younger age and stop using later, but it is still identified as lifetime cannabis use. Therefore, the present study did not use age as a predictive variable or test the relationship between age and lifetime cannabis use. The results of statistical analyses are introduced in the next chapter.

5. CHAPTER 5
FINDINGS

This chapter will present the statistical analysis results. First, the results of the cross-tabulation will be presented. Next, the binary logistic regression results are shared. The binary logistic regression results can provide more details of which variable can contribute to non-use of cannabis and which variable can facilitate cannabis use.

5.1 Cross-tabulation Analysis Results

Table 5-1 indicates the cross-tabulation results. The statistical findings are presented as follows.

5.1.1 Gender and Lifetime Cannabis Use

For gender differences in lifetime cannabis use, there was a valid sample of 8,124 respondents. Of the 3,233 males, 1,797 reported they had used cannabis in their lifetime, and 1,436 reported they had abstained from cannabis use. Of 4,891 females, 2,123 reported they had used cannabis in their lifetime, and 2,768 reported they had never used in their lifetime. $\chi^2(1)$ =115.582, and the result was significant (p=.000) at the level of 0.05. Men in this study had a significantly higher probability of using cannabis (55.6%) than women (43.4%).

5.1.2 Rural/non-rural Area and Lifetime Cannabis Use

There was a valid sample of 8,124 respondents. Of the 1,950 people living in rural areas, 861 reported they used cannabis in their lifetime, and 1,089 reported they had never used cannabis in their lifetime. Of 6,174 people residing in urban areas, 3,059 reported using cannabis, and 3,115 reported never having used. $\chi^2(1)$ =17.259, and the result was significant (p=.000) at the level of 0.05. The results of this study indicate that Canadians living in urban areas had a significantly higher possibility of using cannabis (49.5%) than people living in rural areas (44.2%).

Table 5-1. Cross-tabulation analysis results

	Never used	Used	N	χ^2
Gender				
Male	1436(44.4%)	1797(55.6%)	8124	115.582***
Female	2768(56.6%)	2123(43.4%)		
Area				
Non-rural	3115(50.5%)	3059(49.5%)	8124	17.259***
Rural	1089(55.8%)	861(44.2%)		
Marital status				
Never married&				
divorced&separated	1206(47.6%)	1327(52.4%)		
Widowed	136(63.3%)	79(36.7%)	8055	32.488***
Married/living with partner	2817(53.1%)	2490(46.9%)		
Highest education level				
High school and lower	1560(56.5%)	1199(43.5%)		
Some post-secondary&			8070	40.210***
University	2608(49.1%)	2730(50.9%)		

***p<0.001, **p<0.01, *p<0.05

5.1.3 Marital Status and Lifetime Cannabis Use

As presented in Table 5-1, after excluding 104 missing cases, there was a valid sample of 8,055 respondents divided into three categories (never married/divorced/separated, widowed, and married or living with partner). Of 2,533 respondents who were in the group of never married/ divorced/separated, 1,206 reported never using cannabis, and 1,327 reported they had used cannabis in their lifetime. Of 215 respondents who were widowed, 136 reported they had never used cannabis, while 79 had used cannabis during their lifetime. For people who were married or living with a partner, 2,817 never used cannabis, while 2,490 had used cannabis in their lifetime. χ^2 (2) =32.488, and the result was statistically significant at the level of 0.05 (p=.000). Respondents who were in the group of never married/divorced/separated had the highest

percentage of lifetime cannabis use (52.4%), followed by married respondents (46.9%), and widows (36.7%). Individuals who were married or living with a partner tended to have greater attachment to their partners, which provided social constraint, making them less likely to use cannabis than those who never married or were divorced. The cross tabulation results supported the hypothesis—individuals with lower levels of attachment tended to have higher rates of cannabis use.

5.1.4 Highest Education Level and Lifetime Cannabis Use

There was a valid sample of 8,070 respondents. Of 5,311 respondents who had obtained some post-secondary training or a university degree, 2,608 reported they never used cannabis in their lifetimes, and 2,703 had used in their lifetimes. Of 2,750 respondents whose highest education level was high school or lower, 1,560 reported they never used cannabis, and 1,190 used. χ^2 (1) =40.210, and the result was statistically significant at the level of 0.05 (p=.000). Respondents who had some post-secondary training or university degrees had a higher rate of lifetime cannabis use (50.9%) than those in the group of high school or lower (43.5%). According to Hirschi's theory, people who have higher levels of education may report lower rates of cannabis use because they receive more social constraints. However, the results of this study did not support this hypothesis.

In general, the cross-tabulation analysis results supported the two main research hypotheses in this study. For gender difference, females had a significantly lower rate of cannabis use than males. For the geographic difference, the cross tabulation results showed that rural residents had a significantly lower percentage of cannabis use compared with non-rural residents. The element of attachment in social control theory hypothesizes bonding to others is able to constrain deviant behaviours such as cannabis use. As explained in the literature review, females tend to have stronger ties to others than males, so this may be the reason we saw lower rates of cannabis use by females in this study. Similarly, greater interpersonal interactions with family members and other neighbours may also be a reason for less cannabis use in rural areas.

For the variable of highest education level, respondents with a university degree or some post-secondary training had a higher lifetime cannabis use rate than those who were in the group of high school and lower. The cross-tabulation analysis results presented that the three variables related to the element of attachment supported the hypothesis that greater attachment to others might contribute to less cannabis use. On the other hand, getting some post-secondary training or university degrees was not associated with decreased cannabis use.

5.2 Binary Logistic Regression Analysis Results

Table 5-2 presents the results of binary logistic regression. There were two stages of logistic regression, and the results are as follows.

Model 1 shows the result of three variables related to attachment and lifetime cannabis use. Overall, -2 Log likelihood, Cox & Snell R^2, and Nagelkerke R^2 for the model were 10997.566, 0.020, and 0.026 respectively. By using Nagelkerke R^2, the model could explain 2.6 percent of the samples. Odds ratios or Exp (B) for gender and area were significant at the level of .05. After controlling other variables, being female reduced the odds of using cannabis in one's lifetime by 38.6 percent ([1-Exp(-.488)]×100). Living in rural areas reduced the odds of using cannabis in one's lifetime by 18.8 percent ([1-Exp(-.209)]×100). For marital status, compared with the group of never married/divorced/separated, being widowed decreased the odds of using cannabis in one's lifetime by 40.9 percent ([1-Exp(-.527)]×100), and being married or living with a partner reduced the odds of using cannabis in one's lifetime by 19.1 percent ([1-Exp(-.212)]×100). The results were all statistically significant.

Model 1 indicates that females, people living in rural areas, and people who were married or living with a partner were less likely to use cannabis compared with males, people residing in non-rural areas, and people who were never married. In general, the findings support the hypothesis that people who have more attachment to others have lower rates of cannabis use.

Table 5-2. Binary logistic regression models predicting odds ratios of lifetime cannabis use, 2012

	Model 1		Model 2	
	B	Exp(B)	B	Exp(B)
Gender(1=female)	-.488	.614***	-.511	.600***
Area(1=rural area)	-.209	.812***	-.168	.845**
Marital status				
(never married and divorced as				
reference group)				
Widowed	-.527	.591***	-.484	.616***
Married/living with partner	-.212	.809***	-.257	.773***
Highest education level				
(1= Somepost-secondary				
&university)			.337	1.401***
Constant	.431		.243	
N	8055		8018	
-2 Log likelihood	10997.566		10897.560	
Cox & Snell R Square	.020		.026	
Nagelkerke R Square	.026		.034	

***p<0.001, **p<0.01, *p<0.05

After adding the variable of highest education level in model 2 (Table 5-2), -2 Log likelihood decreased to 10897.560, while Cox & Snell R^2 and Nagelkerke R^2 rose to 0.026 and 0.034 respectively, which indicated that the fitness of the model was increased slightly compared with model 1. After controlling other variables, gender, area, being widowed, and being married still had significant influence on cannabis use in one's lifetime. To be more specific, females were 40.0 percent ([1-Exp(-.511)]×100) less likely to use cannabis . Residing in rural areas reduced the odds of using cannabis by 15.5 percent ([1-Exp(-.168)]×100). For marital status, compared with people who never married or divorced, being married or living with a partner decreased the odds of using cannabis in one's lifetime by 22.7 percent ([1-Exp(-.257)]×100), and being widowed reduced the odds of using cannabis by 38.4 percent ([1-Exp(-.484)]×100). For the variable of highest education level, Model 2 shows that people who had some post-secondary

training or a university degree were 1.401 times more likely to use cannabis in their lifetime compared with the group of high school and lower. The results were statistically significant.

After adding the variable of highest education level, model 2 suggests that females, people living in rural areas, and people who were married or living with partners were still less likely to use cannabis compared with males, people residing in urban areas, and people in the group of never married and divorced. Attachment to others was shown to constrain cannabis use. On the other hand, respondents with some-postsecondary training or a university degree had a higher rate of lifetime cannabis use.

The two binary logistic regression models reveal that gender was a fairly strong predictive variable of lifetime cannabis use. Being female reduced the likelihood of cannabis use significantly after controlling other variables. Living in rural areas also reduced the likelihood of lifetime cannabis use significantly. For marital status, being married/living with a partner and being widowed reduced lifetime cannabis use significantly compared with the reference group of never married or divorced. In general, being female, residing in rural areas, and getting married or living with a partner showed a decreased rate of lifetime cannabis use. According to Hirschi's social control theory, greater attachment to others can contribute to less deviant behaviours. Greater attachment held by women, rural residents, and respondents with spouses may be the possible reason for less cannabis use. As for the variable of highest education level, compared with the group of high school education and lower, respondents with some post-secondary training or a university degree showed significantly increased lifetime cannabis use. The logistic regression results did not support the hypothesis based on social control theory.

6. CHAPTER 6
DISCUSSION AND CONCLUSION

This chapter discusses the research findings of this study and also provides implications for policy, practice, and research. Using the 2012 Canada Alcohol and Drug Using Monitor Survey, the relations between the element of social bonds outlined in social control theory and cannabis use were examined. Social control theory, or social bonding theory, attempts to understand why people do not commit deviant behaviours, and it proposes people are able to constrain deviance because they have a strong stake in conformity (Agnew, 1992). There are various forms of control within society which keep people 'in line', with bonds to society crucial to understanding conformity. A lack of bonds to society may result in deviancy and even criminal behaviours (Franzese, 2009). In the book *Causes of Delinquency* (1969)*,* Hirschi made significant contributions to social control theory; he proposed that strong positive bonds to conventional society could reduce the possibility of deviance. He also distinguished four elements of social bonds: attachment, commitment, involvement, and belief. He suggested that people who had stronger bonds to conventional society were less likely to be deviant.

6.1 Discussion

Using the data from CADUMS 2012, this study examined whether social control theory is associated with lower rates of cannabis use. To be more specific, the element of attachment to others from Hirschi's theory was examined, emphasizing different cannabis use rates between females and males, and between rural and non-rural areas. The study used bivariate analysis and binary logistic regression to test two main research hypotheses: (1) women are less likely to use cannabis than men; (2) rural residents are less likely to use cannabis than non-rural residents. These hypotheses assume that women and rural residents may have greater attachment to others, which may be the possible reason for lower rates of cannabis use. In general, based on the statistical analysis results, the variables related to the element of attachment to others were associated with decreased rates of lifetime cannabis use, while respondents with some

post-secondary training or a university degree had a higher rate of lifetime cannabis use compared with respondents in the group of high school education and lower.

For gender difference, both the results of cross tabulation analysis and logistic regression analysis suggest that females have a significantly lower rate of cannabis use than males. Previous studies focusing on gender differences have suggested that women are more relationship-oriented than men (Umberson, 1996; Parsons, 1956). This orientation may be formed during the process of socialization. For instance, "girls are socialized to fulfill women's traditionally domestic roles, like caring for children and other family members. Thus, women are expected to be more skilled than men at developing and maintaining interpersonal relationships" (K. Van Gundy, *et al.,* 2005, p.3). Through the process of socialization, boys are encouraged to express traditional male behaviours, such as aggressiveness and competitiveness, which are regarded as barriers to intimacy. On the other hand, girls are encouraged to restrict competition and aggression and to display emotions and nurturance. An empirical study based on a national two-wave panel survey in the United States showed that men and women had different types of relationships (Umberson, *et al.,* 1996). The researchers found that women had higher scores than men on intimate and informal social ties, such as having a confidant, receiving social support from friends and family, and visiting with friends. Women were also more likely to provide care to impaired individuals. The researchers concluded that men received "more of the instrumental aspects of relationships (e.g., practical, tangible aspects)," while women received "more of [the] intimate, interactive aspects of relationships" (Umberson, *et al.,* 1996, p.851). Hence, women have greater attachment to others, which can be a source of control.

However, previous research focusing on gender differences in substance use also found that women tended to start using substances later than men, and that women tended to be more dependent on those substances and have more problems (e.g., issues related to mental health and interpersonal relationships) than men (Grella, Scott, Foss, & Dennis, 2008). Thus, these results may suggest that unsatisfying relationships impact women more intensely than men. Having

unsatisfying relationships maybe a possible reason for cannabis use by females. Men are less likely to create and maintain interpersonal ties than women. In this regard, men may have less support from others and be more likely to feel greater "social loneliness" (Chen, 2010). Social loneliness may be a factor in men's cannabis use.

For the geographic difference, both the cross tabulation results and logistic regression results show that rural residents have a significantly lower percentage of lifetime cannabis use compared with non-rural residents. The results support that residing in rural areas is associated with a decreased rate of cannabis use.

Greater attachment to others may be one of the reasons for less cannabis use in rural areas (Conger, 1997; Sampson, 1992; Dew et al., 2007). First of all, rural residents have greater attachment to their family members, and this attachment extends from families to community. (Dew et al., 2007). In other words, residents in rural areas have more attachment to not only family members but also community members, which contributes to lower rates of cannabis use because people consider expectations from others. Second, because of low population density, smaller size of communities, and less residential mobility, people living in rural areas are familiar with each other and have more interaction with each other, which often leads to the development of greater friendship and support networks. Also, young people in rural communities may be monitored not only by their parents, but also by other community members, which may constrain illicit substance use (Conger, 1997; Sampson, 1992; Clark, Nguyen, & Belgrave, 2011). On the other hand, higher residential mobility and ethnic heterogeneity in urban settings may break local friendship and support networks, which may result in weaker social controls in urban areas compared with rural areas. Also, urban residents are more likely to observe deviant behaviours, which may facilitate deviant behaviours (Clark, Nguyen, & Belgrave, 2011). This may be one of the possible reasons for a higher rate of cannabis use in urban areas.

The other variable representing the element of attachment to others is marital status. According to the statistical analysis results, people who were married or living with a partner are less likely to use cannabis compared with respondents who were never married or divorced. This finding also supports the research hypothesis. According to Hirschi's theory (1969), greater attachment or social bonds which form as a result of marriage may change one's deviant behaviours and constrain cannabis use (Sampson, Laub, Whimer, 2006). Researchers pointed out that "the social tie of marriage is important because it creates interdependent systems of obligation, mutual support, and restraint" (Sampson, Laub, Whimer, 2006, p.467). Therefore, getting married or living with a partner may reduce the likelihood of cannabis use. However, we should also notice that previous research has pointed out that living with non-users can control cannabis use, whereas living with a cannabis user might increase cannabis use (Hathaway, 1997). The dataset used in this study is not able to provide such details, and this is one of the limitations of the study based on the available data. In general, greater attachment to others is associated with a decreased rate of cannabis use.

For the variable of highest education level, according to the statistical analysis in this study, people with post-secondary training and university degrees are more likely to use cannabis than the respondents with lower levels of education. This result is consistent with Dull's (1986) findings that suggested that enrolling in colleges was not able to control cannabis use. Another study focused on adolescents also found that fewer bonds to schools were not directly related to substance use problems (Fothergill & Ensminger, 2006). Other researchers also found that college students in their early adulthood had greater alcohol consumption compared with non-college peers (Fleming, White, Haggerty, Abbott, & Catalano, 2012; Thompson, Homel, & Leadbeater, 2015). Those who enroll directly to college out of high school have significantly increased alcohol and cannabis use (Carter, Brandon, & Goldman, 2010). Moving away and lower parental supervision as well as living with students drinking alcohol and using cannabis could be the possible reasons (White, et al., 2008).

In conclusion, based on the findings, variables related to the element of attachment from social control theory are associated with decreased rates of cannabis use. For the two questions examined in this study, the statistical results show that females and rural residents are less likely to use cannabis than males and non-rural residents, and the possible reason is that females and rural residents have greater attachment to others which may be a constraint on increased cannabis use. On the other hand, achieving some post-secondary or having a university degree is not associated with a decreased rate of lifetime cannabis use.

6.2 Implications for Policy, Practice, and Research

There are a number of people who feel cannabis is socially acceptable (Room, *et al.*, 2010), and using cannabis for medical purposes is also allowed in Canada (Canadian Centre on Substance Abuse, 2015). However, the proportion of cannabis use for medical use is small relative to the number of people using cannabis for recreational purposes (Pedersen & Sandberg, 2013). There is some evidence that suggests cannabis use for non-therapeutic purposes poses health risks to some users (Nolin & Kenny, 2003; Room, *et al.*, 2010; Porath-Waller et al., 2013). The National Treatment Indicators Report showed that cannabis was the most commonly used illicit drug among Canadians accessing publicly funded substance abuse treatment in 2012–2013 (Pirie & National Treatment Indicators Working Group, 2015). At the provincial level in Canada, alcohol use was the most commonly reported reason for seeking treatment. Cannabis is then the second most commonly reported reason for entering treatment, for example, in Ontario and the third most commonly reported reason in Nova Scotia (Canadian Centre on Substance Abuse, 2015). Non-medical cannabis use may cause individual and social harms, so it is important to identify protective factors against cannabis use.

Previous studies have identified protective factors against drug use and other deviant behaviours: prosocial involvement in the community, school, family, and with peers has been found to reduce drug use (Nolin & Kenny, 2003; Hallstone, 2006; Room, *et al.*, 2010). Greater attachment to parents and interaction with prosocial peers, as well as belief in norms and a moral

order can also protect against drug use (Nagasawa, Qian, & Wong, 2000; Porath-Waller et al. 2013). Taking these findings into account alongside the results of this present study, when family members, friends, colleagues, as well as community members provide "feelings of support, understanding, respect, and appreciation" (Han, Kim, & Ma, 2015), individuals may have more bonds to others, which may contribute to decreased cannabis use.

Cannabis is currently a Schedule II drug in Canada (Canadian Centre on Substance Abuse, 2015), which means that cannabis has medical value and is acceptable for medical prescription (Mosher & Akins, 2014), but growing, possessing, distributing, and selling cannabis is illegal. Driving under the influence of cannabis is also an offence under the Criminal Code of Canada (Canadian Centre on Substance Abuse, 2015, p. 2). This situation may be changed given that the Liberal Party of Canada won a majority government in the 2015 federal election. The Liberal Party of Canada's website states that the Liberals will push forward the legalization of marijuana. They claim that the current regime of marijuana prohibition is not effective in preventing adolescents and young adults from using marijuana and results in too many people with criminal records for possessing small amounts of the drug (Liberal Party of Canada, 2015). The Liberal Party also suggests that the illegal drug trade results in organized crime, such as human trafficking and trade in harder drugs, which threatens public safety. Therefore, the Liberals claim that they "will remove marijuana consumption and incidental possession from the Criminal Code, and create new, stronger laws to punish more severely those who provide it to minors, those who operate a motor vehicle while under its influence, and those who sell it outside of the new regulatory framework" (Liberal Party of Canada, 2015).

This statement of legalizing marijuana is consistent with the depenalization of marijuana from the public (Room, et al., 2010), but there is still a lot to do before the legalization of marijuana. A report released recently by the Canadian Centre on Substance Abuse reviews lessons learned from the legalization of marijuana in Colorado and Washington in the United States (Canadian Centre on Substance Abuse, 2015c). The report emphasized the importance of

developing a comprehensive regulatory framework in order to minimize the negative influence of the legalization of cannabis. The regulatory frameworks in Colorado and Washington contain age restriction (21 years and older), maximum personal possession, maximum personal production (not permitted in Washington state), taxation, driving restrictions, and so forth (Canadian Centre on Substance Abuse, 2015c, p.4). It is also important to provide adequate prevention, education, and treatment approaches as well as prevent commercialization and use by youth in order to minimize the negative health and social influence related to cannabis use (Canadian Centre on Substance Abuse, 2015c). With cannabis to be legalized in the future, there will still be some potential deviant behaviours related its use, such as using cannabis underage and driving under the impact of cannabis. There remain issues of concern in key areas addressed in the present study: adolescents and cannabis use, gender and cannabis use, and rural areas and cannabis use.

6.2.1 Adolescents and cannabis use

The first issue concerns adolescents and cannabis use. The Liberals contend that they will keep cannabis out of the hands of children. However, evidence shows that Canadian adolescents have the highest rate of cannabis use in the world (Canadian Centre on Substance Abuse, 2014). As mentioned in the Introductory chapter, because adolescent brains are still developing, cannabis is more harmful for adolescents than it is for adults (Porath-Waller et al., 2014). Also, because children are undergoing major physical, emotional, and social developmental changes, cannabis use and other illicit substance use may have greater negative impacts on them in comparison with adults (Canadian Centre on Substance Abuse, 2010). A study from the Canadian Centre on Substance Abuse showed that young people tend to underestimate the negative effects of cannabis. Hence, it is important to educate adolescents about the negative effects of this substance (Porath-Waller et al., 2014). Some participants in the CCSA study also suggested that prevention interventions should be delivered earlier to young people (Porath-Waller et al., 2014) because "the earlier a young person engages in regular substance

use, the more likely that both immediate and later harm will occur" (Canadian Centre on Substance Abuse, 2010, p. 11). What is more, prevention is most effective when it is multifaceted and sustained over time (Canadian Centre on Substance Abuse, 2010). This allows prevention efforts to take advantage of interactions between families, schools, and communities. Taking the findings of the CCSA study and previous research into account, prevention programs will be most effective when they build stronger ties to parents and peers, and hold more school and community activities that offer alternatives to adolescents and reduce opportunities for young people to bond to deviant peers. The statistical findings of this current study show that attachment to others can be a protective factor against cannabis use. These findings may also be useful in developing prevention or intervention programs for the general population.

Recent studies also show that social media has a significant influence on substance use (Frech, 2011; Salimain, Chunara, & Weitzman, 2014). A survey in the U.S. showed that there was a strong relationship between frequent social media use and substance use (Frech, 2011). The survey presented that "adolescents aged 12-17 years old who use social networking sites daily are five times more likely to use tobacco, three times more likely to use alcohol, and twice as likely to use marijuana as are their counterparts" (Frech, 2011). Frech (2011) pointed out that adolescents who had seen peers' photos of alcohol and drug use were more likely to abuse substance and had more access to alcohol, cannabis, and prescription drugs without a prescription. Frequent social media use may reduce adolescents' attachment to parents, teachers, and friends, which may be the reason for the positive relationship between social media use and increased substance use. Also, lack of guidance and supervision when using social media and exposure to peers' pictures of alcohol and drug use on social networking sites may be related to increased substance use (Salimain, Chunara, & Weitzman, 2014). Although the present study does not examine the relationship between bonding with other users and cannabis use due to the unavailability of data, previous studies have found a positive relationship. This is an interesting topic for future research, because insufficient bonds with conformity and bonding with other users in the virtual world may

also increase the likelihood of illicit drug use. On the other hand, researchers also pointed out that social media had the potential to improve the efficacy of substance use prevention and intervention programs (Frech, 2011; National Institute on Drug Abuse, 2015). For example, providing platforms to provide knowledge about substance use and increase the frequency of interaction and communication between young users and prosocial others (National Institute on Drug Abuse, 2015).

6.2.2 Gender and cannabis use

Investigating gender differences in cannabis use provides implications for policy and practice. As a report of the CCSA stated, "gender is an important consideration for those developing, implementing and evaluating prevention programs" (Canadian Centre on Substance Abuse, 2014, p. 1). Women tend to have more intimate and emotional ties to others, while men have more ties to formal associations (Umberson, *et al.,* 1996); intervention programs should take these patterns into account. Some studies have found that family factors such as parental attachment, parental supervision, closeness, and communication might have a stronger influence on female substance use (Fothergill & Ensminger, 2006; Canadian Centre on Substance Abuse, 2014). On the other hand, individual and community factors might have a stronger influence on male substance use (Canadian Centre on Substance Abuse, 2014). Therefore, different prevention programs may have different effects for females and males. The legalization of cannabis in the future may have some potential negative influences on public health, so it is necessary to provide prevention and treatment programs and it may be more effective to provide different programs for men and women. Drawing on previous research on the effectiveness of prevention programs, the Canadian Centre on Substance Abuse suggests that family-based prevention programs have been more effective for females, but the results were more ambiguous for males (Canadian Centre on Substance Abuse, 2014). The statistical analysis results in the present study show that females have a lower rate of lifetime cannabis use than males. The possible reason is that females have greater attachment to others, which can constrain the use of

cannabis. Parsons (1956) also pointed out that the female role was high on expressiveness, while the male role was high on instrumentality. Combining the findings and statements above, attachment to others seems to have more influence on females in prevention and intervention programs. For males, increasing attachment to others via encouraging males to participate in prosocial activities as well as reducing bonds to other users may decrease the risk of cannabis use problems.

6.2.3 Rural and urban areas and cannabis use

Although the results from previous studies on cannabis use in rural and urban areas are under debate, this present study supports the research hypothesis that people living in rural areas have a lower rate of cannabis use. From the perspective of social control theory, less cannabis use can be explained by more attachment to others in rural communities. Previous studies have suggested that strong community ties and local friendship networks are more prevalent in rural settings, which be protective factors against cannabis use (Conger, 1997; Dew et al., 2007; Clark, Nguyen, & Belgrave, 2011; Mosher & Akins, 2014). For the prevention and intervention programs in urban areas, encouraging urban participants to get more involved in community activities and have more frequent interactions with family and community members may be helpful to build more attachment to others, which may prevent or reduce cannabis use.

Although the findings in the present study suggest that cannabis use is lower in rural areas, we should note that previous studies indicate rural areas are not immune to drug problems (Paulozzi & Xi, 2004; National Center on Addiction and Substance Abuse, 2012). There are several reasons for increased cannabis use in rural areas. First, although illegal drugs may have been more difficult to access in rural areas in the past (Mosher & Scott, 2014), research indicates that it is not difficult for rural residents to currently obtain cannabis (National Center on Addiction and Substance Abuse, 2012). Cannabis supply and "availability is obviously a prerequisite, if not an explanation, for use" (Addiction and Substance Abuse, 2002, p. 8). Becker also argued that the first control on marijuana use is supply (Becker, 1956). However, at present

people can purchase cannabis online. According to a survey in the United States, the proportion of people residing in rural areas, small cities, and large urban centres who found cannabis "very easy" or "fairly easy" to obtain was 59.9 percent in rural areas, 61.1 in small cities, and 59.3 in big cities (National Center on Addiction and Substance Abuse, 2002). The U.S report also pointed out that American cannabis supply traditionally was import dependent, but more recently domestic cannabis cultivation has increased. When considering cannabis cultivation as a factor in availability, it is important to consider geographical advantages. Rural or suburban areas can provide "good geographic opportunities" for soil-based cannabis growing because "distance from cities means better access to land and less visibility due to lower population density" (Chadillon-Farinacci, Apparicio, & Morselli, 2015, p.312). Therefore, supply as the first kind of control in Becker's model is diminished.

The second factor in increased cannabis consumption in rural areas may be related to declines in the agricultural industry that have increased burdens on farming families (Cronk & Sarvela, 1997; Scheer, Borden, & Donnermeyer, 2000). Average incomes in rural areas are lower than those in urban areas (Statistics Canada, 2001) and previous research has indicated that farmers have higher levels of anxiety compared with non-farmers (Brannen, Emberly, & McGrath, 2009). A relatively high level of anxiety and stress may result in increased cannabis use. Other factors that increase the likelihood of drug involvement, such as low school achievement and a family history of substance use, were more prevalent in rural areas (National Center on Addiction and Substance Abuse, 2002).

Also, considering the legalization of cannabis, it is possible that cannabis use in rural areas may rise in the future. The lack of proper prevention and treatment strategies for rural residents may increase the negative influence of cannabis use on public health. Hence, it is necessary to pay more attention to the issue of cannabis and other illicit substance use in rural areas and to initiate more prevention and treatment strategies for rural residents. (Rhew et al., 2011). Researchers focusing on the issue of substance use in rural areas have pointed out that

rural residents are more vulnerable when faced with the negative effects of cannabis and other drugs (Conger, 1997; National Center on Addiction and Substance Abuse, 2002). There are two primary reasons for this increased vulnerability. First, due to their remoteness and lower population densities, there are limited health care providers and services in rural areas. Thus, it is more difficult for rural residents to obtain medical and mental health services for drug education or treatment (Rhew et al., 2011). "Smaller communities have greater difficulty in providing accessible drug treatment programs and attracting trained substance abuse professionals, school nurses and counselors" (National Center on Addiction and Substance Abuse, 2002, p. iii).

In Canada, physicians are not distributed evenly across geographic space, and physicians are concentrated in urban areas (Laurent, 2002; Canadian Institute for Health Information, 2005). In 2004, although 21.1 percent of Canadian population lived in rural areas, only 9.4 percent of physicians were located in these areas (Canadian Institute for Health Information, 2005). A researcher predicted that the ratio of physicians per 1,000 residents in rural areas was expected to decrease from 0.79 in 1999 to 0.53 by 2021 (Hutten-Czapski, 2001). Geographic distribution imbalances result in more difficulties for rural residents in accessing health care. Given the fact that there are limited treatment centres in rural areas, rural residents must also travel longer distances to obtain care and treatment.

The second factor that increases rural residents' vulnerability to the negative effects of illicit substance use is related to the fact that greater attachment to others can be a 'double-edged sword'. On the one hand, greater attachment to others and greater emotional ties to families and neighbours can control cannabis use. People living in rural areas are more attached to their neighbourhoods, and they may have a stronger sense of shared identity, closer relations with others, and higher community cohesion. On the other hand, users in rural areas may give up treatment because they are more likely than their urban counterparts to suffer stigma related to drug abuse and addiction (Dew et al., 2007). The lack of proper treatment and health care, remoteness from treatment centres, and the fear of stigma can act as barriers to appropriate

treatment for rural residents. Therefore, it is important to provide more access to health care and treatment programs for rural residents.

Researchers have also pointed out that risk and protective factors have different effects in different residential settings (Rhew et al., 2011). Some researchers have also argued that residential contexts vary among rural settings, such as varying degrees of rurality and socio-environmental characteristics (Rhew et al., 2011). Hence, cannabis use patterns should be understood under different rural residential contexts. By using CADUMS 2012, the present study finds that there is a lower rate of cannabis use in rural areas than non-rural areas. The possible reason is that rural residents have greater attachment to others. However, because of the unavailability of data, whether there are different use patterns and whether there are different risk and protective factors in different rural communities cannot be examined. Therefore, cannabis use rates in different residential contexts require further investigation.

6.3 Limitations

There are several potential limitations in the present study.

As mentioned above, there were more female respondents than male respondents in the survey (60.5 percent of women and 39.5 percent of men). After excluding respondents over 65 years old, there were still 60.2 percent of women and 39.8 percent of men. CADUMS 2012 oversampled women, which may cause some biases and make the statistical analyses not as accurate. This is the limitation caused by the data.

The second limitation of this study is the limited operationalization of the independent variables. This study is based on existing data and applies quantitative analyses. One advantage of using existing data is that we can see findings based on a large sample size selected by an accurate sampling method (Creswell, 2009). The disadvantage here is that the operationalization of the variables is limited. For instance, the element of attachment to others could be operationalized to several variables, such as attachment to family, friends, and so forth (Chriss, 2007), which can provide more details regarding the relationship between attachment and

cannabis use. However, based on the dataset used in this present study, the element of attachment is only operationalized to three variables. Further, some researchers have criticized Hirschi's social control theory arguing that he overlooked the effect of bonding to deviant peers and involvement in unconventional activities (Murray, 1986; Özbay & Özcan, 2008). However, because the dataset did not provide survey questions about bonding to other users or involvement in unconventional activities, the present study is not able to examine the relationship.

The dependent variable in this study is lifetime cannabis use. A potential limitation of using lifetime cannabis use as a dependent variable is that it uses the current values as explanatory variables to explain past deviant behaviours (Smith & Paternoster, 1987), and this is also a limitation of using cross-sectional data. The limitation is obvious when testing relationships between different age groups and lifetime cannabis use. Although according to previous studies, cannabis use, usually past-year cannabis use, declines as people get older (Dull, 1984; Sampson & Laub, 1993; Room et al., 2010), this trend may not be revealed by using lifetime cannabis as a dependent variable since people might use cannabis in their younger ages. Because the relationship between age and lifetime cannabis use could not be tested properly, the present study did not add age as a predictive variable. The dataset also provides the variable of past-year cannabis use, but only 10.8 percent of all the respondents answered "yes." In order to guarantee the validity of the statistical analyses, this study used lifetime cannabis use. This study focused on gender and geographic differences which tend to remain relatively stable for respondents, so it is still meaningful to examine the relationships between gender/area and lifetime cannabis use. For future research, it may be better to use past cannabis use to test changes of cannabis use with aging. Longitudinal studies or qualitative methodology can also provide more details.

Finally, although quantitative research can uncover larger trends, it is not able to provide more specific details. Consider marital status and cannabis use as examples. Previous studies have mentioned that bonding to non-users was able to constrain higher cannabis use, while

bonding to users might increase cannabis use (Becker, 1956; Hathaway, 1997). The results of this study suggest that respondents who are married or living with partners have significantly lower rates of lifetime cannabis use. However, the study is unable to determine whether being married to a non-user can constrain cannabis use or whether living with a cannabis user can increase use because of the absence of data. Therefore, the influence of bonding to users and non-users as a factor in cannabis use requires further research. Some prior studies also pointed out that there are bidirectional relationships between social bonds and deviant behaviours (Ford, 2005; Han, Kim, & Ma, 2015). For instance, lack of social bonds may result in higher rate of cannabis use, and higher cannabis use also decreases one's bonds to conventional societies. Because of the limited availability of data, again, these bidirectional effects also need future investigation.

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APPENDIX
VARIABLES USED IN THE STUDY

SEX

1=Male

2=Female

EDUCAT4 Highest level of education recoded (4 categories)

1=Less than high school

2=Completed high school

3=Some post-secondary(college)

4=University degree

MARSTAT4 Marital status recoded (4 categories)

1=Married/Living with partner

2=Divorced, separated

3=Widowed

4=Never married

CANLIFE Lifetime cannabis use including one time use

0=Never used

1=Ever used in lifetime