

Running Head: TREATMENT UTILIZATION BY PROBLEM GAMBLERS

Treatment Utilization by Problem Gamblers in Northwestern Ontario

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Master of Public Health Thesis

Lakehead University

March, 2010

Abstract

The Catalyst database, which is operated through the Ontario Centre for Addiction and Mental Health, was used to explore factors that may be related to treatment non-compliance and the number of admissions in the population of clients receiving addiction treatment in Thunder Bay between 2003 and mid-2006. The distinction between Primary and Secondary Gamblers identified by Nguyen (2007) was explored to determine whether this distinction is useful in predicting if the two groups differ in treatment non-compliance and the number of admissions. A total of 2,743 clients were examined. Comparisons were made between those who presented for treatment of gambling as their primary problem ($N = 138$), those who presented for a substance addiction ($N = 280$) with gambling as a secondary problem, and those who had only a substance addiction ($N = 2,178$). Non-compliant individuals are more likely to be gambling clients, younger, female, have a higher education level, better income source, better employment, and no legal problems. An individual with more admissions to treatment is more likely to be a Secondary Gambler or Substance Problem Only client, older, have a poorer source of employment and have legal problems. The distinction between primary and secondary gamblers was not found to be useful for predicting treatment non-compliance but did predict the number of admissions. It appears that these two outcome variables are measuring different aspects of treatment utilization and that it is important to consider each separately, as they both provide useful program planning information.

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Treatment Utilization by Problem Gamblers in Northwestern Ontario

Many people are affected by problem gambling and the prevalence rate can be expected to increase due to the increased availability of legalized gambling activities (Shaffer, LaBrie, LaPlante, Nelson, & Stanton, 2004). Treatment for problem gambling in Ontario is provided by regional addiction treatment centres, which also treat alcohol and drug addictions. Each centre has the right to access data about their clients, which is stored in a provincial database called Catalyst. The data for all clients seen by the treatment centre in Thunder Bay between 2003 and mid-2006 was obtained, in order for the Centre to learn more about their clients. An initial study using this database (Nguyen, 2007) examined comorbidity and demographic characteristics of the problem gamblers. The present study explored two other aspects of the data, treatment compliance and number of admissions. There is a need to learn more about the types of clients who drop out of treatment and those who require more extensive treatment, in order to facilitate planning of service design and program availability.

Problem Gambling

Problem gambling is gambling behaviour that results in difficulties for daily life (Morasco, vom Eigen, & Petry, 2006). The diagnostic criteria for problem gambling outlined by the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association [APA], 2000) fall into three broad categories: compulsion or craving, loss of control, and continuing behaviour regardless of negative consequences (Shaffer et al., 2004). The compulsion or craving involves an individual being unable to resist impulses to gamble (Raylu & Oei, 2002). Losing control of one's behaviour

includes unsuccessful attempts to reduce or stop his or her gambling problems, such as trying to avoid going to the casino or limiting expenditures while at the casino (Colman, 2003). The final category, where gambling is continued despite costs, involves behaviours such as trying to regain losses from gambling with further gambling, thereby jeopardizing work, family, and educational opportunities (Colman, 2003). Problem gambling encompasses a range of harmful effects ranging from personal and social to vocational and legal. These harmful effects are captured in the major measures of problem gambling (e.g., Problem Gambling Severity Index [PGSI], South Oaks Gambling Screen [SOGS]) which explicitly identify both behaviours and consequences in their definitions of a problem gambler (Ferris & Wynne, 2001; Lesieur & Blume, 1987).

Many people are affected by problem gambling and the prevalence rate can be expected to increase due to the increased availability of legalized gambling activities (Shaffer et al., 2004). Examples of this availability include greater access to casinos as well as internet gambling, where any individual with internet access is able to engage in gambling activity. Younger people are more likely than older people to be problem gamblers with the most common age range being 35-44, although rates among the elderly are increasing (Rush & Moxam, 2001; Shaffer et al., 2004). Also, ethnic minorities and people with lower socioeconomic status or presence of mental health disorders have higher prevalence rates of gambling problems (Shaffer et al., 2004). Rush, Veldhuizen and Adlaf (2007) examined rates of problem gambling with Ontario-specific data from a large representative survey of Canadians conducted by Statistics Canada (Canadian Community Health Survey). They reported that Northwestern Ontario has one of the highest rates of problem gambling in the province of Ontario, 3.6%.

However, there is growing evidence that exposure to gambling activities and/or venues may have a protective effect for communities. For example, Shaffer, LaBrie, and LaPlante (2004) describe the “social adaptation model” which stems from social learning theory (e.g., Bandura, 1986) where new events stimulate interest, but through social learning individuals adapt to the novelty of the new event and its effect is limited in the long term. In reference to gambling, Shaffer et al. (2004) explain that increases in early exposure to new patterns of gambling are usually followed by an adaptive process that leads to lower levels of involvement or abstinence. Jacques and Ladouceur (2006) observed this effect during a four-year follow-up period examining the impact of opening a casino on gambling behaviour. They observed an increase in gambling behaviour problems initially, but the effect was not sustained over time.

Problem Gambling Severity

Although the *DSM-IV* definition of pathological gambling is categorical, a growing body of recent evidence supports the idea of a dimensional model or continuum of disordered gambling (e.g., Petry, 2003; Strong & Kahler, 2007; Toce-Gerstein, Gerstein, & Volberg, 2003). Using this approach, gambling-related problems can range from minor or occasional difficulties through to severe or pathological problems meeting the full *DSM-IV* diagnostic criteria. The terms “disordered gambling” or “problem gambling” may be used to describe problems ranging in severity along this continuum or dimension.

Measurement tools have been developed to characterize problem gamblers by degree of severity. Ferris and Wynne (2001) developed the Canadian Problem Gambling Index (CPGI) which is a highly valid and reliable measure of problem gambling. The

measure contains 31-items, nine of which measure the prevalence rate for problem gambling. The remaining items are used as indicators of gambling involvement and correlates of problem gambling which can be used to understand the different profiles of problem gamblers. Each item can be scored from zero to three (0 = never, 1 = sometimes, 2 = most of the time, 3 = almost always), making the total index score from zero to twenty-seven. All nine prevalence items refer to the past 12 months. The CPGI classifies respondents as non-gambler or non-problem gambler (score zero), low-risk gambler (score 1-2), moderate-risk gambler (score 3-7), and problem gambler (score 8+) (Ferris & Wynne, 2001). Non-problem gamblers engage in gambling infrequently (less than five times a year); low- and moderate-risk gamble more than five times a year and show some sort of problem gambling behaviour. Low-risk gamblers do not typically experience any adverse consequences, while moderate-risk may or may not have experienced those consequences. Problem gamblers engage in gambling more than five times a year, experience adverse consequences and the act creates negative consequences for them, their loved ones or the community (Ferris & Wynne, 2001). The authors comment that these groupings are practical and useful as they allow for specific targeting for the various levels of prevention (primary, secondary, and tertiary) and any indication of problem gambling behaviour is scored as “potentially at risk” (i.e., low-risk gambler) (Ferris & Wynne, 2001). Categorizing problem gambling along a continuum allows for identifying groups of problem gamblers and trends in treatment utilization.

Another conceptualization of problem gambling severity surrounds the concept of hierarchies. In contrast to describing problem gambling along a continuum, the idea of hierarchies of gambling disorders suggests that there are distinct patterns of behaviour

which are characteristic of differing levels of severity. Toce-Gerstein et al., (2003) found four separate patterns of gambling behaviour by examining DSM-IV pathological gambling criteria. Although as gambling severity increased, most DSM-IV criteria were endorsed by participants, distinct patterns of behaviours emerged. At-risk problem gamblers most commonly reported a non-clinical pattern of chasing losses from gambling, and being preoccupied with gambling and gambling for emotional escape. Problem gamblers most often reported lying about gambling activities. These individuals also endorsed preoccupation and emotional escape. Low-severity pathological gamblers most often reported withdrawal symptoms from gambling and loss of control over wagering. Endorsement of these criteria indicates the threshold of clinical pathological gambling from problem gambling (Toce-Gerstein et al., 2003). High-severity pathological gamblers most often reported risking their job or other significant relationships and committing one or more illegal acts (Toce-Gerstein et al., 2003). Although describing problem gamblers along a continuum is one way to conceptualize gambling severity, Toce-Gerstein et al.'s (2003) study supports the idea that gambling severity can be categorized by clusters of symptoms which allows for intervening therapeutically with problem gamblers before they reach a pathological level.

However, problem gamblers are a heterogeneous group and there is a lack of evidence on a general profile for a problem gambler (Raylu & Oei, 2002). Problem gamblers exhibit different gambling patterns and psychosocial difficulties (Petry, 2003). This presents a challenge for treatment programs as problem gamblers can develop their problematic behaviour from a variety of sources, and most show different gambling patterns and psychosocial difficulties (Petry, 2003). Blaszczynski and Nower (2002)

developed the pathways model which proposes that problem gambling can develop from three different pathways. The first group, behaviourally conditioned gamblers, may show symptoms for pathological gambling, but have minimal levels of psychopathology.

These individuals fluctuate between heavy and problem gambling, which result from distorted cognitions and poor decision making, not psychopathology (Blaszczynski & Nower, 2002). They suggest that this group is motivated to enter treatment, be compliant and may be able to control their gambling post-treatment with minimal intervention or counseling. The second group, emotionally vulnerable gamblers, typically has diagnoses of anxiety or depression and they gamble to cope with affective states. These individuals gamble to escape from emotions through dissociation and narrowing attention to the game being played (Petry, 2003). Blaszczynski and Nower (2002) state that this psychological dysfunction makes the group more resistant to change, and treatment needs to target both gambling and co-morbidity. The third group, antisocial impulsivist gamblers, show signs of impulsivity and antisocial personality disorder and engage in problematic behaviours including substance abuse, suicidality and criminal acts. These individuals are less motivated to seek treatment, are non-compliant and do not respond well to any type of intervention (Blaszczynski & Nower, 2002).

Primary versus Secondary Gambler Distinction

Nguyen (2007) categorized gamblers receiving treatment in Thunder Bay, Ontario, as “Primary” or “Secondary” depending on whether they identified gambling as their primary presenting issue for entering addiction treatment or if they identified substance use as their primary presenting issue and gambling as one of the other presenting problems. These two types of gamblers showed very different demographic

profiles (Nguyen, 2007). Clients with gambling as the primary problem had a lower rate of substance comorbidity and were more likely to be female, widowed, employed/retired, older, better educated, and without legal problems. The Secondary Problem gambling clients were more similar to the Substance Addiction Only clients.

Urbanoski and Rush (2006) summarized the sociodemographic characteristics of 6,966 gambling clients who entered addiction treatment in Ontario between April 1998 and March 2002. They reported a distinction between gamblers who “were seeking help specifically for a gambling problem” and those for whom a “gambling problem was identified over the course of treatment for another problem (e.g., for problems related to their alcohol and/or drug use)” (p.8). The majority of clients (90%) who entered addiction treatment identified themselves as seeking help specifically for a gambling problem. Urbanoski and Rush (2006) also used the terms “Primary” and “Secondary” to describe the two groups. While somewhat different criteria were used by Nguyen (2007), and Urbanoski and Rush (2006) to define these two groups, the Primary/Secondary distinction described is essentially the same in both studies, although other findings differed. Urbanoski and Rush (2006) compared the gender of Primary and Secondary Gamblers and did not find a difference between the two groups, whereas Nguyen (2007) found that Primary Gamblers were more likely to be female. As well, Urbanoski and Rush (2006) reported that the majority were Primary Gamblers, while Nguyen (2007) reported the majority were Secondary Gamblers. These differences likely reflect the different populations used in the studies. Nguyen (2007) looked at all clients in addiction treatment who reported gambling problems, while Urbanoski and Rush (2006) only looked at clients receiving treatment for gambling problems.

Comorbidity in problem gamblers

Comorbidity is the co-occurrence of two or more disorders. Problem gamblers who seek treatment have been described as having a range of comorbid problems, from mental health, to substance use problems and general medical conditions (Morasco, Pietrzak, Blanco, Grant, Hasin, & Petry, 2006; Rush, Bassani, Urbanoski, & Castel, 2008; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001). Among psychiatric disorders, the most commonly reported relationships involve the dual disorders, or the associations between substance use disorders and psychotic, anxiety, and mood disorders (Crockford & el-Guebaly, 1998; Westphal & Johnson, 2003). Problem gamblers typically have comorbid diagnoses of depression and anxiety disorders (Crockford & el-Guebaly, 1998; Goodyear-Smith, Arroll, Kerse, Sullivan, Coupe, Tse et al., 2006). It should also be noted that high levels of comorbidity are also present in problem gamblers in the general population (Newman & Thompson, 2007; Petry, Stinson, & Grant, 2005).

Studies have also examined health problems among problem gamblers (Morasco et al., 2006; Morasco et al., 2006). Problem gamblers have been reported to have higher occurrences of insomnia, irritable bowel syndrome, peptic ulcer, hypertension, migraines, and other stress-related physical problems than do those in the general population (Lesieur, 1998). Problem gamblers present with these comorbid health conditions in part because the stressors inflicted upon themselves as a result of their addiction (e.g., financial losses, relationship problems, employment difficulties) contribute to the development of stress-related disorders (such as hypertension) (Morasco et al., 2006). Furthermore, problem gamblers are prone to health conditions which are a direct cause of their co-occurring substance use disorders (e.g., alcohol and cirrhosis; smoking and heart

disease) (Welte et al., 2001). Lastly, the sedentary nature of gambling may appeal to those with limited physical abilities (e.g., arthritis, obesity, and diabetes) (Morasco et al., 2006).

Catalyst Database

In Ontario, the Ministry of Health and Long Term Care (MoHLTC), Mental Health and Addictions Program, funds an ongoing client-based information system called DATIS (Drug and Alcohol Treatment Information System). Developed by the staff of the Centre for Addiction and Mental Health, DATIS collects and reports client demographic and service utilization data from addiction and problem gambling treatment services in Ontario. Approximately 160 agencies funded by MoHLTC provide data and participate in a Provincial Accountability Framework. Participation in DATIS was made mandatory for centres that receive program funding for substance abuse treatment and problem gambling treatment (DATIS, 2001). Upon admission into a treatment program, DATIS staff collects information on a number of variables. Agency staff enter this information into Catalyst - the specialized browser-based application used by organizations to input their data on-line (DATIS, 2001). Catalyst allows data to be entered automatically and the central database that organizes all the data is maintained by DATIS staff. The information in Catalyst allows for detailed reports on the use of addiction treatment services and the types of clients who are accessing those services.

There are two aspects of the Catalyst data that reflect treatment utilization. The first measure is the number of admissions. Readmissions to treatment reflect those individuals who have relapsed or for whom treatment was not successful. The number of admissions is a measure of how often these clients needed treatment and the demands

they placed on the services offered. The other aspect of Catalyst which reflects treatment utilization is dropping out (or non-compliance) which is given by a variable called “Reason for Termination”. While most clients terminate for reasons such as “program completed” or “client withdrew and notified staff,” other clients simply disappear. Dropping out without any contact or discussion reflects an extreme of non-compliance with the treatment program. In contrast, some clients withdraw from treatment and notify staff that they cannot continue with the program at this time, informing staff of their reason for leaving. Often in this situation, a client will discuss which program would be suitable when they are ready to begin treatment again. Non-compliance, when individuals stop attending the program for no apparent reason, is of much more concern for treatment agencies. It is important to identify who is likely to disappear in this way, so that efforts can be focused towards these individuals, encouraging them to return for services to address their problem.

Non-compliance is a large health care issue as it wastes resources in the form of health care dollars and productivity (DiMatteo, 2004). Literature about each of these aspects of treatment utilization is reviewed below.

Number of admissions

The number of admissions reflects the pattern of services utilized over time. It shows how often a client relapses into their problematic behaviour and receives treatment services again. Predictors of the number of admissions have been studied in many areas of treatment: addiction, substance abuse, and psychiatric illness. Substance addiction clients generally show high rates of readmission, ranging from 62.5 percent to 89 percent (Neale, Robertson, & Bloor, 2007). The mean number of admissions for substance abuse

clients varies depending on the study, but ranges from 3.5 to 9.5 (Anglin, Hser, & Grella, 1997; Neale et al., 2007). Individuals who readmit for treatment have been found to differ from those who only receive treatment once. Treatment repeaters typically are older, unmarried (or single), have a lower level of education, more legal problems, and a poorer source of employment (Anglin et al., 1997; Castel, Rush, Urbanoski, & Toneatto, 2006; Neale et al., 2007). These individuals are also likely to have more severe drug use problems (report longer duration of drug use and more severe drug use patterns) (Anglin et al., 1997; Neale et al., 2007).

Ferri, Gossop, Rabe-Hesketh, and Laranjeira (2002) examined factors associated with first treatment entry and treatment re-entry among cocaine users in addiction treatment clinics. Roughly 45 percent of the sample was readmitted for treatment and a majority of these clients reported having a comorbid substance addiction problem. Individuals who readmitted to treatment were male, older, had more severe drug problems, had legal issues and had social support. Life-time use of amphetamines and sedative drugs were higher in those individuals with several admissions. Claus, Mannen, and Schicht (1999) compared the profiles of clients entering treatment for the first time versus those returning to treatment to examine the similarities and differences in psychological profiles and clinical needs. The participants who were returning for treatment were more likely to be older, female, and in a relationship. Individuals who readmitted to treatment were more likely to have comorbid substance problems (alcohol and drugs) and psychiatric diagnoses. Castel et al. (2006) also found that the average number of admissions was higher in addiction clients with more comorbid problems.

Havassy and Hopkin (1989) identified factors which differentiated patients with multiple admissions from those with only a single admission. Participants were admitted to an acute psychiatric inpatient unit and received psychiatric services. Individuals with more than one admission were more likely to be chronically unemployed and have a diagnosis of schizophrenic or affective disorder. The authors found that having a history of prior admissions was predictive of further hospitalizations. Other studies also demonstrate that a history of even a single previous treatment is predictive of further treatment (Boyle, Polinsky, & Hser, 2000; Finney & Moos, 1995).

Number of admissions in problem gamblers

Only one study was found that examined number of admissions in problem gamblers. Jackson, Dowling, Thomas, and Holt (2008) examined the number of admissions of problem gamblers by comparing new clients and returning clients attending gambling treatment. Returning clients were more likely to have lower rates of employment, higher rates of receiving pensions or benefits, and lower incomes compared to new clients. There is a need for further research to identify the range of factors that may influence problem gamblers to return for additional treatment.

Non-compliance

Compliance is the extent to which a person's behaviour coincides with medical or health advice (Winnick, Lucas, Hartman, & Toll, 2005). Compliance is not a unique issue to problem gambling treatment; it is an on-going issue in many areas: medical advice, prescription drug use, exercise training, smoking cessation therapy, and substance addiction therapy (Ainsworth & Hagino, 2006; Castel et al., 2006; DiMatteo, 2004; Winnick et al., 2005). DiMatteo (2004) found that there were no demographic

differences between patients who complied with medical recommendations and those who did not. Compliance was high for more “life threatening” diseases such as HIV and cancer, while it was low for diabetes and pulmonary diseases. Castel et al., (2006) found that clients in addiction treatment with more comorbid psychiatric problems had better treatment compliance, compared to those without comorbid problems.

Compliance in exercise programs is better when a patient’s motivation and self-esteem are higher (Ainsworth & Hagino, 2006). Non-compliant patients had lower motivation and sedentary lifestyles, and claimed being too busy and forgetting to exercise as reasons for not maintaining the exercise program. Ainsworth and Hagino (2006) discussed the importance of identifying "likely to comply" and "not likely to comply" patients in prescribing programs. Categorizing patients allows for more attention to the non-compliant patient in order to create an individualized program which addresses their barriers to compliance (Ainsworth & Hagino, 2006). In addition to the strain on health care resources, non-compliance also results in diseases, lower quality of life, and even death which could have been prevented (DiMatteo, 2004).

Non-compliance in problem gamblers

Although problem gambling prevalence rates are reported to be quite high, only a small proportion of problem gamblers will seek treatment (Leblond, Ladouceur, & Blaszczynski, 2003). Hodgins and el-Guebaly (2000) found that individuals with a history of pathological gambling were reluctant to seek treatment for various reasons, including wanting to handle the problem on their own, feeling treatment was unnecessary, and not knowing the availability of treatment. Problem gamblers often seek support from family members or other community social networks before admitting

themselves into a formal treatment program (Clarke, Abbott, DeSouza, & Bellringer, 2007). When individuals do enter into a treatment program it is usually because they have experienced a serious financial or emotional crisis, job loss, or criminal charges (Australian Medical Association, 1999; Pulford, Bellringer, Abbott, Clarke, Hodgins, & Williams, 2009). It is at this point the problem gambler realizes the seriousness of his or her actions (Clarke et al., 2007). Another factor that influences the problem gambler to enter into professional treatment is pressure from loved ones. Problem gamblers are often referred or pressured into treatment by their significant others or people in their immediate social network (Raylu & Oei, 2007). These problem gamblers felt as though they did not need help, but entered the program to satisfy the demands of their loved ones. Although these studies have shown that many problem gamblers are pressured into treatment, the majority of individuals receiving professional treatment were found to have sought help for their own problem (Rush & Moxam, 2001; Urbanoski & Rush, 2006).

It has also been noted that problem gamblers are reluctant to enter treatment or may stop their treatment due to their perception of treatment being unsatisfactory. The main reason reported by problem gamblers for stopping treatment was that they “didn’t like the treatment” (Department of Justice, 2004, p.16).

Non-compliance in treatment is very common for problem gamblers: drop out rates have been found to range from 43 percent to 80 percent (Grant, Kim, & Kuskowski, 2004). However, only a few studies have examined predictors of non-compliance in problem gamblers. Crisp, Thomas, Jackson, Thomason, Smith, Borrell, et al. (2000) found that females were more likely to drop out of treatment. Grant et al. (2004) examined the correlates of treatment retention, by comparing the demographic

characteristics of those who dropped out of treatment and those who remained in treatment. None of the demographic predictors (e.g., age, gender, marital status) measured in the study significantly predicted dropout. Leblond et al. (2003) examined the characteristics of pathological gamblers who completed treatment compared to those who terminated treatment prematurely. Treatment completer and drop out groups were compared on sociodemographic variables of age, gender, education level, job status, marital status, family income, family structure, religion, and place of birth. The authors found no significant difference between the two groups on any of the variables.

Echeburua, Fernandez-Montalvo, and Baez (2001) examined demographic, personality, and psychopathology variables to identify the profile of an individual who would not complete gambling treatment. The results showed that 14.5% of participants dropped out of treatment. The only variable that significantly differentiated treatment drop out was state-anxiety, where those with high levels of anxiety were more likely to drop out of treatment.

Milton, Crino, Hunt, and Prosser (2002) examined factors that may predict treatment completion. Gamblers with a comorbid drinking problem were 2.5 times more likely to drop out of treatment than those without comorbid drinking problems. A similar result was demonstrated for comorbid drug users, where an odds ratio of 2.6 was reported between comorbid drug use and dropping out of treatment. Poor compliance was also predicted by the duration of gambling: those individuals who had gambled at a problem level for more than ten years were 2.5 times more likely to drop out of treatment than those with a shorter history of problem gambling (Milton et al., 2002). These studies demonstrate that problem gamblers with a comorbid problem are more likely to drop out

of treatment, unlike substance addiction clients who demonstrate the opposite pattern: as comorbid problems increase, their treatment compliance also increases (Castel et al., 2006).

The Present Study

The present study explored factors that may be related to treatment non-compliance and the number of admissions in the population of clients receiving addiction treatment in Thunder Bay between 2003 and mid-2006. These factors included demographic indices, whether they also have mental health problems, or other health problems. A second purpose of the present study is to further examine the distinction between Primary and Secondary Gamblers identified by Nguyen (2007) as these two groups demonstrated different profiles in demographics and comorbidity. The present study explored whether this distinction is also related to treatment non-compliance and the number of admissions.

Method

Clients

The data for 2,743 clients who entered treatment for addictions at St. Joseph's Addiction Treatment Centre in Thunder Bay between August 2003 and December 2006 was taken from the Catalyst database. There was no identifying information provided in the database used for this study. All clients remained completely anonymous.

The addiction treatment programs offered at St. Joseph's consist of several options which range from substance abuse treatment, co-occurring substance/drug abuse and problem gambling treatment, and problem gambling treatment. Although there are several options for treatment programs, clients may be admitted to a program that is not

specific to their needs because that may be the only addiction program running at that time. Although treatment data was available in Catalyst, the program director advised that any program related variables were not meaningful to analyze because of how individuals are admitted into programs. Therefore, the specific treatment types were not examined in the present study.

Catalyst Database

Every client that enters addiction treatment in Ontario is required to complete an assessment, where individuals are asked to provide information about themselves. Clients are given an automatically generated client number that allows the individual to remain completely anonymous when they are entered into the system. The assessment includes a 7-item gambling screen developed by CAMH (see Appendix A). The first 5 items on the screen are similar to questions on the South Oaks Gambling Screen and assess whether the clients have gambled more than intended, have falsely claimed to be winning, have felt guilty about their gambling, have been criticized for their gambling and have had arguments about their gambling. The next question asks whether they felt they had to continue gambling until they won. The last question asks for the frequency of these occurrences. Those answering "yes" to 3 or more questions are categorized as having a gambling problem; unless question 7 shows that these occurrences were only once. Although this gambling screen is derived from the SOGS, the screen is different from the validated tool and therefore the CAMH screen does not have the same validity as the SOGS.

As part of the assessment clients are asked to describe why they are seeking treatment. The responses are entered into preexisting categories in Catalyst as Presenting

Issues. Up to seven Presenting Issues are entered. According to CAMH, these issues are not indicative of severity, simply the order that the issue was brought up by the client upon intake. However, it is reasonable to assume that those who report gambling as their first presenting issue may have a more salient and perhaps more serious gambling problem than those who report a different addiction problem first.

The additional measures from Catalyst examined in the present study were:

- a) *Demographic information*: gender, age, marital status, education level (1 = some primary, 2 = some secondary, 3 = completed high school, 4 = some college, 5 = some university), legal problems (yes/no), employment status, and source of income.
- b) *Mental health diagnoses*: anxiety disorder, depression, ADHD, personality disorder, psychotic disorder, bipolar disorder and other disorders (not specified).
- c) *Health conditions*: blood pressure problems, cancer, chronic pain, diabetes, eating disorders, heart disease, Hepatitis C, STD, stomach/gastrointestinal problems, visual problems, mobility problems, and pregnancy status.

Procedure

Permission to access the data was granted by Lakehead University Research Ethics Board and the Addiction Treatment Centre Ethics Committee of St. Joseph's Care Group (see Appendix B for a copy of the ethics approval). Nguyen (2007) created an SPSS data file from the Microsoft Excel spreadsheet supplied by CAMH which contained a single line of data for each client, usually the first admission. Nguyen used presenting issues to separate those who had a gambling problem identified on the gambling screen into two gambling groups, based on what they reported as their first presenting issue. A total of 138 clients reported "gambling" as their first presenting issue. Nguyen called those who

reported gambling as their first presenting issue “Primary Gamblers” ($N = 138$), while the other problem gamblers ($N = 280$), who reported other first presenting issues were called “Secondary Gamblers”. The Primary and Secondary gambling groups were also compared to a third group, those with a substance addiction, but no gambling problem who were called “Substance Problem Only” ($N = 2,178$).

This file was augmented for the present study by adding two new outcome variables: non-compliance and number of admissions. The process by which the two new outcome measures were created is described below:

1. Non-compliance:

The groups were compared on indicators of treatment non-compliance by examining the variable “Reason for Termination” which has the following outcomes: client withdrew and notified staff, completed program, deceased, drop out, external transfer - other than hospitalized, hospitalized, incarcerated, internal program transfer, mutually agreed upon termination, other, terminated by staff/involuntary discharge, and unknown.

Non-compliance in the present study was categorized as:

a) Compliant: completed program, client withdrew and notified staff, external transfer - other than hospitalized, internal program transfer, hospitalized, incarcerated, mutually agreed upon termination, terminated by staff/involuntary discharge.

b) Non-compliant: drop out, other, unknown, missing.

The director of the Addiction program said her agency is most interested in learning about those clients who simply disappear, i.e., drop out without consulting the agency. Such consultation can be beneficial to the client, for example it may result in

them being directed to alternative services that better meet their needs. Her concern was with the clients who disappear and remain untreated since they do not receive needed assistance. These clients will have reasons for leaving as either: drop out, unknown, missing or other. Based on her recommendation, these clients were classified as Non-compliant, and those with other reasons for program termination were classified as Compliant.

Since this study is part of a project initiated by the agency to obtain findings that may aid in service delivery or planning, her recommendations were adhered to. However, this definition of non-compliance may be at odds with definitions used in the literature, for two reasons: a) the category ‘client withdrew and notified staff’ might be viewed as non-compliant in some studies since it does involve dropping out and not completing the program; b) the category ‘missing’ might just be treated as missing data in other studies rather than treated as non-compliant, since in any study missing data can happen for a variety of reasons. For these reasons, a second definition of non-compliance was also examined; in which missing data were excluded and the category ‘client withdrew and notified staff’ was treated as Non-complaint. The findings from this set of analyses are included in Appendix C, and described briefly in the Discussion.

2. Number of admissions

Number of admissions was measured by counting the number of times a unique case number occurs. The number of admissions was logarithmically transformed for the analyses as it was positively skewed (Crisp, Jackson, Thomas, Thomason, Smith, Borrell, et al., 2001). While analyses were conducted on the logarithmic transformed number of

admissions, descriptive statistics are presented for the original variable since it is inherently more meaningful.

Data analysis

To compare the groups, ANOVAs followed by SNK post-hoc tests or Chi square tests with pairwise Chi squares as post-hoc tests followed by modified Bonferroni corrections were used (Howell, 2002). Two orthogonal comparisons among the groups were of primary interest. Comparing the Primary to the Secondary Gamblers specifically tests whether the order of issue presentation is an important indicator of problem severity. The second comparison, between the Primary and Secondary groups combined versus the non-gamblers tells whether, overall, those with a gambling problem are different from those without a gambling problem.

Predictors of the outcome measures were explored using Chi-square tests, one-way ANOVAs, and correlations. The predictors included: demographic measures (legal status, education, gender, age, income source, employment status, and marital status), health problems, and mental health diagnosis. Age and the number of admissions was not examined due to the confounded relationship between the variables. To examine if any predictors contributed unique variance, hierarchical logistic and multiple regression were used. In the first step, three measures of socioeconomic status (SES), education level, employment status and income source were entered. In the second step, the other demographic variables were entered. In the last step, the group variable was entered as two dummy variables, one comparing the Primary to the Secondary Gamblers, and the other comparing the Primary and Secondary groups combined to the non-gamblers. Hierarchical analyses were conducted to control for SES when looking at other

demographic measures, and to control for all demographic measures when examining gambling group differences.

Results

Demographics

The clients had a mean age of 34.83 years ($SD = 14.58$), and 62.7% were male. The mean education was 2.51 ($SD = 1.02$), where a score of 2 indicates that the individual has “some primary education” and a score of 3 indicates “completed high school”. For income source, 23.0% of clients were relying on welfare or disability, 20.7% had no income, 19.4% rely on employment, 17.9% rely on family support or other, and 6.9% rely on retirement or insurance. In terms of marital status, 58.1% of clients were single (not married), 23% were married or living in common-law marriages, 15.2% were separated or divorced, and 2.2% were widowed. For employment, 42.4% of clients were not in labour force, 22.8% were employed full-time or part-time, 20.6% were students (in training), 11.2% were disabled, and 3.0% were retired. The majority of clients had legal problems (68.7%).

Treatment Compliance

Compliance was created by taking the variable “Reason for Termination” in Catalyst and grouping labels into two categories: compliant and non-compliant. The majority of clients were treatment compliant (80.7%).

Primary versus Secondary Gambler. There were significant differences in treatment compliance among the groups, $\chi^2(2, N = 2592) = 26.88, p < .001$. Pairwise Chi-square post hoc comparisons showed that Primary Gamblers were significantly more likely to be non-compliant than Substance Problem Only Clients ($p < .001$). As well, the

Secondary Gamblers were significantly more non-compliant than the Substance Problem Only Clients ($p = .001$). Primary and Secondary Gamblers did not show significant differences in treatment non-compliance ($p = .192$) (see Table 1).

Table 1
Treatment compliance by group

	Primary Gambler (%)	Secondary Gambler (%)	Substance Problem Only (%)
Non-compliant	42 (30.7%)	69 (24.6%)	357 (16.4%)
Compliant	95 (69.3%)	211(75.4%)	1818 (83.6%)

Demographic predictors. Demographic measures were examined to determine whether any were related to compliance. Those clients who were treatment non-compliant versus treatment compliant were compared on each demographic predictor. Correlations were used for the two score type measures (age and education level), while Chi Square tests were used for the category type measures. Presented below are the findings from those analyses.

There was a significant difference in treatment compliance between males and females, $\chi^2(1, N = 2592) = 4.28, p = .039$. Males were significantly more likely than females to be treatment compliant (see Table 2).

Table 2
Gender by treatment compliance

	Male (%)	Female (%)
Non-compliant	274 (16.9%)	194 (20.1%)
Compliant	1352 (83.1%)	772 (79.9%)

There was a significant negative correlation with treatment compliance and a client's level of education, $r(2445) = -0.068, p = .001$, where individuals with more education were more often non-compliant. There was no significant correlation between age and treatment compliance, $r(2592) = -0.001, p = .962$.

Significant differences in treatment compliance were found between clients who did or did not have legal problems, $\chi^2(1, N = 2592) = 4.18, p = .04$. Those with legal problems were more likely to be treatment compliant than those without any legal problems (see Table 3). However, the differences between the groups are quite small and may be reflecting the large sample size of the database.

Table 3
Legal problems by treatment compliance

	Legal Problems	
	Yes (%)	No (%)
Non-compliant	303 (17.0%)	165 (20.3%)
Compliant	1478 (83.0%)	646 (79.7%)

Relationship status was significantly related to treatment compliance, $\chi^2(3, N = 2561) = 24.72, p < .001$. Post hoc comparisons showed that married/partnered clients were significantly more likely to be non-compliant than single (never married) clients ($p < .001$). As well, separated or divorced individuals were significantly more non-compliant than single (never married) clients ($p = .001$) (see Table 4).

Table 4
Relationship status by treatment compliance

	Married/Partnered (%)	Separated or divorced (%)	Single (never married) (%)	Widow or widower (%)
Non-compliant	142 (23.5%)	84 (21.3%)	226 (15.0%)	9 (16.1%)
Compliant	462 (76.5%)	323 (78.7%)	1281 (85.0%)	47 (83.9.2)

Income source was significantly related to treatment compliance, $\chi^2(4, N = 2279) = 11.94, p = .018$. Pairwise post-hoc comparisons showed that individuals with employment as their income source were significantly more likely to be non-compliant than individuals on welfare or disability ($p = .004$) and individuals with no income source ($p < .001$) (see Table 5).

Table 5
Income source and treatment compliance

	Retirement or Insurance (%)	Employment (%)	Welfare or Disability (%)	Family Support or Other (%)	None (%)
Non-compliant	34 (19.1%)	120 (23.9%)	110 (18.4%)	80 (17.3%)	86 (16.0%)
Compliant	144 (80.9%)	383 (76.1%)	487 (81.6%)	383 (82.7%)	452 (84.0%)

Employment status approached significance, $\chi^2(4, N = 2507) = 9.02, p = .06$ (see Table 6). However, since the overall difference was not significant, no post-hoc comparisons were conducted.

Table 6
Employment status by treatment compliance

	Employed FT or PT (%)	Disabled (%)	Retired (%)	Student (training) (%)	Not in labour force (%)
Non-compliant	131 (22.2%)	44 (15.2%)	14 (18.4%)	92 (17.2%)	175 (17.2%)
Compliant	460 (77.8%)	246 (84.8%)	62 (81.6%)	443 (82.8%)	840 (82.8%)

Health disorders. The Catalyst file included a number of health disorders, and those disorders which had adequate sample size were examined to determine their relationship to treatment compliance. Each health disorder was analyzed separately; since they were not mutually exclusive (clients could have more than one). Significant differences in treatment compliance were found between individuals who did or did not have visual problems. Those with visual problems were more likely to be non-compliant with treatment than those with no visual problems (see Table 7). Significant differences in treatment compliance were also found between clients who did or did not have mobility problems. Those with mobility problems were more likely to be non-compliant with treatment than those without any mobility problems. Two health disorders approached significance: eating disorders and sexually transmitted diseases (STDs).

Table 7
Health disorders by treatment compliance

Health Disorder	Non-compliant (%)	Compliant (%)	Statistic $\chi^2(1, N = 2592)$	<i>p</i>
Blood pressure problems	25 (18.0)	114 (82.0)	0.000	.982
Cancer	2 (10.5)	17 (89.5)	0.733	.392
Chronic pain	9 (19.1)	38 (80.9)	0.039	.844
Diabetes	14 (14.7)	81 (85.3)	0.734	.392
Eating disorders	7 (31.8)	15 (68.2)	2.84	.090
Heart disease	6 (14.0)	37 (86.0)	0.497	.481
Hepatitis C	10 (17.2)	48 (82.8)	0.027	.870
STD	6 (33.3)	12 (66.7)	2.86	.090
Stomach/Gastrointestinal	24 (18.2)	108 (81.8)	0.001	.969
Mobility	47 (24.6)	144 (75.4)	5.98	.014
Visual	98 (23.3)	322 (76.7)	9.44	.002
Pregnant	5 (22.7)	17 (77.3)	0.327	.567

Note: See Appendix D for alternative analyses comparing non-compliant clients with and without the health disorders

Mental health diagnoses. In addition to the health conditions examined, a number of mental health measures were examined to determine their relationship with treatment compliance. Each diagnosis was analyzed separately, since they were not mutually exclusive. None of the mental health measures were significantly related to treatment compliance (see Table 8).

Table 8
Mental health diagnoses by treatment compliance

Mental Health Diagnosis	Non-compliant (%)	Compliant (%)	Statistic $\chi^2(1, N = 2592)$	<i>p</i>
ADD	12 (15.0)	68 (85.0)	0.521	.470
Anxiety	10 (17.5)	47 (82.5)	0.010	.919
Depression	12 (14.0)	74 (86.0)	1.01	.315
Personality	4 (21.1)	15 (78.9)	0.116	.733
Psychotic	3 (12.0)	22 (88.0)	0.626	.429
Bipolar	13 (22.8)	44 (77.2)	0.889	.346
Other	20 (18.7)	87 (81.3)	0.031	.861

Note: See Appendix D for alternative analyses comparing non-compliant clients with and without the mental health disorders

Number of Admissions

The number of admissions was found to be positively skewed (Skew = 17.25). The number of admissions was logarithmically transformed for the analyses to improve the skew (Skew = 2.7). All of the analyses were performed using the logarithmic transformed number of admissions, however, the means for the original variable are presented, as they are more meaningful. The mean number of admissions was $M = 2.19$, $SD = 6.59$. The range for the number of admissions was 1 to 191.

Primary versus Secondary Gambler. There were significant differences in the number of admissions among the three groups, $F(2, 2592) = 7.413, p = .001$, where Primary Gamblers had a significantly lower mean number of admissions, compared to the other two groups (see Table 9). Post-hoc SNK tests indicated that the mean number of admissions for the Secondary Gambler group is significantly higher than both the Primary Gambler and Substance Problem Only groups ($p = .05$).

Table 9
Number of admissions by group

Group	<i>M</i>	<i>SD</i>
Primary Gambler	1.46	1.70
Secondary Gambler	2.61	5.75
Substance Problem Only	2.18	6.88

Demographic predictors. Demographic measures were examined to determine whether any were related to the number of admissions. The analysis compared each demographic predictor with the logarithmic transformed number of admissions. One-way ANOVA tests were used with SNK post hoc tests. Correlations were also used when appropriate. Presented below are the findings from those analyses.

The relationship between the number of admissions education level was examined using correlation. The correlation between education level and the number of admissions was not significant, $r(2448) = -0.003, p = .882$.

Employment status was significantly related to the number of admissions, $F(4, 2590) = 7.50, p < .001$. Post-hoc SNK tests revealed that those retired and students (training) had significantly fewer admissions than those who were disabled or not in the labour force. Those employed FT or PT had an intermediate mean that did not differ significantly from either the higher or lower sets of groups (see Table 10).

Table 10

Number of admissions by employment status

	<i>M</i>	<i>SD</i>
Retired	1.49	1.46
Student (training)	1.60	3.02
Employed FT or PT	1.84	3.90
Not in labour force	2.34	6.19
Disabled	3.61	13.87

Males ($M = 2.34, SD = 7.67$) did not differ significantly from females ($M = 1.94, SD = 4.19$) in the number of admissions, $F(1, 2593) = 2.40, p = .122$. Clients with legal problems ($M = 2.63, SD = 8.64$) did not differ significantly from those with no legal problems ($M = 2.05, SD = 5.83$), $F(1, 2593) = 3.20, p = .074$. Income source was not

significantly related to the number of admissions, $F(4, 2276) = 1.86$, $p = .116$ (see Table 11).

Table 11
Number of admissions by income source

	<i>M</i>	<i>SD</i>
Family support or other	1.60	1.84
None	1.78	3.31
Employment	2.04	7.79
Retirement/Insurance	2.06	5.48
Welfare or Disability	2.26	5.47

There was no significant difference between relationship status and the number of admissions, $F(3, 2563) = 1.38$, $p = .246$ (see Table 12).

Table 12
Number of admissions by relationship status

	<i>M</i>	<i>SD</i>
Married/Partnered	2.36	7.81
Separated or Divorced	2.24	3.96
Single (Not married)	2.10	6.64
Widow or widower	2.88	7.70

Health disorders. The health disorders analyzed in the previous section were also examined to determine their relationship with the number of admissions. Each health disorder was analyzed separately, since they were not mutually exclusive. The mean number of admissions for clients with and without each health disorder is reported below (see Table 13).

Table 13
Other health disorders by number of admissions

Health Disorder	Yes <i>M (SD)</i>	No <i>M (SD)</i>	Statistic <i>F(1, 2593)</i>	<i>p</i>
Blood pressure problems	2.37 (7.04)	2.18 (6.57)	0.085	.772
Cancer	2.11 (3.08)	2.19 (6.61)	0.000	.989
Chronic pain	2.38 (3.40)	2.19 (6.57)	0.607	.436
Diabetes	2.75 (7.27)	2.17 (6.57)	2.96	.086
Eating disorders	1.32 (.568)	2.20 (6.62)	0.787	.375
Heart disease	2.60 (6.06)	2.18 (6.62)	1.87	.172
STD	1.11 (.323)	2.20 (6.62)	2.72	.099
Stomach/Gastrointestinal	1.91 (2.65)	2.20 (6.62)	0.474	.491
Mobility	1.87 (3.19)	2.21 (6.79)	0.862	.353
Visual	2.50 (9.62)	2.13 (5.83)	5.02	.025
Pregnant	2.27 (2.39)	2.19 (6.62)	1.50	.221

There was only one significant difference in the number of admissions: between those who did or did not have a visual problem. Individuals with visual problems had a higher mean number of admissions than those without any visual problems (see Table 13). Although no other significant effects were found for the health conditions, some did approach significance: STD's and diabetes (see Table 13).

Mental health diagnoses. A number of mental health measures were examined to determine their relationship with the number of admissions. Each measure was examined separately. The mean number of admissions for individuals with and without the mental health diagnosis is reported below (see Table 14). There was a significant difference in the number of admissions for those with or without a diagnosis of psychotic disorder. Those individuals with the diagnosis had a higher mean number of admissions compared to those without the disorder (see Table 14). The remaining diagnoses did not show any significant relationships to number of admissions.

Table 14
Mental health diagnoses by treatment compliance

Mental Health Diagnosis	Yes <i>M (SD)</i>	No <i>M (SD)</i>	Statistic <i>F(1, 2593)</i>	<i>p</i>
ADD	3.19 (10.06)	2.16 (6.45)	1.53	.215
Anxiety	2.29 (4.56)	2.19 (6.63)	0.427	.514
Depression	2.56 (6.36)	2.18 (6.60)	0.392	.531
Personality	1.37 (.83)	2.20 (6.61)	0.720	.396
Psychotic	4.60 (11.33)	2.17 (6.53)	4.33	.038
Bipolar	2.26 (3.38)	2.19 (3.65)	1.07	.299
Other	1.96 (2.99)	2.18 (6.70)	0.005	.943

Multivariate analyses

Logistic regression. The previous sections examined a range of predictors of non-compliance. Many of these variables may share a common prediction. For example, those on a pension are more likely to be retired and older. The following analyses use logistic regression to identify which variables contribute a unique prediction, not shared by the other variables. Orthogonal coding was used to create two dummy variables to compare the three gambling groups. The first variable compared Primary Gamblers to Secondary Gamblers; the second variable compared both gambling groups to Substance Problem only clients. The predictors were entered in three steps, and those which made a significant unique contribution to the prediction are reported. As well, for those significant predictors that are dichotomous, odds ratios and 95% confidence intervals for the odds ratios are also reported. In the first step, education level, employment status and income source (all measures of socioeconomic status [SES]) were entered. In the second step gender, relationship status, legal status and age were entered. In the third step gambling group was entered. Four category variables were converted to dichotomies for these analyses, to facilitate interpretation. Income was converted to better sources (employment, retirement/insurance, welfare/disability) versus poorer sources (family

support/other, none). Education was converted to higher level of education (some college or some university) versus lower levels of education (some primary, some secondary or completed high school). Relationship status was converted to single versus other. Employment was converted to employed, retired or disabled versus student or unemployed. These latter two variables were created to reflect the main differences that were apparent between groups on those variables in the univariate analyses. Mental health and other health conditions were excluded because of the large number of categories and minimal significant results in the univariate analyses

The variables significantly predicted treatment compliance, $\chi^2(9, N = 2048) = 49.66, p < .001$, explaining 3.9% of the variability. The first step explained 0.5% of the variability, the second step explained 2.2% and the third explained 1.2% of the variability. Significant unique prediction, relative to the other variables, was found for four variables: age, $p = .02$, where younger individuals were more likely to be non-compliant, relationship status, $p < .001$, where those who are not single were more likely to be non-compliant; legal status, $p = .018$, where clients with no legal problems were more likely to be non-compliant; and the gambling groups versus Substance Problem Only clients, $p < .001$, where the gamblers were more likely to be non-compliant (See Table 15).

Table 15

Predictors of logistic regression, p values, percent variance (Nagelkerke R²) explained by step entered

Step	Predictors	Odds Ratio (C.I.)	Statistic	p	% variance explained
1			$\chi^2(3, N = 2048)$ = 6.02	.111	0.5
	Education level	1.24 (.95-1.61)		.110	
	Employment status	1.02 (.82-1.28)		.840	
	Income source	1.19 (.95-1.50)		.136	
2			$\chi^2(4, N = 2048)$ = 28.71	< .001	2.2
	Age	1.01 (1.00-1.02)		.02	
	Gender	1.19 (.95-1.51)		.126	
	Relationship status	1.84 (1.39-2.43)		< .001	
	Legal status	1.35 (1.05-1.73)		.018	
3			$\chi^2(2, N = 2048)$ = 14.93	.001	1.2
	Primary versus Secondary	1.02 (.78-1.33)		.860	
	Gamblers versus Substance Problem Only	1.20 (1.09-1.33)		< .001	

Multiple regression. A multiple regression was conducted using the same predictor variables as the logistic regressions, but with the log number of admissions as the dependent variable. The overall prediction was significant, $R^2 = .011$, $F(8, 2041) = 2.76$, $p = .005$. The first step, SES, explained 0.2% of the variability, the second step, gender, legal status, and relationship status explained 0.3% of the variability, and the third step, group, explained 0.6% of the variability. Significant unique prediction was made by relationship status ($p = .038$), and Primary versus Secondary Gamblers ($p = .001$), with individuals who are single and Secondary gamblers having a higher number of admissions (see Table 16).

Table 16
Predictors of multiple regression, p values, R² change by step entered

Step	Predictors	Correlation	Statistic	p	R ² Change
1			F(3, N = 2046) = 1.47	.219	.02
	Education level	0.025		.251	
	Employment status	-0.022		.319	
	Income source	0.026		.231	
2			F(6, N = 2043) = 1.66	.128	.03
	Gender	-0.022		.325	
	Relationship status	0.046		.038	
	Legal status	0.013		.572	
3			F(8, N = 2041) = 2.76	.001	.06
	Primary versus Secondary	-0.075		.001	
	Gamblers versus Substance Problem Only	0.003		.890	

Discussion

The present study explored factors that may be related to treatment non-compliance and number of admissions in the population of clients receiving addiction treatment in Thunder Bay between 2003 and mid-2006. The distinction between Primary and Secondary Gamblers identified by Nguyen (2007) was not found to be useful for predicting treatment non-compliance but did predict the number of admissions. A number of factors were found to predict treatment compliance and number of admissions, and these findings are described below.

Non-compliance

Primary versus secondary gambler. The results showed that the two gambling groups were significantly more likely to be non-compliant than the Substance Problem Only clients. Primary Gamblers had the highest proportion (30.7%) of non-compliant

clients. This finding remained significant even when the demographic variables were controlled using logistic regression. The pattern of non-compliance is lower than findings reported by Grant et al. (2004) where rates of non-compliance were found to range from 43 percent to 80 percent. However, the proportion of non-compliance is higher than those reported by Echeburua et al. (2001) where 14.5 percent of the participants were non-compliant. Differences in the rates of compliance observed between the present study and previous findings may reflect different definitions of compliance. Compliance can indicate simply attending treatment after the initial assessment, remaining in treatment for the duration of a program, or staying in treatment for a specific number of days (Castel et al., 2006; Ingle, Marotta, McMillan, & Wisdom, 2008). Non-compliance has been defined as those who choose to discontinue treatment (Crisp et al., 2000; Grant et al., 2004). Ingle et al. (2008) categorized non-compliance as those individuals who did not attend treatment services. Grant et al. (2004) defined non-compliance as individuals who chose to stop attending treatment for a specific reason. These reasons ranged from missing the thrill of gambling, hopelessness about getting better and having no support, and wanting to try alternative therapies (Grant et al., 2004).

A number of demographic factors: age, gender, level of education, employment, legal problems, relationship status, and income source were found to be significantly related to treatment non-compliance. Significant unique prediction was found for three demographic variables: age, relationship status, and legal status. However, these significant findings are due in part to the large sample size of the database, and reflect rather small effect sizes. Nevertheless, the findings could be of clinical relevance for

practitioners as they identify important service variables which relate to treatment non-compliance. These findings are discussed below.

Age. Logistic regression found age to contribute significant unique variance. Younger individuals were significantly more likely to be non-compliant compared to older individuals. This finding is consistent with Rehm, Gschwend, Steffen, Gutzwiller, Dobler-Mikola, and Uchtenhagen (2001) study which found that non-compliant addiction clients tended to be younger.

Gender. Females were significantly more likely than males to be treatment non-compliant. This finding is consistent with previous studies (Arfken, Klein, di Menza, & Schuster, 2001; Crisp et al., 2000) where females were more likely to drop out of treatment. The number of female problem gamblers is increasing (Piquette-Tomei, Norman, Dwyer, & McCaslin, 2008) and these individuals have different presenting problems compared to males, which creates challenges for effective treatment (Wenzel & Dahl, 2009). Females who enter treatment have been found to have greater problems in their life (e.g., childhood physical neglect, emotional abuse, sexual abuse, and depression) and enter treatment with different areas of concern (e.g., parenting issues) (Grella, Polinsky, Hser, & Perry, 1999; Petry & Steinberg, 2005; Wenzel & Dahl, 2009). Furthermore, mixed-gender models of service delivery are less effective for women (Currie, 2001), which has led to the development of gender specific treatment programs (Piquette-Tomei et al., 2008). However, in spite of such programs, females still exhibit higher non-compliance, as was found in the present study. Greater efforts to appropriately serve female addiction clients may need to be considered.

Level of education, income source, and employment. These variables are interrelated: those individuals with higher levels of education typically have better sources of employment and income compared to individuals with lower levels of education. This study found that individuals with a higher level of education, better sources of income and better employment were significantly more likely to be treatment non-compliant. This finding appears paradoxical: one would expect that an individual who is more educated would be more responsible, but in the present study this was not the case. Although this finding appears to be contradictory, other studies have found the same pattern of results. Previous research (Petry, 2003; Shaffer et al., 2004) has found that individuals with lower levels of socioeconomic status do not spend as much money on their addiction as higher socioeconomic status individuals, but the money they do spend is a large proportion of their income and they cannot afford to maintain that behaviour. When this situation arises, entering treatment may be a convenient option since, in certain treatment settings (i.e., residential), many living expenses are covered. Individuals with better sources of income and employment have the option of going home and back to work, while not fully addressing their addiction problem. However, some studies have found either no relationship between treatment compliance and level of education or income source (Leblond et al., 2003), or even the reverse relationship where more years of education protected against drop-out (Olfson, Mojtabai, Sampson, Hwang, Druss, Wang et al., 2009). The reasons for these diverse findings are unclear and suggest a direction for future research.

Legal problems. Clients who did not have legal problems were more likely to be non-compliant with treatment. This finding was also supported with logistic regression

where a significant unique prediction was found. Again this finding seems paradoxical, since those who do not comply with the law were more likely to comply with treatment. Yet it is consistent with a study by Sayre, Schmitz, Stotts, Averill, Rhoades, and Grabowski (2002) who found that clients with a history of legal problems were more likely to complete treatment. Addicts are known to commit crimes to compensate for the loss of money associated with their problem (Australian Medical Association, 1999; Raylu & Oei, 2007). Individuals in this situation are in a vicious cycle where legal problems will continue for clients that continue to gamble as a way to cope with or escape from their legal problems (Raylu & Oei, 2007). Sayre et al., (2002) commented that it is possible clients with legal problems were treatment compliant due to enforcement by law or probation/parole officers. In this situation, the other option (e.g., incarceration) may be less appealing.

Relationship status. Clients who were not married were significantly more likely to be treatment compliant, while clients that were married/partnered, or separated/divorced were significantly more likely to be treatment non-compliant. Logistic regression confirmed that this relationship contributed unique variance, where single clients were more likely to be compliant with treatment. These findings are consistent with Olsson et al. (2009) and The Northstar Problem Gambling Alliance (2007) where married clients were found to be significantly more likely to drop out of treatment. Previous research has found that spouses of individuals receiving treatment may respond negatively to their partner's treatment (Roberts, 1996). For example, individuals in Piquette et al.'s (2008) study commented that partners' negative influences were a commonly reported barrier for not accessing treatment services. Furthermore,

single (not married) clients do not have that social support and therefore receive support from their counselor and in turn are more likely to comply with treatment (Bornstein, 1993).

Health conditions. The present study found that individuals with visual problems and mobility problems were more likely to be treatment non-compliant than those without the health conditions. This suggests that addiction clients with these health conditions may not be having their treatment needs adequately addressed. The non-compliance may be related to difficulties in accessing treatment that is appropriate for their disabilities. In any case, this finding highlights an issue that needs to be examined in this, and perhaps in other, addiction treatment facilities.

Although significant unique prediction was found for several variables using logistic regression, only a small proportion of variance (3.9%) was explained for compliance. Demographics and the Primary/Secondary Gambler distinction did not account for much of the variance in treatment non-compliance. It is unfortunate that the Catalyst database lacked a measure of problem gambling severity, since those with less severe gambling problems would be expected to be less compliant. Including a measure of gambling problem severity (e.g., Blaszczynski & Nower, 2002) might have accounted for a larger proportion of variability in compliance, and increased the power of the analyses.

Number of admissions

The mean number of admissions was 2.17 which is somewhat lower than the mean number of admissions generally reported for substance abuse clients, which ranges from 3.5 to 9.5 (Anglin et al., 1997; Neale et al., 2007). The relatively lower mean

number of admissions in the present study may have been affected by the relatively short time frame of the data collection (less than four years). However, the differences observed between the present study and previous findings are not reflective of a longer period of data collection as the studies had a shorter observation period. Nevertheless, a number of factors were found in this study to be significantly related to the number of admissions, and these are described below.

Primary versus Secondary gambler. There were significant differences in the number of admissions among the three gambling groups. Primary Gamblers had a significantly lower mean number of admissions ($M = 1.46$) than Secondary Gamblers ($M = 2.61$) and Substance Problem Only ($M = 2.18$) clients; the latter two groups also differed significantly. The difference between the Primary and Secondary gambling groups remained significant when demographic variables were controlled using multiple regression. This pattern of findings, where the Primary Gamblers differed significantly from the other two groups and the Secondary Gamblers differed in the other direction from the Substance Problem Only clients, contrasts with the pattern of findings from compliance, where the two gambling groups did not differ from each other but did differ significantly from the Substance Problem Only group. However, this pattern of findings is consistent with those of Nguyen (2007) for demographic comparisons among the three groups. Nguyen (2007) reported that the Primary Gamblers were significantly more likely than the other two groups to be female, not single, employed or on retirement income, older, better educated and without any legal problems.

One demographic factor, employment status, was found to be related to the number of admissions. As well, multiple regression found relationship status to

contribute significant unique variance relative to the other demographic variables. These factors are discussed below.

Employment status. The main differences show that those who were disabled or not in the labour force had significantly more admissions than retired persons and students (in training). This finding is consistent with previous research which has found that individuals with lower rates of employment or who have difficulty attaining employment were more likely to have repeat admissions into gambling treatment (Havassy & Hopkin, 1989; Jackson et al., 2008). Individuals with poorer sources of employment have restricted incomes and gambling has more of an impact which may increase the likelihood of returning for treatment (Jackson et al., 2008). However, the higher number of admissions among these individuals may simply reflect that they have more time to attend treatment (Jackson et al., 2008). The finding that students (in training) had fewer admissions likely reflects the younger age of this group.

Relationship status. Multiple regression found relationship status to contribute significant unique prediction for the number of admissions. Individuals who are single (not married) had a higher mean number of admissions compared to those who were not single. This finding is consistent with existing literature where those individuals who are single were more likely to return for treatment multiple times (Holstein & d'Elina, 1985).

Health conditions. Individuals with visual problems had significantly more admissions than those without visual problems. This relationship is confounded by age since individuals with visual problems tend to be older.

Mental health diagnoses. Clients with a diagnosis of psychotic disorder had a significantly higher number of admissions than those without the disorder. This finding

is consistent with previous research where individuals with a diagnosis of schizophrenic disorder had more than one admission (Desai & Potenza, 2009). The authors comment that higher utilization of services is indicative of severity of illness among individuals with psychotic disorder and comorbid addictions. The finding that an individual with a comorbid mental health diagnosis is more likely to readmit for treatment is consistent with Castel et al. (2006) who found that individuals with more comorbid problems were more likely to utilize treatment.

Comparison of gambling groups for compliance and number of admissions.

The question of why the Secondary Gamblers behave like the Primary Gamblers in non-compliance, but behave more like the Substance Problem Only group in number of admissions is an intriguing one. The Secondary Gamblers have both a gambling problem and a substance problem. It appears that for compliance, the gambling aspect dominates and they behave like Primary Gamblers. However, for number of admissions, they behave like Substance Problem Only clients. Is there any basis for inferring that compliance and number of admissions measures tap into different processes, with the compliance process more sensitive to issues related to gambling, while the number of admissions is more sensitive to issues related to substance addiction? The answer is “yes” since these two possibilities are consistent with existing research. Problem gamblers are generally found to be non-compliant with treatment and dropping out is a very common outcome for this group of clients (Echeburua et al., 2001; Grant et al., 2004). Substance addiction clients generally show high rates of readmission, ranging from 62.5 percent to 89 percent (Neale et al., 2007), whereas Jackson et al. (2008) only reported 23 percent of problem gambling clients readmitted to treatment. Individuals with several admissions to

treatment have been found to have more severe substance use problems and are more severely impacted by their addiction in several areas of their lives (Claus et al., 1999; Ferri et al., 2002). Thus the present finding that gamblers, both Problem and Secondary, have poorer compliance is consistent with the literature. As well, the finding that those who have a substance addiction, Secondary Gamblers and Substance Problem Only, had more admissions is also consistent with previous findings.

Thus it appears that compliance may more affected by gamblers' reluctance to receive treatment, and that this appears even when the gamblers have a comorbid substance addiction. In contrast, number of admissions appears to be primarily affected by the presence of a substance addiction. Adding in the findings of Nguyen (2007), demographic differences among the three groups also appear to primarily reflect the presence of a substance addiction. Further research is needed to confirm these patterns and to better understand their origins.

Comparison of demographic findings for compliance and number of admissions.

Only two demographic factors, employment source and relationship status, significantly predicted both outcome variables. Those with poorer employment sources were more compliant and had more admissions. Individuals who are not married (single) were more likely to be compliant and have more admissions. However, the other significant findings revealed quite different profiles for those who were non-compliant compared to those who had more admissions. Non-compliant individuals are more likely to be gambling clients, female, younger, have a higher education level, better income source, better employment, and no legal problems. An individual who has more admissions to treatment is a Secondary Gambler or Substance Problem Only client, is

retired, not married (single) and with a higher level of education. These findings present quite different demographic profiles of a person who is likely to be non-compliant versus one who has more admissions. It appears that these two outcome variables are measuring different aspects of treatment utilization and that it is important to consider each separately, as they both provide useful program planning information.

Alternative measure of Non-compliance

The present study defined compliance as a client having some sort of treatment resolution. These individuals have had their treatment program result in an outcome, whereas individuals that were non-compliant are those who simply disappeared. This definition of compliance focuses on the population of clients that is of particular concern to the addiction treatment agency, namely clients who cut all contact. Communication with these clients has been lost and it is not possible for the agency to explore alternative treatment programs, perhaps with a different agency, that would provide the help the clients need. However a second set of analyses were also conducted using perhaps a more conventional definition of non-compliance (see Appendix C). The findings using this measure were somewhat different. With the original measure, males were significantly more likely to be compliant, but with the new measure gender was no longer significant. With the new, but not the old measure, age was a significant variable, where younger individuals were more likely to be non-compliant. However, the majority of the other findings, for gambling group, relationship status, income source and employment status remained significant and mostly unchanged with the different measure. Both measures showed similar trends as the literature with respect to relationship status, income source and employment status (Olfson et al., 2009; Petry, 2003). The findings

using the new measure of non-compliance were not notably more consistent with existing literature than those with the first measure. This lack of consistency is perhaps reflective of the generally contradictory findings with respect to treatment non-compliance (LeBlond et al., 2003; Raylu & Oei, 2007).

Limitations

The main limitation of this study is the lack of a measure of gambling severity. As severity of problem gambling increases, different behavioral and clinical problems arise. Categorizing problem gambling clients by using some sort of severity measure is highly useful for public health practices. Shaffer, Hall and VanderBilt (1999) note that problem, at-risk, in-transition or potential pathological gamblers are more responsive to treatment and social policy interventions than diagnosed pathological gamblers. Unfortunately the Catalyst gambling scale does not yield a measure of gambling severity. Moreover, it is possible that the main difference between the Primary and Secondary gambling groups may simply reflect group differences in severity. It is quite likely that the Primary gamblers had more severe gambling problems than the Secondary gamblers. As well, defining groups based on subjective criteria (i.e., presenting problem) results in an increased population of gambling clients by clumping together individuals who may have minor problems together with pathological gamblers (Blaszczynski & Nower, 2002). This grouping may result in increased Type 1 errors as gamblers experiencing gambling-related problems are misclassified as those who are unable to control and regulate impulses to gamble (Blaszczynski & Nower, 2002). The lack of a gambling severity measure such as those provided by other standardized gambling scales (e.g., PGSI, SOGS) is a major limitation of this study, but one that could not be avoided

because of the secondary nature of the data. We could not control the selection of measures included in the database, how the data were collected, or how the data were entered into Catalyst.

A second limitation is that treatment program, while recorded in Catalyst, is not a useful measure, since clients are assigned to treatment programs largely on the basis of what programs are available when they are admitted. It is possible that some non-compliant gamblers in the present study had simply dropped out of a long duration program because they felt they had received sufficient benefit. Hodgins, Currie, el-Guebaly and Peden (2004) have shown that brief interventions can be effective for less severe problem gamblers. This is an issue that should be explored in future studies.

Another limitation of this study is it was exploratory in nature, so a large number of analyses were conducted, without overall control for Type 1 errors. This was done to identify the maximum number of relationships that might be of potential value for program planners. While many of the relationships were highly significant (p 's < .001), others were less so, and reflected relatively small differences, which may or may not be of clinical value. As well, the dataset only includes one region of Canada, Northwestern Ontario, during one time period (mid-2003 to mid-2006). It may be difficult to apply the findings from this somewhat isolated Northwestern Ontario community to larger metropolitan populations. Because the time period is only a span of less than four years, the present study may be limited by confounds of cultural and social influences present at the time of data collection. However, the consistency of many of the findings with the existing literature (Castel et al., 2006; Crisp et al., 2000; Ferri et al., 2002; Havassy & Hopkin, 1989; Jackson et al., 2008; Neale et al., 2007; Petry, 2003; Raylu & Oei, 2007;

Shaffer et al., 2004) suggests that the clients receiving service from this addiction treatment agency are similar to addiction clients elsewhere.

Future Research

The measures specific to gambling in Catalyst are weaker than existing measures of problem gambling (e.g. PGSI, CPGI). Although Catalyst is weak in its gambling measure, the demographic, substance use, mental health and health condition information provide a great deal of useful information. Future studies should look past the weaknesses of Catalyst and focus on its strengths including the large sample size of addiction treatment centre data. As well, efforts could be made to have a measure of gambling problem severity included in the Catalyst database.

A few unexpected findings emerged: poorer compliance in higher socioeconomic status individuals and those with visual and mobility problems. These issues need to be examined to ensure that appropriate addiction services are provided for everyone regardless of socioeconomic status or disability.

Summary

The present study explored factors that may be related to treatment non-compliance and the number of admissions in a population of addiction clients. The findings revealed quite different demographic profiles of a person who is likely to be non-compliant versus one who has more admissions. Non-compliant individuals are more likely to be Primary Gambling clients, younger, female, have a higher education level, better income source, better employment, and no legal problems. An individual who has more admissions to treatment is likely to be a Secondary Gambler or Substance Problem Only client, and have a poorer source of employment. These findings do not

support the value of the Primary versus Secondary Gambler distinction identified by Nguyen (2007) as the distinction was found to predict number of admissions, but not treatment compliance. Overall, these findings show that treatment non-compliance and the number of admissions are measuring quite different aspects of treatment utilization which indicates that it is important to consider each separately, as they both provide useful program planning information.

References

- Ainsworth, K.D., & Hagino, C.C. (2006). A survey of Ontario chiropractors: Their views on maximizing patient compliance to prescribed home exercise. *Journal of the Canadian Chiropractic Association, 50*(2), 140-155.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, D.C.: American Psychiatric Association.
- Anglin, M.D., Hser, Y., & Grella, C.G. (1997). Drug addiction and treatment careers among clients in the Drug Abuse Treatment Outcome Study (DATOS). *Psychology of Addictive Behaviours, 11*, 308-323.
- Arfken, C.L., Klein, C., diMenza S., & Schuster, C.R. (2001). Gender differences in problem severity at assessment and treatment retention. *Journal of Substance Abuse Treatment, 20*, 53-57.
- Australian Medical Association. (1999). *Problem gambling and public health: Productivity Commission Inquiry into Australia's Gambling Industries, AMA Submission*. Retrieved July 11, 2009, http://www.problemgambling.vic.gov.au/researchdata/documents/ama_submission.pdf.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction, 97*, 487-499.

- Bornstein, R.F. (1993). Dependency and patienthood. *Journal of Clinical Psychology, 49*, 397-406.
- Boyle, K., Polinsky, M., & Hser, Y.I. (2000). Resistance to drug abuse treatment: A comparison of drug users who accept or decline treatment referral assessment. *Journal of Drug Issues, 30*, 555–574.
- Castel, S., Rush, B., Urbanoski, K., & Toneatto, T. (2006). Overlap of clusters of psychiatric symptoms among clients of a comprehensive addiction treatment service. *Psychology of Addictive Behaviours, 20*(1), 28-35.
- Clarke, D., Abbott, M., DeSouza, R., & Bellringer, M. (2007). An overview of help seeking by problem gamblers and their families including barriers to and relevance of services. *International Journal of Mental Health and Addiction, 5*, 292-306.
- Claus, R. D., Mannen, R. K. & Schicht, W. W. (1999). Treatment career snapshots: profiles of first treatment and previous treatment clients. *Addictive Behaviors, 24*, 471–479.
- Colman, A. M. (Ed.). (2003). *Dictionary of psychology* (rev. ed.). New York, NY: Oxford University Press.
- Crisp, B., Jackson, A., Thomas, S., Thomason, N., Smith, S., Borrell., J., et al. (2001). Is more better? The relationship between outcomes achieved by problem gamblers and the number of counselling sessions attended. *Australian Social Work, 54*(3), 83-92.

- Crisp, B., Thomas, S., Jackson, A., Thomason, N., Smith, S., Borrell, J., et al. (2000) Sex differences in the treatment needs and outcomes of problem gamblers. *Research on Social Work Practice, 10*(2), 229-242.
- Crockford, D., & el-Guebaly, N. (1998). Psychiatric comorbidity in pathological gambling: A critical review. *Canadian Journal of Psychiatry, 43*, 43-50.
- Currie, J. (2001). *Best practices: Treatment and rehabilitation for women with substance use problems*. Ottawa, Ontario: Health Canada. Retrieved November 15, 2009 from http://www.hc-sc.gc.ca/hl-vs/alt_formats/hecs-sesc/pdf/pubs/adp-apd/bp_women-mp_femmes/women-e.pdf.
- Department of Justice. (2004). *Problem gamblers, loved ones and service providers* (Victorian Government Publication ISBN 0975119117). Melbourne, VIC: Gambling Research Panel.
- Desai, R.A., & Potenza, M.N. (2009). A cross-sectional study of problem and pathological gambling in patients with schizophrenia/schizoaffective disorder. *Journal of Clinical Psychiatry, 70*(9), 1250-1257.
- Dimatteo, R.M. (2004). Variations in patients' adherence to medical recommendations: A quantitative review of 50 years of research. *Medical Care, 42*(3), 200-209.
- Drug and Alcohol Treatment Information Service. (2001). *How do agencies participate in DATIS?* Retrieved July 6, 2007, from <http://www.datis.ca/about/participation.html>.
- Echeburua, E., Fernandez-Montalvo, J., & Baez, C. (2001). Predictors of therapeutic failure in slot-machine pathological gamblers following behavioural treatment. *Behavioural and Cognitive Psychotherapy, 29*(3), 379-383.

- Ferri, C.P., Gossop, M., Rabe-Hesketh, S., & Laranjeira, R.R. (2002). Differences in factors associated with first treatment entry and treatment re-entry among cocaine users. *Addiction, 97*(7), 825-832.
- Finney, J. W., & Moos, R. H. (1995). Entering treatment for alcohol abuse: A stress and coping model. *Addiction, 90*, 1223–1240.
- Goodyear-Smith, F., Arroll, B., Kerse, N., Sullivan, S., Coupe, N., Tse, S., et al. (2006). Primary care patients reporting concerns about their gambling frequently have other co-occurring lifestyle and mental health issues. *BioMed Central Family Practice, 7*(25).
- Grant, J., Kim, S., & Kuskowski, M. (2004). Retrospective review of treatment retention in pathological gambling. *Comprehensive Psychiatry, 45*(2), 83-87.
- Grella, C.E., Polinsky, M.L., Hser, Y., & Perry, S.M. (1999). Characteristics of women-only and mixed-gender drug abuse treatment programs. *Journal of Substance Abuse Treatment, 17*(1-2), 37-44.
- Havassy, B.E., & Hopkin, J.T. (1989). Factors predicting utilization of acute psychiatric inpatient services by frequently hospitalized patients. *Hospital & Community Psychiatry, 40*, 820-823.
- Hodgins, D., Currie, S., el-Guebaly, N., & Peden, N. (2004). Brief motivational treatment for problem gambling: a 24-month follow-up. *Psychology of Addictive Behaviours, 18*(3), 293-296.
- Hodgins, D., & el-Guebaly, N. (2000). Recovery from gambling problems: A comparison of resolved and active gamblers. *Addiction, 95*, 777-789.

- Holstein, F., & d'Elina, G. (1985). Patients with multiple admissions in community mental health service in Western Norway. *Social Psychiatry, 20*(2), 55-59.
- Howell, D. C. (2002). *Statistical methods for psychology* (5th ed.). Pacific Grove, CA: Duxbury.
- Ingle, P.J., Marotta, J., McMillan, G., & Wisdom, J.P. (2008). Significant others and gambling treatment outcomes. *Journal of Gambling Studies, 24*, 381-392.
- Jackson, A.C., Dowling, N., Thomas, S.A., & Holt, T.A. (2008). Treatment careers in problem gambling: Factors associated with first treatment and treatment re-entry. *Addiction Research and Theory, 16*(6), 618-632.
- Jacques, C., & Ladoceur, R. (2006). A prospective study of the impact of opening a casino on gambling behaviours: 2- and 4-year follow-ups. *Canadian Journal of Psychiatry, 51*, 764-773.
- Leblond, J., Ladouceur, R., & Blaszczynski, A. (2003). Which pathological gamblers will complete treatment? *British Journal of Clinical Psychology, 42*(2), 205-209.
- Lesieur, H.R. (1998). Costs and treatment of pathological gambling. *Annals of the American Academy of Political and Social Sciences, 556*, 153-171.
- Lesieur, H.R., & Blume S.B. (1987). The South Oaks Gambling Green (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144*(9), 1184-1188.
- Milton, S., Crino, R., Hunt, C., & Prosser, E. (2002). The effect of compliance-improving interventions on the cognitive-behavioural treatment of pathological gambling. *Journal of Gambling Studies, 18*(2), 207-229.

- Morasco, B.J., vom Eigen, K.A., & Petry, N.M. (2006). Severity of gambling is associated with physical and emotional health in urban primary care patients. *General Hospital Psychiatry, 28*, 94-100.
- Morasco, B.J., Pietrzak, R.H., Blanco, C., Grant, B.F., Hasin, D., & Petry, N.M. (2006). Health problems and medical utilization with gambling disorders: Results from the National Epidemiologic Survey on alcohol and related conditions. *Psychosomatic Medicine, 68*, 976-984.
- Neale, J., Robertson, M., & Bloor, M.J. (2007). Treatment experienced and treatment naive drug agency clients compared. *International Journal of Drug Policy, 18*, 486-493.
- Nguyen, A. (2007). *The comorbidity of problem gamblers in Northwestern Ontario*. Unpublished Master's Thesis. Lakehead University, Thunder Bay, Ontario, Canada.
- Olfson, M., Mojtabai, R., Sampson, N., Hwang, I., Druss, B., Wang, P., et al. (2009). Dropout from outpatient mental health care in the United States. *Psychiatric Services, 60*(7), 898-907.
- Petry, N.M. (2003). A comparison of treatment-seeking pathological gamblers based on preferred gambling activity. *Addiction, 98*(5), 645-655
- Petry, N.M., & Steinberg, K.L. (2005). Childhood maltreatment in male and female treatment-seeking pathological gamblers. *Psychology of Addictive Behaviors, 19*(2), 226-229.

- Piquette-Tomei, N., Norman, E., Dwyer, S., & McCaslin, E. (2008). Group therapy for women problem gamblers: A space of their own. *Journal of Gambling Issues, 22*, 275-296.
- Pulford, J., Bellringer, M., Abbott, M., Clarke, D., Hodgins, D., & Williams, J. (2009). Reasons for seeking help for a gambling problem: The experiences of gamblers who have sought specialist assistance and the perceptions of those who have not. *Journal of Gambling Studies, 25*, 19-32.
- Raylu, N., & Oei, T.P. (2007). Factors that predict treatment outcomes in a community treatment agency for problem gamblers. *International Journal of Mental Health and Addiction, 5*, 165-176.
- Raylu, N., & Oei, T.P. (2002). Pathological gambling: A comprehensive review. *Clinical Psychology Review, 22*(7), 1009-1061.
- Rehm, J., Gschwend, P., Steffen, T., Gutzweiler, F., Dobler-Mikola, A., & Ambros, U. (2001). Feasibility, safety, and efficacy of injectable heroin prescription for refractory opioid addicts: A follow-up study. *The Lancet, 358*(9291), 1417-1420.
- Roberts, J. (1996). Perceptions of the significant other of the effects of psychodynamic psychotherapy: Implications for thinking about psychodynamic and systemic approaches. *British Journal of Psychiatry, 168*, 87-93.
- Rush, B.R., Bassani, D.G., Urbanoski, K.A., & Castel, S. (2008). Influence of co-occurring mental and substance use disorders on the prevalence of problem gambling in Canada. *Addiction, 103*, 1847-1856.
- Rush, B.R., Veldhuizen, S., & Adlaf, E. (2007). *Mapping the prevalence of problem gambling and its association with treatment accessibility and proximity to*

- gambling venues*. Retrieved August 7, 2007, <http://www.camh.net/egambling/issue20/pdfs/05rush.pdf>.
- Rush, B.R., & Moxam, R.S. (2001). *Treatment of problem gambling in Ontario: Service utilization and client characteristics*. Retrieved July 11, 2007, from <http://www.gamblingresearch.org/download.sz/Ont%20treatment%20survey.pdf?docid=2986>.
- Sayre, S.L., Schmitz, J.M., Stotts, A.L., Averill, P.M., Rhoades, H.M., & Grabowski, J.J. (2002). Determining predictors of attrition in an outpatient substance abuse program. *American Journal of Drug and Alcohol Abuse, 28*(1), 55-72.
- Shaffer, H., Hall, M., & Vanderbilt, J. (1999). Estimating the prevalence of disordered gambling behaviour in the United States and Canada: a research synthesis. *American Journal of Public Health, 89*, 1369-1376.
- Shaffer, H.J., LaBrie, R.A., LaPlante, D.A. (2004). Laying the foundation for quantifying regional exposure to social phenomena: Considering the case of legalized gambling as a public health toxin. *Psychology of Addictive Behaviours, 18*(1), 40-48.
- Shaffer, H.J., LaBrie, R.A., LaPlante, D.A., Nelson, S.E., & Stanton, M.V. (2004). The road less traveled: Moving from distribution to determinants in the study of gambling epidemiology. *Canadian Journal of Psychiatry, 49*(8), 504-516.
- The Northstar Problem Gambling Alliance. (2007). *Pathological gambling treatment programs/providers*. Retrieved November 15, 2009 from <http://www.northstarproblemgambling.org/vertical/Sites/%7B5A8CAA27-8D99->

[452A-980D-63F469BD7AD0%7D/uploads/%7B72B9824A-22F2-421C-8DBE-42DE37D2E1D7%7D.PDF](#)

- Toce-Gerstein, M., Gerstein, D., & Volberg, R. (2003). A hierarchy of gambling disorders in the community. *Addiction, 98*, 1661-1672.
- Urbanoski, K.A., & Rush, B.R. (2006). Characteristics of people seeking treatment for problem gambling in Ontario: Trends from 1998 to 2002. *Journal of Gambling Issues, 16*.
- Welte, J., Barnes, G., Wiezorek, W., Tidwell, M., & Parker, J. (2001). Alcohol and gambling pathology among U.S. adults: Prevalence, demographic patterns and comorbidity. *Journal of Studies on Alcohol, 62*, 706-712.
- Wenzel., H.G., & Dahl, A.A. (2009). Female pathological gamblers – A critical review. *International Journal of Mental Health and Addiction, 7*, 190-202.
- Westphal, J., & Johnson, L. (2003). Gender differences in psychiatric comorbidity and treatment-seeking among gamblers in treatment. *Egambling: The Electronic Journal of Gambling Issues, 8*.
- Winnick, S., Lucas, D., Hartman, A., & Toll, D. (2005). How to you improve compliance? *Pediatrics, 115*, 718-724.

Appendix A. CAMH 7-Item Gambling Screen

Please complete the following questions by circling the best answer for you:

1. In the past 12 months have you gambled more than you intended to?
NO ONCE ONLY YES – MORE THAN ONCE
2. In the past 12 months have you claimed to be winning money when you were not?
NO YES
3. In the past 12 months have you felt guilty about the way you gamble, or about what happens when you gamble?
NO YES
4. In the past 12 months have people criticized your gambling?
NO YES
5. In the past 12 months have you had money arguments centered on gambling?
NO YES
6. In the past 12 months when you were gambling, did you feel that you had to keep playing until you won?
NO YES
7. If you answered yes to 2 or more of these questions, how often has it happened?
ONCE ONLY SOMETIMES OFTEN

Appendix B. Copy of Ethics Approval



FORM F – Research Ethics Amendment/Change

SJCG Protocol No.

Principal Investigators:

Research Title:

Date of Initial approval by SJCG Research Ethics Board:
 (yyyy/month/day)

Number of Amendment/Change form(s) previously submitted:

Changes to Approved Protocol (inclusive of previously approved amendments):

On the list below, please check all areas where changes occur:		Check all that apply (✓)
a.	Principal Investigator	
b.	Research Team Membership	✓
c.	Title of Research Project	
d.	Research Sponsorship or funding (amount and/or sources)	
e.	Timelines – major changes or extension beyond proposed completion date	
f.	Participants involved in the research (e.g. recruitment processes)	✓
g.	Confidentiality of data	
h.	Access to Personal Health Information (participants or health records)	
i.	Changes to the Risk/Benefit assessment for participants	
j.	Changes in the informed consent process/form or information letter	

	(attach copies, clearly indicating changes)	
k.	Changes to or addition of assessment tools or tests (attach tools)	
l.	Changes in SJCG resources to continue project (human or financial) (submit a revised FORM C – Organizational Impact)	

If you are changing/adding a test instrument, information letter or consent form, submit the original document(s) with revisions clearly indicated.

What follow-up action do you propose for participants who are already enrolled in the study?

		Check all that apply (✓)
a.	No action required	✓
b.	No participants recruited to date	
c.	Inform participants as soon as possible	
d.	Re-consent participants with the revised consent forms	
e.	Other: please provide details:	

Please explain the changes being requested and the rationale for the changes.

We are seeking your approval of several minor amendments to this project. There are no substantive changes to the basic methodology. You might recall that this project involves the analysis of secondary (archival) data that does not contain any information that would permit the identification of any individual or individuals. The details are provided below.

(1) *Updating the database.* The original database contained information from 2003 to mid-2006. We are now able to update the database with more recent information from 2006 to March 31, 2009. The updated data contains the same variables and is in the same format as the original data. The number of additional cases or records is, of course, not known at this time. The database does not contain names of other identifying information. We wish your approval to include this newer data in our analyses.

(2) *Extended data analyses.* The database contains information from all individuals seeking treatment for addictions at the Sister Margaret Smith Centre and the Balmoral Centre of St. Joseph’s Care Group. This population includes people with only a gambling problem, people with both a gambling problem and a substance-use problem, and people with a substance-use problem but no reported gambling problem. In our original protocol we stated that we would conduct comparative analyses of the first two

groups (i.e., those with only a gambling problem and those with both a gambling problem and a substance-use problem). We have run into a logical problem. While the approved analyses permit us to identify the ways in which people with a gambling problem differ from those with a gambling problem and a substance-use problem, we have no way of knowing if either of these two groups differ from people with only a substance-use problem, nor in what ways they might be similar. This is a critically important question from both a theoretical and practical (program development) point of view. We are seeking your approval to extend all analyses to include all three groups of people, and to conduct such additional analyses as might be required to acquire a complete picture of people with only substance-use problems.

(3) *Personnel changes (updates and additions)*. We received your approval to include Sara Craig, Missy Teatero, and Emily Russell as research assistants. We also informed you that portions of the analyses might constitute Sara Craig's Master of Public Health thesis. We now wish to inform you that portions of these analyses will, in fact, constitute Sara Craig's MPH thesis (under Dr. Jamieson's supervision). We will continue to employ Missy Teatero and Emily Russell as might be required. We seek your approval to include one additional graduate student as a research assistant: Alexander Penny. Alexander is an MA student in the clinical psychology program at Lakehead University. He has also completed the Tri-Council Ethics Tutorial (certificate attached), completed our graduate-level course in ethics and professional standards, and has received additional individual instruction in research ethics from Dwight Mazmanian (confirmation attached). He has successfully completed multiple university courses in statistics and research methodology. His MA thesis is not related to this project.

We have met with the Manager of the Mental Health, Addictions, and Problem Gambling Programs, Nancy Black, to discuss these amendments. She fully supports the amendments we propose, and she remains very interested in our findings.

These amendments have been reviewed and approved by the Lakehead University Research Ethics Board (copy of approval letter attached).



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June 23, 2009

Dr. John Jamieson
Sister Margaret Smith Centre
St. Joseph's Care Group
35 Algoma St. N.
Thunder Bay, ON P7B 5G7

Dear Dr. Jamieson:

Re: Protocol Number: 2007021 ~ Re-Approval
Project Title: The Comorbidity of Problem Gamblers in Northwestern Ontario - Continuation and Minor Modifications

Thank you for your submission for re-approval of your research protocol # 2007021 which was originally approved on June 19, 2008. All documentation relating to your request for re-approval for Protocol # 2007021 was reviewed through the delegated review process on June 23, 2009.

- **Re-Approval** for Protocol # 2007021 ~ The Comorbidity of Problem Gamblers in Northwestern Ontario - Continuation and Minor Modifications was granted on June 23, 2009. This approval is inclusive of the amendment # 2 dated June 23, 2009. This renewal will expiry on June 19, 2010.
- The decision will be reported to the Research Ethics Board at the next full board meeting scheduled on July 14, 2009.

We wish you continued success with your future research endeavours.

Sincerely,

Michel Bédard, PhD
Chair, Research Ethics Board

Copy: Nancy Black, Sister Margaret Smith Centre, SJCG
Kelly Morris, Coordinator, Research Services, St. Joseph's Care Group – LPH Site

Care **Compassion**
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June 23, 2009

Dr. John Jamieson & Dr. Dwight Mazmanian
Lakehead University
Sister Margaret Smith Centre
St. Joseph's Care Group
35 Algoma St. N.
Thunder Bay, ON P7B 5G7

Dear Drs. Jamieson and Mazmanian:

Re: Protocol Number: 2007021 ~ Amendment # 2
Project Title: The Comorbidity of Problem Gamblers in Northwestern Ontario - Continuation and Minor Modifications

Thank you for your submission for an amendment to research protocol # 2007021 which was originally approved on June 19, 2008. All documentation relating to amendment # 2 for Protocol # 2007021 was reviewed through the delegated review process on June 23, 2009. The delegated review will be reported to the REB at the next full board meeting on July 14, 2009.

- Approval of amendment # 2 for Protocol # 2007021 ~ The Comorbidity of Problem Gamblers in Northwestern Ontario - Continuation and Minor Modifications was granted on June 23, 2009.
- Your annual re-approval or closure report for The Comorbidity of Problem Gamblers in Northwestern Ontario - Continuation and Minor Modifications remains due on the anniversary date of your original project approval which was June 19, 2008.

We wish you continued success with your future research endeavours.

Sincerely,

Michel Bédard, PhD
Chair,
Research Ethics Board

Copy: Nancy Black, Sister Margaret Smith Centre, SJCG
Kelly Morris, Coordinator, Research Services, St. Joseph's Care Group – LPH Site

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Appendix C. Non-compliance alternate analysis

Treatment Compliance

Compliance was created by taking the variable “Reason for Termination” in Catalyst and grouping labels into two categories: compliant and non-compliant. The majority of clients were treatment compliant (68.1%) while roughly one-third was non-compliant (31.9%).

The correlation between education level and treatment compliance was not significant, $r(2208) = -0.025, p = .244$. There was a significant relationship between age and treatment compliance, $r(2337) = -0.087, p < .001$.

No significant differences in treatment compliance were found between males and females, $\chi^2(1, N = 2335) = 1.78, p = .181$. Females were more likely than males to be treatment compliant (see Table 1).

Table 1
Gender by treatment compliance

	Male (%)	Female (%)
Non-compliant	486 (32.9%)	260 (30.2%)
Compliant	991 (67.1%)	600 (69.8%)

No significant differences in treatment compliance were found between clients who did or did not have legal problems, $\chi^2(1, N = 2337) = 2.26, p = .13$. Those with legal problems were more likely to be treatment compliant than those without any legal problems (see Table 2).

Table 2
Legal problems by treatment compliance

	Legal Problems	
	Yes (%)	No (%)
Non-compliant	529 (32.9%)	217 (29.8%)
Compliant	1079 (67.1%)	512 (70.2%)

Relationship status was significantly related to treatment compliance, $\chi^2(3, N = 2311) = 25.51, p < .001$. Pairwise post-hoc comparisons showed that married/partnered clients were significantly more likely to be non-compliant than single (never married) clients ($p < .001$). As well, separated or divorced individuals were significantly more non-compliant than single (never married) clients ($p = .002$) (see Table 3).

Table 3
Relationship status by treatment compliance

	Married/Partnered (%)	Separated or divorced (%)	Single (never married) (%)	Widow or widower (%)
Non-compliant	197 (37.0%)	138 (39.3%)	385 (27.9%)	17 (35.4%)
Compliant	336 (63.0%)	213 (60.7%)	994 (72.1%)	31 (64.6%)

Income source was significantly related to treatment compliance, $\chi^2(4, N = 2046) = 34.61, p < .001$. Pairwise post-hoc comparisons showed that individuals with employment as their income source were significantly more likely to be non-compliant than individuals with no income source ($p = .001$) (see Table 4).

Table 4
Income source and treatment compliance

	Retirement or Insurance (%)	Employment (%)	Welfare or Disability (%)	Family Support or Other (%)	None (%)
Non-compliant	52 (32.9%)	130 (30.2%)	213 (39.4%)	111 (26.0%)	118 (24.0%)
Compliant	106 (67.1%)	300 (69.8%)	327 (60.6%)	316 (74.0%)	373 (76.0%)

Employment status was significantly related to treatment compliance, $\chi^2(4, N = 2337) = 31.32, p < .001$. Pairwise post-hoc comparisons showed that clients with full-time or part-time employment ($p = .001$) and disabled individuals ($p < .001$) were more likely to be non-compliant with treatment than students (in training) (see Table 5).

Table 5
Employment status by treatment compliance

	Employed FT or PT (%)	Disabled (%)	Retired (%)	Student (training) (%)	Not in labour force (%)
Non-compliant	163 (31.7%)	98 (36.8%)	21 (30.4%)	107 (22.0%)	357 (35.6%)
Compliant	351 (68.3%)	168 (63.2%)	48 (69.6%)	379 (78.0%)	645 (64.4%)

Health disorders. The Catalyst file included a number of health disorders, and those disorders which had adequate sample size were examined to determine their relationship to treatment compliance. Each health disorder was analyzed separately; since they were not mutually exclusive (clients could have more than one). Significant differences in treatment compliance were found between individuals who did or did not have diabetes. Those with diabetes were more likely to be non-compliant with treatment than those with no visual problems (see Table 6). Two health disorders approached significance: eating disorders and sexually transmitted diseases (STDs).

Table 6
Health disorders by treatment compliance

Health Disorder	Non-compliant (%)	Compliant (%)	Statistic $\chi^2(1, N = 2337)$	<i>p</i>
Blood pressure problems	35 (27.8)	91(72.2)	1.052	.305
Cancer	6 (33.3)	12 (66.7)	0.017	.897
Chronic pain	9 (21.4)	33 (78.6)	2.167	.141
Diabetes	38 (43.2)	50 (56.8)	5.336	.021
Eating disorders	7 (43.8)	9 (56.3)	1.037	.308
Heart disease	16 (40.0)	24 (60.0)	1.222	.269
Hepatitis C	10 (17.2)	48 (82.8)	0.027	.870
STD	6 (40.0)	9 (60.0)	0.453	.501
Stomach/Gastrointestinal	36 (30.3)	83 (69.7)	0.161	.688
Mobility	44 (26.8)	120 (73.2)	2.104	.147
Visual	129 (35.1)	239 (64.9)	1.973	.160
Pregnant	6 (31.6)	13 (68.4)	0.001	.974

Mental health diagnoses. In addition to the health conditions examined, a number of mental health measures were examined to determine their relationship with treatment compliance. Each diagnosis was analyzed separately, since they were not mutually exclusive. None of the mental health measures were significantly related to treatment compliance (see Table 9).

Table 9
Mental health diagnoses by treatment compliance

Mental Health Diagnosis	Non-compliant (%)	Compliant (%)	Statistic $\chi^2(1, N = 2337)$	<i>p</i>
ADD	20 (27.4)	53 (72.6)	0.710	.400
Anxiety	10 (17.5)	47 (82.5)	0.010	.919
Major Depressive	12 (14.0)	74 (86.0)	1.01	.315
Personality	4 (21.1)	15 (78.9)	0.116	.733
Psychotic	3 (12.0)	22 (88.0)	0.626	.429
Bipolar	21 (41.2)	30 (58.8)	2.055	.152
Other	20 (18.7)	87 (81.3)	0.031	.861

Logistic Regression.

The variables significantly predicted treatment compliance, $\chi^2(9, N = 1837) = 49.66, p < .001$, explaining 2.6% of the variability. The first step explained 1.3% of the

variability, the second step explained 1.1% and the third explained 0.4% of the variability. Significant unique prediction, relative to the other variables, was found for 2 variables: income, $p < .001$, where individuals with poorer sources of income were more likely to be non-compliant, relationship status, $p = .011$, where those who are not single were more likely to be non-compliant; comparing Primary versus Secondary gambling groups approached significance, $p = .054$, where Primary Gamblers were more likely to be non-compliant (See Table 10).

Table 10

Predictors of logistic regression, p values, percent variance explained by step entered

Step	Predictors	Odds Ratio (C.I.)	Statistic	p	% variance explained
1			$\chi^2(3, N = 1837)$ = 17.26	.001	1.3
	Education level	1.01 (.83-1.25)		.601	
	Employment status	1.06 (.83-1.39)		.850	
	Income source	1.54 (1.26-1.90)		< .001	
2			$\chi^2(4, N = 1837)$ = 12.17	.016	1.1
	Age	2.49 (1.01-10.0)		.401	
	Gender	1.07 (.75-1.15)		.539	
	Relationship status	1.37 (1.07-1.75)		.011	
	Legal status	1.00 (.75-1.25)		.963	
3			$\chi^2(2, N = 1837)$ = 5.05	.08	0.4
	Gamblers versus Substance Problem Only	1.20 (1.09-1.33)		< .001	
	Primary versus Secondary	1.02 (.78-1.33)		.860	

Appendix D. Alternative analyses for health conditions and mental health conditions

Health disorders by treatment compliance

Health Disorder	% with Disorder (Non-compliant)	% without Disorder (Non-compliant)	Statistic $\chi^2(1, N = 2592)$	<i>p</i>
Blood pressure problems	25 (5.3)	443 (94.7)	0.000	.982
Cancer	2 (0.4)	466 (99.6)	0.733	.392
Chronic pain	9 (1.9)	459 (98.1)	0.039	.844
Diabetes	14 (3.0)	454 (97.0)	0.734	.392
Eating disorders	7 (1.5)	461 (98.5)	2.84	.090
Heart disease	6 (1.3)	462 (98.7)	0.497	.481
Hepatitis C	10 (2.1)	458 (97.9)	0.027	.870
STD	6 (1.3)	462 (98.7)	2.86	.090
Stomach/ Gastrointestinal	24 (5.1)	444 (94.9)	0.001	.969
Mobility	47 (10.0)	421 (90.0)	5.98	.014
Visual	98 (20.9)	370 (79.1)	9.44	.002
Pregnant	5 (1.1)	463 (98.9)	0.327	.567

Mental health diagnoses by treatment compliance

Mental Health Diagnosis	% with Disorder (Non-compliant)	% without Disorder (Non-compliant)	Statistic $\chi^2(1, N = 2592)$	<i>p</i>
ADD	12 (2.6)	456 (97.4)	.521	.470
Anxiety	10 (2.1)	458 (97.9)	.010	.919
Major Depressive	12 (2.6)	456 (97.4)	1.01	.315
Personality	4 (0.9)	464 (99.1)	.116	.733
Psychotic	3 (0.6)	465 (99.4)	.626	.429
Bipolar	13 (2.8)	455 (97.2)	.889	.346
Other	20 (4.3)	448 (95.7)	.031	.861