

**EVALUATING METHADONE MAINTENANCE  
TREATMENT OUTCOMES IN AN ATLANTIC CANADIAN MILIEU**

by

Angela M.M. Burbridge, Ph.D.

and

Mary Ann Campbell, Ph.D.

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## **Executive Summary**

Methadone Maintenance Treatment (MMT) is an intervention for individuals dependent on opioids. Past research evaluating the effectiveness of MMT has primarily focused on heroin users and has emphasized substance abuse and health-related outcome indicators.

The current research examined a primarily prescription opioid abusing population enrolled in MMT in Atlantic Canada through longitudinal design spanning five years. Records of all clients enrolled in MMT in Saint John, New Brunswick since it began were reviewed to obtain relevant information about their psychosocial functioning and substance abuse, as well as program involvement from the point of their intake into MMT to their discharge or withdrawal from MMT.

Repeated measures and multiple regression analyses were used to identify changes in psychosocial factors throughout MMT and factors contributing to positive outcomes. Results indicated that the majority of changes on outcome variables occurred during the first 12 months of treatment, including reductions in substance use and criminal activity, with improvements in mental and physical health ratings. The highest drop-out rates were also observed during the first year of treatment. Clients who had higher self-reported mental health functioning and perceived social support ratings tended to remain in treatment longer. Urinalysis tests were not a reliable indicator of treatment progress because these tests were not randomly requested. Feedback from the program staff indicate that urinalysis drug tests were more commonly requested from participants later in the program only when they were suspected of drug use, which artificially inflated the ratio of positive urinalysis tests.

This research extends the MMT effectiveness literature to a primarily prescription opioid using population in Atlantic Canada. Recommendations based on these findings centered on the importance of developing stages of intervention for participants who are new to MMT, those who have been involved in the program for some time, and those who are transitioning to methadone only recovery needs. Such tiered intervention programming will better match clients to their stage in addiction recovery and be more responsive to their needs and progress. In addition, additional resources are needed during the first year of treatment, given that this was the year of greatest change, but also greatest risk of drop-out from MMT. Use of motivational interviewing and other engagement services may be useful to integrate into the early stages of treatment.

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## EVALUATING METHADONE MAINTENANCE TREATMENT OUTCOMES IN AN ATLANTIC CANADIAN MILIEU

Methadone maintenance treatment (MMT) has received substantial attention as a medically-based treatment for heroin and opioid dependence since its controversial inception nearly 50 years ago. Since that time, clinicians, medical staff, and program administrators have often been faced with the difficult task of evaluating and improving the treatment effectiveness of MMT. Although policies and standards for methadone program development are provided by such agencies as Health Canada, the evaluation of methadone programs is not a straightforward task. The lack of clear theoretical expectations about what are important predictors and outcomes of MMT make it challenging to assess its true impact. A multitude of individual client and intervention variables may influence any treatment outcome. A review of the literature on MMT makes it clear that additional research on its utility is needed. The current study complements the existing literature on MMT effectiveness. This work represents the largest empirical evaluation of MMT in the Atlantic Canadian provinces, in which methadone clients primarily experience prescription opioid addiction, rather than the heroin abuse that is typical of most MMT outcome studies. In order to contextualize MMT, the following introduction will first review existing literature on the Canadian prevalence of drug use with an emphasis on opioid addiction and its personal and socioeconomic costs. Second, a discussion of the key empirical knowledge and theoretical perspectives relating to the study of addictions and MMT will be presented. This discussion will include a review of previous research investigating the effectiveness of MMT on specific treatment outcomes, and predictors of treatment outcomes.

### **Substance Abuse and Dependence**

Darke, Degenhardt, and Mattick (2007) argued that the conceptualization and measurement of substance use problems has changed over the past thirty years, and has given rise to the concept of separate and distinct substance use patterns, including substance dependence syndrome and substance abuse. Originally conceptualized by Edwards and Gross (1976) and applied to alcohol use problems specifically, substance dependence syndrome refers to a cluster of unique symptoms that discriminate between an individual who is dependent on a substance and one who experiences substance related problems. The American Psychiatric Association (2000) included both Substance Dependence and Substance Abuse as separate diagnostic categories in the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV). In order to meet criteria for Substance Dependence, an individual must meet three or more of seven criteria. These criteria include tolerance (i.e., the need for increasing amounts of substances to achieve desired effect), withdrawal (i.e., unpleasant symptoms experienced with abstaining from or reducing substance use), increasing amounts of substances taken over time, a desire or unsuccessful attempts to decrease substance use, prolonged engagement in activities intended to obtain substances, reduction in important activities (e.g., social, professional) as a result of substance use, and continued substance use despite recurrent substance-related problems.

The American Psychiatric Association (2000) recognized that not all individuals experiencing significant substance-related impairment also experience dependency issues. Therefore, the concept of substance *abuse* has been developed to classify individuals who, although not dependent on a substance, are experiencing significant problems related to their substance use. Specifically, DSM-IV diagnostic criteria for Substance Abuse includes clinically significant

impairment, as indicated by one or more of the following: substance-related interference with major role obligations (e.g., employment absences, neglect of home duties); use of substances in physically dangerous situations, such as driving; recurrent legal problems resulting from substance use; and continued substance use despite recurrent substance-related social or interpersonal problems.

Straussner (2004) emphasized the importance of discriminating between substance *abuse* and substance *dependence*. The author argued that substance dependence is synonymous with drug addiction<sup>1</sup>, while substance abuse is sometimes viewed as less severe due to the absence of dependency symptoms. Therefore, substance abuse does not necessarily equate with addiction. In fact, according to the American Psychiatric Association (2000), an individual cannot meet criteria for both Substance Abuse and Substance Dependence.

The American Psychiatric Association (2000) recognized several classes of substances under the diagnosis of Substance Dependence, including opioids. Opioids are a class of drugs that includes opium, heroin, morphine, codeine, and synthetic opioids such as methadone. Prescription opioids (e.g., morphine, oxycodone, codeine) are often used for alleviation of physical pain, while illicit use can arise from the tranquilizing or euphoric effect of opioids. Opioids are considered to be a highly addictive class of drugs, whether in prescription or illegal form (Friedman & Wilson, 2004). Withdrawal is characterized by a wide variety of symptoms, including diarrhea, abdominal cramps, chills, irritability, and nausea. Although these symptoms may appear similar to flu symptoms, their intensity and duration may seem unbearable to an individual, thus contributing to the high rate of relapse (Straussner, 2004).

### **Prevalence of Substance Use Involving Drugs**

The recreational use of illicit drugs is common throughout Canadian society. Adlaf and Lalomiteanu (2005) examined data from a Canadian national health survey and found that 29% of Canadians had a lifetime prevalence of cannabis use only, and 16% had a lifetime prevalence of cannabis use in addition to use of other illicit drugs (i.e., hallucinogens, cocaine/crack, amphetamine, steroids, ecstasy, and inhalants). In contrast, the lifetime prevalence of illicit drug use excluding cannabis was approximately one percent. Prevalence rates were lower with respect to use over the previous 12 months; 11.5% for cannabis only, 2.6% for cannabis with other illicit drug use, and 0.4% for non-cannabis illicit drug use. These rates of use are similar to Canadian statistics reported by other researchers (e.g., Fischer, Cruz, & Rehm, 2006; Vega et al., 2002; Wall et al., 2000). With respect to prevalence rates between individuals, higher prevalence rates have generally been associated with being male, being between the ages of 20 and 24 years, and living within a lower socioeconomic bracket (Tjepkema, 2004).

Compared to users of more common illicit drugs (e.g., cannabis), there are fewer abusers of illegal opioids. Based on their research, Popova, Rehm, and Fischer (2006) estimated that there were approximately 80,000 regular illegal opioid users in Canada, representing 0.3% of the Canadian population. There was some variability, however, in results between provinces. The province of New Brunswick's prevalence rate was amongst the lowest (0.04%), while the

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<sup>1</sup> For the purposes of maintaining consistency with current literature, the term "addiction" will refer to substance dependence throughout this study.

province of Nova Scotia demonstrated the highest rate across the country (1.3%). This difference is startling considering the close proximity and similar demographic characteristics of these two provinces, and highlights the need for research examining MMT predictors and outcomes within specific rural and urban populations.

Opioid misuse has been present in North America, including Canada, for well over a century. However, recent history has seen a changing trend with respect to the type of opioid most frequently abused (Fischer & Rehm, 2006). Historically, heroin was at the forefront of opioid use and abuse, but prescription opioids obtained and illegally diverted from the medical system are playing an increasingly larger role (Fischer et al., 2006). Brands, Blake, Sproule, Gourlay, and Busto (2004) found that 24% of participants from a MMT center in Toronto, Ontario, reported using prescription opioids. An additional 24% reported using prescription opioids before advancing to heroin use, while 17% of the sample reported using only heroin as their primary drug of choice. The increasing role of prescription opioids in drug addiction is also particularly true for populations in Eastern Canada. According to a two-year program report prepared by Mullin (2007), the majority of clients (87.8%) enrolled in Saint John, New Brunswick's Methadone Clinic reported the prescription drug Dilaudid (hydromorphone) as their preferred drug upon admission to the program. This changing trend toward prescription opioid use has implications for current research, particularly considering differences between heroin users and prescription opioid users.

### **Differences Between Prescription and Non-prescription Opioid Users**

As prescription opioid use increases, researchers have begun examining differences and similarities between prescription and non-prescription opioid users. According to Fischer, Patra, Firestone-Cruz, Gittins, and Rehm (2008), users of illicit prescription opioids are more likely to be Caucasian, have a legal income, use drugs by non-injection means, have increased physical health problems compared to heroin users, and are more likely to use private physician services. Sigmon (2006) found that prescription opioid users tend to display increased social stability compared to their heroin-using counterparts. Prescription opioid users in Sigmon's study also displayed less severe drug use histories upon entering treatment. Specifically, prescription opioid users tended to use smaller amounts of substance on a daily basis, spend less money on opioids, have fewer overdoses, and fewer previous opioid treatment episodes. Sigmon concluded that, compared to heroin-only users, prescription opioid abusers tend to display several characteristics that may predict more favorable treatment outcomes. Conversely, users of heroin are more likely to be older, use drop-in shelters, and are less likely to use walk-in clinics (Fischer et al., 2008). In general, heroin users tend to engage in more polysubstance use, including benzodiazepines and cocaine, and have higher rates of multiple substance use disorders (Wu, Woody, Yang, & Blazer, 2011). Heroin users are also significantly more likely to report IV administration as their primary mode of use (Sigmon, 2006). Considering such differences, Wu et al. emphasized the need to distinguish between prescription and non-prescription opioid users in research and treatment. These populations are likely to have different historical experiences and, thus, treatment needs. These differences highlight the need for research examining the increasing prevalence of prescription opioid use and the implications for treatment for this sub population of opioid users.

## Personal Costs of Substance Use

### Dependency

While not all drug users experience addiction, many users of illicit substances do experience symptoms of drug dependency (Higgins, Sigmon, & Heil, 2008). Based on an analysis of Statistics Canada data, Tjepkema (2004) reported that approximately 194,000 (0.8 %) Canadians experienced drug dependence. However, prevalence rates appeared to be contingent on the type of drug being used. Although 2.4% of cannabis users reported dependence on that substance, as many as 18.1% of users of other illicit drugs reported symptoms of dependency. These findings imply that, although the use of illicit drugs may be less common than cannabis, the impact of these other drugs may be much greater in terms of addiction. Similar to prevalence rates of drug use, gender differences also exist for drug dependency. Males display significantly higher rates of drug dependency than females. Prevalence rates of dependency are also significantly higher within the age range of 25 to 54 years.

### Adverse Health Effects

Substance-dependent individuals are at increased risk of developing an array of physical health problems. Adlaf and Lalomiteanu (2005) found that 30.3% of Canadians who have used illicit drugs (excluding cannabis) at some point during their lifetime reported experiencing adverse physical health effects as a result of their substance use (e.g., liver problems, increased risk of pneumonia and bronchitis). Likewise, 23.9% of past-year users also noted a negative impact of their drug use on their physical health. In another Canadian study, Fischer et al. (2006) found that approximately 50% of illicit opioid users enrolled in MMT indicated fair or poor health status, with 70% reporting at least one serious health problem. Additionally, the rate of health complaints among illicit opioid users is higher than in the general population (e.g., Garrity et al., 2007, Idler & Angel, 1990). These health complaints may be inflated, in part, due to higher rates of infectious diseases among opioid users compared to the general population (Centre for Disease Control and Prevention, 2009; New Brunswick Department of Health and Wellness, n.d.).

Not only is substance abuse associated with poorer health outcomes in general, but it is also associated with behaviours that place individuals at increased risk for potentially fatal infectious diseases. For example, Paul, Stall, and Davis (1993) found that substance use was strongly associated with risky sexual behaviour. Specifically, as substance use increased, so did rates of unprotected sexual intercourse. Likewise, the U.S. Center for Disease Control and Prevention (2009) reported that 62.6% of intravenous drug users reported having unprotected sexual intercourse. Aside from risky sexual behaviours, risk of contracting infectious diseases is compounded by the manner in which drugs are administered. The U.S. Center for Disease Control and Prevention has reported that 31.8% of intravenous drug users admit to sharing syringes, which places these users at risk for contracting blood borne diseases such as human immunodeficiency virus infection (HIV) and hepatitis B and C. The authors also noted that an estimated 12% of new HIV infections in the United States occur among intravenous drug users. Locally, 21% of HIV/AIDS cases reported in New Brunswick between 1985 and 2006 included a history of intravenous drug use (New Brunswick Department of Health and Wellness, n.d.).

In addition to increased physical health problems, substance users also appear to be at risk for mental health problems. Approximately 1/3 of opioid users in Fischer et al.'s (2006) study

reported mental health problems, while Strain (2002) found that up to 80% of individuals dependent on opioids displayed some form of mental health problem. Depression appears to be the most common mental health concern amongst opioid users. For example, one-half of participants in Fischer et al.'s study reported symptoms of depression. In a similar vein, Tjepkema (2004) reported that 26.1% of Canadians dependent on drugs experienced a major depressive episode within a 12 month period. Despite the increased prevalence rates of mental health problems among opioid users, Wall et al. (2000) caution that it is still unclear whether opioid abuse precedes mental health problems or is a consequence of these problems. Nonetheless, presence of mental health problems amongst users continues to be a concern, particularly given that depressive symptomatology is associated with additional health risks, such as needle sharing, overdose, and frequency of substance use (Fischer et al., 2006; Jones et al., 2002).

### **Mortality**

Consistent with the increased risk of physical health problems and risky health behaviours amongst illicit substance users, mortality rates are also increased. In 1995, illicit substances were the leading cause of death among adults 30-49 years of age in Vancouver, British Columbia (Miller, 1998). Nationally that same year, Single, Rehm, Robson, and Truong (2000) reported that 805 Canadian deaths in 1995 occurred due to illicit substance use, accounting for 0.4% of all deaths in Canada. The authors estimated that approximately 33 662 years of life were lost, given the relatively young ages at which these deaths occurred. Among untreated opioid users particularly, mortality rates range from one to four percent (Amato et al., 2005; Bargagli et al., 2006; Fischer et al., 2006). Notably, Dukes, Robinson, and Robinson (1992) estimated that mortality rates amongst opioid users are between 6 and 20 times greater than those of the general population. Although the majority of research has focused on heroin addiction, evidence suggests that prescription opioid users are also at increased risk for mortality. Paulozzi, Budnitz, and Xi's (2006) research in the United States revealed the rate of prescription opioid-related overdoses has surpassed heroin and cocaine-related overdose. Comparable Canadian statistics are not yet available (Fischer et al., 2009).

Fischer et al. (2006) noted that mortality among illicit substance users primarily occurs as a result of fatal overdoses and consequences of infectious diseases. The authors found that approximately 20% of their Canadian sample of regular opioid users had at least one overdose during a 12 month period. Neale and Robertson (2005) found that 11.5% of heroin users in their study reported at least one overdose in the ninety day period prior to entering treatment, and 2.4% of participants reported more than one overdose. Finally, lifetime prevalence rates of overdosing at least once have been reported to be as high as 68% among individuals who use heroin (Darke, Ross, & Hall, 1996). Thus, illicit substance use and dependence is associated with significant physical and mental health risks.

### **Socioeconomic Costs of Substance Use**

Aside from the significant personal costs of substance use to individual users, the socioeconomic costs of illicit substance use are staggering. In Canada, the cost of illicit substance use is estimated to be approximately \$5 billion per year (Office of the Auditor General, 2001). This estimation includes an array of costs associated with social and mental health resources, criminal behaviour and victimization, productivity loss in occupational settings, drug-related illnesses,

and the ultimate cost of mortality. The impact of illicit opioid use substantially contributes to this cost. Wall et al. (2000) estimated the annual cost of untreated opioid dependence in Toronto, Ontario to be \$5.086 million. This estimation included the costs of crime victimization (44.6%), law enforcement (42.4%), productivity loss (7.0%), and utilization of health care (6.1%). Additional research suggests that the majority of opioid users contribute to such costs, rather than only a minority of users. In a separate study, also drawn from the Toronto, Ontario population, Fischer, Medved, Kirst, Rehm, and Gliksman (2001) found that up to 75% of opioid users received income from a social benefit program, such as financial assistance or disability, 68% reported receiving income from illegal means, and 47% were involved in property crime. Additionally, 94% of participants had been arrested at least once, with 50% experiencing incarceration during the previous year. These characteristics contribute to the substantial financial burden of illicit substance use on society.

### **Theoretical Perspectives on the Causes of Drug Addiction**

Considering the substantial personal and socioeconomic costs of illicit substance use, researchers have proposed various theories to explain drug abuse and addiction, and, thus, inform prevention and treatment strategies. Currently, there are three dominant and inter-related perspectives that are advocated by researchers and mental health professionals as relevant to understanding drug abuse and addiction. These theories reference the role of biological, psychological, and psychosociological influences on the individual. The most comprehensive conceptualization of these theories is an integration of the three into a single biopsychosocial perspective.

#### **Biological Basis of Drug Addiction**

The disease model is a biologically-based approach which advocates that addiction should be viewed under the same criteria as a medical disease (Gelkopf, Levitt & Bleich, 2002). According to this perspective, addiction is viewed as a chronic condition that develops from the complex interaction of genetic, drug-induced, and environmental contributions (van den Brink & van Ree, 2003). Multiple studies have suggested that different brain structures and neuro-transmitters influence the process of drug use and eventual addiction, including cravings, tolerance, withdrawal, and relapse (e.g., Bart et al., 2004; Kreek, Nielsen, Butelman & LaForge, 2005; Kreek, Schlussman, Bart, LaForge, & Butelman, 2004; Williams et al., 2007). Researchers have also examined the role of genetic influences in the development of addiction. Specifically, researchers have been interested in genetic predispositions that may make an individual vulnerable to developing an addiction. Ehlers et al. (2007) found that heritability was related to initiation of drug use. Other research has shown heritability of traits related to drug abuse, such as impulsivity and hypothalamic-pituitary-adrenal axis dysfunction (Verdejo-García, Lawrence, Clark, 2008; Zhang et al., 2008).

Ward, Mattick, and Hall (1998a) discussed the acceptance of the disease model by clinicians and researchers in the field of addictions, and the implications this has had for methadone treatment. According to the authors, conceptualizing opioid addiction as a chronic disease necessitates viewing treatment as a long-term process (i.e., indefinite maintenance on methadone). As Kreek et al. (2004) have argued, the concept of prescribing methadone as a treatment for opioid addiction is consistent with the biological perspective of addictive behaviours.

While biological influences may account for some drug use and dependency, an individual's physiological response may also contribute to both the development of drug addiction, continued addiction, and high relapse rates. Carter and Tiffany (1999) conducted a meta-analysis examining various biological responses to both drug-related and drug-neutral stimuli. Based on their review, the authors concluded that certain stimuli (e.g., drug-related imagery, in vivo exposure) elicit significant physiological reactions in heroin addicts, including increases in heart rate, increases in sweat-gland activity and decreases in skin temperature. In addition to physiological effects, participants also reported increases in drug cravings in the presence of drug-related stimuli. These findings emphasize the important role of conditioned environmental stimuli in opioid addiction. For example, an individual who typically consumes opioids with certain friends, at a certain time, or perhaps in a certain location (e.g., home, drug dealer's house) will develop a conditioned response (i.e., physiological response, cravings) to these stimuli even in the absence of the drug. Conditioned environmental stimuli also contribute to tolerance – as the biological system adapts to environmental cues, an increasing amount of substance is required in order to achieve the desired high. The importance of this cannot be overstated, particularly given that opioid users enrolled in MMT may still be exposed to these cues in their environment. Such environmental cues cause an individual's biological system to react differently to increasing or decreasing amounts of the drug when using outside of these conditioned cue environments. As a result, a novel environment would require less substance to achieve the desired effect because the biological system would not be primed by contextual cues; however, individuals are likely to consume the typical amount of drug. Thus, opioid users may be more likely to relapse in the presence of such cues, and overdose in the absence (Siegel, 2001). Biological influences and responses alone, however, do not completely account for drug use and dependency (Gelkopf et al., 2002).

### **Psychological and Psychosocial Contributors to Drug Addiction<sup>2</sup>**

A complete understanding of drug abuse also requires consideration of psychological perspectives. In light of these influences, Khantzian (1985) developed the Self-Medication Hypothesis to describe the psychological aspect of addiction. The Self-Medication Hypothesis contends that drug use and abuse occurs in response to underlying psychological or social distress. Kidorf, King, and Brooner (2006) noted that many substance users experience personal difficulties, including employment problems and comorbid mental health issues. According to Khantzian, the user initially engages in substance use as a form of self-medication and addiction occurs after prolonged substance use as a form of coping. While there may be utility to the Self-Medication Hypothesis, it remains to be determined whether individuals abuse substances in response to negative psychological affect, whether distress (e.g., as associated with family discord) arises from substance abuse, or perhaps an interaction between these aspects.

Despite questions regarding causation, there is ample evidence to support a strong association between psychological states and substance abuse. Research suggests that negative affect (Colder & Chassin, 1997), poor emotional regulation (Cooper, Frone, Russell, & Mudar, 1995; Thorberg & Lyvers, 2006), and poor emotional coping methods (Eftekhari, Turner, & Larimer, 2004) are related to increased risk for substance abuse and addiction. The use of drugs helps to alleviate

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<sup>2</sup> Although the literature typically separates psychological and sociological contributors to substance abuse, they will both be considered under the heading of psychological and psychosocial contributors due to substantial overlap between the two areas.

these states temporarily given their effects on behaviour, mood, and cognition. Individuals may also use substances to enhance positive states. For example, active use of opioids is associated with elevated mood, increased self-confidence, and increased energy and productivity (Dodgen & Shea, 2000). Given these reinforcing effects, Gelkopf et al. (2002) asserted that counselling is an integral component to substance abuse treatment, oftentimes focusing on psychological change (e.g., increasing personal responsibility, incorporating changes in habit and lifestyle, enlisting social support) and alternative ways to enhance positive states.

In addition to the prevailing biological and psychological theories for substance abuse, some researchers have examined the role of psychosocial factors in the etiology of drug use and addiction (Kerridge, 2009). Specifically, interpersonal relationships (i.e., peer, marital, and partner relations) have been associated with substance abuse and dependence. Gogineni, Stein, and Friedmann's (2001) results indicated that substance abusers were more likely to have substance-using peers. Similarly, Vanyukov, Neale, Moss, and Tarter (1996) found that individuals were more likely to use substances when their intimate relationship partners engaged in substance-related behaviours. Although the authors noted that it is unclear whether substance users tend to seek each other out, or whether individuals begin using substances when coupled with a substance-using partner, the implication remains that individuals' substance use can be influenced by their partners' use. Aside from partners' behaviours, relationship status also influences substance use. Fu, Haishan, and Goldman's (2000) and Martin, Beaumont, and Kupper's (2003) research has suggested that individuals are more likely to have substance dependency issues if they are single, divorced, or experiencing marital discord, including intimate-partner violence.

In addition to interpersonal relationships, family environment has been consistently associated with substance use and dependence, particularly in youth. According to Biederman, Faraone, Monuteaux, and Feighner (2000), youth are at increased risk for substance use, abuse, or dependence if either of their parents exhibit signs of substance abuse or dependence. Parental psychopathology, including anxiety, depression, and antisocial characteristics, also have been related to adolescent substance use (Biederman et al. 2000; Brook et al., 2002). As well, family dysfunction (e.g., inconsistent rules, loud arguments between parents, maternal difficulty controlling anger toward the child, and verbal abuse) has been consistently related to substance use in adolescents (e.g., Johnson et al., 2001). For example, Pilowsky, Wickramaratne, Nomura, and Weissman (2006) found that the lack of a close and supportive relationship between parents and children increased the likelihood that the youth would engage in substance use. Additional research by Fagan, Brook, Rubenstone, and Zhang (2005) suggested that these effects may not be limited to adolescence. The authors found that childhood experiences, such as the parent-child relationship, were related to substance use and dependency in adulthood as well. Notably, while these findings link psychosocial characteristics with substance abuse, it is unclear whether these findings are mediated by genetic influences. Twin studies have shown shared environmental effects for substance use initiation, although not necessarily dependency (Kendler, Aggen, Tambs, & Reichborn-Kjennerud, 2006; Kendler, Karkowski, Neale, & Prescott, 2000; Lynskey et al., 2002).

Considering findings that support biological and psychological contributors to substance abuse, the most comprehensive understanding of substance abuse is likely gained from a compilation of

both perspectives into a single, unified perspective termed the biopsychosocial perspective. The biopsychosocial perspective emphasizes the interaction between biological, psychological, and psychosociological contributors of substance abuse (Gelkopf et al., 2002). This unified perspective is reflected in current treatment approaches for drug addiction.

### **Treatment Approaches for Drug Addiction**

#### **The Abstinence Based Approach**

Denning, Little, and Glickman (2003) described the abstinence based approach to addiction treatment as one that adheres mainly to the biologically based disease model. Thus, individuals with addiction are viewed as having a life-long disease, for which complete abstinence from the problematic substance is the only treatment. Success, therefore, is defined as abstinence. This approach has been accepted by mainstream treatment modalities, particularly popular 12-step based programs, such as Alcoholics Anonymous and Narcotics Anonymous (Peele, 2012). The National Consensus Panel on Effective Medical Treatment of Opioid Addiction (1998) contended that while complete abstinence from illicit drugs was an ideal treatment goal, evidence at that time suggested that it was an unrealistic expectation. Consistent with this view, Denning et al. (2003) concluded that abstinence based approaches, when applied to substance use generally and opioid addiction in particular, have limited success rates ranging from only 5 to a maximum of 39%. The authors further asserted that 80% of substance users are incapable of, or choose not to, cease all use of substances. In their earlier review of the opioid addiction literature, Maddux and Desmond (1992) examined research on long-term opioid use among individuals who had either undergone MMT or drug-free treatment (i.e., abstinence-based). Among those completing MMT, 9-21% remained abstinent from opioids at least 5 years following treatment termination. Similarly, 10-19% of drug-free treatment clients were found abstinent from opioids at follow-up. These small percentages suggest that, regardless of treatment modality, the majority of opioid users do not achieve abstinence. In a more recent study, Conner, Hampton, Hunter, and Urada (2011) compared outcomes of opioid users engaged in either MMT or one of two abstinence based approaches (outpatient or residential treatment). The authors found that MMT was superior to both of the abstinence based approaches in terms of increased retention and greater reductions in opioid use. Complete abstinence is difficult to achieve with opioids because, as Denning et al. noted, the physiological symptoms that occur after stopping or dramatically reducing opioid drugs can be difficult for an individual to endure and oftentimes result in relapse. As Viswanath, Chand, Benegal, and Murthy (2012) point out, these physiological symptoms result in poor retention and high-relapse rates amongst abstinence based programs. With this understanding, an alternative approach known as harm reduction has been developed to intervene with substance dependency.

#### **The Harm Reduction Approach**

Harm reduction treatment models differ from abstinence based models in that they focus on *any* effort made to reduce the harmful effects of substance use on the individual and/or society, including efforts that impact psychological (e.g., emotional regulation, stress) and psychosociological contributors (e.g., interpersonal relationships) to addiction. This effort includes not only complete abstinence if it can be achieved, but also encourages any additional positive changes that may decrease the impact of substance use on one's life, such as reductions in the amount of substances used, engaging in safer health practices (e.g., using safe-sex methods), or using milder drugs or less frequent use of drugs. The goal of the harm reduction

approach is to establish a positive change in the lives of substance users, no matter how small (Denning et al., 2003).

The harm reduction approach is frequently used in the field of addictions (e.g., Department of Health, Prince Edward Island, 2008; Mullin, 2007; Roy, Arruda, & Bourgois, 2011). For example, needle-exchange programs, which provide access to sterilized (i.e., clean) needles for injection drug users, are intended to reduce the harm associated with injection drug use, particularly HIV infection and other blood-borne diseases (Hayashi, Wood, Wiebe, & Kerr, 2010). More than two decades ago, the British government was among the first government bodies to mandate and establish a harm reduction approach for intravenous substance users by providing medical care, medications (e.g., methadone, morphine, and heroin), education, and clean needles to drug users. Within five years of implementing their program, the British government boasted an HIV infection rate of 0.1%, compared to 60% in some areas of the United States (Denning et al., 2003). MMT programs adhering to a harm-reduction philosophy have also reported success with this approach (Department of Health, Prince Edward Island, 2008; Mullin, 2007).

### **The History of Opioid Addiction Treatment**

Differences between the abstinence and harm reduction approaches exemplify the disparity with which opioid addiction has been viewed and treated throughout history. At varying times, opioid addiction was treated as a medical problem, a moral problem, and a criminal problem. In the early 20<sup>th</sup> century, physicians counter-intuitively treated opioid addiction with prescription narcotics (Courtwright, 2001). Carstairs (2006) indicated that opioids were legal in Canada during the 19<sup>th</sup> and early 20<sup>th</sup> centuries. Canadians used opioids, such as opium, morphine, and heroin, for a variety of ailments, including pain relief, fever reduction, cough reduction, and general relaxation. Laudanum, a liquid preparation of opium, in particular was frequently used as an analgesic despite its potency and highly addictive properties (Courtwright, 2001). Dependency, which was experienced by some users, was not necessarily considered a problem because the substances were available at local pharmacies for reasonable prices. Dependency was primarily considered to be a medical problem and physicians became increasingly cautious about prescribing opioids (Carstairs, 2006).

By 1911, Canada passed its first drug laws. The use of non-prescription narcotics became viewed as a moral and criminal problem, as opposed to strictly a medical problem. Canada's Opium and Drug Act of 1911 restricted the possession and sale of opium in order to prevent addiction and its recreational use (Carstairs, 2006). Similarly, the United States introduced the Harrison Act in 1914, designed to control the production and distribution of narcotics. The Harrison Act specified that any physician who continued to prescribe narcotics would be indicted and prosecuted (Stroller & Bigelow, 2006). As a result of drug-related legislation in both Canada and the United States, access to opioids was much more difficult for dependent consumers and the deficit in available treatments for narcotic dependency in both countries soon became obvious. In response, many local governments established formal morphine clinics for the treatment of opioid addiction, in which morphine was administered to treat opioid addiction (Carstairs, 2006; Courtwright, 2001). However, in 1920, the American Medical Association ruled that prescribing narcotics to individuals dependent on opioids was *not* an acceptable medical treatment. Consequently, local treatment facilities were closed (Lambert et al., 1930).

Following closure of opioid treatment clinics, opioid addiction continued to be viewed as a legal problem. Individuals who were dependent on opioids and engaged in criminal behaviour were incarcerated or admitted to detoxification facilities. Hunt and Ordoroff's (1962) research suggested that recidivism rates for individuals who were either incarcerated or admitted to in-patient detoxification programs was nearly 100% at the time. Despite poor success rates, opioid addiction continued to be treated through incarceration or detoxification with the goal of abstinence. Consequently, individuals struggling with addiction began to obtain narcotics through illegal means. Courtwright (2001) noted that heroin use had increased substantially by the 1950's and 1960's, which, in turn, led to increased crime rates and drug-related deaths.

By 1959, the American Medical Association recognized that its current narcotics policy needed re-evaluation, and admitted that the early clinics of the 1920s had been unfortunately closed due to their lack of congruence with the prevailing drug policy at the time (i.e., that complete abstinence should be the sole treatment goal), rather than due to a lack of treatment success. The American Medical Association's revision of their original policy renewed debate about medical maintenance therapies for narcotic addictions. Despite ongoing debate, a landmark decision by the American Supreme Court in 1962 arguably led to the establishment of many of the opioid dependence treatment facilities available today. The Court ruled that conviction for narcotic dependency was a violation of constitutional rights (Chavkin, 1990). Carstairs (2006) indicated that public perception of opioid addiction was also changing within Canada. Whereas dependency previously had been viewed as an individual problem that could be controlled, the emergence of the disease model of addiction was leading to improved public support and sympathy for addicts.

In light of changing political and social climates within Canada and the United States, several modes of treatment and treatment facilities were established for the treatment of opioid addiction. These included drug-free therapeutic facilities, in-patient detoxification, in-patient rehabilitation, and MMT (Carstairs, 2006; Courtwright, 2001). These approaches continue to reflect current practices for the treatment of opioid addiction in North America (Carstairs, 2006; Courtwright, 2001). The Province of New Brunswick, Canada opened its first provincially funded methadone maintenance treatment programs in 2005 (Luce & Strike, 2011).

### **The History of Methadone Maintenance Treatment**

MMT involves the prescription of methadone, a synthetic opioid known for its long-acting effects, as an opioid substitution. Methadone was originally developed in Germany during World War II as a painkiller. In terms of addiction treatment, methadone was first used in opioid detoxification during the late 1940s. It was not until the early 1960s that the first MMT program was opened in New York City. At that time, the use of methadone as a long-term maintenance treatment was a new concept, but early research demonstrated promising results on several outcome variables. For instance, methadone clients reportedly had lower rates of illicit drug use, reduced criminal behaviour, and no longer experienced drug cravings (Bowden, Maddux, & Esquivel, 1978). In 1963, researcher and psychiatrist Robert Halliday established Canada's first methadone maintenance program in British Columbia. By the late 1960s, methadone maintenance was available as a treatment option for opioid addiction throughout Canada. MMT continues to be one of the most widely used therapies for opioid addiction (Carstairs, 2006; Health Canada, 2002).

## **Overview of Methadone Maintenance Treatment**

The concept of MMT, which supplies methadone as a medical treatment for opioid dependence, is consistent with the harm reduction approach to drug treatment. The goal of MMT is to reduce the adverse physiological side effects associated with detoxification and opioid withdrawal. Rather than stop substance use completely, as advocated in abstinence based approaches, MMT replaces illicit opioid use with prescription methadone and, thus, reduces the withdrawal symptoms that otherwise would increase risk of relapse (Walsh & Strain, 2006). The harmful effects associated with illicit substance use (e.g., mortality, infectious diseases) are also reduced as a result, while other important aspects, such as quality of life, are improved (van den Brink, Goppell, & van Ree, 2003).

Currently, there is no universal definition of what constitutes a MMT “program”, and this has led to wide variability between treatment programs in their structure and procedures. However, all methadone maintenance programs include the prescription of methadone for the treatment of opioid dependence (Health Canada, 2002a). During MMT, clients consume an oral dose of methadone provided by the methadone clinic, a participating pharmacy, or physician. Dosage administrations range from daily to weekly in frequency, while specific dosages are based on individual characteristics (Centre for Addiction and Mental Health, 2003).

### **Methadone Dose Induction Phase of MMT**

Assuming a client qualifies for MMT, the first step in any methadone program is to start the client on methadone (Strain, 2006). During this induction phase, the primary goal is to provide the client with relief from common opioid withdrawal side effects. The client’s methadone dose may be adjusted to reduce symptoms of opioid withdrawal, while it is expected that some symptoms of withdrawal will need to be tolerated. Opioid withdrawal tends to peak 3-5 days after last opioid use, with physical symptoms continuing for 5-10 days. Opioid withdrawal symptoms during induction of methadone include nausea, abdominal cramps, and chills (Kastelic, Dubajic, & Strbad, 2008). Additional psychological symptoms, such as insomnia, anxiety, and drug craving, may persist beyond methadone dose induction (Littlejohn, 2009).

One of the foremost challenges experienced by methadone maintenance programs is determining an appropriate methadone dose. Unfortunately, the initial methadone dose may not provide adequate relief because the methadone may not have had sufficient time to accumulate in body tissues. Thus, relief of symptoms may not occur until the second dose of methadone. There has been surprisingly limited research examining the best strategy for methadone dose induction. Furthermore, what research does exist appears to be somewhat inconclusive. Early work (e.g., Cheung & Pugliese, 1973; Dole, Nyswander, & Warner, 1968; Nichols, Salwen, & Torrens, 1971) suggested that multiple daily doses of methadone provided better relief from withdrawal symptoms than single daily doses during initial induction. Conversely, Goldstein (1971) found that single daily dosing was just as effective as multiple daily dosing. More recently, Greenwald (2006) compared gradual dose increases during induction to rapid dose increases, and found the former to be superior in terms of managing heroin craving and opioid withdrawal. Strain (2006) asserted that, in light of limited research to guide clinical practice, clinical experience must be relied on to make initial dosing decisions. The College of Physicians and Surgeons of Ontario (2005) advocated starting at low dosages of methadone with gradual increases until a level appropriate for the individual is reached. This is consistent with the position of the National

Institute on Drug Abuse (1995), which recommended that methadone dosage should be based on individual client needs, treatment progress, and treatment goals.

### **Stabilization/Maintenance Phase of MMT**

The stabilization or maintenance phase of MMT typically represents the greatest proportion of treatment. Friedman and Wilson (2004) noted that the maintenance phase involves prolonged detoxification from substances. During this phase, individuals continue to receive methadone as an ongoing treatment for opioid addiction. Friedman and Wilson added that methadone is most commonly used as a maintenance treatment, indicating that the treatment can last a period of years and, for some, may be indefinite.

With respect to illicit drug use while on methadone, program policies can sometimes vary. Nonetheless, the majority of programs adhering to the harm-reduction approach recognize that complete abstinence is not an attainable goal for everyone. Thus, it is recognized that some individuals may continue to use substances during MMT. As such, substance use becomes the target of supplementary counselling and intervention services during the maintenance phase of MMT. Regarding opioid use specifically, the use of illicit opioids is strongly discouraged during MMT considering the increased risk of overdose for individuals combining other opioids with methadone. Considering treatment planning implications and potential lethality, substance use during MMT is often monitored through urinalysis (Ward, Mattick, & Hall, 1998b).

### **Methadone Dose Withdrawal Phase of MMT**

The final stage of MMT focuses on methadone withdrawal or detoxification. During this stage, clients undergo medically supervised withdrawal from methadone. Withdrawal symptoms during this final phase should be minimal, although clients may experience insomnia, loss of appetite, and general body aches. These symptoms may last up to two weeks, but in some cases may be more prolonged (Martinez-Raga, Sabater, Perez-Galvez, Castellano, & Cervera, 2004). Although methadone withdrawal is considered to be a phase of MMT, Strain (2006) cautioned that methadone withdrawal has been successful for only a small number of methadone clients. Considering this view, van den Brink and van Ree (2003) reported that methadone withdrawal should be restricted to clients who are psychologically stable, physically fit, and socially integrated, or to clients who have achieved these statuses through MMT. Thus, not all clients benefiting from MMT will be appropriate for methadone dose withdrawal. It may be clinically appropriate to continue an individual in MMT long-term, particularly if there have been relapses in the past.

### **Additional Program Components of MMT**

The indefinite nature of MMT has sparked criticism about the use of methadone as a treatment for opioid addiction. Critics of MMT argue that methadone is an addictive substance, and MMT, therefore, is merely substituting one addiction for another (Newman, 2005). Additional arguments claim that methadone programs fail to *treat* individuals facing addiction by focusing on pharmacological treatments as opposed to psychological or psychosocial treatments. Although this controversy is not unfounded, it is important to note that there is substantial variation between programs in terms of individual program components and policies (Marsch, 1998; Prendergast, Podus, & Chang, 2000).

While some programs offer only methadone as the intervention, other programs include additional psychosocial components intended to address substance dependency in a greater context (Department of Health, Prince Edward Island, 2008; Prendergast et al., 2000). Psychosocial treatments may include individual counselling, group counselling, skills training (e.g., coping skills, job skills), relapse prevention, and family therapy (Mattick, Ward, & Hall, 1998). Health Canada (2002b) has suggested that a comprehensive methadone maintenance approach should generally incorporate several key components, including, but not limited to, methadone dose, medical care, mental health services, counselling and support, other substance use treatment, health promotion, outreach and advocacy, and relationships with community-based supports and services. Kidorf et al. (2006) asserted that methadone treatment programs are ideal settings in which to incorporate counselling and psychosocial services intended to improve treatment outcomes. The authors argued that substance abusers experience an array of problems that contribute to, and maintain, drug dependency. Therefore, administering methadone alone may not be sufficient. The inclusion of psychological and psychosocial treatments with methadone administration may prove extremely beneficial in meeting the prolonged needs of individuals addicted to opioids and contributing to treatment outcomes.

### **MMT Treatment Outcomes**

Farrell et al. (1994) asserted that MMT is the most evaluated form of treatment for drug abuse. There have been several reviews and meta-analyses examining the effectiveness of MMT on a variety of treatment outcome variables (e.g., Johansson, Berglund, & Lindgren, 2007; Marsch, 1998; Mattick, Breen, Kimber, & Davoli, 2003; O'Connor & Fiellin, 2000; Ward, Hall, & Mattick, 1999). Evidence strongly supports the overall effectiveness of MMT compared to placebo and no treatment controls, as well as other types of treatment for opioid dependence, such as detoxification and outpatient counselling (Dolan et al., 2003; Dole et al., 1969; Gunne & Gronbladh, 1981; Mark et al., 2006; Yancovitz et al., 1991). Despite the substantial research examining the efficacy of MMT, there have been contradictory findings related to different treatment outcomes. The following discussion reviews the evidence of MMT's effectiveness for specific outcomes commonly examined in the literature.

#### **Retention in Treatment**

Retention in treatment is one of the foremost primary outcome measures included in research studies. Clark et al. (2002) noted that a treatment is only as successful as its ability to retain clients within its program. Therefore, it is imperative that MMT programs demonstrate reduced drop-out rates compared to other treatment modalities. There has been ample research in this area. D'Ippoliti, Davoli, Perucci, Pasqualini, and Bargagli (1998) found that the retention rate for heroin users enrolled in MMT was 40% at one year post-admission. Amato et al.'s (2005) meta-analysis of 52 studies involving over 12 000 participants found that clients enrolled in MMT were less likely to drop-out compared to clients receiving no medical treatment, methadone detoxification, and buprenorphine maintenance. Based on current research findings, it can be concluded with confidence that MMT contributes to higher client retention rates compared to other opioid and heroin addiction treatments (Amato et al., 2005; Clark et al., 2002; Mattick, Ali et al., 2003). With respect to differences among prescription opioid and heroin users, research suggests that these populations demonstrate similar MMT retention rates (Banta-Green, Maynard, Koepsell, Wells, & Donovan, 2009). Additional replication of this type of research will further clarify the role of drug type in retention rates.

### **Reduced Opioid Use**

Just as retention in treatment is a necessary treatment outcome, so too is reduced opioid use. Researchers have been examining this outcome since methadone's inception as a treatment for opioid dependence. Marsch's (1998) meta-analysis of 11 empirical studies found a consistent statistical relationship between MMT and reductions in illicit opioid use. Johansson et al.'s (2007) more recent meta-analysis supported Marsch's earlier findings. Examination of eight randomized controlled trials revealed that MMT significantly reduced opioid abuse. However, all studies in Johansson et al.'s meta-analysis involved heroin users and only examined reductions in heroin use. Additional research has shown similar findings, although most samples have focused only on heroin use (e.g., Stewart, Gossop & Marsden, 2002; Teesson et al., 2006). Consequently, conclusions about the effectiveness of MMT may not generalize to prescription opioid users.

While MMT has been associated with reductions in opioid use, evidence suggests that these reductions may depend on adequate dosage levels, and may only occur as long as an individual continues to receive methadone (i.e., methadone maintenance; National Institute on Drug Abuse, 1995). Based on their literature review, Ward et al. (1998b) concluded that clients were less likely to use heroin as their methadone dose increased. However, Hall, Ward, and Mattick (1998) suggested that reductions in illicit opioid use may only continue as long as the client remains in treatment. For example, Knight et al. (1996) found that the majority of clients who were detoxified from MMT demonstrated increased heroin use.

### **Reduced Non-Opioid Substance Use**

While there appears to be a link between MMT and reduced heroin use, the impact of MMT on use of other substances is less clear. According to the National Consensus Development Panel on Effective Medical Treatment of Opioid Addiction (1998), MMT has been shown to reduce secondary abuse of cocaine, marijuana, alcohol, benzodiazepines, barbiturates, and amphetamines in opioid abusers. More recent research findings are contradictory. Teesson et al. (2006) reported that MMT did not reduce non-opioid drug use, while Fischer, Cruz, Patra, and Rehm (2008) found that clients who were engaged in MMT reported lower levels of non-opioid substance use. With respect to alcohol use, Srivastava, Kahan, and Ross (2008) reviewed 15 published studies examining alcohol use during MMT. The authors concluded that, although contradictory results were evident, the research appears to indicate no major changes in alcohol use with MMT. This conclusion is expected considering that MMT is intended to reduce opioid use, and programs may not target alcohol use specifically.

In summary, current published studies are contradictory in terms of whether or not MMT reduces non-opioid substance use. Moreover, current published studies involve samples characterized primarily by heroin use, and drawn from large urban populations. Therefore, these findings may not be representative of the smaller urban or more rural populations typical of prescription opioid use (Fischer et al., 2006). Additional research examining the effect of MMT on non-opioid substance use is required before more definitive conclusions can be reached.

### **Reduced Criminal Activity**

Reduction in criminal activity is another common outcome examined in MMT effectiveness studies. Research over the past twenty years has produced strong evidence indicating that MMT is effective in reducing criminal activity (Fletcher & Battjes, 1999). Researchers have examined

various types of crime, including drug-related crime, property-related crime, and less serious types of crime, such as traffic violations and misdemeanours (Fletcher & Battjes, 1999; Hall et al., 1998). Hall et al. reviewed relevant literature and concluded that specific methadone programs appear to vary in their effectiveness in reducing criminality. It was unclear as to which specific variables may mediate this relationship, but Hall et al. hypothesized that program characteristics (e.g., methadone dose, treatment duration) and client characteristics were likely involved. Unfortunately, there has been very little research to test these hypothesized mediators.

Marsch's (1998) meta-analysis of the efficacy of MMT in opioid substance abuse suggested that the effect of MMT on criminal activity may depend on the type of crime being investigated. She found a strong relationship between MMT and reductions in drug-related criminal behaviour. This finding is not surprising – as drug use decreases, one would expect criminal activities related to drug use (e.g., possession of controlled substances) to also decrease. Marsch also found an effect of MMT on non-drug-related crimes (e.g., theft), although she noted that the effect was small. Johansson et al.'s (2007) meta-analysis supported Marsch's conclusion that MMT can reduce criminality. Although there certainly appears to be a relationship between MMT and criminal activity, further research is required to strengthen these conclusions and examine which client characteristics and program variables mediate the relationship.

### **Reduced Mortality**

In addition to reductions in substance use and criminal activity, MMT programs have focused on reduced mortality as a measure of successful outcome. There is strong support for the conclusion that MMT reduces mortality among individuals addicted to opioids. Esteban et al. (2003) found that individuals with opioid addiction who remained in MMT had a lower mortality rate compared to those who left treatment prior to completion. Additionally, the longer a client remained in treatment, the longer they were likely to live. Similar findings have been reported by other researchers (Caplehorn, Dalton, Cluff, & Petrenas, 1994; Caplehorn, Dalton, Haldar, & Petrenas, 1996; Fugelstad, Stenbacka, Leifman, Nylander, & Thiblin, 2007; Gearing & Schweitzer, 1974).

### **Improved Physical Health Outcomes**

While MMT outcome is often evaluated in terms of reductions in substance use, criminality, and mortality, researchers have also examined improvements in various domains, including physical health. The vast majority of research investigating physical health outcomes has focused on rates of infection and transmission of HIV and other blood-borne diseases. Hartel and Schoenbaum (1998) investigated trends in injection drug use, HIV infection levels, and MMT over the course of two decades in New York City. The authors found that rates of HIV infection decreased with longer treatment durations, and concluded that long-term maintenance treatment acts as a protective factor against HIV infections. Other research (e.g., Pang et al., 2007) suggests that MMT may contribute to lower infection rates within mere months of beginning treatment.

There has been an abundance of published literature on health behaviour outcomes of methadone clients. Specifically, researchers have been interested in risky health behaviours that contribute to HIV and other infections, including sexually transmitted diseases. Millson and her colleagues (2007) determined that the proportion of risky health behaviours among MMT clients decreased significantly from treatment entry to six month follow-up including a decrease in injection drug

use and needle sharing. Similarly, Pang et al. (2007) demonstrated dramatic decreases in injection drug use from treatment entry (69%) to 6 month follow-up (8.9%), and these benefits were maintained at 12 month follow-up (8.8%). These findings highlight the importance of remaining in MMT for lengthier durations.

There has been surprisingly little research examining general physical health outcomes of MMT. While several authors make assertions that physical health outcomes improve with MMT (e.g., Fletcher & Battjes, 1999; Health Canada, 2002b), research is not available to support these claims. Research has shown that substance users, as a general group, are at increased risk for physical health problems and tend to report poorer levels of overall physical health compared to general populations (Adlaf & Lalomiteanu, 2005; Fischer et al., 2006; Garrity et al., 2007). Despite these findings, researchers have not examined whether there is a relationship between MMT and physical health improvements. Moreover, the increasing prevalence rate of addictions resulting from legitimate medical prescriptions lends a more immediate sense of urgency to this topic (Fischer et al., 2006). Thus, it is unclear whether actual clients' health status improves with MMT.

### **Improved Mental Health Outcomes**

The effect of MMT on mental health functioning is another area that has been relatively understudied. To date, the majority of research on mental health and MMT has examined psychosocial program variables as predictors of treatment outcome, rather than mental health as an outcome itself (e.g., Kraft, Rothbard, Hadley, McLellan, & Asch, 1997; Magura, Rosenblum, Fong, Villano, & Richman, 2002; Woody, 2003). That said, available research examining MMT and mental health outcomes has shown promising results. McLellan, Arndt, Metzger, Woody, and O'Brien (1993) found that clients receiving enhanced methadone services (methadone and standard counselling targeting drug use, employment status, illegal activity, and interpersonal relationships, plus availability of additional group and individual services and access to more mental health professionals) experienced significant improvement in their mental health status at six month follow-up. Mattick, Ali, et al. (2003) reported similar findings. In contrast, Chun, Guydish, Silber, and Gleghorn (2008) found that individuals on a MMT wait-list displayed increased levels of psychiatric problems. Researchers have shown interest in more specific forms of mental health concerns, but have focused primarily on depression, which is a common disorder among methadone clients (Kosten et al., 2003). Schreiber, Peles, and Adelson (2008) explored changes in depression scores from baseline to 18 month follow-up in clients enrolled in MMT. The authors found that symptoms of depression were significantly reduced to non-clinical levels at follow-up. Similar reductions in depressive symptomatology have been observed by other researchers in the field (Strain, Stitzer, & Bigelow, 1991; Kosten et al., 2003). Thus, MMT is associated with significant reductions in symptoms of depression.

In order to fully understand the effect of MMT on mental health outcomes, subsequent research must emphasize this link. Previous studies, such as those by McLellan et al. (1993) and Schreiber et al. (2008), offer an important starting point, but additional research replicating and extending their findings is important. The current study contributes significantly to existing research by measuring general mental health outcomes over a much longer-term follow-up, as compared to McLellan et al.'s six month follow-up and Schreiber et al.'s (2008) 18-month follow-up, and included individuals addicted to prescription opioids.

### **Improved Social and Occupational Functioning**

Employment is a third domain that often has been evaluated as a MMT outcome variable. Several evaluations have shown that MMT can improve social and occupational functioning in some opioid dependent clients. In one of the earliest longitudinal studies on MMT and social functioning, Gearing and Schweitzer (1974) followed clients from first admission to six years into their MMT and found that the percentage of socially productive clients, as defined by being employed, attending school/training, or being a homemaker, increased from 36 to 85%. More recently, Pang et al. (2007) assessed employment status at treatment entry, 6 month follow-up, and 12 month follow-up. Upon treatment entry, 23% of methadone clients in their sample were employed. The employment rate significantly increased to 43% at 6 month follow-up, and 41% at 12 month follow-up. The difference in employment rate between the 6 month and 12 month follow-up was not significant.

Despite the promising finding noted above, the conclusion that MMT improves employment status is not always supported in the research literature. Sees et al.'s (2000) findings differed from other research in that they did not find improvement in employment outcomes for methadone clients. The lack of effect, however, may stem from the fact that nearly 50% of participants were already employed when MMT was initiated. This sample may not be representative of typical MMT-seeking populations, which often have lower pre-treatment employment rates (Gearing & Schweitzer, 1974; Pang et al., 2007). Additionally, Sees et al. noted that employment-specific psychosocial services were not provided as part of MMT. This distinction may have impacted employment outcomes (McLellan et al., 1993; Pang et al., 2007). Although there is some variability in the research, the general consensus amongst researchers appears to be that MMT results in at least some improved employment status (Health Canada, 2002b).

### **Summary of MMT Outcomes**

Research evidence strongly supports methadone maintenance treatment as an empirically-based treatment for opioid addiction (e.g., Dolan et al., 2003; Johansson et al., 2007; Mark et al., 2006). A review of current outcome literature demonstrates the effectiveness of MMT on various outcome measures. MMT has been found to be associated with reductions in opioid use (e.g., Johansson et al., 2007; Teesson et al., 2006), criminal activity (e.g., Fletcher & Battjes, 1999; Johansson et al., 2007), and mortality (e.g., Caplehorn et al., 1996; Esteban et al., 2003; Fugelstad et al., 2007). In addition, MMT can result in positive improvements on outcome measures of retention (e.g., Amato et al., 2005; Clark et al., 2002; D'Ippoliti et al., 1998), physical health (e.g., Baker et al., 1995; Millson et al., 2007), mental health (e.g., Chun et al., 2008; Mattick, Ali et al., 2003; Schreiber et al., 2008), and employment status (e.g., Gearing & Schweitzer, 1974; Pang et al., 2007). The relationship between MMT and reductions in non-opioid substance use is less clear. Some research suggests that methadone may reduce non-opioid drug use (e.g., Fischer et al., 2008; Teesson et al., 2006), and other research suggests that MMT does not result in changes in alcohol use (e.g., Srivastava et al., 2008).

Future research is required to replicate previous MMT outcome findings in the literature. An extension of previous research is required particularly in terms of the type of opioid user sample examined. Previous research samples have consisted primarily of heroin users, while researchers rarely examine differences between heroin and prescription opioid users in terms of treatment

outcomes. Despite pharmacological similarities between heroin and prescription opioids, there have been differences found between users of these substances (Fischer et al., 2008). Research has also focused on programs within larger urban centers. There has been noticeably less research accumulated on prescription opioid use in smaller urban centers, or more rural areas. The current study contributes to existing research by examining treatment outcome variables within a MMT population consisting primarily of prescription opioid users living within a smaller urban city (Saint John, New Brunswick) and outlying rural areas. Thus, this research offers a unique contribution to existing literature.

### **Predictors of MMT Outcomes**

Research on MMT treatment outcomes is undeniably important from the perspective of program evaluation and improvement. Likewise, examining predictors of MMT outcomes can inform research and clinical practice. There is no doubt that some clients experience greater treatment success than others. Thus, understanding which specific client characteristics (e.g., age, gender) predict MMT outcomes can enable MMT programs to better target the treatment needs of different individuals within their programs. Similarly, treatment processes and program features may also impact MMT outcome and must, therefore, be evaluated as predictors of MMT outcome.

#### **Client Characteristics**

**Age.** Age of the methadone client as an individual client variable has received some attention in the literature. Ward et al. (1998a) noted that there was no association between age and outcome for most MMT treatment outcome variables in their review, but age may be associated with treatment retention. For example, Grella, Anglin, Wugalter, Rawson, and Hasson (1994) found that older injection heroin users were more likely to stay in treatment longer, compared to younger age cohorts. More specifically, Torrens, Castillo, and Perez-Sola (1996) reported that being older than age 30 years was predictive of longer treatment retention. As a result of these findings, older age, because it increases the likelihood of retention, and retention is associated with better outcomes, is generally believed to be associated with improved treatment outcomes in MMT (Health Canada, 2002b). While there is some merit to this conclusion, there has been limited research examining age as a predictor variable for treatment outcome in methadone clients primarily dependent on prescription opioids.

**Gender.** Gender is a second client variable that may be related to MMT outcome. Researchers do not always include analyses of outcome by gender, but do tend to examine its influences on treatment retention. Unfortunately, these results have been contradictory. Torrens et al. (1996) found no association between gender and treatment retention in a MMT program based on a harm-reduction model. Contrary to Torrens et al.'s findings, Grella et al.'s (1994) study suggested that females were more likely to remain in treatment than males. Notably, the MMT program in Grella et al.'s study had lower criteria for discharge than Torrens et al.'s study. Clients were discharged for non-compliance with program rules, failure to attend treatment for 14 days, and for stating intentions to use heroin. In contrast, participants in Torrens et al.'s study were involuntarily discharged only if they displayed aggressive behaviour or if drug trafficking occurred. Thus, differences between these studies may have been an artefact of different program discharge criteria. Similarly to Grella et al.'s study, Gogineni et al.'s (2001) results supported gender-differences in treatment outcomes, specifically intravenous drug use. These

authors found that male methadone clients were twice as likely to continue injection drug use as females while on methadone. Notably, all of these studies focused primarily on heroin addicts, which raises the issue of whether these results are applicable to individuals addicted to prescription opioid.

**Drug use.** Aside from basic demographic variables, an individual's drug use, both prior to and during MMT, may predict treatment outcome. Based on their review of the literature, Ward et al. (1998a) concluded that clients with long and severe histories of opioid use were more likely to relapse and have poorer treatment outcomes. Indeed, several studies have determined that pre-treatment opioid abuse likely increases the likelihood of post-treatment relapse. Dole and Joseph (1978) examined pre-treatment, treatment, and post-treatment opioid use, and discovered that methadone clients who used heroin for more than four years prior to treatment were more likely to relapse after methadone detoxification compared to clients who used heroin for fewer than four years prior to treatment. However, pre-treatment heroin use did not predict progress while clients remained in treatment. Based on these findings, it appears that history of opioid use is more relevant in terms of success following methadone detoxification, but may be limited as a predictor of treatment outcome during methadone maintenance. These findings have been replicated through supplementary research (Fischer et al., 2008).

Drug use other than heroin has been found to be an indicator of poorer prognosis for clients in MMT, particularly considering the increased risk associated with polysubstance use. For example, Darke, Swift, Hall, and Ross (1993) noted that these substances are associated with both fatal and non-fatal overdose in heroin users specifically. Unfortunately, researchers report high rates of both benzodiazepine and cocaine use among treated and untreated heroin users (Darke, 1998). These findings are problematic considering methadone clients who use multiple substances also tend to display poorer psychological functioning and riskier behaviours compared to other clients, which may contribute to poorer prognoses (Darke, 1998).

**Mental health status.** Just as drug use has been examined as a predictor of treatment outcome, so too has mental health status. McLellan, Luborsky, Woody, O'Brien, and Druley (1983) assessed methadone clients with high psychiatric severity and found little to no treatment improvement on any of their MMT outcome measures (i.e., medical condition, alcohol use, drug use, employment, legal status, family relations, and psychiatric status). Similarly, Rounsaville, Glazer, Wilber, Weissman, and Kleber's (1983) sample of individuals with opioid addiction showed that individuals with dual diagnoses or manifesting psychopathology tended to display poorer treatment outcomes (i.e., retention, substance use, psychological symptoms, social functioning). More recently, Craig and Olsen (2004) found that MMT clients with higher levels of psychological/psychiatric problems were less likely to be employed during MMT, and attended fewer counselling sessions throughout treatment. Based on these research findings, poorer mental health status is believed to be associated with poorer treatment outcomes in MMT.

**Criminality.** As is the case with drug use and poorer mental health status, criminality is also associated with poorer treatment outcomes. Simpson and Sells (1982) indicated that pre-MMT criminality was one of the most important predictors of post-treatment success in their study. Specifically, clients with more severe criminal histories were less likely to demonstrate improvements in drug use, criminality, and productive activities. These findings have been

supported by Rounsaville et al.'s (1983) research, which found that pre-treatment criminality predicted criminality upon treatment discharge. Additionally, the authors noted that individuals in their sample who engaged in criminality displayed poorer treatment outcomes in general. Similar results have been found by other researchers (e.g., Joe, Simpson, & Broome, 1999). This is likely because MMT does not address the criminogenic factors associated with pre-existing criminality, such as antisocial attitudes (e.g., Andrews & Bonta, 2006).

**Interpersonal relationships.** While some variables are associated with poorer treatment outcomes, other variables, such as those related to interpersonal relationships, are associated with improved treatment outcomes. More specifically, social support, particularly that which is facilitated through close interpersonal relationships, appears to be related to better treatment outcomes in methadone clients. For example, Simpson and Joe (1993) found that clients who were widowed, separated, or divorced were over twice as likely to drop-out of treatment within the first 60 days compared to married or single clients. In a similar vein, participants in Torrens et al.'s (1996) study were more likely to remain in treatment if they lived with family members. These findings are widely supported throughout the literature (Goehl, Nunes, Quitkin, Hilton, 1993; Heinz, Wu, Witkiewitz, Epstein, & Preston, 2009; Ward et al., 1998a).

While social support is generally accepted as an influential predictor of treatment success, some research suggests that the specific type of social support may need clarification. Wasserman, Stewart, and Delucchi (2001) examined social support as a predictor of drug abstinence for clients in MMT. Results demonstrated that clients were more likely to abstain from drug use when they had a relationship (e.g., friend, family member) with an individual who supported the client's drug abstinence. In contrast, more general social support was not related to abstinence outcomes.

Just as abstinence-specific social support may influence clients' reductions in drug use, social support systems that are supportive of drug use may contribute to clients' poorer treatment outcomes. Gogineni et al. (2001) demonstrated that intravenous drug users enrolled in MMT were more likely to continue intravenous drug use if their live-in partners or social networks also engaged in the behaviour. Nearly 66% of methadone clients with drug using live-in partners and social networks continued to inject, compared to only 17% of clients without these peer groups. Interestingly, the authors found that emotional support was not associated with injection drug use. These findings imply that it may not be the quantity of social support that is important, but rather the quality and whether the social support is specific to a client's treatment needs (e.g., promoting abstinence).

**Employment.** As with positive social support, employment may also predict more positive treatment outcomes. In an earlier review, McLellan, Luborsky, Woody, O'Brien, and Druley (1983) examined 113 studies assessing client characteristics as predictors of MMT outcome. Based on their review, McLellan et al. concluded that employment history and employment status at treatment entry were positively associated with treatment retention and improved treatment outcomes. Based on their results, Rounsaville et al. (1983) also concluded that pre-treatment employment was a significant predictor of post treatment employment. Moreover, Simpson and Sells (1982) indicated that one of the most important predictors of treatment outcome is employment during treatment. Similarly, Simpson and Joe (1993) illustrated that

methadone clients who were unemployed were three times more likely to drop out of treatment within the first 60 days. More recent research by Ward et al. (1998a) reiterated that individuals who were employed before, during, or after methadone treatment were less likely to relapse during and after MMT.

**Treatment readiness and involvement.** While many of the variables noted above have been related to treatment outcome, client treatment readiness and involvement is perhaps the most fundamental construct of any drug abuse program, including MMT. Treatment readiness and therapeutic involvement are considered two separate, yet closely related, constructs in the evaluation of MMT. Therapeutic readiness is often measured in terms of motivation to begin and remain in MMT. This construct has been popularly conceptualized by DiClemente's (2003) Transtheoretical Model, which depicts stages of motivational change that an individual may experience (i.e., precontemplation, contemplation, preparation, action, maintenance). In contrast, therapeutic involvement refers more to phenomena that occur during treatment, such as rapport between client and counsellor, treatment confidence, and treatment commitment. Both of these constructs have received attention in the literature as possible predictors of MMT outcome (Fletcher & Battjes, 1999).

Several authors have commented on the clinical importance of client motivation and therapeutic involvement in the treatment of addictions (e.g., DiClemente, 2003; Simpson & Joe, 1993; Straussner, 2004). Simpson and Joe provided a multi-dimensional view of motivation that included an individual's belief that he or she has drug-related problems, his/her general desire to receive help and acknowledge a need for help with their drug related problems, and an individual's readiness for treatment. These components encompassed clients' commitment levels and expectations of treatment outcome. Findings from Simpson and Joe's study illustrated that an individual's lower level of motivation significantly predicted treatment drop-out within the first 60 days of treatment. Using the same motivation constructs, Joe et al. (1999) examined data from the national Drug Abuse Treatment Outcome Studies (DATOS), a longitudinal study of 96 U.S. treatment agencies conducted in the early 1990s. These authors assessed the role of motivation and discovered that pre-treatment motivation strongly predicted therapeutic involvement, which, in turn, predicted retention rates. Based on these findings, the authors conclude that motivation may be both directly and indirectly related to treatment outcomes. Simpson, Joe, Rowan-Szal, and Greener (1997) found that pre-treatment motivation was also positively associated with session attendance. Other research by Joe, Simpson, and Hubbard (1991) indicated that clients were more likely to remain in treatment when their treatment-related attitudes and satisfaction were high. Similarly, Broom, Simpson, and Joe (1999) found that higher pre-treatment motivation was related to higher confidence and commitment after three months of treatment, suggesting that pre-treatment motivation may have a lasting effect beyond the initial few months of treatment.

Although most research has examined internal motivation as a predictor of treatment outcome, Joe et al. (1999) examined the role of extrinsically motivating factors, specifically, legal pressure (i.e., court mandated treatment). The authors found that increased legal pressure was negatively related to treatment retention. External pressure to attend treatment, therefore, may be of little benefit in terms of retention. However, legal pressure may positively contribute to other treatment processes that, in turn, impact treatment outcomes. For example, Joe et al.'s findings

also showed that legal pressure was positively related to therapeutic involvement. Contradictory findings regarding the role of legal pressure suggest a complex relationship between legal pressure and its impact on motivation and subsequent treatment outcomes. Treatment processes may act as a mediator between legal pressure and treatment outcomes. Conflicting findings may also be a reflection of differences between treatment programs and modalities of MMT administration. Joe et al.'s study evaluated 96 treatment programs included in DATOS and found that there was often wide variability between agencies in terms of treatment components (e.g., counselling, program administration). Consequently, additional research is required in order to clarify the relationship between legal pressure as a form of extrinsic motivation and its effect on therapeutic involvement and treatment outcomes.

**Summary of client characteristics as predictors of outcome.** In summary, there has been substantial research examining various client characteristics as predictors of treatment outcome. The most prevalent outcome measure impacted by individual characteristics appears to be treatment retention. Evidence suggests that the following client characteristics are positively associated with treatment retention: older age (e.g., Grella et al., 1994; Torrens et al., 1996), interpersonal relationships and positive social support (e.g., Heinz et al., 2009; Simpson & Joe, 1993; Torrens et al., 1996), employment status (e.g., McLellan et al., 1983; Simpson & Joe, 1993), and treatment readiness/motivation (e.g., Joe, Simpson, & Broome, 1999; Simpson & Joe, 1993). Additional treatment outcomes, such as reductions in opioid use, treatment attendance, and employment also have been examined. Generally, the following client characteristics have been associated with poorer treatment outcomes: poorer mental health status (e.g., Craig & Olsen, 2004; McLellan et al., 1983), history of criminal behaviour (e.g., Rounsaville et al., 1983; Simpson & Sells, 1983), and more severe history of drug use (e.g., Darke, 1998; Dole & Joseph, 1978). Findings with respect to gender are inconclusive, although available research suggests that females may have better prognoses (e.g., Gogineni et al., 2001). As with the limitations in outcome research, research examining client characteristics as predictors of outcomes must include greater consideration of these factors within prescription opioid addiction populations. The current research, therefore, replicated and extended previous literature in this domain with primarily opioid prescription users involved in MMT.

### **Treatment Processes/Program Features**

There is no doubt that individual client characteristics have received substantial attention in the literature as predictors of MMT treatment outcome. In a similar vein, researchers also have been interested in how treatment processes and program features may impact outcome measures. In the current context, treatment processes refer to specific characteristics of individual programs. This may include such aspects as specific services offered, accessibility, or duration and intensity (treatment hours) of services (Prendergast et al., 2000). Examination of individual program features is essential considering the common occurrence of conflicting research findings between MMT agencies that purport to adhere to identical treatment processes (Joe et al., 1999). Furthermore, program features are particularly relevant to the issue of improving MMT outcomes, considering that many program factors are amenable to change (Prendergast et al., 2000).

**Retention.** Generally, it appears that the prognosis is better for clients who remain in treatment longer, which lends further support for the maintenance model of methadone treatment. Simpson

and Sells (1982) assessed methadone clients who had been in treatment for three separate periods, included from intake to 90 days, 91 days to 365 days, and greater than 365 days. The authors found that treatment outcomes improved with extended treatment duration. Thirty-three percent of clients within the first 90 days of treatment displayed encouraging outcomes; however, this percentage increased to 47% for clients who had been in treatment longer than 12 months. Notably, the authors indicated that their sample included clients who were only involved in treatment for a short-term before dropping out. Therefore, these numbers may be somewhat skewed, as clients who drop-out of treatment earlier may be qualitatively different from clients who remain in treatment for a longer period. The authors did not include any analyses to compare the two groups to determine whether differences existed. This criticism notwithstanding, clients who remain in treatment longer appear to experience greater treatment success.

**Maintenance orientation.** Consistent with findings suggesting that treatment retention is associated with improved treatment outcomes, the majority of evidence also suggests that methadone programs that focus on long-term maintenance are superior in terms of client outcome. Research comparing methadone detoxification programs with methadone maintenance programs enables comparisons between maintenance orientations and abstinence-based orientations (i.e., represented by detoxification). Simpson and Sells (1982) compared treatment outcomes between methadone maintenance and detoxification clients at 12 month follow-up from intake. They found that 47% of MMT clients showed favourable treatment outcomes on measures of drug use, criminality, and productive activities. Comparatively, only 25% of detoxification clients displayed favourable outcomes on the same measures. Dole and Joseph's (1978) research also provided support for the long-term maintenance model. They compared individuals remaining on methadone maintenance with those who either dropped out or were expelled. Their results supported the long-term maintenance model. Only 10% of individuals remaining on methadone maintenance reported illicit opioid use, while 70% of clients who had left treatment experienced relapse. Only 20% of those who had left treatment were considered to have actually completed the program. After controlling for reasons for leaving treatment, only 34% of those who fully completed treatment were described as doing well post treatment. Generally, those who had left treatment prematurely also showed poor post treatment outcomes, with only 2% of those who dropped out and 1% of those who were expelled, respectively, being described as doing well. These results suggest that those who leave MMT, either voluntarily or under expulsion, are likely to demonstrate a poorer prognosis. These findings have been replicated through Dole and his colleagues' subsequent research (des Jarlais, Joseph, & Dole, 1981). Thus, the orientation of the MMT program as either being long-term versus an expectation of eventual withdrawal of methadone might influence client outcome.

**Client centered approach.** The client centered approach is another program variable that may influence client outcome. This approach emphasizes identification of client treatment needs, and encourages programs to adapt their services to the needs of each individual client (Marsh & Skinner, 1998). Meeting the needs of the individual client is an important component of any intervention strategy. This is particularly relevant to methadone programs considering the heterogeneity within its target client population. Clients presenting for methadone maintenance often show wide variability in terms of individual characteristics, drug use histories, and other

biographical information (Marsch, 1998). As a result, there has been growing interest in a client centered approach to methadone treatment.

Joe et al. (1991) presented research findings that supported the utility of a client centered approach of methadone treatment. They compared 21 different methadone clinics on several treatment predictors and outcome measures and found that clients were more likely to remain in treatment when their individual needs were properly assessed and treated. Specifically, retention rates were higher when specialized professions were available for diagnosis and treatment planning (e.g., medical, psychological) and when individual service needs were addressed (e.g., counselling). Friedmann, Hendrickson, Gerstein, and Zhang (2004) reported additional evidence to support the effect of a client centered approach on addiction treatment outcome measures. As part of their analysis of five different treatment modalities, they examined the effect of matching a client's identified needs with treatment services for drug use. Results indicated that needs-matching in all treatment modalities, including methadone, was positively associated with decreases in substance use. A client centered approach may also be advantageous in terms of methadone dosage. According to Ward et al.'s (1998a) review of the literature, programs with more flexible dosage policies were more likely to meet client needs. Based on available research, it is possible that individualizing methadone dosages for each client will impact other outcome measures.

**Integrated, comprehensive services.** Individual MMT programs may be better able to adhere to a client centered approach when integrated, comprehensive services are available to clients. Comprehensive services include any service that is intended to improve treatment outcomes for individuals with opioid addiction and may include counselling, medical care, other substance use treatment, mental health services, health promotion, disease prevention, and education services. Health Canada (2002a) recommended that methadone maintenance programs integrate these services into standard treatment practice. Given the prevalence of psychosocial problems with which many methadone clients present, Health Canada (2002b) asserted that integrated services were a key component to any harm-reduction strategy, including MMT. Unfortunately, there is wide variability between methadone programs in terms of availability of these comprehensive services (Joe et al., 1999; Prendergast et al., 2000).

Some research supports the effectiveness of specific comprehensive services, particularly counselling (Ward et al., 1998a). More specifically, McLellan et al. (1993) examined the effect of psychosocial services on the outcome measures included in the Addictions Severity Index (McLellan, Luborsky, O'Brien, & Woody, 1980). They compared methadone services with no counselling services, minimal counselling services, and enhanced counselling services that included counselling along with medical/psychiatric, employment, and family therapy services. Results indicated that methadone programs without any counselling components or minimal counselling displayed significant reductions in illegal drug use, but there were no significant improvements observed on any other problem areas (i.e., medical, employment, other drug use, legal, family, and psychiatric concerns). In contrast, clients receiving enhanced counselling services showed significant decreases in alcohol and other drug use, illegal activity, and significant improvements in employment status, family relations, and psychiatric status. Based on these results, McLellan et al. concluded that methadone alone may have limited effectiveness and may only be appropriate for a minority of clients. Most importantly, extended on-site

counselling services were related to the greatest improvement in outcome measures. Other research examining counselling services has produced results similar to McLellan et al. (1993). For example, Gossop, Stewart, and Marsden (2006) found that drug-focused counselling in MMT significantly reduced heroin and cocaine use. Thus, supplementary psychosocial services appear to be beneficial to clients who used them. Broome, Simpson, and Joe's (1999) study extended McLellan et al.'s findings by suggesting that the mere availability of supplementary services produced increased confidence in clients, even if their individual needs were not met through these services. Broome et al.'s results illustrated that programs utilizing more social and public health services tended to have greater client involvement. Clients also displayed more confidence in treatment when referral services were accessible within programs, regardless of whether individual clients utilized these services. These findings have important implications for methadone program development. Client perceptions of services are important, considering the role they may have in client involvement and subsequent treatment outcomes (DiClemente, 2003; Joe et al., 1999; Simpson et al., 1997). Conclusions drawn from current research emphasize that supplementary counselling services in general should not be overlooked within methadone maintenance programs, as they may contribute substantially to client outcomes and, thereby, the client's involvement and commitment to the treatment process.

**Summary of treatment processes/program features as predictors of outcome.** Research examining treatment components as outcome predictors has included a variety of program features. Generally, it appears that programs that adhere to a maintenance orientation and client-centered approach are associated with improvements in measures of retention, substance use, criminality, and productive activities (e.g., Brands, Blake, & Marsh, 2003; Dole & Joseph, 1978; Friedmann et al., 2004; Simpson & Sells, 1982). Likewise, availability of integrated, comprehensive services produces similar improvements, in addition to improvements in employment status, family relations, psychiatric status, and client involvement (e.g., Broome et al., 1999; Gossop et al., 2006; McLellan et al., 1993). Finally, programs that retain clients for a longer duration generally display better client prognosis (Simpson, & Sells, 1982).

### **The Current Research**

The most evident shortcoming of research conducted to date on methadone maintenance treatment and its outcome, as well as predictors of this outcome, is the lack of examination of these variables within a primarily prescription opioid abusing population. While some previous research has addressed MMT within this population, the majority of research has focused on heroin users. Consequently, additional research is required to increase practitioners', clients', and researchers' understandings of methadone's relationship to outcome variables and predictors of these outcomes within a sample of individuals addicted to prescription opioids. In addition, there has been no published, empirically based research that has examined a methadone maintenance program within Atlantic Canada. Consequently, it is unclear whether previous research generalizes to this region of Canada, which is characterized by more dominant prescription drug abuse relative to other regions of the country. The current study addressed these gaps.

This study focussed specifically on a methadone maintenance program in Saint John, New Brunswick, by means of an archival analysis of existing MMT case files. The Saint John Methadone Maintenance Treatment clinic (SJ-MMT) has been in operation since February, 2005. According to Mullin (2007), SJ-MMT follows Health Canada's (2002a) guidelines for best

practices in MMT. SJ-MMT adheres to a harm-reduction approach, which includes adoption of a maintenance orientation and a focus on client engagement and retention. SJ-MMT operates within a multi-disciplinary team environment and offers a variety of comprehensive services that range from basic screening and assessment procedures to intervention services that include consultation, referral to other agencies, psychoeducation, group and individual counselling, and the delivery of community based services. Additionally, SJ-MMT provides a client-centered approach to addictions management (Mullin, 2007).

Individuals are eligible for admission into SJ-MMT if they are experiencing opioid dependency. Individuals also may be prioritized for wait-list status (e.g., pregnant women receive admission priority). Upon admission, SJ-MMT clients are expected to adhere to basic program guidelines. These include attending physician and counselling appointments, taking all prescribed methadone doses, providing urine screens when requested, and abstaining from illicit substance use while on methadone. Additional rules related to the clinic itself are also expected to be followed, including but not limited to zero tolerance for violence, no loitering on premises, and not soliciting or selling illicit drugs on the premise. New admissions to SJ-MMT are provided with a three month grace period to allow for stabilization, with an additional three month period granted if necessary. Discharge for an individual may be considered if the client continuously fails to meet the basic conditions and expectations of the program (e.g., misses three or more methadone doses), or if the risk of continuing methadone outweighs the benefits (e.g., if the client continues to engage in illicit substance use, which could contribute to increased mortality). Mullin (2007) reported that every effort is made to retain a client in treatment. While clients are individually case managed, any decisions regarding admission, sanction, or discharge is a collaborative effort made by the Treatment Team (Mullin, 2007).

The Social Determinants of Health described by the Commission on the Social Determinants of Health (CSDH; 1998) were used as a conceptual framework for the evaluation of the SJ-MMT program. The Social Determinants of Health refer to the conditions in which individuals live and which affect their lives (e.g., living conditions, social environment, health care, gender, and social inequalities). According to the CSDH, these conditions are shaped by society and government policy, and influence health outcomes (e.g., mortality, mental health, physical health). In the context of this study, the social determinants of health framework was used to structure MMT predictor and outcome variables.

The evaluation of SJ-MMT and its characteristics uniquely contributes to the substance treatment literature because, to date, there has been no published systematic evaluation of an Atlantic Canadian methadone program by independent researchers. Although many programs complete regular descriptive evaluations of their services and outcomes, the current research provides a more extensive evaluation than has been previously completed by agencies in Atlantic Canada. The results, therefore, inform research and clinical practice for methadone programs within Atlantic Canada, and the Saint John Methadone Clinic specifically. Additionally, this research contributes uniquely to existing Canadian literature that has focused primarily on methadone programs in Central and Western Canada.

The current research employed a non-randomized repeated measures within-subjects design. Specifically, this research examined client and program characteristics as predictors of MMT

outcome at various follow-up time periods. The current research examined data for up to 5 years of involvement in MMT, which included measured changes from intake to the first annual follow-up period 12 months later, and subsequent annual follow-up periods over a maximum of 4 years. Thus, this research included up to 5 years of data. These follow-up periods were used to determine whether changes occurred in outcome variables across time, and to identify which client and program characteristics were related to these changes.

### **Hypotheses and Predictions**

The central thesis of this research was that prescription opioid users would experience benefits similar to those seen in heroin users from MMT on outcome measures. It was predicted that both client and program characteristics would be related to treatment outcomes. These general predictions, therefore, provided the basis for the specific hypotheses relevant to the research.

(1) The first research question examined the point (measured in weeks) at which MMT clients were most likely to terminate treatment prematurely (e.g., drop-out, discharged). Consistent with previous research, it was predicted that the majority of withdrawals would occur during the initial 12 months of treatment (e.g., Luo, Pang, & Wu, 2007). Reasons for early departure were explored.

(2) The second hypothesis predicted that MMT clients would demonstrate improvements across time from Intake to subsequent 12 month follow-up periods. Specifically, the greatest changes were expected to occur in the domains of opioid use, mental health, physical health, and criminality. Changes in non-opioid use were also examined; however, no specific hypotheses regarding its impact were made given contradictions in existing literature for this variable (e.g., Fischer et al., 2008; Srivastava et al., 2008).

(3) The third hypothesis was that client characteristics would be related to MMT outcomes. Specifically, older age, being female, positive social support, employment, treatment readiness/motivation, and client satisfaction with services were predicted to be related to positive treatment outcomes. These client characteristics fall within the social determinants of health identified by CSDH (1998). It was expected that the relationship between individual characteristics and outcome variables would be most strongly reflected in increased retention rates and decreases in opioid use amongst clients after admission into MMT. Furthermore, specific client characteristics were expected to be related to poorer treatment outcomes. Consistent with previous literature (e.g., Craig & Olsen, 2004; Darke, 1998; Rounsaville et al., 1983), it was anticipated that clients displaying poorer pre-treatment mental health status, criminal history, and more severe substance use would show less favourable outcomes on measures of retention and opioid use.

(4) The fourth hypothesis of this research was that program variables would be related to MMT outcome measures. It was expected that clients who received comprehensive services would demonstrate improved treatment outcomes. Consistent with previous literature (e.g., Broome et al., 1999; Gossop et al., 2006), it was hypothesized that addressing client needs through comprehensive services would lead to positive treatment outcomes. Specifically, the total number of hours of treatment service received from SJ-MMT (i.e., intensity of services) was expected to positively relate to improved treatment outcomes (e.g., retention, substance use).

## Method

### Participants

Participants for the study were drawn from a population of opioid abusing and dependent clients. Participants consisted of an archival sample of all clients who had been enrolled in the methadone maintenance outpatient treatment program at Ridgewood Addictions Services in Saint John, New Brunswick. Participants qualified for enrolment in SJ-MMT if they were over 18 years of age, dependent on opioids (e.g., regular use, experiencing problems associated with use, withdrawal symptoms), and were unlikely to benefit from non-methadone-based addiction treatment.

### Materials and Measures

The current database maintained by SJ-MMT as part of their standard operating procedure was used to access archival client information. SJ-MMT staff collect database information at intake and at 12 month follow-up periods for as long as the client remains in MMT. The database at the time of this research contained up to five years of client intake and follow-up information. The database consisted of clinician-recorded client information and progress across several dimensions (see Appendix A). These dimensions included basic demographic information, assessment information, drug screen results, methadone dosage levels, participation in treatment programs, and date and type of client contacts. Information regarding the client's phase in MMT, goals, and treatment plan was also included. Additional variables allow staff to track client change and progress over time. These included drug of choice, amount of opioid and other substance use, employment status, criminal activity, and health concerns. Additionally, clients provided ratings of their own interpersonal relationships, health status, self-esteem, and ability to deal with a variety of emotions, including stress, anxiety, depression, and anger. These client ratings were provided on an 11-point Likert scale, with higher scores indicating more positive ratings. Clients also completed a Client Satisfaction Survey, which asked them to indicate their agreement or disagreement with 13 items referring to such constructs as service quality and general satisfaction with services (see Appendix B). This clinician-obtained predictor and outcome data were used to test the hypotheses relevant to the current research from the client perspective given its self-report nature. Inter-rater reliability was not available for database elements, as clients were interviewed by only one clinician.

### Procedure

**Permission to access client records.** Traditionally, individual client consent is required to review file records collected for non-research purposes. However, it was recognized that difficulties may arise when trying to contact all clients involved with SJ-MMT since the program began 5 years ago. All clients may not be available for contact due to outdated contact information, death, incarceration, or general difficulties contacting this population (i.e., frequent moves, homelessness). Additionally, the clients that may be most difficult to contact may be precisely the clients that are most critical to include in an evaluation of MMT treatment effectiveness (e.g., those who left treatment prematurely, were discharged, or have been out of contact with SJ-MMT). The *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (1998) suggests that, in these circumstances, consultation with representative members of the group would be appropriate. Notably, the *Tri-Council Policy Statement* does not specify what percentage of members of the group would be considered representative, nor does it indicate the proportion of agreement that is required for representational consent. In the absence

of guidelines, a conservative approach to obtaining representational consent was used. The primary researcher contacted a group of 20 SJ-MMT clients to serve as representatives of the broader sample. In order to proceed with file review, a criterion for representative consent agreement of  $\geq 80\%$  was required. A convenience sample of representative clients was identified by SJ-MMT staff and contacted by the primary researcher to describe the study and ask them to sign an informed representational consent (see Appendix C). Using this approach, 100% consent agreement was gained from the representative sample ( $n=20$ ).

Once the appropriate informed consent was received, file information was extracted based on information collected at intake and each subsequent 12 month follow-up period. There were up to five annual follow-up periods depending on how long each client had remained in MMT. Data was originally in Microsoft© Access format, and was extracted using Standard Query Language (SQL) programming language directly into IBM© Statistical Package for the Social Sciences (SPSS) format. Data was extracted by a software engineer with a specialized background in data analysis.

**Outcome variables.** Several primary and secondary outcome measures were examined based on data extracted from the database. Retention and drug use were the primary treatment outcomes under examination in the proposed research. Retention was defined as the number of weeks the client had been enrolled in MMT since intake up to their final available follow-up period. Consistent with previous literature, opioid use was defined as the frequency of opioid use at each follow-up period as recorded in the SJ-MMT database. Frequency was recorded as an ordinal variable ranging from none (i.e., no drug use), occasional (i.e., less than once per month), monthly, weekly, and daily use. Urinalysis drug screen results were also examined as a measure of opioid use.

Secondary treatment outcomes include mental health status, physical health, non-opioid use, and criminality at each annual follow-up period. Mental health status encompassed self-reported levels of anger, anxiety, depression, panic, stress, and self-esteem based on information recorded in the SJ-MMT database (i.e., their ratings on the 11-point rating scales measuring these constructs). For data analysis purposes and as a means of condensing the available dataset, ratings on these constructs were summed to yield an overall mental health score. Higher scores were indicative of more positive mental health functioning overall. An internal reliability analysis was conducted to determine the homogeneity of this general mental health scale. Should the scale not have been internally reliable (i.e., Cronbach's  $\alpha < .60$ ), then these mental health outcomes would have been analyzed separately. Physical health referred to clients' self-report ratings of their general physical health on the same 11-point Likert scale that assessed mental health constructs. Non-opioid use referred to the frequency of other substance use, including alcohol, and was recorded on an ordinal variable ranging from none (i.e., no drug use), occasional (i.e., less than once per month), monthly, weekly, and daily use. Urinalysis drug screening results testing positive for non-opioid substances were also examined. Lastly, criminality was assessed according to general criminal activity recorded in the SJ-MMT database. Criminal activity was recorded on an ordinal scale ranging from no self-reported criminal activity to monthly self-reported criminal activity.

**Predictor variables.** Predictor variables included both client and program characteristics. Client characteristics extracted from the database included age, gender, employment status, income source, and client satisfaction with services. Client satisfaction with services was based on the total score derived from the Client Satisfaction Survey information collected by SJ-MMT consisting of 13 items. In order to derive a total score, “Yes” responses received a rating of one, while “No” responses received a rating of zero. Higher scores indicate higher satisfaction with overall services.

Information relevant to program characteristics was coded based on information recorded in the SJ-MMT database. Comprehensiveness of services was based on the type of services received (e.g., individual counselling, group counselling). This information was drawn from the SJ-MMT database and was coded into a total score for comprehensiveness of services, where each type of service received was given a single point. Points were then summed to estimate the comprehensiveness of services received by each individual client. For example, individual counselling and group counselling received one point each for a total score of two points on comprehensiveness. Intensity of services received was defined by the total number of treatment hours received by an individual client, which was recorded in the SJ-MMT database.

## Results

Prior to statistical analyses, data were screened for accuracy, completeness, outliers, and for the assumptions of the specific procedures with which data were analysed (e.g., skewness, kurtosis, non-linearity, multicollinearity, sphericity). Then descriptive analyses were conducted on each of the scales used in the study to describe the sample at intake and general information about the SJ-MMT program outcome data. A complete-case analysis of data was employed. Thus, all cases with missing values (e.g., at follow-up) were removed from the corresponding analyses. This approach is consistent with recommendations offered by experts who have statistically compared data analysis strategies for studies with substantial dropout rates and have concluded that complete-case analysis is superior to other methods in terms of lower Type I error and increased power (e.g., Chakraborty & Gu, 2009; Salim, Mackinnon, Christensen, & Griffiths, 2008). Although a complete-case analysis was used, Intake data for the two participant groups (i.e., dropped-out versus retained) was compared on demographics (e.g., age, gender) and substance abuse history to determine whether differences existed between these two groups.

Following descriptive analysis, the main research questions of the study were addressed. Data were analysed using analysis of variance (ANOVA) to test for between group differences with respect to Intake and each annual follow-up period on the various dependent variables. Where the assumptions of ANOVA were not met, nonparametric analyses were conducted (e.g., Kruskal-Wallis tests). Data analyses included all possible main effects and 2-way interactions. An alpha level  $\leq .05$  was used as the criteria for statistical significance. Sample sizes varied across analyses because of missing data points (e.g., follow-up data was not available for some clients despite continued enrolment in SJ-MMT), and the use of complete-case analysis. In addition, effect sizes were calculated to assess the strength of relationships between variables.

Results of data analyses are presented in sections organized according to the dependent variable assessed in these analyses. First, correlational results between demographic variables (i.e., age, education) and outcome variables are presented following general demographic information.

Data analyses involving retention and discharge are then presented, followed by analyses conducted on outcome variables of interest (Opioid Use, Non-opioid Use, Needle Use, Physical Health, Mental Health, and Criminal Activity).

### **General Demographics**

Given that the current study was longitudinal in nature, the number of participants varied somewhat for each time period due to attrition and variations in discharge rates. Intake data were available for 458 participants, consisting of 260 males and 198 females. Of these original participants, 216 completed the initial one year follow-up assessment (124 males, 92 females); 135 were available for the two year follow-up (80 males, 55 females); 70 participants completed a third year follow-up (39 males, 31 females); 26 completed a fourth year follow-up (15 males, 11 females); and data were available for one participant at the five year follow-up (demographics will not be reported to protect confidentiality). Overall, the age of participants at intake ranged from 18 to 58 years, with an average age of 31 years ( $SD = 8.79$ ). With respect to geographic locations, 46% of participants lived within 50 kilometres of the SJ-MMT program (i.e., Greater Saint John), 10% lived 50 to 100 kilometres from the program, 42% were located 100 to 200 kilometres away, and 2% were located a distance greater than 200 kilometres from SJ-MMT. Sixty-eight percent of participants were unemployed at intake, while others were employed in various occupations (e.g., professional, labourer). Overall, the sample consisted of a group with high school education or lower (75%), with public assistance being the primary source of income (57%), and most reporting income of \$10 000 or less (71%). The mean length of drug use at the time of admission into SJ-MMT was 77.1 months ( $SD = 66.62$ ), or 6.4 years. While 64% of clients reported an opioid as their primary drug of choice at intake, there was a substantial amount of data missing for this variable at the intake level (35%). However, the amount of missing data in the drug of choice variable amongst those admitted was much smaller (11%). A 1% minority reported a non-opioid as their primary drug of choice at admission. Amongst those who reported an opioid as their primary drug of choice, 94.6% indicated a prescription opioid specifically, while less than 1% reported heroin use. The mean length of enrolment in SJ-MMT was 75 weeks ( $SD = 71.43$ ), or 18 months.

There was some variability in attrition rate across time. There was an attrition rate of 45% between Intake and the first annual follow-up (i.e., Year 1). Of these cases, 5% were reported as having had completed treatment and 11% had been transferred to other methadone programs either within or outside of New Brunswick. The majority left without completing the program (e.g., treatment non-compliance, against medical advice) during the first year. An additional 37% of the remaining participants left the program between Intake and Year 1 follow-up, 17% of which completed treatment and 9% had been transferred. Of the remaining clients at Year 1 follow-up, 48% were discharged between Year 1 follow-up and Year 2 follow-up (29% completing treatment, 13% transferred); and 62% were discharged between Year 2 and Year 3, most of whom (60%) had completed treatment or had been transferred (20%).

A comparison between participants who were retained in treatment (including those who successfully completed treatment) versus those who dropped out revealed no differences between the two samples on demographic or substance use variables (i.e., gender, age, ethnicity, language, travel distance from clinic, daily dosage, substance of choice),  $ps \geq .05$ . However, these groups did differ on the number of daily needles reported at intake,  $t(401) = -2.36$ ,  $p = .02$ .

Clients who remained in treatment reported fewer daily needles at intake ( $M = 5.51$ ,  $SD = 5.80$ ) compared to those who dropped-out ( $M = 7.05$ ,  $SD = 7.05$ ).

### **Client Satisfaction with Services**

Table 1 presents data for client satisfaction with services over time, as measured by the Client Satisfaction Survey. Table 2 shows means and standard deviations for Overall Client Satisfaction and Program Quality. Higher Client Satisfaction ratings indicate increased satisfaction rates, whereas lower Program Quality ratings suggest improved Program Quality ratings (i.e., this rating is similar to a ranking system in which a rank of 1 indicates the highest ranking of program quality). Results for Year 5 are not reported due to decreasing sample size ( $n = 4$ ) and to protect confidentiality. In general, clients were consistently satisfied with the program each year of their involvement, and similarly viewed it as a quality service.

### **Relation Between Demographic Variables and SJ-MMT Outcome Measures**

Correlational analyses were conducted to determine whether specific demographic variables (i.e., age, gender) were related to outcome variables. Neither age,  $r_{pb}(592) = .02$ ,  $p = .68$ , nor gender,  $\chi^2(1, N = 769) = .21$ ,  $p = .65$ , were significantly correlated with client retention status (i.e., retained vs. drop-out) in SJ-MMT. Similarly, drug of choice,  $\chi^2(1, N = 508) = 2.37$ ,  $p = .12$ , daily dosage, social support ratings, physical health status, stress, anxiety, depression, self-esteem, anger, and overall mental health were each not significantly related to these demographic variables ( $r_s = .00$  to  $.08$ ,  $p_s > .05$ ). With respect to panic, participant age was negatively related to higher self-reported panic ratings; however, the correlation was small and only marginally significant,  $r(440) = -.09$ ,  $p = .048$ . Gender was related to daily needle use in that being female was associated with increased daily needle use,  $r_{pb}(406) = .20$ ,  $p < .001$ .

### **Retention and Discharge**

Chi-square analyses were used to determine whether the occurrence of client drop-out significantly varied as a function of the data collection period (Intake, Year 1, Year 2, Year 3, and Year 4). For the purposes of this analysis, clients who had left the program because they had completed treatment were not included. Drop-out rates varied significantly across time,  $\chi^2(4, 195) = 326.31$ ,  $p < .001$ , with more cases being retained than dropping out in the first two years. Within individual time periods, 57% of clients were retained in the first year of treatment, compared to 43% who dropped-out,  $\chi^2(1, 318) = 6.09$ ,  $p < .05$ . Results were similar in the second year of treatment, with 62% of clients remaining in treatment and 38% leaving prematurely,  $\chi^2(1, 181) = 10.22$ ,  $p = .001$ . Year 3 showed a shifting trend in which more clients left treatment (59%) compared to those who remained (41%); however, this result was not significant,  $\chi^2(1, 60) = 2.4$ ,  $p > .05$ . This trend was significant in year 4 in which 40% of clients remained in treatment and 60% left prior to treatment completion,  $\chi^2(1, 24) = 20.17$ ,  $p < .001$ .

To determine whether primary reasons for leaving the program changed over time, Chi-square analyses were conducted to examine reasons for discharge between the first three data collection time periods (i.e., Intake – Year 1, Year 1 – Year 2, Year 2 – Year 3); analyses were not possible for additional time-periods due to decreasing  $n$ 's. The reasons for discharge included incarceration, non-compliance, medical risk, self (including self-request and against medical advice), transfer, treatment completion, and wait list (including no contact and leaving detox). Primary reasons for discharge across annual evaluation time points are presented in Table 3, with

the most common reasons in Year 1 and Year 2 consistently being non-compliance and self-termination prior to program completion,  $\chi^2(6, N = 200) = 12.49, p = .05$ . Although non-compliance was the dominant reason for leaving in Year 3, the percentage of cases falling into each reason category did not significantly vary from Year 2,  $\chi^2(4, N = 77) = 5.95, p = .20$ .

There were, however, differences in discharge reasons between the first and third years,  $\chi^2(6, N = 185) = 28.58, p < .001$ . Follow-up analyses were conducted to identify where these differences rested. Compared to Year 3, clients in Year 1 were more likely to be discharged at their own request,  $\chi^2(1, N = 65) = 53.55, p < .001$ , with 40.8% requesting discharge in Year 1 compared to only 9.7% in Year 3. Alternatively, 48.4% of clients in Year 3 were discharged due to non-compliance, compared to 32.2% in Year 1,  $\chi^2(1, N = 64) = 18.06, p < .001$ . While this finding was statistically significant, the discharge rate for non-compliance remained quite high in Year 3.

### General Program Characteristics

**Comprehensiveness of service.** There were a maximum of 17 different types of services available to clients admitted to the SJ-MMT, including both individual and group modalities. There were 15 different types of groups available to clients throughout the 5 years of the program. A list of groups with descriptive information is included in Table 5. Comprehensiveness of Service scores (i.e., the variety of services a client receives) for clients admitted into SJ-MMT ( $n = 450$ ) ranged from 1 to 11 services, with clients receiving a mean of 3.72 ( $SD = 1.93$ ) different types of services (e.g., individual contact and a specific group).

Table 5 shows information only pertaining to clients admitted into the program; however, clients on the waitlist also received some services, including assessment for admittance into the program. Service comprehensiveness scores for waitlist individuals ranged from 0 to 3 ( $M = 1.2, SD = .48$ ). Adding waitlisted clients to the pool of admitted SJ-MMT cases decreased the mean number of services provided to 3.43 ( $SD = 1.99$ ). Means and standard deviations for Comprehensiveness of Services (excluding waitlist) are shown in Table 6.

A repeated measures ANOVA was conducted to examine differences in Comprehensiveness of Service ratings between annual follow-up periods. Greenhouse-Geisser correction was used for violations of the assumption of sphericity (i.e., epsilon values less than .75). There were significant differences in comprehensiveness scores across four years of program enrollment,  $F(2.65, 188.15) = 30.46, p < .001, \eta^2 = .30$ . Follow-up ANOVAs were consistent in that the longer clients remained in treatment, the fewer types of services they used: (a) Year 1 – Year 2,  $F(1, 223) = 91.57, p < .001, \eta^2 = .29$ ; (b) Year 2 – Year 3,  $F(1, 136) = 54.17, p < .001, \eta^2 = .29$ ; (c) Year 3 – Year 4,  $F(1, 71) = 8.08, p = .006, \eta^2 = .10$ ; (d) Year 4 – Year 5,  $F(1, 31) = 19.55, p < .001, \eta^2 = .39$ .

**Intensity of services.** Intensity of services, measured in total hours of service received by individual clients during their enrollment in the program, ranged from 0 to 111.33 ( $M = 26.47, SD = 21.05, Mdn = 21.75$ ). These services comprised both individual and group treatment modalities. Individual treatment hours ranged from 0 to 70.75 ( $M = 19.92, SD = 14.83, Mdn = 17.38$ ), while group treatment hours ranged from 0 to 70.67 ( $M = 6.53, SD = 9.13, Mdn = 3.67$ ). The means and standard deviations for Service Intensity across time, including both Group and Individual treatment hours within treatment years, are presented in Table 7.

A repeated measures ANOVA was conducted to examine differences in Intensity of Services across time. Due to decreasing  $n$  for Year 4, an initial ANOVA was conducted for Years 1 to 3 inclusively. Huynh-Feldt correction was used for sphericity violations. Significant changes occurred in Intensity of Services throughout the first 3 years of SJ-MMT,  $F(1.46, 42.48) = 12.78, p < .001, \eta^2 = .31$ , with clients receiving less intense service over time. Follow-up ANOVAs indicated that clients received the most intense services during the first year of SJ-MMT,  $F(1, 108) = 57.32, p < .001, \eta^2 = .35$ . Comparisons between subsequent years were not significant: (a) Year 2 – Year 3,  $F(1, 30) = 1.68, p = .204, \eta^2 = .05$ ; (b) Year 3 – Year 4,  $F(1, 9) = .38, p < .552, \eta^2 = .04$ .

A repeated measures ANOVA was conducted to examine differences in Service Intensity across time as measured by total treatment hours. Due to decreasing  $n$ , Year 5 was not included in analyses. Huynh-Feldt correction was used for sphericity violations where appropriate. Significant changes occurred in the total amount of treatment hours throughout the first 3 years of SJ-MMT,  $F(1.46, 42.28) = 12.78, p < .001, \eta^2 = .31$ , with clients accessing fewer treatment hours over time. A similar decline was found when comparing Year 1 to Year 2,  $F(1, 108) = 57.32, p < .001, \eta^2 = .35$ .

**Group treatment hours.** Using repeated-measures ANOVA, differences in group treatment were examined across time. Huynh-Feldt correction was used for violation of the sphericity assumption. There were differences in the amount of group treatment hours during the first 3 years of treatment,  $F(1.29, 37.27) = 18.90, p < .001, \eta^2 = .18$ . Clients received significantly more group treatment hours during the initial years of treatment: (a) Year 1 – Year 2,  $F(1, 1.09) = 35.79, p < .001, \eta^2 = .25$ ; (b) Year 2 – Year 3,  $F(1, 30) = 10.33, p = .003, \eta^2 = .26$ . Differences in group treatment hours were not significant between Year 3 and Year 4,  $F(1, 9) = 2.35, p = .16, \eta^2 = .21$ .

**Individual treatment hours.** Repeated-measures ANOVA were used to examine changes in individual treatment hours across time. The assumption of sphericity was violated for some analyses. As such, Greenhouse-Geisser correction was used with epsilon values less than .75, while Huynh-Feldt correction was used with epsilon values greater than .75. As with group treatment, the number of individual treatment hours received by SJ-MMT clients decreased over time from Year 1 to Year 5 inclusive,  $F(2.91, 87.40) = 10.50, p < .001, \eta^2 = .26$ . This finding was consistent in all follow-up comparisons: (a) Year 1 – Year 2,  $F(1, 221) = 128.48, p < .001, \eta^2 = .37$ ; (b) Year 2 – Year 3,  $F(1, 136) = 17.13, p < .001, \eta^2 = .11$ ; (c) Year 3 – Year 4,  $F(1, 70) = 23.29, p < .001, \eta^2 = .25$ ; (d) Year 4 – Year 5,  $F(1, 30) = 20.00, p < .001, \eta^2 = .40$ .

### Outcome Variables

Statistical analyses on outcome variables were based on all cases remaining in SJ-MMT at the time of each annual follow-up.

**Substance use.** Correlational analyses were conducted to determine whether the length of substance use history at intake was related to MMT retention length in weeks. Length of use for primary,  $r(372) = .06, p = .23$ , and secondary substances of choice,  $r(255) = -.04, p = .54$ , was not correlated to retention length; however, participants who reported lengthier histories of a third substance stayed in treatment for a shorter duration,  $r(88) = -.24, p = .02$ .

**Opioid use.** The ANOVA assumption of normality was violated for this dependent measure; therefore, a Friedman test was used in place of the repeated measures ANOVA to assess whether opioid use (measured in milligrams) varied significantly across time for SJ-MMT participants. There was a statistically significant difference found in opioid use between intake and the four year follow-up,  $\chi^2(4, N = 10) = 40.00, p < .001$ . Four orthogonal contrasts were performed using Wilcoxon tests with Bonferroni correction (comparison-wise  $\alpha = .013$ ). The contrast between opioid use at intake ( $M = 164.60$  mg,  $SD = 283.94$ ) and one year follow-up ( $M = 0$  mg,  $SD = 0$ ) was significant ( $r = -.84$ ), whereas contrasts between subsequent follow-up years were not (i.e., mean reported opioid use remained at zero at subsequent annual follow-ups). The significant contrast between intake and one year follow-up indicated a large effect size (Cohen, 1988) for reduction in opioid use during the first year of SJ-MMT that was retained over time.

**Non-opioid use.** Less than 1% of participants at intake reported non-opioids as their primary drug of choice. Thus, there was an insufficient number of cases ( $n = 8$ ) to perform statistical analyses on non-opioid drug use. Among these few cases, there was a slight increasing trend in use from the first to second annual follow-ups, with 2% and 3% of these participants, respectively, reporting non-opioids as their primary drug of choice. However, interpretation is cautious given the limited number of cases. Information on secondary drug of choice was not available (i.e., information on non-opioid drug use was not available for those primarily reporting opioid use) to examine whether non-opioids may be used more frequently.

**Daily needle use.** A Friedman test was conducted to assess if there were differences in daily needle use across time. A statistically significant difference was found,  $\chi^2(4, N = 11) = 36.00, p < .001$ , indicating that there were changes in reported daily needle use across time. Four orthogonal contrasts were performed using Wilcoxon tests with the Bonferroni correction (comparison-wise  $\alpha = .013$ ). The contrast between intake ( $M = 6.38, SD = 6.56$ ) and year 1 follow-up ( $M = .24, SD = 1.26$ ) was significant ( $r = -.76$ ). There were no significant differences in daily needle use between subsequent follow-up years. The significant contrast between intake and year 1 indicated that effect size for daily needle use reduction was large (Cohen, 1988) during the first year of SJ-MMT and was maintained over time.

**Drug screening results.** On average, clients in SJ-MMT submitted an average of 11.2 drug screens during their enrolment in the program. The total number of annual drug screens and per person averages along with descriptive information for drug screening results obtained through urinalysis are shown in Table 8. The number of drug screen tests completed per person declined over time. "Inconclusive" results refer to urine samples which could not be tested for the presence of substances due to dilution. Dilution can occur due to intentional tampering or other factors such as medical conditions or medication, but the exact causes of dilution for each sample are not necessarily known by program staff. As a result, inconclusive results were not included in further analyses.

Paired sample t-tests were conducted to compare drug screen results between annual time frames. The results are presented in Table 9. Significant differences in drug screen results were found between years 2 and 3 with respect to both proportion of negative and proportion of positive drug screen results. The proportion of negative drug screens decreased from 49% to

44%, while the proportion of positive drug screens increased from 49% to 54%. There were no significant differences between years on positive tests for opioids; however, the average number of screens per person decreased over time from 20.66 screens during the first year to 6.65 screens in year 5. There was an increase in positive tests for other substances between years two and three, 52% and 60% respectively.

**Physical health status ratings.** Table 10 presents the means and standard deviations for health status ratings listed in chronological order from intake to the last follow-up period. Health status ratings ranged from 1 to 10, with higher ratings indicating improved health status. A repeated measures ANOVA was conducted to assess whether there were differences between health status ratings from intake to each annual follow-up period. The assumption of sphericity was violated for some analyses. Thus, Greenhouse-Geisser correction was used with epsilon values less than .75, while Huynh-Feldt correction was used with epsilon values greater than .75. Results were consistent across years, indicating that health status ratings increased over time when compared to intake: (a) intake to year 1,  $F(1, 158) = 26.71, p < .001, \eta^2 = .15, r = -.27$ ; (b) intake to year 2,  $F(1.59, 123.92) = 56.60, p < .001, \eta^2 = .42, r = -.52$ ; (c) intake to year 3,  $F(2.06, 84.50) = 38.17, p < .001, \eta^2 = .48, r = -.60$ ; and (d) intake to year 4,  $F(2.64, 50.07) = 13.09, p < .001, \eta^2 = .41, r = -.59$ .

Repeated measures ANOVAs also were used to examine health status ratings between annual follow-up periods (i.e., year 1 compared to year 2, year 2 compared to year 3, etc.). Beyond significant improvements in health status from intake to year 1, no subsequent year by year comparisons were significant: (a) year 1 to year 2,  $F(1, 80) = .24, p = .63, \eta^2 = .00, r = -.06$ ; (b) year 2 to year 3,  $F(1, 49) = 1.88, p = .18, \eta^2 = .04, r = -.07$ ; and (c) year 3 to year 4,  $F(1, 22) = .75, p = .40, \eta^2 = .03$ .

**Global mental health status ratings.** In order to examine changes in mental health across time, an overall mental health variable was created by summing client ratings on Stress, Anxiety, Panic, Depression, Self-Esteem, and Anger. This created a Global Mental Health Status variable ranging from 0 to 60, with higher scores suggesting better mental health status. To assess whether these six indices formed a reliable scale, Cronbach's alpha was computed. The alpha for this six item scale was .91, which indicated very good internal reliability. Thus, a repeated measures ANOVA was conducted to examine whether the mean global mental health status rating changed over time. The means and standard deviations for the individual mental health status ratings and Global Rating are presented in Table 11, with higher scores indicating improved mental health status across each index. Results indicated significant increases in Global Mental Health across time (i.e., Intake – Year 4 inclusive),  $F(3.96, 87.10) = 43.03, p < .001, \eta^2 = .66, r = -.75$ . Repeated measures ANOVAs were also conducted to determine if there were differences in Global Mental Health ratings between each follow-up period (i.e., intake versus year one, year one versus year two, etc.). These results indicated that after the first year of SJ-MMT, no additional significant changes in Global Mental Health occurred (i.e., functioning stabilized): (a) year 1 to year 2,  $F(1, 91) = .50, p = .48, \eta^2 = .01$ ; (b) year 2 to year 3,  $F(1, 51) = 1.94, p = .17, \eta^2 = .04$ ; and (c) year 3 to year 4,  $F(1, 23) = 1.06, p = .32, \eta^2 = .04$ .

**Stress.** A repeated-measures ANOVA was conducted to assess whether there were differences between stress ratings of the initial four assessment periods (i.e., intake, year 1, year

2, etc.). Huynh-Feldt correction was used to correct for violations of the sphericity assumption. Results indicated that participants rated their perceived ability to cope with stress differently across time periods,  $F(3.80, 87.38) = 33.34, p < .001, \eta^2 = .68$ . Repeated measure ANOVAs were conducted to identify the location of these differences. Specifically, the most significant change within the stress variable occurred during year one and these changes remained fairly stable at subsequent follow-up: (a) intake to year 1 follow-up,  $F(1, 173) = 174.14, p < .001, \eta^2 = .50$ ; (b) year one to year two follow-up,  $F(1, 91) = 2.02, p = .16, \eta^2 = .02$ ; (c) year two to year three follow-up,  $F(1, 52) = 1.86, p = .18, \eta^2 = .04$ ; and (d) year three to year four follow-up,  $F(1, 23) = 33.34, p = .04, \eta^2 = .17$ .

**Anxiety.** Changes in anxiety ratings across time (i.e., intake to year four follow-up) were analysed using repeated-measures ANOVA, with Huynh-Feldt correction for violation of the sphericity assumption. Results indicated that participants rated their perceived ability to cope with anxiety differently across time periods,  $F(3.22, 74.11) = 25.58, p < .001, \eta^2 = .53$ . Follow-up repeated measures ANOVAs indicated that most significant changes on this variable occurred during the first year,  $F(1, 173) = 206.94, p < .001, \eta^2 = .55$ , with no changes in subsequent years: (a) year one to year two,  $F(1, 91) = 1.12, p = .29, \eta^2 = .55$ ; (b) year two to year three,  $F(1, 52) = .27, p = .61, \eta^2 = .01$ ; and (c) year three to year four,  $F(1, 23) = 1.41, p = .25, \eta^2 = .06$ .

**Panic.** Using a repeated-measures ANOVA, differences in panic ratings were examined across time. Huynh-Feldt correction was used for violations of the sphericity assumption. Results indicated that participants' perceived ability to cope with feelings of panic increased while they remained in SJ-MMT,  $F(3.26, 75.13) = 22.75, p < .001, \eta^2 = .50$ . Additional ANOVA's were conducted for annual follow-up periods. The significant changes on the panic variable occurred during the first year of SJ-MMT,  $F(1, 172) = 224.04, p < .001, \eta^2 = .57$ . Changes in subsequent years were not significant: second annual follow-up,  $F(1, 91) = 1.79, p = .18, \eta^2 = .02$ ; third annual follow-up,  $F(1, 52) = 1.40, p = .24, \eta^2 = .03$ ; and fourth annual follow-up,  $F(1, 23) = 1.35, p = .26, \eta^2 = .06$ .

**Depression.** A repeated-measures ANOVA was conducted to assess whether there were differences between depression ratings of the initial four assessment periods (i.e., intake, year 1, year 2, etc.). Huynh-Feldt correction was used to correct for violations of the sphericity assumption. Perceived ability to cope with symptoms of depression increased as participants remained in SJ-MMT,  $F(4, 92) = 32.35, p < .001, \eta^2 = .58$ . These changes occurred during the first 12 months of treatment,  $F(1, 173) = 255.68, p < .001, \eta^2 = .60$ . No significant changes were found between annual follow-up periods following year one: year two,  $F(1, 91) = .17, p = .68, \eta^2 = .002$ ; year three,  $F(1, 52) = .57, p = .45, \eta^2 = .01$ ; and year four,  $F(1, 23) = .45, p = .51, \eta^2 = .02$ .

**Anger.** Results from repeated-measures ANOVA indicated that anger ratings changed over time,  $F(4, 88) = 30.22, p < .001, \eta^2 = .58$ . Similar to other mental health measures, these changes occurred in the first year of treatment,  $F(1, 170) = 126.30, p < .001, \eta^2 = .43$ . Additional follow-up results showed no further significant changes in anger: (a) year two,  $F(1, 91) = .002, p = .96, \eta^2 = .00$ ; (b) year three,  $F(1, 52) = .65, p = .42, \eta^2 = .01$ ; and (c) year four,  $F(1, 23) = .77, p = .39, \eta^2 = .03$ .

**Self-esteem.** A repeated-measures ANOVA was conducted, using Greenhouse-Geisser correction for sphericity violations, to assess changes in the self-esteem variable across time. Participants' ratings improved over time,  $F(2.45, 56.38) = 25.40, p < .001, \eta^2 = .53$ . Repeated-measures ANOVAs were conducted to determine where these differences occurred on an annual basis. These results indicated that no further growth in self-esteem occurred beyond the first year of SJ-MMT: (a) intake to year one,  $F(1, 172) = 43.42, p < .001, \eta^2 = .20$ ; (b) year one to year two,  $F(1, 91) = 3.33, p = .07, \eta^2 = .04$ ; (c) year two to year three,  $F(1, 51) = .26, p = .61, \eta^2 = .01$ ; and (d) year three to year four,  $F(1,23) = 1.13, p = .30, \eta^2 = .05$ .

**Criminal activity.** The self-reported criminal activity variable, which measured frequency of self-reported criminal activity (i.e., none, daily, weekly, monthly), violated assumptions of normality and sphericity; therefore, a Friedman test was conducted to assess whether there were differences among clients' self-reported criminal activity across time. Differences across time for criminal activity were observed,  $\chi^2(4, N = 9) = 14.44, p = .006$ . Four orthogonal contrasts were performed using Wilcoxin tests with the Bonferroni correction (comparison-wise  $\alpha = .013$ ). The contrast between criminal activity at intake and one year follow-up was significant ( $r = -.66$ ); however, the contrasts between subsequent follow-up years were not significant. The significant contrast between intake ( $M = 1.39, SD = 1.34$ ) and one year follow-up ( $M = .09, SD = .42$ ) indicated a very large (Cohen, 1988) reduction in criminal activity during the first year of SJ-MMT. Reductions in drug use-related criminal activity were also found,  $\chi^2(1, N = 26) = 15, p < .001$ , between intake ( $M = 2.85, SD = 1.43$ ) and year 1 follow-up ( $M = 1.23, SD = .82$ ). Sufficient data were not available for subsequent annual comparisons related to this type of criminal activity.

**Employment.** Chi-square analysis was conducted to examine changes in employment status (i.e., employed, unemployed) from intake to first annual follow-up (i.e., year one follow-up). Amongst participants that data was available for at both intake and one year follow-up, significantly more were employed at follow-up (27.6 %) compared to intake (14.6 %),  $\chi^2(1, N = 196) = 16.46, p < .001$ . The majority of this data (i.e., over 92%) was missing for subsequent follow-up periods, thus, comparison between additional follow-up periods were not made.

### Multiple Regression

Bonferroni correction ( $\alpha = .017$ ) was used as the criterion for determining statistical significance in each regression discussed below as a means of controlling Type I error.

**Retention.** To investigate how well client characteristics and program variables predicted retention rates, while statistically controlling for gender and age, a hierarchical regression was conducted using stepwise entry within each block of independent variables. The assumptions of linearity, normally distributed errors, and uncorrelated errors were checked and met. Means, standard deviations, and correlations between retention and variables associated with it presented in Table 12.

After controlling for variance associated with age and gender, the block of client characteristics variables including social support, substance use, and mental health significantly predicted retention,  $R^2_{adj} = .08, F(3, 139) = 4.25, p = .007$ . As indicated by  $R^2_{adj}$ , 8% of the variance in retention was predicted by these particular client characteristics. Examination of individual Beta

weights shown in Table 13 indicated that less serious global pre-treatment mental health ratings and higher perceived social support were unique predictors of retention in SJ-MMT in this block of variables. Adding program characteristic variables of comprehensiveness of services and intensity of services did not significantly improve the prediction of retention beyond these client characteristics.

**Substance use.** A hierarchical multiple regression using a stepwise entry method was conducted to investigate how well client characteristics and program variables predicted self-reported substance use at first annual follow-up, after controlling for variance associated with gender and age. The assumptions of linearity, normally distributed errors, and uncorrelated errors were checked and met. Means, standard deviations, and intercorrelations are presented in Table 14.

When client characteristics of social support, substance use, and mental health were entered as a group, they did not significantly predict post-admission substance use at year one,  $R^2_{adj} = .04$ ,  $F(3, 58) = .86$ ,  $p = .47$ . As indicated by  $R^2_{adj}$ , only 4% of the variance in retention could be predicted by client characteristics. Adding program characteristic variables of comprehensiveness of services and intensity of services only marginally improved this prediction,  $F_{ch}(2, 56) = 2.91$ ,  $p = .06$ ,  $\Delta R^2 = .09$ . There were no independent predictors within any of the models. Results are shown in Table 15. Post-hoc power analyses indicated that the power to detect obtained true effects given an  $N = 64$ ,  $p = .016$  level was .42 for the overall regression in prediction of Substance Use. The minimum sample size required to detect a medium effect size of .15 (Cohen, 1988) and power of .80 was 137. Thus, the sample size may not have been large enough to detect a true effect for this analysis.

**Positive urinalysis.** To investigate how well client characteristics of social support, substance use, and mental health predict the proportion of positive urinalysis results during the first year, while controlling for gender and age, a stepwise multiple regression strategy was computed. When gender and age were entered together, they did not significantly predict positive urinalysis results,  $F(2, 144) = 1.97$ ,  $p = .14$ , adjusted  $R^2 = .01$ . Adding client characteristics did not significantly improve prediction,  $F(5, 144) = 1.18$ ,  $p = .32$ , adjusted  $R^2 = .04$ . After correcting for Type I using Bonferonni correction, the entire group of variables showed a trend towards predicting positive urinalysis,  $F(7, 144) = 2.24$ ,  $p = .02$ . Results are shown in Table 16.

**Global mental health.** Hierarchical multiple regression with stepwise entry within each block of independent variables was conducted to determine the best linear combination of intake level of daily substance use, pre-treatment global mental health, perceived social support, comprehensiveness of services, and intensity of services, while controlling for age and gender, for predicting global mental health scores at first annual follow-up. The means, standard deviations, and inter-correlations can be found in Table 17.

When client characteristics of social support, substance use, and mental health were entered as a group, they did not significantly predict global mental health outcome ratings,  $R^2_{adj} = .05$ ,  $F(3, 62) = 1.20$ ,  $p = .32$ . Only 5% of the variance in global mental health was predicted by these particular client characteristics. Adding program characteristic variables of comprehensiveness

of services and intensity of services did not significantly improve the prediction of global mental health outcome,  $\Delta R^2 = .02$ ,  $F(2, 60) = .73$ ,  $p = .49$ . Using Bonferroni correction ( $\alpha = .017$ ) gender was not a significant predictor of global mental health,  $p = .049$ ; nor was the model with age and gender significant,  $R^2_{\text{adj}} = .04$ ,  $F(2, 65) = 2.31$ ,  $p = .11$ . Post-hoc power analyses indicated that the power to detect obtained effects given  $N = 68$ ,  $p = .016$  level was .46 for the overall regression in prediction of Global Mental Health. The minimum sample size required to detect a medium effect size of .15 (Cohen, 1988) and power of .80 was 137. Full results of hierarchical multiple regression are shown in Table 18.

## Discussion

This study investigated methadone maintenance treatment outcomes in an Atlantic Canadian program, with specific attention to program and client characteristics that may predict retention. Data from 480 individuals admitted to SJ-MMT for opioid dependence were used in this research.

### The SJ-MMT Context

Basic demographic information for the current sample of MMT participants was similar to the population of methadone maintenance clients in Canada. Fischer et al. (2006) examined demographic characteristics of clients in methadone maintenance clinics in Vancouver, Edmonton, Toronto, Montreal, and Quebec. The average age of methadone maintained clients was 35 years; with 70% being unemployed and receiving some form of social benefit. This is very similar to the current sample, which had an average age of 31 years and 68% unemployment rate. Consistent with Fischer et al.'s study, more males than females were enrolled in the SJ-MMT program.

Although general demographics were similar to other programs in Canada, the SJ-MMT population differed in terms of substance use. An overwhelming majority (94.6%) of clients in the current study reported prescription opioids as their primary drug of choice, whereas there were relatively few heroin users (less than 1%). This is a consistent trend in smaller cities in Canada, such as Edmonton and Quebec, in which 72% and 63% of methadone clients report prescription opioid use. However, opioid addiction is vastly different in larger Canadian cities where heroin use is highly prevalent and ranges from 53% in Toronto to 90% in Vancouver (Fischer et al., 2006).

Differences in opioid use across Canada could be due to increasing rates of opioid prescriptions in the medical system, particularly in Atlantic Canada. According to the final report of the Oxycontin Task Force in Newfoundland and Labrador (2004), opioid prescriptions increased by 280% between 2001 and 2003. At the same time, the number and strength of tablets for opioid prescriptions also increased. Several issues may account for the increase in opioid prescriptions. Most notably, an increasing prevalence of chronic diseases, combined with an aging population, has led to greater pain relief needs in general and, thus, resulted in more prescriptions. This pattern is particularly relevant for the Atlantic Canadian provinces, which have higher rates of chronic diseases compared to the rest of Canada (Hayward, 2003). In addition, as the street value of opioids increases, a minority of patients are engaging in "double doctoring" practices that enable them to receive multiple prescriptions from multiple physicians (Oxycontin Task Force, 2004). Such prescriptions then may be diverted into the illegal drug market either intentionally

by the patient, or through robbery or fraudulent prescriptions (e.g., falsely assuming a physician's identity) with a street value of 15 to 50 times the original pharmacy cost (Sajan, Corneil, & Grzybowski, 1998). The combination of these factors has likely contributed to increasing rates of opioid addiction.

### **Pre-Treatment Functioning**

SJ-MMT clients' pre-treatment functioning was measured through self-report ratings of physical health, mental health (i.e., stress, anxiety, panic, depression, anger, and self-esteem), criminal activity, and social support. Participants generally reported a moderate to poor level of physical health status at intake. This finding is not surprising considering that substance using populations in general tend to report poorer physical health (e.g., Fischer et al., 2006; Garrity et al., 2007). Similarly, SJ-MMT clients had a somewhat low perceived ability to cope with mental illness. This self-report was reflected in low global mental health status at intake. These low ratings have particular relevance to the SJ-MMT program as poorer pre-treatment mental health ratings have been associated with poorer treatment outcomes in MMT (Craig and Olsen, 2004). On average, the SJ-MMT population also reported engaging in criminal activity on a biweekly basis at intake.

The average pre-treatment length of drug use reported by SJ-MMT clients was 6.4 years. While length of drug use varies across individuals and populations, Ward et al.'s (1998a) review of the literature indicated that lengthier drug use histories are related to poorer treatment outcomes in general. Dole and Joseph's (1978) findings found that MMT clients who used heroin for longer than four years prior to treatment were more likely to relapse following conclusion of MMT. The current study did not collect follow-up data on treatment completers, nor was there an association found between the length of use for either the first or second substances of choice and program retention; however, the longer clients reported using a third substance, the less likely they were to remain in treatment. Increased poly-substance use suggests more severe addiction, which then leads to increased risk of drop-out (Ward et al., 1998a).

### **Retention**

With high drop-out rates, client retention in particular has been a concern for MMT programs. Overall, the retention rate of SJ-MMT clients was slightly higher at 57% than the 40% rate reported in D'Ippoliti et al.'s (1998) research, but similar to retention rates reported in other studies (e.g., Kelly, Kevin, Mitchell, Brown, & Schwartz, 2011). Clients remained in treatment for an average of 16 months. The most significant drop-outs occurred during the first 12 months of treatment, as has been found in previous research (Luo, Pang, & Wu, 2007). This finding is not surprising considering that it may take some time before the correct methadone dosage is established, clients are stabilized, and maintenance begins (Kastelic, Dubajic, & Strbad, 2008). Withdrawal symptoms during the initial stages of treatment, and the challenge of making individual lifestyle changes to support sobriety, likely contribute to these retention difficulties in the first year. Consistent with this view, clients leaving treatment in the first year primarily did so at their own request, whereas another subset of clients was removed due to treatment noncompliance. These discharge reasons suggested that motivation and readiness to change are likely particularly important at this stage of treatment. Unmotivated clients are less likely to be engaged in treatment and more likely to continue substance use, thereby contributing to decreased retention (Broom, Simpson, & Joe, 1999). Individuals who did not remain in the program were demographically similar to those who stayed in treatment. With respect to

substance use variables, however, clients who remained in treatment reported fewer daily needles at intake. Thus, daily needle use may be a risk factor for premature drop-out.

Considering the importance of retention in MMT, programs throughout Canada have increased efforts to improve retention rates. Many of these changes have occurred in three domains at a systemic level: (1) increasing client accessibility, (2) improving service quality, and (3) offering individualized treatment (Luce & Strike, 2011; Parkes & Reist, 2010). In an effort to improve client accessibility, many clinics, including SJ-MMT, offer evening hours, in addition to satellite location clinics in rural areas. Telemedicine and nurse practitioners have also increased accessibility for populations that otherwise may not have access, such as isolated areas in Northern Canada and First Nations Communities (Luce & Strike, 2011). Condelli's (1993) research demonstrated that clients who rate quality of services highly are more likely to be retained in treatment. In light of this, programs have focussed on increasing service quality through such things as providing educational opportunities for staff (e.g., cross training in mental health and addictions), and facilitating communication with participating community partners (e.g., pharmacies, physicians). MMT programs are also beginning to recognize the importance of individualized treatment in retention rates, and have made some adjustments as a result (Parkes & Reist, 2010). For example, the SJ-MMT program no longer requires full participation in comprehensive services (note: this change was made post-data collection for the current study). A comprehensive program in Toronto, Ontario found that retention rates increased when more stable clients were transferred to community physicians for follow-up (Strike et al., 2008). Similarly, the Department of Health in New Brunswick and College of Family Physicians have been working to develop a process through which to transfer more stable clients to the community (Luce & Strike, 2011). With changes such as these taking place, it is expected that retention rates will improve overall as more clients will have their needs met through MMT.

### **Outcome Variables**

In terms of outcome, the major finding of the current study is that the vast majority of improvements in client functioning occurred during the first 12 months of MMT. There were substantial reductions in substance use, specifically opioid use and daily needle use. The decrease in self-reported opioid use from intake to year one follow-up went from an average of 164.60 milligrams per day to 0. This treatment gain was maintained at subsequent annual follow-up periods. This data suggests that many individuals who continued with MMT stopped using illicit opioids. Similar reductions also were observed in self-reported daily needle use. At intake, clients reported a daily average of more than 6 needles. One year later, the average daily needle use reduced to less than 1 needle per day (.24). This reduction persisted throughout treatment in subsequent follow-up periods. However, discrepancies between self-reported substance use and urinalysis results, which indicate at least some continuing substance use, suggests that these findings should be interpreted with caution.

Urinalysis results provided an objective measure of drug use with which to compare the self-report data. There was a general decreasing trend in the amount of drug screens submitted by clients during MMT, which may reflect the tendency of staff to be more selective over time with regard to whom and when they request samples. Random urine samples from clients identified as having greater difficulties in MMT and suspected of using are likely more common (i.e., clients viewed as stabilized are subjected to fewer urinalyses). Consistent with this view, the proportion of negative drug screens decreased, whereas the proportion of positive drug screens increased for

any substance. Notably, however, there were no changes in the proportion of positive tests for opioids across time. Rates of positive opioid tests were low relative to other substances in all years. This result is inconsistent with Chermack et al.'s (2000) finding that opioid positive drug screen results decreased over time. Given that staff may be more likely to screen cases they suspect of using more frequently, the lack of change in proportion of positive tests should not be used to infer that MMT does not decrease opioid use. Urinalysis results may be more representative of those who continue to use and less representative of those who do not raise staff suspicion. As such, urinalysis findings may overestimate use level.

The proportion of positive tests for other substances remained at a moderate level, with over half of all urinalysis testing positive for at least one non-opioid substance. The current study also found an increase in positive tests for other substances between years two and three. Similarly to opioid positive results, these results may be inflated due to biases in sampling. One might expect no changes in non-opioid substance use considering that MMT programs target opioid use specifically. However, there have been contradictory findings in the literature in terms of reductions in non-substance use (Fischer, Cruz, Patra, & Rehm, 2008). The majority of research tends to suggest that MMT does not reduce non-opioid substance use (e.g., Srivastava, Kahan, & Ross, 2008; Teesson et al., 2006). Unfortunately, results of the current study are likely complicated by biased sampling.

Improvements in self-rated physical health status also occurred during the first year of MMT. After the first year of treatment, these gains were maintained and showed a non-significant trend towards continued improvement. Improvement in physical health status may be a consequence of reduced substance use as treatment progresses. Research has clearly established the fact that substance users are at increased risk for physical ailments and report poorer overall physical health (Adlaf & Lalomiteanu, 2005; Fischer et al., 2006; Garrity et al., 2007). Thus, it would be expected that decreases in substance use would coincide with improvements in physical health. Although there has been frequent discussion of a connection to improved health status in the literature, no published studies have specifically examined the relationship between MMT and physical health improvements. As such, the current findings provide a unique contribution to this effect from the client's perspective.

In addition to the substance use and health benefits of MMT involvement, the current findings indicated that this treatment contributes to improved mental health. Previous MMT research has demonstrated improvements in mental health status at 6 month and 18 month follow-up (Mattick et al., 2003; McLellan et al., 1993; Schreiber et al., 2008). These results were replicated in the current study. Notably, clients experienced the majority of the improvement in their overall mental health status during the first year of MMT and these initial gains were maintained for at least four years.

Although the majority of studies have examined mental health outcome using indices of depression (e.g., Kosten et al., 2003; Schreiber et al., 2008; Strain et al., 1991), the current study examined mental health from a multidimensional prospective that included stress, anxiety, panic, anger, and self-esteem in addition to depression. These variables were operationally defined as an individual's perceived ability to cope with these symptoms. The majority of improvements in perceived mental health coping ability occurred within the first year of treatment and were

maintained. Enhanced self-efficacy to cope with challenging emotions is essential to the promotion of mental health, resiliency, and the addiction recovery process. Sebanjo, Wolff, Marshall, and Strang (2009) examined self-efficacy amongst MMT clients and found that low perceived coping self-efficacy was a predictor of increased opioid use. Further, individuals with poorer coping self-efficacy reported increased symptoms of depression. Sebanjo et al. also asserted that poor coping self-efficacy may mediate substance use in situations of conflict, social pressure, and unpleasant emotions. Considering Sebanjo's findings, and those of the current research, coping self-efficacy appears to be an important factor in promoting positive MMT outcomes. Although perceived mental health coping self-efficacy improves with MMT involvement, further research is required to examine the mechanisms by which enhanced mental health functioning promotes relapse prevention relative to normative comparisons of such functioning. Future research using standardized measures of mental health symptoms that go beyond clients' perceptions of their coping ability is required to confirm whether their perceptions match actual functional changes in coping and mental health relative to normative comparisons of such functioning (e.g., collateral and assessor related).

Consistent with previous research, MMT was effective at reducing the frequency of self-reported criminal activity (Fletcher & Battjes, 1999). Although Marsch's (1998) meta-analysis found a small, yet significant, reduction in non-drug related criminal activity, the current study found a very large (Cohen, 1988) reduction in such activity. This reduction went from moderate (i.e., biweekly) to low (i.e., near to none) in frequency during the first year of MMT. This reduction was maintained over subsequent follow-up periods. With respect to drug-use related criminal activity specifically, current results are consistent with Johansson et al.'s (2007) meta-analysis. Clients reported significant decreases in drug-use related criminal activity at annual follow-up compared to intake. Although clients reported at intake that most of their criminal activity was drug-use related, only some of their criminal activity was drug-use related at 12 month follow-up. Drug-related criminal activity data for SJ-MMT were not available at time points between intake and 12 month follow-up, but research by Digiusto et al. (2006) suggested that decreases in drug-related criminal activity can occur as early as three months into treatment. It is unknown whether gains in the current study were maintained beyond 12 months given the absence of sufficient data in subsequent follow-up periods to assess the outcome further. However, Johansson et al.'s meta-analysis suggested that there is long-term maintenance of these gains of up to three years. It is not surprising that decreases in drug-related crime occur as individuals are stabilized through MMT. As an individual achieves stabilization through MMT, they decrease their association with criminal peers due to reductions in substance use. Association with antisocial peers is a well-known risk factor for criminality, and the decline in such association would help reduce criminal risk (Andrews & Bonta, 2010). In addition, employment status among SJ-MMT clients improved from intake to first annual follow-up, which likely further contributes to reductions in criminal activity in general given the role of this factor in criminogenic risk as well (Andrews & Bonta, 2010).

### **Program Characteristics**

There has been ample research examining MMT program characteristics in relation to treatment outcomes (e.g., Joe et al., 1999; Prendergast et al., 2000). This research has found that programs employing a maintenance orientation and client-centered approaches tend to produce the best treatment outcomes (e.g., Brands, Blake, & Marsh, 2003; Dole & Joseph, 1978; Friedmann et al.,

2004; Simpson & Sells, 1982). Similarly, integrated, comprehensive services (e.g., individual counselling, group therapies) also have been associated with improved treatment outcomes (e.g., Broome et al., 1999; Gossop et al., 2006; McLellan et al., 1993).

Considering the multitude of psychosocial correlates to addiction, Health Canada (2002b) has recommended that MMT programs include integrated, comprehensive services. As such, program characteristics examined in the current study included comprehensiveness of services and intensity of services. Based on the current data, the SJ-MMT program provided both individual and group intervention to all clients admitted into the program. Up to 15 different types of groups were available to clients during the first five years of the program. These programs not only targeted substance specific issues, such as addiction recovery and maintenance, but also focussed on a wide variety of topics relevant to a substance using population, including infectious diseases, anxiety, and self-esteem. There has been substantial research demonstrating improved MMT outcomes when supplemental services, such as counselling, are offered (e.g., Gossop, Stewart & Marsden, 2006; McLellan et al., 1993). Moreover, the availability of diverse services has been found to increase client involvement and commitment to MMT (Broom et al., 1999). Overall, clients were highly involved in the SJ-MMT program, accessing nearly four different services on average. Thus, there was a high tendency for clients to use services that were offered, with the greatest variety of services occurring during the first year. Overall, SJ-MMT provided a high variety of group services target towards clients' specific needs, including infectious diseases, new moms, and anxiety, as well as more general needs, such as orientation and recovery.

In addition to comprehensiveness, treatment intensity has been associated with improved treatment outcomes. Rosenblum, Magura, Foote, Palij, Handelsman, and Lovejoy (1995) found that treatment intensity during MMT, as measured by the number of group sessions attended, inversely predicted cocaine use at follow-up. Individuals attending more group sessions reported less cocaine use. With respect to SJ-MMT, the highest intensity of treatment services, measured in treatment hours, occurred during the first year. These services included both individual and group treatment hours. The longer clients remained in the program, the fewer direct treatment hours they accessed and/or received. This pattern is consistent with D'Ippoliti et al.'s (1998) research, which found that the greatest period of treatment needs was during the first 12 months of treatment. Thus, clients who remain in MMT, and continue to improve, likely require less intensive intervention as they stabilize.

### **Predicting MMT Outcomes**

To capture unique predictive relationships for key outcomes, predictors of retention, improved mental health, and substance use also were examined separately as outcome variables. With respect to retention from intake to drop-out point, results indicated that individuals who rated their mental health and perceived social support higher at intake, tended to remain in treatment longer. Meanwhile, individuals reporting poorer mental health better and lower perceived social support were less likely to be retained in treatment. This finding is consistent with previous research and highlights the importance of these variables in MMT responsiveness. Craig and Olsen (2004) found that clients reporting more severe mental health at intake were less likely to be employed and were more difficult to engage in treatment, measured by fewer counselling sessions attended. Social support also has been related to better treatment outcomes. Not only are

clients who live with family members more likely to remain in treatment, but clients with relationships that encourage abstinence are more likely to abstain from drug use (Torrens et al.'s, 1996; Wasserman, Stewart, & Delucchi, 2001). Conversely, clients who remain involved with drug-related peers experience poorer treatment outcomes (Gogineni et al., 2001).

Predicting substance use and global mental health as outcomes in the first year of MMT was less clear. Due to missing data (i.e., cases with missing data were not included in analyses), power analyses indicated that the sample size was not large enough to create sufficient statistical power in these two regression analyses to identify predictors. This continues to be an area for future research.

### **Other Research Considerations**

To put the previous discussion into perspective, it is necessary to note the limitations of the current study. First, the majority of data used in this study represents the client's perspective of their treatment progress in the form of self-report. The client's perspective is valuable and necessary, and certainly consistent with client-centered approaches. However, addictions research has shown that specific client characteristics, such as personality (e.g., social desirability), attitudes and beliefs (e.g., related to addiction), sobriety level, motivation, and psychological state (e.g., anxious, depressed) can influence respondent validity (Del Boca & Noll, 2000). Chermack et al. (2000) compared self-reported opioid use to urinalysis results and found that MMT clients tended to underreport opioid use, with the exception of new clients beginning treatment who tended to overestimate their substance use. Conversely, other addictions research has shown that carefully collected self-report data is just as accurate, and sometimes more accurate, than information collected from collateral sources (Babor, Steinberg, Anton, & Del Boca, 2000). Overall, given the limitations of self-report data, objective data from secondary sources (e.g., clinicians' impressions, psychometric measures) would lend further credibility to the current findings (Marsh & Skinner, 1998). Notably, the current study did include urinalysis data; however, biases in sampling may have reduced the validity of this variable. Therefore, it is important that information not only be included from secondary sources, but that steps be taken to ensure the integrity of the data collected (e.g., ensuring random urinalysis testing).

Unfortunately, Phase II of the research, which would have provided more objective data from psychometric measures, was discontinued due to recruitment difficulties. Over the course of six months, only four participants were recruited, of which two eventually participated in the study. Recruitment difficulties are common in substance-using populations (e.g., Coviello, Zanis, Wesnoski, & Domis, 2009). In addition, during the six months of recruitment for Phase II, the SJ-MMT program underwent several changes that may have affected recruitment. Specifically, the program lost the services of a physician, which greatly slowed its capacity to accept new clients. Simultaneously, a new methadone-only maintenance clinic opened in the area, which likely contributed to lower new enrollments in SJ-MMT.

An additional limitation of the current study pertained to the measurement of substance use itself. The amount of substance used by clients was analysed according to their self-report of the number of milligrams consumed of the drug per day. However, there can be quite a discrepancy in the strength of various drugs based on milligrams. For example, 10 mg of morphine is

equivalent in strength to 200 mg of codeine. This measurement issue is further complicated when one considers that the route of administration (e.g., intravenously versus oral) can further affect dosage strength (Department of Veterans Affairs & Department of Defense, 2010). Although this limitation does not necessarily change the current study's interpretation of opioid use reduction as a function of MMT because reported drug use reduced to 0 mg per day, it does limit the ability to assess the severity of the opioid addiction at intake. Analysis could not be conducted separately by drug type or method of delivery because this information was not gathered by MMT staff at intake or at annual follow-ups.

Another limitation to the current study related to the manner in which mental health was operationalized as a perceived coping variable. While coping self-efficacy is an important variable, there continues to be a lack of research examining objective indicators of mental health recovery. Additionally, mental health was measured as a rating of current mental health status. As such, this variable may have been susceptible to the influence of transient life events (i.e., an individual having a particularly difficult day may provide a lower rating). The initial evaluation of the SJ-MMT program was to include administration of standardized measures of mental health and addiction severity on a broader level. However, low recruitment ( $n = 2$ ) made this approach infeasible. Such data should be collected as part of standard intake and follow-up to establish normative baseline and change data on these variables. A measure, such as DASS (Lovibond & Lovibond, 1995) could be implemented in the current assessment protocols to provide this information. Considering the high mental health needs of substance abusing populations (e.g., Schreiber et al., 2008), assessment of this variable is pertinent to ongoing program evaluation and improvement.

High drop-out rates are another limitation inherent in the current study. A complete-case analysis strategy was used to reduce Type I error and increase power. Such an approach is generally viewed as superior to intent-to-treat analysis, which analyzes individuals leaving treatment based on their last available data point (Chakraborty & Gu, 2009; Salim et al., 2008). However, using complete-case analysis may have impacted results. This is particularly relevant considering that individuals reporting increased daily needle use tended to leave treatment prematurely (i.e., those who leave treatment display more severe substance use and may not have been as successful in treatment had they remained). As such, analysing only those remaining in treatment could dilute findings and lead to inaccurate conclusions. While data limitations prevented alternative approaches from being used in the current study, future research may benefit from alternative approaches, such as collecting follow-up measures on those who leave treatment prematurely and matching treatment drop-outs to those who complete treatment (Hatcher, McGuire, Bilby, Palmer, & Hollin, 2012).

### **Recommendations and Future MMT Research**

The current study addressed several questions previously unanswered in the literature. First and foremost, the examination of an Atlantic Canadian MMT program uniquely contributed to existing research, which has historically been focussed outside of the Atlantic Provinces. The SJ-MMT population is unique in that the majority of clients report a prescription opioid as their primary substance as choice, as opposed to heroin. The results of the current study demonstrated that MMT is indeed effective for a prescription opioid abusing population. Understanding more about this population can influence program development and treatment protocols as policy

makers work to improve service delivery of MMT in Atlantic Canada. Specifically, clients in the first 12 months of MMT showed substantial progress in outcome variables, but this also was the period of highest drop-out. This finding suggests a need for program developers to increase focus on retention strategies during the initial 12 months of MMT. Client motivation and therapeutic involvement have been found to be highly related to drop-out rates (e.g., Simpson & Joe, 1993; Straussner, 2004). Consequently, there may be benefits to addressing these responsibility factors more directly through intervention during the first months of MMT.

The high rate of prescription drug addiction reported by SJ-MMT clients indicates a critical need for policy makers and the medical community to address the systemic issues contributing to the high prevalence of prescription drug addiction. This strategy may take the form of increased awareness about prescription opioid addiction through professional and public education (Oxycontin Task Force in Newfoundland and Labrador, 2004). Prescription drug monitoring programs can also serve to increase regulations and control of prescription opioids. Currently, Nova Scotia is the only Atlantic Province with a prescription drug monitoring program (Office of the Legislative Counsel, Nova Scotia House of Assembly, 2004). The New Brunswick Department of Health (2009) introduced the *Prescription Monitoring Act* in 2009. However, the act has yet to be enforced. The results of the current study emphasize the need for such policies to be implemented.

The current study has specific implications for the SJ-MMT program in New Brunswick. In accordance with Health Canada's (2002b) recommendations, the SJ-MMT program offers integrated, comprehensive services. Results from the current study validate the need for such programming from a client perspective—clients accessed multiple services on a frequent basis, as measured by service comprehensiveness and treatment needs. Involvement in this comprehensive program was associated with meaningful and lasting reductions in opioid use and other areas of functioning. Perhaps one of the greatest strengths of the SJ-MMT program is the variety of programming offered to clients. These services may not only increase client involvement and commitment, but also may lead to more favourable treatment outcomes (Broom et al., 1999; Gossop et al., 2006). Future research comparing the SJ-MMT sample to a group of methadone only cases would further assess whether favourable treatment outcomes are due to methadone, comprehensive services, or their combination.

Results also suggest the necessity of matching services to treatment needs. Whether clients present as low, moderate, or high in treatment need should impact the intensity of their service needs. Specifically, clients with high treatment needs (e.g., lengthier substance use histories that includes poly-substance use, increased mental illness, poor social support) would likely benefit from more intense services at the start of MMT that emphasize responsibility issues that affect engagement in intervention, including stabilization (e.g., housing, methadone dosage adjustment, financial needs) and enhance engagement in the recovery process (e.g., motivational interviewing and client-centred goal setting). Conversely, clients who present to treatment with some stabilization already underway, positive support and lower functional need, would require less intensive services, such as methadone only. As high need clients progress through treatment and experience stabilization (thereby lowering their treatment needs), services can be adjusted accordingly based on level of need. Thus, MMT may be best managed through a matching clients-to-service model that attends to responsibility factors (i.e., factors that interfere with or

could enhance one's ability to participate in treatment) as much as direct targets for changing substance use behaviours. Furthermore, the use of at least two phases of intervention over time might help adjust the level of treatment intensity for individuals who have become stabilized and are ready for maintenance. For example, clients in the earlier stages of treatment with higher overall needs could be targeted through Phase I treatment, including methadone and individualized matching to services based on needs and required intensity. As clients experience improvement and stabilization following the first 12 months of MMT, clients could move to Phase II level treatment that continues to include methadone but with a decreased intensity of services to maintain the progress achieved in the first year of treatment. Consideration of the range of intensity from methadone administration only to full comprehensive MMT services and use of a continuum of care and service delivery would ideally improve individualized service delivery to all clients (i.e., the right type of service at the right intensity for the right amount of time). A one size fits all model (whether it is a full comprehensive service or a methadone only service) is likely insufficient to meet the requirements of low, moderate, and high risk opioid abusing clients within the same system.

The necessity of individualized treatment programs based on client needs has been well established in corrections research. Andrews and Bonta's (2010) risk-need-responsivity (RNR) model emphasizes targeting treatment towards an offender's risk level (e.g., intensive services for higher risk offenders), needs (e.g., identifying risk factors related to criminal behaviour), and responsivity (e.g., matching intervention to the offender's abilities and learning style). This model has been strongly supported in corrections research. As adherence to the RNR model increases, so too do reductions in recidivism (Andrews & Bonta, 2010). The concept of the RNR model is similar to client-centered approaches in addictions treatment. Matching treatment services with clients' identified needs has been positively associated with decreases in substance use, including opioid use amongst MMT clients (Friedmann, Hendrickson, Gerstein, & Zhang, 2004). The RNR model has the advantage of providing a very clear framework for individualizing programs and improving outcomes (i.e., clearly identifying "client-centered" principles).

Just as treatment needs should be considered in program planning and implementation, so too should a client's motivational level. Based on DiClemente's (2003) Transtheoretical Model, motivation is considered one of the most fundamental constructs in addictions treatment. Low client motivation has been well established as a predictor of MMT client drop-out rates (Joe, Rowan-Szal, & Greener, 1997; Simpson & Joe, 1993). Considering these findings, MMT programs would greatly benefit from assessing and targeting (e.g., through Motivational Interviewing) client motivation throughout treatment, with particular emphasis during the first 12 months when clients are at the highest risk for dropping out.

The current research also emphasized the benefits of implementing ongoing outcome evaluations into standard treatment and assessment protocols. The current study represents the largest MMT evaluation to date in Atlantic Canada, spanning five years. Information for the current evaluation was available largely because of ongoing data collection integrated directly into the SJ-MMT program. This procedure provides researchers, program staff, and other stakeholders with a direct means for ongoing program evaluation.

Although the SJ-MMT program decreased opioid use, non-opioid drug use (based on urinalyses) appeared to increase between years two and three of the program. It is well established that secondary, non-opioid use is common in methadone maintained populations (Teesson et al., 2006). Biases in sampling may account for the apparent increase in non-opioid drug use. There continues to be a need for future research examining reductions in poly-substance use amongst prescription opioid users in Atlantic Canada. In order to reduce potential biases, urinalysis testing should be performed on a random sampling basis.

An additional area of future research relates to data collection measures. The current study relied primarily on self-report measures. Recruitment difficulties prevented more objective data collection in this study. Therefore, there continues to be a need for data collection using measures from the researcher and/or clinician's perspective before the true impact of MMT on outcome measures can be understood. Future research evaluating MMT in general, and SJ-MMT specifically, would benefit from implementing additional objective measures, such as the *Addiction Severity Index (ASI)* developed by McLellan et al. (1980), the *Depression Anxiety Stress Scales (DASS)* developed by Lovibond and Lovibond (1995), and *The University of Rhode Island Change Assessment Scale (URICA)* developed by DiClemente and Hughes (1990) to assess stages of change. Considering recruitment difficulties identified in the current study, it is advisable that these measures be implemented as part of the ongoing assessment protocol used by SJ-MMT and other agencies.

In a similar vein, if researchers are to gain a clearer understanding of the most sensitive time frame in terms of drop-out in MMT, then further assessment examining client progress at shorter time intervals (e.g., monthly as opposed to annually) is essential. The accumulation of additional studies examining MMT in Atlantic Canada will assist researchers and program developers in understanding this unique population, and with implementing more effective and efficient treatment programs.

In summary, the current study extended existing research by examining MMT outcomes in a primarily prescription opioid abusing population, and was the first of its kind to target an Atlantic Canadian population specifically. The majority of treatment gains were observed during the first 12 month of MMT, and were maintained for at least four to five years while involvement in MMT continued. Another notable finding in the present research was the role of mental health and social support in retention rates. Overall, this study provided very promising support for comprehensive MMT programs in Atlantic Canada.

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Table 1

*Percent Agreement for Client Satisfaction Ratings*

Item	Year 1 <i>n</i> = 197	Year 2 <i>n</i> = 107	Year 3 <i>n</i> = 54	Year 4 <i>n</i> = 22
SJMMT Program Information	80.7(159)	79.4 (85)	79.6 (43)	59.1 (13)
General Information	94.4 (188)	96.3 (103)	96.3 (52)	100.0 (22)
Individual Counselling	95.4 (188)	99.1 (106)	98.1 (53)	100.0 (22)
Group Counselling	93.4 (184)	97.2 (104)	98.1 (53)	100.0 (22)
Community Resources	95.4 (188)	97.2 (104)	98.1 (53)	100.0 (22)
Education	94.4 (186)	96.3 (103)	96.3 (52)	100.0 (22)
Staff Support	95.4 (188)	99.1 (106)	96.3 (52)	90.9 (20)
Environment	88.8 (175)	97.2 (104)	96.3 (52)	90.9 (20)
General Service Satisfaction	94.4 (186)	95.3 (102)	94.4 (51)	100.0 (22)
Respectful Staff	95.9 (189)	96.3 (103)	98.1 (53)	100.0 (22)
Respectful Clients	91.9 (181)	98.1 (105)	94.4 (51)	100.0 (22)
Respectful Pharmacy	89.8 (177)	97.2 (104)	94.4 (51)	100.0 (22)

*Note:* Individual client satisfaction items are reported as the percentage of respondents answering “yes” for satisfaction with each item. Numbers in brackets refer to the number of participants answering “yes” to each individual item.

Table 2

*Means and Standard Deviations for Client Satisfaction and Program Quality*

Item	Year 1 <i>n</i> = 197 <i>M</i> ( <i>SD</i> )	Year 2 <i>n</i> = 107 <i>M</i> ( <i>SD</i> )	Year 3 <i>n</i> = 54 <i>M</i> ( <i>SD</i> )	Year 4 <i>n</i> = 22 <i>M</i> ( <i>SD</i> )
Overall Client Satisfaction (0-12)	11.11 (2.02)	11.4(1.00)	11.41(1.27)	11.41 (.59)
Program Quality (1-4)	1.45 (.61)	1.50(.59)	1.52 (.58)	1.32 (.48)

*Note:* Overall client satisfaction is composed of the sum of “yes” responses over all individual satisfaction items. Higher scores on client satisfaction indicate increased client satisfaction.

Lower scores on the Program Quality variables indicate higher perception of program quality among clients.

Table 3

	Year 1	Year 2	Year 3	Overall
Discharge Reason				(Intake – Year 5)
Non-Compliance	n (%)	n (%)	n (%)	15 (2.6)
Self (AMA, Request)	49 (32.2) <sup>a</sup>	19 (40.4) <sup>a</sup>	15 (48.4) <sup>b</sup>	7 (1.2)
Treatment Completion	62 (40.8) <sup>a</sup>	14 (29.8) <sup>a</sup>	3 (9.7) <sup>b</sup>	30 (5.2)
Transfer	8 (5.3) <sup>a</sup>	8 (17.0) <sup>a</sup>	4 (12.9) <sup>a</sup>	82 (14.2)
Incarcerated	17 (11.1) <sup>a</sup>	4 (8.5) <sup>a</sup>	4 (12.9) <sup>a</sup>	7 (1.2)
Medical Risk	8 (5.3) <sup>a</sup>	1 (2.2) <sup>a</sup>	0 <sup>a</sup>	85 (14.8)
Deceased	6 (3.9) <sup>a</sup>	1 (2.2) <sup>a</sup>	0 <sup>a</sup>	7 (1.2)
	2 (1.3) <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>	

*Note.* Values with the same superscript across rows are not significantly different, whereas differing superscripts (i.e., <sup>a</sup> and <sup>b</sup>) are significantly different at  $p \leq .05$ . Percentages refer to the percent of participants *admitted* and excluded those on the waitlist or who were discharged due to successful program completion.

Table 4

*Descriptive Results for Completion, Discharged, and Retained Across Time*

	<i>n</i> (%)				
	(Year 1) Intake – Y1	(Year 2) Y1 – Y2	(Year 3) Y2 – Y3	(Year 4) Y3 – Y4	(Year 5) Y4 – Y5
Completed	7 (2)	6 (3)	9 (5)	6 (9)	-
Discharged	155 (41)	75 (34)	90 (53)	38 (54)	25 (96)
Retained	216 (57)	135 (63)	70 (42)	26 (37)	1 (4)

Table 5

*Types of Services Offered During SJMMT*

Service Offered	<i>n</i>	(%)
Individual Counselling	449	(28.6)
Physician Contact	79	(4.7)
Group Counselling	1161	(66.4)
Activities Group	17	(1.0)
Clean Start Group	99	(5.9)
Cluster Group	26	(1.6)
Early Recovery Group	313	(18.7)
Infectious Diseases Education/Group	13	(.8)
Methadone Recovery Group	34	(2.0)
Orientation Group	48	(2.9)
Self-Esteem Group	1	(.1)
Hope of Wellness (HOW)	329	(19.6)
Navigating Our Wellness (NOW)	23	(1.4)
Wonder of Wellness (WOW)	162	(9.7)
Morning Program	43	(2.6)
New Moms/Moms to Be	3	(.2)
Anxiety Group	18	(1.1)
Wellness Group	20	(1.2)

*Note.* *n* refers to the number of clients who accessed the services at least once. Percentage refers to the proportion of clients who received the service out of the total number of services provided

(i.e., 28.6% of the services received by SJMMT clients were for individual treatment). Service utilization is not mutually exclusive across service type, as clients could receive more than one type of service during their involvement in the program.

Table 6

*Means and Standard Deviations for Comprehensiveness of Service Score for Admitted Cases*

*(Excluding Waitlist)*

Annual Time Period	<i>n</i>	<i>M (SD)</i>
Year 1	455	3.69 (.86)
Year 2	224	3.38 (.91)
Year 3	138	3.10 (.75)
Year 4	72	3.06 (.89)
Year 5	35	2.37 (.94)

*Note:* Comprehensiveness of service score had a possible range from 0 to 15, with higher scores indicating increased variety of services received.

Table 7

*Means and Standard Deviations for Intensity (Hours of Treatment Received on An Annual Basis) Across Time*

Annual Time Period	<i>n</i>	<i>M (SD)</i>	<i>Mdn</i>
<b>Total Treatment</b>			
Year 1	363	19.96 (13.29)	17.50
Year 2	114	13.70 (9.49)	11.50
Year 3	45	12.24 (5.35)	11.58
Year 4	19	13.04 (7.35)	11.50
Year 5	3	15.97 (13.34)	11.75
TOTAL	456	26.47 (21.06)	21.75
<b>Group Services</b>			
Year 1	363	6.56 (7.72)	4.68
Year 2	116	3.56 (6.08)	1.08
Year 3	45	1.65 (2.16)	.67
Year 4	19	3.43 (4.48)	1.00
Year 5	5	4.70 (5.66)	1.83
TOTAL	456	6.54 (9.14)	3.67
<b>Individual Services</b>			
Year 1	449	12.18 (7.68)	11.00
Year 2	222	8.24 (5.54)	8.00
Year 3	138	7.88 (5.07)	7.96
Year 4	71	7.31 (4.96)	6.17
Year 5	31	4.96 (5.87)	2.75
TOTAL	456	6.54 (14.84)	17.38

Table 8

*Descriptive Results for Urinalysis Drug Screening Outcomes.*

	(Year 1) Intake – Y1	(Year 2) Y1 – Y2	(Year 3) Y2 – Y3	(Year 4) Y3 – Y4	(Year 5) Y4 – Y5
Total # of Screens	7785	2371	1277	717	173
Enrolment (n)	446	446	128	74	27
Per person average # of drug screens	17.46 (9.87)	5.32 (7.47)	9.98 (5.59)	9.69 (6.56)	6.41 (6.51)
% screens with Positive Result	62.53	56.17	53.41	52.44	56.07
% screens with Opioids	20.67	11.97	6.16	3.46	20.62
% screens with Min. One Other	82.03	89.65	94.57	96.28	98.97
% screens with Inconclusive Result	.10	1.00	1.00	1.00	.30

*Note:* Numbers in brackets represent standard deviations. Reported statistics are for entire sample of participants providing urine samples. Combined percentages for opioids and other drug screens exceed 100 in some cases due to presence of both opioids and at least one other substance within a single urinalysis result.

Table 9

*Paired Sample t-tests Comparing Changes in Drug Screening Results Between Years in SJ-MMT*

Comparison	<i>N</i>	<i>df</i>	<i>t</i>	<i>p</i> -value
Negative Urinalysis				
Year 1 vs. Year 2	205	1, 204	.83	.41
Year 2 vs. Year 3	128	1, 127	2.36	.02
Year 3 vs. Year 4	73	1, 72	-.44	.66
Year 4 vs. Year 5	27	1, 26	1.06	.30
Positive Urinalysis				
Year 1 vs. Year 2	205	1, 204	-.42	.67
Year 2 vs. Year 3	128	1, 127	-2.27	.03
Year 3 vs. Year 4	73	1, 72	.30	.76
Year 4 vs. Year 5	27	1, 26	-1.23	.23
Positive for Opiates				
Year 1 vs. Year 2	205	1, 204	1.09	.28
Year 2 vs. Year 3	128	1, 127	-1.00	.32
Year 3 vs. Year 4	73	1, 72	1.93	.06
Year 4 vs. Year 5	27	1, 26	-1.22	.23
Positive for Other Substances				
Year 1 vs. Year 2	205	1, 204	-.53	.59
Year 2 vs. Year 3	128	1, 127	-2.22	.03
Year 3 vs. Year 4	73	1, 72	-.24	.81
Year 4 vs. Year 5	27	1, 26	-1.33	.20

*Note:* Year one indicates drug screen results during the first 12 months of SJ-MMT, year two indicates drug screen results between 12 and 24 months in SJ-MMT, etc.

Table 10

*Means and Standard Deviations for Health Status Ratings Across Time*

Variable	<i>N</i>	<i>M</i> ( <i>SD</i> )
Intake	442	4.65 (2.13) <sup>a</sup>
Year 1	159	6.95 (2.40) <sup>b</sup>
Year 2	79	7.20 (1.61) <sup>b</sup>
Year 3	42	7.20 (1.47) <sup>b</sup>
Year 4	20	7.40 (1.57) <sup>b</sup>

*Note:* Values with the same superscript are not significantly different, while differing superscripts (i.e., <sup>a</sup> and <sup>b</sup>) are significantly different at  $p \leq .05$ . Health status ratings range from 1 to 10, with higher scores indicating improved health status.

Table 11

*Means and Standard Deviations for Mental Health Status Ratings Across Time*

MH Rating Variables	<i>M (SD)</i>				
	Intake <i>n</i> = 449	Year 1 <i>n</i> = 181	Year 2 <i>n</i> = 103	Year 3 <i>n</i> = 59	Year 4 <i>n</i> = 24
Stress	4.15 (2.42) <sup>a</sup>	6.59 (1.87) <sup>b</sup>	7.02 (1.69) <sup>b</sup>	7.27 (1.81) <sup>b</sup>	7.54 (1.62) <sup>b</sup>
Anxiety	4.15 (2.60) <sup>a</sup>	6.67 (2.17) <sup>b</sup>	6.95 (2.17) <sup>b</sup>	7.14 (1.93) <sup>b</sup>	7.12 (2.03) <sup>b</sup>
Panic	4.71 (2.94) <sup>a</sup>	7.43 (2.39) <sup>b</sup>	7.70 (2.36) <sup>b</sup>	8.15 (1.89) <sup>b</sup>	7.7 (2.15) <sup>b</sup>
Depression	4.44 (2.63) <sup>a</sup>	6.96 (2.09) <sup>b</sup>	7.21 (2.23) <sup>b</sup>	7.41 (2.08) <sup>b</sup>	7.33 (2.20) <sup>b</sup>
Anger	5.22 (3.89) <sup>a</sup>	7.09 (2.04) <sup>b</sup>	7.25 (2.02) <sup>b</sup>	7.54 (1.98) <sup>b</sup>	7.92 (1.61) <sup>b</sup>
Self-Esteem	4.26 (3.81) <sup>a</sup>	6.77 (2.09) <sup>b</sup>	7.11 (1.96) <sup>b</sup>	7.28 (1.80) <sup>b</sup>	7.33 (2.28) <sup>b</sup>
Global	18.24 (10.34) <sup>a</sup>	27.96 (7.37) <sup>b</sup>	29.03 (7.47) <sup>b</sup>	30.79 (5.96) <sup>b</sup>	0.33 (6.25) <sup>b</sup>

*Note:* Values with the same superscript are not significantly different, while differing superscripts (i.e., <sup>a</sup> and <sup>b</sup>) are significantly different at  $p \leq .05$ . Mental health status ratings range from 1 to 10, with higher ratings indicating increased perceived ability to cope with mental health concern.

Table 12

*Means, Standard Deviations, and Intercorrelations for Retention and Predictor Variables*

Variable	<i>M</i> ( <i>SD</i> )	1	2	3	4	5
Retention (weeks)	90.62 (63.95)	-.02	-.23**	.10	.16*	.02
Predictor Variable						
1. Daily Substance Use (mg)	134.22 (211.05)	-	.12	-.03	.01	-.02
2. Global Mental Health	16.99 (9.43)		-	.29***	-.11	-.06
3. Perceived Social Support	18.77 (7.82)			-	-.08	-.17*
4. Comprehensiveness of Services	4.05 (.53)				-	.09
5. Intensity of Services (hours)	1241.38 (833.17)					-

*Note.* *N* = 145; \**p* < .05; \*\**p* < .01; \*\*\**p* < .001.

Table 13

*Hierarchical Multiple Regression Analysis Summary with Stepwise Within Block Entry for Client and Program Characteristics Predicting Retention at Annual Follow-up*

Variable	$\beta$	$R^2$	$\Delta R^2$
Model 1		.01	.01
Gender	.03		
Age	.12		
Model 2		.10	.08
Gender	.05		
Age	.13		
Daily Substance Use (mg)	.01		
Global Mental Health	-.28**		
Perceived Social Support	.19*		
Model 3		.11	.02
Gender	.04		
Age	.11		
Daily Substance Use (mg)	.01		
Global Mental Health	-.27**		
Perceived Social Support	.20*		
Comprehensiveness of Services	.14		
Intensity of Services (hours)	.01		

Note:  $N = 145$ ;  $F(7, 137) = 2.52$ ,  $p = .02$

\* $p < .05$ ; \*\* $p < .01$ .

Table 14

*Means, Standard Deviations, and Intercorrelations for Substance Use and Predictor Variables*

Variable	<i>M (SD)</i>	1	2	3	4	5
Substance Use at 12 Months (mg)	1.25 (10.00)	-.06	.05	-.19	-.27*	-.18
Predictor Variable						
1. Daily Substance Use (mg)	127.88 (162.52)	-	.16	.02	.25*	-.03
2. Global Mental Health	16.36 (9.04)		-	.21*	-.02	.03
3. Perceived Social Support	19.47 (7.82)			-	.02	-.07
4. Comprehensiveness of Services	4.05 (.49)				-	.10
5. Intensity of Services (hours)	1190.78 (755.12)					-

*Note:*  $N = 64$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Table 15

*Hierarchical Multiple Regression Analysis Summary with Stepwise Within Block Entry for Client and Program Characteristics Predicting Substance Use at Annual Follow-up*

Variable	$\beta$	$R^2$	$\Delta R^2$
Model 1		.01	.01
Gender	-.11		
Age	-.06		
Model 2		.05	.04
Gender	-.08		
Age	-.05		
Daily Substance Use (mg)	-.06		
Global Mental Health	.11		
Perceived Social Support	-.20		
Model 3		.14	.04
Gender	-.01		
Age	-.02		
Daily Substance Use (mg)	-.01		
Global Mental Health	.10		
Perceived Social Support	-.21		
Comprehensiveness of Services	-.25		
Intensity of Services (hours)	-.17		

Note:  $N = 64$ ;  $F(7, 56) = 1.34, p = .25$

\* $p < .05$ ; \*\* $p < .01$ .

Table 16

*Hierarchical Multiple Regression Analysis Summary with Stepwise Within Block Entry for Client and Program Characteristics Predicting Positive Urinalysis Results*

Variable	$\beta$	$R^2$	$\Delta R^2$
Model 1		.03	.03
Gender	-.14		
Age	-.12		
Model 2		.04	.01
Gender	-.15		
Age	-.12		
Daily Substance Use (mg)	-.10		
Global Mental Health	.06		
Perceived Social Support	-.06		
Model 3		.11	.07
Gender	-.17		
Age	-.14		
Daily Substance Use (mg)	-.11		
Global Mental Health	.08		
Perceived Social Support	-.04		
Comprehensiveness of Services	.26*		
Intensity of Services (hours)	.04		

*Note:*  $N = 45$ ;  $F(7, 137) = 2.45$ ,  $p = .02$

\* $p < .01$ .

Table 17

*Means, Standard Deviations, and Intercorrelations for Global Mental Health and Predictor Variables*

Variable	M (SD)	1	2	3	4	5
Global Mental Health (12 Months)	27.71 (6.96)	.02	.24*	-.01	-.10	.01
Predictor Variable						
1. Daily Substance Use (mg)	129.65 (159.52)	-	.18	.04	.24*	-.01
2. Global Mental Health	15.59 (8.56)		-	.16	.03	.03
3. Perceived Social Support	19.01 (7.81)			-	.09	-.05
4. Comprehensiveness of Services	4.03 (.49)				-	.15
5. Intensity of Services (hours)	1122.06 (516.39)					-

*Note:* N = 68; \*p < .05; \*\*p < .01; \*\*\*p < .001.

Table 18

*Hierarchical Multiple Regression Analysis Summary with Stepwise Within Block Entry for Client and Program Characteristics Predicting Global Mental Health at Annual Follow-up*

Variable	$\beta$	$R^2$	$\Delta R^2$
Model 1		.07	.07
Gender	-.25*		
Age	.03		
Model 2		.12	.05
Gender	-.25*		
Age	-.02		
Daily Substance Use (mg)	-.004		
Global Mental Health	.24		
Perceived Social Support	-.04		
Model 3		.14	.02
Gender	-.28*		
Age	-.01		
Daily Substance Use (mg)	.03		
Global Mental Health	.22		
Perceived Social Support	-.03		
Comprehensiveness of Services	-.13		
Intensity of Services (hours)	.11		

*Note:*  $N = 68$ ;  $F(7, 60) = 1.38$ ,  $p = .23$

\* $p < .05$ . \*\* $p < .01$ .

## Appendix A

**Database Elements**

- I. Demographics
  - a. Age
  - b. Gender
  - c. Ethnicity
  - d. Language
  - e. Employment
  - f. Education
  - g. Marital status
  - h. Income source
  - i. Income level
- II. Intake Information
  - a. Vitals
  - b. Medications
  - c. Allergies
  - d. Present medical problems
  - e. Mental health history
  - f. Length of time/mode of use of opioids
  - g. Use related to injury or illness
  - h. Source of opioids
  - i. Prior substance abuse

- j. Family history of substance abuse
  - k. Family physician
  - l. Status of Hepatitis A, B, C and HIV/AIDS
  - m. First use of opioid
  - n. Risk factors (e.g., abscesses, needle sharing, tattoos, risky sexual behaviours, contraception)
  - o. Health factors (e.g., ulcers, asthma, seizures, migraines, back, heart, diabetes)
  - p. History of overdose
  - q. Past of present treatment for anxiety or depression
  - r. History of mental health admissions, emotional, sexual, physical abuse
  - s. Legal status
  - t. Make up of household and awareness of client's addiction
- III. Drug screen results
- IV. Methadone dosage levels
- V. Participation in other substance abuse treatment programs at Ridgewood Addiction Services
- VI. Access/referral to programs, counselling, or community services
- VII. Client service contacts and type
- VIII. Client phase level, assessment, and planning (e.g., client phase level and data, client goals, treatment plan)
- IX. Predictive/Outcome Variables
- a. Drug of choice
  - b. Daily amount of opioid use

- c. Daily needle use
- d. Use of all addictive substances
- e. Client rating of interpersonal relationships (e.g., family, partner, children)
- f. Employment status
- g. Legal status
- h. Previous criminal convictions
- i. Self-reported criminal activity
- j. Self-reported relationship of criminal activity to addiction
- k. Health concerns
- l. Self-ratings of: health status, self esteem, and ability to deal with stress, anxiety, panic, depression, and anger (1=very poor; 10=excellent)
- m. Client satisfaction with services survey

## Appendix B

**Client Satisfaction Survey**

1.	Did you receive appropriate information about the Methadone program during admission?	YES	NO
2.	Did you receive adequate services in the area of individual counselling?	YES	NO
3.	Did you receive adequate services in the area of group counselling?	YES	NO
4.	Did you receive adequate services in the area of access and referral to community resources?	YES	NO
5.	Did you receive adequate services in the area of educational information?	YES	NO
6.	Did you receive adequate services in the area of support?	YES	NO
7.	Did you receive adequate services in the area of information?	YES	NO
8.	Does the Methadone clinic provide a safe, comfortable environment?	YES	NO
9.	Are you satisfied with the services you received?	YES	NO
10.	Are you being treated with dignity and respect by other participants?	YES	NO
11.	Are you being treated with dignity and respect by pharmacy staff?	YES	NO
12.	Are you being treated with dignity and respect by Methadone Clinic Team Members?	YES	NO
13.	Are there any areas you would suggest need improvement?	YES	NO

## Appendix C

**Representational Consent Form**

Researchers at the University of New Brunswick are conducting a study on the Saint John Methadone Clinic. We are interested in learning about how clients do when they participate in methadone maintenance and what predicts these outcomes. Thus, this study will evaluate the effectiveness of methadone maintenance treatment, and is intended to improve treatment services offered by the Saint John Methadone Clinic and other similar clinics.

Unfortunately, it is not possible to contact every person who has been admitted to and discharged from the methadone maintenance treatment program (MMT). As such, we are seeking advice from a group of people who are representative of clients who participated in MMT.

This study would be conducted as part of the requirements for the principal investigator's Doctor of Philosophy degree in clinical psychology at the University of New Brunswick. This study would be reviewed by research ethics boards at UNB-Saint John and Atlantic Health Sciences Corporation. If you had further questions concerning this research, you could contact the primary researcher, Angela Burbridge (Angela.Burbridge@unb.ca), or her supervisor, Dr. Mary Ann Campbell (506-648-5969 or [mcampbel@unbsj.ca](mailto:mcampbel@unbsj.ca)). You could also contact Dr. David Flagel, Chair, UNBSJ Research Ethics Board ([flagel@unbsj.ca](mailto:flagel@unbsj.ca)).

This study involves extracting relevant information from client records. This information would include such things as type of addiction and services received. All information coded from client records will be kept confidential, and no identifying information will be stored with the information we collect. Data would be identified only by encrypted participation ID numbers. All data and materials collected would be kept in a locked filing cabinet at the University of New Brunswick in Dr. Campbell's research lab. Researchers working on this project would be the only individuals who would have access to the data. No one person's data would be singled out or reported to others. This information will only be described as collective data in which the sample is described as a group.

If you were asked to participate in the above described study, would you agree to participate in it and allow the research team access to your records at Saint John Methadone Clinic for the purposes of the evaluation? Whether you agree or do not agree, your response will not be shared with treatment staff/administrators of the methadone program or Ridgewood Addictions Services and will not affect your admittance or participation in the methadone program or any other treatment program offered at Ridgewood.

Please circle your response.

YES I WOULD AGREE

NO I WOULD NOT AGREE

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix D

### Proposed Phase II: Prospective Piece

The following procedure was originally proposed as Phase II of the current research. Unfortunately, due to recruitment difficulties ( $n = 2$ ), this phase of the research was not completed. Over a six month period, four potential participants were recruited, only two of which completed the baseline questionnaires. As a result of this difficulty, Phase II of the current research was discontinued. The originally proposed methods and procedures for the prospective piece follow.

#### Hypotheses

(1) The first hypothesis of the prospective piece of the proposed research is that clients will demonstrate improvements in outcomes from Intake to a six-month follow-up assessment. These improvements are expected to be observed on measures of addiction severity and affect (i.e., depression, anxiety, and stress).

(2) The second hypothesis of Phase II relates to whether clients experience changes in motivation as they progress through the first six months of MMT. Since there is a lack of research examining changes in motivation and readiness for change during MMT amongst opioid dependent individuals, the following hypothesis is considered to be exploratory in nature. Motivation is expected to improve from Intake to Time 1 for those clients who remain in MMT. Additionally, the association between motivation and number of weeks in treatment will be explored.

(3) The third hypothesis focusses on the relationship between motivation and treatment outcomes, including measures of retention, addiction severity, and changes in depression, anxiety, and stress levels that occur from Intake to follow-up. Previous research (e.g., Joe et al., 1999; Simpson & Joe, 1993) has found that motivation significantly predicts retention, while also suggesting a possible relationship between motivation and treatment outcomes in general. The current study will examine the hypothesized relationship between motivation and measures of addiction severity, depression, anxiety, and stress.

## Method

#### Participants

Participants for this phase of the study will consist of newly admitted SJ-MMT clients, which are termed “active” clients for the purpose of the current research. Participants will be recruited at intake through verbal descriptions of the opportunity to participate in a research study by either SJ-MMT staff (e.g., social workers, nurses, and physicians) or the primary researcher. Individuals who have been engaged in methadone maintenance for longer than 30 days will be excluded from the research in order to ensure that the most accurate baseline data was collected. This criterion is based on previous research, which has often defined “current” intake information as being based on the previous 30 day period prior to admission or near the time of admission (McLellan et al., 1980). The opportunity to have their name entered in a prize draw for eight grocery store gift certificates (valued at \$25 each) will be offered as an incentive for participation. In the past, SJ-MMT has admitted between 10 and 14 clients per month (M. Mullin, personal communication, October 5, 2009). Based on this, it is expected that the

prospective piece will include approximately 20-28 participants, assuming that data collection will take place over the course of eight weeks.

### **Prospective Data Collection Measures**

**Addiction Severity Index (ASI).** The ASI was developed by McLellan et al. (1980) to assess aspects of clients' lives that may contribute to their substance abuse problems. Specifically, the severity of current (i.e., last 30 days) and lifetime problems in seven domains is assessed through self-report information acquired during a semi-structured interview lasting approximately 45 minutes. These domains include: medical, employment, alcohol, drug, legal, family/social, and psychiatric problems. Seven composite scores are calculated based on the sum of scores provided to questions asked to clients within each domain. The Medical composite is comprised of questions regarding hospitalizations, physical health problems, and prescription medication history. The Employment composite includes information such as education level, training, occupation, and employment pattern. Frequency of substance use, type of substance use, and problems associated with substance use are assessed by the Alcohol and Drug use composite scores. Information obtained about legal arrests, charges, and incarceration contributes to the Legal composite. The Family/Social composite score includes marital status, living arrangements, and interpersonal conflict. Finally, the Psychiatric Problems composite examines current and past mental health status. Specifically, lifetime and current incidence of multiple mental health issues are addressed, including depression, anxiety, suicidal thoughts or attempts, and psychopharmacological interventions. Scoring is based on a weighting procedure performed by a computer software scoring system developed by DiClemente and Hughes (1990). Composite scores range from zero to one and provide an objective measure of problem level. Higher scores within each composite are indicative of more severe problem areas, while lower scores indicate less severe problems. In addition to these composite scores, the ASI includes severity ratings for each of the seven domains. Severity ratings are made on a 10-point rating scale, and are provided by the interviewer based on clinical judgement. The ASI will be used to assess active clients in MMT at intake and at a six month follow-up.

The ASI composite scales have reasonably good psychometric properties. For example, Bovasso, Alterman, Cacciola, and Cook (2001) examined the ASI's psychometric properties within a sample of MMT clients and found acceptable levels of internal consistency for the ASI composites: Medical ( $r = .93$ ), Alcohol ( $r = .91$ ), Psychiatric ( $r = .77$ ), Legal ( $r = .74$ ), Drug ( $r = .71$ ), Family/social ( $r = .71$ ), and Employment ( $r = .69$ ). Similar internal consistency levels have been reported by other authors (e.g., Leonhard, Mulvey, Gastfriend, & Schwartz, 2000). Stoffelmayr, Mavis, and Kasim (1994) examined the inter-rater reliability of the AIS and found reliability coefficients ranging from .92 to 1.0 for composite scores. Conversely, reliability coefficients for severity ratings have ranged from .48 to .87. These findings suggest that composite scores are more reliable than clinician severity ratings. Based on these findings, the current research intended to focus on ASI composite scores only. The ASI also shows good construct validity. According to McDermott et al. (1996), the ASI's various composite scores are significantly correlated with similar constructs. Specifically, the ASI legal problems composite was associated with the total score and the criminality versatility item of the Psychopathy Checklist-Revised (PCL-R). In a similar vein, the ASI psychiatric problems composite was associated with State-Trait Anxiety Inventory (STAI) subscales, Beck Depression Inventory (BDI), and with the Structured Clinical Interview for DSM Disorders (SCID) psychiatric

disorders subscale and measure of lifetime major depression. With respect to substance use, the ASI alcohol problems scale was associated with a SCID diagnosis of lifetime alcohol disorders, while the ASI drug problems scale was associated with SCID diagnosis for lifetime disorders involving sedatives, opioids, cocaine, and related substances.

**Depression Anxiety Stress Scales (DASS).** The DASS was developed by Lovibond and Lovibond (1995), and will be used to assess active MMT participants' mental health status. The DASS is a 42 item, self-administered instrument designed to assess the respondent's level of depression, anxiety, and stress. Participants are asked, using the previous one week as a time frame, to indicate the degree to which each item reflects their experience. Ratings are provided on a four point Likert scale (0 = did not apply to me at all; 3 = applied to me very much, or most of the time). Items are then summed and multiplied by two according to their factor loadings on the appropriate subscale: Depression (items 3, 5, 10, 13, 16, 17, and 21), Anxiety (items 2, 4, 7, 9, 15, 19, and 20), and Stress (items 1, 6, 8, 11, 12, 14, and 18). The first factor, Depression, assesses feelings of hopelessness, sadness, devaluation of life, lack of interest/involvement, self-deprecation, and inability to experience pleasure. The second factor, Anxiety, measures situational anxiety, autonomic arousal, skeletal muscle effects, and subjective experience of anxious feelings. The final factor, Stress, measures the ability to relax, nervous arousal, and the tendency to become easily irritable, over-reactive, easily upset, agitated, and impatient. Higher scores are indicative of increased self-reported problems with depression, anxiety, and stress.

Antony, Bieling, Cox, Enns, and Swinson (1998) reported that the DASS demonstrated good levels of internal consistency, with Cronbach's alphas for the Depression, Anxiety, and Stress subscales of .91, .92, and .95, respectively. DASS subscales also display acceptable construct validity. The Depression subscale correlated most strongly with other measures of depression, particularly the Beck Depression Inventory ( $r = .77$ ) and, as expected, least with measures of anxiety, such as the Beck Anxiety Inventory ( $r = .42$ ). In contrast, the Anxiety subscale correlated most with the Beck Anxiety Inventory ( $r = .84$ ) and least with the Beck Depression Inventory ( $r = .57$ ). With respect to the Stress subscale, correlations were moderate with the State Trait Anxiety Inventory ( $r = .59$ ). The Stress subscale was correlated most strongly with the Beck Depression Inventory ( $r = .65$ ), and least with the Beck Anxiety Inventory ( $r = .44$ ). These findings suggest that the Stress subscale, as a measure of tension and agitation, may overlap with features of depression and anxiety.

**The University of Rhode Island Change Assessment Scale (URICA).** The URICA was originally developed by DiClemente and Hughes (1990) to assess stages of change in individuals with alcohol dependency. This instrument has been since used in a wide variety of settings, including with drug abusing populations. The URICA consists of 32 self-report items designed to assess client motivational readiness to change a problem-related behaviour. Participants indicate a problem of focus, and then complete the questionnaire based on that problem. Participants rate their agreement with each one of 32 statements on a five point scale (1 = strongly agree; 5 = strongly disagree). Individual items pertaining to each composite are then summed and divided by seven to yield the composite score: Precontemplation (items 1, 5, 11, 13, 23, 26, and 29), Contemplation (items 2, 8, 12, 15, 19, 21, 24), Action (items 3, 7, 10, 14, 17, 25, and 30), and Maintenance (6, 16, 18, 22, 27, 28, 32). The Readiness for Change score is computed by subtracting the Precontemplation composite score from the sum of the Contemplation, Action, and Maintenance composite scores. The resulting numerical value is then compared to cut-off

scores to determine an individual's readiness to change: least ready (<8), middle ready (8-11), and most ready (11-14).

For the purposes of the current research, URICA wording was modified slightly. The word "problem" on the original scale was replaced with the words "drug use problem". This was done to decrease participant confusion about the problem of focus and ensure that participants responded while considering their drug use problems, as opposed to other problems that they may be experiencing. URICA subscales correspond directly to Prochaska and DiClemente's (1992) Transtheoretical Stages of Change Model: Precontemplation, Contemplation, Action, and Maintenance.

Research on the URICA has demonstrated that it has acceptable to good internal consistency. Napper et al. (2008) reported the following Cronbach's alphas for its subscales: .96 (Precontemplation), .65 (Contemplation), .85 (Action), and .76 (Maintenance). Other research has shown good test-retest reliability ranging from one week to 12 months (e.g., Abellanas & McLellan, 1993; Steinberg, 2000). With respect to concurrent validity, Napper et al. (2008) found that the URICA was significantly related to the Readiness to Change Questionnaire ( $r = .76$ ), an alternative instrument also based on Prochaska and DiClemente's (1992) Transtheoretical Model. The URICA's 4 dimensions of readiness to change have been supported through factor analysis (e.g., Carney & Kivlahan, 1995; DiClemente & Hughes, 1990).

## Procedure

**Prospective data collection.** The prospective piece of the proposed research will enable a more systematic review of SJ-MMT client outcomes than is possible from archival review alone. Participants will be recruited at intake or during initial SJ-MMT appointments and will be excluded if they have been engaged in MMT for longer than four weeks. This exclusionary criterion was developed to ensure that the most accurate pre-treatment baseline data was obtained. The opportunity to participate in a research project will be described to eligible individuals at their intake appointment. Individuals will also be informed that participation involves access to their intake and file data, as well as two separate interviews with the researcher at intake and at a six month follow-up. Participants will be given the option of interviews at either Ridgewood Addictions Services (i.e., SJ-MMT) or at the University of New Brunswick, Saint John, depending on which location is most convenient for participants. Also, on-site babysitting services will be offered to parents who otherwise would be unable to secure alternative caregivers and who, as a result, may not be able to participate in the research.

When clients meet with the intake clinician or the primary researcher, they will be asked to read and sign an informed consent form, indicating their agreement to participate in the research and to be contacted for the follow-up portion of the research within six months. Participants will also be asked to provide contact information for someone who would likely be able to locate them should their contact information change within the next six months.

Upon receiving informed consent, the initial (i.e., Intake) AIS interview will be conducted and the DASS and URICA administered. In the Intake and Time 1 (i.e., follow-up) sessions, the order of the self-report instruments will be randomized to control for order effects (e.g., detailed ASI questions may influence self-report on DASS and URICA, and vice versa). Questionnaires

will be presented to participants in one of six orders: ASI-DASS-URICA, ASI-URICA-DASS, DASS-URICA-ASI, URICA-ASI-DASS, DASS-ASI-URICA, or URICA-DASS-ASI. Participation in this initial phase will take approximately 60 minutes in total. In order to link participants' responses from Time 1 to responses from the Time 2 follow-up session, each participant will be assigned a randomly generated four character identification code. This code will be written on all research materials (i.e., ASI and DASS forms). A master list of clients' names and unique identification code will be kept for data matching purposes (i.e., to ensure participants are assigned the correct ID code during Time 1), but stored separately from all other research materials in a locked cabinet.

Following the completion of Intake data collection, participants will be informed that they will be contacted in six months' time with instructions on how to participate in the final portion of the research. At the end of the Intake session, participants will have the opportunity to complete a ballot for the first of two gift certificate prize draws (see Appendix I). The first prize draw gives participants the opportunity to win one of four grocery store gift certificates valued at \$25 each. Ballots will be stored in a separate file, and will not be attached to their data. One draw will be for the Intake session and a second draw for attendance at Time 1 follow-up session.