Poly substance use and mental health among individuals presenting for substance abuse treatment

Wouter Vanderplasschen
Jessica De Maeyer
Kathy Colpaert
Serge Cogels
Andrea Rea
Geert Dom
Bernard Sabbe
Eric Broekaert

Introduction

1. Background of the study

In Europe as well as in the United States, poly substance use has become the rule rather than the exception. In a society in which a diversity of psychoactive substances are available, it is easy for drug users to experiment with various combinations or to look for other substances that replace their primary drug of choice. Several researchers have demonstrated an increase in poly substance use over the past years. This evolution has also been observed among persons who ask for treatment. Still, experts do not agree on how 'poly substance use' should be exactly defined. In the early seventies, this phenomenon was given a name for the first time. Later, several definitions have been used for this phenomenon. 'Simultaneous' as well as 'consecutive' use of substances can be considered as forms of poly substance use. Therefore, it is of utmost importance to verify how poly substance use is conceptualized. Moreover, some authors suggest to differentiate within the group of poly substance users, e.g. based on the number of substances used or on the specific combination of substances that people use.

Poly substance use, and 'simultaneous' use in particular, may cause aggravated (physical and mental) health consequences. It is assumed that the prevalence of co-morbid psychiatric disorders is higher among poly substance users than among persons who just use one substance. Based on the literature, it further appears that poly substance use may affect treatment retention and effectiveness. Poly substance use makes treatment more difficult and professionals are confronted with a number of problems: poly substance users tend to drop-out early and more often and may show more behavioural problems (e.g., disinhibition, impulsivity and aggressive behaviour) during treatment. The presence of co-occurring substance use problems which are not recognised as such, may also be detrimental for the treatment outcome of the primary substance. Finally, adequate assessment and treatment of persons with so-called 'dual dependence' (alcohol and drugs) brings along new challenges for professionals (Gossop, Marsden & Stewart, 2002).

Given the relative lack of information about the prevalence of poly substance use and the specific characteristics of poly substance users and given the unclear

association between poly substance use and mental health, this study focuses on the prevalence of poly substance use and the profile of poly substance users as compared with problem drug users who (mainly) use one single drug.

2. Objectives of the study

The research objectives are threefold:

- First, we want to map the prevalence of poly substance use and the characteristics of poly substance users in out- and inpatient substance abuse treatment in Belgium;
- Second, we will explore the extent and type of psychiatric complaints and disorders among persons following substance abuse treatment in Belgium and the prevalence and type of DSM Axis I and II-disorders in this population;
- Third, we will compare the characteristics and psychiatric profile of poly substance users with that of persons who only use one substance.

3. Research methodology

In order to realize these research objectives, the study consists of three parts:

1) a literature review
2) quantitative analyses of available databases
3) the presentation and discussion of the main research findings and formulation of recommendations.

The study of the literature will start with an overview of the conceptualization of poly substance use in the international literature. The literature review on poly substance use will focus on the history and origins of this phenomenon: is poly substance use increasing, or is it rather the recognition of how it always was? Furthermore, we will look at the prevalence of poly substance use among alcohol and drug users and at factors and variables associated with it. The second part of the literature study will focus on 'dual diagnosis', more specifically on the link between poly substance use (c.q. abuse or dependence) and psychopathology, and the role of gender in substance use and other psychiatric disorders.

For the quantitative analyses, we will first analyse data from all EuropASI-interviews administered in 2007-2008 in outpatient agencies of De Sleutel (large network of drug treatment services in Flanders) and from the Sentinelle-network (specialized and non-specialized services that help and support drug users) in the region of Charleroi. Based on these analyses, we will study the prevalence of poly substance use and the characteristics of poly substance users. In addition, factors and variables asscoiated with poly substance use will be studied. The data from De Sleutel allow to estimate the prevalence and severity of psychological problems among poly substance users. The Sentinelle-data will be analysed in order to assess changes in poly substance use between 1997 and 2009.

Although the data from De Sleutel and Sentinelle allow to analyse poly substance use and its correlates, information concerning psychological problems is rather weak. Therefore, we plan a secondary analysis of the data from the PhD-study of Kathy Colpaert (2008-2012). This study used the ASI (Addiction Severity Index) to measure the severity of alcohol and drug-related problems, and the MINI and ADP-IV to assess psychiatric disorders (cf. infra). Given the instruments used and the selection of a representative sample of alcohol and drug users treated in psychiatric hospitals, this PhD-study is a reliable source to assess the association between poly substance use and psychopathology. However, since the majority of subjects in this sample are primary alcohol abusers and given the availability of specialized and categorical services for drug users in Belgium (Vanderplasschen, De Bourdeaudhuij & Van Oost, 2002), an extension of the above-mentioned study was planned, applying the same methodology. Using the same assessment instruments, we initially intended to collect data among a sample of 180 persons entering specialised drug treatment in Belgium in three types of treatment services (methadone maintenance, detox and long-term residential treatment) in Flanders and Walloonia. In each service, we aimed to interview 30 persons, resulting in a total of 180 interviews. Eventually, it appeared impossible to recruit this large number of individuals, especially in detox and outpatient treatment, given the short treatment contacts and the long duration of the interview (90-120 minutes).

In order to explore whether poly substance use is an increasing phenomenon or rather a constant observation, we analysed EuropASI-data of residents of therapeutic communities in Flanders from three time-periods (1996-1998; 2000-2002; 2009-2011) regarding the number of poly substance users and the prevalence of psychological problems. These data will provide indications of any substantial shifts in poly substance use during the last 15 years in Flemish therapeutic communities. Finally, a secondary analysis of the 'Minimal Psychiatric Data' (MPG), a common registration tool for all Belgian psychiatric hospitals, was planned. However, given the various methodological constraints (e.g. multiple recorders, poor reliability of diagnoses, no exclusion of double counts) related to this data collection system (Dom, De Groot & Koeck, 2004), we decided to not report MPG-data on poly substance use and mental health.

4. Overview of the report

In part 1, a review of the literature on poly substance use and mental health is presented. After discussing the definition, prevalence and factors associated with poly substance use (*chapter 1*), we assess the assumed association between poly substance use and mental health problems (*chapter 2*).
A specific chapter (*chapter 3*) is dedicated to gender issues in substance abuse and psychopathology. For this chapter, we collaborated with Prof. Edle Ravndal, Centre for Addiction Research (SERAF) at the University of Oslo.

In part 2, we present the results of the analyses of various databases that contain information on the prevalence of substance abuse and/or associated mental health problems in Belgium and evolutions over time. As each database was established and compiled in a different way, the results of these analyses are presented in different chapters.
Chapter 4 focuses on differences in the severity of drug-related problems between persons who used multiple drugs or just one type of drug before entering treatment in one of the outpatient centres of De Sleutel. UNivariate analyses were used to assess significant differences between both groups, in

particular concerning mental health problems. Logistic regression analyses were used to explore possible predictors of poly substance use. Hierarchical cluster analyses were done to investigate the presence of specific clusters of poly substance use.

The Sentinelle-database has been developed since more than 10 years in the region of Charleroi to monitor drug use at treatment entry. An analysis of the evolution of the number of poly substance users, patterns of poly substance use and associated characteristics are presented in *Chapter 5*.

Based on a secondary analysis of data from 11 substance abuse treatment units in psychiatric hospitals in West- and East-Flanders, the association between poly substance use and psychiatric disorders is studied in *Chapter 6*. A logistic regression analysis was performed to identify independent predictors of use of multiple substances during the month preceding treatment entry.

Since the data presented in chapter 6 mainly concern persons with a primary alcohol use disorder, additional data were collected in specialised treatment centres for drug users like methadone treatment centres and therapeutic communities. These data were compiled with the sample mentioned in chapter 6 in order to generate a more varied clinical sample. Results from the analyses of this integrated sample are presented in *chapter 7*.

In *chapter 8*, a longitudinal analysis is presented of the addiction severity profiles of drug users who were treated in drug-free therapeutic communities in Belgium between 1996 and 2011. Three cohorts of TC-residents are compared concerning their drug use and mental health problems.

Part 3 is the concluding chapter in which the findings from the different studies are brought together and are discussed based on the available literature. This leads to conclusions concerning the (evolution of the) prevalence of poly substance use and its hypothesised association with mental health problems. Clear recommendations are presented concerning the conceptualisation of poly substance use, the assessment of drug use and mental health problems and the way poly substance use should be dealt with in treatment.

Throughout this publication, we use the terms ‘substance’ and ‘poly substance’ to refer to legal (e.g. alcohol, prescription drugs) and illegal (e.g. cocaine, cannabis) substances. ‘Use’ may include ‘problem use’, ‘abuse’ or ‘dependence’, but the latter terms are only applied to refer to the corresponding definition as provided by the EMCDDA and the DSM IV. ‘Drug’ and ‘Poly drug’ are used to refer to illegal substances.

Part 1

Review of the literature

Chapter 1

Poly substance use: Conceptualisation and prevalence

Katrien Goossens
Laura Stevens
Kathy Colpaert
Geert Dom
Wouter Vanderplasschen

1.1 Introduction

In Europe as well as in the United States, poly substance use has become the rule rather than the exception. In a society in which a diversity of psycho-active substances is available, it is easy for drug users to experiment with various combinations or to look for other substances that replace their primary drug of choice (Klee, Faugier, Hayes, Boulton & Morris, 1990). The use of both alcohol and drugs and so-called 'dual dependence' that may result from this 'dual use', can be considered a special form of poly substance use (Colpaert, Vanderplasschen, Van Hal & Broekaert, 2008; Gossop, Marsden & Stewart, 2002). Several researchers (Byqvist, 2006) have suggested an increase in poly substance use over the past years. This evolution has also been observed among persons who ask for treatment in drug services (EMCDDA, 2005; SAMHSA, 2005). Fragmented and anecdotal information from service providers in Belgium points into the same direction.

1.1.1 'Poly substance use': A poorly defined concept

It appears to be unusual for illicit drug users to restrict their drug use to one primary drug. Most of the time, substance use is nested in a broader pattern (Martinotti et al., 2009). Yet, substance use disorders remain relatively poorly understood as well as notoriously difficult to treat (McLellan & Meyers, 2004). An issue that may confound our understanding of addictive processes is the tendency for drug users to administer multiple substances. This phenomenon is, since the early seventies (Johnston, 1974), known as poly drug (ab)use or polysubstance (ab)use (Barrett, Darredeau & Pihl, 2006). Since that date, various definitions have been formulated to describe this phenomenon. Throughout this report, we chose the term 'poly substance use/abuse/dependence' respectively, for describing use, abuse and dependence of multiple substances.

Despite high rates of poly substance use, the literature and consensus on this topic is limited (Kedia, Sell & Relyea, 2007). The term poly substance use has been applied to several substance use contexts and definitions (Brecht, Huang, Evans & Hser, 2008). Moreover, experts still do not agree on how 'poly

substance use' should be exactly defined. In many cases, poly substance use is a poorly defined concept (Ives & Ghelani, 2006). There is an inadequacy of current definitions (Schensul, Convey & Burkholder, 2005). Therefore, it is extremely important to verify how poly substance use has been conceptualized. Poly substance use is associated with the progression to regular and problem drug use, including multiple negative consequences. Recent research demonstrates that poly substance use is taking new forms. Consequently, existing approaches for measuring poly substance use may be irrelevant and need to be kept up-to-date (Schensul et al., 2005).

Methodological difficulties

Most drug related research and data monitoring systems tend to focus on the primary substance of abuse and do not provide information about the regular or occasional use of additional substances. Consequently, most research projects and publications have been conceptualised from a substance-specific point of view (Schensul et al., 2005) and do not delineate the specific ways in which drug users typically use substances (Barrett et al., 2006). Furthermore, data on poly substance use are seldom systematically collected and aggregated (Ives & Ghelani, 2006). In fact, knowledge about poly substance use has been drawn from small and convenience-based samples (Grov, Kelly & Parsons, 2009), not necessarily representative for the drug using population. A shortcoming of a substance-specific approach is the possibility that substance users may use more than one substance within any specified time period (Brecht et al., 2008). However, practically it is easier to compare and interpret differences between primary substance use typologies (e.g. opiate vs. cannabis or stimulant users) as opposed to comparing multiple categories representing various combinations of substances, including differences in frequency of use. Therefore, some authors have suggested to make a more precise and comprehensive assessment of substance use than is done in most current studies (Ives & Ghelani, 2006). Focusing on a single primary substance may obscure the overall picture of substance use behavior, if there is considerable poly substance use (Gossop,

2001). Several studies show that multiple dependencies may present a barrier to successful treatment (Williamson , Darke, Ross & Teesson, 2006). Thus, while poly substance use appears to be common among substance abusers, longitudinal patterns and effects of use of multiple substances remain understudied (Brecht et al., 2008). When researchers only focus on the primary drug, they may miss the increased use of other substances. Still, analytic models for research on poly substance use are often complex and results may be difficult to interpret (Brecht et al., 2008).

An attempt to conceptualise 'poly substance use'

The broad definition of 'poly drug use' applied by most Member States is the use of more than one drug or type of drug by an individual, consumed at the same time or sequentially (as defined in the WHO lexicon). In its broadest terms, poly substance use is defined as the use of an illegal drug plus another legal or illegal drug. However, considerable differences exist in the substances included in the definition and in the time frames employed. Differences appear to depend on the survey data available and on the risk perceptions associated with the use of particular substances or combinations. The substances included in the definition are usually the main illegal drugs, alcohol and psychotropic medication. Energy drinks are sometimes included and in France tobacco is included in the definition of poly substance use. The time frames of these definitions range from lifetime use of multiple substances to the recent consumption of multiple substances during a six-hour period (EMCDDA, 2002).

As illustrated above, several studies demonstrate the inadequacy of current definitions of poly substance use, which do not include sufficiently refined measures of time, combination or agency in drug selection, sequencing, use and mediation of effect (Schensul et al., 2005). Most studies of poly substance use define it as the interaction of two or more drugs used during a specified time period ranging from four hours or less (e.g. Boys, Lenton & Norcross, 1997) to 30 days (e.g. Wang et al., 1997), a year (Collins, Ellickson & Bell, 1998), or even longer. In that way, there is a categorization in terms of the time frame in

which the drugs are used. The broadest interpretation refers to the substance user's historical drug use. This should indicate the previous use of other substances, but not necessarily during relatively short, specified observation periods (Brecht et al., 2008).

An alternative application of the term 'poly substance use' indicates the use of other drugs during a specified observation period. This interpretation indicates the use of different drugs over a drug-using career (Ives & Ghelani, 2006). Poly substance users are classified as individuals who actively use more than one drug, though not by definition using them at the same time (Medina & Shear, 2007). This is often labeled as *concurrent poly substance use* (CPU) (Midanik, Tam & Weisern, 2007). A more narrow definition limits poly substance use to simultaneous use of multiple substances (*simultaneous poly substance use*, SPU). The latter term refers to persons who actively combine two or more substances at the same time or in temporal proximity. Synonyms of this term are concomitant use, co-ingestion, … (Barret et al., 2006; Clatts, 2005; Collins et al 1998; Leri, Bruneau & Stewart, 2003, Grant & Harford, 1990). Several reasons have been found for the simultaneous use of multiple drugs, for example, to achieve a unique 'high' or to conform to normative ways of using drugs (Hoffman, Barnes, Welte & Dintcheff, 2000). Poly substance use is often delineated in terms of the effects of mixing drugs on the consumer (Schensul et al., 2005). For example, the combination of drugs may increase or decrease the effects of another drug, or new effects may be generated by the combination of two substances. Reasons for poly substance use can be categorized in four clusters (Finlinson, Colon, Robles & Soto-Lopez, 2006; Leri et al., 2003). First, in some situations drugs are used to counteract the effects of other substances. Second, one drug can be used to compliment the effects of another drug. A third motive could be to enhance one or more drugs' effects. A fourth reason is to extend drug effects and/or generate new ones (Grov et al., 2009).

The terms that describe the combination of various drugs within different time periods are often confusing and inconsistent, involving problems in the definition of time period, number of drugs and the interactive effects of the drugs (Schensul, et al., 2005). For example, the behavior of consuming two or more

drugs at the same time has often been labeled differently. As early as 1974, this phenomenon was referred to as 'multiple' drug use (Simpson & Sells, 1974). Others have cited it as 'simultaneous multiple' drug use in order to refer to mixing and ingesting two or more drugs during a specific period of time (Clayton, 1986). The definitional confusion is also reflected in terms like 'co-occurrence of abuse and dependence' (Heffner, Rosenberg, Rothrock, Kimber-Riggs & Cloud, 1996), 'co-use' (Forsyth, 1996) or 'combinational use' (Hoffman et al., 2000), as either happening at regular intervals or over a designated time period, including lifetime use. Finally, when co-occurrence is labeled as a specific time bound event, such as a party or concert, the use of multiple drugs overlaps and often results in synergistic effects (Boys et al., 1997).

Since defining poly substance use as using multiple drugs over a period of time is no longer sufficient to capture the timing, the interactive effects and various combinations need to be taken into account when studying poly substance use (Schensul et al., 2005). Some studies have assessed concurrent use as opposed to simultaneous use within clinical samples (Earleywine & Newcomb, 1997), as well as in general population samples (Barnwell & Earleywine, 2006; Collins et al., 1998; Barrett et al., 2006). Though the classification 'simultaneuous – concurrent' has been used in many studies, definitions reflecting different time periods are most of the time confusing and inconsistent (Schensul et al., 2005). Consequently, poly substance use is often labeled and defined differently. Accurate research is needed to indentify new patterns of poly substance use and to capture and predict variations in this behavior and its consequences.

1.1.2 Prevalence and associated factors

Research on poly substance use remains a challenge, both at conceptual and practical level. From a conceptual point of view, poly substance use encompasses wide variations in user populations and patterns of use. As cited above, defining poly substance use related to periods of time leads to inconsistency and confusing labels. Moreover, it is difficult to agree about one

single definition of poly substance use. Another difficulty is the question whether to focus on 'poly substance use', 'poly substance abuse' or 'poly substance dependence'? In addition, different settings can be used for research, etc.

Consensus and transparency on these questions and issues is necessary to develop standardized measures. Moreover, reported aggregated national data are mostly substance-specific. Differences could also occur due to different data collection methods, sample sizes and the way questions are asked. Consequently, understanding poly substance use requires a focus on the use of a range of drugs by the individual. These difficulties explain why it is hard to provide an overview of figures of poly substance users. Comparing different studies is not evident and remains a tough challenge. Still, we have attempted, in correspondence with a recent EMCDDA-report (EMCDDA, 2009), to give an overview of poly substance use among three different populations: adolescents (aged 15-16 years), young adults (aged 16 to 35) and drug users entering treatment. These three populations seem to differ apparently in patterns and consequences of poly substance use.

Poly substance use among adolescents

Since the 1990s, the use of alcohol, cigarettes, cannabis and other psychoactive substances has steadily increased among adolescents (EMCDDA, 2008). Several school-based surveys demonstrate a high prevalence of alcohol use and cigarette smoking. Illicit drugs are used to a lesser extent. The most commonly used illicit drug is cannabis (EMCDDA, 2009). Frequent and problem drug use remains usually limited (except for tobacco) in this age group. As the use of psychoactive substances is a risk factor for the developing brain and other organs, monitoring adolescent drug use and targeted prevention are essential.

In the EMCDDA study of 2009, a definition of poly substance use among adolescents is applied as the recent use of at least two different psychoactive substances. Based on a study among 70 000 students (15-16 years) from 22 European countries, the use of more than one illicit drug during the last month

preceding the survey seldom exceeded 1% of the school population (EMCDDA, 2002; Hibell et al., 2004). Moreover, adolescents state to use drugs mostly during short periods of time or at specific events, such as parties, clubs or festivals (Collins et al., 1998).

Types of poly substance use and associated factors

Although poly substance use is not the norm among students in the ESPAD study (Hibell et al., 2004), around 30% of the 15- to 16-year-old students reported to have consumed two or more legal/illegal substances during the last month. Based on the prevalence levels of drug use during the last month, the 22 countries in the ESPAD-study were divided into three distinct groups. The proportion of poly substance users was nearly 40% in the high-prevalence country group, 36% in the medium prevalence country group and 22.5% in the low-prevalence group. More than 90 different combinations of poly substance use were revealed. These differences depend on varying lifestyles and drug markets, but still three types of poly substance users could be distinguished (Hibell et al., 2004):

- A type – alcohol and cigarettes
- B type – cannabis together with alcohol and/or cigarettes
- C type – cannabis together with alcohol and/or cigarettes and at least one of the following: cocaine, LSD, heroin, ecstasy or amphetamines.

It is remarkable that almost three-quarters of all last month poly substance users did not mention the use of illicit drugs. Only 3.5% of the respondents reported the use of ecstasy, cocaine, amphetamines or LSD. About one-fifth mentioned the use of cannabis and alcohol and/or cigarettes. In addition, interesting gender differences were revealed. While the combination of alcohol and cigarettes during the last month was a little bit higher among girls, boys were overrepresented among the C-type of poly substance use. Social indicators, such as lack of parental control, truancy from school and perceived family affluence,

were consistently associated with type C-poly substance use in all participating countries.

Poly substance use among young adults (16-35 years)

Several surveys have shown that alcohol use and cigarette smoking, followed by cannabis use, were the most prevalent forms of substance use reported by young adults between 2005 and 2008 (EMCDDA, 2009). Alghough wide variations can be observed between countries, the prevalence of cannabis use in the last year ranged from 3.6% to 20.9% and last year cocaine use ranged from 0.9% to 5.1%. It is remarkable that heavy alcohol drinking can be linked with more cannabis and cocaine consumption. This association was strongest in countries with the lowest prevalence of alcohol use. Another striking finding is that young adults who reported using cocaine in the last year, also used other illicit drugs during the same period (EMCDDA, 2009).

Poly substance use in recreational settings

Many young people are exposed to the dynamic and flourishing drug market, where we regularly observe new drugs and trends, but also an increasing availability of cannabis, cocaine and other stimulant drugs. Prices and availability are clearly associated with consumption rates. In the context of recreational settings, surveys have demonstrated that drug use is more prevalent among visitors of bars, clubs and festivals (EMCDDA, 2009; Van Havere et al., 2011). Moreover, prevalence of poly substance use appears to be higher among young people in dance clubs than among young people in other settings. Club drug users may be more likely to experiment with poly substance use (Lankenau & Clatts, 2002). Poly substance use in clubs may be more common among younger adults (aged 18-29 years), and particularly concerns the use of alcohol, cannabis and stimulating drugs (Kelly, Parsons & Wells, 2006). It may not surprise that leading researchers (Calafat, Fernandez & Juan, 2003; Bellis,

Hughes & Lowley, 2002) have stated that a critical multitude of potential poly substance users has obviously appeared in clubs and other recreational settings.

Studies conducted in recreational settings in Belgium, the Czech Republic, Latvia, Lithuania and Austria revealed that the lifetime prevalence of ecstasy use ranged from 15% to 71% and from 17% to 68% for the use of amphetamines (EMCDDA, 2009). Geographical differences are clearly apparent between countries. Tobacco, cannabis and alcohol were most often used on a regular basis (five or more days a week) and concomitant alcohol and other drug use was commonplace. There is some evidence that the prevalence of recreational poly substance use is higher among males and regular users of cannabis than it is among females and cannabis experimenters (EMCDDA, 2002).

A study of over 2000 people in Flanders in three clubs between 2003 and 2007, found that almost half of those who reported the use of an illicit drug during the last year stated that they regularly combined alcohol and an illicit drug (EMCDDA, 2009). Moreover, one in four drug users regularly combined various illicit drugs. Cannabis and cocaine were reported to be used before as well as after going out. Another Belgian study, in the French Community, surveyed 2444 persons during music festivals in 2007. It was demonstrated that 68% of the attendants used at least one psychoactive substance (tobacco not included) during the festival, 18% used two substances, while 12% used three or more substances during the event. The most common combination among those who had used alcohol and drugs during the festival (n=1649), was alcohol and cannabis (19%). Ecstasy users used on average at least three other products (n=165), while cocaine users consumed on average four other substances (n=86).

Nearly all young adults (aged 18-29 years) involved in the New York City dance club scenes (91.7%) indicated they had previously combined at least one club drug with another substance. Patterns of poly substance use closely mirrored the prevalence of club drug use: ecstasy and cocaine were the most common drugs participants had ever used and were the drugs respondents had mixed with other substances. In particular, participants frequently stated mixing cocaine with alcohol and marijuana (Grov et al., 2009).

It should be noticed that poly substance use in recreational settings is often time-limited and linked to particular social events or situations or to specific stages of life. Several authors have, for example, demonstrated higher frequencies of drug use during holiday periods, or even increased incidence of illicit drug use on holidays. Finally, the proportion of people who adopt 'heavy' patterns of poly substance use in recreational settings is associated with repeated exposure to drug availability and positive images of drug combinations among peers (Bellis, Hale, Bennett, Chaudry & Kilfoyle, 2000, EMCDDA, 2009).

Poly substance use among persons entering treatment

Considerable poly substance use has been reported among substance abusers in treatment (e.g. Booth, Leukefeld, Falck, Wang & Carlson, 2006; Byqvist, 2006; Darke, Ross & Teesson, 2007; Gossop et al. 2002. Leri et al., 2003; Martin et al., 1996a, Martin, Kaczynski, Maisto & Tarter, 1996b). Poly substance use may be more prevalent than in the past due to changing cultural norms and increased drug availability (Byqvist, 1999). The European information system on characteristics of drug treatment service users (the Treatment Demand Indicator (TDI) protocol), allows to register up to four substances per person, starting with primary and any subsequent substances. EMCDDA-data reveal that most clients in drug treatment services use a secondary drug in combination with their primary drug (83.2%) (EMCDDA, 2002). A more recent study in 14 European countries demonstrated that more than half of the clients (57%) who entered drug treatment in 2006 (n=262 477) reported at least one problematic drug in addition to the primary substance for which they had entered treatment: 33% of all clients reported one secondary drug, 20% reported two additional substances and 3% reported three or more problem substances (EMCDDA, 2009). Despite variations between countries, most countries report an increase in poly substance use (EMCDDA, 2002, EMCDDA, 2009). Also, other studies report, depending on the definition used, poly substance use rates of one third to over half of all treatment seeking individuals (Gossop, Marsden, Stewart & Kidd, 2003; Grella, Anglin & Wugalter, 1995, 1997; Leri et al., 2005; SAMHSA, 2007).

Patterns of poly substance use

Patterns of use obviously differ between countries and sexes. For example, in Spain and the Netherlands, where the proportion of cocaine as primary substance of abuse is considerably higher as compared with other EU-countries, cocaine also frequently appears as secondary substance in combination with heroin or stimulant drugs (EMCDDA, 2009). Therefore, patterns of poly substance use can hardly be compared throughout the EU. However, it is remarkable that a higher proportion of clients entering drug treatment for the first time abuse multiple substances as compared with clients re-entering treatment. This may suggest a recent increase in multiple substance use among problem drug users who are not (yet) in treatment (EMCDDA, 2009).

The 'Drug and Alcohol Services Information System' (DASIS) Report of 2005 reveals that of all treatment admissions in 2002, more than half of the clients (56%) misused more than one substance (SAMHSA, 2007). Among those poly substance admissions, alcohol was the most common substance reported (76%). Marijuana was the second most commonly reported substance (55%). On the other hand, in the EMCDDA-registration – which does not include alcohol treatment centers – the lowest proportion of poly substance use was recorded among primary cannabis users (EMCDDA, 2009). Moreover, while the DASIS Report (2005) noted that cocaine (48%), opiates (27%) and other substances (26%) were reported less frequently, the EMCDDA-publication (2009) showed that users of cocaine and other stimulant drugs have the highest proportion of poly substance use. The most common patterns of problem poly substance use are: a) heroin combined with other opiates (for instance illegal methadone) b) heroin combined with cannabis, cocaine, alcohol or stimulants c) cocaine used with alcohol or stimulants (EMCDDA, 2002).

Primary heroin users use an average of 5.2 other classes of substances in the six months prior to treatment admission (Darke & Hall, 1995). Moreover, concomitant use of opiates and stimulants (including cocaine) has been documented widely, but patterns of and reasons for cocaine use are poorly understood. There is evidence that cocaine is combined with opioid drugs in

various ways for different reasons. For example, some users inject the two drugs simultaneously as a speedball to experience the effects of both drugs at the same time. Others mix those substances to reduce heroin use and to eliminate the physical dependence on opiates (Leri, et al., 2002). Interestingly, such drug combinations do not appear to be confined to specific regions, since stimulant use in opioid dependent individuals has been reported in various countries including the United States (Schottenfeld, Pakes, Ziedonis & Kosten, 1993; Hartel et al, 1995), Switzerland (Hausser, Kubler & Dubois-Arber, 1999), Canada (Lauzon et al., 1994), Spain (Perez et al., 1997), Italy (Guadagnino et al., 1995) and Australia (Kaye & Darke, 2000). This observation was also illustrated among a sample of 116 opiate addicts attending treatment in South London: in the month preceding the interview, 90% reported heroin use, while 60% used (crack) cocaine and 58% used alcohol (Beswick et al., 2001). During the same period, 70% of all clients reported simultaneous use, particularly of heroin and cocaine. High rates of cocaine use have also been observed in individuals in methadone maintenance treatment, at entry as well as at follow-up (Hartel et al., 1995; Perez et al., 1997). Grella and colleagues (1997) reported that 50% of all heroin users used cocaine before and during methadone treatment. Also, cocaine was present in 63% of the urine samples collected from a group of methadone maintained individuals over a six year period (Black, Dolan, Penk, Robinowitz & Deford, 1987). However, it should be noted that the use of cocaine by opiate dependent persons is by no means the only type of poly substance use observed in this population. The use of alcohol, marijuana, benzodiazepines, caffeine and tobacco is likewise omnipresent and equally interesting (Gossop et al., 2002; Staines, Magura, Foote, Deluca & Kosanke, 2002).

Combination of alcohol and illicit drugs

Among the many possible poly substance use combinations, the use of alcohol and illicit substances is the most common pattern (Earleywine & Newcomb, 1997). A high comorbidity is observed between alcohol and drug-related disorders. A significant increase in the combined use of alcohol and illicit drugs

has occurred over the past 40 years. Few studies have focused on the prevalence of the specific combination of alcohol and drugs (Colpaert et al., 2008). Most research on concurrent use of substances is based on clinical samples of clients who enter treatment with the belief that they only use alcohol or one specific substance (Brown, Vik, Patterson, Grant & Schuckit, 1995). However, 54% of a sample of clients admitted to alcohol detoxification centers had urine samples indicating the use of alcohol and at least one illicit drug (Ogborne, Kapur & Newton-Taylor, 1992). More and more, poly substance use has become the rule for clients entering alcohol and drug treatment (Brown et al., 1995 Gossop et al., 2002).

Wide variations in drinking patterns can be observed among drug misusers. In a sample of 735 people seeking treatment for drug misuse problems, about two-thirds reported heavy drinking (Gossop et al.., 2002). Similarly, other studies have demonstrated high rates of high-risk drinking and alcohol dependence among persons in drug treatment (Gossop, Marsden, Stewart & Rolfe, 2000; Miller, Klamen, Hoffmann & Flaherty, 1996), especially in methadone treatment programs (Best et al., 1998; Hillebrand, Marsden, Finch & Strang, 2001). The use of three or more substances concurrently, and sometimes simultaneously, is commonplace among clients in drug treatment programs. Martin and colleagues (1996a) reported that 61% of all individuals in drug treatment used two or more drugs simultaneously in the past 120 days. Similarly, about 17% of adolescents treated for alcohol use disorders combined alcohol with two or more illicit substances in the past year (Martin et al., 1996b). Similar findings were reported by Staines and colleagues (2001): 68% of 248 clients starting treatment for alcohol problems had also used illicit drugs (predominantly heroin, cocaine and cannabis) in the 90 days preceding the start of treatment.

The afore-mentioned results are in line with the findings from a Belgian study that showed that more than a quarter of a sample of 1626 individuals seeking substance abuse treatment were using alcohol as well as illicit drugs. The characteristics of the latter group corresponded better to those of drug users than to those of alcohol users (Colpaert et al., 2008). A large majority of treatment demanders regularly used more than one substance during the three months

preceding treatment intake (cf. Conway, Kane, Ball, Poling & Rounsaville, 2003; Gossop et al., 1998). Almost half of all illicit drug users (47.3%) misused alcohol regularly (more than five glasses of alcohol during ≥ three days/week). These findings correspond with the results of the Swedish Drug Abuse Treatment Evaluation (SWEDATE)-study, in which 55% of the respondents misused alcohol in addition to illicit substances (Byqvist, 1999). Gossop and colleagues (2002) demonstrated that more than one third of all clients in drug treatment were also dependent on alcohol, based on the National Treatment Outcome Research Study (NTORS) in England (Gossop et al., 2000). We can conclude that alcohol plays an important role in all substance use patterns (Byqvist, 1999).
Alcohol-dependent individuals tend to be less frequent users of heroin and crack cocaine, but use more frequently cocaine powder, amphetamines and non-prescribed benzodiazepines (Lehman & Simpson, 1990; Gossop et al., 2000). Also, Marsden and colleagues (1998) showed that severely dependent drinkers use crack cocaine less frequently, but use more frequently cocaine powder, illustrating that crack cocaine and cocaine powder differ in patterns of use, profile and type of problems (Gossop, Griffiths, Powis & Strang, 1994, Grella et al., 1995, Marsden et al., 1998). Finally, the NTORS-study revealed that the most problematic drug misusers showed clearer patterns of poly substance use. Also, poly drug use and heavy drinking were more common among service users admitted to residential treatment (Gossop et al., 1998).

Socio-demographic characteristics of poly substance users

Although differences in substance use patterns may affect treatment outcomes, studies that have compared the characteristics of clients entering treatment with and without poly substance use problems are limited (Chaleby, 1996; Finkbiner & Wisdom, 2000).
Poly substance users in treatment are mostly men, especially those who use heroin in combination with cocaine and opiates or alcohol. A remarkably higher proportion of women is found among clients who using stimulants and cannabis, or stimulants and other substances (hypnotics, sedatives, volatiles, …).

Poly substance use is also associated with age. Persons who use cannabis as a second substance are mainly between 15 and 24 years. Users of opiates and cocaine are usually older (20-39 years). On the other hand, users of heroin and crack were significantly younger, had more psychological distress, more frequent heroin use and shorter lengths of stay in treatment (Beswick et al., 2001). Crack cocaine is the main drug used by female treatment seekers to supplement heroin.
In a previous EMCDDA-report on poly substance use (2002), four patterns of poly substance use have been distinguished:

- Older clients, mainly men, using opiates as main drug in combination with other opiates or cannabis;
- Younger clients, both males and females, using cannabis and stimulants combined with alcohol or other substances (for example psychedelic drugs);
- Males, under 30, using cocaine combined with alcohol and other stimulants;
- Males, 20 to 39 years, using heroin and cocaine.

Abusers of both alcohol and illicit drugs show more similarities with drug abusers than with alcohol abusers. When compared with alcohol abusers, so-called 'dual abusers' are significantly younger, more often male and more often unemployed and homeless (Colpaert et al., 2008; Finkbiner & Wisdom, 2000; Gossop et al., 2001; Rhee et al., 2006; Tam, Weisner & Mertens, 2000). Also, Beswick and colleagues (2001) found that alcohol use was lower among women, while women were also significantly less likely to use benzodiazepines in combination with heroin than men. 'Dual abusers' have more often a treatment history.
All these indicators point at more severe substance use disorders, more drug-related problems due and a greater need for treatment among poly substance users (Colpaert et al., 2008; Finkbiner & Wisdom, 2000; Stinson et al., 2005).

1.2 Discussion

The object of our study 'poly substance use' is referred to in the literature with different terms like 'concurrent' or 'simultaneous' use, 'multiple substance use', 'poly drug use', 'poly substance use', 'poly substance dependence', 'poly substance abuse', etc. When differentiating between individuals using a single substance and individuals using multiple drugs, one should be clear about what is meant with 'poly substance use'. This term can refer to being dependent on several substances, while alternatively, it can mean the use or abuse of multiple substances. Moreover, poly substance use can reflect the concurrent use of various substances during one day or can alternatively refer to the simultaneous use of two or more substances. Clarity about the conceptualisation of 'poly substance use' is required, since psychiatric disorders are generally more strongly associated with substance dependence than with substance abuse (Grant et al., 2006). However, only few studies provide clear information about this important distinction. Also, simultaneous use (or the use of alcohol and other drugs at the same time) may have substantial and unpredictable additive or interactive effects (Norton & Colliver, 1988), as opposed to concurrent use for which interacton effects are limited. It has been demonstrated that the synergistic interaction of multiple substances can enhance potential negative consequences (Leri et al., 2003).

Second, most studies on dual diagnosis focus on the primary substance of abuse, a typical approach to categorise substance users for epidemiological purposes. However, this categorisation can obscure the overall picture of substance use, if there is considerable poly substance use. Moreover, as demonstrated by Griffin and colleagues (2009), identifying the 'principal' or 'primary' substance is not always straightforward, since it can be defined and assessed in various ways. The heterogeneity in definitions and assessment methods related to the primary substance can elicit diverging responses. Asking an individual about his 'major problem' may yields another primary substance than asking about his 'primary substance'. Similarly, measuring the substance that is most frequently used yields another answer than the question for the 'major problem'. Most studies

even differ in the terms used to describe the primary substance, such as ‘preferred drug’ (Winters, Stinchfield, Opland, Weller & Latimer, 2000), ‘primary drug’ (Lejuez, Bornovalova, Daughters & Curtin, 2005; Pirard, Sharon, Kang, Angarita & Gastfriend, 2005), ‘drug of choice’ (e.g., Conway et al., 2003; Sumnall, Wagstaff & Cole, 2004), ‘principal substance’, or ‘primary substance problem’ (e.g., Blanchard, Morgenstern, Morgan & Labouvie, 2003). As argued by Griffin and colleagues (2009), these terms reflect a variety of operational definitions of the principal substance and can refer to the drug most frequently used (Lejuez et al., 2005; Winters et al., 2000), the drug that elicited the current treatment episode (Lawrinson, Copeland & Indig, 2005) or the severity of drug use.

Instruments used to determine the primary substance include standardised measurements such as the Addiction Severity Index (ASI: McLellan et al., 1992), the Severity of Dependence Scale (Gossop et al., 1995) and the Structured Clinical Interview for DSM-IV (SCID: First, Spitzer, Gibbon & Williams, 1996). However, in a substantial number of studies the method used to determine the primariy substance is not clearly specified.

A third potential source of inconsistent findings is related to differences in sample composition. When the prevalence of psychiatric disorders is compared between poly and single substance users, the latter group consists of ‘pure’ alcoholics in the majority of studies (Landheim, Bakken & Vaglum, 2003; Tomasson & Vaglum, 1995), whereas other studies have included a more heterogeneous sample of illicit drug users (Martinotti et al., 2009). These differences in sample composition can elicit heterogeneous findings, since the magnitude of psychiatric comorbidity is generally greater for drug use than for alcohol use disorders (Merikangas et al., 1998). This might explain why Martinotti and colleagues (2009) have found a lower prevalence of psychiatric disorders among poly substance users, as opposed to most studies that have reported a higher prevalence of psychiatric disorders among poly substance users.

Forth, it is important to note that differences in the prevalence of psychiatric disorders between studies might be due to variations in the setting where participants have been recruited, e.g. drug-free programs, inpatient psychiatric services, inpatient detoxification units or outpatient services. It is reasonable to assume that estimates of comorbidity will be inflated when respondents are recruited from treatment services as opposed to the general population, since the presence of substance use or other psychiatric disorders increases the likelihood that individuals will address treatment services. Consequently, most estimates of comorbidity are probably an overestimation due to sampling bias (Mueser, Drake & Wallach, 1998).

Finally, authors should be clear about the spectrum of psychiatric disorders that have been assessed. If not, differences in the prevalence of psychiatric disorders between studies may be a result of the spectrum of disorders examined. Whereas some studies have investigate the whole spectrum of Axis I and II disorders, other authors have only included mood and anxiety disorders. Such choices may eventually lead to substantial differences in prevalence rates.

REFERENCES

Barnwell, S.S., & Earleywine, M. (2006). Simultaneous alcohol and cannabis expectancies predict simultaneous use. *Substance Abuse Treatment, Prevention and Policy, 1*, 1-29.

Barret, S.P., Darredeau, C., & Pihl, R.O. (2006). Patterns of simultaneous polysubstance use in drug-using university students. *Human Psychopharmacology: Clinical and Experimental, 21*, 255-263.

Bellis, M., Hughes, K., & Lowley, H. (2002). Health nightclubs and recreational substance use: from a harm minimization to a healthy settings approach. *Addictive Behaviours, 27*, 1025-1035.

Bellis, M.A., Hale, G., Bennett, A., Chaudry, M., & Kilfoyle, M. (2000). Ibiza uncovered: changes in substance use and sexual behaviour amongst young people visiting an international nightlife resort. *International Journal of Drug Policy, 11*, 235-244.

Best, D., Lehmann, P., Gossop, M., Harris, J., Noble, A., & Strang, J. (1998). Eating too little, smoking and drinking too much: Wider lifestyle problems among methadone maintenance patients. *Addiction Research, 6*(6), 489-498.

Beswick, T., Best, D., Rees, S., Coomber, R., Gossop, M., & Strang, J., (2001). Multiple drug use: patterns and practices of heroin and crack use in a population of opiate addicts in treatment. *Drug and Alcohol Review, 20*, 201-204.

Black, J.L., Dolan, M.P., Penk, W.E., Robinowitz, R., & Deford, H.A. (1987). The effect of increased cocaine use on drug treatment. *Addictive Behaviours, 12*, 289-292.

Blanchard, K.A., Morgenstern, J., Morgan, T.J., & Labouvie, E.W.. (2003). Assessing consequences of substance use: Psychometric properties of the Inventory of Drug Use Consequences. *Psychology of Addictive Behaviors, 17*, 328–331.

Booth, B., Leukefeld, C., Falck, R., Wang, J., & Carlson, R. (2006). Correlates of rural methamphetamine and cocaine users: results from a multistate community study. *Journal on Studying Alcohol, 67*, 493-501.

Boys, A., Lenton, S., & Norcross, K. (1997). Poly substance use at raves by a Western Australian sample. *Drug and Alcohol review, 16*(3), 227-234.

Brecht, M.L., Huang, D., Evans, E., & Hser, Y.I. (2008). Poly substance use and implications for longitudinal research: Ten-year trajectories for heroin, cocaine, and methamphetamine users. *Drug and Alcohol Dependence, 96*, 193-201.

Byqvist, S. (1999). Polydrug misuse patterns in Sweden: gender differences. *Journal of Substance Use and Misuse, 34*(2), 195-216.

Byqvist, S. (2006). Patterns of drug use among drug misusers in Sweden gender differences. *Substance Use & Misuse, 41*, 1817-1835.

Calafat, A., Fernandez, C., & Juan, M. (2003). *Enjoying the nightlife in Europe: the role of moderation*. IREFREA, Palma de Mallorca.

Chaleby, K. (1996). A comparative study of alcoholics and drug addicts in an Arabian Gulf country. *Social Psychiatry, 21*, 49-51.

Clatts, M.C. (2005). Patterns of poly substance use among ketamine injectors in New York City. *Substance Use & Misuse, 40*, 1381-1397.

Clayton, R.R. (1986). Multiple drug use. Epidemiology, correlates, and consequences. *Recent Developments in Alcoholism, 4*, 7-38.

Collins, R.L., Ellickson, P.L., & Bell, R.M. (1998). Simultaneous poly substance use among teens: prevalence and predictors. *Journal of Substance Abuse, 10*, 233-253.

Colpaert, K., Vanderplasschen, W., Van Hal, G., Broekaert, E., & Schuyten, G. (2008). Dual substance abusers seeking treatment: demographic, substance-related. *Journal of Drug Issues, 38*(2), 559-584.

Conway, K.P., Kane, R.J., Ball, S.A., Poling, J.C., & Rounsaville, B.J. (2003). Personality, substance of choice and polysubstance involvement among substance dependent patients. *Drug and Alcohol Dependence,71*, 65-75.

Darke, S., & Hall, W. (1995). Levels and correlates of poly substance use among heroin users and regular amphetamine users. *Drug and Alcohol Dependence, 39*, 231-235.

Darke, S., Ross, J., & Teesson, M. (2007). The Australian Treatment Outcome Study ATOS: what have we learnt about treatment for heroin dependence? *Drug & Alcohol Review, 26*, 49-54.

Earleywine, M., & Newcomb, M. (1997). Concurrent versus simultaneous poly substance use: Prevalence, correlates, discriminant validity, and prospective effects on health outcomes. *Experimental and Clinical Psychopharmacology*, *5*, 353-364.7

EMCDDA (2002). Polydrug use (EMCDDA 2002 selected issue). In: *EMCDDA 2002 Annual report on the state of the drugs problem in the European Union and Norway*. Luxembourg: Publications Offices of the Union.

EMCDDA (2005). *Annual Report 2005: the state of the drugs problem in Europe*. Luxembourg: Publications Offices of the Union.

EMCDDA (2008). *Annual Report 2008: the state of the drugs problem in Europe*. Luxembourg: Publications Offices of the Union.

EMCDDA (2009). *Selected Issue: Poly substance use: patterns and responses*. Luxembourg: Publications Offices of the Union.

ESPAD (2000). *The 1999 ESPAD report: Alcohol and other drug use among students in 30 European countries*. Stockholm: Swedish Council for Information on Alcohol and Other Drugs (CAN) & the Pompidou Group of the Council of Europe.

Finkbiner, R.G., & Wisdom, G.A. (2000). Clients in treatment for alcohol problems: Treatment experiences and outcomes. *Journal of Psychopathology and Behavioral Assessment, 22*(4), 365-382.

First, M.B., Spitzer, R.L., Gibbon, M., & Williams, J.B.W. (1996). *Structured Clinical Interview for DSM-IV Axis I Disorders, Clinical Version, (SCID-CV)*. Washington, DC: American Psychiatric Press, Inc..

Finlinson, H.A., Colón, H.M., Robles, R.R., & Soto-López, M. (2006). An exploratory qualitative study of poly substance use histories among recently initiated injection drug users in San Juan, Puerto Rico. *Substance Use & Misuse, 41*, 915-935.

Forsyth, A.J. (1996). Places and patterns of drug use in the Scottish dance scene. *Addiction, 91*(4), 511-521.

Gossop, M. (2001). A web of dependence. *Addiction, 96*, 677-678.

Gossop, M., Darke, S., Griffiths, P., Hando, J., Powis, B., Hall, W. & Strang, J. (1995). The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction*, *90*(5), 607-614.

Gossop, M., Griffiths, P., Powis, B., & Strang, J. (1994) Cocaine: patterns of use, route of administration, and severity of dependence. *British Journal of Psychiatry*, *164*, 101– 104.

Gossop, M., Marsden, M., & Stewart, D. (2002). Dual dependence: assessment of dependence upon alcohol and illicit drugs, and the relationship of alcohol dependence among drug misusers to patterns of drinking, illicit drug use and health problems. *Addiction*, *97*, 169-178.

Gossop, M., Marsden, J., Stewart, D., & Kidd, T. (2003). The National treatment outcome research study NTORS: 4-5 year follow-up results. *Addiction*, *98*, 291-303.

Gossop, M., Marsden, J., Stewart, D., Lehmann, P., Edwards, C., Wilson, A., & Segar, G. (1998) Substance use, health and social problems of clients at 54 drug treatment agencies: intake data from the National Treatment Outcome Research Study (NTORS). *British Journal of Psychiatry*, *173*, 166–171.

Gossop, M., Marsden, J., Stewart, D., & Rolfe, A., (2000). Patterns of drinking and drinking outcomes among drug misusers 1-year follow-up results. *Journal of Substance Abuse Treatment*, *19*, 45-50.

Gossop, M., Stephens, S., Stewart, D., Marshall, J., Bearn, J., & Strang, J., (2001). Health care professionals referred for treatment. *Alcohol & Alcoholism*, *36*(2), 160-164.

Grant, B.F., & Harford, T.C. (1990). Concurrent and simultaneous use of alcohol with sedatives and tranquilizers: Results of a nation survey. *Journal of Substance Abuse*, *2*, 1-14.

Grant, B.F., Hasin, D.S., Stinson, F.S., et al. (2006). The epidemiology of DSM-IV panic disorder and agoraphobia in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*, *67*(3), 363–374.

Grella, C.E., Anglin, M.D., & Wugalter, S.E. (1997). Patterns and predictors of cocaine and crack use by clients in standard and enhanced methadone maintenance treatment. *American Journal on Drug and Alcohol Abuse*, *23*, 15-42.

Grella, C.E., Anglin, M.D., & Wugalter, S.E. (1995) Cocaine and crack use and HIV risk behaviours high risk methadone maintenance clients. *Drug and Alcohol Dependence*, *37*, 15–21.

Griffin, M.L., Kolodziej, M.E. & Weiss, R.D. (2009). Measuring principal substance of abuse in comorbid patients for clinical research. *Addictive Behaviors*, *34*(10), 826-829.

Grov, C., Kelly B.C., & Parsons, J.T. (2009). Poly substance use among club-going young adults recruited through time-space sampling. *Substance Use & Misuse*, *44*(6), 848-864.

Guadagnino, V., Zimatore, G., Izzi, A., Caroleo, B., Rocca, A., Montesano, F., ... D'Amelio, R. (1995). Relevance of intravenous cocaine use in relation to prevalence of HIV, hepatitis B and C virus markers among intravenous drug

abusers in southern Italy. *Journal of Clinical Laboratory Immunology*, *47*, 1-9.

Hartel, D.M., Schoenbaum, E.E., Selwyn, P.A., Kline, J., Davenney, K., Klein, R.S., & Friedland, G.H. (1995). Heroin use during methadone maintenance treatment: the importance of methadone dose and cocaine use. *American Journal of Public Health*, *85*, 83-88.

Hausser, D., Kubler, D., & Dubois-Arber, F. (1999). Characteristics of heroin and cocaine users unknown to treatment agencies. Results from the Swiss Hidden Population Study. *Sozia-und Präventivmed*, *44*, 222-232.

Heffner, K.P., Rosenberg, H., Rothrock, N., Kimber-Riggs, K., & Gloud, C. (1996). Recreational drug use concurrent with abuse or dependence on other psychoactive substances. *Journal of Substance Abuse Treatment*, *13*(6), 499-504.

Hibell, B., Andersson, B., Bjarnason, T., Ahlström, S., Balakireva, O., Kokkevi, A., & Morgan, M. (2004). *The ESPAD Report 2003. Alcohol and Other Drug Use Among Students in 35 European Countries*. Stockholm: The Swedish Council for Information on Alcohol and Other Drugs (CAN) and the Pompidou Group at the Council of Europe.

Hillebrand, J., Marsden, J., Finch, E., & Strang, J. (2001). Excessive alcohol consumption and drinking expectations among clients in methadone maintenance. *Journal of Substance Abuse Treatment*, *21*, 155-160.

Hoffman, J.H., Barnes, G.M., Welte, J.W., & Dintcheff, B.A. (2000). Trends in combinational use of alcohol and illicit drugs among minority adolescents, 1983-1994. *American Journal of Drug and Alcohol Abuse*, *26*(2), 311-324.

Ives, R., & Ghelani, P. (2006). Poly substance use (the use of drugs in combination): A brief review. *Drugs: Education, Prevention and Policy*, *13*(3), 225-232.

Johnston, L.D. (1974). Drug use during and after high school: results of a national longitudinal study. *American Journal of Public Health*, *64*(12), 29-37.

Kaye, S., & Darke, S. (2000). A comparison of the harms associated with the injection of heroin and amphetamines. *Drug and Alcohol Dependence*, *58*, 189-195.

Kedia, S., Sell, M.A. & Relyea, G. (2007). Mono- versus polydrug abuse patterns among publicly funded clients. *Substance Abuse Treatment, Prevention, and Policy*, *2*, 33.

Kelly, B.C., Parsons, J.T., & Wells, B.E. (2006). Prevalence and predictors of club drug use among club-going young adults in New York City. *Journal of Urban Health*, *83*, 884-895.

Klee, H., Faugier, J., Hayes, C., Boulton, T., & Morris, J. (1990). AIDS-related risk behaviour poly substance use and temazepam. *British Journal of Addiction*, *85*, 1125-1132.

Landheim, A.S., Bakken, K., & Vaglum, P. (2003). Gender differences in the prevalence of symptom disorders and personality disorders among poly-substance abusers and pure alcoholics. *European Addiction Research*, *9*, 8–17.

Lankenau, S.E., & Clatts, M.C. (2002). Ketamine injection among high-risk youth: preliminary findings from New-York. *Journal of Drug Issues*, *32*, 893-905.

Lehman, W.E.R., & Simpson, D.D. (1990). Alcohol use. In: Simpson, D.D. & Sells, S.B. (Eds), *Opioid Addiction and Treatment: a 12 year follow-up*, pp. 177–192. Melbourne: Kreiger.

Lauzon, P., Vincelette, J., Bruneau, J., Lamothe, F., Lachance, N., Brabant, M., & Soto, J. (1994). Illicit use of methadone among i.v. drug users in Montreal. *Journal of Substance Abuse Treatment*, *11*, 457-461.

Lawrinson, P., Copeland, J., & Indig, D. (2005). Development and validation of a brief instrument for routine outcome monitoring in opioid maintenance pharmacotherapy services: The brief treatment outcome measures (BTOM). *Drug and Alcohol Dependence*, *80*, 125–133.

Lejuez, C.W., Bornovalova, M.A., Daughters, S.B., & Curtin, J.J. (2005). Differences in impulsivity and sexual risk behavior among inner-city crack/cocaine users and heroin users. *Drug and Alcohol Dependence*, *77*, 169–175.

Leri, F., Bruneau, J., & Stewart, J. (2003). Understanding poly substance use: review of heroin and cocaine co-use. *Addiction*, *98*, 7-22.

Leri, F., Stewart, J., Fischer, B., Rehm, J., Marsh, D., Brissette, S., … Cameron, T. (2005). Patterns of opioid and cocaine co-use: a descriptive study in a Canadian sample of untreated opioid-dependent individuals. *Experimental Clinical Psychopharmacology*, *13*, 303-310.

Marsden, J., Gossop, M., Stewart, D., Best, D., Farrell, M., Lehmann, P., ... Strang, J. (1998). The Maudsley Addiction Profile (MAP): a brief instrument for assessing treatment outcome. *Addiction*, *93*, 1857–1867.

Martin, C., Clifford, P., Maisto, S, Earleywine, M., Kirisci, L., & Longabaugh, R. (1996a). Poly substance use in an inpatient treatment sample of problem drinkers. *Alcoholism: Clinical and Experimental Research*, *20*, 413-417.

Martin, C., Kaczynski, N., Maisto, S., & Tarter, R. (1996b). Poly substance use in adolescent drinkers with and without DSM-IV alcohol abuse and dependence. *Alcoholism: Clinical and Experimental Research*, *20*, 1099-1108.

Martinotti, G., Carli, V., Tedeschi, D., Di Giannantonio, M., Roy, A., Janiri, L., & Sarchiapone, M. (2009). Mono- and polysubstance dependent subjects differ on social factors, childhood trauma, personality, suicidal behaviour, and comorbid Axis I diagnoses. *Addictive Behaviours*, *34*, 790-793.

McLellan, A.T., & Meyer, K. (2004). Contemporary addiction treatment: a review of systems problems for adults and adolescents. *Biological Psychiatry*, *56*, 764-770.

McLellan, A.T., Kushner, H., Metzger, D., Peters, R., Smith, I., Grissom, G., et al. (1992). The 5th Edition of the addiction severity index. *Journal of Substance Abuse Treatment*, *9*(3), 199-213.

Medina, K.L., & Shear, P.K. (2007). Anxiety, depression, and behavioral symptoms of executive dysfunction in ecstasy contribution of poly substance use. *Drug and Alcohol Dependence*, *87*, 303-311.

Merikangas, K.R., Rajni, L.M., Molnar, B.E., Walters, E.E., Swendsen, J.D., Aguilar-Gaziola, S., et al. (1998). Comorbidity of substance use disorders

with mood and anxiety disorders: Results of the International Consortium in Psychiatric Epidemiology (ICPE). *Addictive Behaviors*, 23, 893-907.

Midanik, L.T., Tam, T.W., & Weisern, C. (2007). Concurrent and simultaneous drug and alcohol use: results of the 2000 National Alcohol Survey. *Drug and Alcohol Dependence*, *90*, 72-80.

Miller, N.S., Klamen, D., Hoffmann, N.G., & Flaherty, J.A. (1996). Prevalence of depression and alcohol and other drug dependence in addictions treatment populations. *Journal of Psychoactive Drugs*, *28*(2), 111-124.

Mueser, K., Drake, R., & Wallach, M. (1998). Dual diagnosis: A review of etiological theories. *Addictive Behaviors, 23*, 717-734.

Norton, R., & Colliver, J. (1988). Prevalence and patterns of combined alcohol and marijuana use. *Journal of Studies on Alcohol, 49*, 378−380.

Ogborne, A.C., Kapur, B.M., & Newton-Taylor, B. (1992). Characteristics of drug users admitted to alcohol detoxification centers. *American Journal of Drug and Alcohol Abuse*, *18*, 177-187.

Perez, d.l. C., Trujols, J., Ribalta, E. & Casas, M. (1997). Cocaine use immediately prior to entry in an inpatient heroin detoxification unit as a predictor of discharges against medical advice. *American Journal of Drug and Alcohol Abuse*, *23*, 267–279.

Pirard, S., Sharon, E., Kang, S.M., Angarita, G.A., & Gastfriend, D.R. (2005). Prevalence of physical and sexual abuse among substance abuse patients and impact on treatment outcomes. *Drug and Alcohol Dependence*, *78*, 57–64.

Rhee, S.H., Hewitt, J.K., Young, S.E., Corley, R.P., Crowley, T.J., & Neale, M.C. (2006). Comorbidity between alcohol dependence and illicit drug dependence in adolescents with antisocial behavior and matched controls. *Drug and Alcohol Dependence*, *84*(1), 85-92.

Substance Abuse and Mental Health Services Administration (SAMHSA) (2005). *Polydrug Admissions: 2002 (Drug and Alcohol Services Information System)*. Arlington: SAMHSA.

Schensul, J.J., Convey, M., & Burkholder, G. (2005). Challenges in measuring concurrency, agency and intentionality in poly substance research. *Addictive Behaviours*, *30*, 571-574.

Schottenfeld, R.S., Pakes, J., Ziedonis, D., & Kosten, T.R. (1993). Buprenorphine: dose-related effects on cocaine and opioid use in cocaine-abusing opioid-dependent humans. *Biological Psychiatry*, *34*, 66-74.

Simpson, D.D., & Sells, S.B. (1974). Patterns of multiple drug abuse: 1969-1971. *International Journal of the Addictions*, *9*(2), 301-314.

Staines, G.L., Magura, S., Foote, J., Deluca, A., & Kosanke, N. (2001). Polysubstance use among alcoholics. *Journal of Addictive Diseases*, *20*(4), 53-69.

Stinson, F.S., Grant, B.F., Dawson, D.A., Ruan, W.J., Huang, B., & Saha, T. (2005). Comorbidity between DSM-IV alcohol and specific drug use disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence*, *80*(1), 105-116.

Substance Abuse and Mental Health Services Administration (SAMHSA) (2007). *Treatment episode data set (TEDS): 1995-2005. National Admissions*

to substance abuse treatment services (DASIS Series: S-37). Available at http://wwwdasis.samhsa.gov/teds05/tedsad2k5web.pdf (accessed 03.03.10)

Sumnall, H.R., Wagstaff, G.F., & Cole, J.C. (2004). Self-reported psychopathology in poly substance users. *Journal of Psychopharmacology, 18*, 63–69.

Tam, T.W., Weisner, C., & Mertens, J. (2000). Demographic characteristics, life context, and patterns of substance use among alcohol-dependent treatment clients in a health maintenance organization. *Alcoholism Clinical and Experimental Research, 24*(12), 1803-1810.

Tomasson, K., & Vaglum, P. (1995). A nationwide representative sample of treatment-seeking alcoholics: a study of psychiatric comorbidity. *Acta Psychiatrica Scandinavia, 92*, 378–385.

Vanderplasschen, W., De Bourdeaudhuij, I., & Van Oost, P. (2002). Co-ordination and continuity of care in substance abuse treatment – An evaluation study in Belgium. *European Addiction Research, 8*, 10-21.

Van Havere, T., Vanderplasschen, W., Lammertyn, J., Broekaert, E. & Bellis, M. (2011). Drug use and nightlife: more than just dance music. *Substance Abuse Treatment, Prevention, and Policy, 6*, 18.

Wang, M.Q., Collins, C.B., DiClemente, R.J., Wingood, G. & Kohler, C.L. (1997). Depressive symptoms as correlates of polydrug use for blacks in a high-risk community. *South Medical Journal, 90*(11), 1123-1128.

Williamson, A., Darke, S., Ross, J., & Teesson, M. (2006). The effect of persistence of cocaine use on 12-month outcomes for the treatment of heroin dependence. *Drug Alcohol Dependence, 81*, 293-300.

Winters, K.C., Stinchfield, R.D., Opland, E., Weller, C., & Latimer, W.W. (2000). The effectiveness of the Minnesota Model approach in the treatment of adolescent drug abusers. *Addiction, 95*, 601–612.

Chapter 2

Poly substance use and mental health:

A review of the literature

Laura Stevens
Kathy Colpaert
Geert Dom
Wouter Vanderplasschen

2.1 Introduction

Recently, evidence has indicated that significant differences exist between poly substance users on the one hand and single substance users on the other hand in terms of socio-demographic background, suicidality and various life domains (Martinotti, et al., 2009; Kedia et al., 2007; Hakansson, Schlyter & Berglund, 2011). Moreover, evidence is available to suggest that poly substance users have more severe disorders and experience more problems due to their substance use (Colpaert et al., 2008; Finkbiner & Wisdom, 2000; Stinson et al., 2005). For example, based on data from the Drug Abuse Warning Network (DAWN), McCabe and colleagues (2006) demonstrated that the majority of emergency room visits related to substance misuse intakes involved poly substance abuse. Also, several studies have shown that poly substance use is associated with poorer physical health and a greater level of risk-taking, e.g. sexual risk behavior (Patterson et al., 2005, Floyd et al., 2010). While still scarce, a growing body of research has emerged that examined differences between both populations in terms of mental health, psychiatric comorbidity or personality features. While the results have been mixed, the majority of studies indicate that poly substance use is associated with a greater likelihood of mental health problems (Driessen, Veltrup, Wetterling, John & Dilling, 1998; Tomasson & Vaglum, 1995) and higher levels of mental distress (Hoxmark, Nivison & Wynn, 2010). Mental health appears to be an important factor that has been identified as adversely affected by poly substance use (Kelly & Parsons, 2008). The co-occurrence of psychiatric disorders and substance use disorders (SUD) is often construed more narrowly as ‘dual diagnosis’.

2.2 Background

A large body of evidence supports the strong relationship between SUD and non-substance related psychiatric disorders. International research found that the co-morbidity of substance-related disorders and other psychiatric disorders is between 50 and 90% (Alverson , Alverson & Drake, 2000; Strathdee et al., 2002; Weaver, Charles, Madden & Renton, 2002). In clinical samples of substance

users, the prevalence of current or lifetime psychiatric disorders varies between 8 and 86% (Havassy, Alvidrez & Owen, 2004). However, a consistent critique on these studies is that the level and involvement of poly substance use is often ignored. Although evidence suggests that substance users frequently administer multiple substances, most research on the prevalence of psychiatric disorders among substance misusers tends to focus on the primary substance of abuse. This approach ignores the specific ways that drug users typically use their substances (Barrett, Darredeau & Pihl, 2006). As a consequence, these studies report on the prevalence and nature of psychiatric comorbidity based on individuals' primary substance of abuse, while the observed effects may be due to comorbid poly substance use, which is the norm among most users (Parrott, 2001).

Since it is unusual for illicit drug users to restrict their drug use to one primary substance, it is difficult to determine whether the observed psychological symptoms are due to the primary substance of abuse or rather to the level of poly substance use in these samples. Indeed, it is reasonable to assume that the interaction between several substances can enhance the neurological, physiological, and psychological impact on the individual and may increase the negative consequences of substance use (Kedia et al., 2007). On the other hand, persons with psychiatric disorders might be more vulnerable for engagement in the use of multiple substances as compared with individuals without a pre-existing psychiatric disorder (Pristach & Smith, 1996). Only few studies have controlled for the presence or level of poly substance use when examining the prevalence and nature of psychiatric disorders among individuals with a SUD. Studies that have directly compared the prevalence of psychiatric disorders between individuals with and without poly substance use are rare. In this chapter, we briefly discuss the few studies that have taken into account the level of poly substance use when examining associations between SUD and psychiatric comorbidity.

2.3 Results

In the past two decades, studies have began to take into account the presence of poly substance use when examining the prevalence and nature of Axis I and II disorders in SUD. Most of these studies have demonstrated that, in general, psychiatric and psychosocial impairment tend to be heightened in case of poly substance use (Salgado, Quinlan & Zlotnick, 2007) or that poly substance use can at least be seen as an important confounding factor when examining the relationship between SUD and mental health.

Whereas the majority of studies have taken into account the level of poly substance use while examining the relationship between mental health and a specific substance (e.g. ecstasy), others have studied the relationship between mental health and specific combinations of drug use (e.g. ecstasy and cannabis use, cocaine using opioid addicts, ...). A minority of studies have made comparisons between a heterogeneous group of poly substance users on the one hand and single drug or alcohol users on the other hand. The first line of research, in which the level of poly substance use has been taken into account while examining the prevalence of psychiatric symptomatology, will be illustrated with evidence gathered among ecstasy users. While a number of studies have focused on other substances, an extensive research tradition exists concerning psychological impairments among ecstasy users who use multiple substances. The second line of research, in which the prevalence of psychiatric symptomatology among users of multiple substances is compared with single drug users, will be illustrated with studies focusing on cannabis consuming ecstasy users and cocaine using opioid addicts. Finally, some studies will be discussed that have compared heterogeneous samples of poly substance users with single drug users.

2.3.1 Mental health and the use of specific substances: The role of poly substance use

The case of ecstasy

A growing body of evidence has lend support for the hypothesis that ecstasy users have elevated levels of psychiatric symptoms and disorders, including

depression, anxiety, panic disorders, paranoia, hostility, sleep disturbances, impulse control disorders, and eating disorders (Parrott, Sisk & Turner, 2000; Schifano, Di Furia, Forza, Minicucu & Bricolo, 1998). More specifically, several studies have demonstrated that, compared to controls, ecstasy users have higher levels of depression (deWin et al., 2004; Thomasius et al., 2005) and anxiety disorders (Parrott et al., 2001; Thomasius et al., 2005). However, a consistent critique on these studies is that the observed effects may be due to comorbid poly substance use. The high levels of poly substance use among ecstasy users make it difficult to determine whether and to which extent the observed psychological symptoms are due to the use of ecstasy or other substances. In order to examine the contribution of poly substance use, a number of studies have controlled for the level of poly substance use when investigating the association between psychiatric disorders and ecstasy use (Medina and Shear, 2007; Verdejo-Garcia, López-Torrecillas, de Arcos & Pérez-Garcia, 2005; Daumann et al., 2004). Interestingly, several of these studies have found that the relationship between ecstasy use and psychological disorders was no longer significant, after controlling for the use of other substances (Daumann et al., 2004; Roiser & Sahakian, 2004; Verdejo-Garcia et al., 2005).

For example, Medina and Shear (2007) found that mental health problems, such as depression and anxiety, were not associated with ecstasy use per se, but with engagement in poly substance use. A more recent study of Scott and colleagues (2010) showed that the severity of current mood and anxiety disorders among ecstasy users was not associated with lifetime nor with recent ecstasy use. The severity of these problems was rather predicted by recent poly substance use. Also, Bedi and colleagues (2010) found that the high prevalence of psychiatric symptomatology in poly substance users who used ecstacy was rather associated with poly drug than with ecstasy use. In support of these results, Thomasius and colleagues (2003) found no significant group differences in self-reported psychopathology between ecstasy users and poly drug controls, suggesting that there was no statistical effect of ecstasy use beyond the use of other illicit drugs. These findings indicate that impaired psychological well-being is rather associated with poly substance than with ecstasy use.

Repeated ecstasy use has not only been associated with psychiatric symptoms, but has consistently been found to impair cognitive functioning (Rogers et al., 2009; Lyvers, 2006). However, these studies have failed to take into account the contribution of drugs other than ecstasy (Halpern et al., 2010). Again, poly substance use may be an important confounding factor that might lead to an overestimation of ecstasy-induced neurocognitive dysfunctions. In support of this hypothesis, recent studies have reported few ecstasy-specific impairments (Roiser & Sahakian, 2004; Halpern et al., 2010). Halpern and colleagues (2010) compared ecstasy users and non-users, while excluding individuals with substantial life-time exposure to other illicit drugs or alcohol. The results of this study demonstrated no significant residual cognitive effects in ecstasy users and, therefore, great caution is needed when interpreting studies of cognitive functioning in ecstasy users. Similarly, a study of Hoshi and colleagues (2007) that compared the cognitive functioning of current ecstasy users, ex-ecstasy users and poly drug-using controls, failed to show any group differences, except for the fact that recent drug use had the strongest impact on cognitive performances. The results of this study suggest that drug use in general, rather than ecstasy use per se, may lead to subtle cognitive impairments.

Finally, these results suggest that heavy poly substance use is more strongly related to the presence or severity of comorbid psychiatric disorders or cognitive dysfunctions than the use of specific substances such as ecstacy. Consequently, poly substance use needs to be regarded as an important confounding factor when examining the prevalence and nature of psychiatric disorders and cognitive dysfunctions in substance users.

2.3.2 Mental health and specific patterns of substance use

Cannabis use among ecstasy users

While several of the above-mentioned studies among ecstasy users have reported a stronger association between psychopathology and poly substance use than with ecstasy use per se, others have suggested that the apparent high prevalence of psychiatric disorders among ecstasy users may be due to cannabis use

(Daumann et al., 2004; Durdle, Lundahl, Johanson & Tancer, 2008). As the prevalence of cannabis use is exceptionally high among ecstasy users (Lieb, Schuetz, Pfister, von Sydow & Wittchen, 2002) and as heavy cannabis use has frequently been associated with depression (Degenhardt, Hall & Lynskey,, 2003), several studies have attempted to control for cannabis use in ecstasy users.

Daumann and colleagues (2004) found that abstinence from cannabis (and not ecstasy) was a reliable predictor for remission of psychological problems in ecstasy users, suggesting that self-reported psychopathology in ecstasy users is predominantly attributable to concomitant cannabis use. In addition, Durdle and colleagues (2008) have demonstrated that ecstasy use alone did not account for depressive symptomatology in substance users. However, the presence of cannabis use disorders was significantly associated with major depression in female ecstasy users. Consequently, these studies stress the importance of controlling for concurrent use of cannabis and other substances in ecstasy users, as it may account for higher levels of psychiatric comorbidity.

Since many ecstasy users have concurrent cannabis use disorders, it can be assumed that the observed cognitive impairments in ecstasy users may be associated with comorbid cannabis use. Consequently, cognitive impairments may have been overestimated as ecstasy-specific dysfunctions. Lamers and colleagues (2006) demonstrated that single cannabis users showed similar levels of cognitive dysfunctions compared with cannabis consuming ecstasy users, which suggests that these impairments are attributable to cannabis use. Also, Croft and colleagues (2001) did not find differences in neuropsychological test performance between single cannabis users and individuals who used ecstasy and cannabis. Finally, Wareing et al. (2004) demonstrated that when statistically controlling for the presence of cannabis use, cognitive impairments in ecstasy users did no longer reach statistical significance.

Cocaine using opioid addicts

Several studies have indicated that the prevalence of cocaine use among opioid addicts is high, ranging from 30% to 80% among individuals out of treatment (Schutz, Vlahov, Anthony & Graham, 1994; Grella, Anglin & Wugalter 1995; Frank & Galea 1996; Grella, Anglin & Wugalter 1997). Similar high rates of concurrent cocaine use have been reported among individuals participating in methadone maintenance treatment (MMT) (Hartel et al 1995; Joe & Simpson 1995; Grella et al. 1997; Magura, Kang, Nwakeze & Demsky, 1998). The use of cocaine at MMT entry does not only predict worse clinical outcomes, including attrition and failure to attain initial abstinence (DeMaria, Sterling & Weinstein, 2000; Downey, Helmus, & Schuster, 2000; Kosten, Sofuoglu, Poling, Gonsai, & Oliveto, 2005; Marsch et al., 2005; Peirce et al., 2009; Sofuoglu, Gonzalez, Poling, & Kosten, 2003; Stitzer et al., 2007), but is also associated with higher levels of psychopathology. Malow and colleagues (1992) found that compulsive speedball users experienced significantly greater problems with depression, trait anxiety, and related psychopathology, compared to men who used cocaine without opioids. In addition, Torrens and colleagues (1991) found that cocaine consuming opiate addicts showed more persistence of depressive symptoms during opiate detoxification as compared with heroin addicts who did not abuse cocaine. More recently, higher rates of Axis I disorders were demonstrated in individuals who used both cocaine and heroin compared to single heroin addicts (Bandettini Di Poggio et al., 2006). More specifically, individuals who used both drugs had a significantly higher frequency of schizophrenia, schizoaffective disorders, bipolar disorders and depressive disorders.

2.3.3 Poly vs. single substance users

Poly substance users vs. pure alcoholics

Some studies have compared the prevalence and nature of psychological health problems in a heterogeneous group of poly substance users with that in single substance users. In most studies, the latter group consisted of pure alcohol users.

- *Axis I disorders and symptomatology*

According to various authors (Thomasson & Vaglum, 1995; Landheim, Bakken & Vaglun, 2003), poly substance abusers had a higher frequency of anxiety disorders, as compared with pure alcoholics. Poly substance abusers had particularly high rates of social phobia and post-traumatic stress disorders (PTSD), also after controlling for gender differences (Landheim et al., 2003). The presence of social anxiety disorders (SAD) was found to be significantly higher among poly substance dependent individuals as compared with alcohol-dependent individuals (Bakken, Landheim & Vaglum, 2005). Moreover, the age of onset of SAD was significantly lower in the poly substance-group and primary SAD was found to be a significant predictor of poly substance dependence.
The co-occurrence of alcohol use disorders and major depression has frequently been reported in alcoholic and psychiatric populations (Grant and Harford, 1995; Kushner et al., 2005). Given its association with poor treatment response (Kushner et al., 2005; Driessen et al., 2001), the co-occurrence of depression and alcohol abuse is of major clinical relevance. However, the level of poly substance use may be an important confounding factor. Midanik and colleagues (2007) demonstrated that the simultaneous use of alcohol and illicit drugs correlated significantly with the presence of depression, while heavy drinking alone was not significantly associated with depression.

- *Axis II disorders*

Although few studies are available, poly substance use has been associated with high rates of cluster B personality disorders. According to Landheim and colleagues (2003), poly substance abusers have a significantly higher prevalence of cluster B personality disorders as compared with single substance abusers. In particular, poly substance abusers had more often antisocial and borderline personality disorders. On the other hand, a higher frequency of cluster A and cluster C disorders was found in pure alcoholics compared to poly substance abusers. A review by Verheul and colleagues (1995) has shown that personality

disorders are more frequently assessed in poly substance abusers than in alcoholics. Similarly, Thomasson and Vaglum (1995) found that 58% of the polysubstance abusers in their sample had an antisocial personality disorder, compared with 15% of the alcoholics. Finally, Torrens and colleagues (1991) showed that cocaine abusing opiate addicts had more antisocial personality disorders than heroin addicts who did not abuse cocaine.

- *Axis II personality features*

While Martinotti and colleagues (2009) did not assess the prevalence of Axis II disorders among poly drug dependent individuals, they did find a significantly higher prevalence of cluster B personality features (i.e., impulsivity and sensation seeking) among these poly substance users (Dolan, Deakin, Roberts & Anderson, 2002). These results have also been demonstrated in other studies, indicating that poly substance users have particularly high levels of impulsiveness and sensation seeking (Kelly & Parsons, 2008; Donovan, Soldz, Kelley & Penk, 1998; Conway, Kane, Ball, Poling & Rounsaville, 2003). For example, poly drug cocaine users scored significantly higher on drug sensation seeking when compared to single cocaine users (Kelly and Parsons, 2008). Conway and colleagues (2003) found that personality traits such as behavioral disinhibition and novelty seeking to be linearly associated with the extent of polysubstance involvement. These findings suggest a relationship between behavioral disinhibition and addiction severity, primarily defined in terms of poly substance involvement.

A significantly higher prevalence of juvenile convictions, a history of multiple crimes and more violent behaviour during detention has been demonstrated among poly drug dependent individuals (Martinotti et al., 2009). Also, Hakansson, Schlyter and Berglund (2011) have found that using five or more substances was associated with more difficulties in controlling violent behaviour. Since cluster B personality disorders have consistently been linked with high levels of aggressiveness (Fossati et al., 2007) and violent and criminal behaviour (Bovasso et al., 2002; Verheul, van den Brink, Hartgers & Koeter, 1999), these

results implicitly suggest a relatively higher prevalence of cluster B personality disorder symptoms in poly substance users.

Poly vs. single drug users

Whereas most studies have compared poly substance users with pure alcoholics, only one study has compared poly drug users with users of just one illegal drug (Martinotti et al., 2009). Interestingly, the results of this study are in contrast with the evidence found in the afore-mentioned studies. A significantly higher prevalence of Axis I comorbidity was found among mono-substance dependent subjects compared with poly-substance dependent subjects, with especially large numbers of mood disorders.

2.4 General discussion

Due to intrinsic and methodological reasons, a long tradition can be observed of research on substance-specific associations and psychiatric comorbidity. However, growing insights in the specific ways in which individuals use substances have forced researchers to take into account the level and contribution of poly substance use. The increasing body of evidence that has emerged from these studies indicates few substance-specific psychological or psychiatric impairments, but underscores the significant association between psychiatric disorders and poly substance use. If substance-specific impairments exist, they might have been overestimated in previous research in which the effect of poly substance use has been ignored. The significant association between various psychiatric disorders and poly substance use raises the question to what extent this association is of clinical relevance.

2.4.1 Dual diagnosis and clinical implications

Psychiatric comorbidity among individuals with a SUD has important clinical implications, as it has been associated with increased severity of substance use

(Mills, Lynskey, Teesson, Ross & Darke, 2005; Watkins et al., 2004) and psychiatric and personality disorders (Kessler et al., 2001; Cassidy, Ahearn & Carroll, 2001; Grant et al., 2004; Kandel, Huang & Davies, 2001). More specifically, psychiatric comorbidity among individuals with SUD has been associated with: more severe functional impairments, greater vulnerability to rehospitalisation and repeated treatment admissions; higher service utilisation and treatment costs; higher levels of depression, suicidality, and proneness to violence; greater non-compliance with medication and other treatments; higher prevalence of HIV infection; increased family burden and legal, medical, employment, social and financial problems; disruptive behaviour and a protracted course of illness (Schafer & Najavits, 2007; Soyka, 2000).

Regarding treatment outcomes, mixed results have been found. Several authors have suggested that co-morbid psychiatric or personality disorders predict poor treatment response or outcomes, including difficulties in the therapeutic relationship, resistance to change, noncompliance and premature treatment drop-out (Strand & Benjamin, 1997; Reich & Vasile, 1993; Weiss, Martínez-Raga & Hufford, 1996; Compton, Cottler, Ben-Abdallah; Cunningham-Williams & Spitznagel, 2003; Haro et al., 2004). Others have shown that individuals with a comorbid psychiatric disorder benefit from treatment at least as much as those without (Cacciola, Alterman, Rutherford & Snider, 1995; Cacciola, Alterman, Rutherford, McKay & Snider, 1996; Verheul et al., 1999; Cecero, Ball, Tennen, Kranzler & Rounsaville, 1999), and that Axis II disorders are not associated with premature drop-out or lower motivation for change (Marlowe, Kirby, Festinger, Husband & Platt, 1997; Kokkevi, Stefanis, Anastasopoulou & Kostogianni, 1998). According to Ross and colleagues (2003), individuals with personality disorders improve as much as individuals without personality disorders during inpatient hospitalization, although they are less likely to attend their initial follow-up appointment.

While results regarding the value of categorical diagnoses of personality disorders in predicting clinical outcomes have been mixed, the importance of dimensional scores and certain personality traits in predicting treatment outcomes has been supported by various studies (Passetti et al., 2008, Moeller et

al., 2001; Sellman, Mulder, Sullivan Joyce, 1997). For example, evidence is available that high levels of impulsiveness and sensation seeking among substance users are predictive foor poor addiction treatment outcomes (Moeller et al., 2001). Higher sensation seeking predicts reduced odds of abstinence from smoking, as well as more alcohol use over 26 weeks of follow-up (Kahler et al., 2009). Also, Helmus and colleagues (2001) showed that high novelty seeking heroin dependent cocaine users were more likely to drop-out of addiction treatment in comparison with low novelty seekers. Moreover, Kravitz and colleagues (1999) found that individuals who scored higher on novelty seeking were significantly more likely to drop-out of alcohol treatment.

Typically, the majority of these studies did not control for pre-treatment functioning, such as the level of poly substance use involvement. While the clinical significance of dual diagnosis among individuals with a SUD has been well established, poly substance use and co-occurring serious psychiatric illness is common and may complicate the assessment and understanding of this association (Weiss et al., 2007). Although it can be assumed that poly substance use may present a significant barrier to successful treatment (Brecht, Huang, Evans & Hser, 2008; Williamson, Darke, Ross & Teesson, 2006; Bovasso & Cacciola, 2003), only few studies have taken into account the level of poly substance use when assessing the relationship between dual diagnosis and clinical outcomes.

Clinical outcomes are affected by the presence or level of poly substance use (DeMaria et al., 2000; Downey et al., 2000; Kosten et al., 2005; Marsch et al., 2005; Peirce et al., 2009; Sofuoglu et al., 2003; Stitzer et al., 2007). Several studies focusing on multiple drug use have found that poly substance use is negatively related to treatment outcomes (Bovasso & Cacciola, 2003; DeMaria et al., 2000; Downey et al., 2000; Williamson et al., 2006). For example, the use of cocaine or heroin among methamphetamine users has been found to be a significant predictor of not completing treatment (Brecht et al., 2008). Also, high levels of cocaine use at treatment entry predicted poor clinical outcomes of heroin-dependent poly substance abusers (Downey et al., 2000).

However, the question remains how the relative contribution of these prognostic factors can be discriminated. For example, the poorer clinical outcomes typically found in drug users with comorbid psychiatric disorders could be partially or even fully accounted for by the higher proportion of poly substance use associated with dual diagnoses. Alternatively, the often observed relationship between poly substance use and poor treatment outcomes may be mediated by elevated levels of psychiatric disorders among this population. For example, it has been reported that cocaine-using opioid addicts suffer from more severe co-morbid psychopathology (Malow et al., 1992) and are more likely to drop-out of treatment and to relapse as compared with single heroin users. (Downey et al., 2000; Dolan, Black, Penk, Robinowitz & Deford, 2001). Similarly, personality traits including impulsiveness and sensation seeking are generally heightened among poly substance users and have been consistently associated with a poorer treatment response (Moeller et al., 2001; Passetti et al., 2008). Consequently, it can be assumed that poly substance use, through its association with cluster B personality features, may be a significant barrier to successful treatment.

2.4.2 Conclusion and recommendations

Numerous studies have found Axis I and II disorders to be highly prevalent among individuals with SUD. Only few studies have differentiated between poly and single substance users. However, poly substance use appears to be an important confounding factor when examining psychiatric comorbidity. Some studies have indicated that the often observed relationship between substance use and psychopathology is more closely linked to the level of poly substance use than to the particular substance of abuse. Moreover, the apparent relation between particular substances (e.g. ecstasy) and psychiatric comorbidity appears to be rather due to other substances. The use of multiple substances may complicate the understanding of the clinical implications of psychiatric comorbidity among individuals with a SUD. Consequently, it is important for studies exploring the relationship between mental health and SUD to approach this theme from a poly substance use perspective.

The few available studies that have applied a poly substance use approach indicate that, in general, psychiatric comorbidity tends to be higher in poly substance users (Landheim et al., 2003; Medina & Shear, 2007; Midankik et al., 2007). However, due to a lack of extensive research, few definite conclusions can be made at this time. For a more proper understanding of the prevalence and clinical significance of co-morbid psychiatric disorders in individuals with SUD, greater emphasis on the role of poly substance use is needed. Many factors can affect study results, such as the timing of the diagnostic interview, the spectrum of psychiatric disorders examined, the nature of the sample, etc.. Differences across studies on any of these aspects are likely to have a large impact on the results regarding the prevalence and nature of psychiatric comorbidity in substance users.

Various methodological issues may lead to inconsistent findings. First, axis I and II disorders in substance users have typically been studied separately, while disorders on these axes co-occur frequently (Siever & Davis, 1991; Oldham, Skodol & Kelleman, 1995) and should therefore preferentially be examined simultaneously (Verheul et al., 2000). For, these disorders may interactively increase pre-treatment problem severity and elicit even poorer treatment outcomes (Verheul et al., 2000). Second, only few studies have taken into account gender differences, although patterns of co-morbid personality disorders have been found to be clearly different between male and female poly substance abusers and alcoholic men and women (Landheim et al., 2003). Third, the timing of the diagnostic assessment is of utmost importance. Levels of comorbid psychiatric symptoms are likely to be temporarily elevated if drug users are interviewed in the phase of intoxication or withdrawal or shortly after having achieved abstinence (Brown, Vik, Patterson, Grant & Schuckit, 1995). As recent substance use can result in sub-acute or short-term psychological impairments and as substance-induced psychiatric symptoms can partially be recovered within several weeks/months of abstinence, duration of abstinence can yield different prevalences of psychological symptoms. Fourth, categorical diagnoses of personality disorders reduce the prognostic reliability drastically (Widiger &

Samuel, 2005). As proposed by Hesse and Thylstrup (2008), personality disorders should be seens as dimensions instead of categories. Such a dimensional approach could shed new light on the (slight) differences between single and poly substance users.

Finally, the causal link between substance use and psychiatric disorders remains unclear. Whereas some authors have argued that the use of several substances can contribute to the development of certain psychiatric disorders (Caton et al., 2005; Degenhardt et al., 2003), psychopathology has been identified as a risk factors for the development of SUD. For example, Kessler and colleagues (2001) demonstrated that approximately 50% of current drug dependence disorders could be attributed to pre-existing mental disorders, since the observed mental disorders preceded SUD.

REFERENCES

Alverson, H., Alverson, M., & Drake, R. E. (2000).An ethnographic study of the longitudinal course of substance abuse among people with severe mental illness. *Community Mental Health Journal, 36*, 557- 569.

Bakken, K., Landheim, A.S., & Vaglum, P. (2005). Substance-dependent patients with and without social anxiety disorder: Occurrence and clinical differences: A study of a consecutive sample of alcohol-dependent and poly-substance-dependent patients treated in two counties in Norway. *Drug and Alcohol Dependence, 93*, 321-328.

Bandettini Di Poggio A., Fornai, F., Paparelli, A., Pacini, M., Perugi, G., & Maremmani, I. (2006). Comparison between heroin and heroin-cocaine polyabusers: a psychopathological strudy. Annals of the New York Academy of Sciences., 1074, 438-45.

Barrett, S.P., Darredeau, C., & Pihl, R.O. (2006). Patterns of simultaneous polysubstance use in drug using university students. *Human Psychopharmacology: Clinical and Experimental, 21*, 255–263.

Bedi, G., Van Dam, N.T., & Redman, J. (2010). Ecstasy (MDMA) and high prevalence symptomatology: somatic anxiety symptoms are associated with poly drug, not ecstasy, use. *Journal of Psychopharmacology*, 24(2), 233-240.

Bovasso, G.B., Alterman, A.I., Cacciola, J.S. & Rutherford, M.J. (2002). The prediction of violent and non-violent criminal charges in a methadone maintenance population*. Journal of Personality Disorders, 16*, 360-373.

Bovasso, G., & Cacciola, J. (2003). The long-term outcomes of drug use by methadone maintained patients. *Journal of. Behavioral. Health Services & Research. 30*, 290–303.

Brecht, M.L., Huang, D., Evans, E., & Hser, Y.I. (2008). Poly substance use and implications for longitudinal research: Ten-year trajectories for heroin, cocaine, and methamphetamine users. *Drug and Alcohol Dependence, 96*, 193-201.

Brown S.A., Vik P.W., Patterson T.L., Grant I., & Schuckit M. A. (1995). Stress, vulnerability and adult alcohol relapse. *Journal of Studies on Alcohol, 56*, 538–45.

Cacciola, J.S., Alterman, A.I., Rutherford, M.J., McKay, J.R., & Snider, E.C. (1996). Personality disorders and treatment outcome in methadone maintenance patients. *The Journal of Nervous and Mental Disease, 184*, 234–239.

Cacciola, J.S., Alterman, A.I., Rutherford, M.J., & Snider, E.C., (1995). Treatment response of antisocial substance abusers. *The Journal of Nervous and Mental Disease, 183*, 166–171.

Cassidy, F., Ahearn, E.P., & Carroll, B.J. (2001). Substance abuse in bipolar disorder. *Bipolar Disorders, 3*, 181–188.

Caton, C.L.M., Drake, R.E., Hasin, D.S., Dominguez, B., Shrout, P.E., Samet, S., & Schanzer, W.B. (2005). Differences between early phase primary psychotic disorders with concurrent substance use and substance-induced psychoses. *Archives of General Psychiatry, 62*, 137–45.

Cecero, J., Ball, A., Tennen, H., Kranzler, R., & Rounsaville, J. (1999). Concurrent and Predictive Validity of Antisocial Personality Disorder

Subtyping among Substance Abusers. *The Journal of Nervous and Mental Disease, 187*, 478-486.

Colpaert, K., Vanderplasschen, W., Van Hal, G., Broekaert, E., & Schuyten, G. (2008). Dual substance abusers seeking treatment: demographic, substance-related. *Journal of Drug Issues, 38*(2), 559-584.

Compton, W.M. Cottler, L.B., Ben-Abdallah, A., Cunningham-Williams, R., & Spitznagel, E.L. (2003). The role of psychiatric disorder in predicting drug dependence treatment outcomes. *American Journal of Psychiatry, 160*, 890–895.

Conway, K.P., Kane, R.J., Ball, S.A., Poling, J.C., & Rounsaville, B.J. (2003). Personality, Substance of Choice, and Polysubstance Involvement Among Substance Dependent Patients. *Drug and Alcohol Dependence, 71*, 65-75.

Croft, R. J., Mackay, A. J., Mills, A., & Gruzelier, J. (2001). The relative contributions of ecstasy and cannabis to cognitive impairment. *Psychopharmacology, 153*, 373–379.

Daumann, J., Hensen, G., Thimm, B., Rezk, M., Till, B., & Gouzoulis-Mayfrank, E. (2004). Self-reported psychopathological symptoms in recreational ecstasy (MDMA) users are mainly associated with regular cannabis use: further evidence from a combined cross-sectional/ longitudinal investigation. *Psychopharmacology, 173*, 398–404.

Degenhardt, L., Hall, W., & Lynskey M. (2003). Exploring the association between cannabis use and depression. *Addiction, 98*,1493–1504.

DeMaria, P.A., Sterling, R., & Weinstein, S.P. (2000). The effect of stimulant and sedative use on treatment outcome of patients admitted to methadone maintenance treatment. *American Journal of the Addictions, 9*, 145–153.

de Win, M.M.L., Reneman, L., Reitsma, J.B., den Heeten, G.J., Booij, J., & van den Brink, W. (2004). Mood disorders and serotonin transporter density in ecstasy users- the influence of long-term abstention, dose, and gender. *Psychopharmacology, 173*, 376–382.

Dolan, M. P., Black, J. L., Penk, W. E., Robinowitz, R., & Deford, H. A. (2001). Predicting the outcome of contingency contracting for drug abuse. *Behaviour Therapy, 17*, 470–474.

Dolan, M., Deakin, W.J.F., Roberts, N., & Anderson, I. (2002). Serotonergic and cognitive impairment in impulsive aggressive personality disordered offenders: are there implications for treatment? *Psychological Medicine, 32*, 105–117.

Donovan, J.M., Soldz, S., Kelley, H.F., & Penk, W.E. (1998). Four addictions: the MMPI and discriminant function analysis. *Journal of Addictive Diseases, 17*, 41-55.

Downey, K.K., Helmus, T.C., & Schuster, C.R. (2000) Treatment of heroin-dependent poly drug abusers with contingency management and buprenorphine maintenance. *Experimental and Clinical Psychopharmacology, 8*, 176–184.

Driessen, M., Veltrup, C., Wetterling, T., John, U., & Dilling, H. (1998). Axis I and Axis II comorbidity in alcohol dependence and the two types of alcoholism. *Alcoholism: Clinical and Experimental Research, 22*,77–86.

Driessen, M., Meier, S., Hill, A., Wetterling, T., Lange, W., & Junghanns, K. (2001). The course of anxiety, depression and drinking behaviours after

completed detoxification in alcoholics with and without comorbid anxiety and depressive disorders. *Alcohol & Alcoholism, 36*, 249–255.

Durdle, H., Lundahl, L.H., Johanson, C.-E., & Tancer, M. (2008). Major depression: the relative contribution of gender, MDMA, and cannabis use. *Depression and Anxiety, 25*, 241–247.

Finkbiner, R.G., & Wisdom, G.A. (2000). Clients in treatment for alcohol problems: Treatment experiences and outcomes. *Journal of Psychopathology and Behavioral Assessment, 22*(4), 365-382.

Floyd, L.J., Heddes, S., Lawson, A., Salama, C., Moleko, A.G. & Latimer, W. (2010). The association between poly-substance use, coping, and sex trade among black South African substance users. *Substance Use & Misuse, 45*(12), 1971-1987.

Fossati, A., Barratt, E.S., Borroni, A., Villa, D., Grazioli, F., & Maffei, C. (2007). Impulsivity, aggressiveness and DSM-IV personality disorders. *Psychiatry Research, 149*, 157–167.

Frank, B., & Galea, J. (1996) Cocaine trends and other drug trends in New York City, 1986–94. *Journal of Addictive Diseases, 15*, 1–12.

Grant, B.F., Stinson, F.S., Dawson, D.A., Chou, S.P., Dufour, M.C., Compton, … Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry, 61*, 807−816.

Grant, B.F., & Harford, T.C. (1995). Comorbidity between DSM-IV alcohol use disorders and major depression: Results of a national survey. *Drug and Alcohol Dependence, 39*, 197–206.

Grella, C.E., Anglin, M.D., & Wugalter, S.E. (1995). Cocaine and crack use and HIV risk behaviours among high-risk methadone maintenance clients. *Drug and Alcohol Dependence, 37*, 15–21.

Grella, C.E., Anglin, M.D., & Wugalter, S.E. (1997). Patterns and predictors of cocaine and crack use by clients in standard and enhanced methadone maintenance treatment. *American Journal of Drug and Alcohol Abuse, 23*, 15-42.

Hakansson, A., Schlyter, F., & Berglund, M, (2011). Associations between polysubstance use and psychiatric problems in a criminal justice population in Sweden. *Drug and Alcohol Dependence, 118*, 5-11.

Halpern, J.H., Sherwood, A.R., Hudson, J.I., Gruber, S., Kozin, D., Pope, H.G. (2011). Residual neurocognitive features of long-term ecstasy users with minimal exposure to other drugs. *Addiction, 106*(4), 777-786.

Haro, G., Mateu, C., Martinez-Raga, J., Valderrama, J.C., Castellano, M., & Cervera, G. (2004) The role of personality disorder on drug dependence treatment outcomes following inpatient detoxification. *European Psychiatry, 19*, 187–192.

Hartel, D.M., Schoenbaum, E.E., Selwyn, P.A., Kline, J., Davenny, K., Klein, R.S., & Friedland, G.H. (1995). Heroin use during methadone maintenance treatment: the importance of methadone dose and cocaine use. *American Journal of Public Health, 85*, 83–88.

Havassy, B.E., Alvidrez, J., & Owen, K. (2004). Comparisons of patients with comorbid psychiatric and substance use disorders: Implications for treatment and service delivery. *American Journal of Psychiatry, 161*, 139−145.

Helmus, T. C., Downey, K. K., Arfken, C. L., Henderson, M. J., & Schuster, C. R. (2001). Novelty seeking as a predictor of treatment retention for heroin dependent cocaine users. *Drug & Alcohol Dependence, 61*(3), 287-295.

Hesse M, Thylstrup B. (2008). Inter-rater agreement of comorbid DSM-IV personality disorders in substance abusers. *BMC Psychiatry* 8(37).

Hoshi, R., Mullins, K., Boundy, C., Brignell, C., Piccini, P. & Curran, H.V. (2007). Neurocognitive function in current and ex-users of ecstasy in comparison to both matched polydrug-using controls and drug-naïve controls. *Psychopharmacology, 194*(3), 371-379.

Hoxmark, E., Nivison, M., & Wynn, R. (2010). Predictors of mental distress among substance abusers receiving inpatient treatment. *Substance Abuse Treatment, Prevention, and Policy, 5,* 15.

Joe, G.W., & Simpson, D.D. (1995). HIV risks, gender, and cocaine use among opiate users. *Drug and Alcohol Dependence, 37*, 23–28.

Kahler, C.W., Spillane, N.S., Metrik, J., Leventhal, A.M., & Monti, P.M. (2009). Sensation seeking as a predictor of treatment compliance and smoking cessation treatment outcomes in heavy social drinkers. *Pharmacology, Biochemistry and Behavior, 93*, 285-290.

Kandel, D.B., Huang, F., & Davies, M. (2001). Comorbidity between patterns of substance use dependence and psychiatric syndromes. *Drug and Alcohol Dependence, 64*, 233-241.

Kedia, S., Sell, M.A. & Relyea, G. (2007). Mono- versus polydrug abuse patterns among publicly funded clients. *Substance Abuse Treatment, Prevention, and Policy, 2*, 33.

Kelly, B.C. & Parsons, J.T. (2008). Predictors and comparisons of polydrug and non-polydrug cocaine use in club subcultures. *American Journal of Drug and Alcohol Abuse, 34*(6), 774-781.

Kessler, R.C., Aguilar-Gaxiola, S., Andrade, L., Bijl, R., Borges, G., Caraveo-Anduaga, J.J., … Üstün, T.B. (2001). Mental-substance comorbidities in the ICPE surveys. *Psychiatria Fennica, 32*, 62– 80.

Kokkevi, A., Stefanis, N., Anastasopoulou, E., & Kostogianni, C. (1998). Personality disorders in drug abusers: Prevalence and their association with AXIS I disorders as predictors of treatment retention. *Addictive Behaviors, 23*(6), 841–853.

Kosten, T., Sofuoglu, M., Poling, J., Gonsai, K., & Oliveto, A. (2005). Desipramine treatment for cocaine dependence in buprenorphine- or methadone-treated patients: Baseline urine results as predictor of response. *American Journal on Addictions, 14*, 8–17.

Kravitz, H.M., Fawcett, J., McGuire, M., Kravitz, G.S., & Whitney, M. (1999). Treatment attrition among alcohol-dependant men: Is it related to novelty seeking personality traits? *Journal of Clinical Psychopharmacology, 19*, 51–56.

Kushner, M.G., Abrams, K., Thuras, P., Hanson, K.L., Brekke, M., & Sletten, S. (2005). Follow-up study of anxiety disorder and alcohol dependence in

comorbid alcoholism treatment patients. *Alcohol Clinical and Experimental Research, 29*, 1432–1443.

Lamers, C.T., Bechara, A., Rizzo, M. & Ramaekers, J.G. (2006). Cognitive function and mood in MDMA/THC users, THC users and nondrug using controls. *Journal of Psychopharmacology, 20*, 302–311.

Lieb, R., Schuetz, C.G., Pfister, H., von Sydow, K., & Wittchen, H. (2002). Mental disorders on ecstasy users: A prospective-longitudinal investigation. *Drug and Alcohol Dependence, 68*, 195–207.

Lyvers, M. (2006). Recreational ecstasy use and the neurotoxic potential of MDMA: current status of the controversy and methodological issues. Drug and Alcohol Review, 25, 269–76.

Magura, S., Kang, S.Y., Nwakeze, P.C., & Demsky, S. (1998). Temporal patterns of heroin and cocaine use among methadone patients. *Substance Use and Misuse, 33*, 2441–2467.

Malow, R.M., West, J.A., Corrigan, S.A., Pena, J.M., & Lott, W.C. (1992). Cocaine and speedball users: differences in psychopathology. *Journal of Substance Abuse Treatment, 9*, 287–291.

Marlowe, B., Kirby, C., Festinger, S., Husband, D., & Platt, J. (1997). Impact of Comorbid Personality Disorders and Personality Disorder Symptoms on Outcomes of Behavioral Treatment for Cocaine Dependence. *The Journal of Nervous and Mental Disease, 185*, 483-490.

Marsch, L.A., Stephens, M.A., Mudric, T., Strain, E.C., Bigelow, G.E., & Johnson, R.E. (2005). Predictors of outcome in LAAM, buprenorphine, and methadone treatment for opioid dependence. *Experimental and Clinical Psychopharmacology, 13*, 293–302.

Marsden, J., Gossop, M., Stewart, D., Rolfe, A., & Farrell, M. (2000). Psychiatric symptoms among clients seeking treatment for drug dependence – Intake data from the National Treatment Outcome Research Study. *British Journal of Psychiatry, 176*, 285–289.

Martinotti, G., Carli, V., Tedeschi, D., Di Giannantonio, M., Roy, A., Janiri, L., & Sarchiapone, M. (2009). Mono- and polysubstance dependent subjects differ on social factors, childhood trauma, personality, suicidal behaviour, and comorbid Axis I diagnoses. Addictive Behaviours, 34, 790-793.

McCabe, S.E., Cranford, J.A., Morales, M., & Young, A. (2006). Simultaneous and concurrent poly substance use of alcohol and prescription drugs: Prevalence, correlates, and consequences. *Journal of Studies on Alcohol, 67*, 529-537.Medina, K.L., & Shear, P.K. (2007). Anxiety, depression, and behavioral symptoms of executive dysfunction in ecstasy contribution of poly substance use. *Drug and Alcohol Dependence, 87*, 303-311.

Midanik, L.T., Tam, T.W., & Weisern, C. (2007). Concurrent and simultaneous drug and alcohol use: results of the 2000 National Alcohol Survey. *Drug and Alcohol Dependence, 90*, 72-80.

Mills, K.L., Lynskey, M., Teesson, M., Ross, J., Darke, S. (2005). Post-traumatic stress disorder among people with heroin dependence in the Australian treatment outcome study (ATOS): prevalence and correlates. *Drug and Alcohol Dependence, 77*, 243-249.

Moeller, F., Dougherty, M., Barratt, S., Schmitz, J., Swann, A., & Grabowski, J. (2001). The impact of impulsivity on cocaine use and retention in treatment. *Journal of Substance Abuse Treatment, 21*, 193– 198.

Oldham, J.M., Skodol, A.E., & Kelleman, H.D. (1995). Comorbidity of Axis I and Axis II disorders. *American Journal of Psychiatry, 152*, 571-578.

Parrott, A.C., (2001). Human psychopharmacology of Ecstasy (MDMA): a review of 15 years of empirical research. *Human Psychopharmacology, 16*, 557–577.

Parrott, A.C., Sisk, E., & Turner, J.J.D. (2000). Psychobiological problems in heavy 'ecstasy' (MDMA) poly substance users. *Drug and Alcohol Dependence, 60*, 105–110.

Passetti, F., Clark, L., Mehta, M.A., Joyce, E. & King, M. (2008). Neuropsychological predictors of clinical outcome in opiate addiction. *Drug and Alcohol Dependence, 94*(1-3), 82-91.

Patterson, T.L., Semple, S.J., Zians, J.K., & Strathdee, S.A. 2005). Methamphetamine-using HIV-positive men who have sex with men: Correlates of polydrug use. *Journal of Urban Health. 82*, (I Suppl 1), 120-126.

Peirce, J.M., Petry, N.M., Roll, J.M., Kolodner, K., Krasnansky, J., Stabile, P. Q., et al. (2009). Correlates of stimulant treatment outcome across treatment modalities. *American Journal of Drug and Alcohol Abuse, 35*, 48–53.

Pristach, C.A., & Smith, C.M. (1996). Self-reported effects of alcohol use on symtpoms of schizophrenia. *Psychiatric Services, 47*, 421–423.

Reich, J.H., & Vasile, R.G. (1993). Effect of personality disorders on the treatment outcome of Axis I conditions: an update. *The Journal of Nervous and Mental Disease, 181*, 475–484.

Rogers, G., Elston, J., Garside, R., Roome, C., Taylor, R., Younger, P. … Somerville, M. (2009). The harmful health effects of recreational ecstasy: a systematic review of observational evidence. *Health and Technological Assessment, 13*, 1–315.

Roiser, J.P., & Sahakian, B.J. (2004). Relationship between ecstasy use and depression: a study controlling for poly-drug use. *Psychopharmacology, 173*, 411-417.

Ross, S., Dermatis, H., Levounis, P. & Galanter, M. (2003). A comparison between dually diagnosed inpatients with and without axis II comorbidity and the relationship to treatment outcome. *American Journal of Drug and Alcohol Abuse, 29*, 263-279.

Salgado, D.M., Quinlan, K.J., & Zlotnick, C. (2007). The relationship of lifetime polysubstance dependence to trauma exposure, symptomatology, and psychosocial functioning in incarcerated women with comorbid PTSD and substance use disorder. *Journal of Trauma Dissociation, 8*(2), 9-26.

Schäfer, I. & Najavits, L.M. (2007). Clinical challenges in the treatment of patients with posttraumatic stress disorder and substance abuse. *Current Opinions in Psychiatry, 20*(6), 6148.

Schifano, F., Di Furia, L., Forza, G., Minicucu, N., & Bricolo, R. (1998). MDMA (ecstasy) consumption in the context of poly-drug abuse: A report of 150 patients. *Drug and Alcohol Dependence, 52*, 85–90.

Schutz, C.G., Vlahov, D., Anthony, J.C., & Graham, N.M. (1994). Comparison of self-reported injection frequencies for past 30 days and 6 months among intravenous drug users. *Journal of Clinical Epidemiology, 47*, 191–195.

Scott, R.M., Hides, L., Allen, J.S., Burke, R. & Lubman, D.I. (2010). Depressive and anxiety symptomatology in ecstasy users: the relative contribution of genes, trauma, life stress and drug use. *Psychopharmacology, 209*(1), 25-36.

Sellman, J.D., Mulder, R.T., Sullivan, P.F., & Joyce, P.R. (1997). Low persistence predicts relapse in alcohol dependence following treatment. *Journal of Studies on Alcohol, 58*, 257–263

Siever, L.J., & Davis, K.L. (1991). A psychobiological perspective on the

Sofuoglu, M., Gonzalez, G., Poling, J., & Kosten, T. (2003). Prediction of treatment outcome by baseline urine cocaine results and self-reported cocaine use for cocaine and opioid dependence. *American Journal of Drug and Alcohol Abuse, 29*, 713–727.

Soyka, M. (2000). Substance misuse, psychiatric disorder and violent and disturbed behaviour. *The British Journal of Psychiatry, 176*, 345-350.

Stinson, F.S., Grant, B.F., Dawson, D.A., Ruan, W.J., Huang, B. & Saha, T. (2005). Comorbidity between DSM-IV alcohol and specific drug use disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence*, *80*(1), 105-116.

Stitzer, M.L., Petry, N., Peirce, J., Kirby, K., Killeen, T., Roll, J., … Li, R. (2007). Effectiveness of abstinence-based incentives: Interaction with intake stimulant test results. *Journal of Consulting and Clinical Psychology, 75*, 805–811.

Strand, J.G., & Benjamin, L.S. (1997). Resistance to change in individuals with personality disorder. *Current Opinions in Psychiatry, 10*, 132–135.

Strathdee, G., Manning, V., Best, D., Keaney, F., Bhui, K., Witton, J., … Wilson Jones, C. (2002). *Dual Diagnosis in a Primary Care Group*. London: National Treatment Agency.

Thomasius, R., Petersen, K.U., Zapletalova, P., Wartberg, L., Zeichner, D., & Schmoldt, A. (2005). Mental disorders in current and former heavy ecstasy (MDMA) users. *Addiction, 100*, 1310–1319.

Thomasius, R., Peterson, K., Buchert, R., Andresen, B., Zapletalova, P., Wartberg, L., Nebeling, B., & Schmoldt, A. (2003). Mood, cognition and serotonin transporter availability in current and former ecstasy (MDMA) users. *Psychopharmacology, 167*, 85–96.

Tomasson, K., & Vaglum, P. (1995). A nationwide representative sample of treatment-seeking alcoholics: a study of psychiatric comorbidity. *Acta Psychiatrica Scandinavia, 92*, 378–385.

Torrens, M., San, L., Peri, J.M., & Olle, J.M. (1991). Cocaine abuse among heroin addicts in Spain. *Drug and Alcohol Dependence, 27*, 29–34.

Verdejo-García, A.J., López-Torrecillas, F., de Arcos, F.A., & Pérez-Garcia, M. (2005). Differential effects of MDMA, cocaine, and cannabis use severity on distinctive components of the executive functions in polysubstance users: A multiple regression analysis. *Addictive Behaviours, 30*, 89–101.

Verheul, R., van den Brink, W., & Hartgers, C. (1995). Prevalence of personality disorders among alcoholics and drug addicts: An overview. *European Addiction Research, 1*, 166-167.

Verheul, R., Krantzler, H.R., Poling, J., Tennen, H., Ball, S., & Rounsaville, B.J. (2000). Co-occurrence of Axis I and Axis II disorders in substance abusers. *Acta Psychiatrica Scandinavia, 101*, 110–118.

Verheul, R., van den Brink, W., Hartgers, C., & Koeter, M.W.J. (1999). Antisocial alcoholic patients show as much improvement at 14-month follow-up as non-antisocial alcoholic patients. *American Journal of the Addictions, 8*, 24–33.

Wareing, M., Murphy, P.N. & Fisk, J.E. (2004). Visuospatial memory impairments in users of MDMA ('ecstasy'). *Psychopharmacology 173*, 391-397.

Watkins, K.E., Hunter, S.B., Wenzel, S.L., Tu, W., Paddock, S.M., Griffin, A., & Ebener, P. (2004). Prevalence and Characteristics of Clients with Co-Occurring Disorders in Outpatient Substance Abuse Treatment. *American Journal of Drug and Alcohol Abuse*, *30*(4), 749–764.

Weaver, T., Charles, V., Madden, P., & Renton, A. (2002). *Co-morbidity of Substance Misuse and Mental Illness Collaborative Study (COSMIC): A study of the prevalence and management of co-morbidity amongst adult substance misuse and mental health treatment populations*. London: DH/NTA.

Weiss, R.D., Martínez-Raga, J., & Hufford, C. (1996). The significance of a coexisting opioid use disorder in cocaine dependence: an empirical study. *American Journal of Drug and Alcohol Abuse, 22*, 173–184.

Weiss, R. D., Griffin, M. L., Kolodziej, M. E., Greenfield, S. F., Najavits, L. M., Daley, D. C., et al. (2007). A randomized trial of integrated group therapy versus group drug counseling for patients with bipolar disorder and substance dependence. *American Journal of Psychiatry*, *164*(1), 100-107.

Widiger, T.A., & Samuel, D.B. (2005). Evidence-based assessment of personality disorders. *Psychological Assessment, 17*(3), 278-287.

Williamson, A., Darke, S., Ross, J., & Teesson, M. (2004). *The effect of cocaine use on short term outcomes for heroin dependence (National Drug and Alcohol Research Centre Technical Report No. 190).* Sydney: University of New South Wales.

Williamson, A., Darke, S., Ross, J., & Teesson, M. (2006). The effect of persistence of cocaine use on 12-month outcomes for the treatment of heroin dependence. *Drug and Alcohol Dependence*, *28*, 293-300.

Winters, K.C., Stinchfield, R.D., Opland, E., Weller, C., & Latimer, W.W. (2000). The effectiveness of the Minnesota Model approach in the treatment of adolescent drug abusers. *Addiction, 95*, 601–612.

Chapter 3

Female poly substance use and psychopathology:

A review of gender differences

Edle Ravndal
Wouter Vanderplasschen

3.1 Introduction

In the literature on substance use, many different definitions of the substances at use and the degree of dependence are used[1]. 'Alcohol use', 'drug use', 'substance use', 'poly-substance use', and 'poly drug use' are among the most used classifications. Concerning the *degree* of dependence terms like substance/drug use, misuse, abuse, and addiction are most common. However, the use of these classifications in the literature, is not always based on the same definitions, which makes it quite difficult to compare studies of (apparently) more or less similar populations.

The aim of the present review is to look at gender differences in psychopathology among poly substance abusers. Studies with substance use populations that have quite similar patterns of illicit drug use and poly drug use are included. Also, some studies of female alcohol abuse are included in order to investigate whether there are clear differences women using legal and illegal substances. The term '*substance abuse',* which may also include abuse of alcohol, is used in this chapter since this seems to be the most commonly used classification in the literature.

When reviewing the literature on gender differences on the subject of substance use and psychopathology one should be aware of some methodological constraints. First, the prevalence of Axis I and Axis II disorders may vary according to certain *sample characteristics* such as age, setting and primary substance. For example, it is well known that non-maintenance clients in inpatient settings, as compared to clients in outpatient settings, have more severe substance abuse problems and more psychiatric co-morbidity. Second, *diagnostic criteria* (depending on the classification system), the time-frame that is employed and exclusion criteria, may vary between studies. Finally, differences in the *assessment procedure* may have an effect on the observed prevalence rates. For example, some authors argue that self-report instruments overestimate the prevalence of personality disorders (PDs) compared to

[1] Literature search was performed using following databases: Medline, Psychlit, Embase and ISI (National Library on Addictions, Norwegian Institute of Alcohol and Drug Research).

interview methods (Hunt et al., 1992; Widiger et al., 1987). Other authors contend that even if the two methods will assess a certain rate of PDs, they will identify somewhat different dimensions of the same underlying disorder (Torgersen & Alnæs, 1990, Butler et al., 1991).

In almost all studies, information is reported on the setting, primary substance and assessment methods, while information on gender distribution, time-frame and exclusion criteria is provided in fewer studies. Actually, available studies on alcohol and drug dependence pay little or no attention to gender differences. Moreover, co-morbid DSM-IV Axis I and II disorders in substance abusers have mostly been studied separately. Also, there is limited knowledge about the relationship between gender and personality disorders (PD) in different subtypes of substance abusers (Landheim et al., 2003).

With this background and limitation in mind, we present the main characteristics of female substance abusers regarding prevalence and nature of Axis 1 and Axis II disorders. However, not only Axis I and II disorders may present different problems among males and females. Women's different way of behaving and relating to others seems of utmost importance when trying to understand their substance abuse problems and for supporting them when they seek treatment (Beyer & Conahan, 2002). Similarly, it is important to take into consideration that women's biological and genetic reaction to various substances may be quite different as compared with men.

3.2 Psychiatric co-morbidity and gender differences

Large-scale, national studies using community samples show consistent gender differences in the prevalence of psychiatric disorders (Regier et al., 1988; Kessler et al., 1994; Grant et al., 2004). Anxiety and affective disorders are most likely to occur in women, while substance use disorders, conduct disorders, and antisocial personality disorders are common in men (Kessler et al., 1997).

3.2.1 Prevalence of psychiatric symptoms among substance abusers in the general population

Data from the National Co-morbidity Survey (NCS) collected in 1994 were analysed to derive gender differences and similarities in psychiatric co-morbidity among problem drinkers in the community (Kessler et al, 1997). The majority of persons with an alcohol disorder had at least one psychiatric disorder, and this co-occurrence was stronger among women. The lifetime prevalence of alcohol abuse was 6.4% among women, and 12.5% among men. Lifetime alcohol dependence rates were 8.2 and 20.1%, respectively. Lifetime drug dependence co-occurred with alcohol dependence among 34.5% of women and 29.5% of men. Moreover, a larger proportion of women with alcohol abuse or dependence reported prior anxiety disorders, affective disorders, and drug use disorders. The presence of prior psychiatric disorders was predictive for alcohol dependence, especially among women. Finally, lifetime comorbidity was associated positively with the persistence of alcohol dependence in women as well as men (Kessler et al, 1997).

3.2.2 Prevalence of personality disorders among substance abusers in the general population

The prevalence of personality disorders (PD) has seldom been studied in the general population. The Epidemiological Catchment Area (ECA)-study showed that 14% of all persons with an alcohol use disorder had an antisocial PD, while this prevalence was somewhat higher (18%) for persons with other substance disorders (Regier et al., 1988). Another population study from the United States indicated that among persons with an alcohol use disorder 29% had at least one PD, compared with 48% among persons with a drug use disorder. Antisocial, histrionic and dependent PDs were the most common disorders among alcohol as well as drug abusers (Grant et al., 2004).

In general, available studies show a high prevalence of psychiatric symptoms and PDs among persons with substance abuse, which is much higher than among persons without substance abuse. In addition, drug abusers show higher prevalences of psychiatric symptoms and PDs than alcohol abusers. Most studies indicate that the more serious the substance abuse, the more serious the psychiatric disorders. Overall, more psychiatric symptoms are observed among female substance abusers. Persons with the most severe patterns of substance abuse and psychiatric disorders are more prone to present for treatment (i.e., the Berkson's fallacy). Consequently, the prevalence of psychiatric co-morbidity is consistently higher in clinical than in general population samples.

3.2.3 Prevalence of psychiatric symptoms among substance abusers in treatment

In a review of 16 studies that assessed psychiatric symptoms among alcohol and/or drug abusers in treatment, eight studies reported gender differences (Landheim, 2007). The 16 selected studies were based on well-known diagnostic instruments, included ≥ 100 persons and were cross-checked with two other relevant literature reviews (cf. Bradizza et al., 2006; Hintz & Mann, 2005). Most studies had investigated the lifetime prevalence of psychiatric symptoms. In six of the studies, females had a higher prevalence of psychiatric symptoms than males, but when calculating the median value no differences were observed between women and men regarding the total prevalence of psychiatric symptoms (Landheim, 2007). In samples with females, prevalence rates varied between 33 and 85% (median: 69%), while in samples with males the corresponding percentages were 16 and 84% (median: 70 %).

On the other hand, several individual studies have shown significant differences in psychopathology between women and men who seek help for substance dependence (Brady et al., 1993; Magura et al., 1998). In a descriptive study of 100 inpatient substance abusers (Brady et al., 1993), women were significantly more likely to have another current Axis I disorder in addition to their substance abuse. The finding is consistent with the ECA-study of the general population,

that found that Axis I diagnoses were twice as prevalent among women (Regier et al., 1988). Women had almost twice the number of current anxiety disorders as men, in particular panic disorders (18 vs. 10%) and post-traumatic stress disorders (PTSD) (46 vs. 24%). No significant differences were found in the rates of affective disorders between female and male substance abusers, which was in contrast with the findings from the ECA-study in which major depression was twice as common in women as in men (Weissman & Klerman, 1977). In addition, the majority of addicted men experienced the onset of depression after the onset of substance abuse, indicating more substance-induced depressive disorders among men. For both women and men, social phobia and PTSD predated the onset of substance dependence in most cases, which rather supports a self-medication hypothesis.

Findings from the BioMed II IPTRP-project, including a sample of 828 inpatient residents of 30 different therapeutic communities from nine European countries (De Wilde, 2005), are in line with findings from American studies in this field. Based on EuropASI-data it appeared that women were more likely to report depressive feelings, problems in understanding, concentrating or remembering, and the prescription of medication for psychologocial problems as compared with their male counterparts (De Wilde et al., 2004). They also reported more suicidal ideation and women had attempted suicides more often than men. Female residents had more often a history of sexual abuse.

Even more pronounced gender differences have been found among primary alcoholics (Landheim, 2007). Female alcoholics had substantially more anxiety and affective disorders than men and the gender ratios were consistent with the ECA-data. Panic disorders were significantly more likely to predate alcoholism in women, supporting the hypothesis that alcohol is used to self-medicate. On the other hand, contrast, no significant gender differences in psychopathology were found among primary cocaine dependent persons. Cocaine use did not precipitate depressive episodes that outlasted the intoxication and withdrawal period, thereby minimizing any gender differences.

Landheim and colleagues (2003) demonstrated in their study of poly substance abusers and pure alcoholics who presented for treatment that the prevalence of PTSD was significantly higher among female poly substance abusers than among female alcoholics (38 vs. 17%). Moreover, more female than male poly substance abusers had PTSD (38 vs. 21 %).

In a study of 212 methadone clients who were dependent on opiates and cocaine, women were more likely to present with a concurrent mood or anxiety disorders than men (Magura et al., 1998). Methadone-dependent women with an antisocial PD were more likely to continue their opiate use, but were less likely to have a concurrent alcohol use disorder. In a study of treatment-seeking opiate abusers (Brooner et al., 1997), lifetime psychiatric comorbidity (especially major depression, social phobia and eating disorders) was more than twice as common among women than among men.

A high frequency of PTSD among female poly substance abusers has been found in various clinical and epidemiological studies (Helzer et al., 1987; Cottler et al., 1992; Brady et al., 1998). In a longitudinal, national study from the U.S., Kilpatrick and colleagues (1997) demonstrated that the use of illicit drugs was strongly associated with sexual as well as physical assault in women. Based on the ECA-study, Cottler and colleagues (1992) found that female gender and the use of cocaine or opiates were the strongest predictors of PTSD. This illustrates the importance of identifying and focusing of PTSD in the treatment of female substance abusers.

In a study of persons presenting for detoxification and residential dual diagnosis treatment, women more often had affective disorders, while men were more often admitted with a diagnosis of schizophrenia (Westreich et al., 1997). More omen had a diagnosis of psychosis, substance-induced hallucinations and borderline PD. The higher percentage of women with a psychiatric treatment history may suggest that substance abusing women are more often directed to psychiatric than to addiction services as compared with men. Women also reported being fearful of treatment due to the belief that they could lose their

children or that there would be inadequate care for their children (Westreich et al., 1997). These findings replicated the results of an earlier study of dually diagnosed outpatients (Comtois & Ries, 1995), which also found that women were more often diagnosed with affective disorders and men with schizophrenia.

3.2.4 Prevalence of personality disorders among substance abusers in treatment

Although prevalence rates of PDs among substance abusers in treatment vary greatly, average rates are rather high (median: 61%) and more prevalent among drug than among alcohol abusers (Landheim, 2007). Few studies have examined PDs and gender differences.

Verheul and colleagues (1995) summarized 52 studies that investigated the total prevalence of PDs and of antisocial and borderline PD among substance abusers in treatment. Twelve of these studies looked at gender differences, but only three studies assessed the prevalence of all PDs. All three studies showed a tendency towards more PDs among women than among men. More men than women had an antisocial PD (median: 39 vs. 19%), while no gender difference was found for borderline PDs.

A Norwegian study examined gender differences in the prevalence of psychiatric symptoms and PDs among substance abusers presenting for treatment (n=260) (Landheim et al., 2003). It was concluded that major depression, PTSD and eating disorders were significantly more prevalent in women than in men. In particular, female poly-substance abusers differed significantly from all other substance abusers by suffering more often from major depression, simple phobia, PTSD, and borderline PD. Male poly-substance abusers more often presented with antisocial PD and less often with Cluster C disorders. Overall, rather small gender differences were found and the primary substance of abuse appears to be a more important variable than gender for explaining differences in prevalence and type of Axis II disorders. By contrast, gender (and not the primary substance) is the most important explanatory factor regarding the prevalence and type of Axis I disorders.

3.3 Different perspectives on gender and treatment

3.3.1 A relational perspective

In the 1970s, the psychological and social development of women began to be studied by progressive feminists like Miller (1976) and Gilligan (1982) and their colleagues at the Stone Center at Wellesley College in the US. Their qualitative research suggested that female development rather occurs in the context of relationships, with mutually empathic and giving relationships being both a source and goal of development. This contrasts with traditional developmental theories that have ignored or pathologized much of women's experiences by studying males and generalizing their experiences to females. According to these female-specific theories, women's focus on relationships is seen as natural and necessary, rather than categorised as 'dependent' or a 'lack of self-esteem'.

According to Miller (1976), women's use of substances should be regarded as an attempt to repair and re-establish destructive relationships. The substance becomes a remedy to endure untenable relations, while substance abuse develops through vicious circles in which the substance deteriorates the quality of the relationship, which – in turn – results in even higher substance use. This phenomenon has been described as the "depressive spiral" (Miller, 1990), in which dysfunctional relationships provoke feelings of contempt, confusion and exhaustion. According to Miller, addiction is the woman's answer to the wish, the need and the loss of taking part in meaningful relationships.

Gilligan (1982) states that the primary task of moral development of girls and women is to achieve a balance between self-nurture and care for others, not between separation and autonomy. This balance fosters a heightened awareness and appreciation of the self. This feminist view of development gives significant weight to contextual influences from media and peers. The significant changes in expectations and negative influences that girls face when they switch to puberty, often increases their vulnerability for drug and alcohol abuse and other mental health problems.

3.3.2 Dysfunctional families of origin

It is assumed that female substance abusers are more likely to come from dysfunctional families of origin. Higher rates of mental illness, alcoholism, drug dependence and depression have been observed in early family life of substance abusing women (Straussner, 1985). On the other hand, some studies indicate that males have experienced as much emotional and physical problems in their families of origin as females, but that the meaning of these adverse circumstances is experienced and talked about in a different way by women than by men (Biong & Ravndal, 2007). However, most studies show that sexual abuse in the family of origin as well as by other people in the surroundings of these families, is far more frequent among female substance abusers (Gil-Rivas et al., 1997; Melberg et al., 2003).

Women typically identify significant life-events connected to family issues as precipitating factors to their substance abuse when entering treatment. Such events may be miscarriage, loss of contact with their children, infidelity, separation, divorce, … It is detrimental for their treatment participation when women are chastised for blaming their addiction problems on these events. Instead, it is important to empathize with the impact of these precipitants during the addiction process. Primary motivators for women to enter treatment are physical and emotional concerns as well as family issues, while men are rather affected by job and legal problems (Blume, 1997; Ravndal, 2008).

3.3.3 The role of the partner

Women who lack or who have lost significant relationships are at greater risk for developing substance abuse problems (Ravndal, 1982; Wilsnack et al., 1986). Interestingly, women who were living/cohabitated with their partners were more likely to be heavy drinkers than those who were married (Wilsnack et al., 1986). Several explanations may be possible, one being that couples who do not get married and just live together, are rather living according to non-traditional

values, hence the female drinking pattern may be different. It might also be that cohabitation, in contrast to being married, is an expression of an emotionally more difficult relationship, where alcohol consumption helps relieve emotional problems and less satisfying relationships. Yet, it is more important that women's drinking pattern is highly correlated with that of their significant others. Research shows that most substance abusing women begin their use under the influence of a significant male in their life (Hser et al., 1987; Ravndal, 2008). By contrast, men are more likely to start using substances in the context of male peer relationships. Moreover, women who enter substance abuse treatment are more likely than men to have an addicted partner, whose substance use patterns are adopted (Dahlgren & Willander, 1989; Ravndal, 2008). Substance abusing women are also more likely to be divorced or separated and describe their existing relationships as less happy and supportive (Schilit & Gomberg, 1987; Dahlgren & Willander, 1989). Finally, women who present for treatment, experience more blame and opposition from their families and friends and report more conflicts with them than men do (Beckman & Amaro, 1986).

3.3.4 The relational model in substance abuse treatment

Covington (1999), who is a pioneer in integrating the relational development theory in substance abuse treatment, has conceptualised the process of addiction and recovery as a spiral. As addiction progresses, it constricts the woman's life until she is totally focused on the substance. The dependence on substances becomes the primary relationship in the woman's life, at the expense of self-care and participation in other relationships and activities. Recovery is a process of transformation that allows a woman to expand her sphere of focus to encompass healthy relationships and other positive activities that promote her self-esteem. Understanding the impact of relationship history has significant implications on the understanding of women's addictive behavior (Ravndal & Vaglum,1994). According to Covington (1999) women may use substances to alter themselves to fit into their available relationships (i.e. to manage the partner's addiction, to engage in sex or cope with violence). Imbalances of power or responsibilities can

significantly decrease a woman's self-esteem. Substance use may provide energy, a sense of power and relief from confusion, compensating for what the relationship is not providing.

When women in treatment are asked what the substance did for them, they are typically able to state what attracted them to the substances and how it helped them to cope. It is very easy for women to conceptualise their relationship with a substance. In a therapeutic community (TC) in Norway (Veksthuset/Phoenix House, Oslo), women in the re-entry phase typically struggled a lot with their grief in the process of giving up their favorite drug during special women groups. Their wordings and reactions were hearth-breaking and very similar to saying goodbye for ever to their most beloved boyfriend (Ravndal, 1990)[2]. Because of this strong association, women with co-occurring mental disorders need to have the ability to acknowledge the positive things that the substance did for them, in order to more fully grieve at the need to let it go. Focusing solely on the consequences of their substance use may not touch at their alliance with the substance. As mentioned earlier, most addicted women date the onset of their heaviest use to some stressful event. Discouraging women from talking about the meaning of this event, since it would foster self-pity instead of self-responsibility, ignores the contextual factors that are so important to women. Although the importance of precipitating events and understanding the meaning of their impact is increasingly acknowledged in the field of mental health care, pharmacological interventions foster the primacy of a medical model, which is primarily directed at the management of symptoms and does not necessarily address contextual variables.

The relational theory is supported by the philosophy of 12-step programs for women, but it also calls for change (Covington, 1999). Twelve-step meetings and the therapeutic community-model have always prioritised making connections and have even elevated the value of relationships, by emphasising their spiritual nature, which can be regarded as fostering a feminist approach. However, women's unique problems and issues in early recovery and their need

[2] Written notes from participant observations in women's groups at Veksthuset 1987-1990.

for less hierarchical, more collaborative relationships may not be ignored, and their focus on relationships should be addressed sensitively.

Recovering women who struggle with the balance between self-care and care for others, are often viewed as being 'relationship'-dependent or co-dependent, while in reality this struggle with priorities is well within the realm of normal for women. Therefore, women's focus on relationships can be used to enhance motivation for recovery. Women can be counselled on how they sacrifice too much of themselves, in order to mold themselves to fit into relationships with persons who are unwilling or unable to change without pathologising their relationship desires and commitment (Ravndal, 1982; Ravndal & Vaglum, 1994; Collins, 1993; Favorini, 1995; Lossius, 2008).

3.4 Physical and biological gender differences

Some physical and biological gender differences are of great importance for the understanding of female substance abuse and psychopathology. Most often gender, psychopathology, physiology and biology are tied together in intrinsic patterns which have to be understood and dealt with, in order to give female substance abusers adequate and professional help. The most important issues are discussed in what follows.

3.4.1 Physical differences

Biological differences in how women metabolize alcohol increase the probability that they will experience physical consequences more rapidly, even with a lower intake of substances. This phenomenon has primarily been attributed to alcohol being more dilute in the bodies of men who have more water and less fat cells, but also to the fact that women have less of the stomach enzyme 'alcohol dehydrogenase', which induces the metabolism of alcohol (Frezza et al., 1990). Far less alcohol is digested and it goes more directly to body tissues. Therefore, it is more likely that women react more intensely to a given dose of alcohol and

that the effects are less predictable (Blume, 1997). Due to women's body proportion of fat and water (which increases with age), also benzodiazepines and barbiturates have longer half-lives and marijuana takes longer to clear (Barry, 1986). The physical effects of alcohol use have a more severe course and more rapid onset in women, probably due to increased chronic concentrations in their body systems (Blume, 1997).

3.4.2 "Telescoped development"

For women abusing alcohol, less years have been observed between landmark symptoms and the progression to later stages of addiction. This has been called the 'telescoped effect' of the progression of the disorder in women (Piazza et al., 1989). Some contend that this syndrome is particularly pronounced for women who are depressed before the onset of their alcohol abuse (Smith & Cloninger, 1981). Analyses of ECA-data confirm the rapid development of alcohol dependence in women, but conclude that this rapid accrual of alcoholic symptoms in women is independent of psychiatric co-morbidity and amount of alcohol consumption (Lewis et al., 1996).

3.4.3 Fertility, sex and promiscuity

Alcohol and drugs interfere with women's fertility and can exacerbate gynecological disorders (Blume, 1997). The presence of premenstrual dysphoria has been associated with increased frequency of alcohol and marijuana use, and women with diagnosable premenstrual syndrome had higher rates of alcohol abuse and dependence (Tobin et al., 1994). Unsafe sex, trading sex for drugs, or relationships with addicted partners are associated with increased prevalence of sexually transmittable diseases. Sexual dysfunctions, such as lack of desire, inability to have an orgasm, and painful intercourse, can provoke alcohol and drug use to cope with these problems, or they may be consequences of addiction.

A subjective need for substances in order to perform sexually may lead to the avoidance of sexual relations among recovering women (Blume, 1997).

As opposed to popular opinions, research shows that alcohol dependent women are not necessarily more promiscuous under the influence of alcohol. Based on a representative population survey, Wilsnack and colleagues (1986) have demonstrated that 60 percent of female drinkers experienced sexual aggression by someone else who had been drinking. Other authours (Blume, 1997) found that 16% of alcohol dependent women reported being raped during their drinking history, and a larger proportion was likely to have experienced violence from their spouses. Stigmatization of female substance abusers is a well-documented phenomenon. Despite studies that have dispelled the stereotype of increased promiscuity, substance abusing women typically internalise the shame and guilt society and accepted cultural and moral norms place on them.

3.4.4 Pregnancy

The impoverished environment often associated with illegal drug use, as well as the stigma associated with drug use during pregnancy is another important issue for female substance users. Although the Fetal Alcohol Syndrome (FAS) caused by alcohol misuse during pregnancy is a more prevalent and persistent problem than the Neonatal Abstinence Syndrome (NAS) among children of heroin addicted mothers, in particular drug abusing women who become pregnant receive most negative attention and moral condemnation. For all substance abusing females, the shame of not living up to the expected female values of being a ‘good and caring mother’ has prevented many addicted women to seek treatment in due time. Unresolved maternal grieving about an abortion or the potential negative effects of addiction on their children and/or the loss of custody are significant treatment issues that can contribute to depression and behavioural problems in addicted women (Raskin, 1992). Addiction may have severe effects on the maternal-infant bonding anc can cause lifelong ramifications. The shame, guilt, loss and fear of separation from their infants that addicted mothers feel can

create important barriers to treatment entry and complicate their cooperation and compliance during treatment.

3.5 Conclusion

The literature focusing on female poly drug abuse and psychopathology is scarce and several methodological problems need to be considered. Differences in sample characteristics, diagnostic criteria and assessment procedures are the main factors which cause problems in drawing final conclusions. The prevalence of Axis I and II disorders vary largely between population and clinical samples. In general, persons with severe substance abuse and more psychiatric disorders are more prone to present for treatment. Hence, the prevalence of psychiatric co-morbidity is higher in studies of clinical populations than in general population studies. In a literature review of various treatment populations, women had a higher prevalence of psychiatric symptoms than males, but based on the median values from these studies there were no differences between females and males regarding the total prevalence of psychiatric symptoms. In samples with females, the prevalence varied between 33 and 85%, while in samples with males the corresponding percentages were 16 and 84%. However, in several other treatment studies the prevalence of depression, anxiety disorders, post-traumatic stress disorders (PTSD) and eating disorders was significantly higher among female substance abusers. Very few studies have examined personality disorders (PD) and gender differences among substance abusers. Based on a literature review, a tendency towards more PDs among women than among men was observed. The prevalence of antisocial PDs was significantly higher among males than among females, while no gender difference was found for borderline PDs.

A relational perspective is needed for understanding female substance abuse and to enhance motivation for recovery. Moreover, physical and biological gender differences play a role in understanding female substance abuse and psychopathology. Consequently, several authors have suggested a gender-

sensitive approach in substance abuse treatment, given their specific problems in various areas of functioning.

REFERENCES

Barry, P.P. (1986). *Gender as a factor in treating the elderly* (NIDA Research Monograph 65). Rockville: National Institute on Drug Abuse.

Beckman, L., & Amaro, H. (1986). Personal and social difficulties faced by women and men entering alcoholism treatment. *Journal of Studies on Alcohol, 47*, 135-145.

Beyer, E., & Conahan, J.A. (2002). Females with dual diagnoses. Implications for specialized clinical approaches. In: O'Connell D & Beyer E (eds.), *Managing the Dually diagnosed Patient*. Binghamton, NY: The Haworth Press, Inc. (pp. 99-151).

Biong, S., & Ravndal, E. (2007). Young men's experiences of living with substance abuse and suicidal behaviour: Between death as an escape from pain and the hope for a life. *International Journal of Qualitative Studies on Health and Well-being, 2*, 246-259.

Blume, S.B. (1997). Women: Clinical aspects. In: Lowinson, J.H., Ruiz, P., Millman, R.B., & Langrod, J.G. (Eds), *Substance abuse: A comprehensive textbook* (3rd edition). Baltimore: Williams & Wilkins (pp. 645-654).

Brady, K.T., Grice, D.E., Dustan, L., & Randall, C. (1993). Gender difference in substance use disorders. *American Journal of Psychiatry, 150*, 1707-1711.

Brady, K.T., Dansky, B.S., Sonne, S.C., & Saladin, M.S. (1998). Post-traumatic stress disorder and cocaine dependence: Order of onset. *American Journal of Addictions, 7*, 128-135.

Bradizza, C.M., Stasiewicz, P.R., & Paas, N.D. (2006). Relapse to alcohol and drug use among individuals diagnosed with co-occurring mental health and substance use disorders: a review. *Clinical Psychology Review, 26*, 162-178.

Brooner, R.K., King, V.L., Kidorf, M., Schmidt, C.V., & Bigelow, G.E. (1997). Psychiatric and substance use comorbidity among treatment-seeking substance opioid abusers. *Archives of General Psychiatry, 54*, 71-80.

Butler, S.F., Gaulier, B., & Haller, D. (1991). Assessment of axis II personality disorders among female substance abusers. *Psychological Reports, 68*, 1344-1346.

Collins, B. (1993). Reconstruing codependency using self-in-relation theory: A feminist perspective. *Social Work, 38*, 470-476.

Comtois, K.A., & Ries, R.K. (1995). Sex differences in dually diagnosed severely mentally ill clients in dual-diagnosis outpatient treatment. *American Journal on Addictions, 4*, 245-253.

Cottler, J.B., Compton, W.M.D., Mager, D., Spitznagel, E.L., & Janca, A. (1992). Post-traumatic stress disorders among substance abusers from the general population. *American Journal of Psychiatry, 149*, 664-670.

Covington, S. (1999). *Helping women recover: A program for treating addiction*. New York: Guilford Press.

Dahlgren, E., & Willander, A. (1989). Are special treatment facilities for female alcoholics needed? A controlled 2-year follow-up study from a specialized female unit (EWA) versus mixed male/female treatment facility. *Alcoholism: Clinical and Experimental Research, 13*, 499-504.

De Wilde, J., Soyez, V., Broekaert, E., Rossel, Y., Kaplan, C., & Larsson, J. (2006). Problem severity profiles of substance abusing women in European

therapeutic communities: Influence of psychiatric problems. *Journal of Substance Abuse Treatment, 26*, 243-251.

De Wilde, J. (2005). *Gender-specific profile of substance abusing women in therapeutic communities in Europe* (doctoral thesis). Ghent: Ghent University, Faculty of Psychology and Educational Sciences.

De Wilde, J., Broekaert, E., & Rosseel, Y. (2006). Problem severity profiles of clients in European therapeutic communities: Gender differences in various areas of functioning. *European Addiction Research, 12*, 128-137.

Favorini, A. (1995). Concept of codependency: Blaming the victim or pathway to recovery? *Social Work, 40*, 827-830.

Frezza, M., DiPadova, C., Pozzato, G., Terpin, M., Baroona, E., & Lieber, C.S. (1990). High blood alcohol levelsin women: The role of decreased gastric alcohol dehydrogenase activity and first-pass metabolism. *New England Journal of Medicine, 12*, 871-878.

Gilligan, C. (1982). *In a different voice. Psychological theory and women's development*. Cambridge, MA: Harvard University Press.

Gil-Rivas, V., Fiorentine, R., Anglin, D., & Taylor, E. (1997). Sexual and physical abuse: Do they compromise drug treatment outcomes? *Journal of Substance Abuse Treatment, 14*, 351-358.

Grant, B.F., Stinson, F.S., Dawson, D.A., Chou, S.P., Ruan, W.J., & Pickering, R.P. (2004). Co-occurrence of 12 month alcohol and drug use disorders and personality disorders in the United States: Results from the National Epidemiologic Survey on alcohol and related conditions. *Archives of General Psychiatry, 61,* 361-368.

Griffin, M.L., Weiss, R.I., Mirin, S.M., & Lang, U. (1989). A comparison of male and female cocaine abusers. *Archives of General Psychiatry, 46*, 122-126.

Helzer, J.E., Robins, J.N., & McEvoy, L. (1987). Post-traumatic stress disorders in the general population : Findings of the epidemiologic catchment area survey. *New England Journal of Medicine, 317*, 1630-1634.

Hintz, T., & Mann, K. (2005). Comorbidity in alcohol use disorders: Focus on mood, anxiety and personality. In: Stohler, R., & Rössler, W. (eds.), *Dual Diagnosis. The evolving conceptual framework* (Bibliotheca Psychiatrica No. 172). Basel: Karger, pp. 65-91.

Hser, Y., Anglin, M., & McGlothlin, W. (1987). Sex differences in addict careers: I. Initiation of use. *American Journal of Drug Abuse, 13*, 33-57.

Hunt, C., & Andrews, G. (1992). Measuring personality disorders: A review of issues and research methods. *Archives of General Psychiatry, 149*, 1645-1653.

Kessler, R.C., McGonagle, K.A., Zhao, S., Nelson, C.B., Hughes, M., Eshleman, S., ... Kendler, K.S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the US. Results of the National Comorbidity Study. *Archives of General Psychiatry, 51*, 8-19.

Kessler, R.C., Crum, R.M., Warner, L.A., Nelson, C.B., Schulberg, J., & Anthony, J.C. (1997). Lifetime co-occurance of DAM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Archives of General Psychiatry, 54*, 313-321.

Kilpatrick, D.G., Acierno, R., & Resnick, H.K. (1997). A 2-year longitudinal analysis of the relationships between violent assaults and substance use in women. *Journal of Consulting Clinical Psychology, 65*, 834-847.

Landheim, A. (2007). *Psychiatric disorders among patients in the substance abuse field: Prevalence and association to the longtime outcome of substance abuse* (Doctoral thesis). Oslo: University of Oslo, Department of Behavioral Sciences in Medicine.

Landheim, A., Bakken, K., & Vaglum, P. (2003). Gender differences in the prevalence of symptom disorders and personality disorders among poly-substance abusers and pure alcoholics. *European Addiction Research, 9*, 8-17.

Lewis, C.E., Bucholz, K.K., Spitznagel, E., & Shayka, J.J. (1996). Effects of gender and comorbidity on problem drinking in a community sample. *Alcoholism: Clinical and Experimental Research, 20*, 466-476.

Lossius, K. (2008). Kvinner, alkohol og behandling (Women, Alcohol and Treatment). In: Duckert F, Lossius K, Ravndal E, Sandvik B (eds), *Women and Alcohol (Kvinner og alkohol)*. Oslo: Universitetsforlaget, pp. 107-143.

Magura, S., Kang, S.Y., Rosenblum, A., Handelsman, L., & Foote, J. (1998). Gender differences in psychiatric comorbidity among cocaine-using opiate addicts. *Journal of Addictive Diseases, 17*, 49-61.

Miller, J.B. (1976). *Toward a new psychology of of women* (Second edition). Boston: Beacon Press.

Miller, J.B. (1990). *Connections, disconnections and violations. Work in progress no. 33.* Wellesley, MA: Stone Center, Working Paper Series.

Piazza, N.J., Vrbka, J.L., & Yeager, R.D. (1989). Telescoping of alcoholism in women alcoholics. *International Journal of Addictions, 24*, 19-28.

Raskin, V.D. (1992). Maternal bereavement in the perinatal substance abuser. *Journal of Substance Abuse Treatment, 9*, 149-152.

Ravndal, E. (2008). Kvinner og alkohol (Women and Alcohol). In: Duckert F, Lossius K, Ravndal E, & Sandvik B (eds), *Kvinner og alkohol (Women and Alcohol)*. Oslo: Universitetsforlaget, pp. 37-66.

Ravndal, E., & Vaglum, P. (1994).Treatment of female addicts: The importance of relationships to parents, partners and peers for the outcome. *The International Journal of the Addictions, 29*, 115-125.

Ravndal, E. (1982). *Hvordan kvinner selv kan mestre sine alkoholproblemer (How females themselves can cope with their own alcohol problems).* Oslo: National Institute for Alcohol and Drug Research.

Regier, D.A., Boyd, J.H., Burke, J.D., Rae, D.S., Myers, J.K., Kramer, M., ... Locke, B.Z. (1988). One month prevalence of mental disorders in the US. *Archives of General Psychiatry, 45*, 977-986.

Regier, D.A., Farmer, M.E., Rae, D.S., Locke, B.Z., Keith, S.J., Judd, L.L., & Goodwin, F.K. (1990). Comorbidity of mental disorders with alcohol and other drug abuse. Results from the The Epidemiological Catchment Area (ECA) Study. *Journal of the American Medical Association, 264*, 2511-2518.

Schilit, R., & Gomberg, E. (1987). Social support structures of women in treatment for alcoholism. *Health and Social Work, 12*, 187-195.

Smith, E.M., & Cloninger, C.R. (1981). Alcoholic females: Mortality at twelve-year follow-up. *Focus on Women, 2*, 1-3.

Straussner, S. (1985). Alcoholism in women: Current knowledge and implications for treatment. *Alcoholism Treatment Quarterly, 5*, 139-155.

Tobin, M.B., Schmidt, M.D., & Rubinow, D.R. (1994). Reported alcohol use in women with premenstrual syndrome. *American Journal of Psychiatry, 151*, 1503-1504.

Torgersen, S., & Alnæs, R. (1990). The relationship between the MCMI personality scales and DSM III, axis II. *Journal of Personality Assessment, 55*, 698-707.

Verheul, R., van den Brink, W., & Hartgers, C. (1995). Prevalence of personality disorders among alcoholics and drug addicts: an overview. *European Addiction Research, 1*, 166-177.

Weissman, M.M., & Klerman, G.L. (1977). Sex differences and the epidemiology of depression. *Archives of General Psychiatry, 34*, 98-111.

Westrich, L., Guedj, P., Galanter, M., & Baird, D. (1997). Differences between men and women in dual-diagnosis treatment. *American Journal of Addictions, 6*, 311-317.

Widiger, T.A., & Frances, A. (1987). Interviews and inventories for the measurements of personality disorders among alcoholics admitted to an alcoholism rehabilitation setting. *Clinical Psychological Review, 7*, 49-75.

Wilsnack, S.C., Wilsnack, R.W., & Klassen, A.D. (1986). *Epidemiological research on women's drinking 1974-84. Women and Alcohol: Health-related issues* (Research Monograph no. 16). Washington DC: Department of Health and Human Services, NIAAA.

Part 2

Quantitative analyses of available data in Belgium

Chapter 4

Poly substance use, mental health and related problems among persons seeking treatment in De Sleutel

Veerle Raes
Jessica De Maeyer
Wouter Vanderplasschen
Jan Lammertyn

4.1 Introduction

De Sleutel is a large treatment network in Belgium, providing residential and outpatient treatment to drug abusers in Flanders. For years, poly substance abuse has appeared to be an obstacle when recording the primary drug in the European Treatment Demand Indicator. Already in 2004, it was concluded that the obligation to indicate just one primary drug (which could not be 'poly or multiple drugs') led to an overappreciation of opiates as primary drug in treatment demand statistics (Raes et al, 2004a). Besides the registration for epidemiological purposes, clinicians in De Sleutel administer the EuropASI during the assessment or orientation phase since 1998 (Raes et al, 2004b). The existence of several definitions of 'poly substance use' has limited in-depth analyses on this issue. However, since most evidence-based treatment guidelines focus on abusers of one specific substance (Autrique et al 2009) and since most clients entering treatment use multiple drugs, the reality of poly substance use remains a considerable concern in everyday treatment practice in De Sleutel.
The aims of this study were fourfold: 1) to find the most appropriate operational definition of poly substance use based on data gathered with the EuropASI; 2) to determine the prevalence of poly substance use in a clinical sample of outpatient treatment demanders in the treatment network of De Sleutel; 3) to explore the predictive value of socio-demographic, (mental) health and family characteristics regarding poly substance use; 4) to explore the existence of potential clusters of substance use among clients.

4.2 Methods

4.2.1 Sample selection

Based on 826 EuropASI-interviews that took place in 2007 and 836 in 2008, 1581 of these EuropASI-interviews were selected for secondary analyses. The interviews were administered in outpatient as well as inpatient centres. However, the majority of the interviews (95.5%) concerned individuals seeking treatment

in outpatient settings. About one week after clients' first treatment demand the EuropASI interview took place. 'Last 30 days' questions refer to the 30 days that preceded the interview-session.

4.2.2 Definition of poly substance use

Several possibilities were identified to operationalise poly substance use, based on the EuropASI. First, it was decided to *include the use of alcohol more than 5 glasses, as well as the use of psycho-active medication* in the definition. Then, differentiation could be made based on: "several substances (alcohol and drugs or various illegal drugs) as primary drug", "ever use of more than one substance on the same day", "recent use of more than one substance on the same day", the number of substances ever used (>1), or the number of recently used substances (>1). For counting the number of ever or recently used substances, the specified substances in the EuropASI needed to be reduced to their basic generic category, in order to avoid inappropriate classification of poly substance use when two or more substances from the same generic category are used (e.g., heroin and methadone).

Regardless the definition of poly substance use we applied, significant differences were observed in the profiles of persons with single and poly substance use. Based on these preliminary analyses, it was decided to use "recent use of more than one substance on the same day" as the most appropriate definition of poly substance use. The use of a definition that refers to the last 30 days and to the use of more than one substance on the same day guaranteed most robustness, as it refers to recent polys substance use during a specified time span (24 hours). After dichotomising the sample, 657 individuals (45.3%) were categorised as 'persons with poly substance use', while 794 persons (54.7%) were considered to be 'single substance users'. Analyses are based on 1451 individuals, since information on the 'use of multiple substances on one day during the last 30 days' was missing for 130 individuals.

4.2.3 Data-analysis

Descriptive analyses was performed to compare socio-demographic, substance use and mental health characteristics. The Pearson Chi-square test and the independent samples T-test were used to test for differences in patient characteristics between individuals with single versus poly substance use. A p-value ≤ 0.05 was considered as an indication of statistical significance.

To explore the potential predictive value of socio-demographic, (mental) health and family characteristics regarding poly substance use, logistic regression analyses (method: enter) were performed. Exp(B) with C.I. 95%, Nagelkerke R^2 and Hosmer Lemeshow were calculated to evaluate significant correlates of poly substance use. Then, a model was created, in which only the significant characteristics were inserted as independent variables that could predict recent poly substance use.

Finally, we tried to cluster poly substance users in (mutually exclusive) subgroups, based on their frequency of use in the past month of six generic categories of substances: alcohol (>5 glasses), opiates (heroin and substitution drugs), psycho-active medication (benzodiazepines, hypnotics and antidepressants), cocaine (crack and cocaine), amphetamines (amphetamines and xtc) and cannabis. In a first step, hierarchical cluster analysis using Ward's method (Everitt et al., 2001) was used to get insight into the cluster structure of the data. Second, in order to further describe the clusters found in the first step, partition-based clustering (partitioning around mediods) was used.

4.3 Results

4.3.1 Description of the sample

Substance use behaviour

To evaluate substance use behaviour, eight groups of substances were created based upon their generic category: alcohol, cannabis, opiates (heroin, methadone,

buprenorphine, other opiates), psycho-active medication (benzodiazepines, hypnotics and sedatives), antidepressants, cocaine, stimulants (amphetamines, xtc), other drugs (hallucinogens, fluid xtc, …). It was found that lifetime as well as recent substance use differed in a statistically significant way between individuals with single and poly substance use for all substances, with (logically) higher proportions of use in the group of poly substance users (Table 1).

Table 1: Comparison of drug and alcohol use ever and during the last 30 days (according to EuropASI definition) between people with single and poly substance use (n=1451)

	EVER				RECENT			
	Single N=794	**Poly N=657**	**Pearson Chi²**	**p**	**Single N=794**	**Poly N=657**	**Pearson Chi²**	**p**
Alcohol (%) (>= five glasses)	52.7	70.7	48.76	***	31.6	53.8	72.48	***
Cannabis (%)	84.1	88.9	6.88	***	49.0	71.6	75.91	***
Opiates (%)	28.8	48.6	59.44	***	11.8	37.7	133.96	***
Medication (%)	33.8	60.3	101.88	***	13.5	46.7	194.94	***
Antidepressants (%)	22.5	39.1	47.05	***	8.5	21.9	51.8	***
Cocaine (%)	57.6	76.7	59.0	***	16.9	46.6	150.08	***
Stimulants (%)	60.3	77.3	47.7	***	7.8	29.5	116.72	***
Other (%)	26.9	41.8	35.74	***	6.3	10.5	72.4	***

*p < .05; **p < .01; ***p<.001

More people with poly substance use have ever injected drugs. The age of first use of cannabis was significantly lower among poly substance users (at the age of 16), as compared with single substance users (at the age of 17). Furthermore, the mean number of years of regular alcohol, cannabis and cocaine use was significantly higher in the group of poly substance users. Mean expenses (in Euro) for alcohol and drugs during the last 30 days were much higher in the poly substance use group (alcohol: M=43.19[s.d.=106.46] vs. M=65.26[s.d.=122.39]; drugs: M=118.52[s.d.=274.85] vs. M=325.92[s.d.=493.42]), while single substance users had longer mean periods of abstinence after alcohol a/o drug treatment than poly substance users (alcohol: M=6.6[s.d.=17.54] vs. M=2.96[s.d.=7.67]; drugs: M=8.67[s.d.=17.73] vs. M=6.99[s.d.=17.32]). The composite scores for the ASI-domains 'alcohol' and drugs were also

significantly higher among poly substance users (CS alcohol: M=0.10[s.d.=0.15] vs. M=0.16[s.d.=0.20]; CS drugs: M=0.09[s.d.=0.07] vs. M=0.20[s.d.=0.09]).

Socio-demographic characteristics

In table 2, the socio-demographic characteristics of both groups are presented. Besides age, gender, and civil status, the socio-demographic characteristics that were assessed, were someone's highest degree of education, his/her living situation in the last 30 days, the working situation and the number of working days in the last 30 days. Legal situation in the last 30 days, judicial referral and number of convictions were added to the traditional socio-demographic characteristics. In addition, the composite scores associated with the ASI-domains are also presented in table 2.

It appeared that eight socio-demographic characteristics showed significant differences between persons with single versus poly substance use. The mean age of persons with poly substance use was 28.2 (±7.2), while individuals with single drug use had a mean age of 27.3 (±7.0). A greater number of individuals in the poly substance use group lived with friends or alone, were unemployed or had their main income from health insurance benefits. On the other hand, single substance users lived more frequently in a controlled environment prior to treatment, had more often a legal case pending or were under probation/parole and were significantly more often referred to treatment by the criminal justice system. The civil status, highest degree of education and mean number of convictions showed no significant differences between both groups. The composite scores for economic status and satisfaction with work were significantly higher among poly substance users, indicating a higher problem severity on these domains.

Table 2: Comparison of socio-demographic characteristics between single and poly substance users (n=1451)

Socio- demographic characteristics	Single N=794	Poly N=657	Pearson Chi² or T-value	p
Mean age	27.31	28.20	-2.39	*
[SD]	[6.99]	[7.17]		
Men (%)	85.8	79.3	10.58	**
Civil status (%)			1.94	
- *Married* ˆ	7.5	5.8		
- *Divorced* ˆ	11.0	10.1		
- *Widower*	0.1	0.2		
- *Single* ˆ	81.4	83.9		
Highest degree of education (%)			2.29	
- *Primary or none* ˆ	23.4	26.9		
- *Secondary (vocational)*	47.5	45.4		
- *Secondary (technical or general) or Higher* ˆ	29.1	27.7		
Living situation last 30 days (%)			24.5	***
- *With partner and/or child(ren)* ˆ	24.8	26.2		
- *With parents or other family* ˆ	33.9	31.5		
- *Alone*	15.2	21.5		
- *In controlled environment*	13.4	6.7		
- *With friends or in varying living situations* ˆ	12.7	14.2		
Legal situation last 30 days (%)			57.46	***
- *None* ˆ	29.2	33.8		
- *None, but legal problems in the past* ˆ	11.2	23.4		
- *Case pending/On bail*	18.3	12.2		
- *Probation/Parole* ˆ	16.1	9.6		
- *Other*	25.2	21.0		
Judicial referral, yes (%)	48.2	31.9	37.52	***
Mean number of convictions	1.55	1.76	-0.91	
[SD]	[4.25]	[4.17]		
Mean legal composite score	.17	.18	-.23	
[SD]	[.25]	[.21]		
Working situation last 30 days (%)			41.03	***
- *Part-time or full-time employed* ˆ	45.8	38.7		
- *Health insurance benefits* ˆ	9.6	16.9		
- *Unemployed* ˆ	25.3	32.6		
- *Other (student; retired; ...)*	7.8	6.2		
- *In controlled environment*	11.5	5.6		
Mean number of working days last 30 days	10.17	8.46	3.04	**
[SD]	[10.65]	[10.35]		
Having debts, yes (%)	51.0	58.9	8.94	**
Mean economic composite score	.40	.54	-4.54	***
[SD]	[.45]	[.46]		
Mean work satisfaction composite score	.17	.23	-3.47	**
[SD]	[.25]	[.29]		

* p < .05; ** p < .01; *** p<.001

Mental health situation

The EuropASI assesses some mental health indicators: individuals' past treatment episodes for psycho-emotional problems; lifetime and recent depressive feelings; feelings of anxiety or tension; problems with understanding, concentration and remembering; non drug-induced hallucinations; violent behaviour; being prescribed medication for psycho-emotional problems; suicidal ideation and suicide attempts. Table 3 presents these mental health indicators for single and polys substance users and any statistically significant differences between both groups.

Table 3: Comparison of recent psycho-emotional problems between people with single and poly substance use (n=1451)

	Single N=794	**Poly N=657**	**Pearson Chi² or T-value**	**p**
Psychological problems last 30 days (%)				
- *Depressive feelings*	24.7	36.1	20.9	***
- *Feelings of anxiety or tension*	30.7	42.6	20.68	***
- *Trouble understanding, concentration, remembering*	34.2	44.0	13.65	***
- *Hallucinations*	2.2	4.9	7.86	**
- *Trouble controlling violent behaviour*	20.5	26.4	6.65	**
- *Prescribed medication for psychological problems*	18.4	37.3	60.66	***
- *Serious thoughts of suicide*	7.7	16.7	25.59	***
- *Attempted suicide*	1.0	3.0	7.53	**
Lifetime residential treatment for psycho-emotional problems (%)	17.8	24.8	9.89	**
Lifetime outpatient treatment for psycho-emotional problems (%)	29.8.	40.2	16.01	**
Mean number of suicide attempts [SD]	0.84 [5.78]	0.98 [5.82]	-0.44	
Mean composite score psychological/emotional health [SD]	.21 [.22]	.31 [.22]	-7.26	***

* p < .05; ** p < .01; *** p<.001

Poly and single substance users differed significantly concerning the prevalence of lifetime and recent psycho-emotional problems, except for lifetime prevalence of hallucinations. A significantly higher number poly substance users had followed previous treatment for psycho-emotional problems and the mean

composite score for psychological/emotional health was significantly higher (indicating more severe problems) in the group of poly substance users.

Physical health and social and family situation

Also physical health and family and social relationships may be affected by poly substance use. Table 4 presents all statistically significant differences physical health and family and social relationships, including composite scores. Two physical health indicators and eight variables related to family and social situation were significantly different between single and poly substance users. This was also the case for the composite scores in these domains.

Table 4: Comparison of physical health and family/social situation between single and poly substance users (n=1451)

	Single N=794	**Poly N=657**	**Pearson Chi² or T-value**	**p**
Chronic health problems (%)	32.2	38.0	5.19	*
Mean number of days with medical problems last 30 days [SD]	6.8 [10.3]	8.2 [10.9]	-2.52	*
Mean composite score for physical health [SD]	.22 [.27]	.27 [.30]	-3.39	**
Having a mother with psychiatric problems, yes (%)	17.6	22.3	4.66	*
Having a father with drug problems, yes (%)	4.4	8.1	7.79	**
Having a father with psychiatric problems, yes (%)	11.2	15.5	4.97	*
Living together with s/o with an alcohol problem, yes (%)	7.5	10.7	4.21	*
Living together with s/o with a drug problem, yes (%)	12.5	22.5	23.79	***
Satisfaction with leisure time, yes (%)	54.3	40.8	34.12	***
Physical abuse ever, yes (%)	22.6	32.0	14.77	***
Emotional abuse ever, yes (%)	41.5	51.8	14.26	***
Mean composite score for family relationships [SD]	.12 [.18]	.14 [.20]	-2.29	*
Mean composite score for social relationships [SD]	.10 [.15]	.12 [.17]	-2.93	

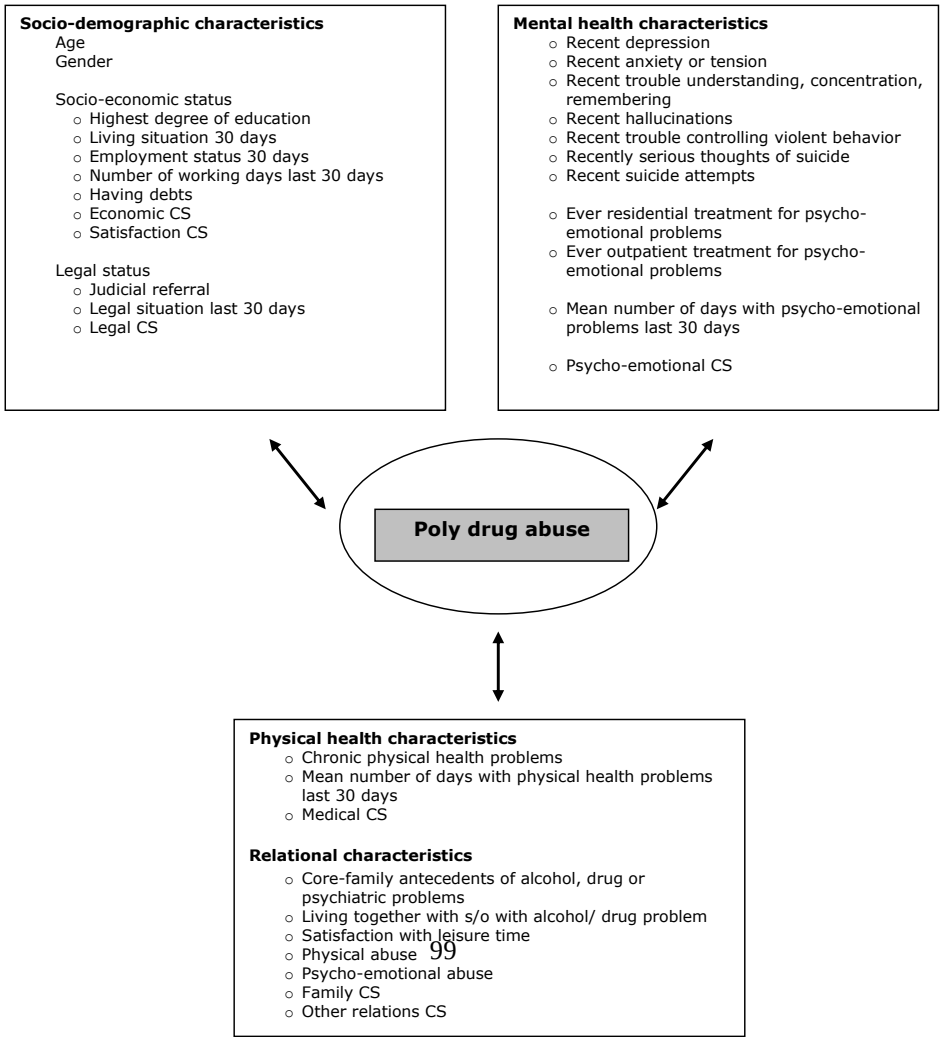
* p < .05; ** p < .01; *** p<.001

4.3.2 Predictive value of socio-demographic, (mental) health and family/social indators

Starting from a theoretical model

Univariate analyses in each area demonstrated significant differences between single versus poly substance users for a number of socio-demographic, (mental) health, family and social characteristics. In order to develop a model that can determine important risk or protective predictors of poly substance use, a logistic regression analysis (method: enter) was carried out. Figure 1 presents the theoretical model upon which the further analyses are based.

Figure 1: Theory-driven model for poly substance use



To control for redundancy and multi-collinearity in each area, correlations were calculated between the characteristics in each area. As expected, a correlation matrix confirmed significantly high correlations (Spearman Rho) of ASI-composite scores with their respective constituting components. Therefore, it was concluded to focus on the components in the analysis and to exclude the composite scores from the model.

Socio-demographic correlates

We hypothesised that a worse socio-demographic profile would be associated with more poly substance use. By introducing the socio-demographic characteristics in the logistic regression model (method: enter), the percentage correct classifications increased from 54% to 64%. Seven variables contributed significantly to the prediction of membership of the group of poly substance users (cf. table 5). It appeared that being female, completion of secondary school or higher, living in a controlled environment and judicial referral were protective factors for poly substance use, while receiving health insurance benefits, having debts and having a criminal record (without current legal involvement) were associated with a higher probability of poly substance use.

Mental health correlates

One of the core hypotheses of the POLYMEH-study is that poly substance use is associated with mental health problems. Individuals with more (severe) mental health problems were expected to be at higher risk for being poly substance users. However, the introduction of recent mental health problems (cf. EuropASI) in the logistic regression model (method: enter), only revealed an increase from 55% to 58% correct classifications. Three mental health indicators were significant determinants of poly substance use, i.e. suicidal ideation in the past 30 days, outpatient treatment history for psychological problems and number of days with mental health problems in the past 30 days (cf. table 5).

Health, family and social correlates

We expected that drug users experiencing problems in various life domains had a higher risk of belonging to the group of poly substance users. This was tested by introducing the socio-demographic characteristics together with the composite scores of all ASI life domains on the one hand, and by introducing all statistically significant health and family/social indicators from the EuropASI in the logistic regression model (method: enter) on the other hand, except the variables that directly referred to alcohol a/o drug use.

The first analysis revealed a model with three risk factors: not working because of living in a controlled environment, the composite score for alcohol use and the composite score for drug use. Based on the socio-demographic characteristics and the composite scores for all ASI-domains (including alcohol and drugs), 74% of the subjects could be classified correctly. The socio-demographic indicators together with the ASI composite scores allowed to predict 42% of the variance in poly substance use (Nagelkerke R^2=0.42), while there was no indication to reject the model (Hosmer and Lemeshow p>0.05).

The introduction of all statistically significant health and family/social variables from the EuropASI, using the particular components but excluding alcohol and drug-related characteristics in the logistic regression model (method: enter) (Table 5), resulted in eight statistically significant predictive characteristics. 67% of the subjects could be classified correctly, compared to 54% for a model with intercept only. All health and social indicators together (excluding the ones related to alcohol and drug use) contributed 20% to the prediction of poly substance use (Nagelkerke R^2= 0.20), while there was no indication to reject the model (Hosmer and Lemeshow p > .05). The results showed three protective and five risk factors for poly substance use. The likelihood of belonging to the group of poly substance users decreased when living in a controlled environment (Exp(B)=0.46; 95% CI:0.21-0.98), being on probation as recent legal status (Exp(B)=0.54; 95% CI:0.32-0.92) and being female (Exp(B)=0.67; 95% CI:0.45-0.99). Individuals were more likely to be poly substance users when they live together with someone who uses drugs (Exp(B)=2.27; 95% CI:1.51-3.40), have a

criminal record, but no current legal involvement (Exp(B)=1.76; 95% CI:1.16-2.67), are dissatisfied with the way they spend their leisure time (Exp(B)=1.75; 95% CI:1.26-2.42), are living alone (Exp(B)=1.58; 95% CI:1.03-2.41), and have debts (Exp(B)=1.38; 95% CI:1.04-1.85).

Table 5: Logistic regression of several bio-psycho-social characteristics as predictors for poly substance use (N=1047)

							95% C.I. for Exp(B)	
	B	S.E.	Wald	Df	p-value	Exp(B)	Lower	Upper
Age	.010	.011	.811	1	.368	1.010	.988	1.033
Gender (Ref. cat. : men)	-.401	.201	3.984	1	.046*	.670	.452	.993
Highest degree of education (Ref. cat. : primary or none)			2.307	2	.316			
- *secondary (vocational)*	-.204	.176	1.335	1	.248	.816	.577	1.153
- *secondary (technical or general) or higher*	-.305	.205	2.206	1	.138	.737	.493	1.102
Living situation last 30 days (Ref. cat.: with partner a/o children)			14.455	4	.006			
- *with parents or other family*	.369	.196	3.532	1	.060	1.446	.984	2.124
- *alone*	.457	.216	4.465	1	.035*	1.579	1.034	2.413
- *with friends or varying*	.371	.288	1.660	1	.198	1.450	.824	2.551
- *in controlled environment*	-.785	.389	4.076	1	.043*	.456	.213	.977
Working situation last 30 days (Ref. cat.: employed)			4.924	4	.295			
- *unemployed*	.406	.273	2.224	1	.136	1.501	.880	2.561
- *health insurance benefits*	.559	.328	2.905	1	.088	1.749	.920	3.325
- *other*	-.105	.360	.086	1	.769	.900	.445	1.821
- *in controlled environment*	.283	.441	.414	1	.520	1.328	.560	3.150
Number of working days	.004	.012	.146	1	.702	1.005	.982	1.028
Having debts, yes	.326	.149	4.800	1	.028	1.385	1.035	1.853
Judicial referral, yes	-.328	.194	2.843	1	.092	.720	.492	1.055
Legal situation last 30 days (Ref. cat.: none)			18.899	4	.001			
- *none but legal problems in the past*	.564	.213	6.971	1	.008**	1.757	1.156	2.670
- *case pending, on bail*	-.369	.254	2.107	1	.147	.692	.420	1.138
- *probation*	-.613	.272	5.058	1	.025*	.542	.318	.924
- *other*	-.116	.228	.261	1	.610	.890	.570	1.391
Depression last 30 days, yes	.025	.184	.018	1	.892	1.025	.715	1.471
Anxiety or tension last 30 days, yes	.091	.170	.289	1	.591	1.096	.785	1.529
Trouble understanding, concentration, remembering last 30 days, yes	-.001	.160	.000	1	.995	.999	.730	1.367
Hallucinations last 30 days, yes	.452	.429	1.111	1	.292	1.572	.678	3.646
Trouble controlling violent behavior last 30 days, yes	.059	.171	.121	1	.728	1.061	.759	1.483

Serious thoughts of suicide last 30 days, yes	.148	.244	.364	1	.546	1.159	.718	1.871
Attempted suicide last 30 days, yes	.509	.562	.822	1	.365	1.664	.553	5.005
Number of days with psycho-emotional problems	.005	.008	.366	1	.545	1.005	.989	1.021
Ever inpatient treatment for psycho-emotional problems, yes	-.039	.196	.039	1	.843	.962	.654	1.414
Ever outpatient treatment for psycho-emotional problems, yes	.242	.155	2.424	1	.120	1.274	.939	1.727
Chronic health problems	.058	.160	.130	1	.719	1.059	.774	1.450
Number of days with medical problems last 30 days	-.005	.007	.389	1	.533	.995	.981	1.010
Mother with psychiatric problems	-.092	.189	.239	1	.625	.912	.630	1.320
Father with drug problems	.475	.320	2.199	1	.138	1.608	.858	3.011
Father with psychiatric problems	-.129	.230	.314	1	.575	.879	.560	1.380
Living together with someone who has an alcohol problem	-.080	.263	.092	1	.761	.923	.551	1.546
Living together with someone who has a drug problem	.819	.207	15.691	1	.000*	2.268	1.512	3.401
Satisfied with leisure time (Ref. cat.: satisfied)			11.800	2	.003			
- *dissatisfied*	.558	.165	11.397	1	.001**	1.747	1.264	2.415
- *not satisfied, not dissatisfied*	.114	.186	.374	1	.541	1.120	.778	1.612
Physical abuse ever	.084	.189	.197	1	.657	1.087	.751	1.575
Emotional abuse ever	-.227	.165	1.888	1	.169	.797	.576	1.102
Constant	-.777	.506	2.352	1	.125	.460		

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

4.3.3 Cluster analyses

Table 6 gives an overview of the absolute frequencies of simultaneous use of various classes of substances. Findings in this table are limited to the use of two substances at the same time.

Table 6: Frequency of simultaneous use of different substances (n=1581)

Substance	Alcohol (>5glasses)	Opiates	Psychoactive medication	Cocaine	Amphetamines	Cannabis
Alcohol (>5glasses)		122	233	257	155	413
Opiates	122		191	128	42	204
Psychoactive medication	233	191		184	114	336
Cocaine	257	128	184		120	283
Amphetamines	155	42	114	120		178
Cannabis	413	204	336	283	178	

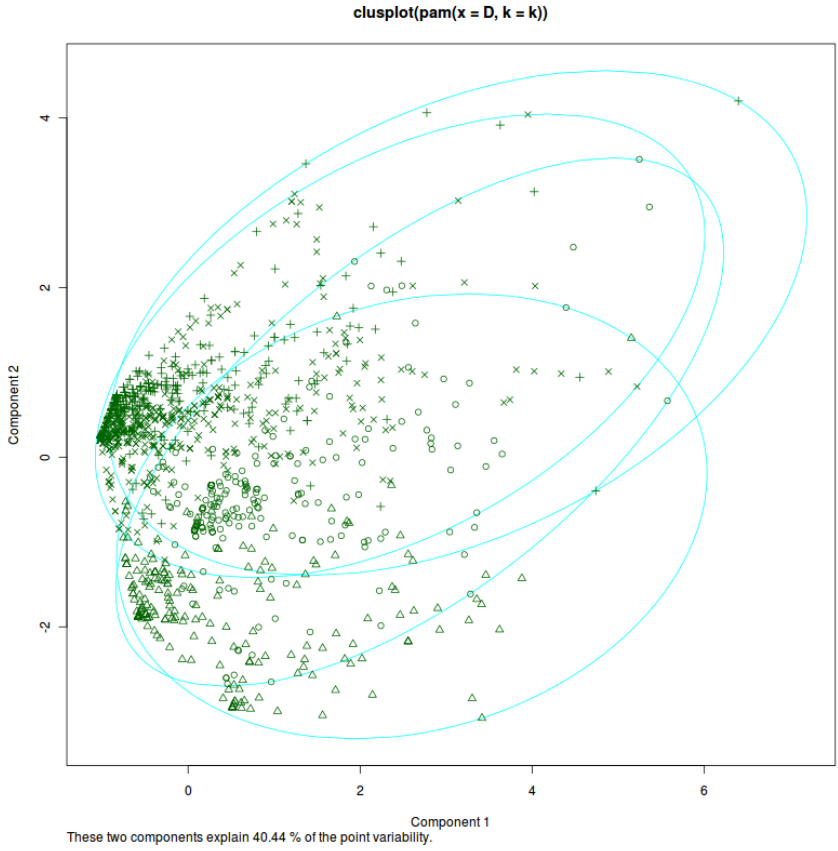
In order to identify specific clusters of poly substance use, a hierarchical cluster analysis was performed. The hierarchical cluster analysis suggested four distinct clusters. The four cluster solution consisted of one cluster representing frequent users of psychoactive medication in combination with moderate use of cannabis (cluster 1), a second cluster containing users with high use of opiates and medium use of psychoactive medication and cannabis (cluster 2), another cluster representing frequent users of cannabis (cluster 3) and, finally, a fourth cluster representing users with an overall low frequency of use (cluster 4) (see Table 7 for cluster means).

Table 7: Frequency (number of days) of drug use for the six generic categories of drug use (n=1581)

Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Alcohol (>5glasses)	3.972	2.958	3.273	3.641
Opiates	2.244	28.076	0.646	0.556
Psychoactive medication	28.864	9.156	1.457	1.016
Cocaine	2.420	2.513	1.516	1.921
Amphetamines	1.864	0.483	1.289	1.398
Cannabis	10.184	8.664	26.127	2.144

However, further scrutiny revealed that the solution was not optimal, due to a lot of overlap between the distinguished clusters. This is illustrated in Figure 2, in which the clusplot for the four cluster solution is shown.

Figure 2: Clusplot for the four cluster solution (n=1581)



Caption for figure:

Clusplot for the four cluster solution (using partitioning around mediods). This clusplot is basically a scatter plot of the observations in the plane of the two first principal components. The rationale is that this is the two-dimensional representation, in which the maximal content of information is retained.

4.4 Discussion

This study aimed at finding an appropriate definition of poly substance use for data gathered with the EuropASI. Further, we wanted to determine the prevalence of poly substance use in a clinical sample of outpatient treatment demanders, and to explore socio-demographic, (mental) health and family/social predictors of poly substance use.

In order to find the most appropriate definition, a classification based on "use of more than one substance" as primary drug was rejected, because of the low differentiation level, absence of transparency in the subjective interpretation related to the classification of substances, and a tendency to mention only one substance as primary drug, as a consequence of the European guidelines concerning the Treatment Demand Indicator (EMCDDA, 2000). For a classification of poly substance use based on the number of substances used – either lifetime or recently – clear decisions are needed about the focus on specific substances versus rather generic categories. The chosen focus on generic categories was inspired by the growing number of new (synthetic) substances (EMCDDA, 2010), which may act as a bias regarding poly substance use as two substances may have a different name, but belong to the same generic category (e.g. amphetamines and MDMA, or heroin and methadone). Then, agreement was needed about the inclusion of legal substances, such as alcohol and prescribed psycho-active medication, methadone, buprenorphine, etc.. It was decided to include both categories, since the use of legal and prescribed substances refers to the very essence of addiction. From a public health perspective, the legal status of a substance is less relevant. If addiction is seen as a chronic disease, the importance of the substance itself disappears in the damages it can produce in the brain and related functioning (Mc Lellan et al., 2000; Leshner, 2003; Gould, 2010; ASAM, 2011; Dom et al., 2005). Ultimately, we decided to classify poly versus single substance users by clients' information on their use of more than one substance on the same day in the last 30 days.

Based on this definition, we were able to assess the prevalence of poly and single substance use in a sample of drug abusers seeking treatment in outpatient setting.

It appeared that nearly half of the persons in outpatient substance abuse treatment (45,3%) could be categorised as poly substance users. Clearly significant differences were reported regarding the use of various substances, which was much higher among poly substance users. Remarkable differences included the lower age of onset for regular cannabis use, longer duration of regular alcohol, cannabis and cocaine use, and lower abstinence rates after treatment in the group of poly substance users as compared with single substance users. All composite scores were significantly higher among poly substance, except for legal problems.

As univariate analyses compare separate characteristics between two or more groups for each, potential interactions between variables are not taken into account. Univariate analyses do not provide an order of importance, neither any information on the loss of statistical significance if other variables are also included. Therefore, logistic regression analyses (Method: enter) were used to focus on the most important – risk or protective – correlates of poly substance use. A first analysis – including the composite scores instead of their respective components – revealed a higher proportion of correct classifications and a higher contribution to the model, although the results were hard to interpret from a clinical point of view. Yet, composite scores are abstract entities that need to be computed and they are not directly available for practitioners. Moreover, in the final model three correlates of poly substance use were retained, of which two are aspects of the dependent variable, i.e., the composite scores for alcohol and for drug use. A more comprehensive logistic regression analysis introduced the specific components of the composite scores in all domains, except alcohol and drug use related variables. Starting from a theoretical model, socio-demographic, (mental) health and social/family characteristics were analysed separately. Next, a model was constructed in which all components were introduced together. Although the model with the composite scores revealed a higher percentage of correct classifications and a higher predictive value, the model including the particular components was chosen in order to provide more relevant information for clinical practice. Living in a controlled environment**,** being on probation as recent legal status and being female were found to be protective factors for poly

substance use. On the contrary, living together with someone with drug problems, having a criminal record but no current legal problems, dissatisfaction with the way they spend their leisure time, living alone, and having debts (compared with the respective reference categories for each variable) appeared to be risk factors for poly substance use.

Finally, based on the findings from a hierarchical cluster analysis, the existence of specific subgroups of poly substance users can be confirmed, but patterns of use are very diverse and not divergent enough to distinguish clear subgroups. Consequently, the findings of the cluster analyses did not result in an optimal cluster model, since a lot of overlap is observed between the different clusters.

4.5 Conclusion

Recent use of more than one substance on the same day (including alcohol and psycho-active medication) was regarded to be the most appropriate operational definition of poly substance use. Based on this definition, the prevalence of poly substance use in an outpatient substance abuse treatment population was 45.3%. Results of logistic regression analyses that introduced all significant variables (based on univariate analyses) in one model, suggest the protective value of legal control (e.g. living in a controlled environment, legal pressure) and the dangers of a lack of/adverse social support (e.g. living alone or living with a substance abusing person) and the lack of daily activities (i.e. dissatisfaction with leisure activities, unemployment) for developing and keeping poly substance use.

REFERENCES

American Society of Addiction Medicine (ASAM) (2011). *Public Policy Statement: Definition of Addiction* (Long version). Chevy Chase: American Society of Addiction Medicine.

Autrique, M., Vanderplasschen, W., Broekaert, E. & Sabbe, B. (2009). Evidence-based guidelines in Belgian substance abuse treatment. *European Addiction Research, 15*(1), 47-55.

Dom, G., Sabbe, B., Hulstijn, W., & van den Brink, W. (2005). Substance use disorders and the orbitofrontal cortex: systematic review of behavioural decision-making and neuro-imaging studies. British Journal of Psychiatry, 187, 490

EMCDDA. (2000). *Treatment Demand Indicator. Standard Protocol 2.0*. Lisboa: European Monitoring Centre for Drugs and Drug Addiction.

EMCDDA (2011). *Annual Report 2010*. Lisboa: European Monitoring Centre for Drugs and Drug Addiction.

Everitt, B.S., Landau, S., & Leese, M. (2001). *Cluster Analysis* (Fourth edition). London: Hodder Arnold.

Gould, T.J. (2010). Addiction and cognition. *Addiction science and clinical practice, 12*, 4-14.

Leshner, A. (2003). Science is revolutionizing our view of addiction and what to do about it. *The Journal of Lifelong Learning in Psychiatry, 1*(2), 194-195.

McLellan, A., Lewis, D., O'Brien, C.P. & Kleber, H. (2000). Drug dependence, a chronic medical illness: Implications for treatment, insurance, and outcome evaluation. *JAMA, 284*(13), 1689-1695.

Raes, V., Deleruelle, S., Depaepe, Ph., Colpaert, K., & De Clercq, T. (2004). *Application of the concept "primary drug" during registration of treatment demand data*. Brussels: Scientific Institute of Public Health, Epidemiology Unit.

Raes, V., & Lombaert, G. (2004). EuropASI: A standard in De Sleutel, Belgium. *Journal of Substance Use, 9*(3-4), 196-204.

Chapter 5

Longitudinal analysis of 12 years of treatment demands in the region of Charleroi: A trend towards more poly substance use

Serge Cogels

Jerôme Boonen

Andrea Rea

5.1 Introduction

5.1.1 The Sentinelle network

Sentinelle is the name of a questionnaire (and a database resulting from this continuous quantitative survey) which has been implemented in 1995 in the region of Charleroi (Belgium). It gathers epidemiological data among drug users who ask (or re-ask) for treatment within any of the ten drug treatment centres that form the Sentinelle Network: four referral agencies (therapeutic orientation)[3]; two residential units[4]; one hospital (crisis unit)[5]; three ambulatory units (medical and psycho-social support)[6]. Sentinelle is a monitoring agency: data are collected i) periodically (Cf. *Infra*) ; and ii) permanently (over the years). The objective of the network is to observe how the population of substance users who ask for help for drug-related problems evolves over time, be it in terms of way/context of life or in terms of consumption of new (illegal) substances. The objectives of the survey as well as the items retained in the registration form were defined by the above-mentioned treatment centres.

5.1.2 The Sentinelle intake interview

The intake interview covers three important fields: part one is devoted to socio-demographic data (identification, living situation, resources, judicial status, etc.); part two addresses issues related to the treatment demand (demand expressed, answer formulated, history of treatment demands, etc.) and part three, the consumption habits and drug use trajectory. Drug-related emotional, psychological or psychiatric problems are not registered. The questionnaire is administered verbally for any person who enters one of the agencies for the first time during the civil year. Information is updated each year on January, 1st, if the

[3] CATD (Charleroi), Alter Ego & Quai 25 (Châtelet), Family doctors (Arrondissement de Charleroi)
[4] Trempoline (Châtelet), Transition (Gilly)
[5] SICUP Hôpital Vincent Van Gogh (Marchienne-au-Pont)
[6] Diapason (Charleroi), Symbiose (Chapelle-lez-Herlaimont), Unisson (Farciennes)

patient is still in treatment. A new registration form is completed each time a client makes a new treatment demand in the network of services (most often after a relapse). Clients can be tracked through the system by a unique identification code (including a sophisticated procedure to protect individuals anonymity). Consequently, the treatment trajectory can be followed, as long as clients address one of the services from the Sentinelle network. The characteristics of persons recorded in the Sentinelle database (in which the prevalence of heroin use approaches 90%) cannot be extrapolated to the total population of drug users or to other regions.

5.1.3 Secondary analysis: Research methodology

In this secondary analysis, we make a quantitative analysis of all interviews registered between 1997 and 2009, while distinguishing between two subgroups of drug users: mono and the poly substance users. The latter group consists of persons who consumed (simultaneously or consecutively) more than one illegal substance in the month preceding the interview, while the former used just one substance. The objectives of the study were double:

i) describing the socio-demographic profile and the consumption habits of mono versus poly substance users and exploring the relationship between both;
ii) monitoring the evolution of mono versus poly consumption of legal and illegal substances over 12 years.

Two hypotheses will be tested in this study:

i) the characteristics of poly substance users differ from those of mono substance users
ii) poly drug consumption is an increasing phenomenon over time

The database was provided by 'Prévention Drogues Charleroi', the owner and responsible for the data collection, with the authorisation of all network partners:

the Sentinelle database gathers[7] information on all users who got in touch with the network between 1997 and 2009. The total number of registered individuals is 3 614, based on in total 7 136 contacts.

Three samples were drawn from this database:

- Sample 1: drug users asking for treatment for the first time between 1997 and 2009, except persons who intented to start substitution treatment AND who, at the time of the interview, stated they were not using any illegal product (n=3 045)
- Sample 2: drug users who asked (or re-asked) for admission to treatment within the Sentinelle network in the year 2009: n= 372
- Sample 3: drug users at their first treatment demand in the Sentinelle network between 1997 and 2008: n=3 614

Sample 1 and sample 2 aim at testing hypothesis 1; sample 3 at testing hypothesis 2.

The study progressed in two steps:

The approach in step 1 (sample 1) aimed at assessing the impact of demographic variables on consumption habits over the whole period. Here, we preliminarily tested (chi square and T-tests[8]) correlations between socio-demographic variables[9] and each of the subgroups - mono and poly users- and sorted out statistically significant differences. Finally, we assessed the specific contribution of these variables to the explanation of the model 'mono' versus 'poly' users (logistic regression).

The objective in step two was twofold: first, we give an overview of the main socio-demographic variables and how they interact with consumption patterns, based on information collected in 2009 (sample 2). Second, we analyze poly substance use from a longitudinal perspective by comparing user's consumption profiles over 12 years (sample 3), divided into four periods of three years each.

[7] After cleaning the database for double countings and incomplete data

[8] All the p-values appearing in this chapter are calculated with a level of type error 1 of 0.005

[9] At least variables useful for the study, dropping 50% of them which proved to be useful for practitioners only

In this section, we distinguish between “current use” (substance used at least once in the month preceding the interview), “past use” (consumption stopped since at least one month) and “never used” (substance never consumed by treatment demanders).

5.2 The ‘mono versus poly substance use’ model

Preliminary analyses made on the socio-demographic variables retained for the study, show that seven variables were significantly associated with “mono/poly substance use” (cf. Table 1).

Table 1: Socio demographic characteristics (<0.05=sign.)

	p	Cramer’s V	Strenght of association
Age	0.000	0.378	Moderate
Age classes	0.000	0.333	Moderate
Place of living	0.000	0.119	Weak
Cohabitation type	0.000	0.172	Weak
Financial resources	0.000	0.155	Weak
Law case running	0.000	0.095	Weak
Ever incarcerated	0.000	0.156	Weak

Results of the logistic regression calculated in a second step are the following:
Step 0 : If we assume that all individuals in our sample are poly substance users, the category that they occupy in the “mono/poly use” model is predicted correctly in 61.8% of the cases.
Step 1: If we introduce the independent socio-demographic variables (age, sex, cohabitation type, resources) in the model, the latter does not allow to predict the dependent variable (mono/poly substance user) effectively: the R^2 (Cox & Snell) is very weak: 0.0033. Indeed, when we place the individuals in the mono/poly use model in function of the values they take for all the variables, it appears that our predictions are good in 62.9% of the cases. The explanatory power of the variables age, sex, cohabitation type and legal resources is thus very low, since we only won 1.1% in this step.
Nevertheless, the results show that (cf. Table 2):

- the variable gender is not significant: men and women do not differ concerning poly substance use
- age: the older one is, the less chance one has to belong to the poly substance use-category
- the categories living 'with family' are equivalent to the reference category 'living alone': on the other hand, persons in the categories 'living with sexual partner' or 'living in an institution' slightly decreases the chance of belonging to 'poly substance use' category. Conversely, living with friends or acquaintances or living in varying settings increases the probability of being a poly substance user.
- Also, receiving social or health insurance benefits or being on the dole increases the probability of being a poly substance user, as opposed to persons who have a job or who are still living with their parents (i.e. no legal resources).

Table 2. Logistic regression analysis

	B	S.E.	Wald	Df	p-value	Exp(B)
Age	-.020	.007	8.530	1	.003	.980
Sex	-.105	.119	.783	1	.376	.900
(Co) habitation type : alone			37.148	7	.000	
- With sexual partner (1)	-.160	.121	1.760	1	.185	.852
- With near family (2)	-.160	.124	1.661	1	.198	.852
- With extended family (3)	.109	.252	.187	1	.666	1.115
- In institution (4)	-.808	.180	20.161	1	.000	.446
- With friends/acquaintances (5)	.579	.293	3.900	1	.048	1.784
- No fixed residence (6)	.712	.296	5.783	1	.016	2.039
- Other settings (7)	-.226	.373	.367	1	.545	.798
Legal resources : none			25.823	4	.000	
- Has a job (1)	.125	.156	.642	1	.423	1.133
- Depends upon Social security (2)	.638	.157	16.560	1	.000	1.892
- On the dole (3)	.318	.124	6.576	1	.010	1.374
- Depends upon Social relief (4)	.613	.157	15.301	1	.000	1.845
Constant	.947	.240	15.607	1	.000	2.579

We conclude that socio-demographic variables contribute little to explaining why someone belongs to the 'mono' or 'poly' substance use category. This may be due to the fact that the Sentinelle database is not a normally distributed, but a rather homogeneous sample (in terms of education, occupation, family life, etc.).

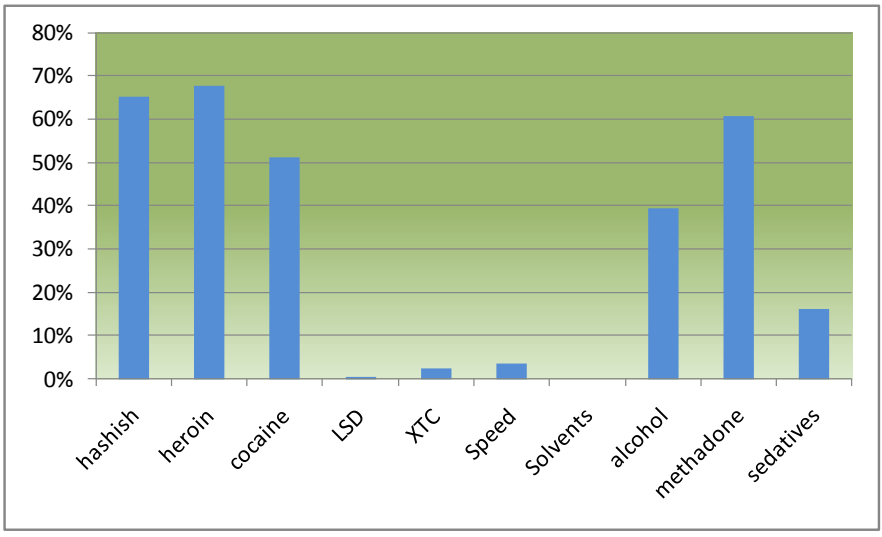
5.3 Longitudinal analysis

5.3.1 Description of the sample of patients who were admitted (or re-admitted) in the Sentinelle Network in the year 2009

Substance use

The relative weight of substance consumed at treatment entry is very uneven: there are three core illegal products (hashish, heroin and cocaine). In addition, consumption of legal products is a marked phenomenon, in particular that of methadone and alcohol. In this section, we analyse the products consumed (currently, in the past or never) successively, in comparison with their reference category: core illegal products/other illegal products (LSD, XTC, speed and solvents)/legal products.

Graph 1. Current use of various substances, in % of patients using any of them (n=372)



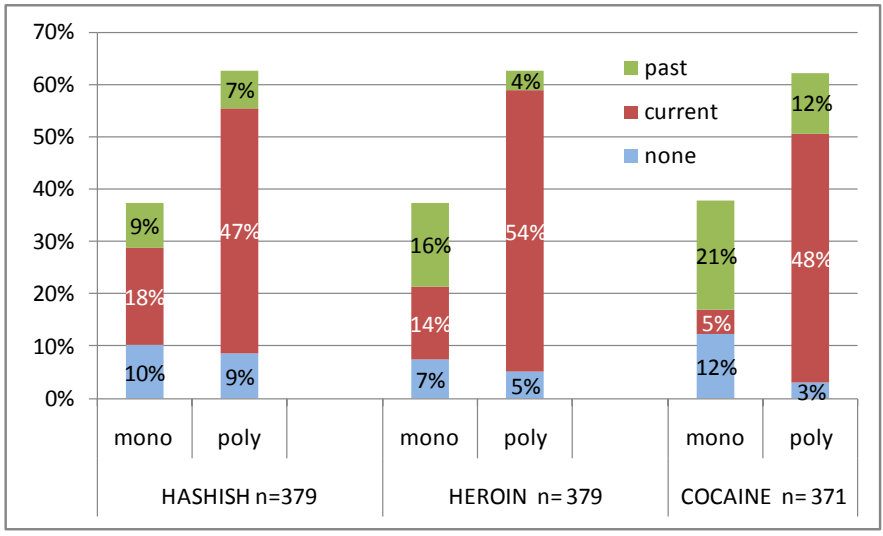
Consumption of illegal products: hashish, heroin & cocaine

Hashish, heroin and cocaine are the core illegal products used by registered clients. The majority currently uses at least one of them: heroin (57%); hashish (55%) and cocaine (43%). Of all poly substance users (n=228), 62% currently uses two illegal products (heroin + coke: 26%; hash + heroin: 23%; hash + coke: 13%) and 38% currently uses all three substances.

Current use of (at least) one of the three substances is proportionally more frequent among poly substance users than among single users: +43% for cocaine; + 40% for heroin and +29% for hashish. Analysis of past use shows a reverse image: it is a marginal phenomenon among poly substance users, while more frequent among single users. Ratios for persons who never used these substances are very low, and slightly more represented among single substance users.

A significant association was found between the variable "mono/poly substance use" and the "past/current/never use"of each of the three illegal products: this association is weak for hashish (p= 0.003; V=0.208), but strong for heroin (p=0.000; V=0.520) as well as for cocaine (p=0.000; V=0.631).

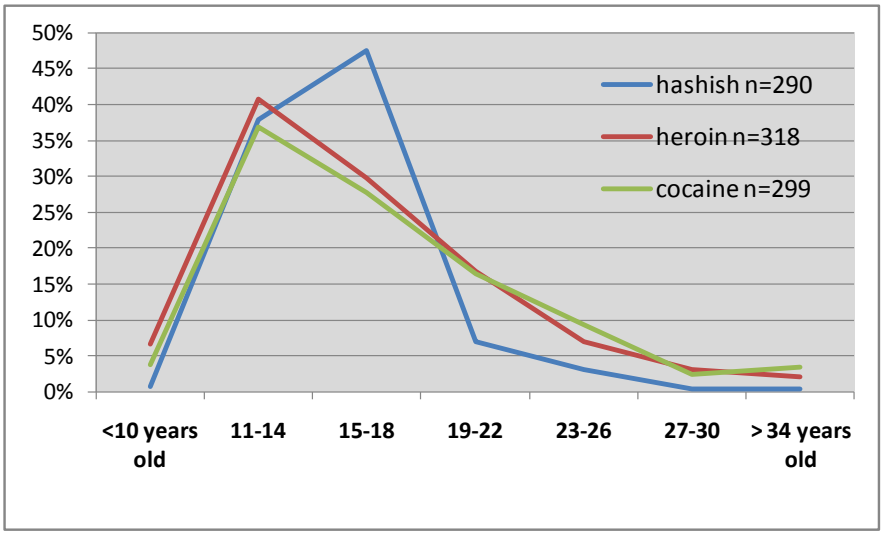
Graph 2: Consumption of core illegal products, in % of mono versus poly substance users



Age at first consumption

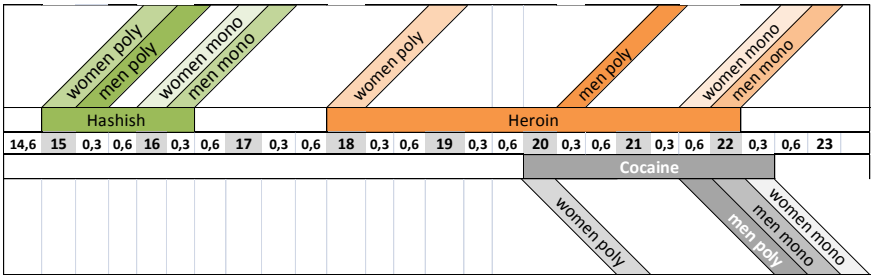
The curves in graph 3 show the age of substance users at first use of one of the three core products. Age distribution is very similar for the three substances: few users experiment before the age of eleven, while this number increases steeply between the age of 11 and 14 (for heroin and cocaine), and between 15 and 18 (for hashish). Few persons have used heroin, cocaine or hashish for the first time after the age of 22.

Graph 3. Illegal 'core' substances: age classes at first use



If we compare the average age at first consumption by gender and mono/poly substance use (cf. table 3), it appears that i) poly substance users systematically start consuming at an earlier age than mono substance users, ii) women start to use earlier than men, and iii) experimental use starts with hashish (around the age of 15), is followed by heroin (around the age of 18) and cocaine (around the age of 20).

Table 3. Core illegal substances: mean age at first use



Intravenous use of heroin and cocaine

Current intravenous drug use is common among poly users: 89% of iv heroin users (n=216), and 77% of iv cocaine users (n=156) are poly substance users. However, no significant association was found between the variables "current iv drug use" and "mono/poly use" (p= 0.123 (heroin); p= 0.432 (cocaine)). The proportion of past intravenous users is high among poly substance users who use heroin (67%), but low among poly substance users who use cocaine (27%), which corroborates the fact that heroin is more often abandoned in the course of drug use trajectories than cocaine.

Core illegal products: stopped since how long?

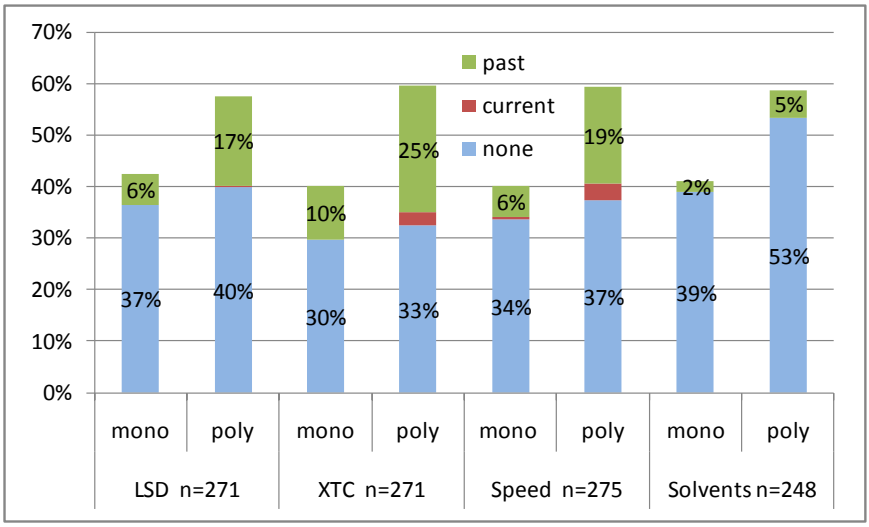
Although the number of interviewees who gave information on how long ago they had stopped using one or more illegal substances is limited, it appears that the average time span since they stopped heroin and cocaine use is shorter for poly substance users than for single substance users (1.3 vs. 2.8 years, and 1.8 vs. 3.7 years, respectively). A reverse pattern is observed for hashish (1.5 years for mono users vs. 3.3 years for poly users), which confirms that hashish is rarely abandoned by poly substance users.

Consumption of other illegal products: LSD, ecstasy, speed, solvents

The current use of other illegal substances in the Sentinelle database is zero for LSD and solvents, and negligible for ecstasy and amphetamines (2 to 3% of the

users). Past use of these substances is more common, in particular among poly substance users (+11%, on average) (Graph 4). A significant association was observed between "mono/poly substance use" and "current/past/never use" of ecstasy, speed and LSD (p=0.002; p=0.001; p=0.005, respectively).

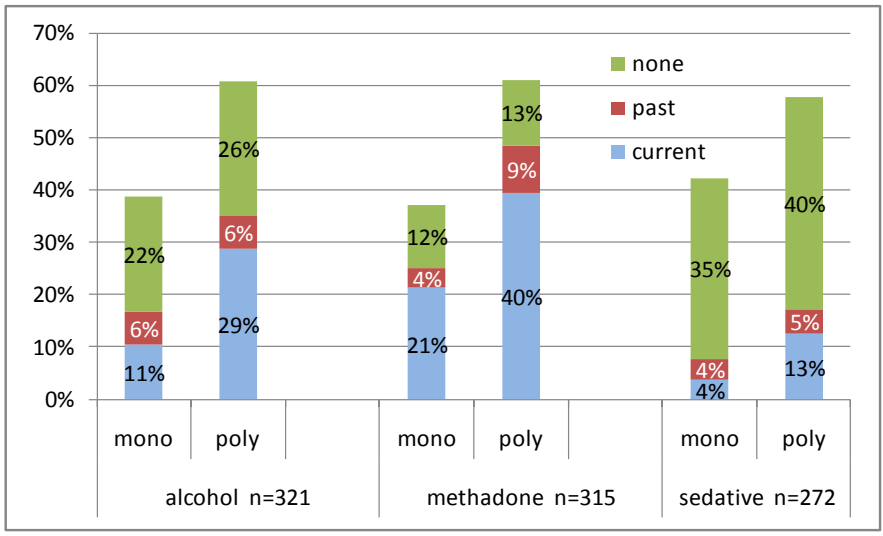
Graph 4. Consumption of other illegal products, in % of users for each substance



Consumption of legal products: alcohol, methadone, sedative drugs

Globally, the proportion of current users of legal substances is higher among poly substance users: +19% (methadone), +18% (alcohol); +9% (sedatives). Methadone is the legal product which is currently most often used (61%), which is not surprising given the participation of three substitution programs in the Sentinelle network. On the other hand, the use sedatives is seldom reported (75% reported "no use"). The proportion of "past users" for these substances are small and identical for mono and poly substance users, indicating that the use of these substances is not often stopped in the course of drug use trajectories. The association between "mono/poly substance use" and the "current/past/no use" is significant for alcohol (p=0.003) and sedatives (p=0.01), but not for methadone (p=0.069).

Graph 5. Consumption of legal substances, % of users for each substance



Treatment demand variables

Time span between first treatment demand and treatment demand in 2009

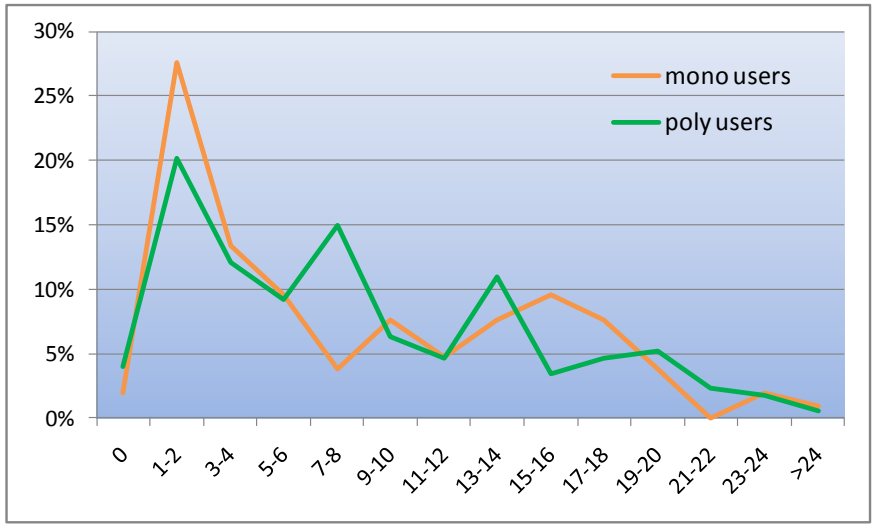
The mean age of all registered individuals at the first treatment demand in the Sentinelle network is 26.1 years. Subtracted from the mean age in the 2009 registration (33.5 years), an average time span of 7.4 years is observed during which drug use might have been considered problematic enough to make a (new) treatment demand in the network.

The comparison of mono versus poly substance users based on the time span between the first treatment demand and the 2009 demand shows similar curves (cf. Graph 6). This observation demonstrates that many clients who were mono substance users in 2009 have been poly substance users in the past, sometimes with a long consumption history. No significant association was found between the age category at first treatment demand and 'mono/poly substance use' (χ^2=73.806; df=68; p=0.238). Gender differences are small: men are on average 1.58 years older than women (25.9 vs. 24.4) at their first treatment demand.

Number of past treatment demands in the past

For the majority of clients (53%), the 2009 registration was their first registration in the network. The proportion of mono versus poly substance users is not significantly different between persons with and without treatment history in the Sentinelle network. Few differences can be observed between mono and poly substance users, whatever the number of past admissions. In general, poly substance users have had more frequent treatment demands.

Graph 6. Comparison of number of treatment demands between first demand and 2009 among mono/poly substance users (n=279)



Type of service contacted in the Sentinelle network

In 2009, four out of ten patients contacted an outpatient medical unit, mainly in order to engage in a substitution program; 26% took contact with a residential treatment centre and 23% with 'interface services'; less than 10% contacted a hospital for a detoxification program. A weak, but significant association was found between the type of service contacted and mono/poly substance use, indicating that slightly more poly substance users seeking treatment in curative programs and more single substance users contact 'orientation services'.

Persons that express specific treatment or support demands[10] (e.g. psychological support, detoxification and methadone treatment) are most frequently poly substance users. Note that the demand for psychological support is the only information the Sentinelle database contains concerning a possible link between substance use and mental problems or disorders.

Socio-demographic characteristics

Gender and age

No significant association was observed between gender and poly substance use (χ^2=0.047; df=1; p=0.829). Women (n=69) represent 18.5% of the total sample: 64% of them are poly substance users, compared with 62% of all men. On the other hand, the mean age of mono and poly substance users differed significantly (34.5 versus 32.5 years old, respectively), with a tendency for single drug users to (re-)contact treatment services at an older age (F=6.59; df=1; p=0.011).

Country of origin and place of residence

Three out of four treatment seekers originate from Belgium[11], while 14% is coming from an EU country and 10% from outside the EU. The proportions of mono and poly substance users originating from Belgium and from outside the EU are similar, while more single drug users (10.6% difference) were observed among persons originating from other EU countries. The association between country of origin and mono vs. poly substance use was significant (χ^2=7.99; df=2; p=0.018), but weak (V=0.147).

Drug users seeking treatment in the Sentinelle network live preferably in the city Charleroi and its suburbs (54%) and, to a lesser extent, in the province of Mons (19%), Liège (10%) and Namur (10%). Proportionally more poly substance users live in the city of Charleroi (58% vs. 42%), but this difference is not significant: χ^2=8.750; df=7; p=0.271).

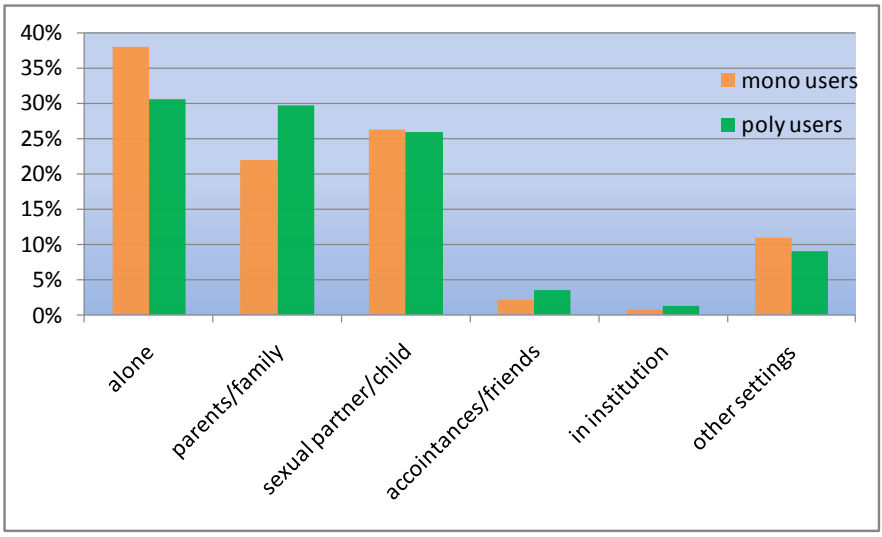
[10] A same treatment seeker may express three different support demands.

[11] Indicating that this person or their parents were born in Belgium.

Cohabitation type and parental status

Most treatment seekers live in a family, be it with their partner (and children) (26%) or with their parents (23%). One out of three lives alone (33%).

Graph 7. (Co)habitation type: mono versus poly substance users (n=369)



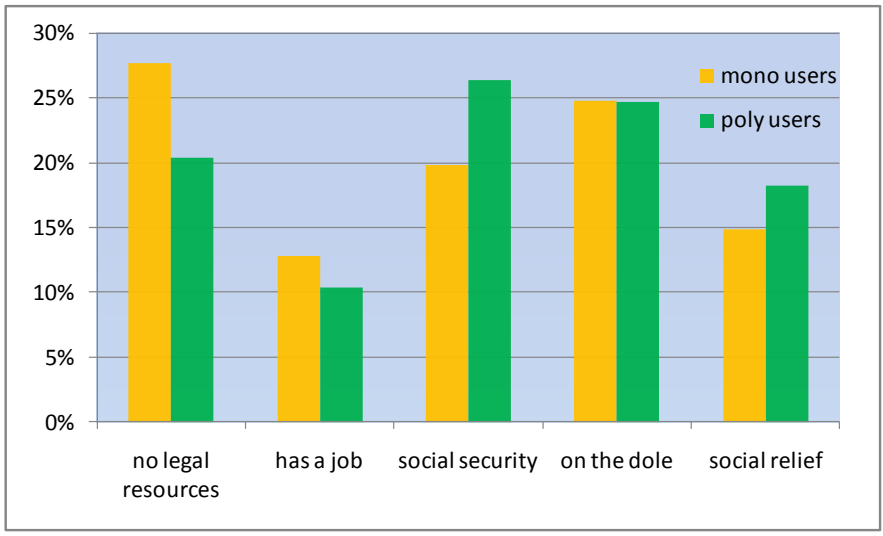
No significant association was found between individuals living status and poly substance use (p=0.517), although single drug users were more likely to live alone (38 vs. 31%), while poly substance users lived more often in a family setting (30 vs. 22%).

55% of all treatment seekers in the Sentinelle-database declare they have one or more children. More women than men have children (65 vs. 43%), but no association was observed between parental status and poly substance use.

Sources of income

Income status and poly substance use are not significantly associated (p=0.332), but proportionally more single drug users receive (financial) help from their family, while more poly substance users receive social benefits (44 vs. 35%).

Graph 8. Sources of income: mono versus poly substance users (n=372)



5.3.2 Longitudinal analysis

Between 1997 and 2008, 3614 unique individuals have been registered at least once in the Sentinelle database. When comparing different time periods, it appears that the proportion of poly substance users has clearly increased over time (χ^2=415.130; df=6; p=0.000), though this association is weak (V=0.240).

			Substances used			
			no product	mono user	poly user	Total
4 periods	1997-1999	Amount	298	485	558	1341
		% within period	22.2	36.2	41.6	100.0
	2000-2002	Amount	193	237	421	851
		% within period	22.7	27.8	49.5	100.0
	2003-2005	Amount	126	177	317	620
		% within period	20.3	28.6	51.1	100.0
	2006-2008	Amount	53	65	684	802
		% within period	6.6	8.1	85.3	100.0
Total		Total amount	670	964	1980	3614
		% from total period	18.5	26.7	54.8	100.0

Core illegal products: hashish, heroin & cocaine

Globally, one out of two respondents (n=3614) are current users of hashish and heroin (57% and 51%, respectively). However, their proportion has slightly decreased over time (-8% for each product). The percentage of current cocaine users is lower (36%), but remains stable over the periods (variations not exceeding 3%). The proportion of past users of hashish and heroin remained stable over the various time periods, but a strong decrease in the number of past cocaine users (-300%) was obvious.

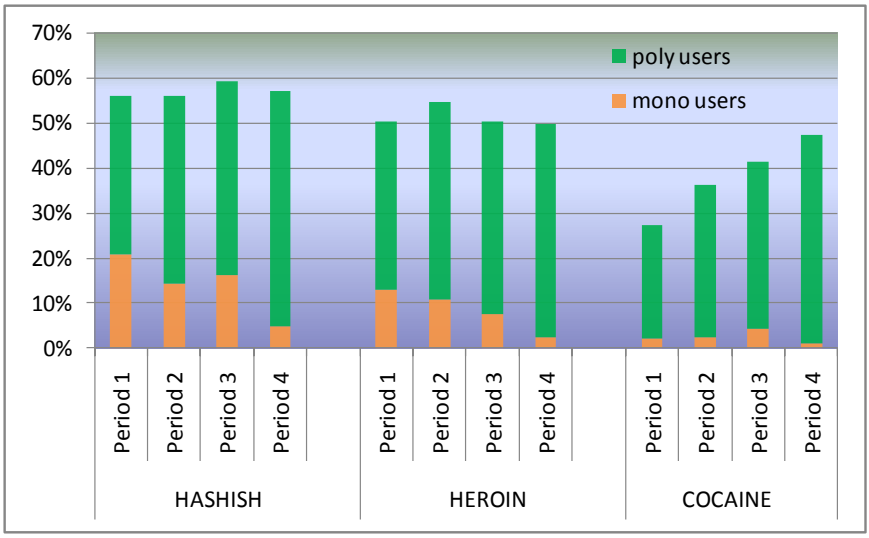
Mono and poly substance users: current and past use

Current poly substance users consume preferably hashish (41.9%) and heroin (42.0%), but also cocaine (34.0%). Since the first registration period (1997-1999), a strong increase increase is observed in the use of cocaine (+21%) and hashish (+17%) among poly substance users, but also an increase in heroin use (+10%) (cf. Graph 9).

If we consider current users of each substance separately, an association is found between the variable 'mono/poly substance use" and time period. This association is significant, but weak (V=0.125), for current use of cocaine (χ^2=20.402, df=3, p=0.000). The same is true for heroin (χ^2=78.46; df=3; p=0.000; V=0.206) and hashish (χ^2=121.067; df=3; p=0.000; V=0.243).

Past consumption of these substances is, logically, more frequent among mono than among poly substance users.

Graph 9. Current use of 'core' illegal substances among mono and poly substance users, by product (n=3 164)



Intravenous heroin and cocaine use

The majority of intravenous heroin and cocaine users are poly substance users: 76.8 and 91.6% respectively, which demonstrates that intravenous drug use is strongly correlated with poly substance use. Moreover, the number of poly substance users among injectable drug users has increased over time by 21% for heroin, and by 11% for cocaine shooters.

Age of first use

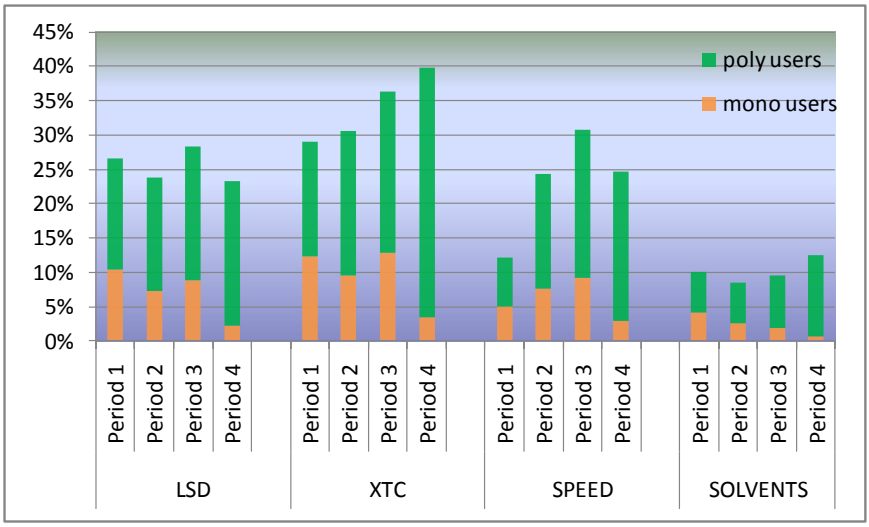
The mean age at first use for hashish is 15.7 years old, which has remained stable over time and is not different between mono and poly substance users. Also, the mean age of first cocaine use (20.6 years) did not differ between both groups, and was only slightly different for first heroin use. This suggests that the age at first use of the core problem substance in the Sentinelle database does not affect future consumption behaviour.

Other illegal substances: LSD, XTC, amphetamines, solvents

Current use of other illegal products is mainly associated with poly substance use, but prevalence rates remained stable between 1997 and 2008. Only the prevalence of amphetamine use increased by 4% over the period, while the current use of LSD, solvents and XTC has been stable among poly substance

users. Past use of these substances is far more prevalent among poly substance users than among single drug users (cf. Graph 10).

Graph 10. Past use of other illegal substances, in % of the answers for each product



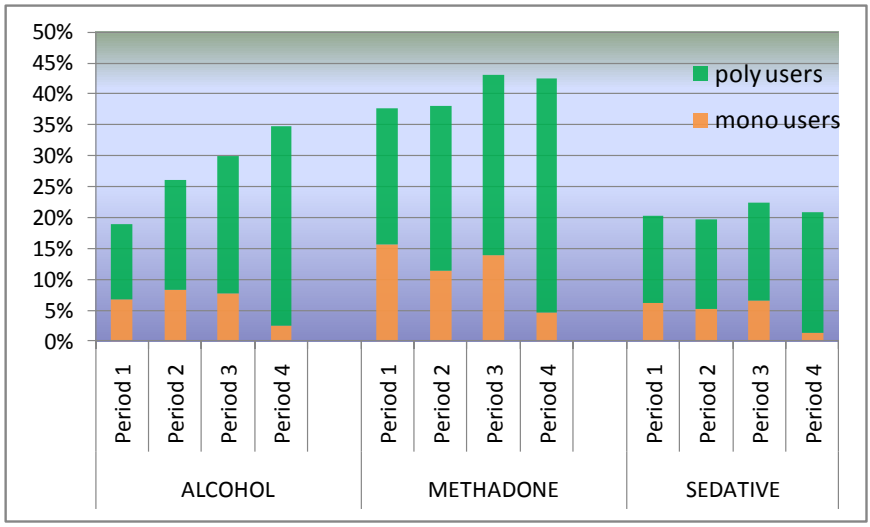
Use of legal products: alcohol, methadone, prescription drugs

Legal products are currently consumed by the majority of poly substance users, and the proportion of users has increased steadily between periods 1 and 3, and markedly in period 4. For alcohol, the proportion of poly substance users increases by 10% between 1997 and 2005, and by another 10% in the period 2006-2008; methadone used increased by 7% in period 1 to 3, and by 9% in period 4 (cf. Graph 11). Prevalence rates in the mono and poly substance use group have evolved differently (+26% for methadone, and +25% for alcohol, respectively), illustrating that the use of these substances has become more associated with the use of hashish, heroin and cocaine over time.

Interestingly, the number of persons who never used one or more legal products as well as those who stopped using them tends to decrease over the years (-9% for alcohol, -7% for sedatives; -6% for methadone), suggesting that a higher proportion of treatment seekers had ever used these substances in the period 2006-2008. These findings are complementary to the data about current use of legal substances.

Strikingly, the mean age for first alcohol use has decreased by 3.3 years among mono substance users (M=18.2 years) and by 3.7 years among poly substance users (M=17.8 years). old; n=758). On the other hand, the mean age for first methadone use has risen by 1.6 years for mono drug users (M=25.2 years) and by 1.5 years for poly substance users (M=23.9 years).

Graph 11. Current use of legal products, in % of total answers, by product



5.4. Conclusion

Based on the analysis of the Sentinelle database, the first hypothesis was not confirmed: no or few socio-demographic differences could be observed between mono and poly substance users. Consequently, we concluded (trivally) that mono and poly substance users mainly differ regarding their (past) use of substances, and partly regarding their safety net. The emerging profile of poly substance users is one of treatment seekers using several legal and illegal substances, who abandon but also combine some substances occasionally. Given the rather small set of variables in the Sentinelle database (e.g. not including information on individuals' social or (mental) health status), only a small proportion of the variance in poly substance abuse was explained by the selected variables.

On the other hand, evidence was found that a progressively larger number of drug users asking for treatment in the Sentinelle network are poly substance

users. This trend was clearly visible between 1997 and 2005, and became even more apparent between 2006 and 2008. Also, the proportion of single drug users and of persons who have never used a specific (illegal) substance has decreased accordingly, even up to 300% for cocaine.

The steep increase in the number of poly substance users in the Sentinelle database in the period 2006-2008 (when they make up 85% of all treatment seekers) characterises well two phenomena: first, it is accompanied by a noticeable increase in the use of some core illegal products (hashish, heroin and cocaine), as well as that of alcohol and methadone; second, past consumption of some substances is not typical for single drug users, since four out of five poly substance users have abandoned at least one of their core illegal products (hashish, heroin and cocaine), compared with previous treatment demands.

Chapter 6

Mental health and quality of life of single and poly substance users in psychiatric hospitals in Belgium

Jessica De Maeyer
Kathy Colpaert
Maarten De Schrijver
Wouter Vanderplasschen

6.1 Introduction

Residential substance abuse treatment in Belgium has traditionally been split up between drug and alcohol abuse treatment. From the 1970s and 1980s on, drug abusers were approached differently as compared with alcohol abusers due to their younger age, challenging behaviour (e.g., the so-called junkie syndrome) and (at that time) the inappropriateness of the existing mental health care system to deal with drug dependence. Consequently, a specific treatment offer has been created for drug dependent individuals including therapeutic communities, crisis intervention centres, etc. which has been financed and dealt with separately by the National Health Insurance Organisation (RIZIV/INAMI) (Vanderplasschen et al., 2002). Residential treatment for alcohol dependent persons (detoxification as well as intensive treatment) has been established in most psychiatric hospitals, but only few psychiatric hospitals have a specific ward for drug dependent individuals. However, in most psychiatric units an increase in the number of persons abusing various substances (alcohol, benzodiazepines, cannabis, cocaine, ...) is observed, or at least assumed (Dom, 2009).

Based on the assumed relation between poly substance use and mental health problems, this study aims at determining the prevalence of poly substance use in a clinical sample of individuals seeking residential substance abuse treatment in psychiatric hospitals. In particular, we want to compare the prevalence and nature of substance use and psychiatric problems (i.c. personality, mood and anxiety disorders) and the perceived quality of life between single and poly substance users.

6.2 Methods

6.2.1 Sample and data selection

This study was set up as a multi-center, cross-sectional study. Data were collected between July 1st, 2007 and October 31st, 2008 in 11 units for substance abuse treatment, situated in psychiatric hospitals in the provinces of East- and

West-Flanders (Belgium). In order to be included in the study, the psychiatric hospitals needed to have a specialised unit for intensive residential treatment of alcohol and/or drug abuse problems following initial detoxification. All 11 psychiatric hospitals that were selected on the basis of this criterion agreed to participate in the study. In all participating units, data were collected during a 4-month period. Interviews lasted approximately 97.3 minutes (SD=22.3) and all participants were interviewed between the 7th and 21st day after admission. All individuals that were admitted to one of these specialised units during the 4-month period and who met the inclusion criteria, were invited to participate in the study. In order to be eligible for the study, patients had to (a) have started a new residential treatment episode, (b) be older than 18, and (c) be able to speak and read Dutch. Individuals were excluded if: (a) they started day- or night-care treatment only, (b) had Korsakoff syndrome or limited cognitive abilities, (c) suffered from acute psychotic symptoms, (d) had already participated in the study, or (e) left the hospital during the first seven days after admission. After being informed in detail about the objectives of the study and their specific contribution, patients gave written informed consent to participate in the study.
During the data collection period, 682 individuals were admitted to one of the participating treatment units. About one third of the patients (n=248; 36.3%) did not meet the inclusion criteria, and 154 patients (22.6%) refused to participate in the study. Of the remaining 280 interviews that were conducted, six were not fully completed. Comparisons between patients who were interviewed (n=280) and those who refused to participate (n=154) showed no significant differences with regard to age, gender or type of dependence (none, alcohol only, drugs only or dual dependence). In total, 274 patients were included in the study.

6.2.2 Instruments

Data on substance abuse problems were collected using the EuropASI, while the mental health status was measured with the M.I.N.I. and ADP-IV. Individuals' quality of life was assessed using the WHOQoL-Bref.

Addiction severity index (EuropASI)

The European version of the Addiction Severity Index (EuropASI) was administered to measure the severity of substance use and related problems (Kokkevi & Hartgers, 1995; McLellan, Luborsky, Woody & O'Brien, 1980). The EuropASI is a semi-structured interview that uses a multidimensional approach to map the nature and severity of diverse problems in seven areas of functioning: physical health; education and employment; alcohol use; drug use; legal problems; family and social relationships and psychological/emotional health. For each of these life areas, a problem inventory is compiled based on a number of objective and subjective items. The EuropASI is used for both clinical and research purposes and is a validated and widely-used instrument (McLellan, Cacciola, Alterman, Rikoon & Carise, 2006).

The MIN I – International Neuropsychiatric Interview (M.I.N.I)

The Mini-International Neuropsychiatric Interview (M.I.N.I.) is a short, structured diagnostic interview for DSM-IV and ICD-10 Axis I disorders (Sheehan et al., 1998). The M.I.N.I. has been validated in the United States as well as in Europe and is available in several languages, including Dutch. Research has demonstrated that the M.I.N.I. reaches sufficiently high validity and reliability scores in comparison with the Structured Clinical Interview for DSM Disorders (SCID), but it can be administered in a much shorter time period (Jones et al., 2005; Sheehan et al., 1997).

The Assessment of DSM-IV Personality Disorders (ADP-IV)

The Assessment of DSM-IV Personality Disorders (ADP-IV) is a self-report instrument that assesses DSM-IV personality disorders (Schotte, de Doncker, Vankerckhoven, Vertommen & Cosyns, 1998). It consists of 94 items, representing the 80 criteria of the 10 DSM-IV personality disorders and the 14 criteria representing depressive and passive-aggressive personality disorders in a

randomized order. Each item needs to be scored on a trait (T) and a distress (D) scale. The trait scale is a 7-point Likert scale ranging from 1 ("totally disagree") to 7 ("totally agree"). When an individual agrees with the item (score 5, 6 or 7), he/she needs to indicate the level of distress on a 3-point scale ranging from 1 ("totally not") to 3 ("most certainly"). This instrument has the substantial advantage of allowing a dimensional as well as a categorical personality disorder assessment (Schotte et al., 1998). A dimensional assessment is obtained by adding up the ADP-IV trait scores for the 12 personality disorders, for the three clusters of personality disorders and for a total score. Categorical personality disorder diagnoses are obtained according to the DSM-IV cut-off scores. Research demonstrates that the ADP-IV shows satisfying psychometric properties with regard to test-retest reliability and construct validity (Schotte, de Doncker & Courjaret, 2007). The internal consistency of the ADP-IV trait scales in our clinical sample of substance users was adequate. Cronbach's Alpha values ranged from 0.706 to 0.839. For two trait scales, the Cronbach's Alpha values were below 0.70: the schizoid PD (Cronbach's Alpha = 0.552) and the obsessive-compulsive PD (Cronbach's Alpha = 0.618). Research indicates that these two scales generally obtain the lowest scores on internal consistency (Schotte et al., 1998).

World Health Organisation Quality of Life Scale-Bref (WHOQOL-Bref)

The World Health Organization Quality of Life Scale-Bref (WHOQOL Group 1998) is a validated, self-report questionnaire to assess quality of life. It consists of two general items (overall perception of QoL; overall perception of health), followed by 24 items representing four domains of quality of life: physical and psychological health, social relationships, and environment. All items are rated on a 5-point Likert scale with higher scores reflecting greater life satisfaction.

6.2.3 Data analysis

In order to compare single and poly substance users, the sample was split up in two subgroups based on the presence or absence of recent poly substance use. In this chapter, recent poly substance use was defined as the "use of more than one substance~~s~~ on the same day during at least one of the last 30 days" (cf. EuropASI; Raes, Lombaert & Keymeulen, 2008). Given the specificity of the setting of this study (psychiatric hospitals) and the observation that a large share of the respondents is prescribed medication for the treatment of co-occurring psychiatric disorders (e.g. mood and anxiety disorders), we decided to adapt the definition of recent poly substance use in the following way: in case respondents had used prescription drugs (antidepressants or benzodiazepines) in the last 30 days and declared that they used these substances only according to the frequency and dosage as prescribed, this substance was not taken into account to decide on recent poly substance use (last 30 days).

A descriptive profile of both single and poly substance users is presented including socio-demographic characteristics, their substance use, psychological wellbeing and quality of life. To test statistically significant differences between the single and poly substance use group, chi^2-tests were applied in case of categorical variables (when > 20% of the cells had an expected count <5, the Fischer's exact test was used) and *t*-tests for continuous variables. When the overall chi^2 was significant, custom tables were used to evaluate which specific categories of each variable were significant. EuropASI composite scores were computed to analyse the problem severity on different life domains (physical health, education and employment, legal problems, family and social relationships, alcohol use, drug use and psychological/emotional health).

A logistic regression analysis was used to assess factors (continuous and categorical) that are independently associated with recent poly substance use (the dependent variable). Following univariate comparisons by substance use category (poly vs. single substance use), nineteen predictors (variables with a p-value ≤ 0.05 (except for gender)) were included in the logistic regression model: gender, age, educational level, living situation, employment, legal status, ASI composite score for drug use, ASI composite score for education and employment, ASI composite scores for family and social relationships, ASI

composite score for legal problems, ASI composite score for psychological/emotional health, WHO overall perception of quality of life, WHO overall perception of health, WHO transformed score for physical health, WHO transformed score for psychological health, WHO transformed score for social relationships, WHO transformed score for environment, having at least one personality disorder, having at least one anxiety disorder. In a next step, the recursive feature elimination method as implemented by the R-package Caret (for more details, see Kuhn, 2008) was used to prespecify the important variables to be included in our final prediction model. To prevent overfitting, 10-fold cross-validation was applied. Within each of the 10 resampling iterations, in which one sample was held back to test model performance, several models were fit. The process started by fitting a logistic regression model using all 19 variables. The rankings – indicating the variable importance – were calculated based on the residual deviances of the variables included in the model. Next, the least significant variable was eliminated from the model and the model with the remaining 18 candidate predictors was fit. This procedure was repeated until one variable was left in the model (cf. backward selection). For each model, the prediction accuracy was calculated, using the held-back sample of the current iteration. In a final step, the average performance was calculated over all 10 cross-validation samples and the model with the highest average prediction accuracy was selected.

6.3 Results

6.3.1 Poly substance use and substance-related problems

Twenty-eight percent of the sample (n=77) reported recent poly substance use (last 30 days). Lifetime and recent use of almost all substances (except alcohol and antidepressants) was significantly higher among poly substance users as compared with single substance users (cf. table 1).

When the sample was split up based on diagnoses of substance dependence, 65.1% of the sample (n=175) had a ‘current alcohol dependence’, while 20.4%

(n=55) had a 'dual dependence' on alcohol and illicit drugs. Only 14.2% of the respondents (n=39), were labelled with a diagnosis of 'current drug dependence'. Only 6.3% of the respondents with current alcohol dependence reported poly substance use in the last 30 days. This number was significantly higher in the group with dependence on a illicit substance (59.0%) or with dual dependence (76.4%).

In terms of drug and alcohol use, poly substance users are significantly younger when they start drinking alcohol and start using benzodiazepines and amphetamines regularly. The group of single substance users has been significantly more often in treatment for alcohol problems, while the poly substance use group reported consisted of a greater proportion of persons who had followed drug treatment. Single substance users have been significantly more often abstinent after previous alcohol treatment and had, on average, longer periods of abstinence after previous alcohol or drug treatment.

EuropASI severity ratings differed significantly between single and poly substance users on all life domains (cf. table 2). In general, single substance users had less severe problems, except concerning medical health and alcohol use. Moreover, poly substance users reported a significantly higher need for help regarding medical, drug and legal problems, while single substance users only reported a higher need for help regarding alcohol problems.

Table 1: Comparison of drug and alcohol use ever and during the last 30 days (according to ASI definition) between single and poly substance users (n=274)

	EVER				RECENT			
	Single N=197	**Poly N=77**	**Pearson Chi²**	**p**	**Single N=197**	**Poly N=77**	**Pearson Chi²**	**p**
Alcohol (every amount) (%)	98.0	93.5	3.471	.062	85.8	88.3	.302	.583
Alcohol (>= five glasses) (%)	94.9	88.3	3.751	.053	80.2	81.8	.093	.761
Cannabis (%)	10.2	74.0	111.788	.000**	2.5	58.4	115.976	.000**
Heroin (%)	5.1	39.0	50.985	.000**	1.5	32.5	57.781	.000**
Methadone (%)	3.0	27.3	36.580	.000**	1.0	19.5	32.437	.000**
Buprenorphine (%)	1.0	10.4	13.835	.001**	.5	1.3	.478	.484

Other opiates (%)	12.2	33.8	17.288	.000**	1.0	13.0	18.947	.000**
Benzodiazepines (%)	57.4	83.1	16.060	.000**	39.6	64.9	14.282	.000**
Antidepressants (%)	58.4	61.0	.162	.687	38.1	33.8	.441	.507
Cocaine (%)	9.1	50.6	57.906	.000**	2.5	41.6	72.167	.000**
Amphetamines (%)	10.7	54.5	60.218	.000**	1.5	20.8	31.810	.000**
Hallucinogens (%)	2.0	11.7	11.426	.002**	0.0	7.8	15.694	.000**
Ecstasy (%)	6.6	44.2	54.949	.000**	0.0	9.1	18.379	.000**

* p < .05; ** p < .01

Table 2: Severity ratings on all domains of the EuropASI: comparison between single and poly substance users (n=274)

	Single N=197	**Poly N=77**	**T-value**	**Df**	**p**
Physical health [SD]	2.88 [2.27]	2.18 [2.24]	2.311	272	.022*
Education and Employment [SD]	2.76 [1.92]	4.17 [1.98]	-5.341	285	.000**
Alcohol use [SD]	5.92 [1.93]	5.12 [2.19]	2.884	114.875	.005**
Drug use [SD]	1.11 [2.12]	5.82 [1.96]	-16.901	272	.000**
Legal Problems [SD]	1.27 [1.69]	2.97 [2.35]	-5.808	107.920	.000**
Family and Social relationships [SD]	3.43 [1.84]	4.05 [1.88]	-2.512	272	.013*
Psychological/emotional health [SD]	4.60 [2.28]	5.70 [2.13]	-3.644	272	.000**

* p < .05; ** p < .01

Also, the more robust ASI composite scores demonstrate significantly more severe problems among poly substance users on the domains education and employment, drug use, legal situation, family and social relationships and psychological/emotional health (cf. table 3).

Table 3: Composite scores on all domains of the EuropASI: comparison between single and poly substance users (n=274)

	Single N=197	**Poly N=77**	**T-value**	**Df**	**P**
Physical health [SD]	.27 [.34]	.20 [.30]	1.659	155.060	.099

Education and employment (economic situation) [SD]	.66 [.43]	.76 [.38]	-1.981	153.761	.049*
Education and employment (satisfaction work situation) [SD]	.21 [.30]	.17 [.27]	1.000	150.510	.319
Alcohol use [SD]	.54 [.28]	.46 [.32]	1.943	122.657	.054
Drug use [SD]	.04 [.07]	.21 [.13]	-11.090	91.469	.000**
Legal Problems [SD]	.08 [.15]	.21 [.27]	-4.232	96.007	.000**
Family relationships [SD]	.15 [.22]	.23 [.23]	-2.684	264	.008**
Social relationships [SD]	.08 [.17]	.12 [.19]	-1.525	270	.128
Psychological/emotional health [SD]	.32 [.23]	.41 [.22]	-3.025	272	.003**

* p < .05; ** p < .01

6.3.2 Socio-demographic characteristics and social and legal situation

Table 4 shows the socio-demographic characteristics of both groups: poly substance users are significantly younger, have a lower educational level, live more frequently with their parents/family or in varying living situations and are more often unemployed compared with single substance users. The mean number of days employed is significantly higher in the group of single substance users, but single substance users were also significantly more often dependent on health insurance benefits. The majority of poly substance users are single (80.5%), as opposed to single substance users who are more often married (27.9%) or divorced (42.1%). No differences are observed between both groups regarding the number of individuals living with a partner with alcohol or drug problems, nor regarding the number of individuals with a mother with substance use or psychiatric problems. However, significantly more poly substance users have a father with a drug use or psychiatric problem.

In addition, poly substance users have had more legal problems in the past, had been convicted more frequently and were more often on probation at the time of the interview. The presence and frequency of medical problems (e.g. chronic health problems) did not differ between both groups, nor did we find any differences regarding physical or sexual abuse.

Table 4: Comparison of socio-demographic characteristics between single and poly substance users (n=274)

	Single N=197	Poly N=77	Pearson Chi² or T-value	Df	p
Mean age	45.16	32.79	9.253	272	.000**
[SD]	[9.44]	[11.14]			
Men (%)	68.0	72.7	.577		.448
Civil status (%)			61.517		.000**
- *Married* ^	27.9	6.5			
- *Divorced* ^	42.1	13.0			
- *Widower*	1.5	0.0			
- *Single* ^	28.4	80.5			
Highest degree of education (%)			7.723		.021*
- *Primary or none* ^	13.7	24.7			
- *Secondary*	62.9	63.6			
- *Higher* ^	23.4	11.7			
Living situation last 30 days (%)			55.850		.000**
- *With partner and/or child(ren)* ^	46.2	18.2			
- *With parents or other family* ^	4.1	22.1			
- *Alone*	28.4	29.9			
- *In controlled environment*	20.8	15.6			
- *With friends or in varying living situations* ^	0.5	14.3			
Legal situation last 30 days (%)			36.644		.000**
- *None* ^	71.1	32.5			
- *None, but legal problems in the past* ^	11.2	31.2			
- *Case pending/On bail*	9.6	16.9			
- *Probation/Parole* ^	2.5	9.1			
- *Other*	5.6	10.4			
Mean number of convictions	0.37	1.16	-3.150	100.939	.002**
[SD]	[1.30]	[2.05]			
Working situation last 30 days (%)			26.866		.000**
- *Part-time or full-time employed* ^	30.5	18.2			
- *Health insurance benefits* ^	39.1	26.0			
- *Unemployed* ^	15.7	45.5			
- *Other (student; retired; ...)*	5.1	3.9			
- *In controlled environment*	9.6	6.5			
Mean number of working days last 30 days	5.74	3.51	2.168	170.014	.032*
[SD]	[8.82]	[7.15]			

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

6.3.3 Mental health problems and DSM Axis I and II disorders

Based on the EuropASI, it appears that significantly more poly substance users experienced difficulties regarding controlling violent behaviour (ever and during the last 30 days) and understanding, concentrating and remembering (ever and during the last 30 days) and they had more often had hallucinations (lifetime) (not as a result of drug or alcohol use) (cf. table 5). During the last 30 days, poly substance users were prescribed medication for psychological problems significantly more often. Moreover, they had significantly more often serious thoughts of suicide and a higher prevalence and number of suicide attempts.

Table 5: Prevalence of recent psychological and emotional problems: comparison between single and poly substance users (n=274)

	Single N=197	***Poly N=77***	***Pearson Chi² or T-value***	***p***
Psychological problems last 30 days (%)				
- *Depressive feelings*	38.6	44.2	.717	.397
- *Feelings of anxiety or tension*	47.2	48.1	.016	.900
- *Trouble understanding, concentration, remembering*	25.4	48.1	13.131	.000**
- *Hallucinations*	2.5	6.5	2.463	.117
- *Trouble controlling violent behaviour*	14.7	28.6	7.011	.008**
- *Prescribed medication for psychological problems*	55.8	74.0	7.695	.006**
- *Serious thoughts of suicide*	18.8	32.5	5.923	.015*
- *Attempted suicide*	3.6	10.4	5.000	.037*
Mean number of suicide attempts	0.69	1.57	-2.294	.014*
[SD]	[1.58]	[2.91]	*(df=94.101)*	

* p < .05; ** p < .01

The prevalence of current Axis I mood and anxiety disorders is slightly (although not significantly) higher for mood disorders among poly substance users (46.1 vs. 41.1%) (cf. Table 6). However, compared with single substance users, poly substance users have significantly more often anxiety disorders (63.2 vs. 44.7%). Significant differences were also found for social phobia (p=0.016) and obsessive-compulsive disorders (p=0.000), and the prevalence of post-traumatic stress disorders approached significance (p=0.051).

When looking at the prevalence of Axis II personality disorders, even larger differences were observed (cf. table 7). Over 67% of all poly substance users met

the criteria for at least one personality disorder, while only one third of the single substance users did so. A significantly higher prevalence of cluster B antisocial and borderline personality disorders was observed among poly substance users, while no statistically significant differences were found in clusters A and C.

Table 6: Prevalence of Axis I mood and anxiety disorders: comparison between single and poly substance users (n=274)

	Single N=197	***Poly N=77***	***Pearson Chi²***	***p***
Mood disorders				
- *Depressive episode (%)*	34.0	34.2	.001	.975
- *Manic episode (%)*	1.0	1.3	.046	.831
- *Dysthymia (%)*	9.9	17.6	2.061	.151
Anxiety disorders				
- *Panic Disorder (%)*	4.6	7.9	1.169	.372
- *Agoraphobia (%)*	10.2	13.2	.507	.477
- *Social phobia (%)*	9.1	19.7	5.798	.016*
- *Specific phobia (%)*	5.7	9.3	1.111	.292
- *Obsessive-compulsive disorder (%)*	8.1	23.7	12.182	.000**
- *Generalised anxiety disorder (%)*	25.9	32.9	1.340	.247
- *Post-traumatic stress disorder (%)*	4.6	12.0	4.854	.051
At least one mood disorder (%)	41.1	46.1	.547	.460
At least one anxiety disorder (%)	44.7	63.2	7.498	.006**

* p < .05; ** p < .01

Table 7: Prevalence of Axis II personality disorders: comparison between single and poly substance users (n=274)

	Single N=197	***Poly N=77***	***Pearson Chi²***	***p***
Paranoid PD (%)	7.7	15.1	3.248	.072
Schizoid PD (%)	6.2	4.1	.431	.511
Schizotypical PD (%)	3.1	6.8	1.895	.169
Antisocial PD (%)	4.1	26.0	27.996	.000**
Borderline PD (%)	20.1	43.8	15.304	.000**
Histrionic PD (%)	1.0	2.7	1.050	.301
Narcissistic PD (%)	1.5	4.1	1.586	.350
Avoidant PD (%)	12.9	19.2	1.683	.194
Dependent PD (%)	6.2	8.2	.349	.555
Obsessive-Compulsive PD (%)	10.3	9.6	.030	.862
[Depressive] (%)	6.7	11.0	1.327	.249
[Passive-Aggressive] (%)	3.1	6.8	1.895	.169
At least one PD (%)	33.0	67.1	25.316	.000**

* p < .05; ** p < .01

6.3.4 Quality of life

The lowest QoL-scores for both groups are observed on the domains 'Psychological health' and 'Social relationships' (cf. table 7). Poly substance users reported significantly lower QoL scores on the overall wellbeing and health indexes of the WHOQOL-Bref. Moreover, siignificantly higher QoL-scores were observed on the domains physical and psychological health, social relationships and environment among single substance users. In addition, the satisfaction with leisure time activities (based on the EuropASI) was significantly lower among poly substance users.

Table 8: WHOQOL-Bref: Overall perception and transformed scores (n=274)

Life domain	Single N=191	Poly N=77	T-value	Df	p
Overall perception of QOL [0-4] [SD]	3.03 [0.98]	2.58 [1.06]	3.284	272	.001**
Overall perception of health [0-4] [SD]	3.04 [1.03]	2.61 [1.04]	3.100	272	.002**
Physical health domain [0-100] [SD]	58.79 [18.09]	54.13 [14.87]	2.012	272	.045*
Psychological health domain [0-100] [SD]	52.96 [16.89]	46.54 [15.71]	2.884	272	.004**
Social Relationships domain [0-100] [SD]	55.75 [22.37]	48.81 [21.62]	2.331	272	.020*
Environment domain [0-100] [SD]	65.18 [15.99]	55.03 [13.16]	4.950	272	.000**

* p < .05; ** p < .01

6.3.5 Socio-demographic, mental health and substance use-related correlates of poly substance use

A logistic regression was carried out to investigate which variables predicted recent (last 30 days) poly substance use in this sample of substance users admitted in specialised units in Belgian psychiatric hospitals (cf. table 9). In the best fit model, data on 257 unique individuals were entered in the analysis. A test

of the full model (88.3%) versus a model with intercept only (73.5%) was statistically significant (χ^2(df=14)= 150.531, p=0.000). Three variables emerged as significant determinants of being a poly substance user in the best fit model (Table 9): age (p=0.009), the ASI drug use composite score (p=.000) and employment status (p=0.016) were significant correlates. Being younger was associated with being more likely to belong to the group of poly substance users (95% C.I.: 0.897 to 0.984; p=0.009). The 3.684 odds ratio for the ASI drug use composite score indicates that the odds of belonging to the poly substance use group increase for each unit increase in the ASI drug use composite score (95% C.I.: 2.231 to 6.084; p<0.001). The odds ratios of the dummy variables 'employment status' compare each status (except unemployed) to the status unemployed. For persons gaining their main income from health insurance benefits, the 0.317 odds ratio means that the odds of belonging to the poly substance use group are only 0.317 times those of unemployed individuals (95% C.I.: 0.106 to 0.948; p=0.040). For persons living in a controlled environment, the 0.062 odds ratio means that the odds of belonging to the poly substance use group are only 0.062 times those of unemployed individuals (95% C.I.: 0.010 to 0.381; p=.003).

The variable 'current legal status' approached significance (p=0.083) and the 4.749 odds ratio for legal problems in the past means that the odds of being a poly substance user are 4.749 times higher for individuals with no current legal problems, but with legal problems in the past as compared with those without criminal record (95% C.I.: 1.618 to 13.939; p=0.005).

Although no main effect of overall health perception (WHOQOL-Bref) (p=0.227) was observed, individuals who were dissatisfied or very dissatisfied with their health status were more likely to be poly substance users, as compared with the reference category 'very satisfied with overall health status'.

Table 9: Logistic regression predicting membership of the poly substance use group (compared to the single drug use group) (N=257)

							95% C.I. for Exp(B)	
	B	S.E.	Wald	Df	p-value	Exp(B)	Lower	Upper
Age	-.062	.024	6.911	1	.009**	.940	.897	.984
Employment status (Ref. cat.: unemployed)			12.159	4	.016*			
- *health insurance benefits*	-1.150	.560	4.223	1	.040*	.317	.106	.948
- *fulltime or part-time employed*	-.957	.604	2.511	1	.113	.384	.118	1.255
- *other (student, retired)*	.587	1.018	.332	1	.564	1.799	.244	13.238
- *controlled environment*	-2.773	.922	9.043	1	.003**	.062	.010	.381
Legal situation (Ref. cat.: no legal situation)			8.231	4	.083			
- *legal problems in the past*	1.558	.549	8.039	1	.005**	4.749	1.618	13.939
- *case pending / on bail*	.781	.656	1.418	1	.234	2.184	.604	7.899
- *probation / parole*	1.086	1.311	.686	1	.408	2.962	.227	38.679
- *other*	.751	.811	.858	1	.354	2.118	.433	10.374
Overall health perception (Ref. cat.: very satisfied)			5.744	4	.219			
- *very dissatisfied*	3.607	1.611	5.012	1	.025*	36.843	1.567	866.348
- *dissatisfied*	3.284	1.472	4.977	1	.026*	26.677	1.490	477.608
- *satisfied*	2.871	1.482	3.753	1	.053	17.646	.967	322.044
ASI composite score drug use	1.304	.256	25.966	1	.000*	3.684	2.231	6.084
Constant	-2.726	1.785	2.332	1	.127	.065		

* p < .05; ** p < .01

6.4 Discussion

Given the lack of information on the prevalence and the specific characteristics of poly substance use, the aims of this study were to determine the prevalence of poly substance use among a clinical sample of individuals seeking residential substance abuse treatment and to provide a descriptive profile of poly substance use in this setting. Since higher levels of psychopathology are assumed among poly substancers, the impact of psychological problems on poly substance use was investigated.

Twenty-eight percent of the sample reported recent poly substance use (during the last 30 days), while 42% of the respondents stated to have ever used more than one substance on the same day. The results of this study demonstrate that poly substance users are generally younger and report a worse education level, employment status and legal situation as compared with single substance users. No gender differences were found. Poly substance users experience significantly more recent psychological problems and have a significantly higher overall prevalence of axis I mood and anxiety disorders and axis II personality disorders. Personality disorders (as measured with the ADP-IV) are highly prevalent among poly substance users since 67.1% had at least one personality disorder, and 63.2% of them met the criteria for at least one anxiety disorder. Consequently, it may be not surprising that poly substance users have significantly more severe problems on all ASI domains (education and employment; drug use; legal problems; family and social relationships and psychological/emotional health), except physical health and alcohol use. Also, more subjective outcome measures like QoL indicate that poly substance users report significantly lower scores on various dimensions of quality of life.

On the other hand, further analyses of these findings by means of a logistic regression analysis did not demonstrate a strong, independent impact of psychopathology on poly substance use. Nor the prevalence of at least one personality disorder, nor the prevalence of at least one anxiety disorder, neither the ASI composite score for psychological/emotional health were significant predictors of poly substance use. The only correlate that partly demonstrated a

direct impact of (psychological) wellbeing on poly substance use is the overall health perception index of the WHOQoL-Bref. While assessment instruments such as the MINI and ADP-IV did not show a direct impact on poly substance use, persons with a lower satisfaction about their overall health were more likely to be poly substance users. As this finding represents an individual's subjective experience about his/her health, it urges for a focus on more patient-reported outcomes, such as QoL. The ASI composite score for drug use (measuring the severity of drug problems and need for treatment) was the strongest correlate of poly substance use (p=0.000). This is logical, since poly substance users reported significantly higher levels of lifetime and recent use of a variety of (illegal) substances, except for alcohol and antidepressants. Poly substance use is scarce (6.3%) among persons with a current alcohol dependence disorder only, while individuals with a current drug or dual dependence (alcohol and drugs) reported much higher percentages of recent poly substance use (59.0 and 76.4%, respectively). Also, being younger and a number of specific employment conditions were retrieved as significant correlates of poly substance use, while the role of a person's legal situation approached significance. These findings demonstrate that poly substance use is associated with more severe problems on various life domains (e.g. employment, legal status), not just drug use and mental health.

6.4.1 Limitations of the study

This study highlights the prevalence of poly substance use and the potential impact of various socio-demographic, substance use and health-related variables on this phenomenon. This distinction is seldom made in substance use research and might have some specific treatment implications. However, the results of this study should be regarded in the perspective of some limitations. First, the sample consisted of clients who were admitted to a specific treatment modality, namely specialised addiction units in psychiatric hospitals. Consequently, the sample consisted predominantly of individuals suffering from alcohol dependence. In other treatment settings or in community samples (out of

treatment), different patterns of poly substance use will be retrieved. Second, the low proportion of women in the sample may influence the accuracy of the data. However, no significant gender differences were found, nor in the bivariate analyses, neither in the logistic regression analysis. Third, with regard to the prevalence of personality disorders one might question the reliability and validity of the ADP-IV self-report questionnaire. In future research, it is preferable to use multi-method assessments, including information from other informants than the client. As this study showed the importance of measuring patient-reported outcomes such as QoL to gain insight in the real impact of (psychological) problems on an individual's every day life, it is recommended to use a more comprehensive measure of QoL than the WHOQOL-Bref. Finally, given the cross-sectional character of this study, it is impossible to determine whether poly substance use is a cause or rather a consequence of poor mental health. Therefore, longitudinal research is needed to assess the causality between both variables and to provide insight in the longitudinal course of poly substance use. In addition, future research should give attention to different patterns of poly substance use (e.g. frequency and duration of use, combination of products), since this might result in more specific client profiles, allowing to tailor prevention and treatment initiatives. Also, research is needed on potential protective conditions related to poly substance use.

REFERENCES

Dom, G. (2009). *Polygebruikers in zorg: uitdagingen en vraagtekens* (Lezing op de studiedag 'Verslavingszorg: Geboeid door complexiteit: Een zoektocht naar een gepaste zorg voor polygebruikers', op 9 oktober 2009). Boechout: PC Broeders Alexianen.

Jones, J.E., Hermann, B.P., Barry, J.J., Gilliam, F., Kanner, A.M., & Meador, K.J. (2005). Clinical assessment of axis I psychiatric morbidity in chronic epilepsy: a multicenter investigation. *Journal of Neuropsychiatry and Clinical Neurosciences, 17*(2), 172-179.

Kokkevi, A., Stefanis, N., Anastasopoulou, E., & Kostogianni, C. (1998). Personality disorders in drug abusers: Prevalence and their association with AXIS I disorders as predictors of treatment retention. *Addictive Behaviors, 23*(6), 841-853.

Kuhn, M. (2008). Building predictive models in R using the caret package. *Journal of Statistical Software, 28*(5).

McLellan, A.T., Cacciola, J.C., Alterman, A.I., Rikoon, S.H., & Carise, D. (2006). The Addiction Severity Index at 25: Origins, Contributions and Transitions. *The American Journal on Addictions, 15*, 113-124.

McLellan, A.T., Luborsky, L., Woody, G.E., & O'Brien, C.P. (1980). An improved diagnostic evaluation instrument for substance abuse patients, the Addiction Severity Index. *Journal of Nervous and Mental Disease, 168*, 26-33.

Raes, V., Lombaert, G. & Keymeulen, R. (2008), *De nederlandse vertaling van de handleiding voor training en afname van EuropASI vraaggesprekken, aangepast voor België Vlaanderen, met integratie van de Treatment Demand Indicator*. Gent: De Sleutel, Dienst Wetenschappelijk Onderzoek.

Schotte, C.K.W., de Doncker, D., Vankerckhoven, C., Vertommen, H., & Cosyns, P. (1998). Self-report assessment of the DSM-IV personality disorders. Measurement of trait and distress characteristics: the ADP-IV. *Psychological Medicine, 28*(5), 1179-1188.

Sheehan, D.V., Lecrubier, Y., Sheehan, K.H., Amorim, P., Janavs, J., Weiller, E., et al. (1998). The Mini- International Neuropsychiatric Interview (MINI): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry, 59*, 22-33.

Sheehan, D.V., Lecrubier, Y., Sheehan, K.H., Janavs, J., Weiller, E., Keskiner, A., et al. (1997). The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. *European Psychiatry, 12*(5), 232-241.

Vanderplasschen, W., De Bourdeaudhuij, I., & Van Oost, P. (2002). Co-ordination and continuity of care in substance abuse treatment - An evaluation study in Belgium. *European Addiction Research, 8*(1), 10-21.

The WHOQOL Group (1998). Development of the world health organization WHOQOL-BREF quality of life assessment. *Psychological Medicine, 28*(3), 551-558.

Chapter 7

Poly substance use and mental health of substance users presenting for treatment in alcohol and drug services in Belgium

Jessica De Maeyer
Kathy Colpaert
Serge Cogels
Maarten De Schrijver
Wouter Vanderplasschen

7.1 Introduction

An increase in poly substance use has been demonstrated over the past years (Byqvist, 2006; EMCDDA, 2009). This tendency has been noticeable in society, but has also among substance users who ask for treatment in specialised drug treatment services. However, information on this phenomenon in Belgium is limited. In the previous chapter 6, poly substance use was studied among persons seeking substance use treatment in psychiatric hospitals. Since this is just one treatment modality that is merely addressed by persons with a primary alcohol use disorder, the study design of the PhD-study of Kathy Colpaert (chapter 6) was repeated in specialised treatment agencies for drug users, i.e. detoxification units, medical-social care centres and long-term residential treatment centres.
Therefore, the specific aims of this study are to determine the prevalence of poly substance use in an integrated sample of substance users, seeking treatment in psychiatric hospitals, long-term residential treatment settings, detoxification units or outpatient methadone maintenance services and to identify specific variables that are significant correlates of poly substance use during the last 30 days. Specific attention is given to the characteristics of poly substance users and the extent and type of psychiatric disorders in this population.

7.2 Methods

7.2.1 Sample and data collection

This study is based on an integrated sample of two cross-sectional studies. The first study is a multi-centre, cross-sectional study in 11 units for substance abuse treatment, situated in psychiatric hospitals in the provinces of East- and West-Flanders (Belgium) (n=274). The methodology of this study is extensively described in chapter 6. The second study is based on a clinical sample of individuals (n=55) seeking in- or outpatient substance abuse treatment in

specialised drug treatment settings. This study was set up in three types of treatment services: methadone maintenance treatment, detoxification and long-term residential treatment (e.g. therapeutic communities) in Belgium. Data were collected between April 1st and December 31st, 2010. In order to be eligible for the study participants had to (a) be older than 18, (b) be able to speak Dutch or French, (c) be treated for an initial drug problem. Individuals were excluded if they (a) had Korsakoff syndrome or limited cognitive abilities, or (b) suffered from acute psychotic symptoms. Informed written consent was obtained from all participants prior to their inclusion in the study. Participation was entirely voluntary and confidentiality was assured. Individuals received a voucher (worth 20 EUR) for participation in the study. In total, 55 participants were interviewed in the second study during the data collection period.

Table 1: Overview of treatment settings where the second sample was recruited (n=55)

Type of treatment setting	N	%
Methadone maintenance treatment	25	45.4
Detoxification	16	29.1
Long-term residential treatment	14	27.3

7.2.2 Data analysis

Both samples were merged in one single database. The total sample (n=329) was split up in two subgroups, based on the presence or absence of recent poly substance use (last 30 days). Poly substance use was defined as the use of more than one substance on the same day (Cf. EuropASI; Raes, Lombaert & Keymeulen, 2008). A descriptive profile of both, single and poly substance users is presented including socio-demographic characteristics, substance use patterns and information on psychological problems and wellbeing. To test statistically significant differences between single and poly substance users, chi^2-tests were applied in case of categorical variables (when > 20% of the cells had an expected count < 5, the Fischer's exact test was used) and *t*-tests for continuous variables. When the overall chi^2 was significant, custom tables were used to evaluate which specific categories of each variable were significant. EuropASI composite scores

were computed to analyse the severity of problems on various life domains (physical health, education and employment, legal problems, family and social relationships, alcohol use, drug use and psychological/emotional health).

A logistic regression analysis was used to assess factors (continuous and categorical) independently associated with recent poly substance use (the dependent variable). After the univariate comparisons by substance use category (poly vs. single substance use), 18 predictors (variables with a p-value <0.05 (except for gender)) were initially included in the logistic regression model: gender, age, civil status, living situation, employment, legal status, mean number of suicide attempts, mean number of hospital admissions ever, mean number of convictions, living with someone with alcohol problems, ASI composite score for drug use, ASI composite scores for education and employment, ASI composite score for legal problems, ASI composite score for psychological/emotional health, having at least one personality disorder, having at least one anxiety disorder, having at least one mood disorder, and suicidal ideation. In a next step, the recursive feature elimination method as implemented by the R-package Caret (for more details, see Kuhn, 2008) was used to prespecify the important variables to be included in the final prediction model. To prevent overfitting, 10-fold cross-validation was applied. Within each of the 10 resampling iterations, in which one sample was held back to test model performance, several models were fit. The process started by fitting a logistic regression model using all 18 variables. The rankings – indicating the variable importance – were calculated, based on the residual deviances of the variables included in the model. Next, the least significant variable was eliminated from the model and the model with the remaining 17 candidate predictors was fit. This procedure was repeated until one variable was left in the model (cf. backward selection). For each model, the prediction accuracy was calculated, using the held-back sample of the current iteration. In a final step, the average performance was calculated over all 10 cross-validation samples and the model with the highest average prediction accuracy was selected.

7.3 Results

7.3.1 Poly substance use and substance-related problems

Sixty-four percent of the combined sample (n=329) reported recent (during the last 30 days) poly substance use. Logically, poly substance users reported significantly more lifetime and recent use of any substance, except for alcohol, buprenorphine, hallucinogens and recent ecstasy use (cf. table 1). It should be noted that buprenorphine and hallucinogens have only been used by a limited number of individuals in both groups.

In general, poly substance users have been significantly more often in treatment for drug problems (48.3% vs. 22.0%), as compared with single substance users. No differences were found with regard to respondents' treatment history for alcohol problems. Injecting drug use occurs less frequently (7.7%)among single substance users, while 24.2% of the poly substance users had ever injected drugs (p=0.000).

Table 1: Comparison of lifetime and recent (last 30 days) drug and alcohol use (according to ASI definition) between single and poly substance users (n=329)

	EVER				RECENT			
	Single N=118	**Poly N=211**	**Pearson Chi²**	**P**	**Single N=118**	**Poly N=211**	**Pearson Chi²**	**p**
Alcohol (every amount) (%)	95.8	96.2	.040	.842	76.1	84.4	3.418	.064
Alcohol (>= five glasses) (%)	88.1	90.0	.291	.590	66.9	73.9	1.809	.179
Cannabis (%)	22.0	45.5	17.858	.000**	3.4	30.3	33.502	.000**
Heroin (%)	11.9	30.3	14.269	.000**	.8	21.3	26.391	.000**
Methadone (%)	7.6	24.6	14.511	.000**	2.5	19.0	17.948	.000**
Buprenorphine (%)	1.7	6.6	3.992	.046*	.8	1.9	.556	.456
Other opiates (%)	6.8	22.7	13.664	.000**	.0	5.7	6.965	.005**
Benzodiazepines (%)	41.5	76.3	39.646	.000**	11.0	63.5	84.358	.000**
Antidepressants %)	33.9	71.1	42.903	.000**	7.6	51.2	62.657	.000**
Cocaine (%)	18.6	36.0	10.924	.001**	2.5	22.7	23.590	.000**
Amphetamines (%)	16.9	33.2	10.027	.002**	1.7	11.4	9.742	.002**
Hallucinogens (%)	7.6	14.2	3.146	.076	.0	1.7	1.799	.296
Ecstasy (%)	14.4	28.9	8.801	.003**	.8	4.3	3.000	.102

* p < .05; ** p < .01

Single substance users have significantly higher severity scores for 'alcohol use', while poly substance users report worse ASI-severity scores on the domains 'education and employment', 'drug use', 'legal problems' and 'psychological/emotional health' (cf. table 2). Similar findings were retrieved when comparing the more robust ASI composite scores, although no difference was observed between both groups concerning 'alcohol use' and 'work satisfaction' (cf. table 3).

Table 2: Severity ratings on all EuropASI-domains: comparison between single and poly substance users (n=329)

	Single N=118	Poly N=211	T-value	Df	P
Physical health [SD]	2.51 [2.13]	2.62 [2.33]	-.414	327	.679
Education and employment [SD]	2.73 [2.10]	3.46 [2.05]	-3.052	320	.002**
Alcohol use [SD]	5.47 [2.36]	4.69 [2.61]	2.750	263.297	.006**
Drug use [SD]	1.64 [2.65]	3.75 [3.03]	-6.550	270.293	.000**
Legal Problems [SD]	1.33 [1.90]	2.09 [2.18]	-3.317	270.962	.001**
Family and social relationships [SD]	3.48 [2.08]	3.62 [1.91]	-.609	327	.543
Psychological/emotional health [SD]	1.33 [1.90]	2.09 [2.18]	-5.165	327	.001**

* p < .05; ** p < .01

Table 3: Composite scores on all EuropASIdomains: comparison between single and poly substance users (n=329)

	Single N=118	Poly N=211	T-value	Df	P
Physical health [SD]	.23 [.31]	.26 [.34]	-.832	326	.406
Education and employment (economic situation) [SD]	.62 [.44]	.78 [.37]	-3.436	206.361	.001**
Education and employment (satisfaction work situation) [SD]	.21 [.29]	.21 [.30]	.130	298	.896

Alcohol use [SD]	.45 [.30]	.45 [.33]	.103	256.807	.918
Drug use [SD]	.05 [.11]	.16 [.14]	-7.714	292.972	.000**
Legal use [SD]	.08 [.15]	.16 [.22]	-3.573	311.721	.000**
Family relationships [SD]	.15 [.20]	.19 [.22]	-1.942	311	.053
Social relationships [SD]	.09 [.18]	.11 [.17]	-.599	321	.550
Psychological/emotional health [SD]	.25 [.23]	.38 [.22]	-5.430	327	.000**

* p < .05; ** p < .01

7.3.2 Socio-demographic characteristics and social and heatlh status

Table 4 shows the socio-demographic characteristics of both categories. Poly substance users are significantly younger, are less often employed and depend more often for living on health insurance benefits. Moreover, they are less often married and lived more often with family, friends or in varying living situations as compared with single drug users. It further appears that poly substance users live significantly more often together with someone with an alcohol problem.

Poly substance users have more severe legal problems, including a significantly higher mean number of convictions, they have more often experienced legal problems in the past and are more often currently on probation.

With regard to physical health, poly substance users have been hospitalised for medical problems (e.g. accidents, surgery) more frequently (p = .007), although no significant differences were observed between both groups concerning chronic and recent medical complaints (cf. table 4).

Table 4: Comparison of socio-demographic characteristics between single and poly substance users (n=329)

Characteristics	Single N=118	Poly N=211	Pearson Chi² or T-value	Df	p
Mean age [SD]	42.20 [10.86]	39.34 [11.40]	2.221	327	.027*
Men (%)	74.6	71.1	.460		.498
Civil status (%)			10.192		.006**
- *Married ˆ*	28.0	14.2			
- *Divorced*	29.7	29.9			
- *Single ˆ*	42.4	55.9			
Highest degree of education (%)			.089		.957
- *Primary or none*	19.5	20.9			
- *Secondary*	61.0	60.2			
- *Higher*	19.5	19.0			
Living situation last 30 days (%)			13.950		.007**
- *With partner and/or child(ren)*	40.7	31.8			
- *With parents or other family ˆ*	8.5	17.1			
- *Alone*	25.4	26.5			
- *In controlled environment*	25.4	19.0			
- *With friends or in varying living situations ˆ*	.0	5.7			
Legal situation last 30 days (%)			19.978		.001**
- *None ˆ*	70.3	46.4			
- *None, but legal problems in the past ˆ*	7.6	22.7			
- *Case pending/On bail*	11.9	16.1			
- *Probation/Parole ˆ*	3.4	5.2			
- *Other*	6.8	9.5			
Mean number of convictions [SD]	0.43 [1.34]	1.00 [2.02]	-3.034	317.751	.003**
Working situation last 30 days (%)			18.489		.001**
- *Part-time or full-time employed ˆ*	36.8	17.7			
- *Health insurance benefits ˆ*	22.2	35.9			
- *Unemployed*	22.2	31.1			
- *Other (student; retired; ...)*	4.3	4.3			
- *In controlled environment*	14.5	11.0			
Mean number of working days last 30 days [SD]	6.85 [9.34]	3.77 [7.89]	3.024	210.230	.003**
Mean number of hospital admissions ever [SD]	2.71 [2.59]	3.79 [4.62]	-2.703	326.997	.007**

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

7.3.3 Mental health problems and prevalence of DSM Axis I and Axis II disorders

Based on the EuropASI-items, poly substance users seem to experience significantly more often depressive feelings (lifetime), have more often difficulties in understanding, concentration and remembering (lifetime and during the last 30 days) and report more frequently that they have been prescribed medication for psychological problems (lifetime and during the last 30 days) (cf. table 5). Moreover, poly substance users report more days with psychological problems in the last month. In addition, a significantly higher prevalence and number of suicide attempts is observed among poly substance users and they suffer more often from suicidal ideation (lifetime and during the last 30 days).

Table 5: Recent (last 30 days) and past psychological and emotional problems: comparison of single and poly substance users (n=329)

	EVER				RECENT			
	Single N=118	**Poly N=211**	**Pearson Chi² or T-value**	**p**	**Single N=118**	**Poly N=211**	**Pearson Chi² or T-value**	**p**
Psychological problems (%)								
- *Depression*	61.9	73.5	4.783	.029*	30.5	40.8	3.408	.065
- *Anxiety or tension*	67.8	70.6	.284	.594	43.2	46.9	.417	.518
- *Trouble understanding, concentration, remembering*	29.7	46.0	8.380	.004**	25.4	38.9	6.087	.014*
- *Hallucinations*	10.2	13.3	.681	.409	1.7	4.7	1.996	.158
- *Trouble controlling violent behaviour*	42.4	46.4	.507	.476	16.9	21.3	.915	.339
- *Prescribed medication for psychological problems*	60.2	82.9	20.798	.000**	27.1	72.0	61.950	.000**
- *Serious thoughts of suicide*	39.0	53.6	6.435	.011*	11.0	28.0	12.711	.000**
- *Attempted suicide*	23.7	40.3	9.198	.002**	3.4	5.2	.578	.447
Mean number of suicide attempts [SD]	0.32 [.665]	1.27 [2.384]	-5.412 (df=263.368)	.000**				
Mean number of days with psycho-emotional problems [SD]					10.83 [12.65]	16.07 [12.66]	-3.600 (df=327)	.000**

* p < .05; ** p < .01

Poly substance users report significantly more often at least one mood disorder (cf. table 6). In particular, depressive episodes are common among poly substance users. The same situation was found for anxiety disorders. Furthermore, 60% of all poly substance users have experienced at least one anxiety disorder, as compared with 34.3% of the single substance users (p=0.000). Higher prevalence rates are found among poly substance users for all anxiety disorders, except for specific phobia and panic disorder.

Table 6: Prevalence of Axis I mood and anxiety disorders: comparison between single and poly substance users (n=329)

	Single N=118	***Poly N=211***	***Pearson Chi²***	***p***
Mood disorders				
- *Depressive episode (%)*	26.5	38.6	4.182	.041*
- *Manic episode (%)*	1.0	1.2	.021	1.000
- *Dysthymia (%)*	6.7	15.9	3.528	.060
Anxiety disorders				
- *Panic Disorder (%)*	2.9	7.0	2.045	.153
- *Agoraphobia (%)*	5.9	14.0	4.341	.037*
- *Social phobia (%)*	6.9	15.2	4.184	.041*
- *Specific phobia (%)*	4.5	8.0	1.134	.287
- *Obsessive-compulsive disorder (%)*	5.9	16.4	6.450	.011*
- *Generalised anxiety disorder (%)*	20.6	32.2	4.261	.039*
- *Post-traumatic stress disorder (%)*	1.0	10.0	8.392	.004**
At least one mood disorder (%)	31.4	49.1	8.238	.004
At least one anxiety disorder (%)	34.3	59.1	15.656	.000**

* p < .05; ** p < .01

Finally, more than half of the poly substance users (50.7%) report at least one personality disorder, which is significantly higher as compared with single substance users (30.4%) (cf. table 7). Few differences are found regarding specific personality disorders, except that cluster B borderline (p=0.000) and anti-social personality disorders (p=0.057) are far more prevalent among poly substance users.

Table 7: Prevalence of Axis II personality disorders: comparison between single and poly substance users (n=329)

	Single N=118	Poly N=211	Pearson Chi²	p
Paranoid PD (%)	7.8	10.6	.667	.414
Schizoid PD (%)	5.2	6.3	.150	.698
Schizotypical PD (%)	4.4	4.3	.000	.987
Antisocial PD (%)	7.0	14.0	3.616	.057
Borderline PD (%)	15.7	35.3	14.028	.000**
Histrionic PD (%)	1.8	2.4	.151	1.000
Narcissistic PD (%)	.0	2.9	3.397	.092
Avoidant PD (%)	12.2	13.5	.119	.730
Dependent PD (%)	5.3	7.7	.700	.403
Obsessive-Compulsive PD (%)	10.4	9.7	.049	.824
[Depressive] (%)	7.0	8.2	.163	.687
[Passive-Aggressive] (%)	2.6	4.9	.958	.392
Cluster A (%)	11.4	16.9	1.752	.186
Cluster B (%)	18.4	41.5	17.691	.000
Cluster C (%)	18.4	23.2	.990	.320
At least one PD (%)	30.4	50.7	12.385	.000**

* p < .05; ** p < .01

7.3.4 Socio-demographic, substance use and (mental) health related correlates of poly substance use

A logistic regression analysis was carried out to investigate which variables predict recent poly substance use (in the last 30 days). Data of 309 unique individuals were entered in the analysis. A test of the full model (79.9%) versus a model with intercept only (64.4%) was statistically significant (χ^2(df=16) = 122.174, p=0.000). Three variables emerged in the best fit model as significant correlates of poly substance use: employment status (p = 0.008), the ASI composite score for psychological health (p = 0.001) and the ASI composite score for drug use (p = 0.000) (cf. table 8). The 1.302 odds ratio for the ASI composite score for psychological health and the 2.379 odds ratio for the ASI drug use composite score indicate that the odds of belonging to the poly substance use group increase, for each unit increase in the respective composite scores (95% C.I.: 1.115 to 1.521; p=0.001 and 95% C.I.: 1.709 to 3.312; p<0.001). The odds ratios of the dummy variables 'employment status' compare each status (except unemployed) to the status unemployed. For 'health insurance

benefit status', the 4.269 odds ratio means that the odds of being a poly substance user group are 4.269 times higher for persons dependent on health insurance benefits than for employed individuals (95% C.I.: 1.874 to 9.725; p=0.001). The predictor 'living situation' approached significance (p=0.097) and the 0.290 odds ratio means that the odds of being a poly substance user for persons living in a controlled environment before treatment entry are only 0.290 times those of individuals living with a partner and/or children (95% C.I.: 0.102 to 0.824; p=0.020). Although no main effect of legal status can be observed (p=0.195), the 3.236 odds ratio for legal problems in the past means that the odds of belonging to the category 'poly substance use' is 3.236 times higher for individuals without current legal problems, but who had legal problems in the past as compared to those who have no criminal record (95% C.I.: 1.178 to 8.887; p=0.023). Finally, the number of lifetime hospital admissions approached significance, indicating that a higher number of hospital admissions increases the odds of being a poly substance user (95% C.I.: 0.996 to 1.207; p=0.060).

Table 8: Logistic regression predicting membership of the poly substance use group (compared to the single substance use group) (n=309)

							95% C.I. for Exp(B)	
	B	S.E.	Wald	Df	p-value	Exp(B)	Lower	Upper
Employment status (Ref. cat.: part-time or full-time employed)			13.663	4	.008**			
- *health insurance benefits*	1.451	.420	11.935	1	.001**	4.269	1.874	9.725
- *unemployed*	.566	.447	1.602	1	.206	1.761	.733	4.232
- *other (student, retired)*	1.410	.728	3.755	1	.053	4.096	.984	17.051
- *controlled environment*	.652	.685	.905	1	.341	1.919	.501	7.345
Legal situation (Ref. cat.: no legal situation)			6.095	4	.195			
- *legal problems in the past*	1.174	.516	5.188	1	.023*	3.236	1.178	8.887
- *case pending / on bail*	.589	.454	1.682	1	.195	1.803	.740	4.392
- *probation / parole*	.584	.816	.513	1	.474	1.793	.362	8.876
- *other*	.384	.629	.372	1	.542	1.468	.428	5.037
Living situation (Ref. cat.: living with partner and/or children)			6.313	3	.097			
- *family, friends, varying living situations*	-.278	.534	.270	1	.603	.758	.266	2.159
- *alone*	.077	.382	.041	1	.840	1.080	.511	2.286
- *controlled environment*	-1.237	.533	5.396	1	.020	.290	.102	.824
At least one mood disorder	.359	.342	1.099	1	.295	1.432	.732	2.800
Number of hospitalisations for physical complaints	.092	.049	3.537	1	.060	1.097	.996	1.207
Number of suicide attempts	.215	.162	1.762	1	.184	1.239	.903	1.702
ASI composite score psychological/emotional health	.264	.079	11.136	1	.001**	1.302	1.115	1.521
ASI composite score drug use	.867	.169	26.351	1	.000**	2.379	1.709	3.312
Constant	-2.329	.437	28.378	1	.000	.097		

* p < .05; ** p < .01

7.4 Discussion

The findings from this chapter demonstrate that poly substance use is the rule rather than the exception. At least 64% of the clients currently in treatment for substance use problems report poly substance use during the last 30 days before treatment entry. One can assume that this number is an underestimation of the reality, since numerous individuals included in the study were living in a controlled environment (e.g. hospital, prison) the last 30 days before entering treatment. Such a controlled situation makes it more difficult to use (several) substances, let alone on the same day. The prevalence of poly substance use is much lower among persons with a current alcohol use disorder, than among persons with drug use disorders for whom poly substance use appears to be the norm. In the light of these findings, one can question the present-day tendency in substance abuse treatment to treat the primary substance of abuse. A substance-specific point of view ignores or underestimates the complexity of the situation of substance users, who often combine various substances or replace one substance with another.

The results of the unvariate analyses demonstrate that poly substance users generally have more severe problems than single substance users. These difficulties are not limited to drug use and mental health problems, but also affect other life domains (e.g. family situation, legal status, employment) which may complicate the recovery process.

One of the aims of this study was to gain insight in the psychological health of poly substance users. It appeared that poly substance users are at higher risk for committing suicide and that they report more days with psychological problems as compared with single substance users. Almost three-quarters of the poly substance users are currently prescribed medication for psychological problems. The scores on the MINI and ADP IV confirm these findings and demonstrate that poly substance users experience significantly more often mood and anxiety disorders, as well as personality disorders.

Further analyses of these univariate associations have shown that the severity of psychological and drug use problems and individuals' employment status are

strong, independent correlates of poly substance use. To our surprise, it was the ASI composite score for psychological problems, not any of the domain scores on the more robust, diagnostic instruments for psychological health that we used to measure personality, mood and anxiety disorders, that was strongly related to poly substance use. This finding demonstrates that it is important to assess psychological complaints as reported by clients rather than looking at the presence or absence of psychiatric disorders (as defined by the DSM). Assessment of client-reported outcomes such as quality of life and the use of instruments acknowledging clients' subjective experiences may shed a different light on the assessment and treatment of substance use problems.

7.4.1 Limitations of the study

This study highlights the prevalence of poly substance use in a heterogeneous sample of substance users, seeking treatment for substance abuse problems. Some study limitations need to be mentioned. First, the study sample is divided rather unequally, since the majority of the respondents (83.3%) was recruited in specialised addiction units of psychiatric hospitals, including a large number of individuals mainly suffering from alcohol dependence. Second, although the clear co-occurrence of psychological problems and poly substance use has clear clinical implications, the cross-sectional character of the study hinders causal inference: is poly substance use a cause of poor mental health, or rather a consequence and a way to cope with various psychological problems. Finally, the lack of a clear definition of the concept of 'poly substance use' hampers the comparison with (inter)national data on this subject. It may result in conflicting findings, limiting the availability of services tailored to the needs of poly substance users.

REFERENCES

Byqvist, S. (2006). Patterns of drug use among drug misusers in Sweden gender differences. *Substance Use & Misuse, 41*, 1817-1835.

EMCDDA (2009). *Selected Issue: Poly substance use: patterns and responses.* Luxembourg: Publications Offices of the Union.

Kuhn, M. (2008). Building predictive models in R using the caret package. *Journal of Statistical Software, 28*(5).

Raes, V., Lombaert, G. & Keymeulen, R. (2008). *De nederlandse vertaling van de handleiding voor training en afname van EuropASI vraaggesprekken, aangepast voor België Vlaanderen, met integratie van de Treatment Demand Indicator*. Gent: De Sleutel, Dienst Wetenschappelijk Onderzoek.

Chapter 8

Evolution of poly substance use among TC residents in Belgium between 1997 and 2010

Wouter Vanderplasschen
Jessica De Maeyer
Ilse Goethals
Eric Broekaert

8.1 Introduction

The drug-free therapeutic community is a long-standing treatment modality for drug abusers (Broekaert, 2006). Numerous residential treatment programs in various countries have been inspired by the TC-model. In Belgium, the first therapeutic communities have been established in the middle of the 1970s. To date, the National Service for Medical and Disability Insurance (RIZIV/INAMI) recognises eight TCs in Belgium, for a capacity of around 200 beds (RIZIV, 2000). The Department of Orthopedagogics at the Ghent University has a long tradition of TC-research, including quantitative as well as qualitative research (Broekaert et al., 2002). Since the introduction of the European version of the Addiction Severity Index (ASI) in Belgium, most clinical studies at the Department of Orthopedagogics have used the ASI for data-collection among TC-residents.

Although the basic TC-concept has remained unchanged over the years (Broekaert, Kooyman & Ottenberg, 1998), some features have been adapted to respond to the emerging needs of the population, to new scientific insights and to governmental decisions. For example, an introduction phase now precedes TC-programs, in order to prepare drug users for long-term residential treatment and to avoid early drop-out. Methadone has been accepted as a type of medication that can facilitate detoxification and heroin abstinence in therapeutic communities (De Leon, 1997). Similarly, the depenalisation of cannabis use in Belgium has challenged TCs to deal with this issue during the re-entry phase.

The afore-mentioned changes may also be reflected in the characteristics and severity of drug-related problems of persons presenting for TC-treatment. Anecdotal and empirical evidence suggests that the consumption of various drugs (poly substance use) has increased among treatment populations (EMCDDA, 2009). Also, the number of persons presenting for treatment with severe psychological problems seems to have grown over the years (Sacks, Chandler & Gonzales, 2008). Consequently, the aim of this chapter is to assess whether the proportion of poly substance users and the number of persons with mental health problems has grown in three cohorts of TC-residents (1996-1998,

2000-2002 and 2009-2011) admitted in four therapeutic communities in Belgium. Given the notion that poly substance users display more risk behavior, the severity of substance use and related problems is assumed to be higher among this population as compared with single substance users.

8.2 Methods

Data were collected at intake in four residential drug-free therapeutic communities in Belgium (TC De Kiem, TC De Sleutel, TC Katharsis and TC De Spiegel) between 1996 and 2011 (n=393). The first wave of data (1996-1998) was collected during the Biomed-study in TCs De Kiem and De Sleutel (n=95), an international comparative study for improving psychiatric treatment in residential programs in European therapeutic communities (De Wilde, Broekaert, Segraeus & Rosseel, 2006). The second wave of ASI-interviews (2000-2002) was collected as part of a quasi-experimental study on the implementation of a social network intervention in all four therapeutic communities (n=157) (Soyez, De Leon, Broekaert & Rosseel, 2006). The final cohort (2009-2011) is recruited during an ongoing PhD-study of treatment processes and client involvement in Belgian therapeutic communities (n=141) (Goethals et al., in preparation). Although the time between two study periods was different and although the three samples were not equally large, the compiled sample (n=393) offers unique opportunities for the comparison of the severity of drug-related problems between three cohorts of substance users who entered long-term residential treatment in Belgium between 1996 and 2011. All residents were interviewed within the first three weeks of residential treatment.

In all interviews, the European version of the Addiction Severity Index was used to measure the severity of substance use and related problems. The EuropASI is a semi-structured clinical interview, including an assessment of seven areas of functioning: medical status, employment/support, alcohol use, drug use, legal problems, family/social relationships and psychological problems (Raes, Lombaert & Keymeulen, 2009). An ASI composite score is calculated for each domain (range 0–1), with higher scores indicating higher problem severity.

Besides the composite scores, severity scores can be generated which are more subjective, as they are based on a number of objective items and clients' and interviewers' ratings of problem severity in each domain. Throughout the 15-year interview period, the Dutch version of the EuropASI remained unchanged, except a number of small changes (e.g., addition of some items to the list of substances or treatment modalities).

In this paper, we present a secondary analysis of available EuropASI-data of TC-residents collected at the Department of Orthopedagogics between 1996 and 2011. The three databases were merged into a new database and were first assessed for any socio-demographic evolutions in the TC-population. Second, the three cohorts were compared for any changes concerning drug use patterns and severity of physical and mental health problems. Analyses of variance (ANOVA) were used for comparing continuous variables, while between group significances for non-continuous variables were calculated using χ^2-tests. Third, TC-residents presenting for treatment using one single substance were compared with those who used multiple drugs. Poly substance use was conceptualized in this manuscript as "the use of at least two different drugs on the same day during the 30 days preceding the entry in the therapeutic community". Differences between single and poly substance users were analysed using t-tests for continuous variables and χ^2-tests for categorical variables.

8.3 Results

8.3.1 Socio-demographic evolutions

The comparison of the three TC-cohorts shows that the mean age of residents increased significantly between 1996 and 2011 (cf. table 1). Also, the proportion of drug users living in smaller towns or cities has grown significantly in that period, indicating that drug use has spread from the big cities to smaller towns and villages. Other significant differences concern the education level of persons entering TCs: not only the mean number of years of education has grown since 1997, but also fewer residents are entering the TC without degree. Further,

nowadays more persons are entering treatment who live alone (29.1%) or with their partner (21.3%), while in the 1997 cohort 31.6% lived with their parents before they entered TC.

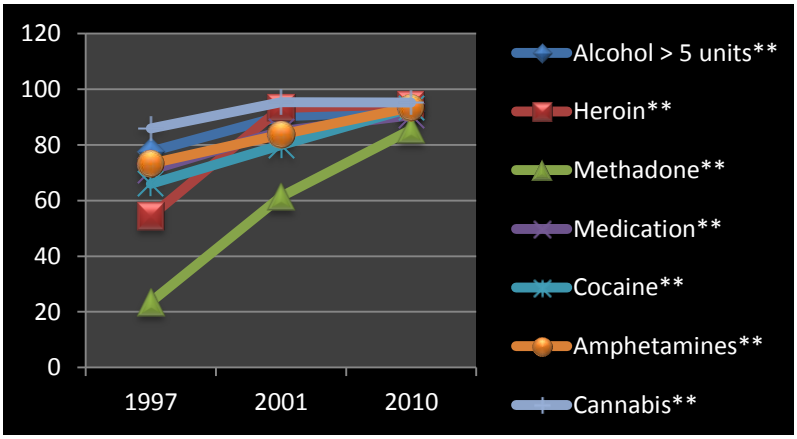
Table 1 : Socio-demographic characteristics of the three TC-cohorts (n=393)

	1997	2001	2010	p-value
% women	14.7	16.6	14.9	NS
Mean age	24.8 (5.9)	26.2 (5.9)	27.5 (5.3)	0.001[b]
% country of birth Belgium	92.6	97.4	97.8	NS
Place of residence (%)				0.003
- *City*	46.8	41.3	27.7	
- *Small town*	31.9	36.1	47.5	
- *Village*	21.3	22.6	24.8	
Mean # years education	10.7 (1.9)	10.8 (2.0)	11.9 (1.6)	<0.001
% without school degree (< secondary school)	52.6	47.8	22.0	<0.001
Living situation (%)				
- *with partner*	14.7	21.3	21.3	<0.001
- *alone*	20.	18.1	29.1	
- *with parents*	31.6	21.9	23.4	
- *in controlled environment*	14.7	19.4	5.7	
- *changing situations*	18.9	19.4	9.9	

8.3.2 Substance use patterns and problem severity

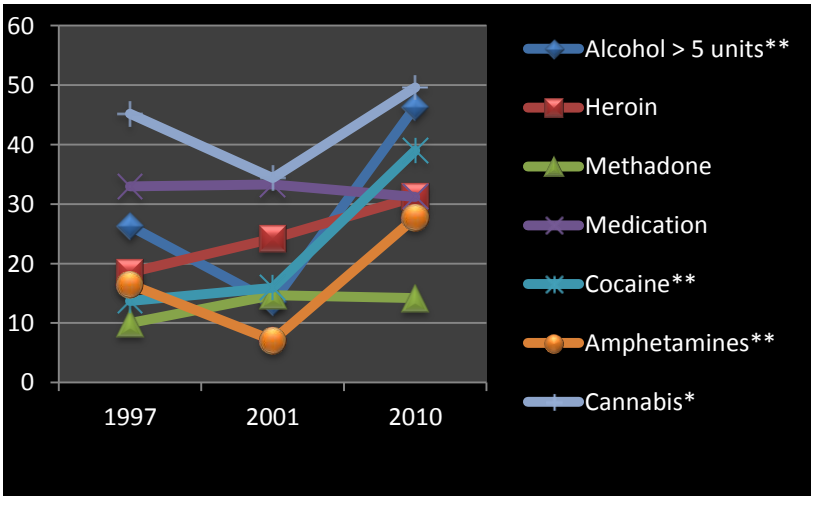
Figure 1 shows that the lifetime prevalence of regular use of any substance clearly increased between 1997 and 2010. While a substantial proportion of TC-residents had not used at least some type of substance in the 1997 cohort (e.g. heroin, cocaine), the converging lines in the 2010 cohort indicate that around 90% of all residents have ever used alcohol, heroin, cocaine, amphetamines, cannabis and benzodiazepines on a regular basis. Also, over 80% has ever used methadone.

Figure 1 : Lifetime prevalence of regular drug use (n=393)



Although recent substance use is usually measured as the number of days with substance use during the last 30 days, this may not be the best indicator of recent substance use in a population starting long-term drug treatment, since they may have gone through detoxification or another type of treatment before entering the therapeutic community or they may have tried to stop or reduce their drug use spontaneously. Despite this limitation, we observe a clear increase in the proportion of persons who recently abused alcohol (>5 units/day) and who used cocaine, heroin and amphetamines (cf. figure 2).

Figure 2 : Prevalence of recent substance use (last 30 days) (n=393)



Given the increased prevalence of substance use among TC-residents, it may not surprise that the proportion of poly substance users in this sample has increased between 1997 and 2010. Lifetime prevalence of poly substance use differed significantly (p=0.010) between the 1997 (90.4%) and the 2002 (98.0%) and 2010 samples (97.1%). Recent poly substance use (past 30 days) was significantly higher in the 2010 cohort (65.9%), as compared with the 1997 (40.4%) and 2002 (29.9%) cohort (p<0.001). Interestingly, the age of onset for regular poly substance use did not change in this 15 year period and starts at the age of 17 (1997: 17.3; 2001:17.4; 2010: 17.0). Similarly, we found no significant differences for the age of onset of regular use of specific substances. However, the mean number of years of poly substance use among TC-residents was significantly higher in the 2010 sample (5.8 years), as compared with the 1997 (7.6 years) and 2001 sample (8.4 years).

Some clear differences were observed between the three cohorts concerning risk behavior and treatment history (cf. table 2). The proportion of TC-residents who ever injected drugs was significantly lower among the 2010 cohort and also the mean age of onset of iv drug use was significantly higher in the latter cohort.
While no differences could be observed in the proportion of residents who followed residential treatment before, the number of persons entering the TC who had followed outpatient drug-free treatment before was (marginally) higher in the 2010 cohort. The most striking difference between the three cohorts concerns their treatment status before entering the TC: while in the 1997 and 2002 cohort half of all residents had followed another type of drug treatment, only 11.3% did so in the 2010 cohort while 53.9% entered the TC directly from the community.

Table 2 : Drug use and treatment characteristics of the three TC-cohorts (n=393)

	1997	2001	2010	p-value
% ever injected drugs	63.2	63.7	46.8	0.006
Age of onset iv drug use	19.2	20.4	21.7	0.031[b]
Mean # years iv drug use	4.4	4.7	4.0	NS
% ever overdosed	42.1	33.8	40.4	NS

Treatment history (%)				<0.001
- *Drug-free outpatient*	16.8	28.8	30.5	
- *Drug-free residential*	54.7	47.8	52.3	
Treatment status at TC-entry (%)				<0.001
- *No (in the community)*	10.4	16.8	53.9	
- *Prison*	13.5	29.8	20.6	
- *Drug treatment*	50.0	45.2	11.3	
- *Psychiatric treatment*	4.2	3.8	9.2	

Besides alcohol and drug problems, the EuropASI also assesses physical and mental health problems. Table 3 shows that the 2010 cohort had fewer physical health problems as compared with the 1997 and 2001 sample. In particular, the proportion of residents suffering from chronic physical complaints, infected with HCV or who are prescribed drugs for physical health problems was significantly lower in 2010. Relatively few differences were observed regarding lifetime and recent psychological problems, as the prevalence of most psychological complaints assessed in the EuropASI remained stable (cf. table 4). Only the proportion of residents who ever or recently experienced problems to understand, concentrate and remember differed significantly between the three cohorts. In addition, the proportion of residents who recently attempted suicide before entering TC was significantly higher among the 2010 cohort.

Table 3 : Physical health indicators (as measured with the ASI) of the three TC-cohorts (n=393)

	1997	**2001**	**2010**	**p-value**
% with chronic, physical complaints	46.3	34.4	12.2	<0.001
% infected with HCV	31.6	22.3	12.1	<0.001
% infected with HIV	2.4	1.3	0.0	NS
% prescribed medication for physical health problems	27.4	19.9	8.5	0.001
% recently treated for medical problems	55.3	39.5	46.8	0.050

Table 4: Lifetime and recent prevalence of psychological health problems among the three TC-cohorts (n=393)

	1997	**2002**	**2010**	**p-value**
Depressive feelings				
Lifetime	60.0	64.3	59.6	NS
Last 30 days	38.3	30.5	29.1	NS

Feeling of tension or anxiety				
Lifetime	62.1	73.4	61.0	NS
Last 30 days	41.1	47.4	36.2	NS
Difficulties to understand, concentrate, …				
Lifetime	38.3	44.8	64.5	<0.001
Last 30 days	24.5	30.5	57.4	<0.001
Hallucinations (not drug induced)				
Lifetime	14.9	13.0	21.3	NS
Last 30 days	4.3	2.6	7.8	NS
Agression control problems				
Lifetime	72.6	67.5	63.1	NS
Last 30 days	38.9	33.8	39.0	NS
Been prescribed medication				
Lifetime	49.5	43.5	39.7	NS
Last 30 days	16.8	16.2	25.5	NS
Suicidal ideation				
Lifetime	58.9	60.8	55.3	NS
Last 30 days	16.8	20.9	19.9	NS
Attempted suicide				
Lifetime	45.3	40.9	39.7	NS
Last 30 days	2.1	2.6	9.2	0.011

Other drug-related problems that differed significantly between the three cohorts were family and social problems: significantly fewer persons in the 2010 cohort were satisfied with their living situation and/or leisure activities at intake ($p< 0.001$) and a higher proportion of persons entering TC was living with someone with alcohol problems ($p< 0.001$). On the other hand, the frequency of serious relational problems with mother, father or partner was significantly lower in the 2010 sample. Also, rates of emotional ($p=0.015$), physical ($p=0.112$) and sexual abuse ($p=0.105$) were marginally lower in the latter sample. No significant differences were observed regarding the employment and judicial status of persons entering TCs in 1997, 2001 and 2010.

Comparison of the ASI composite scores between the three cohorts shows (table 5) that the severity of physical health was significantly (although marginally) higher in the 1997 sample, as compared with the 2001 and 2010 samples. No such differences could be observed for psychological health, employment status or judicial situation. As compared with the 1997 cohort, significantly more serious problems with the inner family were observed among the 2010 cohort

and the 2001 cohort, although the latter difference was only marginal. Finally, the severity of alcohol and drug problems was significantly higher in the 2010 cohort as compared with the 1997 and the 2001 cohort.

Table 5: Mean ASI composite scores of residents entering TCs in 1997, 2001 and 2010 (n=393)

	1997	2001	2010	p-value
Physical health	0.36	0.27	0.27	0.049[a,b]
Employment	0.87	0.90	0.91	NS
Alcohol	0.13	0.13	0.27	<0.001[b,c]
Drugs	0.15	0.17	0.26	<0.001[b,c]
Judicial status	0.34	0.32	0.33	NS
Relation with inner family	0.20	0.28	0.28	0.036[b]
Relations with other	0.17	0.19	0.20	NS
Psychological health	0.30	0.29	0.34	NS

8.3.3 Comparison of single and poly substance users

The total sample consisted of 44.5% poly substance users, while 55.5% of the TC-residents did not use multiple drugs during one day in the 30 days before they entered the therapeutic community. No socio-demographic differences were observed between single and poly substance users in terms of age, gender and ethnicity, except that the educational level of poly substance users was significantly higher (cf. table 6).

Univariate analyses revealed relatively few differences between both groups, except for the variables displayed in table 6. The number of single substance users was significantly higher among persons who stayed continuously in a controlled environment during the last 30 days before they entered the TC and the mean number of days spent in a controlled environment was considerably among this group. This observation indicates that persons who had no or difficult access to substances were less likely to have used multiple drugs during the past 30 days. Also, a higher proportion of single substance users had been treated by a doctor for physical health problems during the past six months. On the other hand, poly substance users were significantly more likely to have a mother with alcohol problems or a father with drug problems. Significantly more poly

substance users lived together with someone who uses drug and spent their spare time more frequently with other drug users. A significantly lower proportion of poly substance users appeared to be satisfied with their leisure activities. Finally, the mean number of months is prison was significantly higher among single drug users (cf. table 6).

Table 6: Comparison of socio-demographic characteristics and significant health and social indicators between single and poly substance users (n=393)

	Single substance users N=218	Poly substance users N=175	p-value
Age	26.4	26.4	Ns
Gender (% females)	16.5	14.3	Ns
Years of education	10.9	11.4	0.013
# days in controlled environment	27.5	18.7	<0.001
% 30 days in controlled environment	68.3	16.0	<0.001
% recent Tx physical health problems	50.7	40.0	0.035
% Alcohol problems mother	13.7	22.5	0.025
% Drug problems father	2.0	8.0	0.007
% Living together with drug user	18.3	26.3	0.059
% Spare time spent with friends who use drugs	47.0	68.6	<0.001
% Satisfied with leisure activities	20.0	8.0	0.004
# months in prison	14.7	8.7	0.009

Despite relatively few differences between single and poly substance users at item-level (cf. table 6), all ASI composite scores differed significantly, except for physical health and relational problems with non-family members (cf. table 7). Poly substance users had more severe problems concering alcohol and drug use, family relations, judicial status and mental health, while single drug users scored significantly higher regarding employment problems.

Table 7: Comparison of ASI composite scores between single and poly substance users (n=393)

	Single substance users N=218	Poly substance users N=175	t-value	p-value
Physical health	0.32	0.26	1.83 (387)	0.069

Employment	0.93	0.85	3.143 (282.4)	0.002
Alcohol	0.11	0.25	-5.072 (272.5)	<0.001
Drugs	0.13	0.27	-12.936 (285.2)	<0.001
Judicial status	0.29	0.37	-3.314 (385)	0.001
Relation with inner family	0.23	0.30	-2.669 (371)	0.008
Relations with other	0.17	0.20	-1.414 (333)	0.158
Psychological health	0.28	0.35	-2.975 (383)	0.003

Given the high proportion of single drug users who stayed in a controlled environment for 30 days before they entered the TC, we controlled for the latter variable among the three study samples. Table 8 demonstrates that poly substance use is a relatively stable phenomenon (between 10 and 23%) among persons who stayed 30 days in a controlled environment before treatment entry, while the proportion of persons who used multiple substance during at least one of the 30 days before they entered the TC was significantly higher (between 56.7 and 83%) among persons who were not limited to come and go as they liked before entering the TC.

Table 8: Proportion of single and poly substance use among individuals who stayed in a controlled environment for 30 days before treatment entry and those who did not (n=393)

	Sample	**Single substance users N=218**	**Poly substance users N=175**
Persons who did not stay for 30 days in a	1997	41.3	58.7
controlled environment before treatment entry	2001	43.3	56.7
	2010	17.0	83.0
Persons staying 30 days in controlled environment	1997	77.1	22.9
before treatment entry	2001	90.0	10.0
	2010	78.9	21.1

Finally, the prevalence of recent psychological complaints was compared between single and poly substance users (cf. table 9), showing significant differences between both groups on almost all indicators, except for recent depressive feelins and feelings of stress and anxiety. Suicidal ideation and recent suicide attempts were clearly more prevalent among poly substance users.

Table 9: Prevalence of recent psychological complaints between single and poly substance users (n=393)

%	Single substance users N=218	Poly substance users N=175	p-value
Depressive feelings	29.5	34.3	ns
Feelings of stress and anxiety	41.7	41.7	ns
Problems with understanding, concentration, memory	34.3	44.6	0.039
Hallucinations (not drug-induced)	1.9	8.6	0.003
Problems with agression control	31.8	42.9	0.024
Been prescribed medication for psychological problems	13.7	27.4	0.001
Suicidal ideation	14.8	25.1	0.010
Suicidal behavior	1.4	9.1	<0.001

8.4 Discussion

Based on this secondary analysis of EuropASI data collected in Flemish therapeutic communities between 1996 and 2011, we noticed a significant increase of poly substance use and of the severity of drug and alcohol problems among the 2010 cohort. As compared with the 1997 sample, more persons entering the TC in 2010 had regularly used various substances, while the prevalence of intravenous drug use and various physical health problems was much lower. Although the mean age of TC-residents was significantly higher in the 2010 cohort, the likelihood of iv drug use or health problems decreased, which may indicate that the introduction of substitution treatment and harm reduction services in Belgium (around the mid-1990s) has been effective for reducing risk behaviour among problem drug users.

Despite the reduction of physical health problems, the severity of mental health problems appeared to be stable in the three cohorts. Still, a significant increase in

the number of residents with lifetime and recent problems to understand, concentrate and remind was observed in the 2010 cohort as compared with the 1997 and 2001 samples. This observation may be linked to the growing body of literature on (stimulant) drug use and hyperactivity, impulsivity and ADHD. (Verdejo-Garcia et al., 2006; 2010). Also, a greater severity of family problems was observed among the 2010 cohort, despite a lower prevalence of lifetime family conflicts and emotional and physical abuse among this sample. This increase may be explained by the greater proportion of persons that stayed in a controlled environment before treatment entry in the 1997 and 2001 sample, which reduced the chance of recent (last 30 days) conflicts with relatives.

Although lifetime prevalence of poly substance use was already omnipresent in the 1997 sample (90.4%), lifetime single drug use was a clear exception (2%) in the 2001 and 2010 samples. The age of onset of poly substance use did not change between 1997 and 2010 and starts around the age of 17. However, the 2001 and 2010 sample had a significantly longer history of poly substance use (2-2.5 years), but this may be related to the higher mean age among the 2001 and 2010 samples, which were on average 2 to 2.5 years older than the 1997 cohort. Although onset and length of poly substance use among TC-residents may not have changed over a 15-year period, the prevalence of poly substance use was clearly higher among the 2010 sample as compared with the 1997 and 2001 samples. Having stayed in a controlled environment during the last 30 days appeared to be an important mediating variable. Poly substance use was considerably lower among persons who resided in a controlled environment the 30 days before entering the TC, but did not differ between the three cohorts. Among residents who did not stay in a controlled environment for 30 days before treatment entry, the prevalence of poly substance use was over 55%, and even 83% in the 2010 sample. Availability and access to various substance seem to play an important role in the prevalence and frequency of poly substance use among in-treatment populations. Consequently, assessment of (poly) substance use at intake, may be biased by the limited availability of certain drugs or a stay in controlled environment (e.g., prison, residential treatment) during the reference period (e.g. last 30 days). Moreover, drug users may switch

spontaneously or due to the situation to less harmful or other substances or may have even stopped to use some (type of) drugs. Therefore, assessment of recent drug use that goes beyond the last 30 days is necessary. Assessment of substance use during the last 6 or 12 months may be a more representative period for assessing someone's substance use habits. Moreover, a functional analysis of the role of various substances in someone's life may help to address substance use problems more effectively (DeFuentes-Merillas & De Jong, 2004).

As compared with single drug users, individuals who used multiple drugs during the 30 days before they entered the TC had more severe problems on most life domains, except concerning physical health and employment. The higher (more severe) composite scores for alcohol, drug and mental health problems confirm our hypothesis that poly substance users have – logically – more serious substance use problems (more frequent drug use and risk behavior) and also more severe psychological problems. In particular, recent suicidal behavior (suicidal ideation and attempted suicide) was significantly higher among poly substance users and they were more often prescribed medication for psychological problems. Both observations may be interrelated and lower rates of suicidal behavior may be explained by the large proportion of single drug users who stayed in a protected and controlled environment before entering the TC. Still, prevalence rates for all items of the psychological health-domain in the EuropASI were systematically higher among the poly substance use-group, indicating that poly substance users experience more mental health problems than persons who just used one type of substance during the last 30 days before entering the TC (cf. table 9). Also, relational problems and problems with the courts were more prevalent among poly substance users. The greater problem severity for physical health problems among single drug users may be associated with the fact that drug users often address treatment for acute medical problems and that they stay in medical treatment facilities (including detox centres) until they enter the therapeutic community. The higher severity of employment problems among single drug users can probably be explained by the fact that poly substance users experience more substance use and drug-related problems and are – therefore – less bothered by their employment or educational situation

at the moment they enter treatment. Moreover, as single drug users stayed more frequently in a controlled environment before entering the TC, awareness of employment problems may have been stimulated during previous treatment.

Although this large sample of TC-residents provides valuable information about the prevalence of substance use and mental health problems among three cohorts over a 15-year period, some limitations of the study need to be mentioned. First, although double counts were excluded from each cohort, we could not control for double counts in the total sample. Given the location of the TCs and the time gap between the three studies, the probability of double counts between the three cohorts is rather limited. Second, the Addiction Severity Index was used to assess substance use and related problems among persons entering the TC. Although the ASI is the most widely used assessment instrument in substance abuse research (McLellan et al., 2006), it offers just a screening of various life domains while further assessment is required, e.g. for assessing psychiatric morbidity. Consequently, the assessed mental health problems should be regarded as indicators of such problems and not as a diagnosis of mental disorders. Further in-depth assessment is required for the assessment of psychiatric disorders. Third, results from this study are affected by the way treatment and assessment procedures in therapeutic communities has evolved between 1996 and 2011. While most TC-residents in the first two cohorts came directly from prison or drug treatment services to therapeutic communities, the majority of persons in the 2010 sample stayed in the outside community before they entered the therapeutic community. This may have influenced in particular rates of poly substance use, as individuals in hospitals or prison do not have the same access to drugs as people in the community. Similarly, changes in capacity and admission policy may have biased the comparison between the three cohorts. Also, various interviewers have been involved in the administration of the ASI, potentially resulting in inter-rater differences. For, all interviewers were trained extensively and we used ASI-composite scores instead of the more subjective (interviewer-based) severity scores in our comparison (Raes et al., 2009). Further, two therapeutic communities were not involved in the first study,

resulting in a smaller sample size and limited comparability of this cohort with the two other cohorts. Still, the inclusion criteria and treatment programs of all four therapeutic communities are comparable, which makes it acceptable to assume that the populations in the four TCs were very similar. Finally, selection bias may have been caused by the voluntary participation rather than random or systematic selection of respondents.

REFERENCES

Broekaert, E. (2006). What future for the Therapeutic Community in the field of addiction? A view from Europe. *Addiction, 101*, 1677-1678.

Broekaert, E., Kooyman, M., & Ottenberg, D. (1998). The new drug free therapeutic community: challenging encounter of classic and open therapeutic communities. *Journal of Substance Abuse Treatment, 15*(6), 595-597.

Broekaert, E., Vandevelde, S., Vanderplasschen, W., Soyez, V., & Poppe, A. (2002). Two decades of "researchpractice" encounters in the development of European therapeutic communities for substance abusers. *Nordic Journal of Psychiatry, 56*(5), 371-377.

DeFuentes-Merillas, L. & De Jong, C.A.J. (2004). *Community Reinforcement Approach Plus Vouchers: behandeling van cocaïneafhankelijkheid*. Nijmegen: Novadic-Kentron.

De Leon, G. (1997). Community as Method: Therapeutic Communities for Special Populations and Special Settings. Westport, CT: Praeger Publishers.

De Wilde, J., Broekaert, E. & Rosseel, Y. (2006). Problem Severity Profiles of Clients in European Therapeutic Communities: Gender Differences in Various Areas of Functioning. *European Addiction Research, 12*(4), 128-137.

EMCDDA (2009). *Selected Issue: Poly substance use: patterns and responses.* Luxembourg: Publications Offices of the Union.

McLellan, A.T., Cacciola, J.C., Alterman, A.I., Rikoon, S.H., & Carise, D. (2006). The Addiction Severity Index at 25: Origins, Contributions and Transitions. *The American Journal on Addictions, 15*, 113-124.

Raes, V., Lombaert, G. & Keymeulen, R. (2009). *De nederlandse vertaling van de handleiding voor training en afname van EuropASI vraaggesprekken, aangepast voor België Vlaanderen, met integratie van de Treatment Demand Indicator*. Gent: De Sleutel, Dienst Wetenschappelijk Onderzoek.

Rijksinstituut voor de Ziekte en Invaliditeitsverzekering (RIZIV) (2000). De RIZIV-revalidatiecentra voor verslaafden: een evaluatie van hun activiteit. Brussel: Rijksinstituut voor de Ziekte en Invaliditeitsverzekering.

Sacks, S., Chandler, R. & Gonzales, J. (2008). Responding to the challenges of co-occurring disorders. *Journal of Substance Abuse Treatment, 34*(1), 139-146.

Soyez, V., De Leon, G., Rosseel, Y, & Broekaert, E. (2006). The impact of a social network intervention on retention in Belgian therapeutic communities: a quasi experimental study. *Addiction, 101*(7), 1027-1034.

Verdejo-Garcıa, A., Bechara, A., Recknor, E.C., & Perez-Garcıa, M. (2006). Frontal behavioural deficits in substance dependent individuals during drug use and abstinence: an examination of the behavioural, cognitive and emotional correlates of addiction. *Journal of the International Neuropsychological Society, 12*, 405-415.

Verdejo-Garcia, A., Betanzos-Espinosa, P., Lozano, O.M., Vergara-Moragues, E., González-Saiz, F., Fernández-Calderón, F., et al. (2012). Self-regulation and treatment retention in cocaine dependent individual: a longitudinal study. *Drug and Alcohol Dependence, 122*(1-2), 142-148.

General Discussion

Wouter Vanderplasschen

Jessica De Maeyer

Kathy Colpaert

Veerle Raes

Eric Broekaert

Geert Dom

The POLYMEH-study (2010-2012) has been set up to map the prevalence of poly substance use and the characteristics of poly substance users in Belgium, based on available treatment demand data. Unfortunately, none of the available databases included comprehensive and representative information on substance users seeking treatment in Belgium, nor were there robust indicators used for 'poly substance use' and 'mental health problems'. Therefore, we had to use several databases that provide complementary information, but which are not easy to compare.

Overall, the various data sources indicate a high prevalence of poly substance use and misuse and a high comorbidity of psychiatric problems among treatment seeking persons. The significant association between poly substance use and mental health problems prompts an adapted approach at conceptual, methodological, organisational and policy level. After answering the main research hypotheses and after discussing the conceptualisation of 'poly substance use', we formulate recommendations for a more comprehensive and integrated approach to substance use problems at all levels.

1. The research hypotheses tested

1.1. Poly substance use has increased during the last decade

Several authors have suggested an increase in poly substance use (Byqvist, 2006; EMCDDA, 2009), although other authors state that this is just the recognition of how it always was (Yates, 1999). Indeed, some early treatment studies (Broekaert, 1978; De Leon, 1984) illustrate the use of various other substances (in particular alcohol, cannabis and psychoactive medication), besides the primary drug of TC residents. On the other hand, substance users seem to have a drug of choice (causing most of their problems) and interventions directed at the treatment of specific substance use disorders have been demonstrated to be highly effective (e.g. methadone maintenance treatment for opiate users (Amato et al., 2006; the CRA + vouchers-approach for cocaine users (Vanderplasschen et

al., 2009)). Still, in an era of increasing availability of and access to synthetic and designer drugs (BMCCDA, 2012), substance users can experiment with a variety of drugs or replace one substance by another. In recreational settings, poly substance use is the norm with alcohol and cannabis as socially accepted and omnipresent substances, but also cocaine, amphetamines and synthetic drugs play an important part (Van Havere et al., 2012). The growing availability of these substances and the increasing tolerance towards poly substance use among persons going out urge for adapted prevention programs not only providing information on the effects and risks of specific drugs, but also on the risks of combined substance use. Typical combinations of substances have been retrieved in the literature (although such clusters were less clear based on a cluster analysis of treatment demand data, cf. chapter 4), but virtually as many combinations are possible as substances can be combined theoretically.

The tendency of increased poly substance use among recreational drug users, was also observed among the treatment samples we studied. The longitudinal analysis of treatment demand data in the Sentinelle network (chapter 5), as well as the TC data (chapter 8) show a clear increase of poly substance use (40.4% in 1997 vs. 65.9% in 2010). In particular, cocaine plays an important role in poly substance use patterns. The Sentinelle data also showed that the (past) use of various substances is much more common among persons who recently made a treatment demand (in the period 2006-2008), as compared with persons who did so the 10 years before. Moreover, besides the use of the 'top 3' substances (cannabis, heroin and cocaine) among treatment demanders, legal products (alcohol, methadone and prescription drugs) are frequently used. Analyses of substance use patterns of persons who made several treatment demands in the Sentinelle-network over the years, show that consumption habits may change when individuals re-enter treatment.

Rates of poly substance use are highly dependent on the way this phenomenon is operationalised: the TC-study has shown that the number of clients who have spent a period in a controlled environment before they entered the TC has diminished between 1997 and 2010, which may have affected rates of poly substance use. On the other hand, analyses in which we controlled for the role of

living in a controlled environment showed that over the years few differences in poly substance use were observed among persons who stayed for 30 days in a controlled environment before treatment entry, whilst a clear increase in poly substance use (from 55 to 83%) was observed among persons living less than 30 days in a controlled environment during that period. Other potential artefacts explaining increased poly substance use may be the increased awareness of and attention for poly substance use among assessors and practitioners, greater openness among clients to talk about their substance use and the inclusion of additional substances in most assessment instruments (e.g. EuropASI (cf. Raes et al., 2009). Despite these potential sources of bias, the available evidence points in the direction of increased poly substance use among substance users in treatment settings.

1.2. Poly substance use is associated with more (severe) psychological problems

The POLYMEH-study was concentrated around the question whether poly substance use is associated with increased mental health problems. Evidence from the literature review (cf. chapter 2) and secondary analyses (cf. chapter 4, 6 and 7) seems to confirm this hypothesis, although the presence of a psychiatric disorder was not identified as an independent determinant of poly substance use. Robust determinants of poly substance use were the severity of drug use problems, persons' employment status, age, living in a controlled environment before treatment entry and severity of psychological complaints (as measured by the ASI).

Still, all of the univariate comparisons of single and poly substance users demonstrate more mental health complaints and psychiatric disorders among persons who used multiple drugs during at least one day in the period before they entered the TC. Anxiety disorders and cluster B personality disorders were more prevalent among poly substance users (cf. chapters 6 and 7), but also the prevalence of concentration problems, suicidal behavior and the prescription of medication for psychological problems was significantly higher among poly

substance users. The literature review showed that more severe drug problems and (mis)use of various substances is associated with psychopathology (cf. chapter 2). Women appear to be more at risk for (some type of) mental health problems, but overall no evidence was found that the prevalence of psychiatric disorders was higher among female substance users (cf. chapter 3). Besides increased mental health problems, poly substance use has been associated with more severe family, legal and physical health problems, and – logically – with more severe alcohol and drug use problems. These findings may vary according to the comparison group (e.g. primary drug or alcohol users), but were stable across the various chapters (4, 6, 7 and 8). Indicators associated with poly substance use were younger age, current living situation and parental substance use problems. Being dependent for living on health care benefits was also associated with poly substance use. Poly substance users have more often a criminal record and have more frequently been admitted to a hospital for medical problems. Overall, the data show a worse overall situation at the start of treatment among poly substance users.

As we only analysed cross-sectional data, we have no information whether poly substance use is also associated with worse treatment outcomes, but at least some studies point in that direction (Hambley et al., 2010). Although the association between poly substance use and increased mental health problems was confirmed in each of the secondary analyses, no causal inference is possible due to the cross-sectional design of the study. It may be that poly substance users are at increased risk of developing mental health problems, but poly substance use may also be a way to cope with (co-occurring) mood and other psychiatric disorders (Leri et al., 2003).

2. Operationalisation and conceptualisation of ‘poly substance use’

From the start of this research project, it appeared that practitioners, researchers and policy makers have a clear, but often different understanding of ‘poly substance use’. The review of the literature confirmed this observation, as at least ten different definitions of poly substance use were retrieved. This ambiguity

was also encountered in some of the databases selected for secondary analysis. Consequently, a pragmatic definition of 'poly substance use' was suggested, i.e. "*the use of more than one legal (alcohol ≥ 5 units) or illegal substance on one day"*. This definition is based on the conceptualisation of multiple drug use in the (European version of the) Addiction Severity Index (Raes et al., 2009), an instrument used in several of the databases under study. Still, issues associated with the definition and conceptualization of poly substance use were a recurring concern throughout the study. Generally, authors describe insufficiently what they mean with 'poly substance use' and how they have operationalised this concept in their study. As conceptual differences may have a huge impact on the (interpretation of the) findings, it is important to describe clearly how poly substance use has been conceptualised and operationalised. In particular, following aspects need to be addressed conscientiously and its potential implications for data-interpretation and analysis should be addressed:

- ***Use, misuse and dependence***. Do respondents 'use' multiple substances, are they 'misusing' more than one substance or are they 'dependent' on several substances? If they just 'use' multiple substances, do they so regularly, or not? In the latter cases, do they meet DSM-IV criteria for substance use disorders? What is meant with 'problem drug use' (EMCDDA), 'regular use' (ASI), or 'addiction' (West, 2006)?
- ***Simultaneous or concurrent.*** Simultaneous use (= at the same time) should be distinguished from concurrent use (= the use of multiple substances at separate occasions during a specified time frame (e.g. 12 or 24 hours)). Simultaneous use of two (or more) substances is likely to cause interaction effects, while the use of various substances during one day may rather serve various functions (e.g., relaxation, waking up, increase concentration).
- ***Substances.*** When poly substance use is concerned, which specific substances are taken into consideration when categorising persons as 'single' or 'poly' substance users? Alcohol, although not whatever use (e.g. one beer) but rather harmful consumption (> 5 units), should be

included. Still, this will be evaluated differently in countries with a 'wet' alcohol culture (e.g. the UK, Italy, Spain), as opposed to 'dry' countries like Sweden and Norway. Are various substances belonging to the same group of substances (e.g., crack and powder cocaine, heroin and codeine) regarded as one or two different substances? Also, some substances are prescribed as part of a substitution treatment (e.g. methadone, buprenorphine), while individuals may continue to use heroin. Should this be regarded as poly substance use? If so, what about heroin addicts who are prescribed diacetylmorphine and continue to use street heroin? It is clear that researchers should at least specify which substances were taken into account when studying poly substance use and which were not.

- ***Time frame.*** The time frame is an important discriminating variable, since the overall majority of drug users will be regarded as poly substance abusers when a large time window is applied (e.g. >90% of TC-residents had a lifetime prevalence of regular use of at least two substances). A more narrow time frame (last week, last month, last three months) may be better to identify poly substance use, although a short or atypical period may underestimate the presence of poly substance use (cf. chapter 8).
- ***Instrument.*** The instrument used to measure substance use is another important aspect for comparing the findings from different studies. Some standardised instruments only look at the frequency of use (e.g. EuropASI), while other tools also assess the amount and intensity of use (e.g. MATE (Measuring Addiction: Treatment and Evaluation), Schippers, Broekman & Bucholz, 2007; *IRAB* (Interview for Research on Addictive Behavior), López-Torrecillas, Godoy, Pérez-García, Godoy & Sánchez-Barrera, 2001).
- ***Heterogeneity***. The results indicate that there may be as many types of poly substance users as the number of substances that can be combined. Therefore, each categorisation (e.g. 'single' vs 'poly' substance users) should be regarded as a simplification for methodological and

pragmatic reasons. Both categories are substantially heterogeneous, as the group of 'single substance users' may comprise 'pure' alcoholics, alcoholics who occasionally use cannabis or users of one type of illegal drug. Polysubstance users may be merely cocaine or opiate dependent persons with additional substance use, users of various types of stimulant drugs (XTC, amphetamine, and club drugs) or cocaine users who abuse alcohol.

ي

Despite the observation that most drug users who present for treatment use and misuse various licit and illicit substances, the common European registration tool (=*Treatment Demand Indicator (TDI)*) does not fully recognise this reality. The TDI collects information on clients at, or close to, their point of entry into treatment facilities for problems with one or more drugs. It is based on a dataset of 20 items including social characteristics, treatment contact details and drug profile (EMCDDA, 2000). This data collection system classifies clients by the primary and secondary drugs used: the primary drug is the drug reported as the drug that causes the client the most problems and that is usually the main reason for entering treatment (EMCDDA, 2009). Secondary drugs are drugs taken in addition (at the same time or consecutively) to the primary drug; up to four different drugs can be recorded for every client. Yet, this approach excludes poly substance use as the primary problem or primary drug, since one substance should be selected as primary drug. In reality, clients often enter treatment for problems with more than one substance, and often relapse into substance use through another substance than the main problem drug at treatment entry. In addition, the TDI denies the substantial proportion of alcohol misuse and dependence in persons addressing drug treatment services, as alcohol can only be registered as secondary drug. Given the mission and objectives of the EMCDDA, alcohol (mis)use is only discussed when it occurs in combination with the (mis)use of illicit substances. However, the predominant focus on illicit drugs and the resulting division of alcohol and drug prevention, treatment and policy needs to be revised, in order to develop more coherent and integrated approaches to deal with substance use problems at European and international level.

Since many drug users have an alcohol use disorder in addition to a dependence on illicit drugs (cf. chapter 7), it is important to document the problem of poly substance use and to recognise that persons may have more than one primary problem substance. Methodological concerns are related to the registration of the primary substance, since this categorisation is based on problems as defined by clients themselves, as well as based on short assessments or diagnoses (EMCDDA, 2009). These variations may hamper the accuracy of the registration and lead to an underestimation of substance use (e.g. misuse of (un)prescribed medication), if not assessed systematically.

It can be concluded that the concept 'primary drug' may be a helpful approach to categorise substance users for epidemiological purposes, but it obscures the overall picture of substance use behaviour in clinical samples with substantial poly substance use. Difficulties to assign persons to one type of primary drug or self-report of only the primary substance may divert the focus from the use of other substances. Therefore, systematic screening of use and misuse of various substances (including alcohol and psychoactive medication) at treatment entry is recommended.

2.1. Towards a definition of poly substance use

Although the concepts 'primary' and 'secondary drug' in the TDI can be criticised for the above-mentioned reasons, its categorisation of substances into nine groups (cf. Table 1) is helpful and allows a functional approach of substance use since similar substances cause the same effects and can therefore be regarded as one substance (e.g. stimulant drugs, opiates). As the reason for poly substance use, in particular simultaneous use, is often to enhance, reduce or alternate the effects of a particular substance, this intention needs to be reflected in the conceptualisation of poly substance use. For the same reason and for indicating that two substances are taken within a relatively short period of time, the time window is best set at one day (24 hours).

Consequently, we suggest the following definition of poly substance use: *"The use of two or more substances from at least two categories of substances (cf. table 1) during a 24 hour period".* As alcohol use is a socially accepted habit

that is omnipresent in drug users, we only consider harmful alcohol use (≥5 units, leading to intoxication) as a substance to be included in the definition of poly substance use. The use of psychoactive medication is regarded as a specific class in this definition, regardless whether it was prescribed by a doctor or not.

Table 1: Categories of substances in the TDI (EMCDDA, 2000)

Category	Substances included
Alcohol	Beer, wine, spirits, ...
Opiates	Heroin, methadone, codeine, morphine, buprenorphine, ...
Cannabis	Marihuana, hash,
Cocaine	Cocaine, crack, ...
Stimulants	Amphetamines, methamphetamine, MDMA, other stimulants and derivates
Hypnotics, anxiolytics and sedatives	Barbiturates, benzodiazepines, ...
Hallucinogens	LSD, magic mushrooms, ...
Inhalants	Glue, toluene, …
Other psychoactive substances	

2.2. Poly substance dependence

In the DSM-IV, the diagnosis 'poly substance dependence' is only assigned if the pattern of multiple drug use is such that it fails to meet the criteria for dependence on any class of substance separately. In reality, this diagnosis is often inappropriately used as a residual category to refer to heavy drug users who are dependent on more than one substance (APA, 2011a). In the latter case, not the diagnosis 'poly substance dependence' but multiple co-morbid diagnoses of substance dependence should be given. In the DSM IV-TR, the definition of poly substance dependence was revised to provide clear examples of situations in which this diagnosis might apply (APA, 2011a). Still, it became clear that more than one interpretation of how to use this poly substance dependence diagnosis exist, as it may include indiscriminant use of a variety of substances, as well as persons who meet only one or two dependence criteria for a single substance, but

who meet three or more criteria when the various classes of drugs are taken together as a whole. The utility of the diagnosis 'poly substance dependence' has been called into question, because of its low prevalence rate (Schuckit et al., 2001). In the light of the development of the DSM-5, it is advisable to once again rethink and reformulate the diagnosis 'poly substance dependence'.

A secondary analysis of the Minimal Psychiatric Data (Minimale Psychiatrische Gegevens, MPG) of patients treated in psychiatric hospitals in Belgium revealed that around 8% of all substance use disorders concerned 'poly substance dependence' (Gorissen, pers comm., 26-10-2010). Moreover, this diagnosis was the most frequently assigned diagnosis after 'alcohol dependence' in this population (60.7%) and concerned 9.6% of all diagnoses of dependence. These rather high prevalence rates in patients in psychiatric hospitals in Belgium may be based on inappropriate use of this diagnostic category, in case of abuse or dependence of various substances (cf. Dom et al., 2004). As discussed above, for situations in which clients use more than one substance and the criteria are met for more than one specific substance-related disorder, each disorder should be diagnosed separately (e.g. opiate dependence AND alcohol abuse/dependence).

The new DSM 5 will, by all odds, leave behind the dichotomisation 'abuse-dependence' in favour of a more dimensional approach, which considers the severity of dependence for every class of substance (i.e., moderate or severe). Instead of the various diagnoses for substance abuse and dependence, more general diagnoses such as substance use disorder, cocaine use disorder, opioid use disorder, … are suggested. Still, it remains unclear how the new diagnosis 'poly substance use disorder' will be described in the new version of the DSM. It looks like the diagnosis will keep its residual character, the only difference being the extension from 7 to 11 symptom categories as is the case with the assessment of each substance (APA, 2011b). We recommend thorough and systematic assessment and diagnosis of dependence for each class of substances, potentially leading to the diagnosis of three or more substances of dependence. The diagnosis 'poly substance dependence' should only be applied to problems associated with the use of one substance that are not pervasive enough to justify a diagnosis of dependence, but in which case the use of other substances impairs

significantly various aspects of functioning (APA, 2011a). Such an approach to substance dependence is more discriminative and clinically relevant, as compared with a general diagnosis of 'poly substance dependence' that refers to persons who are dependent on more than two substances.

3. Recommendations

3.1. Assessment of substance use and other psychiatric disorders in clinical practice

Based on our secondary analysis of various treatment samples, poly substance use appears to be the rule rather than the exception. While among samples recruited in alcohol treatment facilities the prevalence of illicit drug use is often limited or only concerns cannabis use (cf. chapter 6), poly substance use is omniprevalent among clients in drug treatment services (cf. chapter 7 and 8). Still, the number of persons using sedative and hypnotic drugs in alcohol treatment is large, and a great number of them can be classified as 'dependent' on these substances according to the MINI. Therefore, systematic and careful screening of use and misuse of various substances is necessary at intake, as persons entering treatment may hold back or minimize the use of some substances or just mention the main substance(s) they use (cf. supra). In case of poly substance use, the simultaneous or co-occurring use of substances needs to be taken into account with attention for the interactions and interconnections between various drugs. Also, the use of various substances within the same day should be explored, e.g. by making a function analysis of the reasons why individuals use (different) drugs at various moments (De Fuentes-Merillas & De Jong, 2004). Such information may help to increase insight in one's drug use patterns and to anticipate future use. In treatment settings, assessment of the severity of multiple substance use disorders is important, since we found indications that the frequency and intensity of substance use is associated with more severe drug-related problems, including mental health problems. Consequently, the (ab)use of cocaine, alcohol and other substances needs to be assessed in opiate dependent individuals. As abuse and dependence will be

merged into one single category in the DSM 5, it will be important in future times to distinguish between a 'moderate' and 'severe' substance use disorder for each class of substances (DSM, 2011). Overall, the use of a comprehensive assessment instrument is recommended that does not only focus on the history and frequency of substance use, but also takes into account intensity and dosage.

Several data sources (chapter 6 & 7) indicate that poly substance users have more severe psychological complaints as compared with single drug users. Screening and, if necessary, further assessment of mental health is therefore a prerequisite at treatment entry, in particular among poly substance users. Given the negative impact of (untreated) psychiatric disorders on treatment retention and outcomes, early assessment and identification of such problems should be a standard procedure in substance abuse treatment. Various validated screening instruments are available (diverse in length and duration), but should at least screen for symptoms of anxiety, depressive and stress as these are the most common disorders among (poly) substance users.

Also, personality disorders are very common among substance users entering treatment. Knowing that the presence of one or more personality disorders can have an unfavourable influence on the course, prognosis and treatment outcome of substance use disorders (Kokkevi et al., 1998; Rounsaville et al., 1987), we recommend the inclusion of a thorough personality (disorder) assessment. Preferably, a dimensional (instead of categorical) approach of personality disorder assessment should be chosen, in which personality traits are described on dimensions from normal to pathological personalities. The changes that are currently being proposed for the reformulation of the Personality Disorder section of the DSM-5 are going in that direction (Hopwood, Thomas, Markon, Wright, & Krueger, in press). A dimensional assessment system has numerous advantages, including improved clinical utility (e.g. for establishing a therapeutic relation or for developing individualised treatment programmes) (Verheul, 2005). A promising instrument for measuring DSM-5 personality traits is the Personality Inventory for DSM-5 (PID-5) (Hopwood et al., in press).

Given the high rate of mental health problems in (poly) substance users, it may not surprise that the prescription of benzodiazepines and/or antidepressants is very common preceding or during treatment, in particular in methadone maintenance programs and psychiatric services (cf. chapter 6 and 7). However, the role of non-prescribed use and misuse of these substances in poly substance use may not be underestimated and the appropriateness of the prescription of benzodiazepines and antidepressants for individuals with both substance use and other psychiatric disorders needs to be questioned (Brunette, Noordsy, Xie & Drake, 2003). Dependence on sedative and hypnotic substances needs to be assessed at treatment entry and the prescription policy should be adapted accordingly. Besides medical and pharmacological treatment, psychotherapy and psychosocial support should be offered to deal with mental health problems like depression and anxiety. According to Drake and colleagues (2007), integrated treatment of substance use and mental health problems is necessary, given the negative impact of a dual diagnosis on individuals' overall wellbeing. Co-occurrence of both disorders may result in problems in other life domains (e.g. unemployment, social isolation, problems with the courts), which are best addressed in an integrated way.

3.2. Towards the integration of substance abuse and psychiatric treatment

The substantial prevalence of mental health problems among substance users addressing treatment, in particular among poly substance users, the multidimensional and interrelated problems these persons experience and the scientific evidence for an integrated approach of substance use and mental health problems, stress the importance of cooperation with and referral to other services (e.g. social services) in order to address clients' multiple needs. Still, a large gap can be observed between substance abuse and psychiatric services in Belgium. Despite the development of integrated treatment systems for drug users (Vanderplasschen & Lievens, 2009), the old gap between specialised drug treatment facilities (e.g., crisis intervention units, therapeutic communities) with a particular financing system and the general health care services (including psychiatric hospitals) remains up to now (Colpaert, 2012). Most psychiatric

services have traditionally been reluctant to treat drug abusers, although many psychiatric hospitals have a detoxification and/or treatment unit for alcohol abusers. On the other hand, specialised drug treatment services are only accessible for alcohol abusers if these persons also have problems with illicit drugs. This separate treatment system for alcohol and drug abusers is odd from an international perspective (Bergmark, 1998). For, it may in particular hamper the treatment of poly substance abusers, as alcohol treatment services focus by default on alcohol and drug treatment services mainly target problems with illicit drugs. This study in particular has demonstrated the uselessness of such a strict distinction between alcohol and drug treatment, since about half of all substance users are poly substance users who also ab(use) alcohol. Therefore, it is recommended to join insights, methods and expertise from both sectors in order to improve the quality of substance abuse treatment.

Similarly, the division between substance use and psychiatric treatment needs to be bridged. Abundant evidence is available about persons with a dual diagnosis falling through the cracks of the substance abuse as well as the psychiatric treatment system, because they are "too psychiatric" or "too addicted" to be treated in one of both systems (Dom, 2000). It is illustrative that, despite the high comorbidity of substance use and other psychiatric disorders, only a handful of integrated treatment services are available in Belgium. Rather than more specialised dual diagnosis services, the integration of substance use and psychiatric services is required to increase the effectiveness of the treatment of substance use disorders (cf. Drake et al., 2007). Scientific evidence and available examples of good practice need to guide the development of services that combine insights, methods and approaches from both systems, without losing the peculiarities and strengths of each system. Case management is often applied in an integrated treatment approach to link between substance abuse and psychiatric services and to provide continuous monitoring of clients' problems (Vanderplasschen, Rapp, Wolf & Broekaert, 2004). Close collaboration with primary health care professionals and outpatient psychiatric services is needed to improve the quality and continuity of treatment for substance abusers with mental health problems. The coming reform of mental health care in Belgium,

often referred to with the number of the specific article of the Belgian hospital law (article 107), is intended to reduce the number of hospital beds in favour of low threshold, outreaching and rehabilitation initiatives. However, it can be questioned wheter this reform will solve intersectoral gaps, since the establishment of assertive community treatment and outreach teams does not appeal to specialised drug treatment services, which may even deepen the gap between both systems.

3.3. Poly substance use: a clinically relevant construct?

The insight that poly substance use is the rule rather than the exception is important, but even if practitioners, policy makers and researchers would agree about the definition or conceptualization, it cannot be considered a unequivocal construct. Indeed, dozens of combinations of substances are possible leading to the question whether poly substance use is not merely a theoretical construct with few practical relevance.

Despite the diverse interpretations of this construct, it has practical relevance and it may be one of the basic insights in addiction as a disorder that very few substance users stick to one single substance. Second, also other well-defined substance use disorders are characterised by substantial heterogeneity, since opioid dependence may as well refer to 23-year-old injecting heroin users, as to the 42-year-old methadone patient with occasional heroin use as to the 63-year-old codeine addicted lady. Such categorisation is based on binding, instead of distinctive features and some of the core characteristics have been described above. Third, concepts like ‘primary substance’ or a substance-specific approach are not likely to help us in practice, since we should focus on the use of multiple substances, their function and impact on substance abusers’ daily living situation (Schensul, Convey & Burkholder, 2005). Consequently, instead of focusing on substance-specific guidelines for the treatment of substance use disorders, more attention is needed for generic guidelines as substance users are most likely to use more than one substance. Also, when talking about recovery we should not do so focusing on the primary substance that led to a treatment demand, but from a ‘poly substance use’-perspective. Given the role of alcohol in poly substance

use (e.g. as a trigger for drug use and relapse), treatment and (relapse) prevention programs need to be sensitive for the likelihood of alcohol consumption after treatment (in combination with other substances, e.g. heroin) and should inform about the risks of poly substance use. Also, harm reduction initiatives in community and prison settings should give attention to the risks of poly substance use. Further, treatment programs focussing on persons dependent on a specific substance (e.g. substitution treatment, CRA + vouchers) may be evidence-based programs, but should not ignore the use of other substances by program participants. Therefore, generic practice guidelines like the APA-guideline for the treatment of persons with substance use disorders (APA, 2007) should be used in addition to substance-specific guidelines.

3.4. Quality of life as the main outcome indicator?

Drug dependence is increasingly recognised as a chronic, relapsing disorder and the recovery process may be characterised by the replacement of one substance (e.g. methadone, heroin) by another (e.g. alcohol). Consequently, a treatment offer which is solely focused on abstinence or control of the use of one specific substance (e.g. cocaine) ignores the complexity of dependence problems. Starting from clients' needs and expectations may not only improve the accessibility of and retention in treatment, but also enhance treatment outcomes (De Maeyer et al., 2012). Abstinence is not always the primary reason or motivation why individuals seek help or enter treatment. Not seldom, problems in other life domains (e.g. family relations, legal problems) are deemed more important. Therefore, treatment should not solely focus on substance use and mental health problems, but also on individuals' overall wellbeing, including housing, occupation, social inclusion, … As poly substance users often have more substance-related problems and lower quality of life scores on various life domains (physical, psychological, social, environmental) (cf. Chapter 4 & 6), assessment of these problems and adequate support is needed to promote their social inclusion (De Maeyer, Vanderplasschen & Broekaert, 2009). In particular, support concerning their occupational status and legal and living situation (Chapter 4 & 6) is recommended. Improvements in these life domains may

indirectly influence substance use behaviour and result in a reduction of substance-related symptoms (Koo, Chitwood & Sanchez, 2007). From a long-term perspective, improving individuals' overall wellbeing may have a positive impact on the prevention of relapse and on the adoption of a drug-free life style.
Despite the emerging interest in person-centred outcomes, such as quality of life, clinical practice and substance abuse research have been characterised by an almost unique focus on substance-specific outcomes, i.e. abstinence, with no or limited attention for other aspects which may have a bigger impact on individuals' feelings of overall wellbeing (Fischer, Rehm, Kim & Kirst, 2005). According to these authors, person-centred concepts (e.g. QoL) based on individuals' own experiences and expectations, should become part of treatment assessment, planning, monitoring and evaluation. Treatment effectiveness is most likely to be improved when outcomes are based on clients' needs and their definition of success rather than on objectives and outcomes determined by practitioners or society in general.

4. Limitations of the study

One of the main limitations of this study was the (forced) use of different definitions of poly substance use. Since the various databases we have analysed were based on different instruments or registration tools, we could not apply the same definition of poly substance use in each separate chapter. After long discussions, the definition of poly substance use in the Addiction Severity Index (ASI) (i.e. the use of two or more substances on the same day) was used as operational definition throughout the study. Still, we experienced that this definition has its limitations, since persons who use methadone and heroin were also classified as poly substance users. Therefore, we have suggested an adapted, more functional definition of poly substance use, based on classes/categories of substances.
A second limitation we faced was the lack of comprehensive databases in Belgium, including data about alcohol and drug users in various treatment settings. Several authors (De Donder, 2006; Vanderplasschen et al., 2002) have criticised this shortcoming, resulting in unrepresentative and incomparable data

in international comparisons (e.g. EMCDDA drug reports). The aforementioned gap between alcohol and drug treatment and between specialised (drug) treatment facilities and psychiatric services is the main reason for the lack of comprehensive data. DARTS (Drug Aid Registration System) is the most comprehensive registration system for specialised drug services in Flanders (but does not include alcohol services), while the Minimal Psychiatric Data (MPG) is the national registration system for persons admitted in psychiatric hospitals. Both registration systems are incompatible, and other interesting databases (e.g., Permanente Steekproef) only include fragmented data (e.g. on service utilisation in health care services). Moreover, the defederalisation of some authorities (e.g., drug prevention, social welfare, mental health care) is at the basis of the division of most databases in Belgium. An additional problem is the lack of unique client identifier, in order to exclude double countings within and between databases. Some efforts have been done to overcome these problems, but up to now no comprehensive national registration system is available including data on the demographic, health and substance use characteristics and service utilisation of alcohol and drug users entering treatment. Since one of the main goals of the EMCDDA is to collect such data in each European country, it may surprise that these data are not yet available for Belgium. The Scientific Institute of Public Health has recently increased its efforts to implement the TDI-protocol in all specialised and general health care services, which should lead to more representative and comprehensive treatment demand data for Belgium. However, it is not only necessary to expand the range of services included in the TDI-registration, but also to improve the quality of the collected data, since a great deal of missing data are observed regarding some TDI-variables (e.g. primary drug) in the most recent national drug report (Deprez & Vanbussel, 2011).

The POLYMEH-study has resulted in abundant information on the prevalence and extent of poly substance use and mental health problems among alcohol and drug users entering treatment. Still, it was not possible to identify clear patterns of poly substance use, as a cluster analysis did not reveal typical combinations of substances in the treatment demand data of De Sleutel (cf. Chapter 4). In-depth qualitative interviews may be more appropriate to explore the nature of poly

substance use in various treatment settings, as we expect substantial differences in combinations of substances in e.g. methadone maintenance treatment and detoxification centres. Also, interviews with individuals out of treatment who use multiple substances may provide interesting information on how to address this risk behaviour in prevention and harm reduction initiatives, but also in treatment settings.

Another limitation of the presented prevalence data concerns the lack of comparison group. Poly substance use may be an important issue among persons entering treatment, but this is only a (small) proportion of the total group of alcohol and drug users in the community. In absence of large-scale epidemiological research on substance use and mental health in a representative population sample, the total prevalence of substance use disorders is unknown in Belgium. Similar studies in the Netherlands (NEMESIS, Netherlands Mental health Survey and Incidence Study) and the United States (Epidemiological Catchment Area (ECA), and later National Comorbidity Survey (NCS)) have demonstrated the prevalence of various psychiatric disorders in the total population, including substance use disorders. Only some data are available on the lifetime and last year prevalence of alcohol use disorders in Belgium, based on the European Study on Epidemiology of Mental Disorders (ESEMeD) (Bruffaerts et al., 2005). In the light of the forthcoming DSM 5, it is recommended to collect up-to-date data on various psychiatric disorders, including substance use disorders, and to repeat this measurement regularly in order to create a longitudinal perspective on the prevalence of psychiatric disorders in society and to set up interventions as needed.

Finally, the comparison and discussion of the prevalence of substance use and mental health problems in this report is based on distinct (standardised) instruments. This observation debilitates the comparison of percentages from the various chapters, although each of the separate chapters confirmed the main research hypotheses. The EuropASI was used in 4 of the 5 quantitative studies, but still it concerned various populations (in- and outpatient, alcohol and drug users). Assessment of mental health problems was only based on a proper diagnostic instrument (MINI and ADP IV) in the chapters 6 and 7, while in the

other chapters the section on ‘psychological problems’ in the ASI was used for this purpose. Therefore, some caution is warranted when interpreting the results on mental health problems in the chapters 4 and 8. From a comparative and longitudinal perspective, it would be best to use the same assessment instruments in various studies and across treatment settings, but often specific instruments are chosen for their particular characteristics (length, duration and user-friendliness are important concerns).

REFERENCES

American Psychiatric Association (APA) (2007). Practice guideline for the treatment of patients with substance use disorders, 2nd edition. Retrieved online, May 15th, 2007, on: http://www.psych.org/psych_pract/treatg/pg/SUD2ePG_04-28-06.pdf.

American Psychiatric Association (APA). (2011a). *Clarification of Concept of Polysubstance Dependence.* Retrieved online, December 12th, 2011, on: http://www.psych.org/MainMenu/Research/DSMIV/DSMIVTR/DSMIVvsDSMIVTR/SummaryofPracticeRelevantChangestotheDSMIVTR/PolysubstanceDependence.aspx

American Psychiatric Association (APA). (2011b). *DSM-5 development. Rationale for Changes to Substance-Related Disorders Tentative new title of new combined section: Addiction and Related Disorders.* Retrieved online, December 12th, 2011, on: http://www.dsm5.org/ProposedRevision/Pages/proposedrevision.aspx?rid=431#

Broekaert, E., & Vanderplasschen, W. (2003). Towards the integration of treatment systems for substance abusers: Report on the second international symposium on substance abuse treatment and special target groups. *Journal of Psychoactive Drugs, 35*(2), 237-245.

Brunette, M.F., Noordsy, D.L., Xie, H.Y. & Drake, R.E. (2003). Benzodiazepine use and abuse among patients with severe mental illness and co-occuring substance use disorders. *Psychiatric Services, 54*(10), 1395-1401.

Colpaert, K., Vanderplasschen, W., Van Hal, G., Broekaert, E., & Schuyten, G. (2008). Dual substance abusers demanding treatment: demographic, substance-related and treatment utilization characteristics. *Journal of Drug Issues, 38*(2), 559-583.

De Maeyer, J., Vanderplasschen, W. & Broekaert, E. (2009). Exploratory study on drug users' perspectives on quality of life: More than health-related quality of life? *Social Indicators Research, 90*(1), 107-126.

De Maeyer, J., Vanderplasschen W., Camfield, L., Vanheule, S., Sabbe, B., Broekaert, E. (2012). A good quality of life under the influence of methadone: A qualitative study among opiate-dependent individuals. International Journal of Nursing Studies.

Drake, R.E., Mueser, K.T. & Brunette, M.F. (2007). Management of persons with co-occurring severe mental illness and substance use disorder: program implications. *Word Psychiatry, 6*(3), 131-136.

European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). (2000). *Treatment Demand Indicator Protocol 2.0.* Lisboa: EMCDDA.

Fischer, B., Rehm, J., Kim, G. & Kirst, M. (2005). Eyes wide shut? – A conceptual and empirical critique of methadone maintenance treatment. *European Addiction Research, 11*(1), 1-9.

Hambley, J., Arbour, S. & Sivagnanasundaram, L. (2010). Comparing outcomes for alcohol and drug abuse clients: A 6-month follow-up of clients who completed a residential treatment programme. Journal of Substance Use, 15(3), 184-200.

Hopwood, C.J., Thomas, K.M., Markon, K.E., Wright, A.G.C. & Krueger, R.F. (in press). DSM-5 Personality Traits and DSM-IV Personality Disorders. *Journal of Abnormal Psychology*.

Kokkevi, A., Stefanis, N., Anastasopoulou, E. & Kostogianni, C. (1998). Personality disorders in drug abusers: Prevalence and their association with Axis I disorders as predictors of treatment retention. *Addictive Behaviors, 23*(6), 841-853.

Koo, D.J., Chitwood, D.D. & Sanchez, J. (2007). Factors for employment: A case-control study of fully employed and unemployed heroin users. *Substance Use & Misuse, 42*(7), 1035-1054.

McLellan, A.T. (2002). Have we evaluated addiction treatment correctly? Implications from a chronic care perspective. Addiction, 97(3), 249-252.

Meyer, G., Finn, S.E., Eyde, L.D., Kay, G.G., Moreland, K.L., Dies, R.R. et al. (2001). Psychological Testing and Psychological Assessment: A Review of Evidence and Issues. *American Psychologist, 56*(2), 128-165.

Perry, J.C. (1992). Problems and considerations in the valid assessment of personality disorders. *American Journal of Psychiatry, 149*(12), 1645-1653.

Rounsaville, B.J., Dolinsky, Z.S., Babor, T.F. & Meyer, R.E. (1987). Psychopathology as a predictor of treatment outcome in alcoholics. *Archives of General Psychiatry, 44*(6), 505-513.

Schensul, J.J., Convey, M. & Burkholder, G. (2005). Challenges in measuring concurrency, agency and intentionality in polydrug research. *Addictive Behaviors, 30*, 571-574.

Schuckit, M., Danko, G.P., Raimo, E.B., Smith, T.L., Eng, M.Y., Carpenter, K.K.T. & Hesselbrock, V.M. (2001). A Preliminary Evaluation of the Potential Usefulness of the Diagnoses of Polysubstance Dependence. *Journal of Studies on Alcohol, 62*, 54-61.

Vanderplasschen, W., Rapp, R.C., Wolf, J. & Broekaert, E. (2004). The development and implementation of case management for substance use disorders in North America and Europe. *Psychiatric Services, 55*(8), 913-922.

Verdejo-García, B., Rivas-Péreza, C., López-Torrecillasa, F. & Pérez-García, M. (2001). Differential impact of severity of drug use on frontal behavioral symptoms. *Addictive Behaviors, 31*(8), 1373-1382.

Verheul, R. (2005). Clinical utility of dimensional models for personality pathology. Journal of *Personality Disorders, 19*(3), 283-302.

West, R. (2006). Messages from the Editor: Addiction in 2005, 2006 and beyond. *Addiction, 101*(1), 8-9.

(Vanderplasschen & Lievens, 2009),

(Vanderplasschen et al., 2011).