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ALCOHOL AND OTHER SUBSTANCE MISUSE IN SUICIDE

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ACADEMIC DISSERTATION

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ABBREVIATIONS

ASPD	Antisocial personality disorder
BAC	Blood alcohol concentration
BPD	Borderline personality disorder
DSM	Diagnostic and Statistical Manual of Mental Disorders
ECA	Epidemiologic Catchment Area
EEG	Electroencephalography
GAF	Global Assessment of Functioning
ICD	International Classification of Diseases
MAST	Michigan Alcoholism Screening Test
NCS	National Comorbidity Survey
PSD	Psychoactive substance dependence
SDAM	Subthreshold or diagnosed alcohol misuse
SPECT	Single-photon emission computed tomography

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1. LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications, which are referred to in the text by Roman numerals I-V.

I Pirkola S, Isometsä E, Heikkinen M, Henriksson M, Marttunen M, Lönnqvist J. Female psychoactive substance dependent suicide victims differ from male. Results from a nationwide psychological autopsy study. *Comprehensive Psychiatry* 1999; 40:101-107.

II Pirkola S, Isometsä E, Henriksson M, Heikkinen M, Marttunen M, Lönnqvist J. The treatment received by substance dependent male and female suicide victims. *Acta Psychiatrica Scandinavica* 1999; 99:207-213.

III Pirkola S, Marttunen M, Henriksson M, Isometsä E, Heikkinen M, Lönnqvist J. Subthreshold and diagnosed alcohol abuse in Finnish adolescent suicides. *Alcohol and Alcoholism* 1999; 34:320-329.

IV Pirkola S, Isometsä E, Heikkinen M, Lönnqvist J. Suicides of alcohol misusers and non-misusers in a nationwide population. In press, *Alcohol and Alcoholism*.

V Pirkola S, Isometsä E, Heikkinen M, Lönnqvist J. Employment status influences the weekly patterns of suicide among alcohol misusers. *Alcoholism: Clinical and Experimental Research* 1997; 21:1704-1706.

In addition, unpublished data have been included in this thesis.

2. INTRODUCTION

2.1. Definition of suicide

Suicide lacks a unanimously agreed definition. The straightforward definition of ending one's life intentionally certainly needs explication (Mayo 1992). To be classified as suicide, an act of killing oneself must be deliberately initiated and performed by the person concerned in the full knowledge or expectation of its fatal outcome (WHO 1998). Explicit definitions include "a deliberate and intentional act with a fatal outcome, performed by the deceased himself/herself", and "death arising from an act inflicted upon oneself with the intent to kill oneself" (Rosenberg et al 1988, Mayo 1992, Retterstol 1993).

The definition of suicide and the process of determining a death as suicide vary within and between countries (Rosenberg et al 1988, Neeleman & Wessely 1997, Öhberg 1998), which leads to some unreliability in international comparisons of official suicide statistics. However, this is estimated to cause less than 10% of the variation in suicide rates and not to prevent major conclusions and comparisons being made within and between countries (Öhberg 1998). In Finland, the law requires that in every case of violent, unnatural, sudden or unexpected death the possibility of suicide is assessed by police and medicolegal examinations, and the decision on classification into suicide is made by the forensic examiner. Finnish suicide statistics are considered reliable (Lönqvist et al 1988, Karkola 1990, Öhberg 1998).

Suicide can be seen as a multidetermined act. It is a time advancing process with multiple and complex biological, psychological, social, cultural and societal affecting factors. In individual cases the process involves a range of predisposing and precipitating factors that may interact in a most complex way (Blumenthal 1990, Heikkinen 1994). Suicidal behaviour is often seen as a continuum, which in addition to completed suicide also includes suicidal ideation and communication, as well as non-fatal suicide attempts of varying intention and lethality (Beautrais 1996, Suominen 1998). Non-fatal attempts are estimated to be one of the strongest predictors of an eventual fatal attempt (Hirschfeld & Russell 1997, Lewis et al 1997).

2.2. Suicide as a public health problem

The prevalence of suicide in Finland is among the highest in the world; in 1996 it was 24.3/100 000: 38.7/100 000 for males and 10.7/100 000 for females (Statistics Finland 1998). According to WHO statistics for 1995 it is seventh highest for men and sixth highest for women in Europe (WHO 1998). Suicide makes a substantial contribution to the deaths of young and physically healthy individuals. It is among the 10 leading causes of all deaths in most

countries and among the top three among younger age groups in many Western countries. In these age groups the rising trends in suicide rates over recent decades particularly among males, have provoked major concerns (Lönqvist et al 1993, Hawton 1994, WHO 1998). According to the Global Burden of Diseases Study (1990-2020), the rank order of "self-inflicted injuries" among the most important causes of death in the world is expected to rise from 12th to 10th between 1990 and 2020 (Murray & Lopez 1997).

It is a widely accepted view that in individual cases suicide indicates extreme unwellbeing - most often in the context of psychiatric morbidity, and efforts to prevent suicide by relieving the prevailing suffering are justified. Suicide causes suffering to a large number of survivors; relatives, friends and health and other care professionals may have to deal with sorrow, guilt or anxiety, and many more are involved through second-hand information and possibly via the media (Hirschfeld & Russell 1997, Saarinen et al 1997, Öhberg 1998).

2.3. Suicide research

Due to the multidetermined nature of the suicide process research on suicides and suicidal behaviour involves a huge spectrum of scientific inquiry. From a psychiatric perspective, prospective studies of general and treatment populations and retrospective studies of completed suicides are generally regarded as the most powerful tools (Blumenthal & Kupfer 1990, Paykel & Jenkins 1994, WHO 1998). The lifetime risks for suicide in major psychiatric disorders have been presented on the basis of prospective studies (Harris & Barraclough 1998, Inskip et al 1998). Valuable contributors to psychiatric suicide research have been advances in epidemiology and statistical techniques, and especially the development of the psychological autopsy method (Shneidman 1981, Hawton et al 1998). This is a procedure for reconstructing an individual's psychological life after his or her death in order to achieve a better understanding of the psychological circumstances contributing to the death (Clark & Horton-Deutsch 1992). Despite its limitations it is regarded as a valuable means of studying the factors that contribute to suicide and developing potential preventive strategies (Hawton et al 1998).

2.4. Suicide prevention

Some of the diverse contributing factors to the suicidal process may lie beyond the reach of prevention (Lewis et al 1997). Based on research, current prevention strategies focus on the recognition of risk factors and the treatment of psychiatric disorders that are known to associate with the majority of completed suicides (Blumenthal 1990, Lewis et al 1997). Several prevention projects for suicides and parasuicides have been conducted in different parts of the world (WHO 1986, Lönqvist et al 1988, Platt et al 1992, Taylor et al 1997). Due to their high prevalence in general

populations and in suicides, affective disorders and alcohol and other substance use disorders have been of particular interest in suicide research.

Despite a lack of definite evidence for their preventive impact, the following have been suggested to be effective in reducing suicide rates; detecting and treating of depression, substance misuse and schizophrenia; establishing marital counselling; controlling unemployment, poverty and the availability of suicide methods; promoting responsible media reporting of suicide; and creating education programs (Hawton 1994, Lewis et al 1997, Taylor et al 1997, Öhberg 1998, WHO 1998). Reported associations between alcohol consumption and suicide rates (Mäkelä 1996, Caces & Hartford 1998) would suggest some success for limiting general alcohol consumption. Some evidence exist for the effectiveness of educational programs focusing on the recognition and treatment of depression in primary care (Rutz et al 1989).

3. ALCOHOL AND OTHER SUBSTANCE USE DISORDERS

3.1. Alcohol and other substance use

3.1.1. Use of substances

The majority of Western people have used at least one psychoactive substance for either recreational or therapeutic purposes (Schuckit 1995a, Salaspuro et al 1998). In Western countries alcohol features in everyday social activities and situations other than work and routine tasks (Simpura 1985, 1987, 1990). In this context it is regarded as relieving psychological stress, anxiety and inhibition, and is thus considered helpful in efforts towards social integration (Schuckit 1995b, Ahlström 1998). Many psychopharmacological agents are used to treat psychiatric and other illnesses, but in non-medical and illegal contexts also to alter mood and states of mind (Schuckit 1995a, Salaspuro et al 1998.). Subjective experiences of the intoxication states engendered by different substances range from mild to strong changes in mood, altered states in learning, general stimulation or sedation, disturbances in perception, behaviour, coordination and memory, and hallucinatory experiences (Schuckit 1995a-b).

Societies usually disapprove of the non-medical use of most psychoactive substances. In Western countries alcohol use is considered appropriate in a wide variety of contexts from private to highly official ones, whereas many other drugs affecting the central nervous system tend to be consistently disapproved of in non-medical use. Industrially manufactured psychoactive drugs for medical purposes are used for e.g. pain relief, or reduction of anxiety or insomnia, which indications are usually determined by a physician. Social attitudes and legislation concerning psychoactive substance use vary by societies and cultures (Salaspuro et al 1998, Stahl 1996). For instance, debates over the proper use of prescription drugs (Stahl 1996), or the legal and medical use of cannabis products (MacCoun & Reuter 1997, Gray 1998) are recurrently conducted in many Western countries. In Finland, the official policy on illegal drug use has been rather restrictive in a European perspective, which may partly account for the relatively low rates of drug use problems in the eighties (Hakkarainen 1994, Kontula 1995, Poikolainen 1997a).

3.1.2. Patterns of alcohol use

Nine out of ten people in Western countries use alcohol at some time in their lives and forty per cent experience temporary alcohol-related impairment in some area of life because of drinking (Schuckit 1995a-b). Patterns of alcohol use can be examined in relation to either the amounts consumed, the temporal and social attributes of drinking, or to the consequences of alcohol use.

'At risk' alcohol consumption is a level of alcohol use thought to indicate a possible risk to health. In the United Kingdom this is defined as a maintained level of 21 units (1 unit=10g of ethanol) a week or more among males, and 14 units among females. Thus approximately 28% of males and 11% of females are estimated to be at risk consumers in the UK. In Finland, slightly higher weekly limits have been suggested, on which basis 20% of males (24 units) and 10% of females (16 units) are considered at risk consumers (Edwards 1996, Ashworth & Gerada 1997, Seppä 1998). According to the U.S. National Institute on Alcohol Abuse and Alcoholism, at-risk drinking is defined among men more than 14 drinks (12g of alcohol) per week or more than 4 drinks per occasion, and among females as >7dr/wk or >3dr/occasion. Among general practice patients in the United States 41% of men and 28% of women are estimated to be "problem drinkers" (O'Connor & Schottenfield 1998).

The concept of problematic alcohol use includes the negative consequences of drinking to an individual, to their family and social network, and to society (Ashworth & Gerada 1997). Questionnaires for the detection of problematic alcohol use and its disorders usually, and in addition to patterns or abundance of drinking, cover the issue of negative consequences or the reactions of an individual's environment to their drinking (Seltzer 1971, Mayfield et al 1974, Seppä et al 1995, Piccinelli et al 1997). Destructive and harmful patterns of alcohol use are thought to associate with interpersonal adversities and violence, problems with the law, and self-destructive behaviour, all of which are often thought to indicate a particular subtype of possible alcohol dependence (Cloninger et al 1981, Sigvardsson et al 1996, Virkkunen & Linnoila 1997).

The role of alcohol use may vary according to different phases of the life course (Fillmore et al 1991). Reactive and problematic but subdiagnostic alcohol use, or clinically significant alcohol abuse may appear temporarily in the context of adversities such as marital breakdown or unemployment (Catalano et al 1993, Cederblad et al 1995, Stack & Wassermann 1995). Younger adult age groups in particular are sometimes thought to be more vulnerable to reacting to social stress with increased alcohol use and also other psychiatric symptoms (Ager et al 1996, Fergusson et al 1997).

3.1.3. Patterns in Finland

A model for two types of drinking cultures in different countries has been proposed: "wet" cultures with higher per capita alcohol consumption, frequent heavy drinking, higher rates of liver cirrhosis and lower rates of alcohol poisoning, alcohol related violence and social disruption; and "dry" cultures with lower overall consumption, infrequent heavy drinking, lower rates of liver cirrhosis, but higher rates of alcohol poisoning, alcohol-related violence and social disruption (Ager et al 1996). In southern Europe's wine-drinking "wet" cultures alcohol use

integrates more into daily life, whereas in "dry" northern and northeastern beer- and spirit- drinking countries alcohol associates more with social disruption (Ahlström-Laakso 1976, see Ager et al 1996 for a review).

A heavy-drinking pattern is considered typical of alcohol use in Finland (Simpura 1987, Simpura et al 1990). Vaillant (1995) has referred to the contrast between the French "three-litres-of-wine-a-day social drinking" and the Finnish "explosive relief drinking". However, some changes during the last decades in drinking habits towards milder beverages have been reported in Finland (Simpura et al 1995). On the other hand, drinking among adolescents has reportedly increased and become perhaps more intoxication-oriented (Rahkonen & Ahlström 1989, Holmila 1995). The latter finding confirms a major concern in many Western countries of increasing consumption of alcohol and other substances among younger populations in recent decades (Rahkonen et al 1989, Weinberg 1998).

Despite the possible shift towards the use of milder beverages, drinking in Finland still often occurs to intoxication. The proportion of intoxication-oriented drinking - measured as the percentage of drinking occasions with blood alcohol concentration exceeding 1.0 o/oo - was 66% among males and 42% for females in 1992 (Simpura 1993). The rhythm of work influences drinking, which is considered a leisure activity and tends to occur during weekends, holidays and celebrations (Simpura 1985, 1987, Salaspuro et al 1998). Among adolescents, too, alcohol drinking is concentrated at weekends (Wilson 1980, Simpura 1987). In a study at a Finnish children's' hospital, most of the alcohol intoxication admissions occurred on Fridays (37%) and Saturdays (24%) (Lamminpää & Vilksa 1990).

3.1.4. Sex differences in substance use patterns

Substance use in males and females has somewhat different characteristics. With regard to substance use patterns and gender, women are occasionally called the hidden alcoholics; they appear more likely to drink alone and their problems with substance use may be denied by their families (Blume 1986, 1991, Seppä et al 1995), although this interpretation has also been criticised (Österling et al 1992). Furthermore, females are reported to use alcohol along with prescribed psychoactive drugs with sedative and antianxiety properties relatively often (Ross 1989, 1993, Österling & Berglund 1996). Concerns about the increasing alcohol and other substance consumption of younger females have arisen in recent decades (Gomberg 1993, Anonymous 1996).

3.1.5. Patterns of illicit drug use

Reliable data on illicit drug use are rare, but, for instance, 30% of adults in Britain are estimated to have used illicit drugs at some time in their lives, misuse of prescription drugs being probably even more common (Gerada & Ashworth 1997). Contemporary patterns of illegal and multiple drug use and abuse are said to include preference

for a primary drug ("drug of choice") plus a variety of other substances (Chan 1991, APA 1995). In Finland, mixed use of prescription drugs and alcohol is suggested to be typical of illicit substance use patterns, and the occurrence of misuse of other drugs has been relatively low (Kontula 1995, Poikolainen 1997a). In 1995 it was estimated that the need of services for illegal drug use had been relatively small compared to the service needs for alcohol use (Kontula 1995). However, the use of illegal drugs in terms of so-called street drugs is suggested to have risen in the nineties (Hakkarainen 1994, Poikolainen 1997a).

3.2. Neuropsychobiology of psychoactive substance use

The acute effects of alcohol and other substances are diverse, and knowledge about the neurobiological processes involved is constantly expanding (Kiianmaa & Hyttiä 1998). Contemporary theories about the long-term central actions of psychoactive substances integrate neurobiological and behavioural knowledge in terms of positive and negative reinforcement and adaptive changes particularly in neurons of venterotegmental areas of the brain (Koob 1997, Kiianmaa 1998). The mesolimbic dopaminergic areas are thought to act as a general reward and pleasure system through which the reinforcing effects of different substances are mediated. The pharmacological actions of alcohol are numerous and relatively nonspecific. Potential mechanisms are general effects on the lipid solubility of membranes of neurons, particularly dopaminergic neurons in the ventral tegmental areas of the brain, and specific effects on the neurons of the transmitter systems involving gamma-aminobutyric acid (GABA) or N-methyl-D-aspartate and serotonin. (Schuckit 1995a-b, Stahl 1996). In chronic substance use, tolerance and dependence associate with receptor adaptations and the up-regulation of the cAMP pathway in neurotransmitter synthesis (Nestler & Aghajanian 1997).

A model of progressively increasing dysregulation of the brain reward system resulting in compulsive substance use and a loss of control has been presented. Counteradaptation and sensitisation are proposed to be important neurobiological mechanisms underlying the development of psychoactive substance dependence (Koob 1997, Nestler 1997). The effect of stress on the use of alcohol and the development of dependence on it via the hypothalamic-pituitary-adrenal axis and glucocorticoids has been a topic of interest in recent studies (Gordis 1996, Kiianmaa 1998).

3.3. Consequences of psychoactive substance use

A large proportion of current or past users of a psychoactive substance have experienced some adverse consequences (Schuckit 1995a-b). The short and long term direct consequences of psychoactive substance use are multiple, and range from possibly dangerous states of acute intoxication to disturbances and deterioration in psychosocial life (APA 1995, Ashworth & Gerada 1997). The existence and developmental pattern of tolerance and specific withdrawal

syndromes vary by substance, as do behavioural and physical changes, which often parallel the development of a dependence syndrome (Schuckit 1995a-b, 1997). Excessive long term use of alcohol may result in a wide variety of physical illness, including liver, pancreas and heart diseases, affisions and malfunctioning of the brain, peripheral neurons, digestive system and hormonal balance, and frequent accidental injuries (Ashworth & Gerada 1997, Salaspuro & Kiianmaa 1998, Kuoppasalmi et al 1999). Eventual substance use disorders associate with a significant increase in morbidity and mortality, and substance dependence is estimated to indirectly or directly associate with at least 40% of hospital admissions and 25% of all deaths in the USA (APA 1995). In epidemiological studies the relation of alcohol consumption to mortality resembles a J-shaped curve, with total abstinence and heavy consumption associating with higher mortality (Poikolainen 1995). In Finland 5% of all deaths are estimated result from the use of alcohol (Kuoppasalmi et al 1999).

Psychoactive substance use has various consequences in individuals' psychosocial lives. Use of illegal drugs obviously leads to some state of marginalization and a tendency to criminal activities (Holopainen 1998). Misuse of substances is likely to impair an individual's peer group and social activities and in severe cases to disrupt life structure (APA 1995, Ashworth & Gerada 1997). Subjects with alcohol use disorders often seem to experience certain adversities according to a clinical pattern with a typical course. Problems in employment and marital life, as well as fights, arrests and driving while drunk typically appear in the course of severe alcohol dependence (Schuckit et al 1995, 1998).

Neuroradiological findings as physiological signs in fully developed alcohol dependence are constant, and include cortical atrophy and ventral enlargement (Pfefferbaum et al 1998). These supposedly relate to neuropsychologically observable cognitive impairment, including DSM-III-R and ICD-10 diagnosed alcohol-induced dementia (O'Malley & Krishnan-Sarin 1998). Reduced central serotonin transmission has been observed among alcohol dependent subjects in SPECT, most likely following a reduction in transporter density in raphe nuclei due to cumulative toxic effects of ethanol consumption (Heinz et al 1998).

3.4. Diagnoses

3.4.1. Concepts of abuse and dependence

The substance dependence concept was strongly influenced by the studies and the initial description of alcohol dependence syndrome by Gross & Edwards (1976). The major diagnostic classifications of DSM and ICD have since been continuously developed with regard to criteria for psychoactive substance use disorders (Cottler et al 1995). Dependence is generally thought to indicate a central role of the substance in an individual's life, with problems

relating to controlling intake, and the emergence of physical and psychological difficulties despite which the individual continues to use the substance (Schuckit 1995a-b). The significance of physiological symptoms, withdrawal and tolerance for the validity and reliability of psychoactive substance use disorder diagnoses has been a lively topic of discussion, and recent studies have re-emphasised their role in indicating the severity of the clinical course of the syndrome (Cottler et al 1995, Schuckit 1998, 1999a-b). Substance dependence is considered a more reliable and valid diagnosis than substance abuse. The existence or nonexistence of an independent category of substance abuse without the manifestation of a dependence syndrome has been questioned in the trial for valid and reliable criteria for substance use disorders (Rapaport et al 1993, Cottler et al 1995). The concept of abuse has occasionally been seen as a residual diagnosis for dependence, simply indicating a harmful or maladaptive pattern of substance use (APA 1987, Cottler et al 1995, Schuckit 1995a-b).

3.4.2. Classifications

DSM-III-R, the third revised edition of the Diagnostic and Statistic Manual of Mental Disorders (APA 1987) states that "The essential feature of dependence is a cluster of cognitive, behavioural, and physiological symptoms indicating that the individual has impaired control of psychoactive substance use and continues use of the substance despite adverse consequences." The criteria for a dependence syndrome in the various diagnostic systems are usually common to all psychoactive substances, but symptoms for substance-specific intoxication and withdrawal states differ by substance (DSM-III-R, DSM-IV, ICD-10). The latest versions of the Diagnostic and Statistic Manual of Mental Disorders (APA 1994) and the International Classification of Diseases (ICD-10, WHO 1992) agree on the basic elements of psychoactive substance use disorders, with the exception of the categories for abuse (DSM-IV) or harmful use (ICD-10) of a substance, which are not comparable between the two systems (Poikolainen 1998).

The DSM-III-R diagnostic criteria used in this study categorise alcohol and other substance dependence and abuse under psychoactive substance use disorders. The criteria for psychoactive substance dependence are similar for all psychoactive substances and include nine items, at least three of which must be fulfilled for a minimum duration of 1 month for a diagnosis. The most recent version of the International Classification of Diseases (ICD-10) criteria has similarities with DSM-III-R, but includes only six items (Table 1).

Table 1. DSM-III-R and ICD-10 criteria for alcohol and other substance dependence

<u>DSM-III-R psychoactive substance dependence</u>	<u>ICD-10 Dependence syndrome</u>
<p>A. At least three of the following:</p> <ol style="list-style-type: none"> (1) substance often taken in larger amounts or over a longer period than the person intended (2) persistent desire or one or more unsuccessful efforts to cut down or control substance use (3) a great deal of time spent in activities necessary to get the substance, taking the substance, or recovering from its effects (4) frequent intoxication or withdrawal when expected to fulfil major role obligations at work, school, or home, or when substance use is physically hazardous (5) important social, occupational, or recreational activities given up or greatly reduced because of substance use (6) continued use despite knowledge of having a persistent or recurrent social, psychological, or physical problem that is caused or exacerbated by the use of the substance (7) marked tolerance: need for markedly increased amounts of the substance in order to achieve intoxication or desired effect, or markedly diminished effect with continued use of the same amount (8) characteristic withdrawal symptoms (9) substance often taken to relieve or avoid withdrawal symptoms <p>B. Some symptoms of the disturbance have persisted for at least 1 month, or have occurred repeatedly over a longer period of time</p>	<p>A. Three or more of the following manifestations should have occurred together for at least 1 month or, if persisting for periods of less than 1 month, should have occurred together repeatedly within a 12-month period:</p> <ol style="list-style-type: none"> (1) a strong desire or sense of compulsion to take the substance (2) impaired capacity to control substance-taking behaviour in terms of its onset, termination, or levels of use, as evidenced by: the substance being often taken in larger amounts or over a longer period than intended; or by a persistent desire or unsuccessful efforts to reduce or control substance use; (3) a physiological withdrawal state when substance use is reduced or ceased, as evidenced by the characteristic withdrawal syndrome for the substance, or by use of the same (or closely related) substance with the intention of relieving or avoiding withdrawal symptoms; (4) evidence of tolerance to the effects of the substance, such that there is a need for significantly increased amounts of the substance to achieve intoxication or the desired effect, or a markedly diminished effect with continued use of the same amount of the substance; (5) preoccupation with substance use, as manifested by important alternative pleasures being given up or reduced because of substance use; or a great deal of time being spent in activities necessary to obtain, take, or recover from the effects of the substance; (6) persistent substance use despite clear evidence of harmful consequences, as evidenced by continued use when the individual is actually aware, or may be expected to be aware, of the nature and extent of harm.

3.4.3. Concept of misuse

Alcohol and other substance misuse is an expression used in the context of psychoactive substance use in a variety of meanings. Generally it indicates a range of harmful, maladaptive patterns of substance intake with a probable need of intervention, and covers clinical states from problematic substance use to established abuse and dependence (Chick & Cantwell 1994, Neeleman & Farrell 1997, Vassilas & Morgan 1997, Gerada & Ashworth 1997). It is not a categorical diagnostic concept, although some studies refer to misuse as the equivalent of alcohol or other substance abuse (Foster et al 1997). With regard to diagnostic classifications, misuse has in some instances covered DSM-III-R psychoactive substance abuse and dependence and ICD-10 harmful use and dependence syndrome of a substance (Chick & Cantwell 1994). In the present study the concept of misuse means a repetitive and probably harmful pattern

of substance use that possibly (studies IV-V), nearly (study III), or definitely (studies I-II) represents a clinical syndrome of dependence (studies I-V) or abuse (study III).

3.5. Alcohol and other substance dependence

3.5.1. Etiology

Social, cultural, psychological, behavioural, environmental and genetic factors are represented in the etiology of substance use disorders (Vaillant 1995, Schuckit 1995a-b, Poikolainen 1997b). The impact of genetic and environmental factors is currently being vigorously studied (Heath et al 1997, Tsuang et al 1998, Merikangas et al 1998, Bierut et al 1998). Prescott and Kendler estimated a 48%-58% contribution of additive genetic factors to the liability to alcohol dependence in a population-based male twin study (Prescott & Kendler 1999), while among females the heritability of liability to alcoholism was estimated at 50%-60% according to a population-based twin study (Kendler et al 1992). In these studies no evidence for effects of shared environmental factors emerged, whereas in the case of other psychoactive substances an influence of family environmental factors has been found (Tsuang et al 1998).

Despite substantial efforts, the specific regulator genes and their final targets have yet to be determined, but areas on chromosomes 1, 2, 4, 7, 11 and Y-chromosomes have been attracted interest (Schuckit 1997, Goate & Edenberg 1998, Reich et al 1998, Kittles et al 1999). An association of antisocial alcoholism with the serotonin 5-HT_{1B} receptor gene has been reported (Lappalainen et al 1998). On the other hand, certain functional polymorphisms of alcohol dehydrogenase (ADH) and aldehyde dehydrogenase (ALDH) enzymes are protective against alcohol dependence due to an aversive effect of cumulating aldehyde, and are relatively common in Asian populations (Goate & Edenberg 1998, Reich et al 1998).

On the phenotype level, a reduced amplitude of brain P300 awakening potential and a lowered EEG alpha activity have been found among alcohol dependent subjects and their close relatives, regardless of current drinking status (Cook 1994, Begleiter et al 1998). Initial sensitivity to alcohol, a familial, increased tolerance to effects of alcohol (Schuckit et al 1996, Schuckit 1997), and lowered EEG response to a dose of alcohol (Volavka et al 1996) are thought to indicate vulnerability to alcohol dependence. Overall, many observations seem to reflect specific characteristics of central nervous system functioning - including a somewhat altered response to alcohol use - among those with a high familial loading of alcohol use disorders.

Psychological and psychosocial approaches to the etiology of substance use disorders have varied. Earlier psychodynamic theories concerning substance dependence mentioned it as a masturbatory equivalent, a defence against homosexual impulses or a manifestation of oral regression. In more recent psychology it has been formulated as a reflection of disturbed ego function (Schuckit 1995b). According to psychoanalytic observers, weakness of ego and difficulty in maintaining self-esteem, as well as problems with modulation of affect and the capacity for self-care have been thought to associate with alcohol dependence (Donovan 1986, Khantzian 1982, see Gabbard 1994 for a review). Parallels with personality disorders have also been suggested (Hartocollis 1982, Kernberg 1975, see Gabbard 1994 for a review). People with alcohol use disorders are thought to be self-punitive, shy, isolated, impatient, irritable, anxious, hypersensitive and sexually repressed (Schuckit 1995b).

Cognitive, behavioural and social psychological theories refer to concepts of classical and operant conditioning, stimulus generalisation and extinction, self handicapping, social learning, and drinking expectancies in the etiology of alcohol use disorders (Cook 1994). On the other hand, the variation in the availability of alcohol as well as several life-situational and cultural factors are considered to associate with rates of alcohol use disorders in a wide range of countries (Cook 1994, Vaillant 1995).

3.5.2. Clinical characteristics of alcohol dependence

Besides the established physical and behavioural symptoms - e.g. withdrawal symptoms, tolerance and loss of control - the clinical syndrome of alcohol dependence often includes typical alcohol-related consequences. These include problems in interpersonal relationships, employment, and with the law (Schuckit 1995a-b). On the other hand, variation in the clinical characteristics of subjects defined as alcoholic has been emphasised (Vaillant 1995). A study of DSM-III alcohol dependent males and females in a clinical population found more alcohol-related problems among males, but the sex difference disappeared when length of alcohol abuse history, antisocial personality disorder and employment status were controlled for. The overall prevalence of other drug use disorders was similar in both sexes, but women were more likely to abuse sedatives and minor tranquilizers (Ross 1988). In addition, similarity in order of appearance of alcohol related problems among alcohol dependent males and females in clinical samples has been reported (Schuckit et al 1998).

Several classifications for probable subtypes of alcohol dependence have been suggested. According to Cloninger, on the basis of a large Swedish adoption study in 1981, type I alcoholism is characterised by adult onset, relatively slow course and anxious personality traits (Cloninger et al 1981). Type II alcoholism is thought to have relatively high familiarity, to appear predominantly in males, to have early onset, antisocial and multiple impulsive behaviour, including suicidality, and to associate with low serotonin turnover rates as indicated by low cerebrospinal fluid

serotonin metabolite concentrations (Virkkunen et al 1994). Some recent genetic findings seem to support and add validity to this kind of subtyping (Nielsen et al 1998, Lappalainen et al 1998). Another subtyping of alcoholism into types A and B has similarities with the Cloninger subtypes, being also based on the age of onset (Babor et al 1992). Alcohol use and misuse occur on a continuum, and associated problems may occur far before an actual diagnosable alcohol dependence (Heather 1994, Rohde et al 1996). The normal cutoff point for making an alcohol use disorder diagnosis in adults may be particularly inappropriate for adolescents, who often have subthreshold mental disorders not fulfilling all required diagnostic criteria for specific psychiatric disorders (White & Labouvie 1989, Rohde et al 1996).

3.5.3. Clinical characteristics of the abuse of psychotropic medication

Anxiolytic agents, especially the benzodiazepines, are annually used by 8-10% of the general population in Western countries (Ross 1993). Benzodiazepines are of particular use in temporary states of anxiety or insomnia and have useful anticonvulsant and muscle relaxant therapeutic actions as well (Stahl 1996). Occasionally referred to as central nervous system depressants, the benzodiazepines, and formerly the more widely used barbiturates, also have a high abuse potential. They are in non-medical use sometimes mixed with other drugs, such as stimulants in order to modify their effects or side effects (Schuckit 1995a). Exogenous opiates such as codeine or morphine are used for pain relief, but also extramedically because of their euphoric properties (Stahl 1996). Other medical agents with abuse potential include cyclopyrrolones, selective serotonin reuptake inhibitors, anticholinergic drugs and anabolic steroids (Marks 1994, Schuckit 1995a).

Problems with anxiolytic and sedative use are suggested to be characteristic of middle-aged females, and associate with multiple psychiatric symptoms and either problematic alcohol drinking or total abstinence (Seppä et al 1992, Österling et al 1996). According to the Epidemiological Catchment Area Study (ECA), in the general female population drug abuse and dependence associate with alcohol dependence (Heltzer & Pryzbeck 1988). In a clinical sample of alcohol dependent subjects 40% were recent users of benzodiazepines, and this associated with more severe psychopathology and substance abuse problems and current psychological distress (Ross 1993).

3.5.4. Epidemiology

In epidemiological studies alcohol and other substance use disorders are among the most frequent of mental disorders. While prevalences of these disorders are higher for men (Kessler et al 1994), there is some evidence that addictive disorders among females have risen in recent decades, particularly among young women (Beary & Merry 1986, Blume 1986, Gomberg 1993, Alexander 1996, Anonymous 1996, Ashworth & Gerada 1997). The abuse of secondary

substances, particularly prescribed drugs, may be characteristic of alcohol dependent females (Blume 1986, 1991, Gomberg 1986, Ross 1989).

In the National Comorbidity Survey (NCS) the lifetime prevalences of alcohol and drug dependence were 20.1% and 9.2% for males and 8.2% and 5.9% for females in the general population (Kessler et al 1994). A broader category of either abuse or dependence is perhaps more convergent with the general concept of misuse (Chick & Cantwell 1994), although it may lack diagnostic validity (Cottler et al 1995). In the NCS the 12 month prevalences of any substance abuse or dependence were 16.1% for males and 6.6% for females, whereas lifetime prevalences were 35.4% and 17.9% (Kessler et al 1994).

Table 2. Lifetime and 12-month prevalences of alcohol and other substance use disorders in the National Comorbidity Survey (Kessler et al 1994)

	Male		Female		Total	
	Lifetime	12 mo	Lifetime	12 mo	Lifetime	12 mo
Alcohol						
Abuse	12.5%	3.4%	6.4%	1.6%	9.4%	2.5%
Dependence	20.1%	10.7%	8.2%	3.7%	14.1%	7.2%
Drug						
Abuse	5.4%	1.3%	3.5%	0.3%	4.4%	0.8%
Dependence	9.2%	3.8%	5.9%	1.9%	7.5%	2.8%
Any abuse or Dependence	35.4%	16.1%	17.9%	6.6%	26.6%	11.3%

In a population-based male twin study, lifetime DSM-III-R alcohol dependence was found in 27.4% of 18-56 years old males (Prescott & Kendler 1999). In the NCS, a history of extramedical use of anxiolytics, sedatives, hypnotics and analgesics among Americans 15-54 year-old Americans was estimated in 22.4% and a history of dependence on these substances was found in 1.9% (Anthony et al 1994).

In a New Zealand birth cohort follow-up study of 1265 subjects, alcohol abuse was found in 13.8% of adolescents aged 16-18 years and alcohol dependence in a further 5.7%. Other substance abuse, most often cannabis, was diagnosed in 9.1% and other substance dependence in 4.9% of these adolescents (Fergusson et al 1997).

There is little reliable up-to-date data on the prevalences of substance use disorders in the general population in Finland. A recent study based on a computerised questionnaire found 10.8% of a representative sample to be currently (12-months prevalence) alcohol dependent subjects (Poikolainen 1997b). In a Swedish prospective cohort study the

expectancy of developing alcohol dependence in a lifetime was 8.6% (Öjesjö et al 1982). Regarding treatment populations, a review of psychiatric referrals in general hospitals in Finland found 53% of males and 29% of females to have a substance use disorder (Alaja et al 1997).

3.5.5. Comorbidity

Comorbid disorders are said to concentrate in a minority of the general population (Kessler et al 1994). The co-occurrence of addictive and other mental disorders in the general population is highly prevalent: 41.0% to 65.5% of subjects with a lifetime addictive disorder are reported also to have a lifetime history of at least one other mental disorder (Kessler et al 1996, Kessler et al 1997). In males, alcohol use disorders are often thought to precede affective disorders (Kessler et al 1996) whereas in females the opposite has been proposed (Hesselbrock 1985, Helzer & Pryzbeck 1988, Kessler 1995). Helzer and Pryzbeck reported in the ECA more "dual-diagnoses" among alcohol dependent subjects than persons with other psychiatric disorders. A second diagnosis of drug abuse or dependence was found in 31% of women compared to 19% of men, and major depression was nearly four times more frequent in women (19% vs. 5%). In comorbid cases 78% of men were found to have had alcoholism prior to another diagnosis, whereas in women this was true in only 34% (Helzer & Pryzbeck 1988). Although the clinical pictures of independent and substance-induced depression show similarities, the associating sociodemographic characteristics, suicidal behaviour, proper treatment and prognosis may differ (Schuckit et al 1997). In a case-controlled study recent life events were reported to precede the onset of a secondary depression among secondary depressed alcohol dependent males (Roy 1996).

3.5.6. Course and outcome

Alcohol dependence has a relapsing and remitting clinical course of drinking and abstinence periods, the length of both fluctuating widely. The long-term clinical course and outcome may vary remarkably from a deteriorating and progressive course of chronic dependence to a more stable career of remitting abuse (Nordström & Berglund 1987, Schuckit et al 1995, 1998, Vaillant 1996, Neve et al 1997, Mäkelä 1998). Factors predicting the outcome in the initial phase of the course are difficult to identify (Vaillant 1995). In an up to 30 years follow-up study of two socially divergent groups, the "Core City sample" and the "College sample", Vaillant (1996) found that in both groups alcohol abuse remained relatively stable without remission or progression of symptoms, merely fluctuating in severity. The socially more disadvantaged "core city men" were more likely to become alcohol dependent, but also to achieve stable abstinence than the college sample, whose alcohol abuse began later but who more often maintained a pattern of lifelong intermittent alcohol abuse. An increased mortality before the age of 60 years was reported among both samples with alcohol abuse (15% and 25%, respectively). By 60 years of age 32% of the alcohol dependent core city

men had died compared to 62% of the college men at 70 years, these proportions being higher than among the non-dependent in the samples and in the general population of white men. This elevated mortality was suggested to be partly due to heavy smoking and to heart disease and cancer (Vaillant 1996).

In a long-term Swedish follow-up study of originally 2612 subjects, a population of 41 originally nonalcoholic men diagnosed as alcoholic during 1957-72 were examined through 1993. Before the age of 60, 27% had died, accidents and suicides having been the cause of death in 44%. Overall, the study replicated the observation of a significant reduction in life expectancy among alcohol dependent males (Öjesjö et al 1998).

Treatment population studies represent more morbid subjects, among whom the course of alcohol dependence is more progressive than in the general population. In a study of hospitalised female and male alcoholics males reported a longer duration of alcohol abuse problems and a higher number of alcohol-related problems than women (Hesselbrock 1991). Alcoholic women tend to report experiencing driving and nondriving arrests, feelings of guilt and the formation of rigid drinking patterns earlier in their development of problems than their male counterparts. The age of onset of regular drinking for women reportedly occurs a little later. Despite that, their first experience with formal treatment occurs slightly earlier than among the alcohol-dependent men (Ross 1989, Schuckit et al 1995, 1998).

3.6.Treatment of alcohol and other substance use disorders

3.6.1. General strategies

Substance use disorders are a major public health problem involving excessive direct and indirect costs (APA 1995, O'Connor & Schottenfield 1998). Individuals with these disorders are heterogeneous in many clinically important features, and comprehensive treatment strategies evolve from various individually assessed treatment settings. Treatments for individuals include an assessment phase, the treatment of intoxication and withdrawal when necessary, and the development and implementation of an overall treatment strategy.

3.6.2. Psychosocial treatments

Psychosocial approaches to substance use disorders include group-, family- and individual therapies. The specific twelve step program and self-help groups promoted by Alcoholics Anonymous (AA) (Ekholm 1998) are a widely used specific approach for alcohol dependence, and applications for drug use (NA), gambling (GA) and eating disorders have also evolved. Family and marital therapy have proved useful for improving social relationships but evidence for their effectiveness in drinking control is limited (Volpicelli 1995, APA 1995). However, among

adolescents family therapy may be of value in treating substance use disorders (Weinberg et al 1998, APA 1995). Social skills training and brief interventions have been used, but controlled, unambiguous evidence of their effectiveness is still needed (Volpicelli 1995). However, because of its compatibility with other interventions and numerous positive study findings, brief intervention (in Finland called Mini-intervention) is often recommended for the treatment of alcohol problems in various treatment settings (Ashworth & Gerada 1997, Salaspuro & Kiianmaa 1998, APA 1995). Individual psychodynamic psychotherapy is suggested to be useful in alcohol dependence with a relatively milder course, but abstinence and focusing on alcohol use issues are usually required (Schuckit 1995b, APA 1995). Cognitive-behavioural and behavioural therapies are generally thought to be beneficial in substance use disorders, although clear, controlled evidence is again barely sufficient (APA 1995). When cognitive-behavioural coping skill therapy and motivational enhancement therapies along with the twelve-step program were compared, no advantage of one over another emerged (APA 1995, Tinsley et al 1997).

3.6.3. Pharmacological treatments

Total abstinence is considered the treatment of choice among severely alcohol dependent subjects, as controlled maintained drinking seems to lead to recurrent relapses (Vaillant 1996). New pharmacological treatments are reported to prevent relapses and improve short term coping, but evidence for their usefulness in the long run is still required (Volpicelli et al 1992, Volpicelli 1995, O'Malley et al 1996, Sass et al 1996, Ritson 1998, Grabowski & Schmitz 1998).

One traditional pharmacological approach is to make the use of an abused substance aversive by agents such as disulfiram or calcium carbamide. Disulfiram inhibits the aldehyde dehydrogenase enzyme leading to toxic accumulation of acetaldehyde, which causes highly unpleasant symptoms. It is recommended for motivated and abstinent alcohol dependent patients at risk of relapsing in the presence of triggering events that increase alcohol craving (APA 1995). Support for the use of disulfiram and evidence of its effectiveness is equivocal, and adjuvant education, counselling or other psychosocial intervention is recommended, as with other pharmacological agents used for treating alcohol dependence (Hughes & Cook 1997, Schuckit 1996).

Naltrexone is a synthetic opioid receptor antagonist thought to act by blocking the endogenous opioid receptors and thus modifying the reinforcing effects of alcohol (Volpicelli et al 1992, O'Malley et al 1996). It is reported to decrease craving for alcohol probably partly by reducing the pleasure ("high") associated with drinking, and to decrease drinking when used continuously, but adjuvant psychosocial treatment is also recommended (O'Malley et al 1996, Volpicelli et al 1995).

Acamprosate is an analogue of homocysteic acid thought to act as a ligand at the N-methyl-D-aspartate receptor, to have affinity for GABA receptors and to act as a possible opiate antagonist. In clinical studies it has decreased alcohol consumption among detoxified alcoholic patients (Lhuintre et al 1990, Paille et al 1995), and had a significant effect in preventing relapses and maintaining abstinence compared to a placebo-controlled group over a 2 year period (Sass et al 1996).

Fluoxetine is reportedly effective among depressive alcohol dependent subjects in reducing both the depressive symptoms and alcohol consumption as well as cigarette smoking (Cornelius et al 1997a-b), but evidence for its usefulness in milder to moderate alcohol dependence without comorbid depression is lacking (Kranzler et al 1995). In a 4-month follow-up study citalopram was more effective than placebo in the treatment of alcohol dependent subjects (Tiihonen et al 1996). Buspirone reduced anxiety and drinking in a 6-month follow-up among anxious alcohol dependent subjects (Kranzler et al 1994).

3.6.4. Treatment services and facilities

Substance use disorders and their psychiatric comorbidity have been extensively studied in the general population (Helzer & Pryzbeck 1988, Kessler et al 1994, 1996), and are seen as a challenge in developing health care services, especially psychiatric care (Regier et al 1993, Osher & Drake 1996). The segregation of services into separate treatment facilities for psychiatric and substance use disorders has been criticised (Rounsaville et al 1987, Kessler et al 1996). Subjects suffering from addictive disorders are known to need a variety of health care services, and sex differences in the utilisation of treatment have been reported (Helzer & Pryzbeck 1988, Lehman 1996, Weisner & Schmidt 1992, Swift et al 1996).

In recent guidelines for substance use treatment, treatment facilities were categorised into: a) hospitalisation, b) residential treatment, b) partial hospitalisation, and d) outpatient settings, and the least restrictive possible treatment setting was recommended (APA 1995). In Western countries the tendency is toward outpatient facilities rather than inpatient programs (Tinsley et al 1997). In Finland the treatment services for substance use disorders are to some extent segregated into psychiatric services, which are organised under health care, and specific substance use services, which are mainly organised under social welfare. Several kinds of inpatient services exist in the latter, from acute withdrawal units to long term rehabilitation institutes. However, both primary health care and psychiatric care also have some specific facilities for patients with substance use disorders. An independent nationwide network of A-clinics is financed by the municipalities and their confederations and the A-clinic foundation, the units of which are in turn financed by local, municipal funds. There are also several voluntary services and independently organised self-help groups (Mäkelä 1998, Kuoppasalmi et al 1999).

3.6.5. Effects of sex and comorbidity

With regard to gender, substance dependent females appear to prefer seeking psychiatric help, whereas males often opt for services provided for alcohol and other drug problems (Alexander 1996). In a population study of treatment settings female problem drinkers were found more likely than males to prefer non-alcohol treatment settings (Weisner & Schmidt 1992).

In a large epidemiologic study (ECA) female alcoholics were significantly more likely to utilise services than male alcoholics after controlling for both total number of psychiatric diagnoses and severity of alcoholism. For both sexes the number of nonsubstance diagnoses had a strong impact on treatment seeking even after controlling for the severity of alcoholism, meaning that comorbidity increases the likelihood of general treatment utilisation among those with alcohol abuse and dependence (Helzer and Pryzbeck 1988). However, although the occurrence of several comorbid disorders is known to increase the probability of obtaining treatment (Regier et al 1993, Kessler et al 1996), it is also suggested to complicate treatment, by decreasing compliance and worsening functional impairment. Overall, the course of comorbid disorders is thought to be relatively severe and chronic, and individual patients with multiple psychiatric disorders may be more difficult to treat than those with pure disorders (Rounsaville et al 1987, Kessler 1995, Kessler et al 1996, Hannah & Grant 1997, Neeleman & Farrell 1997).

4. ALCOHOL AND OTHER SUBSTANCE USE IN SUICIDE

4.1. Suicidal behaviour and substance use disorders

The contribution of alcohol and other substances to completed suicides and suicide attempts is complex and appears to constitute effects ranging from psychosocial disruption to disinhibited and dysphoric states of mind and choice of suicide method (Tamerin & Mendelson 1969, Mayfield et al 1972, 1979, Roy & Linnoila 1986, APA 1995, Schuckit et al 1995, 1998, Öhberg 1998). Murphy and Wetzel (1990) estimated that 2% to 3.4% of alcohol dependent subjects in the general population commit suicide. According to a recent meta-analysis of mortality studies, the lifetime risk for suicide is 7% in alcohol dependence (Inskip et al 1998). The standardised mortality ratio (SMR) to suicide is estimated at 586 (95% CI 541-633) for DSM-III-R alcohol dependence and abuse (Harris & Barraclough 1997).

In inpatient population studies alcohol and other substance use disorders have independently associated with suicidal ideation (Pages et al 1997, Hall et al 1998). However, the comorbidity of psychiatric disorders among alcohol dependent subjects reportedly relatively more important than the alcohol dependence for the suicidal risk (Driessen et al 1998). Cornelius et al (1995) studied patients in an urban psychiatric inpatient and outpatient psychiatric facility and found differences between depressive alcoholics, nonalcoholic depressives and nondepressed alcoholics. Depressed alcoholics had significantly higher suicidality than subjects with either depression or alcohol dependence. The authors suggested that alcohol dependence and depression act additively or synergistically, resulting in a disproportionate suicide risk among subjects with both disorders (Cornelius et al 1995).

Among adolescents alcohol use and abuse per se are known to associate with aggressive and impulsive behaviour, dysphoric mood, and - among alcohol abusers - suicide risk (Milgram 1993, Bukstein et al 1993). Abuse of or dependence on alcohol and other psychoactive substances among adolescents is often associated with multiple psychosocial problems, psychiatric comorbidity, suicidal ideation, suicide attempts (Berman & Schwartz 1990, Deykin et al 1994, Beautrais et al 1996, Weinberg et al 1998), and completed suicide (Brent et al 1988, Allebeck & Allgulander 1990, Shaffer et al 1996). Longitudinal studies of adolescent psychiatric patients and suicide attempters have found alcohol and drug abuse to be one of the major risk factors for suicide (Östman 1991, Hawton et al 1993). Substance use disorders along with other psychopathology, sociodemographic disadvantage and adverse childhood experiences are also reportedly associated with risk of serious suicide attempts among adolescents (Beautrais et al 1996).

4.2. Alcohol and other substance use disorders in completed suicide

4.2.1. Psychoactive substance use diagnoses in psychological autopsy studies

In most psychological autopsy studies more than 90% of the suicide victims have suffered from mental disorders, affective and addictive disorders being the most frequent (Robins et al 1959, Dorpat et al 1960, Barraclough et al 1974, Beskow 1979, Hagnell et al 1979, Chynoweth et al 1980, Mitterauer 1981, Shafii et al 1985, 1988, Rich et al 1986, Arato et al 1988, Brent et al 1988, Runeson 1989, Åsgård 1990, Conwell et al 1991, Marttunen et al 1991, Apter et al 1993, Henriksson et al 1993, Brent et al 1993, Lesage et al 1994, Cheng 1995, Conwell et al 1996, Shaffer et al 1996, Foster et al 1997). In unselected suicide populations alcohol abuse or dependence is retrospectively found among 15-56% of victims (Table 3). Comorbidity is common in suicide populations (Henriksson et al 1993, Cheng 1995, Conwell et al 1996, Foster et al 1997) and the highly prevalent substance use disorders and their comorbidity patterns are of considerable importance and interest.

Table 3. Psychological autopsy studies

	Robins et al 1959	Dorpat & Ripley 1960	Barraclough et al 1974
Country	United States	United States	Great Britain
Males	77%	68%	53%
Age groups	All	All	All
Psychiatric diagnoses	94%	100%	93%
Depressive disorders	45%	30%	75%
Alcohol abuse/ dependence	23%	27%	15%
Drug abuse/ dependence	1%	0%	4%
Personality disorders	Not specified	9%	27%

	Beskow 1979	Hagnell et al 1979	Chynoweth et al 1980
Country	Sweden	Sweden	Australia
Sample	271	28	135
Males	100% (selected)	82%	63%
Age groups	All	All	All
Psychiatric diagnoses	97%	93%	88%
Depressive disorders	28%	50%	55%
Alcohol abuse/ dependence	31%	18%	20%
Drug abuse/ dependence	6%	0%	34%
Personality disorders	2%	14%	Not specified

	Mitterauer 1981	Shafii et al 1985, 1988	Rich et al 1986
Country	Austria	United States	United States
Sample	94	21	283
Males	Not specified	90%	71%
Age groups	All	11-19 years	All
Psychiatric diagnoses	100%	95%	95%
Depressive disorders	63%	76%	44%
Alcohol abuse/ dependence	32%	62% (incl drugs)	54%
Drug abuse/ dependence	20%	Not specified	45%
Personality disorders	Not specified	29%	5%

	Arato et al 1988	Brent et al 1988a	Runeson 1989
Country	Hungary	United States	Sweden
Sample	200	27	58%
Males	52%	78%	72%
Age groups	All	≤19 years	15-29 years
Psychiatric diagnoses	81%	93%	98%
Depressive disorders	64%	63%	52%
Alcohol abuse/ dependence	20%	37%	36%
Drug abuse/ dependence	0%	30%	24%
Personality disorders	Not specified	Not specified	34%

	Åsgård 1990	Conwell et al 1991	Marttunen et al 1991
Country	Sweden	United States	Finland
Sample	104	18	53
Males	0% (selected)	83%	83%
Age groups	All	50-92 years	13-19 years
Psychiatric diagnoses	95%	89%	94%
Depressive disorders	58%	83%	51%
Alcohol abuse/ dependence	7%	44% (incl drugs)	26%
Drug abuse/ dependence	5%	Not specified	4%
Personality disorders	3%	Not specified	32%

	Apter et al 1993	Brent et al 1993a	Henriksson et al 1993
Country	Israel	United States	Finland
Sample	43 (Military conscripts)	67	229
Males	100% (selected)	85%	75%
Age groups	18-21 years	≤19 years	All
Psychiatric diagnoses	81%	90%	98%
Depressive disorders	58%	49%	59%
Alcohol abuse/ dependence	0%	24%	41%
Drug abuse/ dependence	0%	13%	5%
Personality disorders	5%	42% (a sample, 1994)	31%

	Lesage et al 1994	Cheng 1995	Conwell et al 1996
Country	Canada	Taiwan	United States
Sample	75	116	141
Males	100% (selected)	61%	80%
Age groups	18-35 years	All	≥21 years
Psychiatric diagnoses	88%	98%	90%
Depressive disorders	53%	>90%	47%
Alcohol abuse/ dependence	29%	44%	56%
Drug abuse/ dependence	28%	4%	29%
Personality disorders	57%	Not specified	Not specified

	Shaffer et al 1996	Foster et al 1997
Country	United states	Northern Ireland
Sample	119	118
Males	79%	79%
Age groups	≤19 years	All
Psychiatric diagnoses	91%	90%
Depressive disorders	61%	36%
Alcohol abuse/ dependence	22%	43%
Drug abuse/ dependence	25%	8%
Personality disorders	Not specified	44%

In the San Diego Study, Rich and colleagues suggested that substance abuse was a major contributor to increase in young people's suicides (Rich et al 1986). In this psychological autopsy study they found no significant differences in the rates of substance abuse between men and women, but significantly more diagnoses of drug abuse among the cases aged under 30 than in those aged 30 and over. Substance abuse appeared to be more important in the etiology of suicides in their study than had been previously believed (Rich et al 1989).

Within the Nationwide Suicide Prevention Project in Finland, a study of unselected suicides (Henriksson et al 1993) found more alcohol use disorders than in most previous studies. The prevalence of alcohol dependence among males was higher than observed elsewhere, but female alcoholism was also more common than in previous studies, apart from the San Diego Suicide Study. The study emphasised the impact of comorbidity in mental disorders in completed suicides (Henriksson et al 1993). However, the sex differences in the various patterns of substance use disorders and their comorbidity in completed suicide remain largely unknown.

4.2.2. Role of life events in completed suicide

Clinical studies of suicides have found psychosocial stressors in most suicide cases, with interpersonal losses and conflicts, medical illness and economic problems being the most common (Ripley & Dorpat 1981, Rich et al 1991, Murphy 1992, Marttunen et al 1993, Duberstein et al 1993, Heikkinen 1994). A strong relationship between such stressors and alcohol dependence, and a greater frequency of interpersonal loss in alcoholics compared to depressives in the six weeks prior to their death, have been repeatedly reported in psychological autopsy studies (Murphy & Robins 1967, Duberstein et al 1993, Heikkinen 1994). In addition to clustering of adverse events prior to suicide, a set of cumulative risk factors for alcoholic suicides has been presented, including current heavy drinking, major depressive disorder, lack of social support, unemployment, serious medical illness, living alone and suicidal communication (Murphy et al 1992).

4.2.3. Treatment of substance dependent suicide victims

Despite numerous psychological autopsy studies of completed suicides (Table 3) little is known about the help seeking by substance dependent victims and the treatment they receive, although a few studies have reported psychiatric hospitalisations, multiple admissions and general medical contacts among alcohol dependent victims (Barraclough et al 1974, Runeson 1990, Murphy, 1992).

4.2.4. Alcohol intoxication at the time of suicide

With regard to the final act of suicide, alcohol as an intoxicating substance has been suggested to impair judgement, cause impulsivity and contribute to the choice of suicide method (Welte et al 1988, Hayward et al 1992, Öhberg et al 1996). Current substance abuse is a known risk factor for suicide among victims with a substance use disorder (Murphy et al 1992, Bukstein et al 1993). Hayward et al (1992) found alcohol in the blood in 35.8% of 515 Australian suicides. Based on an analysis of victims in the National Suicide Prevention Project in Finland, Öhberg and colleagues (1996) reported alcohol in the blood in 40.9% of male and 19.6% of female suicides. However, the contribution of an inebriated state to the final act of suicide is not yet well understood.

4.3. Alcohol and variation in suicide rates

4.3.1. Alcohol consumption and suicide rates

Suicide rates are associated with levels of alcohol consumption and heavy drinking in populations (Smart & Mann 1990, Gruenewald et al 1995, Mäkelä 1996, Caces and Harford 1998). Mäkelä (1996) reported that in male age groups 15-34 and 35-49 years the suicide rate in Finland from 1950 to 1991 was associated with per capita alcohol consumption. A similar effect was found in the United States when unemployment was statistically controlled for (Caces and Harford 1998), and a decline in suicide rates in former USSR countries has been reported following strict restrictions on alcohol sales (Wassermann et al 1994).

4.3.2. Temporal variation in suicide rates

Temporal variations in suicide frequencies have been reported (MacMahon 1983). There is evidence that rates vary according to season (Kevan 1980), and a peak of suicides on Mondays has been found (Chew et al 1994, Lester 1979, Schmidtke 1994). A lower incidence at the weekend has been observed, and the peak incidence of the first days of the week has been explained in terms of a transitional phase between the extreme situations of weekend and workdays (Massin et al 1985). In alcohol-associated deaths alcohol has been detected more commonly in persons who died on weekend days, and in suicides with alcohol in the blood there was a slight increase associated with weekends (Smith et al 1989). Temporal variation in heavy alcohol use may explain part of the monthly variation in suicide rates (Poikolainen 1982).

Another factor related to the temporal variation in suicide rates is unemployment (Pritchard 1992). In general, unemployment results, via the financial strain, in negative health effects and leaves the individual more vulnerable to the impact of unrelated adverse life events (Kessler et al 1987). Those exposed to unemployment reportedly have more mental disorders, substance use and suicidal behaviour than those not exposed (Fergusson et al 1997). Moreover, employment is associated with lower rates of psychiatric disorders (Bebbington et al 1981). There seem to be epidemiological associations between unemployment and both suicidal behaviour (Platt 1984) and completed suicide (Pritchard 1992, Lewis & Sloggett 1998).

4.4. Substance use disorders and suicide prevention

It has been suggested that a comprehensive general strategy for the prevention of suicide behaviour should consist of research, improving services, training and information on suicide, and focusing on special groups (Diekstra 1992). On the basis of existing findings, identification and adequate treatment of major psychiatric disorders in health care, and interventions for deliberate self-harm patients may be effective measures for baseline suicide prevention (Hawton 1994, Rihmer 1996, Lewis et al 1997). A challenge in clinical work is to identify subjects at risk for suicide or suicide attempts. Recently, on the basis of research on suicide attempts, a clinical multifactorial diathesis model for assessing suicidal risk among psychiatric patients was proposed, in which in addition to psychiatric illness including substance abuse, a history of impulsivity and aggressivity, and subjective experiences of hopelessness were emphasised (Mann et al 1999).

There is reason to believe that primary prevention in terms of reducing general alcohol consumption would have some decreasing effect on suicide rates, possibly by moderating alcohol use problems (Mäkelä 1996). As alcohol consumption and suicide rates seem temporally related, there may be a time-related variation in the size of a population of individuals with alcohol misuse contributing to their suicide risk.

The ultimate aim of studies of completed suicides is to discover specific information for use in prevention, in terms of identifying subjects at risk and reliably recognising preventable risk factors. With regard to studying substance use disorders and suicide, information is needed about the sex- and age-specific characteristics of substance dependent subjects who eventually commit suicide, the factors associated specifically with their suicides, and their treatment contacts before suicide, if any exist. Evidence of any direct contribution of alcohol inebriation during the final act of suicide would also be important.

5. AIMS OF THE STUDY

The aims of the present studies were:

- I To compare the comorbidity of mental disorders and other characteristics among male and female suicide victims with DSM-III-R psychoactive substance dependence.
- II To evaluate the treatment histories of male and female suicide victims with DSM-III-R psychoactive substance dependence.
- III To examine the characteristics of adolescent suicides with diagnostically subthreshold or diagnosed alcohol misuse.
- IV To explore differences in characteristics between alcohol misusing and nonmisusing suicide victims.
- V To examine weekly variation in completed suicide with regard to patterns of alcohol misuse in relation to employment status.

6. SUBJECTS AND METHODS

6.1. The National Suicide Prevention Project in Finland

All suicides committed in Finland during a 12-month period between April 1, 1987, and March 31, 1988 were carefully analysed using the psychological autopsy method (Shneidman 1981). During this research period of the National Suicide Prevention Project every case of violent, sudden, or unexpected death was assessed for the possibility of suicide by police and medicolegal examinations which were more detailed than usual. The definition of suicide was based on Finnish law for determining the cause of death. Data concerning the suicide victims were collected from comprehensive interviews of the relatives and attending health care personnel and from official police, social agency and medical records. Informed consent for interviews was always requested in structured and documented in written form. Four types of interview were undertaken.

- (1) Face-to-face interviews of next-of-kin were usually conducted in their homes.
- (2) Health care professionals who had attended the victim during the previous 12 months were interviewed face-to-face
- (3) The last contact with health or social care professionals was evaluated separately by interviewing the attending person with a semi-structured interview.
- (4) Additional unstructured interviews were made if needed, generally by telephone.

6.2. Subjects of the present studies

6.2.1. The random sample of the total suicide population

A systematic random sample of all 1397 suicides (1077 males and 320 females) was diagnostically evaluated. This sample consisted of 16.4% (N=229; 172 males, 57 females) of all suicides and the subjects were assigned DSM-III-R diagnoses in a procedure detailed earlier (Henriksson et al 1993). First, two pairs of psychiatrists independently made provisional diagnoses, the reliability of which was tested using kappa statistics (Flies 1981). Second, all cases involving any diagnostic disagreement were reanalysed by a third psychiatrist in order to achieve consensus for the final best-estimate diagnoses. Of the male cases 68 had substance dependence; 61 had alcohol dependence as the sole substance use disorder and 7 had an additional substance use disorder diagnosis. No one was solely dependent on any other substance than alcohol.

6.2.2. Female subjects

The number of substance dependent females in the random sample was too small for comparisons between the sexes or for evaluating female subjects separately. Therefore, for the purposes of studies I-II, the entire 12-month population of female suicides was diagnostically evaluated. Initially, the first author (S.P.P.) reviewed all available information on all 320 female cases for any evidence of a DSM-III-R psychoactive substance abuse or dependence disorder. One hundred and sixty suspected cases emerged.

The author then assessed these cases for substance abuse and substance dependence diagnoses using DSM-III-R criteria and all the information available. Eighty-one cases were suspected to have a possible substance abuse or dependence diagnosis. These included thirty-five cases that had already been diagnosed earlier in the diagnostic sample (Henriksson et al 1993) or in other studies (Marttunen et al 1995, Isometsä et al 1995, Henriksson et al 1996), and seventeen of them had been given a DSM-III-R diagnosis of psychoactive substance dependence.

Next, the 46 suicide cases not studied earlier were carefully analysed by the present author to form multiaxial best-estimate axis I-III diagnoses. Four other psychiatrists (E.T.I., M.J.M, M.E.H., M.M.H) then took an equal share in independently assigning the second provisional diagnoses. In cases of diagnostic disagreement one of the other psychiatrists reviewed the case to achieve consensus for the final best-estimate diagnoses. Thirty two cases additional to those previously studied were diagnosed as having DSM-III-R psychoactive substance dependence.

Finally, 49 (15%) female cases with psychoactive substance dependence (PSD) were identified from the total population and included in the present study. Alcohol dependence as the only substance use disorder was diagnosed in 31 cases, more than one substance use diagnosis in 11 cases and sole dependence on a substance other than alcohol in 7 cases. Again, no diagnosed abuse of or dependence on illicit drugs was found. The interrater agreement on the provisional diagnoses of psychoactive substance dependence was tested using the kappa statistics for all 81 suspected cases and found to be good for a homogenous population of suspects ($\kappa = 0.71$, 95% confidence limits = 0.55 to 0.88). The final proportion of 49 substance dependent females out of 320 cases (15.3%) was quite similar to that expected on the basis of the findings in the systematic random sample ($N=10/57$, 17.5%). The sources of information differed between the male and female populations only in psychiatric records and interviews with health care professionals having attended the victim during the previous 12 months, which were more often available in female cases (74% vs. 49% and 63% vs. 41%, respectively) (Table 4).

In study I, in order to study younger and older PSD victims the populations were divided into those above and below 40 years, which was the median age of the female population.

Table 4. Sources of information in male and female cases

	Males (N=68)		Females (N=49)	
	N	%	N	%
Interviews				
Relatives	63	93	41	84
Professionals attended during last year	28	41	31	63 ^a
Last contact	41	60	37	76
Medical records	60	88	38	78
Psych records	33	49	36	74 ^b
Mean total duration of interviews	167min		180min	
Mean no of interv.	2,5		2,4	

a: $\chi^2=4,710, df=1, p=0.03$

b: $\chi^2=6,327, df=1, p=0.02$

6.2.3. Adolescent victims with subthreshold or diagnosed alcohol misuse

All the adolescent suicide victims (N=116) aged 13-22 years were DSM-III-R diagnosed in the studies by Marttunen et al (1991, 1995).

For the purposes of study III the subjects were those 106 victims (88/97 males, 18/19 females) aged 13 - 22 years for whom the data were sufficient for assessing the use of alcohol. As expected, most (8 of 10) excluded suicides were due to lack of family interviews. The ten exclusions were slightly older than the other 106 victims (mean age 20.5 years, SD=1.35 years vs 19.1 years, SD=2.14, $t=-1.962, df=114, p=.05$), but did not differ statistically significantly with respect to sex, toxicology or method of suicide.

To maximise sensitivity in detecting problematic alcohol use, alcohol misuse was assessed using the Michigan Alcoholism Screening Test (MAST) (Seltzer et al 1971) by scoring every possible item in the MAST based on all the information from different sources. A victim was classified to have misused alcohol if he or she received a total score of 4 or more, a cutoff point Seltzer and coworkers originally considered suggestive of alcoholism. Victims diagnosed with DSM-III-R alcohol dependence or abuse were included in the subthreshold or diagnosed alcohol misusers (SDAM) category. Using these criteria, two researchers (S.P.P., M.J.M.) then independently assessed whether or not each victim was classified as having SDAM. The interrater reliability for the assessment was measured using kappa

statistics (Flies 1981), and was found to be good (kappa 0.88). Eight cases with disagreement between the two researchers were reanalysed with a third researcher to achieve final consensus for the classification.

6.2.4. Alcohol misusers in the total suicide population

Studies IV and V covered the total population of suicides (N=1397). Information from next of kin interviews was available for 1155 cases, of which 12 were excluded because of incomplete interview forms. Among the remaining 1143 cases there was reliable and structured information about the use of alcohol for 997 victims, who formed the present study sample. These cases did not differ from the excluded victims in age or sex, but were more often married or cohabiting (58.1% vs. 40.4%).

Alcohol misuse

The victim was recorded as having misused alcohol if reported by the informant to have been in an obvious state of drunkenness at least once or twice a week during the last year (Heikkinen et al, 1995). A total of 349 cases were considered as misusers: 41.2% (N=317/769) of the males and 14.0% (N=32/228) of the females. The remaining 648 cases were thus treated as non-misusers.

To validate the misuse classification, the agreement between the informant's misuse data and victims' DSM-III-R best-estimate consensus alcohol dependence diagnoses was investigated. These diagnoses had been previously assigned in the diagnostic study of a systematic random sample of 229 suicide cases, and were based on all available information, including multiple interviews and health care records (Henriksson et al 1993). Estimates of possible alcohol misuse were available for 173 of these 229 cases: 35% (60/173) were misusers and 65% (113/173) non-misusers. Misuse was assessed in 79% (N=48/61) of the alcohol dependent subjects, and 80% (N=48/60) of misusers had alcohol dependence (kappa for interrater reliability between misuse and alcohol dependence 0.68). For a supplementary analysis these 173 misusers and non-misusers of the diagnostic sample were examined with regard to some diagnostic and other characteristics that had been individually assessed according to all available information.

6.3. Definition of variables

6.3.1. Sociodemographic characteristics

Occupational status was stratified into five classes. White collar employees included lower and upper level employees, while blue collar employees were manual workers. For logistic regression analysis in study I the variable was dichotomised as (a): a white collar employee or entrepreneur, or (b): other. In study II the socio-economic status was

assessed according to whether or not the victim had ever been self employed or an employee of any kind. A similar dichotomy was used in study V to indicate a lifetime employment of any kind, regardless of the current employment status.

6.3.2. Diagnostic concepts

In the studies of male and female PSD suicide victims (I-II), some diagnostic metacategories were formed for comorbid DSM-III-R axis I disorders. Depressive syndromes included major depressive disorder, depressive disorder not otherwise specified, bipolar disorders and dysthymia and adjustment disorder with depressed mood. Anxiety disorders included DSM-III-R anxiety disorders and adjustment disorder with anxious mood. Psychotic disorders included all psychotic conditions and psychoses except psychotic mood disorders.

All the subjects had at least one substance dependence diagnosis on axis I. If there were additional axis I non-substance diagnoses, an attempt was made to estimate their sequence of onset.

Some evaluations were made for the alcohol dependent and other substance dependent victims separately. Those with only one substance use disorder were classified as solely alcohol dependent or solely other substance dependent, whether or not they had comorbid non-substance disorders. Several alcohol dependent as well as other substance dependent subjects had more than one substance use disorder.

6.3.3. Treatment contacts

In Finland in 1987-88, health and other care services were public services usually free of charge, except for general and speciality polyclinics which took a small registration fee. Health care other than primary and psychiatric services required a referral, but substance use services, which were organised under social services, did not. All health and social care visits were (and are) documented and registered.

For the purposes of study II, health and other care received by the victims were categorised into a) psychiatric services, b) primary health care and other medical services, c) specific substance use treatment services, and d) social agency and other services including the church.

The lifetime history of psychiatric out- and inpatient care (a) was recorded according to all available information - including data from records and all interviews. Treatment ever received in a specific substance abuse in- or outpatient facility (c), regardless of the timing, was also recorded according to all available information. Moreover, treatment

contacts for substance abuse were recorded regardless of the provider (a, b, or c), if the victim had ever sought or been offered treatment to primarily substance use disorder or its complications.

It was also investigated if there had been any current health care contact, regardless of the frequency and provider, at which substance abuse problems in any form were recognised and discussed. Whether suicide intent was discussed in the last evaluated appointment with a health or social care professional was also recorded.

6.3.4. Life events

The interview with the next-of-kin included a separate life-event questionnaire based on the Recent Life Change Questionnaire instrument by Rahe (1977) with some modifications from the list by Paykel et al (1969). In study IV, the 32 items covering events within the three months prior to death were classified on logical grounds into either (1) events independent of the victim's own behaviour, or (2) events possibly dependent on the victim's own behaviour. The independent events included death or severe illness of a family member, while examples of possibly dependent events were separation, serious financial setback or job problems. Included items were combined into larger categories in which more than one event was counted only once for that category.

In study III, psychosocial stressors were recorded by the life-event questionnaire, and by thorough review of all the data collected on the subjects. The assessment of stressors and precipitants was based on consensus between two investigators (Marttunen et al 1994). Interpersonal stressors included separations and conflicts with others. The stressor category of family problems consisted of family discord and parental psychiatric or somatic illness.

6.3.5. Other characteristics

Hanging, shooting, cutting, jumping from high places, or in front of a vehicle, and crashing a vehicle were considered violent suicide methods. Fatal overdose with a solid or liquid substance was also recorded. Information on previous suicidal behaviour and suicidal communication was gathered from several sources. Data on alcohol detected from the blood at autopsy were available in most cases. The level of heavy alcohol intoxication at the time of suicide was set at 1.50/00 in study III. Blood alcohol concentration > 1.00/00 detected at autopsy was considered a state of alcohol intoxication in study IV. In adolescent suicides additional estimates of obvious inebriation at the time of suicide were made case-by-case according to all available information.

6.4. Statistical methods

In comparing study groups and subgroups, the chi-square test with Yates' correction, Fisher's exact test, Student's t-test, the Mann-Whitney U-test and the Mantel-Haenzel test were used, when appropriate. Tests were performed two-tailed, and a p-level <0.05 was considered statistically significant.

In order to control for confounding factors and to discover the relative importance of several different variables, multivariate models were created. Logistic regression models were used with either enter (studies I, II and V) or backwards stepwise (studies III and IV) methods. SPSS software was used (Norusis 1993).

7. RESULTS

The results of studies I-V are presented in Tables 5-18.

7.1. Male and female victims with psychoactive substance dependence (study I)

Information of the clinical characteristics of male and female PSD victims appear on Table 5.

Age, sociodemographic features

Male and female victims with PSD did not differ significantly in age (mean age 45.3 years versus 42.2y, $t=1.38$, $df=115$, $p=0.169$) but alcohol dependent females died younger than males (40.6 years versus 45.5 years, $t=2.12$, $df=106$, $p=0.036$) and also younger than the female victims without the alcohol dependence diagnosis but with other substance dependence (40.6 years versus 50.5 years, $t=2.29$, $df=47$, $p=0.026$).

The occupational status of the victims differed between the sexes: female subjects were upper and lower-level employees more often than males and male subjects were manual workers more often than females. There were no significant differences in other sociodemographic characteristics, but younger males were less often married or cohabiting and more often single than the older.

Diagnoses

Less than one sixth of males and only 8% of females had substance use disorder as the only mental disorder. When medical conditions (DSM-III-R axis III) were also considered, 91% of the males and 96% of the females had comorbid disorders.

Substance use disorders

The distribution of substance use diagnoses differed significantly between the sexes. Men had solely alcohol dependence significantly more often whereas other substance use disorders were more common among females (37% versus 10%, $\chi^2= 10.33$, $df=1$, $p=0.001$). The other substances abused were mainly benzodiazepines, followed by barbiturates and then analgesics. Six victims had abused several of these. No diagnosis of illicit drug use was found.

Four of the nine other substance dependent female subjects had an anxiety disorder and all had a depressive syndrome. The difference between them and the solely alcohol dependent females was statistically significant for both diagnostic groups (Fisher's exact test, anxiety disorder $p=0.028$, depressive disorder $p=0.018$).

Axis I comorbidity

Among victims having additional axis I diagnoses, the onset of the non-addictive disorder was assessed to have preceded the addictive one in 45% of the females and 18% of the males. Signs of substance use disorder preceded the signs of the other diagnosis in 18% of the females and 29% of the males with comorbid axis I disorders. In 53% of the males and 38% of the females the temporal sequence could not be determined ($\chi^2=8.13$, $df=2$, $p=0.017$).

Axis II comorbidity

The overall prevalences of axis II comorbidity were equal between the sexes but the age-related variation and distribution of specific diagnoses were different for males and females. Personality disorders were characteristic of younger females. Borderline personality disorder (BPD) was more common in females (25% versus 6%, $\chi^2=6.85$, $df=1$, $p=0.009$), and all but one with this diagnosis were 40 years or younger. Three male subjects and one female were assigned an antisocial personality disorder diagnosis and all were in the younger age group. The vast majority of all personality disorders were cluster B type.

Previous suicidal attempts and the suicide method

Substance dependent females had previous suicide attempts more often than substance dependent males (74% versus 44%, $\chi^2=8.82$, $df=1$, $p=0.003$). Females with previous attempts were younger than others (39.2 years versus 50.7 years, $t=3.38$, $df=47$, $p=0.001$) whereas there was no such age-difference among males. Males without previous attempts ($N=38$) used more violent methods than those with (87% versus 57%, $\chi^2=6.37$, $p=0.01$), which was not so for females.

Table 5. Comparison of male and female PSD suicide victims by age group

variable	Males			Females			total	
	19-40y (N=27)	41-77y (N=41)	total (N=68)	17-40y (N=26)	41-76y (N=23)	total (N=49)		
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Sociodemographics								
marital status								
married or cohabiting	9 (33)	28 (68)	37 (54)	10 (39)	14 (61)	24 (49)	2 (49)	Am ²
single	14 (52)	3 (7)	17 (25)	7 (27)	3 (13)	10 (20)	10 (20)	Am ³
divorced or widowed	4 (15)	10 (24)	14 (21)	9 (35)	6 (26)	15 (31)	15 (31)	
living alone	9 (33)	9 (22)	18 (27)	5 (19)	3 (13)	8 (16)	8 (16)	
currently employed	8 (30)	15 (37)	23 (34)	10 (39)	7 (30)	17 (35)	17 (35)	
children	11 (41)	36 (88)	47 (69)	19 (73)	19 (83)	38 (78)	38 (78)	Am ³
occupational status:								
entrepreneur	2 (7)	4 (10)	6 (9)	0 (0)	2 (9)	2 (4)	2 (4)	
white collar employee	1 (4)	2 (5)	3 (4)	5 (19)	8 (35)	13 (27)	13 (27)	S ²
blue collar employee	16 (59)	17 (42)	33 (49)	12 (46)	5 (21)	17 (35)	17 (35)	
pensioner	6 (22)	17 (42)	23 (34)	7 (27)	7 (30)	14 (29)	14 (29)	
other	2 (7)	1 (2)	3 (4)	2 (7)	1 (4)	3 (6)	3 (6)	
<i>(for total, $\chi^2=12.81$, $df=4$, $p=0.012$)</i>								
Diagnoses								
<u>Axis I</u>								
alcohol dependence								
sole alc.dependence	24 (89)	37 (90)	61 (90)	17 (65)	14 (61)	31 (63)	31 (63)	S ³
with other subs.dep.	2 (7)	0 (0)	2 (3)	1 (4)	0 (0)	1 (2)	1 (2)	
with other subs.abuse	0 (0)	4 (10)	4 (6)	6 (23)	3 (13)	9 (18)	9 (18)	
other substance dependence								
sole os.dependence	0 (0)	0 (0)	0 (0)	1 (4)	6 (26)	7 (14)	7 (14)	
with alcohol abuse	1 (4)	0 (0)	1 (2)	1 (4)	0 (0)	1 (2)	1 (2)	
<i>(for total, $\chi^2=16.39$, $df=4$, $p=0.003$)</i>								
<u>other axis I diagnoses</u>								
depressive syndrome	14 (52)	28 (68)	42 (62)	12 (46)	20 (87)	32 (65)	32 (65)	Af ²
major depressive disorder	2 (7)	14 (34)	16 (24)	4 (15)	10 (44)	14 (28)	14 (28)	Am ¹
psychotic disorder	7 (26)	2 (5)	8 (12)	5 (19)	0 (0)	5 (10)	5 (10)	
<u>Axis II</u>								
any personality disorder	13 (48)	15 (37)	28 (41)	17 (65)	2 (9)	19 (39)	19 (39)	Af ²
cluster B	10 (37)	13 (32)	23 (34)	16 (62)	2 (9)	18 (37)	18 (37)	Af ²
cluster C	3 (11)	2 (5)	5 (7)	1 (4)	0 (0)	1 (2)	1 (2)	
<u>Axis III</u>								
dg on ax III	6 (22)	22 (54)	28 (41)	7 (27)	12 (52)	19 (39)	19 (39)	Am ¹
Previous suicidal behaviour								
previous attempts	14 (52)	16 (39)	30 (44)	24 (92)	12 (52)	36 (74)	36 (74)	S ² , Af ²
suicidal communication	21 (78)	29 (71)	50 (74)	23 (89)	11 (48)	34 (69)	34 (69)	Af ²
during last 3 months	18 (67)	23 (56)	41 (60)	19 (73)	9 (39)	28 (57)	28 (57)	Af ¹
to relatives	15 (56)	23 (56)	38 (56)	17 (65)	7 (30)	24 (49)	24 (49)	Af ¹
to health care	5 (19)	5 (12)	10 (15)	8 (31)	4 (17)	12 (25)	12 (25)	
suicide note	7 (26)	12 (29)	19 (28)	6 (23)	8 (35)	14 (29)	14 (29)	
Suicide method								
violent method	18 (67)	32 (78)	50 (74)	5 (19)	7 (30)	12 (25)	12 (25)	S ³
liquid/solid s.	6 (22)	3 (7)	9 (13)	21 (81)	13 (57)	34 (69)	34 (69)	S ³
Blood alcohol								
alc at autopsy	14 (52)	19 (46)	33 (49)	18 (69)	11 (48)	29 (59)	29 (59)	
>1.50/oo	9 (33)	15 (37)	24 (35)	9 (35)	7 (30)	16 (33)	16 (33)	

Between the Sexes:S¹: Male/Female, Pearson χ^2 , $p<0.05$ S²: Male/Female, Pearson χ^2 , $p<0.01$ S³: Male/Female, Pearson χ^2 , $p<0.001$ **Between the Age Groups:**A(male,female)¹= Young/Old, Pearson χ^2 , $p<0.05$ A(male,female)²= Young/Old, Pearson χ^2 , $p<0.01$ A(male,female)³= Young/Old, Pearson χ^2 , $p<0.001$

Psychoactive substance dependent (PSD) suicides vs. non-dependent suicides

Overall, psychoactive substance dependent (PSD) female subjects (N=49) were significantly younger than non-dependent female victims (N=271) (mean=42.2 years, SD=11.6, versus mean= 49.2 years, SD=16.9) ($t=3.57$, $df=89,21$, $p=0.001$). This was not the case among the male victims (45.3 years, SD=12.2 versus 44.8 years, SD=19.6) ($t= -0.20$, $df=169,62$, $p=0.841$).

The PSD female victims also differed from non-dependent females in the method of suicide, which was violent in 25% (N=12/49) of the PSD females and in 46% (N=124/271) of the others ($\chi^2=6.83$, $df=1$, $p=0.009$). Overdose was the method in 69% (N=34/49) of the PSD females and 35% (N=96/271) of the non-dependent ones ($\chi^2=18.46$, $df=1$, $p<0.001$). Among the males the method did not differ between PSD subjects and others. The PSD female victims were significantly more likely to have alcohol in their blood than the non-dependent (60%, N=29/48 versus 19%, N=48/260, $\chi^2= 35.83$, $df=1$, $p<0.001$). Among males within the sample the difference was less striking although still significant (51%, N=33/65 versus 33%, N=33/100, $\chi^2= 4.47$, $df=1$, $p=0.03$).

Logistic regression

The logistic model for the sociodemographic and clinical characteristics included age group, occupational status, an other substance use disorder diagnosis, a cluster B personality disorder diagnosis and an interaction term of cluster B diagnosis by age group. It predicted the sex in 71.79% and the overall significance was good ($\chi^2= 26.51$, $df=5$, $p<0.001$). The model for the suicidal process included overdose as the suicide method, previous suicide attempts and suicide communication. It predicted the sex in 79.49% with a good overall significance ($\chi^2= 47.74$, $df=3$, $p< 0.001$) (Table 6).

TABLE 6. The logistic regression models for clinical characteristics and the suicidal process predicting female sex

Model for Clinical Characteristics			
Variable	sig	OR	CI
younger age group	0.986	1.009	0.36-2.81
higher occupational status	0.028	3.217	1.31-9.15
an OS related disorder	0.004	5.290	1.72-16.27
cluster B personality disorder	0.027	7.820	1.26-48.45
younger age group/cluster B PD	0.011	16.661	1.91-145.31

Model for the Suicidal Process			
Variable	sig	OR	CI
previous attempts	0.018	3.309	1.23-8.93
method intoxication	0.000	14.952	5.56-40.18
suicide communication	0.085	2.595	0.88-2.96

7.2. Treatment of male and female psychoactive substance dependent victims (study II)

Data on the treatment contacts of PSD victims by sex appear on Table 7.

Utilisation of services

In their lifetime, 57% of the male and 78% of the female substance dependent suicide victims had received in- or outpatient psychiatric treatment. One third overall had utilised substance abuse treatment services, and five males (7%) and one female (2%) had attended Alcoholics Anonymous (AA) -meetings at some time in their lives. More than two fifths had never had any help for substance abuse problems.

During the last year, 37% of the males and two thirds of the females had received psychiatric care. Two thirds of both sexes had utilised primary health care or other medical services, and a fifth were known to have had contacts with other services, including social agencies and church.

Within the last month, one third of both sexes had contacted primary health care or other medical services, and a sixth of males and 39% of females had a psychiatric contact.

Current recognition of substance use problems

One sixth of the males and a third of the females had a current health care contact at which problems with substance use were discussed in some form. Most of them (93%, N=26/28) had comorbid axis I disorders.

Table 7. Contacts with various health and other care services among male and female substance dependent suicide victims

	males (n=68)	females (n=49)	male/female p-value*
<i>contacts</i>			
<i>Psychiatric services (a)</i>			
last month	11 (16%)	19 (39%)	0.01¶
last year	25 (37%)	33 (67%)	0.01¶
ever	39 (57%)	38 (78%)	0.04¶
hospitalisation ever	27 (40%)	29 (59%)	0.58
<i>primary health care or medical (b)</i>			
last month	20 (29%)	14 (29%)	0.91
last year	45 (66%)	33 (67%)	0.95
<i>substance abuse services (c)</i>			
subst abuse inpatient facility ever	8 (12%)	10 (20%)	0.31
subst abuse outpatient facility ever	16 (24%)	9 (18%)	0.66
any subst use service ever	22 (32%)	16 (33%)	0.87
<i>specific treatment for substance abuse problems (a, b, or c)</i>			
last month	12 (18%)	17 (35%)	0.06
last year	22 (32%)	23 (47%)	0.16
ever	38 (56%)	29 (59%)	0.87
<i>any contact</i>			
any health care last week	18 (27%)	25 (51%)	0.01¶
any health care last month	33 (49%)	33 (67%)	0.07
current recognition of subst use	11 (16%)	17 (35%)	0.04¶

*Chi-square -test with Yates' correction;
 (¶): p <0.05)

number of providers

no services	8 (12%)	1 (2%)
1 organisation	27 (40%)	16 (33%)
2 org	20 (30%)	18 (37%)
3 org	10 (15%)	8 (16%)
4 org	3 (5%)	6 (12%)

Mann-Whitney U, z=-2.147, p=0.03

The last appointment

An interview of the last attending professional contact person was available for 62% (N=42/68) of the male and 71% (N=35/49) of the female subjects. These evaluated contacts took place during the last week in 19% (N=13/68) of the males and in 37% (N=18/49) of the females, and more than a week but less than a month before suicide in one fifth of both sexes. In all but one male the last contact had taken place within a year. The possibility of suicide had been discussed in 9% (N=6/68) of the males and 18% (N=9/49) of the females overall, and in 22% (N=6/27) of the males and 29% (N=8/28) of the females having appointments during the last month. In health care the last contact most often took place in a health care center (13% of the males, [N=9/68], 14% of the females, [N=7/49]).

The effect of sociodemographic factors

Those with a lower socioeconomic status more often had a history of psychiatric care than the others (71% vs. 46%, Mantel-Haenzel controlling for sex, $\chi^2=7.40$, $df=1$, $p=0.007$). Marital status did not have an effect among either sex. A history of psychiatric care was significantly more frequent in the younger age group (79% vs. 55%, Mantel-Haenzel controlling for sex, $\chi^2=5.51$, $df=1$, $p=0.02$).

The effect of axis I comorbid disorders

Subjects with axis I comorbidity had significantly more often received psychiatric treatment (74% vs. 39%, Mantel-Haenzel controlling for sex, $\chi^2=8.68$, $df=1$, $p=0.003$). Males with a depressive syndrome more often had a history of psychiatric care (69% vs. 39%, $\chi^2=4.96$, $df=1$, $p=0.026$), than those without. There was no such difference among females.

Substance dependent victims with any drug-related disorder had more often received some form of help for substance use problems than those with alcohol dependence as the only substance use disorder (80% vs. 52%, Mantel-Haenzel controlling for sex, $\chi^2=4.32$, $df=1$, $p=0.04$), and they tended to have more often received psychiatric care (88% vs. 60%, Mantel-Haenzel controlling for sex, $\chi^2=3.47$, $df=1$, $p=0.06$).

The effect of axis II comorbid disorders

Females with a borderline personality disorder had all received psychiatric care at some time in their lives and had all been prescribed psychopharmacological medication. However, in statistical analysis diagnosis of a borderline or any cluster B disorder failed to associate with psychiatric or substance use treatment among either sex. Females with cluster B disorders ($N=18$) had contacted more treatment organisations than those without the disorder (Mann-Whitney U, $z=-1.9786$, $p=0.048$).

Psychopharmacological treatment

More females than males had been prescribed psychopharmacological medication according to medical records (65% vs. 41%, $\chi^2=5.706$, $p=0.02$). Those with previous suicide attempts or comorbid axis I disorders had been prescribed psychiatric medication more often than the others. Disulfiram had been prescribed to only two female subjects.

Other sex differences

According to all available information, a quarter of the males and half of the females had been in a contact with some health care professional during the last week before suicide. During the last year females overall had been in contact with significantly more treatment organisations than males (Table 7).

Among females 92% of those with previous attempts had received psychiatric care, contrasting with only 39% of the non-attempters ($p<0.001$). Among males the difference was not significant (70% vs. 47%, $p=0.1$).

Logistic regression

The logistic regression model for characterising those receiving psychiatric treatment during the last year performed better for females. Among males the model predicted psychiatric treatment within a year in 77% ($\chi^2=21.72$, $df=5$, $p<0.001$) with previous suicide attempts and a comorbid axis I diagnosis as significant factors. Among females the model predicted psychiatric treatment within a year in 86% ($\chi^2=25.6$, $df=5$, $p<0.001$), with significant factors being previous attempts, a diagnosis related to prescribed drugs and a lower socioeconomic status (Table 8).

Table 8. The logistic regression models predicting psychiatric treatment within a year before suicide

for males			
Variable	sig	OR	CI95%
younger age	0.178	2.28	0.69 -7.55
lower socioeconomic status	0.628	1.58	0.25 -10.12
previous suicide attempts	0.016	4.23	1.31 -13.62
a drug-related diagnosis	0.326	2.79	0.36 -21.51
axis I comorbidity	0.016	14.53	1.63 -129.28

for females			
Variable	sig	OR	CI95%
younger age	0.792	0.76	0.09 -6.07
lower socioeconomic status	0.033	10.37	1.21 -88.55
previous suicide attempts	0.011	22.41	2.02 -248.20
a drug-related diagnosis	0.044	9.03	1.06 -76.56
axis I comorbidity	0.127	5.61	0.61 -51.32

7.3. Adolescent victims with and without subthreshold or diagnosed alcohol misuse

Data on adolescent victims with and without SDAM appear on Tables 9-12.

The mean age of the adolescent subjects was 19.1 years (SD 2.1) and there were 88 males and 18 females. All but one of the victims were unmarried. The parental socioeconomic status (Central Statistical Office of Finland, 1987) was manual worker in 59%, lower-level employee in 16%, upper-level employee in 10%, employer in 3 %, entrepreneur in 7 %, and other or unknown in 5%.

Adolescent suicides with subthreshold or diagnosed alcohol misuse

Five female and 39 male suicides had a history of SDAM. Seventeen had received a diagnosis of alcohol abuse and 12 alcohol dependence.

None of the suicides had only misused substances other than alcohol. Ten victims with SDAM had also used other substances; solvents in two, nonprescribed drugs in five, and marijuana or other illicit drugs in three cases. However, only three victims received an actual diagnosis of other substance abuse or dependence.

A vast majority (82%) of victims with SDAM committed suicide under influence of alcohol and 39% were heavily intoxicated, whereas these figures were 40% and 5% for the others.

Characteristics of victims with and without SDAM

All but one victim with SDAM received a psychiatric diagnosis other than a substance use disorder. In 83.7% (N=36/43) of these cases SDAM was secondary to a psychiatric disorder in temporal sequence. In 75% (N=18/24) of victims with SDAM and a diagnosis of a mood disorder (and in six of eight with major depression) the mood disorder had preceded SDAM. Mood disorders were common both among subjects with SDAM (55%, N=24/44) and those without it (50%, N=31/62). Personality disorders and other comorbid psychiatric disorders were more common among victims with SDAM (Table 10). Ten (23 %) of the 44 victims with SDAM compared to none of the others received a diagnosis of conduct disorder or antisocial personality disorder (Fisher exact test, $p < 0.001$). Sixteen victims (36%) with SDAM had been convicted of an offence compared with none of those without SDAM (Fisher exact test, $p < .0001$).

Previous suicide attempts tended to be more common among victims with than without SDAM (Table 10). A higher proportion of victims with than without SDAM had made their first suicide attempt more than three months before the fatal attempt (38.6%, N=17/44 vs. 19.4%, N=12/62, $\chi^2 = 3.893$, $df = 1$, $p < 0.05$).

Psychosocial impairment during the year preceding suicide was more severe among SDAM victims (mean GAF score 62.6, SD=13.1 vs. 72.7, SD=15.4, $t = -3.51$, $df = 104$, $p = 0.001$).

Dating experiences within the last year were more common in victims with SDAM (75%, N=33/44 vs. 53%, N=33/62, $\chi^2 = 4.308$, $p = 0.038$) as was current dating (50%, N=22/44 vs. 24%, N=15/62, $\chi^2 = 6.450$, $p = 0.01$).

All the victims with SDAM and 95 % (N=59/62) of the others had experienced life event stressors during the last month, and their mean number was higher among victims with SDAM (3.52, SD 1.39 vs. 2.48, SD 1.39; $t=3.510$, $df=104$, $p=0.001$). Problems with discipline or the law and unemployment tended to be more frequent, and home move and financial problems significantly more frequent among SDAM victims (Table 11).

Suicide during weekends

SDAM victims were more likely to commit suicide during weekends than the others (Table 9). Two thirds (N=37/56) of all victims with alcohol detected in the blood had committed suicide during weekend, compared to 30% (N=13/44) of those with no blood alcohol ($\chi^2=11.729$, $df=1$, $p<0.001$). When examined separately, SDAM victims were more likely to have alcohol in the blood regardless of the time of week of suicide (weekend vs. weekday among SDAM, 85%, N=22/26 vs. 73%, N=11/15, $\chi^2=0.220$, $df=1$, $p=0.64$), whereas the others had a greater tendency to alcohol in the blood in weekend suicides (63%, N=15/24 vs. 23%, N=8/35, $\chi^2=7.814$, $df=1$, $p=0.005$).

Table 9. Situational factors and family background of 44 adolescent suicides with subthreshold or diagnosed alcohol misuse and 62 adolescent suicides with no SDAM.

	SDAM (n=44)		no SDAM (n=62)		
	N	%	N	%	
SUICIDE METHOD					
Violent ^{a)}	32	72.7	51	82.3	
Non-violent ^{b)}	12	27.2	11	17.7	
SUICIDE UNDER INFLUENCE OF ALCOHOL					
Blood alcohol concentration $\geq 1.50/00$ ^{c)}	36	81.8	25	40.3	$p<0.001$ ¹⁾
	16/41	39.0	3/59	5.1	$p<0.001$ ²⁾
SUICIDE DURING WEEKEND	28	63.6	26	41.9	$p<0.05$ ³⁾
FAMILY RELATED FACTORS					
Parental divorce	20	45.5	15	24.2	$p<0.04$ ⁴⁾
Parental violence	14	31.8	5	8.1	$p<0.004$ ⁵⁾
Parental alcohol abuse	17	38.6	12	19.4	$p<0.05$ ⁶⁾
Paternal alcohol abuse	15	34.1	9	14.5	$p<0.04$ ⁷⁾
Parental suicidal behaviour ^{d)}	5	11.4	3	4.9	
Institutional rearing	6	13.6	2	3.2	

a) shooting, hanging, jumping from height, traffic death; b) drowning, use of drugs or gases; c) percentage based on the 100 cases with B.A.C. measured; d) completed or attempted suicide of parent

1) Chi square with Yate's correction=16.480, $df=1$; 2) Chi square with Yate's correction=15.967, $df=1$; 3) Chi square with Yate's correction=4.020, $df=1$; 4) Chi square with Yate's correction=4.343, $df=1$; 5) Chi square with Yate's correction=8.322, $df=1$; 6) Chi square with Yate's correction=3.893, $df=1$; 7) Chi-square with Yate's correction=4.568, $df=1$

Table 10. Selected psychiatric diagnoses and clinical factors of 44 adolescent suicides with subthreshold or diagnosed alcohol misuse and 62 adolescent suicides with no SDAM.

	SDAM (n=44)		no SDAM (n=62)		
	N	%	N	%	
PSYCHIATRIC DIAGNOSES					
Major depression	8	18.2	13	21.0	
Non-affective psychotic disorders ^{a)}	1	2.3	8	12.9	
Anxiety disorders	1	2.3	2	3.2	
Adjustment disorders	6	13.6	11	17.7	
Conduct disorder	4	9.1	0	0.0	
Personality disorder	28	61.4	9	14.5	p<0.001 ¹⁾
Two or more comorbid psychiatric disorders on axis I-II ^{b)}	28	63.6	19	30.7	p<0.002 ²⁾
No psychiatric diagnosis	0	0.0	8	12.9	p=0.02 ³⁾
SUICIDE ATTEMPTS AND CONTACTS WITH PSYCHIATRIC CARE					
Previous suicide attempts	20	45.5	16	25.8	p=0.06 ⁴⁾
Contact with psychiatric care lifetime	19	43.2	18	29.0	
previous year	10	22.7	17	27.4	
previous month	3	6.8	13	21.0	p=0.08 ⁶⁾
Psychiatric hospitalisation lifetime	8	18.2	11	17.7	
previous year	5	11.4	11	17.7	

a) includes schizophrenia, schizoaffective disorder, and other psychotic disorders,

b) substance abuse and dependence excluded

1) Chi-square with Yate's correction=23.138, df=1; 2) Chi square with Yate's correction=10.05, df=1; 3) Fisher exact test; 4) Chi square with Yate's correction=3.60, df=1; 5) Chi-square with Yate's correction=2.99, df=1

Table 11. Frequencies of stressors during the month preceding suicides in 106 adolescent victims with (n=44) or without (n=62) subthreshold or diagnosed alcohol misuse.

	SDAM (n=44)		No SDAM (n=62)		
	N	%	N	%	
Interpersonal stressors	33	75	35	56	
Difficulties with discipline or law	12	27	7	11	p=0.06 ⁴⁾
Problems at school or work	8	18	16	26	
Unemployment	15	34	10	16	p=0.06 ³⁾
Home move	8	18	2	3	p<0.02 ¹⁾
Financial problems	18	41	4	6	p<.001 ²⁾
Family problems	22	50	27	43	

1) Fisher exact test ; 2) Chi square with Yate's correction =16.54, df=1; 3) Chi square with Yate's correction =3.664, df=1; 4) Chi-square with Yate's correction=3.446, df=1

Logistic regression

In the backward stepwise (likelihood ratio) logistic procedure (Table 13) the variables that stayed in the model and predicted SDAM in 86.5%, were: previous suicide attempts, a personality disorder, no psychiatric contacts within a month, four or more stressors, current dating, parental violence and alcohol concentration of 1.50/00 or more (Hosmer-Lemeshov Goodness-of-fit $\chi^2=4.859$, df=7, p=0.677).

Table 13. The logistic model predicting subthreshold and diagnosed alcohol misuse among completed adolescent suicides

variable	sig	OR	pseudo R	95%CI
previous attempts	0.083	3.63	0.088	0.84 - 15.60
personality disorder	0.001	13.54	0.277	3.09 - 59.28
no psychiatric contact within the last month	0.022	11.51	0.159	1.43 - 92.72
parental violence	0.109	3.84	0.067	0.74 - 19.88
four or more stressors	0.077	3.50	0.093	0.87 - 14.04
heavy alcohol intoxication	0.009	11.63	0.192	1.83 - 73.99
current dating	0.082	3.32	0.089	0.86-12.86

The other model, predicting suicide under the influence of alcohol in 78.6%, found weekends and SDAM to be the only significant factors.

7.4. Alcohol misusing and nonmisusing victims (studies IV and V)

Data on suicide victims with and without alcohol misuse appear on Tables 14-18.

7.4.1. Characteristics

In the total suicide population those considered as misusers died younger than the non-misusers (42 years vs. 47 years, $t=4.79$, $df=995$, $p<0.001$). Those intoxicated at the time of suicide were younger than those not, among the misusers (40 years vs. 43 years, $t=2.27$, $df=332$, $p=0.024$) and particularly the non-misusers (38 years vs. 48 years, $t=4.39$, $df=612$, $p<0.001$).

Life events

More of the misusers had experienced any life-events within the last three months (87% vs. 76%, $\chi^2=15.66$, $df=1$, $p<0.0001$); four fifths had had life-events possibly dependent on their own behaviour compared to only half of the non-misusers. Within the last three months, more of the male misusers compared with non-misusers had experienced interpersonal loss (38% vs. 18%, $\chi^2=32.53$, $df=1$, $p<0.001$), loss or conflict (55% vs. 27%, $\chi^2=52.03$, $df=1$, $p<0.001$), financial trouble (27% vs. 13%, $\chi^2=20.03$, $df=1$, $p<0.001$), or unemployment (27% vs. 11%, $\chi^2=31.03$, $df=1$, $p<0.001$). Among females, more of the misusers had experienced financial trouble (29% vs. 9%, $\chi^2=7.84$, $df=1$, $p=0.005$) or unemployment (29% vs. 3%, $\chi^2=21.45$, $df=1$, $p<0.001$).

Psychiatric contacts

The misusers had psychiatric hospitalisations and any psychiatric treatment less frequently than the non-misusers, but previous suicide attempts and suicide communication more often (Table 14). Among both groups those without any lifetime psychiatric contacts were more likely to be intoxicated at the time of suicide than those with any psychiatric treatment (66% vs. 48%, $\chi^2=10.60$, $df=1$, $p=0.001$, 19% vs. 9%, $\chi^2=10.91$, $df=1$, $p=0.001$).

Blood alcohol concentration and suicide method

Suicide methods and proportions of victims with alcohol in the blood are presented in Table 15.

Among misusers, alcohol in blood did not associate with any recent life events, whereas non-misusers unemployed within the final three months were significantly more often intoxicated (35% vs. 11%, $\chi^2=20.30$, $df=1$, $p<0.001$) than other non-misusers.

Psychiatric comorbidity among misusers and non-misusers in the diagnostic sample

Within the diagnostic sample, some differences were found between the misusers and non-misusers. Depressive disorder not otherwise specified was more common among the misusers (35% vs. 19%, $\chi^2=4.89$, $df=1$, $p=0.027$), whereas major depression (MD) was more common among the non-misusers (42% vs. 22%, $\chi^2=6.02$, $df=1$, $p=0.014$). Misusers were more likely to have been diagnosed with a personality disorder (43% vs. 26%, $\chi^2=5.45$, $p=0.02$) and less often with a non-organic psychosis (psychotic MD included) (13% vs. 37%, $\chi^2=9.71$, $df=1$, $p=0.001$). Regular treatment with antipsychotic drugs had been prescribed in 8% of the misusers and 30% of the non-misusers ($\chi^2=9.41$, $df=1$, $p=0.002$), the respective figures for benzodiazepine treatment being 8% and 28% ($\chi^2=8.16$, $df=1$, $p=0.004$) and for antidepressive medication 7% and 20% ($\chi^2=4.08$, $p=0.04$).

Table 14. The characteristics of suicide victims with alcohol misuse and no misuse

	MISUSERS		NON-MISUSERS		χ^2	p
	N	%	N	%		
	(349)		(648)			
<i>Sex</i>						
male	(317)	91%	(452)	70%	55.944 (df=1)	p<0.001
female	(32)	9%	(196)	30%		
<i>Age groups</i>						
<35 years	(108)	31%	(189)	29%	37.417 (df=2)	p<0.001
35-49 years	(151)	43%	(177)	27%		
≥50 years	(90)	26%	(282)	44%		
<i>Marital status</i>						
married	(121)	35%	(258)	40%	33.197 (df=3)	p<0.001
separated or divorced	(78)	22%	(73)	11%		
widowed	(11)	3%	(61)	9%		
unmarried	(139)	40%	(256)	40%		
children	(213/321)	66%	(342/608)	56%		
<i>Occupational status</i>						
entrepreneur or employer	(27)	8%	(52)	8%	81.899 (df=4)	p<0.001
employee	(41)	12%	(90)	14%		
manual worker	(194)	56%	(178)	28%		
retired	(80)	23%	(287)	46%		
other	(3)	1%	(19)	3%		
<i>Employment</i>						
any achieved occupation	(262)	75%	(320)	49%	60.552 (df=1)	p<0.001
currently employed	(171)	49%	(261)	40%	6.673 (df=1)	p<0.01
unemployment within 3mo	(88)	25%	(52)	8%	54.118 (df=1)	p<0.001
<i>Suicidality</i>						
previous attempts	(171/327)	52%	(276/627)	44%	5.582 (df=1)	p=0.018
suicide communication	(255/343)	74%	(396/642)	62%	15.433 (df=1)	p<0.001
suicide note	(100)	29%	(176)	27%	n.s.	
<i>Suicide method</i>						
violent	(215)	62%	(433)	67%	n.s.	
intoxication	(77)	22%	(103)	16%	5.423 (df=1)	p<0.02
<i>Psychiatric treatment</i>						
inpatient	(112)	32%	(276)	43%	10.085 (df=1)	p=0.002
any	(176)	50%	(375)	58%	4.783 (df=1)	p=0.029
<i>Life events within 3mo</i>						
interpersonal loss or conflict	(164/306)	54%	(176/589)	30%	47.070 (df=1)	p<0.001
financial trouble	(84/310)	27%	(71/603)	12%	33.025 (df=1)	p<0.001
independent	(110/303)	36%	(264/593)	45%	5.233 (df=1)	p=0.022
dependent	(245/309)	79%	(305/590)	52%	63.854 (df=1)	p<0.001
<i>Alcohol intoxication</i>						
alcohol in blood	(231/334)	69%	(139/614)	23%	194.808 (df=1)	p<0.001
BAC>1.0o/oo	(190/334)	57%	(81/614)	13%	200.172 (df=1)	p<0.001

Table 15. Suicide method for male and female misusers and non-misusers and percentages of victims with alcohol detected in blood

Males (N=769)	misusers (N=317)		non-misusers (N=452)		
	N	%		N	%
			<i>(alc in blood)</i>		<i>(alc in blood)</i>
intoxication	(53)	17%	(69%)	(41)	9% (48%)
hanging	(109)	34%	(63%)	(159)	35% (22%)
drowning	(10)	3%	(70%)	(26)	6% (9%)
exhaustion gas	(38)	12%	(82%)	(44)	10% (35%)
shooting	(78)	25%	(75%)	(132)	29% (30%)
other	(29)	9%	(63%)	(50)	11% (15%)

$\chi^2=14.595, df=5, p=0.012$

Females (N=228)	misusers (N=32)		non-misusers (N=196)		
	N	%		N	%
			<i>(alc in blood)</i>		<i>(alc in blood)</i>
intoxication	(24)	75%	(61%)	(62)	32% (20%)
hanging	(3)	9%	(67%)	(69)	35% (12%)
drowning	(2)	6%	(100%)	(26)	13% (8%)
exhaustion gas	(1)	3%	(100%)	(4)	2% (0%)
shooting	(0)	0%		(3)	2% (0%)
other	(2)	6%	(100%)	(32)	16% (14%)

$\chi^2=23.549, df=5, p<0.001$

Logistic regression

The logistic model predicted alcohol misuser status in 78%. Male sex, being divorced or separated, suicide communication, overdose as the method, any lifetime work, unemployment, financial trouble or interpersonal loss or conflict within three months, and alcohol intoxication at the time of suicide, were partially associated with alcohol misuse (Table 16).

Table 16. Logistic model predicting alcohol misuse

Variable	sig	OR	95% Ci
male sex	0.00	4.21	2.43 - 7.29
divorced/separated	0.03	1.71	1.04 - 2.80
any occupation	0.00	1.76	1.19 - 2.60
suicide communication	0.00	1.79	1.22 - 2.64
B.A.C. > 1.00/00	0.00	5.94	4.06 - 8.70
intoxication as suicide method	0.01	1.99	1.21 - 3.26
unemployment within 3 mo	0.00	2.20	1.34 - 3.62
financial trouble within 3 mo	0.07	1.54	0.97 - 2.44
loss or conflict within 3 mo	0.00	2.19	1.53 - 3.15

7.4.2. Alcohol misuse, employment status and weekly variation of suicide

Employed alcohol misusers were found to commit suicide more often during the weekend than the non-employed (Table 17). The misusers had alcohol in their blood regardless of whether the suicide had been committed on a weekend or not (68.1% vs. 69.9%, $\chi^2=0.060$, $df=1$, $p=0.81$) and somewhat more often if they were employed (74.7% vs. 63.7%, $\chi^2=4.242$, $df=1$, $p=0.04$). In contrast, employed nonmisusers did not differ from the nonemployed ones in the weekly variation of suicide. The nonmisusers were more likely to have alcohol in blood in weekend suicides (36.3% vs. 20.1, $\chi^2=15.343$, $df=1$, $p<0.001$) and somewhat more often if they were employed (31.4% vs. 22.8%, $\chi^2=4.258$, $df=1$, $p=0.04$).

In the logistic regression analysis (Table 18), being employed was the only variable significantly explaining weekend suicide ($p=0.004$) among the misusers, while other variables did not reach significance. The odds ratio (OR) for being employed was 2.02, and the confidence interval (CI) was 1.25-3.26 ($B=0.7035$, $S.E.=0.2434$).

Table 17. Current employment status, alcohol misuse and the weekly pattern of suicide

	Misusers ^a (N=349)				Non-misusers (N=648)			
	Non-employed (N=178)(N=171)		Employed (N=387)(N=261)		Non-employed		Employed	
	N	%	N	%	N	%	N	%
Weekday (M-Th)	117	65.7	82	48.0	226	58.4	149	57.1
Weekend (F-Su)	61	34.3	89	52.0	161	41.6	112	42.9

a: $\chi^2 = 10.533$, $df=1$, $p=0.001$

Table 18. The logistic regression model predicting suicide during weekend among misusers

Variable	sig	OR	95%CI
age	0.255	0.99	0.97-1.01
male sex	0.877	0.94	0.43-2.04
married or cohabiting	0.592	0.87	0.54-1.43
alcohol in blood	0.334	0.79	0.48-1.28
current employment	0.004	2.02	1.25-3.26

8. DISCUSSION

Within the National Suicide Prevention Project in Finland, all suicide victims over a 12-month period were investigated by the psychological autopsy method. The aim of the present study was to compile information on substance-related factors contributing to the suicidal process of victims with substance misuse, which would imply a maladaptive pattern of psychoactive substance use and a probable or definite DSM-III-R psychoactive substance use disorder. Sociodemographic and diagnostic characteristics and treatment histories were found to be different for the substance dependent male and female suicides. Diagnostically subthreshold or diagnosed alcohol misuse with associated psychosocial disturbance characterised a remarkable proportion of the adolescent victims. In the total suicide population alcohol misuse contributed to a great number of suicides, either in the context of recent psychosocial disruption or current alcohol intoxication at the time of suicide as indicated by the weekday-weekend distribution of suicides among employed alcohol misusers.

8.1. Methodological aspects

Some methodological limitations must be addressed. In *studies I-II* the male victims were from a systematic random sample of 172 males, whereas the female victims were diagnosed from a total population of female suicides over a one-year period. Deliberate screening of PSD diagnoses might theoretically have led to overestimation, but this seems unlikely as the final proportion was the same or slightly lower than the female rate reported earlier from the systematic random sample (Henriksson et al 1993). Another potential bias might be underestimation, as among females alcohol problems are thought to be more hidden by both themselves and their families (Blume 1991, Schuckit & Morrissey 1976). In the present study, however, information was gathered from several sources, including in addition to next-to-kin interviews also medical and social agency records and interviews of health care professionals.

No living control subjects were available, which precluded examination of the characteristics investigated as risk factors for suicide. Male and female PSD subjects were compared by characteristics previously suggested to distinguish the sexes in completed suicide or substance use disorders, and by the details of their treatment histories. Logistic models were, among other things, used to control for possible confounding factors and to protect from spurious associations due to multiple univariate testing. Finally, because of the relatively small number of subjects, a type II error must be considered, particularly in the female age group comparisons.

The retrospective diagnosis of personality disorders has been discussed earlier in detail (Isometsä et al 1996). In the present studies the cluster B category included several cases of personality disorders not otherwise specified but with antisocial and/or borderline features. It is possible that with more information, more overall as well as specific

personality disorder diagnoses would have replaced undetermined cases. Possible information bias due to the relative excess of data from psychiatric records could explain part of the sex difference, and also the age-related variation among females in BPD diagnoses, as there were psychiatric records for younger females significantly more often than for older (89% versus 57%). On the other hand, it is likely that this rather reflects higher psychiatric morbidity, particularly actual BPD symptoms.

The MAST questionnaire used in *study III* was not originally designed for retrospective and second hand evaluation. In many cases it was not possible to reliably answer all 25 items. However, based on a thorough review of all collected information, including a separate form for substance use issues, some of the MAST items were always answerable. The questionnaire was scored by two independent researchers (S.P.P., M.J.M.) and a consensus meeting was held in case of disagreement. The fact that in addition to subthreshold alcohol abusers every case with a DSM-III-R substance abuse or dependence was included, suggests that the instrument was valid and more sensitive for alcohol abuse than categorical diagnostic criteria.

Some methodological limitations in *studies IV and V* also need to be noted. First and once again, there were no living controls from the general population. Also, by necessity, only retrospective and second hand information is available in psychological autopsy studies. In the evaluation of life events, recall bias - a tendency to explain suicide ("effort after meaning") - and the limits of the questionnaire may have caused either under- or overreporting of events. Furthermore, although the classification of possibly dependent and independent events was made on logical grounds, the true intentionality of dependent events is beyond reach. These problems have been discussed elsewhere in detail (Miller et al 1986, Heikkinen 1994, Isometsä et al 1995). Third, a number of cases had to be excluded from the total suicide population on the basis of missing, incomplete or unreliable interviews. In addition, some other cases had insufficient reliable and structured information about the victim's use of alcohol, and were also excluded. However, these individuals did not differ from the included cases in terms of sex, age, or current employment, though they tended to be married or cohabiting less often. Fourth, the size of the study population precluded examination of individual alcohol use in the light of all available information, so the informant's estimate of the victim's pattern of heavy drinking was the sole source for categorising their alcohol use. This may have led to underreporting of any problems with alcohol. Finally, due to the relatively high number of univariate tests, the possibility of spurious associations cannot be fully excluded. Nevertheless, the size of the population and use of a logistic model doubtless offered some protection against this. Furthermore, the convergence of the findings with what is already known supports their reliability.

8.2. Male and female victims with PSD (studies I and II)

8.2.1. Sociodemographic and clinical characteristics (study I)

Male and female psychoactive substance dependent victims differed in several characteristics, possibly reflecting a gender divergence in substance use patterns in general, and a difference in the role of substance use disorders in the suicidal process. Females had more diagnoses of prescribed drugs, and, especially in the younger population, more borderline personality disorders. Somewhat unexpectedly, the sexes did not differ in other comorbid diagnoses, but symptoms of other psychiatric disorders preceded the psychoactive substance dependence more often among females. Females with dependence on a substance other than alcohol had more axis I comorbidity than solely alcohol dependent females.

Substance use disorders

Among PSD suicide victims substance dependence usually concerned alcohol, although female subjects were more frequently dependent on prescribed drugs alone or with alcohol use disorders than males. This probably reflects typical patterns of substance use disorders in Finland in the eighties. Similar sex differences have been reported in general and clinical living populations elsewhere (Gomberg 1986, Ross 1989). In this study female victims with prescribed drug use disorders had more axis I morbidity than those solely alcohol dependent, which accords with reports from general and treatment populations among which the abuse of both alcohol and other drugs is associated with more severe psychiatric problems than pure alcohol abuse (Ross et al 1988, Regier et al 1990).

Psychoactive substance dependence was found in 43% of the sample males and 15% of all the female suicides which contrasts with the findings of the San Diego Suicide Study (Rich et al 1989). Moreover, none of the present cases received a diagnosis of illicit drug abuse or dependence. However, this does not exclude the possibility of the occasional use of illicit drugs. It is estimated that they were not widely used in Finland during the study period, whereas the situation has probably changed during the nineties (Hakkarainen 1994, Poikolainen 1995). The differences between the present study population and that of Rich and colleagues most likely reflect differences in substance use patterns in general during the study periods in San Diego and Finland. This should be noted with regard to the generalizability of our findings.

Age and sociodemographic features

Previous studies of suicide among predominantly male alcohol dependent subjects have viewed it as a relatively long term complication of the dependence (Roy & Linnoila 1986). In the present female population alcohol dependent female suicide victims were younger than alcohol dependent males. Females were also more likely to be upper and

lower-level employees, while males were slightly more often manual workers. Some studies report similar differences in living alcoholic populations (Morrissey & Schuckit 1980). However, among the female suicides studied here better occupational status tended to be characteristic of older subjects, who may represent a subgroup distinct from younger females with frequent BPD, better suicide communication and multiple previous suicide attempts. This suggests a heterogeneity of characteristics among female victims with substance use disorders.

Axis I comorbidity

Affective disorders were the most common comorbid disorders among both sexes. They were also more common in the older age groups, which accords with the findings of Conwell et al (1996). The comorbidity pattern of our PSD victims differs from that in living alcoholics: Heltzer and Pryzbeck (1988) found more "dual diagnoses" and comorbid major depression among living female than male alcoholics. However, comorbid axis I disorder symptoms preceded the substance use disorder more often among females, which accords with the literature on male and female alcoholism (Morrissey & Schuckit 1980, Hesselbrock et al 1985, Heltzer & Pryzbeck 1988, Kessler et al 1996) and may reflect a different role of PSD between the sexes among completed suicides. This, however, needs to be verified in further studies with living control subjects.

Axis II comorbidity

Cluster B personality disorders formed the majority of Axis II disorders in both sexes. Among female victims these were most often BPD subjects and clustered in the younger population. Comorbid substance abuse, affective disorders and BPD are known to associate with suicidal behaviour and increased suicide risk (Isometsä et al 1996, Cheng et al 1997). A history of suicide attempts predicts poor general outcome and suicide among BPD patients (Paris et al 1989, Mehlum et al 1994). It seems that some of our female victims had suffered from several known predictors of poor outcome and suicide, which resulted in suicide at relatively young ages.

8.2.2. Treatment (study II)

Within a year before death, up to two thirds of psychoactive substance dependent suicide victims contacted primary health care or general medical services, and roughly a third of the males and two thirds of the females received psychiatric care. However, at the time of death, problems with substance use were usually not recognised in an ongoing treatment contact, although the victims, particularly females, had had contacts with several organisations during the last year. The use of facilities and the characteristics associating with psychiatric treatment differed by sex. In their lifetime, substance dependent suicide victims utilised specific substance use treatment services less than other services.

Although the vast majority of substance dependent victims suffer from comorbid psychiatric disorders, only a minority receive psychiatric care within the month before their suicide. The findings suggest that this highly morbid population of suicide victims do not receive sufficient psychiatric care before suicide, and that when they do, their needs may not be properly met. Furthermore, although at least half of our subjects were in contact with some health care during the last month, rather few - particularly men - had received any help for substance use problems. The relatively low attendance at specific treatments may be because treatment contacts are spread across several segregated services, none of which assumes primary responsibility.

In Finland, as in many other countries, substance abuse and psychiatric treatment services often operate in separate units (Drake et al 1996, Mäkelä 1998). This kind of segregation has been criticised as unhelpful for the patient, as it requires them to be classified with either a primarily psychiatric or addictive disorder (Rounsaville et al 1987, Kessler et al 1996, Alaja et al 1997). In our suicide population some victims had utilised several services concurrently, possibly leading to a lack of proper follow-up in any facility. For the purposes of suicide prevention it would seem reasonable to try to recognise multiple psychiatric and substance use problems in psychiatric settings, and to develop treatment strategies for these subjects. Generally, patients with multiple psychiatric disorders are regarded as more difficult to treat than those with pure disorders (Rounsaville et al 1987, GAP 1991). Furthermore, substance use disorders have been seen as a psychiatric priority (GAP 1991, Hanna & Grant 1997). According to our findings, substance dependent females are better at contacting psychiatric facilities before suicide, whereas males tend to contact primary health care. However, it seems that the problems of females are not fully recognised in spite of these contacts (Hanna & Grant 1997), while males should be referred to appropriate psychiatric treatment more often (GAP 1991).

8.3. Adolescent victims with subthreshold or diagnosed alcohol misuse

The frequency (42 %) of SDAM in this study was somewhat higher than the rates (22 % - 37 %) of alcohol abuse or dependence diagnoses by DSM-III classification in previous psychological autopsy studies (Brent et al 1988, Brent et al 1993, Shaffer et al 1996), and higher than the 20 % frequency of "alcohol use enough to affect the victims' lives" in the study by Eisele and coworkers (1987). Shafii et al (1985), however, reported a much higher frequency (70 %) of "frequent use of alcohol or nonprescribed drugs" in adolescent victims. Other notable disparities between the present and previous studies - mainly from the United States - are our lower frequency of misuse of substances other than alcohol, and the fact that all adolescent victims who had misused drugs had also misused alcohol. These findings probably reflect the substance use patterns prevailing in Finland during the eighties (Hakkarainen 1994).

As expected, a higher proportion of victims with SDAM committed suicide under the influence of alcohol and were also heavily intoxicated. Nevertheless, a large proportion of the others had also consumed alcohol at the time of the act. SDAM victims were frequently intoxicated at the time of suicide almost regardless of its timing in the week. Compared to others, however, their suicides tended to take place during weekends, suggesting that a pattern of weekend drinking among SDAM victims directly contributed to their suicides. In those with no SDAM the suicide rate showed no weekly pattern, but the victims were more likely to be intoxicated during weekend suicides. This certainly again reflects a typical pattern of alcohol use, although as it probably involved less frequency and smaller amounts with less disinhibiting and dysphoric power, it had no effect on the weekly variation in suicide rate. This finding is in agreement with a case-control study by Bukstein and colleagues (1993), which identified current active substance abuse as a risk factor for completed suicide among adolescents with substance abuse.

Socioenvironmental circumstances, such as family history of suicidal behaviour and poor parent-child communication, are reportedly risk factors for adolescent suicides (Gould et al 1996). In this study, a larger proportion of victims with than without SDAM came from unstable family backgrounds, which accords with the findings of Runeson (1990).

In a study by Shaffer et al (1996) of 120 adolescent suicides, substance or alcohol abuse was almost invariably associated with either a mood or a disruptive disorder, or both. Likewise, in this study three quarters of victims with SDAM had either a mood disorder or an antisocial disorder (conduct disorder or ASPD). However, at variance with that study, but consistent with another psychological autopsy study (Brent et al 1993), the majority of our cases had mood disorders predating SDAM. This is also congruent with findings from studies among high school and college students, which revealed that alcohol disorders followed rather than preceded the onset of other psychiatric disorders (Deykin et al 1987, Rohde et al 1996). However, due to the second-hand nature of data collection in our study, the results have to be interpreted with caution.

Adolescent victims with SDAM were significantly more likely to demonstrate antisocial behaviour (conduct disorder or ASPD, or convictions) than the others. This may be suggestive of early onset alcoholism, where antisocial behaviour, violence, depression, suicide attempts and paternal alcoholism are reportedly more common than in those with a later onset (Cloninger et al 1981, Buydens-Branchey et al 1989).

Interpersonal losses and conflicts as well as problems with the law, are common precipitants in serious suicide attempts and completed suicides among adolescents (Gould et al 1996, Beautrais et al 1997). Precipitating life events were identifiable in almost all of our study subjects, but the mean number of stressors was higher among those with SDAM. This accords with what is known about alcohol use disorders in adult suicide populations (Murphy 1992, Heikkinen

et al 1994). Although some of the events may have resulted from the SDAM victims' more unstable lifestyle, the finding probably also reflects their increased vulnerability to several stressors (Murphy 1992).

The more severe psychosocial impairment during the year preceding suicide among victims with SDAM is likely to reflect their greater tendency to psychiatric comorbidity, and particularly to personality disorders, generating maladaptive patterns in their long-term functioning. Despite this, they had received no more psychiatric treatment than the others, but rather tended to have received less during the last month. This may indicate problems in the treatment of dual diagnosed adults, as well as adolescents (Belfer 1993). Furthermore, lack of proper follow-up and segregation of treatment services may be a particular problem for adolescent subjects with alcohol-related as well as social or legal problems.

8.4. Alcohol misusers in the total population of suicides

8.4.1. Sociodemographic and clinical characteristics

Among all suicides during a one-year period in Finland those with alcohol misuse differed from non-misusers in several characteristics that seemed to indicate somewhat better lifetime psychosocial adjustment, but also more problems close to suicide in their interpersonal life and occupation. The alcohol misusers tended to be younger, male, more frequently divorced or separated from a marriage, and to have children. They were more likely to have worked, usually in manual jobs, whereas the non-misusers were very often retired. In accordance with observations by Hayward et al (1992), the misusers had received psychiatric treatment less often. These findings suggest a somewhat higher psychosocial status among the misusers, and perhaps a smaller burden of longstanding psychiatric morbidity and psychosocial stress. However, they were also more likely to have experienced disruption in their lives and committed suicide while drunk. The problems of the misusers in the areas of work, finance and personal relationships were probably at least partly a consequence of their excessive drinking. Moreover, the corrosive influence of habitual misuse may have heightened the vulnerability to suicide in cases with recent adversity. As an example, 75% had regularly worked at some time, but only half were currently employed, a quarter having experienced unemployment within the last three months. Such findings in the suicidal process of an alcohol misuser imply a relatively smaller loading of longstanding contributing factors other than problematic alcohol use per se, with its both short and long term consequences.

With regard to the final act of suicide, alcohol has been suggested to impair judgement, cause impulsivity and contribute to the choice of method (Welte et al 1988, Hayward et al 1992, Öhberg et al 1996). In spite of our finding that the misusers of both sexes had far less often than others been prescribed psychopharmacological medication, death

by intoxication with a liquid or solid substance tended to characterise their suicides. The possible potentiating effect of alcohol on the lethality of another substance used for suicide may partly explain these intoxication suicides as well as the high proportion of misusers with alcohol in the blood.

The supplementary analysis within the random sample showed that the alcohol misusers in this study resembled alcohol dependent suicide victims studied earlier (Murphy & Robins 1967, Murphy 1992, Heikkinen et al 1994), and thus partly confirmed these findings in an unselected nationwide population. Recent interpersonal and employment problems were associated with alcohol misuse, which also accords with previous studies. The misusers had more events possibly dependent on their own behaviour, whereas the non-misusers' problems were slightly more often independent of their own action. These findings suggest that difficulties in alcohol misusers' lives frequently result from the psychosocial disruption in the structure of their personal life caused by excessive drinking. Moreover, a specific vulnerability and current drinking may well be important contributors to the final act (Murphy et al 1992).

According to Mäkelä (1996), the suicide rate of younger Finnish males is associated with prevailing levels of alcohol consumption, and similar findings have been reported elsewhere (Smart & Mann 1990, Gruenewald et al 1995, Caces & Harford 1998). In Finland, heavy drinking and intoxication account for a large proportion of overall alcohol consumption and alcohol related problems concentrate in a heavy drinking minority (Simpura 1987). The alcohol misusing suicide victims in our nationwide psychological autopsy study were almost exclusively male and three quarters were younger than 50 years. While it is tempting to see them as a key group with regard to variations in suicide rates, they had other psychiatric morbidity (Henriksson et al 1993), recent adverse changes and disintegration in their life structure, besides a history of abundant drinking. Thus there were probably multiple contributors to the suicidal process in this group, and alcohol misuse may have played a central role. When combined with psychiatric disorders, alcohol misuse probably predisposes an individual to a particular type of suicide process characterised by disturbances in life course. In this sense alcohol consumption - via alcohol related problems among individuals at risk - may have the potential to cause variation in suicide rates.

It is likely that the population of non-misusers consisted of heterogeneous but basically more psychiatrically ill victims than the misusers. The supplementary analysis within the diagnosed random sample confirms this, revealing more major depressive disorder and non-organic psychotic disorders among the non-misusers. Furthermore, antipsychotic and benzodiazepine psychopharmacological treatments were more common among the non-misusers. The association of recent unemployment with alcohol intoxication among the non-misusers may reflect reactive drinking to adversity among some individuals, which is interesting in the light of general reports on unemployment, suicide and psychiatric illness (Pritchard 1992, Fergusson 1997). Another interesting finding is that the intoxicated non-misusers tended to

be younger than those who were not, probably reflecting the fact that heavy and destructive drinking is more common in younger age groups.

8.4.2. Employment status and weekly variation of suicides

There was a marked difference in the weekday vs. weekend distribution of suicides between the employed and non-employed alcohol misusers. The difference was statistically highly significant and indicates a weekday-weekend variation in suicide among the employed misusers. Employment status was found to influence the timing of suicide among those classified as misusers, which could be due to different weekly patterns of misuse between those employed and those not. No peak was found in suicides on Mondays.

The misusers had alcohol in their blood regardless of the time of week of the suicide. This leads to the interpretation that among employed misusers regular work associates with harmful drinking during the weekends, a pattern reflected in the weekly variation of the misuser suicides. The weekly pattern of misuse is probably different for the employed and non-employed, as the latter may be more prone to drinking during weekdays. Among the misusers active employment may act as a stabilising factor and protect against self-destructive heavy alcohol use on working days, whereas the weekend offers freedom for alcohol use. Problems related to addiction tend to manifest in leisure time.

8.5. Conclusions

8.5.1. Alcohol and other substance misuse in suicide

The different characteristics of male and female psychoactive substance dependent suicide victims (study I) imply that previous findings from (predominantly male) substance dependent suicides cannot be directly generalised to females. Substance dependent female victims probably represent a more heterogeneous group in terms of age, psychiatric morbidity, socioeconomic features, and in patterns of substance use disorders with regard to the use of psychotropic medication.

Victims with psychoactive substance dependence usually suffer from comorbid psychiatric disorders and utilise various health care services before suicide (study II). The treatment contacts are spread across different facilities, and remarkably few subjects, especially males, have contacts with psychiatric care during the last month. Problems with substance abuse are often not recognised or treated before suicide. Males and females use treatment facilities differently before suicide, which should be taken into account when planning preventive efforts. The high proportion of lifetime contacts with psychiatric facilities implies the need to focus on proper follow-up and recognition of substance abuse problems in psychiatric care.

Compared to other adolescent victims, those with subthreshold or diagnosed misuse of alcohol suffer from more severe and longstanding psychiatric morbidity and psychosocial impairment, and are more likely to have antisocial behaviour and disturbed family backgrounds (study III). Nevertheless, these victims receive no more psychiatric treatment than others. The findings suggest that in young people alcohol use at levels not yet fulfilling the categorical diagnostic criteria of alcohol abuse or dependence may be indicative of serious problems and symptoms that can enhance the suicidal process. Moreover, the act of using alcohol in the context of misuse during weekends appears to contribute to the final suicidal act among adolescents with subthreshold or diagnosed alcohol misuse.

In a total population of suicides alcohol misusers are more likely to be male, to have had relatively good psychosocial coping until recent disruption - particularly by unemployment and interpersonal adversities - and to have performed their final act in a state of drunkenness (study IV). Their difficulties seem to be partly a consequence of their own behaviour, frequently excessive alcohol use. They often communicate their suicidal intent and choose overdose as the method, the lethality of which is likely to be enhanced by inebriation. Alcohol misuse may well be an important contributing factor to the suicidal process of a considerable proportion of suicide completers, and as such should justify more attention in the context of alcohol use and suicide risk. The clustering of suicides at weekends among employed alcohol misusers is probably explained by a weekly pattern in the use of alcohol, which suggests that besides the

established risk factors for suicide among alcohol misusers, the act of using alcohol per se also contributes to the suicidal act (study V).

Overall, alcohol and other substances play an important role in the suicide process of a substantial proportion of suicide victims. This role, however, differs to some extent by age and sex. Long term problems with alcohol and more recent problems with mental health and psychosocial coping seem characteristic for middle aged males, whereas among females substance use may indicate multiple psychiatric problems, including suicidal behaviour, already earlier in the life course. Among adolescent suicide victims alcohol misuse is relatively often preceded by parental problems and other mental disorders, and associates with recent adversities, particularly conflicts with discipline and law. Their misuse of alcohol seems to indicate an overall pathological course of psychiatric and psychosocial problems. Moreover, the weekly variation of suicides according to drinking patterns among adolescents and those employed, alcohol intoxication per se contributes at least to the suicides of those who already misuse alcohol.

8.5.2. Implications for prevention

The findings of this study should have several implications for suicide prevention. Of particular importance would seem to be proper recognition and assessment of substance use disorders in treatment contacts by health and other care professionals. A special group in this sense are younger females with other psychiatric morbidity, whose substance use problems may be at risk of being underestimated along with the suicidal tendencies they exhibit. The majority of both sexes communicate their suicidal intent before the final act, and three quarters of females have previous attempts. This kind of suicidal behaviour in the context of abundant and frequent substance use should provoke attention with regard to the possibility of serious suicide risk. Treatment strategies at the individual and organisational level should focus on active efforts for substance use assessment, management of care, and recognition and adequate treatment of other psychiatric disorders and suicidal symptoms. As suggested in previous literature, patients with substance use and other comorbid psychiatric disorders should perhaps be managed in facilities with special knowledge of dual-diagnosis patients. The role of new pharmacological treatments for substance use disorders remains to be studied in this regard.

The present findings suggest that there are important sex differences in characteristics of those who eventually commit suicide. The use of treatment facilities differs between males and females, and there is more heterogeneity among females. This knowledge should be incorporated in planning strategies on the organisational level as well as in individual cases. More explicitly, it may well be that the substance use problems females express in treatment contacts do not become clearly recognised, taken seriously, or appropriately treated. The reluctance of females to use organised substance use services may be partly due to their male-oriented management or strategies. On the other hand, there is

reason to believe that males suffering from substance use problems are too seldom offered psychiatric evaluation whenever and if they seek help, which may often occur in substance use treatment facilities.

In cases of frequent and abundant drinking psychosocial factors should receive particular attention in terms of recent, more or less self-inflicted adversities in marital and occupational life. Where there is a regular rhythm of working, weekends may involve bouts of heavy drinking with a probable risk for suicide in the context of an underlying suicidal tendency. This study also highlights the indicatory role among adolescents of alcohol use for diverse and multiple psychiatric and psychosocial problems, which should alert to potential suicide risk. Heavy drinking occurrences during weekends among alcohol misusing adolescents may represent a time of heightened risk for suicide, particularly among those with a predisposition. This should be recognised at least in emergency and other treatment contacts.

9. SUMMARY

In the National Suicide Prevention Project in Finland a total nationwide population of completed suicides during one year was investigated by the psychological autopsy method. The thorough data collection included police and medicolegal examinations, interviews of the relatives and attending health and other care professionals, and the gathering of police, social agency and medical records. In the present study the role of alcohol and other substance misuse in suicide was investigated. Subjects with a DSM-III-R psychoactive substance dependence were male (N=68) victims from a diagnostic random sample (N=229) of the total suicide population and female (N=49) victims from the total female suicide population (N=320), and they were compared in the search for previously unknown sex-differences in their characteristics (study I). In addition, their treatment careers were thoroughly evaluated by sex (study II). Adolescent suicide victims with subthreshold or DSM-III-R diagnosed alcohol misuse (N=44) were characterised by comparison with adolescent victims with no apparent alcohol misuse (N=62) (study III). From the total population of 1397 suicides, a separate informant-based estimate of the victim's misuse of alcohol was made in cases of sufficient and reliable information (N=997), and the characteristics of the misusers (N=349) and nonmisusers (N=648) were compared (studies IV-V).

Male and female suicide victims with a DSM-III-R psychoactive substance dependence (PSD) had comorbid axis I-III disorders in most cases (91% and 96%, respectively). Among females the age of onset of a comorbid axis I disorder preceded the substance dependence more often than among males (45% vs 18%). Females were more likely to have prescribed drug use disorders (37% vs 10%), which associated with anxiety and depressive disorders. The sexes also differed in the age distribution of personality disorders, which were relatively common among younger females and usually constituted borderline personality disorders among them. Generally, female victims with PSD seemed to represent a more heterogeneous group than males in terms of age, psychiatric morbidity, and socioeconomic features. Within the year before suicide up to two thirds of PSD victims had contacted primary health care or general medical services, and approximately one third of males and two thirds of females had received psychiatric care. However, in only one sixth of the males and one third of the females were substance use problems currently recognised, although the suicide victims, particularly females, had had contacts with several organisations during the last year. In their lifetime, PSD suicide victims utilised specific substance use services less often than other services.

Among adolescents, 42% were estimated to have suffered from subdiagnostic or diagnosed alcohol misuse (SDAM), and this associated with more severe psychopathology in terms of comorbid categorical DSM-III-R diagnoses, disturbed family backgrounds, precipitating life-events as stressors and more severe psychosocial impairment. Furthermore, victims with SDAM were more often alcohol intoxicated at the time of suicide, which appeared to be

a weekend more often among them than others, indicating a contribution of a weekend oriented drinking pattern to their final act of suicide.

Alcohol misusing victims in the total suicide population differed from the nonmisusing victims by being younger, more often male (91% vs 70%), having more often had an active working career, but being more often (25% vs 8%) recently unemployed. Overall, they seemed to have more recent adverse life events before suicide that were possibly consequent on their own behaviour. They had also more often been separated or divorced from a marriage, and were more likely to have children, which together with fewer psychiatric contacts indicates a better long term psychosocial coping that had recently been disrupted, possibly due to problems with alcohol use. Compared to the nonemployed, employed misusers committed suicide more often during weekends (52% vs 34%) probably because of a weekly drinking pattern based on regular work during weekdays and a risk time for drinking during weekends.

In conclusion, alcohol and other substance misuse, in terms of either categorical DSM-III-R psychoactive substance dependence or habitual and frequent alcohol inebriation contribute to the suicide process in various ways. The role of alcohol and other substance misuse varies by age and gender, ranging from an indicator or source of short and long term psychosocial problems during the life course to a severe dependence syndrome with comorbid other psychiatric disorders. The treatment contacts of suicide completers with alcohol and other substance misuse tend to be irregular before suicide and problems with substance use are often not recognised. In addition, alcohol intoxication per se may act as a catalyst in the final suicidal act of the misusers in the form of inebriation, and possibly also by strengthening the lethality of another intoxicating substance. These contributions, in addition to the morbidity of substance use disorders as psychiatric illnesses, should be clearly recognised, and appropriate treatment with proper follow-up should be assessed and managed in health and other care contacts among subjects with alcohol or other substance misuse.

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